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Abstract

The emphasis on location-specific factors, such as climate or disease environment, in the explanation of development outcomes in colonial societies implicitly assumes that settler groups were homogenous. Using tax records, this paper shows that the French Huguenots who immigrated to Dutch South Africa at the end of the 17th century were more productive wine-makers than the already established non-French farmers. Standard factors of production usually associated with faster growth do not explain the differences between the two groups. We posit that the skills of the Huguenots – the ability to make quality wines – provided a sustainable competitive advantage that not only explains initial but persistent productivity differences. We test this hypothesis by dividing the French settlers into two groups – those originating from wine regions, and those from wheat regions – and comparing them with other settler groups. Potential differences between the French (overall) and the Dutch may be attributable to institutional and cultural differences, while variations within the French group are more likely to be skill-related. This intuitive but important insight – that home-country production determines settler-society productivity, even in later generations – sheds new light on our understanding of how newly-settled colonial societies develop, and of the importance of knowledge and skills in economic growth.

Keywords: South Africa, Cape Colony, French Huguenots, VOC, wine, slaves

JEL Codes: N37, D31, D63

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I. INTRODUCTION

More recent investigations into the causes of cross-country growth performance identify institutions as one of the fundamental causes of economic growth. Proponents of this view argue that institutions influence the incentives for the productive use of resources, which in turn affects the future distribution of resources. Furthermore, capital accumulation, quantity and quality of labour, and innovation and technology are merely the embodiments or proximate causes of growth and are themselves influenced by institutions (Acemoglu et al. 2005). Colonial societies are the setting for three important contributions to the field. Acemoglu, Johnson and Robinson (2001) (AJR hereafter) posit that settler mortality determined the institutional outcomes of colonies – low settler mortality ensured that a settler society developed with institutions favourable for growth, while high settler mortality resulted in growth-debilitating, extractive institutions. Engerman and Sokoloff (2000; 2000; 2005) emphasise the importance of initial factor endowments – climate, soil quality and the availability of a large native population – in explaining the formation of different institutions, and consequently diverse growth trajectories. La Porta et al. (2008) show that the legal origins transplanted by the colonial powers created different incentives for investors which influenced financial development in colonies. Institutions are determined by local conditions in both the AJR and Engerman/Sokoloff hypotheses. Both theories and the empirical strategies by extension posit that settlers were, however, a homogenous group, and that variations only exist across the territories colonised. In the context of La Porta et al. (2008), colonial settlers only differed to the extent that legal origins are not the same in each territory; these institutions do not account for the role that various settler groups may have in the development of individual colonies.

The notion of homogenous settler groups (which is implicit in earlier work) is challenged by recent contributions which link the origin of settler migrations to explain modern development differences (Olsson and Hibbs 2005; Comin et al. 2010). The most recent contribution by Putterman and Weil (2010), for example, construct a migration matrix to show empirically that conditions in settlers' countries of origin in the year 1500 (technological, institutional or even geographical) possess high explanatory power in determining 2000 GDP differences between countries. Even here, homogeneity is assumed amongst settlers that originate within the same country borders.

This paper contributes to our understanding of the transmission of origin country conditions to settler welfare in the destination (settler) country. Instead of using cross-country measures to verify correlations between historical indicators and modern levels of development, we use historical micro-level production data of a specific region to identify the *mechanism* through which settler origin may influence the production function in a new setting. The arrival of French Huguenots in the newly settled Dutch Cape Colony is used as a natural experiment: this allows the analysis of two settler groups with different legal origins and cultures. To enable this type of analysis, it is necessary to hold all other possible unmeasured influences constant: throughout, the analysis is conducted in a setting where the local geography and institutions (which were introduced by Dutch East India Company (VOC[1] henceforth) rule) were identical for both the already settled European and new inflows of immigrant populations. We show that new French Huguenot migrants were more productive at viticulture than wheat farming. This impact persists for later generations of settlers. Given that in later generations the French were completely assimilated into Dutch society, culture and religion mattered little in explaining productivity and welfare: by implication, human capital (agricultural skills and wine-making secrets) was transferred within various groups across generations. This is not the case for wheat production where, controlling for other factors, any advantage the French may have disappears.

[1] *Verenigde Oostindische Companje*, the original Dutch version of the company name.

We develop this hypothesis further by splitting the French Huguenots into two groups, those originating from wine regions in France and those descended from wheat-farming regions. Given that both groups were French Huguenots, we would expect no differences in their use of capital and labour and in the formal and, especially, (possibly inherited) informal institutions that they were exposed to and their shared cultural identity. Their skills set is therefore exogenously determined by the geography within their homeland.

To demonstrate these propositions, we use data from the *opgaafrolle.* These constituted production figures which were recorded for the purposes of tax collection by the VOC. Detailed household-level inventories and records of agricultural activities were captured during most of the first Dutch occupation (1652-1795), and even in the early period of British rule (1795-1803). The data used in this analysis spans the period from 1700 to 1773.

Viticulture had important implications for the development trajectory of the Cape. While the shift in output from cattle and wheat to wine seems insignificant, viticulture required a different production function to cattle and (to some extent) wheat farming. Viticulture was associated with short periods of seasonally high labour demand. While the indigenous Khoekhoe could potentially be forced to supply their labour, Dutch policy prevented farmers from enslaving them. But the displacement of Khoesan settlements through frontier migration often left the Khoe with little alternative than to find work on European farms. This process was accelerated through the smallpox epidemic that ravaged the Cape Colony in 1713, and in its aftermath the Cape policy unit in 1717 proposed to the Lords XVII in Amsterdam to import slaves rather than encourage European immigration in order to satisfy the demand for labour. Wine making thus raised the demand for labour, encouraging slave imports and, as our earlier work shows, increasing inequality (Fourie and von Fintel 2010a; 2011). Following the Engerman-Sokoloff hypothesis, severe initial inequality sustains unequal institutions that result in a lower level of comparative development. South Africa today is a case in point.

Our results have important implications for the literature on colonial societies. Colonial institutions are shaped not only by whether settlers stay or not (as per AJR), which legal system they adopt (as per La Porta *et al.*), or their language, religion or beliefs, but by the set of skills, knowledge and experience brought from their country of origin. Even more specifically, this study identifies that regions within origin countries may differ, suggesting that cross-country comparisons may cloud much of the underlying impact that settlers have on the destination country. Skills affect labour productivity and their areas of specialisation in the adopted homeland. This determines the incentives for productive activity and shapes the future distribution of resources and growth potential of the colonial settlement.

II. SETTLERS, INSTITUTIONS AND HUMAN CAPITAL

While the debate still rages on as to which of geography or institutions explain economic development, it has arguably become more refined. Initial proponents of the geography-endowments hypothesis explained economic underdevelopment as a result of the quality of land, climate, the disease environment and labour availability, with each influencing the production technologies available. Temperate zones, for example, are considered to produce higher crop yields, provide more suitable living conditions and are more conducive for technology-augmenting production techniques vis-à-vis tropical zones (Diamond 1997; Bloom and Sachs 1998; Landes 1998; Sachs and Warner 2001; Sachs and Malaney 2002). Landlocked areas far from major markets also struggle to trade (Frankel and Romer 1999; Anderson and Van Wincoop 2004), while ruggedness may increase trade costs and inhibit growth (Nunn and Puga 2009).

Recently, the institutional perspective has emerged as the more dominant view. Building on the role of geography, Engerman and Sokoloff (2000; 2005) argue that initial factor endowments (such as climate, soil and labour availability) influence the early level of inequality. However, while it is not the geographic features that constrain or promote growth, the level of early inequality influences the type of political and economic institutions adopted. Severe inequality resulted in growth-debilitating institutions that preserved the ruling elite's hegemony by way of a narrow franchise, restricted property rights and poor access to education. Easterly (2007) empirically verifies the Engerman-Sokoloff hypothesis, finding that agricultural endowments predict inequality, and that inequality predicts development.

In a seminal contribution, Acemoglu, Johnson and Robinson (2001) posit that geography's impact on today's development levels manifests through the colonial disease environment. They argue that two types of colonisation strategies were adopted: a favourable disease environment (in dominantly tropical regions) yielded low settler mortality rates and consequently the adoption of institutions conducive to economic growth (such as the protection of property rights for a large and expanding settler population). A poor disease environment resulted in high rates of settler mortality, which caused the adoption of extractive institutions (such as power concentrated in the hands of a small elite). The US, Australia and New Zealand are examples of the former, while extractive institutions were mostly limited to the tropical countries of Congo, Ghana, Peru and Mexico to name a few. Moreover, AJR argue that these institutions remained after independence, influencing modern-day development levels. Easterly and Levine (2003) also show that measures of geography only explain cross-country differences in income today through their impact on institutions.

La Porta *et al.* (1997; 1998; 2008) were the first to emphasise factors specific to settlers' origins to explain cross-country variation in colonies' welfare. They show that the legal origins of settlers determine the path of economic development through the laws pertaining to, in part, investor protection, the quality of their implementation and ownership concentration. While not without criticism (Klerman and Mahoney 2007), Le Porta *et al.* move closer to identifying the *mechanisms* through which colonial institutions influence later economic performance.

The diverse explanations in the early attempts to understand cross-country variation in economic development have prompted further investigations to identify the causal mechanisms. Forced labour systems (Nunn 2008; Nunn and Wantchekon 2009; Dell 2010), property right systems (Banerjee and Iyer 2005), public investment and infrastructure (Huillery 2009), technology and innovation (Mokyr 2002; Comin, et al. 2010), culture (Guiso, et al. 2006; Tabellini 2008), religion (Jha 2008) and values (McCloskey 2006) all influence modern economic outcomes through institutions. Yet the connection between these institutions and settler migration (the vehicle by which these institutions migrate to new destinations) remains elusive. In an important contribution, Putterman and Weil (2010) show empirically that correlations between historical (year 1500) and current (year 2000) country-level economic performance measures improve significantly once settler migration between countries is accounted for. They construct a matrix of the year-1500 origins of the current population by country, which is used to convert historical cross-country measures into measures that instead capture the historical performance of the ancestors of the people who now live in each country. For example, whereas the technologies available to South Africa in the year 1500 would have reflected those available to the Khoesan and various Bantu tribes present in the region, the ancestry-adjusted technological variable (in addition to the Khoesan and Bantu technologies) includes technologies used by the Dutch, French, German, British, Indian and Indonesian settlers, slaves and servants that migrated to South Africa in the intervening 500 years. The ancestry-adjusted measures have higher explanatory power than the unadjusted indicators, which Putterman and Weil (2010) argue is proof of the importance of how country-of-origin settler differences matter for economic performance today. Yet, their ancestry adjustments improve the explanatory power of both geographic and institutional variables, which again masks the true mechanisms which

determine long-run development; their empirical results, for example, predict both a positive and large role for a variable measuring government structure (called state history, an institutional variable) and the rise of agriculture (a geographic variable), providing no hint as to underlying forces at play. They acknowledge this shortcoming: "(O)ne would want to know the specific channel through which this effect flows. For the most part, we consider this an issue for future research" (Putterman and Weil 2010:1652).

One such mechanism through which historical linkages influence modern development outcomes is education (or more broadly, human capital). Education seems to be a particularly persuasive factor, also drawing support from the new growth theory (Lucas 1988; Romer 1990; Becker 1993; Romer 1994). Glaeser et. al. (2004) point out that "human capital is a more basic source of growth than are the institutions". And in a detailed review of the empirical literature, Hanushek and Woesmann (2008) find that the relationship between education and earnings is remarkably robust, notably the quality of education. They insist that the relationship cannot be "explained away by a set of plausible alternative hypotheses about other forces of mechanisms that might lie behind the relationship".

History also provides a valuable laboratory to test education's impact on economic outcomes, although it requires innovative ways of quantification. Literacy rates are often the most reliable historical proxy for education, and are used widely to measure human capital's impact on development. Chaudhary, for example, identifies the causes of illiteracy in India in order to explain educational, and consequently economic, inequality (Chaudhary 2009; Chaudhary 2010). Baten and Van Zanden (2008) use book production as a proxy for literacy. They show that those regions that had greater book production, controlling for various other factors, also yielded higher economic growth rates. Another innovative technique to measure numeric competency is the prevalence of age heaping in various regions: poorly educated individuals in historical sources are found to round their age more often than the well-educated. These studies reveal similar positive influences of human capital accumulation on growth (A'Hearn et al. 2009; Crayen and Baten 2010).

Education also effects growth through institutions. Bolt and Bezemer (2009) show that an instrument for colonial human capital is more robust in explaining growth performance than instruments for extractive institutions, as per AJR. Their results are also stable when including measures of geography and legal origins in their specification. Of course, while all of these are theoretically plausible causes of growth, problems of endogeneity and multicollinearity haunt the researcher. Bhattacharyya (2009) uses dynamic panel regressions and finds that both human capital (embodied in schooling) and institutions cause growth. While Bhattacharyya (2009) does not explain the mechanism through which schooling might affect institutions and growth, two recent examples by Becker and Woessmann (2009) and Nunn (2009) illustrate how religious institutions may impact growth through education. Becker and Woessmann (2009) posit that Weber's hypothesis of the Protestant ethic is, in fact, captured in the higher literacy rates of the Protestants vis-à-vis Catholics. While Protestantism led to better economic performance (as per Weber), it also led to better education. Using evidence of Christian missionaries in Africa, Nunn (2009) shows that Protestant missionaries had a significant impact on Christian conversion rates, educational outcomes and economic performance indicators. Again, the link is through education.

Mostly because of data constraints, these studies often treat human capital (or education) as a homogenous concept by focussing on educational attainment levels only. In reality, of course, it is multi-faceted: human capital can be acquired in different ways (learning-by-doing, formal education), and consists of different skills or capabilities (innate talents, trained competencies or specialised knowledge acquisition). One distinction that is relevant for our later discussion is between skills and literacy, which we classify as two different capabilities. The former is associated with learning-by-doing and experience while the latter reflects formal education. We

also distinguish between specific skills and generic skills. This derives from the literature on capability theory (Langlois and Robertson 1993; Argyres 1996; Teece, et al. 1997; Nelson and Winter 2002) which goes beyond the standard production function approach to explain organisational structure. We adapt Jensen and Meckling's (1992) definition of "specific skills" to include only skills that are difficult (or costly) to transfer among agents; in comparison, "generic skills" are easy and inexpensive to transmit.[2] Reasons why "specific skills" are more difficult or expensive to acquire are not clear, but may be due to their technical nature, their applicability to limited work spaces and types, or simply the speed at which knowledge can be transferred. It may also be that they can be concealed. We return to these issues in the final sections.

III. THE HUGUENOTS

The first Europeans to settle in South Africa arrived in 1652 to establish a refreshment station for ships sailing between Europe and the East. The station was under command of the Dutch East India Company officer Jan van Riebeeck. His initial plan was to maintain a small community in and around the newly constructed fort to supply the passing ships with fresh produce, water and fuel for their journey ahead. Cattle could be traded with the indigenous Khoekhoe population.

Van Riebeeck soon realised the difficulty in supplying enough fresh produce for the Company servants and soldiers, and in 1657 he released nine Company officials to become free farmers. The farmers expanded into the interior and by the 1680s had already moved close to the Western mountain ranges that separate the Cape peninsula from the interior. Based on a European blueprint, Van Riebeeck had imagined labour-intensive agriculture with thousands of farmers on small plots in the Cape Peninsula. By the 1670s, however, cattle herding was the dominant economic activity of the farmers, with a small number of households covering a large territory.

At the same time, the Revocation of the Edict of Nantes in France in October 1685 increased the supply of labour in the Netherlands significantly. The Edict, instated in 1598 by Henry of Navarre, sought to create circumstances within which French Roman Catholics and Protestants could co-exist peacefully. With the murder of Henry of Navarre in 1610, however, religious intolerance and violence surfaced once more, which eventually culminated in the Revocation of the Edict in 1685. It is estimated that more than 400 000 Huguenots left France, settling in the neighbouring countries of Britain, Prussia, the Dutch Republic and Switzerland, or to the more remote French colonies of North America and the Cape Colony (Morison 1972).

Only 159 French Huguenots arrived in 1688 at the Cape, augmenting the small number of free farmers by nearly a third. Even given these new arrivals, the Colony expanded slowly. The supply of agricultural produce only exceeded the demand from local residents and ships after 1700. Due to frequent harvest failures and epidemics, it was another three decades before supply stabilised above demand. After the land west of the first mountain ranges had been exhausted, farmers moved into the interior, switching to pastoral farming and in many cases living an isolated and subsistence lifestyle.

While Van Riebeeck already harvested the first grapes on the slopes of Table Mountain in 1658, cattle and wheat farming dominated agricultural output until the turn of the century. The arrival of Huguenots, however, shifted production towards viticulture, also satisfying the demand for alcohol from the growing number of passing sailors and soldiers (and for profit from the mercantilist Dutch East India Company) (Boshoff and Fourie 2008; Boshoff and Fourie 2010). In

[2] Jensen and Meckling (1992) refer to specific versus general *knowledge*.

the following section, we show empirically that the Huguenots produced more wine – and did so more efficiently – than the other settlers.

The Huguenots that left France made significant contributions to the domestic economies wherever they settled. Scoville (1951; 1952; 1952) documents the impact of Huguenot immigration on England, Ireland, Holland, Germany and Switzerland, finding evidence of improvements in especially the textile (high-quality fabrics such as silk) and clothing (including hat-making) industries (Rothstein and Thornton 1960; Mathias 1975). Not only did they contribute directly to production, but they established schools, improved literacy and diffused knowledge through on-the-job training programmes in their adopted countries (O'Mullane 1946; Hornung 2010). Because of this, cities were eager to attract immigrants and provided various incentives to entice them to settle permanently.[3] Moreover, the en masse emigration of the wealthiest Huguenots had a highly detrimental impact on the French economy (Scoville 1953).

For these same reasons, Simon van der Stel, then commander of the Cape Colony, was eager to attract Huguenots to the Cape. He hoped to augment the existing settler population to ensure a stable supply of fresh produce for the Company's ships. While many Huguenots relied heavily on Company and Church support, struggling through the first few decades, the rapid growth in the wine industry during the eighteenth century suggests at least some tentative correlation between French arrival and output growth. It is therefore strange that few scholars have empirically investigated the impact of the French on Cape Colony production.

While the earlier historians speak in romantic terms of the French arrival – highlighting their significant demographic contribution to the Afrikaner people (Nathan 1939) – recent investigations into the early Cape economy have attributed less weight to the impact of the Huguenots (Guelke 1980; Schutte 1980; van Duin and Ross 1987; Giliomee 2003).These studies often even neglect to mention their economic impact. Nevertheless, in what is now the standard text on the French Huguenots in South Africa, Coertzen (1997) notes that before the Huguenots' arrival, the Dutch farmers (knowing little about wine-making) focused mostly on cattle and wheat production. It was only through the endeavours of the Company (notably the Commander Simon van der Stel) that wine production took off before the arrival of the Huguenots. On arrival, according to Coertzen (1997), the Huguenots did not all take up viticulture, mostly due to the slow return on investment and the immediate need to produce other goods for own consumption. Yet, from Company records it is clear that some farmers did pursue viticulture soon after settlement, notably those that "with some certainty could be linked to possessing some knowledge of viticulture" (Coertzen 1997:111). These were Isaac Taillefert, Pierre Joubert, Jacques Malan, François Retif, Josue Cellier, Paul Couvret and the three brothers, Pierre, Jacques and Abraham de Villiers.

The wine produced in the Cape Colony throughout the period of Dutch rule was widely considered to be of inferior quality to that of France.[4] For this reason many historians have downplayed the Huguenots role in the Cape wine industry (Bolsmann 2008). While there was some improvement in quality after Huguenot arrival (Coertzen 1997), the general consensus is that the few French viticulturalists were not necessarily better than their Dutch or German counterparts. While some Huguenot families seemed to have been very successful only two decades after arrival, others "moved backward and gave up when the droughts and plagues hit them" (Coertzen 1996). He attributes this to the "hard work and an enterprising spirit" of the successful farmers and, to some extent, marrying into wealthy families. The skills brought over from the homeland seem to have been relatively unimportant.

[3] Except in the case of Geneva, Switzerland, where there was a strong local opposition to their settlement.
[4] The notable exception being the sweet wines of Constantia which was sent to dignitaries across Europe and which Napoleon requested while in exile on St. Helena.

Some evidence does exist to support the notion that French Huguenots that settled elsewhere "exported" some knowledge of viticulture. Huguenots who settled in the American colonies (in contrast to those whom remained in Europe) tended to favour agriculture (and often viticulture). According to Hirsch (1930), French settlers in the Americas displayed an interest in viticulture from their earliest residence. While vine grew wild in the Southern colonies, Huguenots introduced its artificial culture, and "generous bounties were often bestowed for their industry in this branch of agriculture" (Hirsch 1930:4). According to Hirsch (1930), had a £250 000 bribe not been offered to the British Minister to the American Department in the late eighteenth century to withdraw his support from the American wine industries, "America might easily have become one of the greatest wine marts of the world and France's most daring rival" (Hirsch 1930:5).

In the following sections we consider the possible impact that the French settlers had on Cape Colony production of wine. Differentiating between French and non-French farmers, we show that French Huguenots produced more wine than their non-French compatriots and, controlling for a host of different inputs, maintained this advantage over time. We also split the French Huguenots into two groups: those originating from regions in France where wine was made versus those regions with little or no wine production. If we find that wine production was dominant amongst those farmers originating from regions in France which also produced wine, it supports our hypothesis that settler skills matter for colonial development.

IV. WINE SKILLS AND QUALITY

Which 'skills' matter for wine production? In general, three stages are involved when making wine: viticulture (or the cultivations of grapes), vinification (or how grapes turn into alcohol through the fermentation of sugar) and maturation. Wine-making therefore refers to both agriculture (viticulture, producing grapes) and manufacturing (vinification and maturation).

There is no doubt that the environment – climate, soil quality and grape varieties – is a key input in the first stage of production. According to Unwin (1996:34), "climatic conditions largely determine the parts of the world where it is possible to grow vines", thriving in areas with "long fairly hot summers and cool winters". The *terroir* – an inclusive term which relates to the slope, aspect, soils, altitude, humidity, shelter and drainage – was, at least before the twentieth century, the main factor influencing the character of a wine (Unwin 1996). Yet, skills are required throughout the production process. Given the importance of location, knowledge of *terroir* in selecting the area for cultivation is not a trivial skill of the viticulturalist. Moreover, the first stage of production requires knowledge of pruning, irrigation, fertilisation, cultivation and the timing of the harvest (Unwin 1996).

Different to wheat, the quality of wine is not necessarily correlated with the quantity of production. A successful grain farmer may measure his success in the number of *muids* (the unit of measure used by the VOC) reaped over the number of *muids* sown – the yield – and probably not in the *quality* of wheat produced. Put differently, bread produced from the wheat of a successful harvest would *taste* roughly similar to that of a bad harvest, with the difference only in quantity produced. The same is not true of wine. The quality of grapes produced depends on the *terroir*; while a farmer may produce a high quantity of grapes, the quality of it may be inadequate for wine production. Thus, different to the wheat farmer, the knowledge and expertise of the viticulturalist – choosing the ideal terrain and complimentary cultivar – is an essential first step in producing marketable wine.

The second stage – the 'manufacturing' of wine through vinification – and the third stage – maturation – practiced by an oenologist (wine-maker), require more specialised knowledge and

skills. As Spurrier and Dovaz (1983) remark: "The oenologist's mastery of vinification techniques is just as important as the grape variety, the soil and the climate ... A good oenologist can stamp a wine with distinction; a bad oenologist can produce a bad wine even from excellent grapes." Unwin (1996:50) confirms that "each *vigneron*, or wine maker, builds on local traditions ... and his or her own skills and experience to create a particular style of wine". These skills include pressing, sugaring, control of the fermentation process and ageing (or maturation).

In a description of the early eighteenth-century Cape Colony, traveller O.F. Mentzel (Mentzel 2008) notes that "the inhabitants of the Cape do not yet know how to treat their wine properly", although he points to some exceptions: "(I)nstead of the muscatel wines which are openly sold in Germany under this name, I prefer the Cape wines", notably the "red muscatel grape of which delicious red wine is made at Constantia". His detailed depiction of harvesting and wine-making suggests four elements that enable quality wine production: location ("those of Constantia taking first place, and those round the Tygerberg being the most inferior"), availability of a press or squeezer ("he who possesses neither press nor squeezer has everything pressed out by hand but obtains less wine as a result and can use what remains in the husks for brandy only"), and the availability of barrels ("many a farmer, if only he had enough barrels, would certainly like to own a press or at least a crusher, and thereby obtain more wine without the necessity of first distilling bad brandy [which is very difficult on many farms in any case through lack of firewood] ... but barrels are very scarce and expensive.") (Mentzel 2008:184-186). Land (location) and capital (availability of a press, squeezer and barrels) thus seems to be the critical constraint for wine-makers. Yet, Mentzel is most persuasive about the final element: preparation. In particular, he claims that preparation is the key between good and bad quality wine: "It must be understood that not all Cape wines are suitable for maturing. What is not good wine by nature and quality (or, as I think, *has not been properly prepared*) is not improved by long seasoning, but only becomes sharp and prickly as they say there. Really good, well prepared and well cellared Cape wines improve with age." Quality wine – wine that has longevity – is the result of knowledge and skills.

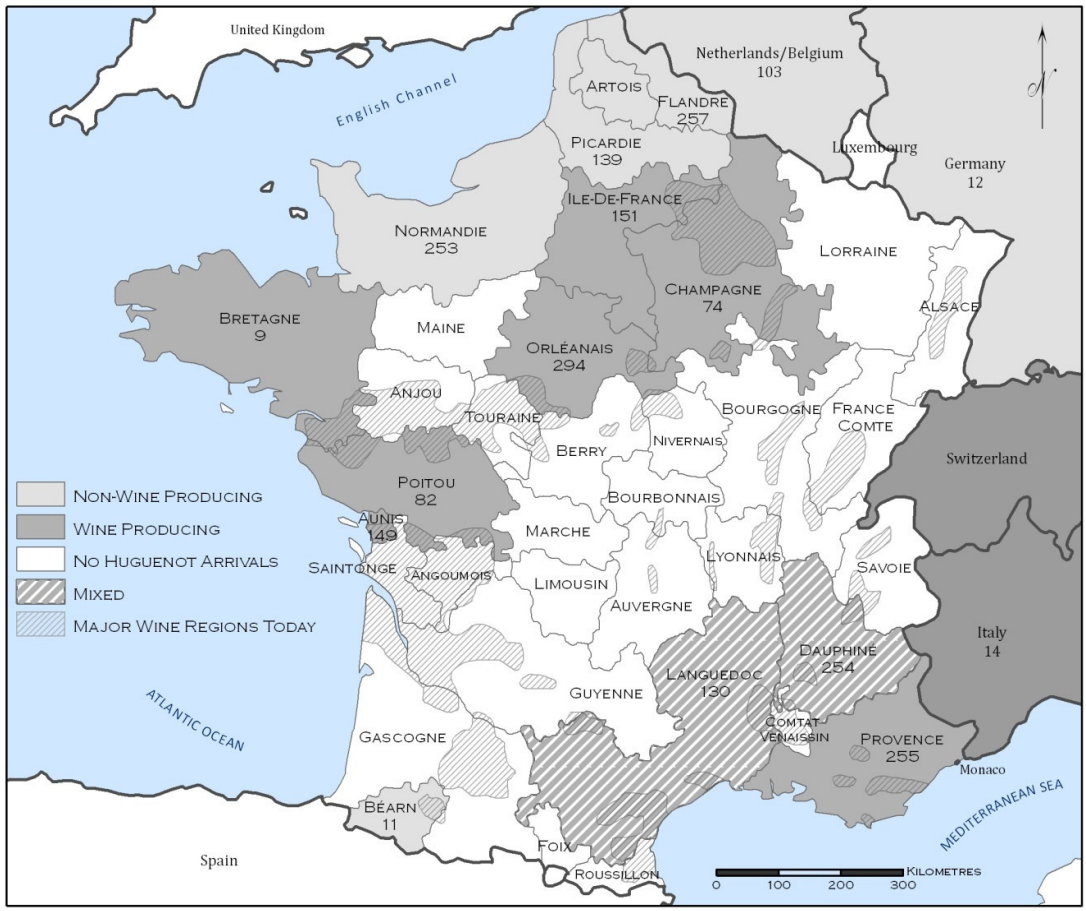
V. DATA

The *opgaafrolle* are household level censuses of all free men at the Cape that were drawn up annually for tax purposes by the Dutch East India Company. Fourteen of these *opgaafrolle* – spaced roughly every five years and subject to the quality of archival sources – have been converted into user-friendly format by the authors based on unpublished earlier work by historian Hans Heese.[5] A more complete description of these censuses can be found in Fourie and Von Fintel (2010).

Apart from household members, slaves and weapons, the censuses include primarily agricultural indicators: wheat, barley and rye sown and reaped, vines planted, wine produced, and cattle, sheep, horses and pigs owned. Most scholars agree that farmers underreported variables to evade Company taxation. Van Duin and Ross (1987) and Brunt (2008) have adjusted these figures upwards based on projections of consumption in the Cape Colony. Fourie (2011) argues that secondary and tertiary production was much greater than previously assumed and that, based on an analysis of probate inventories, a too narrow focus on agricultural indicators underestimates total production in the Cape Colony. Because we focus on comparative production between households, adjustments for aggregate discrepancies would not influence our results if we assume that underreporting occurred randomly across the groups we wish to compare.

[5] The following years are included: 1663, 1670, 1678, 1682, 1685, 1688, 1692, 1695, 1700, 1702, 1705, 1709, 1712, 1719, 1723, 1731, 1738, 1741, 1752, 1757, 1762 and 1773.

Figure 1: Provincial origin of French Huguenots



The analysis of settler performance is conducted by analysing household production of two outputs that dominated agriculture in the Cape colonial period: wheat and wine. These products were also traditionally cultivated in the settlers' respective countries of origin. To construct a Huguenot dummy variable, we trace the surnames of each of the 159 Huguenot arrivals for all the censuses after 1700.[6] A subset of French provinces traditionally excelled at wine production while other regions within that country, as well as Holland, did not enjoy this advantage. Their competitive advantage lay in the cultivation of wheat. A further sub-classification of the French is therefore introduced: surnames of settlers that were known to have come to the Cape from provinces in France that were wine-producing regions during the late seventeenth century were separated from those that were not. Here we follow the guidance of historians, primarily Boucher's *French Speakers at the Cape: The European background* (Boucher 1981). Figure 1 provides a visual presentation of these areas. The numbers provided on the map represent the number of Huguenot households in our dataset over all years in the sample. While we use historical sources to identify wine-producing regions, we also show that these are roughly correlated with Encyclopaedia Britannica's (2009) major French wine regions today. Throughout the rest of this paper, we label WH-farmers as the Huguenots that originate from

[6] Observations are presented at the household level and are classified by the surname of the household head. In most cases this person was male. As a result, if a settler with a Dutch surname had a French maternal grandfather, for instance, this descent is not recorded in this measure. This classification therefore only captures French descent that can be followed via a complete line of exclusively paternal links to an original Huguenot.

wine-producing provinces in France. NWH-farmers are Huguenots that originate from non-wine producing regions in France. NH-farmers are non-Huguenots.

A measure of formal human capital is also included in the French sub-sample. We obtain this from Dorothee Crayen and Jörg Baten's age-heaping estimates of human capital in pre-industrial France (Crayen and Baten 2010). This variable represents the extent of numeracy in the areas from which each of the French settlers came. Potentially more numerate farmers would perform better at their trade. However, numeracy (a more general skill) may not necessarily be relevant to farming, and in particular wine farming (which possibly requires specific knowledge or skills). In this manner we separate the impact of generic from specific skills on production, which we discuss later.

We construct a further dummy – Married – based on the work of Coertzen (1997) and Botha (1939) to indicate when settlers married Huguenot women, differentiating between those women who originated from wine-producing and non-wine producing regions.[7] Another dummy – Born abroad – indicates whether the relevant household head was a first generation Huguenot. Another indicator variable – Coertzen – separately classifies the descendents of the farmers named in Coertzen (1997). These farmers were the first Huguenots to plant vines at the Cape.

Given the predominance of agricultural indicators, we remove all non-farmers (those households with zero scores on all agricultural variables) from the 17 292 household observations in our dataset to exclusively focus on the farming population. There is a possibility that we remove rural farmers who simply had no farming assets on record. However, using only the farming population eliminates the possible bias in undercounting the productive contribution in urban Cape Town for which we have no data to indicate wealth (especially housing and trading stock).

VI. ESTIMATION & RESULTS

We commence with a descriptive analysis to establish whether differences did indeed exist between the various groups of farming settlers. Following this, an extensive set of regression models uncover the patterns that underlie the differences.

TABLE 1: Average household ownership per type of asset, farmer sample

Group	N		HH	Slaves	Knechts	Vines	Wine	Wheat Reaped	Cattle	Horses
NH	6848	M	3.57	5.04	0.15	3.80	2.28	22.98	35.55	5.80
		SD	2.86	8.46	0.77	11.54	7.64	64.22	65.07	10.08
NWH	1038	M	3.62	3.73	0.06	3.65	2.26	20.01	31.78	4.42
		SD	2.82	6.28	0.29	8.81	6.55	55.14	44.15	6.69
WH	1192	M	4.05	4.03	0.08	6.88	4.83	15.58	31.01	4.54
		SD	3.16	6.70	0.36	12.87	10.92	41.05	40.86	6.81
Total	9078	M	3.64	4.76	0.13	4.19	2.61	21.67	34.52	5.48
		SD	2.90	8.04	0.69	11.49	8.08	60.71	60.32	9.39

Notes: N = observations, HH = household size, M = mean, SD = standard deviation. Only farming households are included in the sample.

[7] This partially accounts for the fact that we can only identify Huguenots with completely paternal links to the original settler. However, this measure also only accounts for maternal links within the current generation and cannot trace Huguenot marriages higher up the family tree for a particular household.

Descriptive results

Table 1 provides the average household ownership by group over the full sample of censuses. On all measures, the three groups appear roughly similar, except for vines and wine, where the WH-farmers own on average more than double than the other two groups.

TABLE 2: Mean household per capita production levels, by population groups over time

	Wine (leaguers)			Wheat Reaped (*muids*)		
	NH	NWH	WH	NH	NWH	WH
1700	1.16	1.18	1.40	4.32	2.65	3.69
1709	0.98	0.55	0.83	17.45	7.30	8.14
1719	0.80	0.44	0.98	9.45	5.93	3.76
1731	0.75	0.55	1.13	8.68	6.65	5.46
1741	0.33	0.25	0.67	10.55	11.76	8.33
1752	0.49	0.54	1.18	4.72	3.54	4.20
1757	0.61	0.82	1.23	3.36	1.64	1.53
1773	0.63	0.93	1.89	3.73	5.51	2.82

NOTES: All figures are weighted to reflect the household size of each farmer. Only farming households are included in the sample.

The average household per capita wine and wheat production by group *over time* is provided in the Table 2. While no formal tests for mean differences are shown, it is evident that wine production was strongest amongst WH-farmers. This is illustrated in Figure 2, where the mean per capita household output for various years between 1700 and 1773 is plotted.

FIGURE 2: Mean household per capita output of wine, 1700-1773

Initially there appears to be little difference between the three groups. The first difference between Huguenots from wine-producing regions and the other two groups appear in 1719 and the disparity remains and increases towards the end of the period. Hence, there is already some evidence in the descriptive results that point to an increasing advantage in viticulture at the

Cape for Huguenots from wine-producing regions. While this suggests that the inherent advantage by region of descent was present from the beginning, these initial advantages amplified into persistently higher wine yields over almost a century. This is contrary to what one might expect, as later generations presumably do not inherit "more" of the advantage compared to the first arrivals of wine-producing Huguenots. We investigate this trend more closely in the regression models, when controls for these first arrivals are introduced.

A similar story emerges for wheat production, though now non-Huguenot settlers are the clear winners (see Table 2). This group had, however, already established their presence at the Cape before the arrival of the French, so that the initial advantage may only be a reflection of more mature farming operations. In most periods, the Huguenots from wine-producing regions appear to be the poorest wheat farmers, probably reflecting their focus towards wine production. However, the gap between the groups narrows across time, so that the rankings do not hold by the end of the period. This suggests that acquiring the necessary skills for successful wheat farming was not as costly as for wine making.

Model-based analysis
We estimate standard production functions of household mean per capita production to finally model the following process:

$$Y_{it} = \alpha + \beta Settler\ Group_{it} + \gamma K_{it} + \delta L_{it} + \theta A_{it} + \lambda_t + \varepsilon_{it} \quad \ldots (1)$$

where Y_{it} is household output per capita. *Settler Group*$_{it}$ represents our variables of interest – constituted by a dummy variable for Huguenots from wine-producing regions (WH) and one for Huguenots from non-wine producing regions (NWH), with other European settlers as a base group. In the analysis of the French sub-sample the base group is the NWH. K_{it} is a vector of controls for capital (represented here by slave labour), L_{it} is a vector of controls for paid labour (European Knechts), A_{it} is a vector of additional controls, including the effects of being an original Huguenot and marrying an original Huguenot wife. In the analysis of the French sub-sample this also includes non-numeracy to capture the effects of generic human capital. , λ_t is a set of time fixed effects and ε_{it} is a randomly distributed error term.

Controls for other important determinants of production are also introduced. Most notably, we control for inputs into the production process; in the case of wine, vines, and in the case of wheat reaped, wheat sown. Inputs also act as a proxy for land size. Slavery serves as one of the strongest predictors of success and most closely proxies for capital, while European labour (*knechts*) controls for labour. We also include cattle and horses as control variables; in addition to providing meat, oxen were required for productive activities such as ploughing and transportation, especially over the sandy terrain of the Cape peninsula. Horse ownership was initially limited, but increased substantially during the course of the eighteenth century (Fourie 2011). When estimating wine production, we also control for wheat reaped, and vice versa, to determine the complimentarity or substitutability of the two crops.

While the dummy variables directly measure the production premium of being descendant from various regions in France *vis-a-vis* other European settlers, we propose that they identify other effects more specifically.

β_j = *Production Premium*$_j$ = *E(Prod|Huguenot*$_j$*, K, L, A,) – E(Prod|NonHuguenot, K, L, A)*
= E(Prod|FR, Cape) – E(Prod|NL, Cape)
= Value of Specific Skills$_{WH}$ *+ Generic Human Capital Premium + Inherited Home Country Virtues Premium* ... (2)

where j = WH; NWH. *FR* and *NL* represent inherited (institutional, cultural, religious and geographical) characteristics from home countries, while *Cape* includes the same factors in the colony, in additional to *K, L* and *A.*

Arguably, this impact captures multiple effects simultaneously. The geography, culture, religion, legal origin and other institutions in the home country differed for these groups (captured by *FR* and *NL*). However, the institutions were identical for both groups at the Cape, and we control for selection into better agricultural regions with a set of Cape district dummies in *A* (see *Cape*). Further, the French culture and religion was largely assimilated into the Dutch culture, so that this impact too was equal for both groups. Therefore many "local" colonial differences are conditioned for either implicitly or directly in the regression estimates, so that the impact can be attributed almost completely to characteristics inherited from respective motherlands. While it is unlikely that home geography directly influenced production in the colony (particularly of much later generations), it nevertheless had an impact on the specific skills set that families inherited. Descendants from wine-producing regions were likely to have received a transfer of wine-producing skills. Hence, much of what we identify can be attributed to this type of human capital that is arguably important for the success of settlers in a new colony. Equation (1) shows that we in actual fact estimate an upperbound for the production premium of specific skills, assuming that the remaining influences of generic human capital and inherited home country virtues are small.

Simple ANOVA-type regressions are employed to confirm our hypothesis that Huguenots from wine-producing regions (WH) were more apt at producing wine than either their non-wine region Huguenot compatriots (NWH) or the non-Huguenots (in Table 2, the control group).

The strong economic and statistical significance on the WH-dummies throughout suggests that we cannot reject our hypothesis that specific skills were inherited and employed by the wine-descendant Huguenots. The coefficients suggest that Huguenots from wine-producing regions produce between 65% and 191% (depending on conditional variables) more wine than the non-Huguenots. Consequently, an upper-bound for the specific skills premium of the WH above the NH is 65%. The NWH dummy has mostly positive and significant coefficients (though deviations from this scenario are common), indicating that they too possessed an advantage in wine production relative to non-Huguenots. Consequently a "shared" French wine production premium apparently arises where estimates on both the NWH and WH dummies are positively significant (depending on what is controlled for). This could arguably be attributed to unobservable characteristics such as home country culture, institutions, human capital and religion. However, given that the WH premium exceeds that of the NWH, the evidence points to the fact that a specific skills premium in wine production also realises relative to the NWH. Furthermore, the NWH dummies become insignificant once production inputs (particularly vines in column (4)) are controlled for, while the same is not true for the WH dummy. As a result, we have effectively controlled for the differences between the NWH and the NH with local characteristics, so that it is unlikely that the influence of unobserved home country factors (shared by the WH and the NWH) drive the results. Consequently the remaining premium for the WH can be largely attributed to a specific set of skills. When we control for a direct maternal link to the WH through the positively significant marriage dummy (columns (6) and (7)), it is evident that the previous NWH premium turns into a significant disadvantage, suggesting that much of this group's advantage also came through the transfer of skills from marriage to a WH. However, it appears (through the negative NWH coefficient) that the non-Huguenots benefitted more from this transfer than the NWH. Consequently, all unexplained premia in wine production can be traced to links with the WH, suggesting that a specific skills component sourced in this group dominates our estimates.

Table 3: Dependent Variable: log(Wine per household member produced) (in leaguers), full farmer sample, OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
NWH	0.191	0.482***	0.510***	-0.128	-0.081	-0.343***	-0.516***
WH	1.721***	1.917***	1.793***	0.899***	1.030***	0.764***	0.653***
Slaves		0.168***	0.166***	0.044***	0.068***	0.068***	0.067***
Slaves*NWH			-0.011		-0.022	-0.016	-0.009
Slaves*WH			0.014		-0.074***	-0.073***	-0.066***
Knechts		0.416**	0.369**	0.008	0.096	0.093	0.106
*Knechts**NWH			1.468		-0.894	-0.84	-0.842
*Knechts**WH			2.218*		1.877**	2.004**	1.914**
Vines				0.132***	0.120***	0.120***	0.121***
Vines*NWH				0.112***	0.117***	0.117***	0.114***
Vines*WH				0.03	0.048**	0.048**	0.047**
Cattle				-0.001	-0.003*	-0.003*	-0.002
Wheat reaped				0.011***	0.010***	0.010***	0.010***
Horses				0.01	0.018	0.018	0.017
Stellenbosch					1.419***	1.403***	1.399***
Drakenstein					0.781***	0.726***	0.693***
Swellendam					0.125	0.095	0.067
Married to NWH						0.369***	0.380***
Married to WH						0.368***	0.421***
Born abroad							0.687***
Coertzen							-0.22
Y1702	-0.904***	-0.815***	-0.818***	-0.769***	-0.745***	-0.734***	-0.733***
Y1705	-0.815**	-0.741**	-0.744**	0.237	0.153	0.159	0.162
Y1709	-1.141***	-1.364***	-1.365***	-1.551***	-1.534***	-1.528***	-1.538***
Y1712	-1.652***	-1.942***	-1.947***	-1.947***	-1.954***	-1.943***	-1.932***
Y1719	-1.433***	-1.940***	-1.949***	-1.642***	-1.681***	-1.669***	-1.638***
Y1723	-1.547***	-2.093***	-2.102***	-1.633***	-1.652***	-1.643***	-1.585***
Y1731	-1.981***	-2.771***	-2.775***	-1.979***	-2.031***	-2.024***	-1.935***
Y1738	-2.682***	-3.733***	-3.738***	-2.716***	-2.772***	-2.756***	-2.655***
Y1741	-2.956***	-3.817***	-3.821***	-2.848***	-2.901***	-2.893***	-2.785***
Y1752	-2.996***	-3.219***	-3.229***	-2.743***	-2.800***	-2.790***	-2.659***
Y1757	-3.116***	-3.437***	-3.445***	-2.887***	-2.817***	-2.805***	-2.679***
Y1762	-2.907***	-3.364***	-3.378***	-2.880***	-2.938***	-2.930***	-2.805***
Y1773	-3.386***	-3.735***	-3.741***	-3.311***	-3.210***	-3.200***	-3.074***
Constant	-2.420***	-3.115***	-3.095***	-3.531***	-4.213***	-4.223***	-4.294***
R-squared	0.104	0.296	0.297	0.542	0.564	0.565	0.566
N	9078	9078	9078	9078	9078	9078	9078
F statistic	48.121	148.702	129.223	134.253	217.507	204.4	197.634

NOTES: NWH = Huguenots from non-wine producing regions. WH = Huguenots from wine-producing regions. Base category: non-Huguenots and the year 1700. Wheat reaped is measured in *muiden*, Vines in number of thousands. Converted to household per capita levels. Estimates are weighted by household size and significance levels are based on the use of robust standard errors.. *** denotes significance at the 1% significance level, ** at 5% and * at 10%.

While one might contend that virtues (religious, cultural and those rooted in other informal institutions) from the home country could still have an impact on family success in the colonial setting, these effects are likely to be dominated by the setting into which these people were transplanted. However, to remove this potential identification problem, we also analyse the Huguenot sub-sample separately to equalise each of these home country factors. This more focussed analysis also allows us to use French human capital data estimated by Crayen and Baten (2010). The non-numeracy scores are included to control for the "generic skills" component of human capital that was inherited from the home country. While this does not account for the generic human capital of individual households in the Cape, it does remove this component from the home country premium that we estimate.[8] Hence, the most clearly identified "specific skills" premium in production can be expressed as:

$$\beta = \text{Production Premium}_{WH} = E(Prod|WH, K, L, A, HC_{FR}) - E(Prod|NWH, K, L, A, HC_{FR})$$
$$= E(Prod|WH, Cape) - E(Prod|NWH, Cape) = \text{Value of Specific Skills}_{WH} \quad \ldots (3)$$

Table 4 presents a similar exercise, except that the sample is now limited to only the Huguenot population. The dummies on Huguenots from wine-producing regions are consistently large, positive and statistically significant, confirming our hypothesis of a discontinuity between the Huguenots from wine-producing regions and those from non-wine producing regions. Also, this effect seems to remain positive and large regardless of which factors are controlled for. These estimates implicitly control for both inherited home country and local colonial factors, so that the premium does not depend on culture, geography and institutions. As mentioned above, the critical factor that remains unobserved is the "current" generic human capital achieved by individual families at the Cape, though there is no reason to believe that the WH and NWH would have systematically different scores on this account. Hence, the specific wine making skills premium – of 114% relative to NWH farmers – remains the strongest explanation for the production premium.

The use of interaction terms in Tables 3 and 4 allow for the separation of production functions by settler origin. We find that vines (as the most important input into wine production) and slaves consistently yield positive and statistically significant coefficients. The first controls for the potentially unequal distribution of initial inputs, and also serves as a proxy for land size (Columns (4) to (7)). It is evident that an additional 1000 vines increased production by approximately 12% for the NH, with an additional 11% premium per 1000 vines for the NWH and a small difference from this figure for the WH. Given that the NWH planted the least vines on average, while the WH possessed the most (see Table 1), these results indicate that initially increasing returns to scale were realised, but that these started flattening off (as per Table 3, columns (4) – (6)). Table 3 reveals a statistically significant but small negative coefficient on the interaction term between slaves and the WH-dummy, suggesting that this group somehow did not gain as much as the non-Huguenots from employing slaves. This may be due to the specialisation of WH farmers in viticulture (as per Table 1), with slave use mostly restricted to the harvest season of one crop type. The literature seems to suggest that the intensive use of slavery could be attributed to the success of a number of elite wine farmers (see for instance, Fourie & von Fintel 2010b). However, the results here suggest that on aggregate, productive wine-makers tended to favour fewer not slaves per household and use them sub-optimally.[9]

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[8] Another premium that may remain is if Huguenots from wine-producing regions received more formal education *at the Cape*. Although the Huguenots were allowed a separate school initially, the Company soon abolished these benefits with the aim to integrate the Huguenots into Dutch society (Coertzen 1997). There is thus no evidence that formal education at the Cape differed between French and Dutch, or, more pertinently here, between the WH and NWH groups.

[9] Two points of concern: firstly, slaves may have been loaned to neighbouring farmers during off-peak season, and would the profit from such transactions would not be reflected in the opgaafrolle. Secondly, wine farmers may have rather used Khoe labour during the harvest season, as some evidence suggests

Table 4: Dependent Variable: log(Wine per household member produced) (in leaguers), full Huguenot sample, OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
WH	1.509***	1.430***	1.286***	0.998***	1.003***	1.029***	1.140***
Slaves		0.172***	0.156***	0.046***	0.052***	0.049***	0.029
Slaves*WH			0.025	-0.047**	-0.053**	-0.050**	-0.034
Knechts		2.148**	1.784	-0.541	-0.518	-0.357	2.651***
*Knechts**WH			0.785	2.490	2.559	2.292	-0.977
Vines				0.236***	0.237***	0.235***	0.257***
Vines*WH				-0.066*	-0.068**	-0.066**	-0.088
Cattle				-0.001	-0.001	-0.001	-0.003
Wheat reaped				0.011**	0.012**	0.013**	0.013*
Horses				0.002	0.000	0.004	0.045
Stellenbosch				1.076***	0.982***	0.923***	0.852*
Drakenstein				1.264***	1.158***	1.036***	0.962***
Swellendam				0.294	0.240	0.101	0.158
Married to NWH					0.426***	0.412**	0.33
Married to WH					0.380**	0.419***	0.285
Born abroad						1.019***	0.788***
Coertzen						-0.148	-0.158
Non-numeracy							0.003
Y1702	-1.341**	-1.303**	-1.315**	-1.077***	-1.065***	-1.059**	-1.170**
Y 1705	-1.468***	-1.432***	-1.440***	-0.024	-0.01	-0.005	-0.1
Y 1709	-1.529***	-1.713***	-1.714***	-1.815***	-1.819***	-1.809***	-1.903***
Y 1712	-2.277***	-2.714***	-2.711***	-2.712***	-2.713***	-2.637***	-2.846***
Y 1719	-1.967***	-2.619***	-2.611***	-1.772***	-1.784***	-1.554***	-1.574***
Y 1723	-1.911***	-2.524***	-2.526***	-1.528***	-1.539***	-1.159***	-1.123***
Y 1731	-2.151***	-3.158***	-3.154***	-1.903***	-1.924***	-1.366***	-1.373***
Y 1738	-3.059***	-4.422***	-4.408***	-2.924***	-2.930***	-2.290***	-2.341***
Y 1741	-3.060***	-4.271***	-4.255***	-2.773***	-2.789***	-2.107***	-2.241***
Y 1752	-3.047***	-3.744***	-3.739***	-2.978***	-2.993***	-2.245***	-2.497***
Y 1757	-3.390***	-4.133***	-4.128***	-3.070***	-3.086***	-2.333***	-2.565***
Y 1762	-2.910***	-3.872***	-3.871***	-3.243***	-3.262***	-2.515***	-2.826***
Y 1773	-3.573***	-4.407***	-4.405***	-3.601***	-3.612***	-2.858***	-3.160***
Constant	-1.977***	-2.119***	-2.038***	-4.397***	-4.634***	-5.270***	-5.376***
R-squared	0.092	0.212	0.213	0.602	0.604	0.611	0.596
N	2230	2230	2230	2230	2230	2230	1675
F statistic	16.349	26.165	23.828	95.992	90.772	91.677	70.06

NOTES: WH = Huguenots from wine-producing regions. Base category: Non-Wine Huguenots and the year 1700. Wheat reaped is measured in *muiden*, Vines in number of thousands. Converted to household per capita levels. Estimates are weighted by household size and significance levels are based on the use of robust standard errors.. *** denotes significance at the 1% significance level, ** at 5% and * at 10%.

(Worden 1985; Green 2010). Without data on the number of Khoe employed, this hypothesis is unverifiable.

The WH-group does gain a large productivity advantage through the use of *knechts*. While *knechts* do not seem to add to wine production for the two other groups (especially once controls for districts are introduced from Column (4) of Table 3), Huguenots originating from wine-producing regions produce as much as 191% more wine when an extra *knecht* is employed compared to non-Huguenots (Column (7) in Table 3), though there is no noticeable premium when compared to other the NWH (Table 4). This result may be attributable to returns to scale: in Table 1 it is evident that the WH had the smallest number of *knechts* on average, so that returns are still high at low number of *knechts*. However, given that the other groups did not possess substantially more *knechts* (with the average not even reaching a quarter per household within all groups), it may suggest that some other characteristic is at play.

Including wheat and cattle production in specification (4) in both Tables 3 and 4 accounts for the fact that the Huguenot advantage could have accrued to them because of complementarities between production types. It also quantifies the benefit of using capital invested in other modes of production for multiple purposes. Wheat production is robustly complementary to wine production (though the impact is small), while cattle production shows no significant complementarity. Similarly, we also control for the number of horses farmers possess, without any notable impact. More importantly, it is evident that the Huguenot advantage did not manifest as a spill-over from other production and the lessons learnt there. Rather, the specific skills related to this production type remained more important.

In column (5) of Table 3 and column (4) of Table 4 we introduce controls for regions of *settlement*, with the base category being Cape Town. These controls are introduced to account for the fact that the *quality* of land (as opposed to the *size* of farms, which is proxied for by vines, as above) may have differed in the various districts of the colony (these factors are discussed below). Noticeable premia emerge for wine production in regions that still dominate the industry up until this day – in particular the Stellenbosch and Drakenstein regions enjoyed more favourable wine-producing conditions in all specifications. This is of particular importance, because Huguenots were dominantly allocated land in exactly these regions. However, selection into the various regions does not alter the main result, so that the advantage of the WH and NWH relative to the NH is not likely the attributable to farmers settling in regions more conducive to wine production.

We also control for other familial ties which could have aided the transmission of specific knowledge. It is evident that being married to a Huguenot explains some of the premium, with the coefficients being significantly positive, and (in column (6) of Table 2) the dummy of interest reducing in magnitude. All that this suggests is that specific knowledge is not only transferred via paternal links, but also through maternal family lines. Further, we wish to understand whether the advantage only realised amongst the first group of immigrants (which implies that the specific knowledge eroded and was not transferred to later generations). In the final specifications of Tables 3 and 4 it is evident that Huguenots that were born abroad did indeed enjoy a greater premium than those that were not. While the coefficient of interest diminishes in magnitude, its size and significance remain notable, so that knowledge transfers to later generations remain evident in the data. Similarly, it is also possible that the advantage that the whole Huguenot group enjoys could be driven entirely by the specialist wine farmers – the first movers – identified by Coertzen (1997). However, this coefficient is not statistically significant in any specification.

Given that wheat production does not, as argued above, require the same specific skills as wine making, one expects that any initial advantages in this mode of production can be easily transferred and would thus erode over time. Table 5 reproduces the results of Table 3, but with wheat reaped as the dependent variable. Wheat sown is now used as the input, while wine controls for other capital (and land size).

Table 5: Dependent Variable: log(Wheat produced) (in *muiden*) full sample, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
NWH	0.26	0.249	0.100	-0.006	-0.097	-0.219
WH	0.563***	0.946***	0.566***	0.242	0.084	-0.028
Slaves		0.198***	-0.002	0.01	0.01	0.009
Slaves*NWH		0.060*		-0.019	-0.019	-0.012
Slaves*WH		-0.04		0.012	0.011	0.016
Knechts		-0.096	-0.343	-0.242	-0.241	-0.229
*Knechts**NWH		2.379*		0.212	0.287	0.277
*Knechts**WH		2.836*		1.781*	1.918*	1.831*
Wheat sown			0.317***	0.312***	0.311***	0.312***
Wheat sown*NWH			0.145***	0.154***	0.155***	0.149***
Wheat sown*WH			0.06	0.048	0.046	0.041
Cattle			-0.002	-0.003	-0.003	-0.003
Wine			0.045**	0.007	0.006	0.006
Horses			0.126***	0.141***	0.141***	0.141***
Stellenbosch				0.978***	0.972***	0.966***
Drakenstein				0.975***	0.981***	0.952***
Swellendam				-0.371***	-0.372***	-0.392***
Married to NWH					-0.146	-0.142
Married to WH					0.291	0.285
Born abroad						0.572**
Coertzen						0.06
Y1702	-0.406	-0.288	-0.282	-0.274	-0.271	-0.272
Y1705	0.138	0.216	0.184	0.15	0.15	0.151
Y1709	1.311***	1.037***	0.313	0.28	0.274	0.266
Y1712	0.923**	0.566	0.191	0.126	0.118	0.127
Y1719	0.751*	0.119	0.046	-0.046	-0.051	-0.022
Y1723	0.507	-0.159	-0.276	-0.344	-0.345	-0.289
Y1731	0.416	-0.544	-0.799**	-0.918***	-0.918***	-0.839**
Y1738	-0.697*	-1.979***	-1.660***	-1.806***	-1.807***	-1.719***
Y1741	-0.564	-1.618***	-1.768***	-1.919***	-1.918***	-1.820***
Y1752	-2.104***	-2.414***	-2.180***	-2.201***	-2.195***	-2.084***
Y1757	-2.903***	-3.321***	-2.846***	-2.774***	-2.774***	-2.668***
Y1762	-2.636***	-3.220***	-2.711***	-2.892***	-2.895***	-2.791***
Y1773	-3.039***	-3.489***	-3.082***	-2.943***	-2.941***	-2.833***
Constant	-2.296***	-3.059***	-3.377***	-3.919***	-3.908***	-3.969***
R-squared	0.124	0.278	0.545	0.558	0.558	0.559
N	9078	9078	9078	9078	9078	9078
F statistic	58.898	111.596	139.109	297.805	277.66	262.055

NOTES: NWH = Huguenots from non-wine producing regions. WH = Huguenots from wine-producing regions. Base category: non-Huguenots and the year 1700. Wheat sown is measured in *muiden*, Wine in number of leauguers produced. Wheat reaped is converted to household per capita levels. Estimates are weighted by household size and significance levels are based on the use of robust standard errors.. *** denotes significance at the 1% significance level, ** at 5% and * at 10%.

It is sufficient to note here that while in specifications with limited controls (columns (1) to (3)) the WH also enjoys an inherent advantage, the significance of this finding is eroded as soon as district controls are introduced. Moreover, the coefficient turns negative when the Born Abroad dummy is introduced. In contrast, the advantage relevant to wine production cannot be explained away by any of the controls, and the specific skills in wine production effect has been as closely identified as equations (2) and (3) suggest.

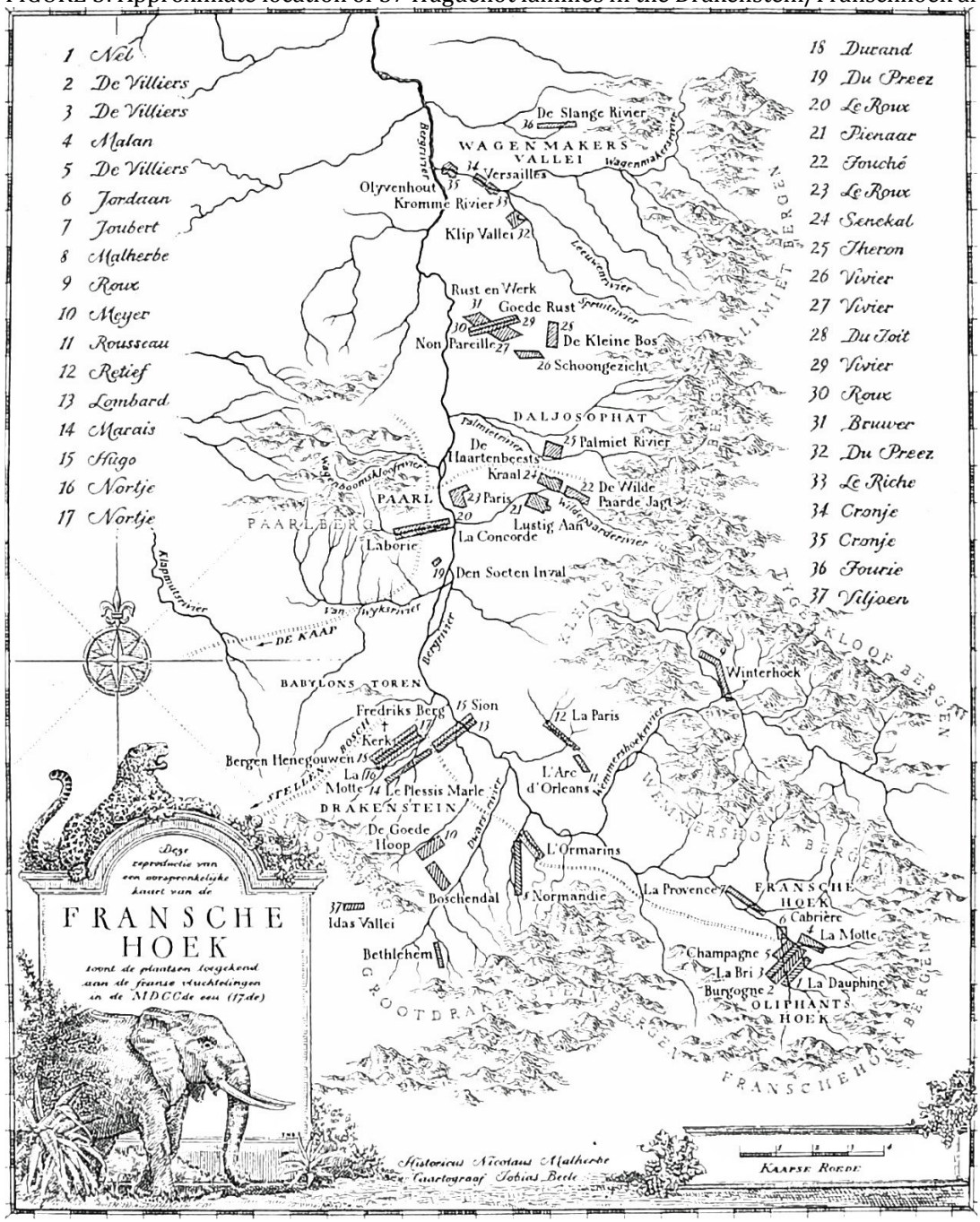
VII. DISCUSSION OF RESULTS

The arrival of the French Huguenots increased the production of wine at the Cape. Our regression results suggest that a selection of the French descended from wine-producing regions, and was significantly better at viticulture than either their French compatriots from non-wine producing areas, or the non-Huguenots.

The first suspects that might explain this advantage are of course the standard factors of production – land, capital and labour. Maybe the French had access to more or better land, a greater stock of capital or access to more labour? Given that no information on land is contained in the *opgaafrolle*, we turn to historical sources and anecdotal accounts.

The Huguenots settled mostly in the areas today known as Franschhoek (literally meaning French corner), Simondium, Drakenstein and Dal Josafat (today merged into the town of Paarl) and Wagenmakersvallei (Wellington). They were not the only settlers to inhabit these areas – many Dutch settlers moved to farms in the vicinity as it was the policy of the Dutch East India Company to amalgamate the French into Dutch society. All farmers were allocated similar land sizes – 60 *morgen* each (which equal roughly 51 hectares) – on condition that they cultivate it within the first three years. Figure 3 shows the location of 37 of the Huguenot households. Except for Franschhoek, the farms are evidently separated, and would have been interspersed with non-Huguenot farms (not shown).

FIGURE 3: Approximate location of 37 Huguenot families in the Drakenstein/Franschhoek area



Source: Digital imprint, Map division: South African Library, Cape Town, 2008.

O.F. Mentzel, travelling through the Cape Colony roughly five decades after the arrival of the Huguenots, provides the following summary of the French influence in Franschoek:

> This valley is on account of its extraordinary fertility the best portion of the Cape. It was unusually well cultivated through the *diligence* and *untiring industry* of the first French colonists and has been maintained in this state by their successors. The fertility of this little district can be imagined from the fact that the first colonists arrived there destitute of all means, and like all others

> had to borrow from the Company their cattle, farm implements, seed and bread-corn and everything else they needed; yet were the first to repay their debt amounting to many thousands of gulden." (Mentzel 1944:64, 65, our emphasis)

While Mentzel refers to the "extraordinary fertility" of the region, it is clear from his quotation that he refers in fact to its *productivity*, rather than soil quality or other environmental characteristics. His observations therefore correspond closely with our empirical results. He refutes the notion that the French had any advantage in capital or land; the greater productivity of the Huguenots, according to Mentzel, is simply due to their greater "diligence and untiring industry", reflecting Coertzen's (1997) observation relating to "hard work and an enterprising spirit". Such qualitative evidence is supported by our empirical analysis; the inclusion of district dummies does not eliminate the WH-group dummy, implying that the so-called "Franschhoek effect" (an advantage gained through the size and fertility of the land, as some scholars have suggested) is separate from the skills effect.

While we control for the quality and quantity of land and capital, the question remains whether the French possibly had access to more or better labour. We have already pointed out the varying use of wage and slave labour by the settlers, with the WH-group using more (but less efficient) slaves than *knechts*. It is unclear why such a distinction would arise along groups originating from different parts of France. One possible explanation might be that WH-settlers, given their competitive advantage in wine, specialized in wine production, whereas the NWH-settlers diversified production into wheat and cattle. While we do control for both wheat and cattle outputs, it might be that the large, positive coefficient on the slave-interaction variable for NWH-farmers may, in fact, relate to the more efficient use of slave labour by the NWH-farmers across all agricultural outputs – i.e. fewer slaves are required when the harvest season is spread over the entire year (when one has production diversification) rather than concentrated in March (when grapes are harvested).

WH-farmers tended also to have larger families than the other two groups (see Table 1). This result is perplexing and as yet unexplained.[10] Given the difference in household size, we use per capita production figures throughout. However, it is possible that larger households afforded economies of scale (specialisation within the household), which may partly explain the additional advantage experienced by the WH-group.

Could the differences between the Huguenots and Dutch have arisen from institutional factors? While the French did have a different legal tradition to the Dutch, they were subject to the same set of legal institutions in the Cape Colony. This is unlike the investment-inducing mechanisms posited by La Porta *et al.* (2008) in explaining cross-country variations in economic performance. There is also little indication that language or culture, broadly defined, could have mattered (based on the robustness of the results in the French sub-sample). The French language disappeared within two generations at the Cape. Simon van der Stel, Governor at the Cape at the time of the Huguenot's arrival, made it clear that he expected them to amalgamate fully into Dutch society. The only concession that was made was to provide a small church and a minister to preach in French. However, there should have been little Weberian differences as both the Huguenots and the Dutch were Protestant.

Regardless of the inclusion of additional explanatory variables, the coefficient of the WH-dummy is positive and statistically significant. We therefore posit that the productivity disparities

[10] The result is contrary to what is expected. Gourbert (1970) finds that women in the northeast of France – including French Flanders – were nearly three times more fecund than their southwestern counterparts. Given that we treat the southwest mostly as wine-producing areas, while most of the non-wine producing Huguenots are from the northeast, origin cannot explain this trend at the Cape.

between the Huguenots and other settlers arise from specific human capital differences (abstracting from the potential *local* generic human capital differences which could potentially have arisen, as in equation (2)). These differences are constituted by the "specific skills" in viticulture that the Huguenot farmers brought from France. Why "specific skills" in viticulture? The results for wheat farming suggest that, although the French from wine-producing regions were initially more productive in both wheat and wine production, the advantage in wheat production dissipated once other controls are included. We hypothesise that wheat farming, different to viticulture, utilises more generic knowledge and farming skills, especially in the secondary production processes of flour- and bread-making. All groups had equal access (at low cost) to such knowledge or skills. The "specific skills" of viticulture and wine-making, where knowledge is transferred from father to son through extensive learning-by-doing, do not disseminate into the broader farming community; even controlling for the farmers born abroad (and thus the direct carriers of the specific skills), the WH-dummy remains positive and significant. Following capability theory, the specialised skills gave farmers (firms) a sustainable competitive advantage, which they maintained independently from the enhancements brought about by acquisitions of capital (slaves) and labour (*knechts*). While such an advantage could be countered through the acquisition of more capital, there is little evidence that such an advantage could be sustained given the higher cost implications.

The set of regressions which only include Huguenot farmers provide more compelling evidence that it was a "specific skill" in viticulture, rather than other institutional factors, that explain the difference. Given that only French Huguenots are included in the sample, all cross-group cultural measures, such as religion, language or other traits, are implicitly eliminated. Our variable of interest is thus provincial origin of the two Huguenot groups and only factors correlated with this could potentially bias the results.

One such measure could potentially be the educational attainment of the citizens. It might be that provinces more conducive to viticulture were also relatively more affluent and could thus afford higher educational attainment. Our inclusion of a measure of average educational levels for regions of origin (non-numeracy scores) attempts to control for this possible bias. This further supports our notion that "human capital" as it is commonly understood may be too generic to determine settler success. By differentiating human capital along the lines of (specific) skills and (generic) education, a more complete picture emerges of the underlying causal mechanism that drives differences in production.

It may simply be that the French Huguenots enjoyed first-mover advantage. Once they settled and utilised their superior skills in viticulture to obtain higher wine yields, they could acquire the best farms and expand their production. Given that a wine farm is a medium- to long-run investment, their initial skills advantage would in one or two generations grow to yield significant differences where they had control over the scarce resource, land. There is however little evidence of such amalgamation of production over the period.[11] In fact, the evidence suggests that farms became smaller, not larger, because of Dutch inheritance laws enforced at the Cape. These laws divided ownership of property at death amongst the deceased's partner and their offspring in two equal shares. As noted above, fertility rates were relatively high, which meant that farms were often split between sons, partitioning the property into smaller and smaller units.[12] Moreover, land was not a scarce resource. Viticulture was not only restricted to

[11] We also include a dummy of the descendants of six farmers named by Coertzen (1997) who were the first to establish wine farms. The coefficients in Table 3 and 4 are both negative and insignificant, suggesting few first-mover advantages.

[12] In fact, it may be that *smaller* households were able to sustain the scale required to remain more productive, because of fewer claims on the existing land. This would imply that the Huguenots from wine-producing regions had to have fewer offspring because they realised the importance of maintaining a certain operational size. This is of course contrary to the empirical evidence. Perhaps having fewer

the Stellenbosch or Franschhoek region. In fact, as is evidenced by crop choice today, the land beyond the first mountains provided fertile opportunity for expansion in viticulture.[13]

The benefits of a first-mover advantage could also transpire through market relations. In a strongly regulated market such as the Cape Colony it helped to have good associations with the owners of the alcohol *pachts* (the monopoly contracts that restricted the number of sellers of wine, beer and brandy). They were the only permitted private wine buyers together with the Company.[14] These *pachts* were sold annually by the Company to the leading bidders, although it seems to have not always been a perfectly competitive process (Groenewald 2004:15).[15] Possibly, the Huguenots, having established early roots in the wine industry, obtained privileged access to these monopoly rights. These *pachts* became an extremely lucrative industry during the eighteenth century, the only one outside of agriculture that was open to the private market. And given the large and growing demand for alcohol and such pleasures from sailors and soldiers stationed on the passing ships during the first few decades of the eighteenth century, the rights to sell liquor in the taverns and inns of Cape Town might have provided the Huguenots with a more profitable outlet for their produce. Yet, there is even less evidence to support that the French had any unique privileges (or social capital) with regards to the *pachts*. In fact, in a survey of the 27 individuals who invested in the alcohol *pachts* during the 1730s (just as the Huguenots began to increase their advantage), there is only one French descendant – Jan le Roux, born in the Cape, who acquired four *pachts* (Groenewald 2009).[16]

Both these arguments are unconvincing. While other channels may have contributed to the growth in observed productivity differences, the specific viticulture skills of the WH-farmers, seems the most plausible in explaining their competitive advantage. As the results suggest, their advantage was not necessarily in producing *more* wine given the number of inputs. It was in producing wine that could last longer – a higher *quality* wine.

The demand for Cape wine was concentrated in the demand from the passing ships. Every year, between 9000 and 11000 soldiers and sailors anchored in Table Bay on their voyage between Europe and the East, a journey that would last at least three months either way. Fresh produce, including wine, was the Cape's major expert commodity, both for consumption in Cape Town and for the next voyage (Boshoff and Fourie 2008; Boshoff and Fourie 2010). What was needed, therefore, was wine that would last the three months at sea: quality wine.

Private[17] wine production flourished with the arrival of the Huguenots in the Cape Colony. Yet, a subset of these Huguenots – most of them from wine-producing regions in France – was better than their compatriots at producing quality wine. Their sons, benefiting from the secrets and knowhow of their fathers, continued and improved these techniques, producing quality wines

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children does not explain the difference, but that only one or two inherited the farm. Others were forced to move away, or marry the daughters of other wealthy farmers. Why the French from wine-producing regions would have been comparatively more amenable to this idea is not clear.

[13] It should be pointed out, though, that because of the difficulty of transporting goods across the mountains in the absence of any adequate passes (which were the case before the nineteenth century), viticulture in the interior would have been extremely costly. While Swellendam was the first magisterial district to be established in this region in 1743, our data show that no wheat or wine farming was practiced here up until 1773.

[14] Most beer was imported.

[15] As Groenewald (2004:15) notes after reviewing the apparent *pacht* auctions: "I do not think that the state of the evidence allows us to deduce that these concessions were really auctioned off every year to the highest bidder."

[16] 12 are German nationals, 8 are Dutch, 6 were born in the Cape Colony and one is from Denmark (Groenewald 2009).

[17] Until 1700, wine production was mostly concentrated on the properties of VOC officials – especially Simon van der Stel (Constantia) and Willem Adriaan van der Stel (Vergelegen).

for which there was always a market in Cape Town. The traveller Mentzel (1944:186-187) alludes to this in his description of wine-making at the Cape:

> "This then is the way in which wine is treated at the Cape of Good Hope, but every sensible man will surely presume that for good wine-making something more is necessary than what has been mentioned. There is no doubt that many colonists at the Cape do indeed know the secret of preparing good wine and therefore wines are made which stand the test, and grow mellower with age: but they are not such fools as to give away their secret and thus make the good wines more common."

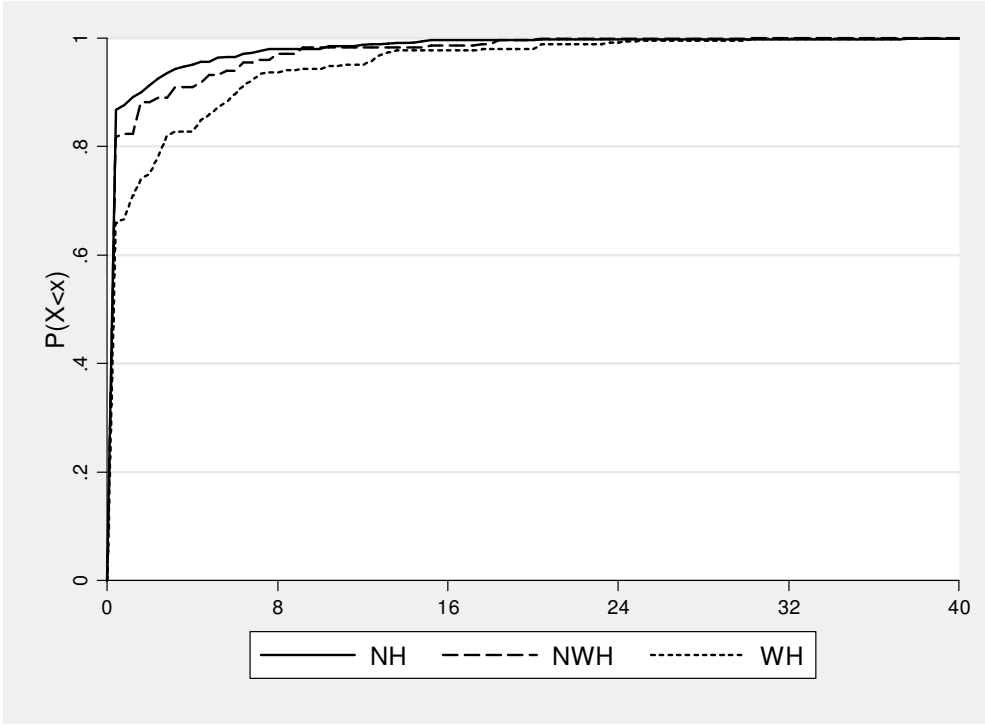
Wine-making, different to wheat farming, requires specific skills and knowledge that the Huguenots from wine-producing regions possessed when they arrived at the Cape. They maintained their advantage by protecting these "secrets" – either deliberately through protective behaviour or accidentally due to the high cost of transfer (i.e. years of learning-by-doing). Other settlers may have attempted to catch up – either through using resources such as capital (slaves) more efficiently or through marrying Huguenot wives – but the sustainable competitive advantage of the Huguenots from wine-producing regions allowed them to prosper independently from these tactics.

WH-farmers sustained and expanded their advantage, even in the face of increased supply and (sometimes) faltering demand during the eighteenth century. Yet, there was always a demand in Cape Town for quality (long-lasting) wines. Produced by the WH-farmers, such wines would be sold at the fixed price imposed by the VOC. However, in the absence of a market mechanism to regulate price and quantity, equilibrium was infrequent and surplus production common, as the numerous references to the streets of Cape Town overflowing with run-off wine for which no buyer could be found, attests to (De Kock 1924). Given a fixed quantity demanded and a fixed demand price (set by the Company), an increase of production by WH-farmers (i.e. quality wine) would crowd out wine production from other groups, resulting in surplus production.[18] Such surpluses were often used as illegal trade goods (either with local inns and taverns, with passing ships, or most probably, with the native Khoekhoe), as inputs for brandy manufacturing (which was of a particularly low quality and again mostly used for trading with the Khoekhoe) or, in the worst cases, let to flow away in the streets of Cape Town when the Company's allotment had been filled (De Kock 1924). In the medium to long run, the producers (and their descendants) of lower quality wines were forced to find alternatives, either as wheat farmers or, more likely, as pastoral farmers in the poorer interior.

A similar result emerges when supply is held constant and demand falls (for example, fewer ships arrive in Table Bay): the monopsonist Company would tend to favour quality wine producers (given an equal price) rather than producers that aim for low-quality, high volume. These suppliers are then forced to either discard their wine, trade it illegally (often with the native Khoekhoe population) or use it for brandy manufacturing (which was of a particularly low quality and mostly used for trading with the Khoekhoe).

[18] A similar result emerges when supply is held constant and demand falls (for example, fewer ships arrive in Table Bay): the monopsonist Company would tend to favour quality wine producers (given an equal price) rather than producers that aim for low-quality, high volume.

FIGURE 4: Cumulative density function, wine production, 1773



Slowly during the eighteenth century, a farming elite emerged that would include mostly affluent wine farmers (Guelke and Shell 1983; Fourie and von Fintel 2010; Fourie and von Fintel 2011). Indeed, Figure 4 shows that by 1773 wine production was non-existent for much of the lower tail of each settler group's production distribution. However, from the 80th percentile, the WH clearly (stochastically) dominated wine production, suggesting that only an elite secured the premia that we discuss throughout this paper. While a decision to restrict immigration and encourage slave imports was already taken by the Council of Policy in Cape Town in 1717, this decision was reinforced during the 1750s when the Lords XVII again suggested European immigration as a way to supplement labour shortages experienced by the farmers (Giliomee 2003). This time, the elite farmers were consulted. Engerman and Sokoloff's hypothesis, that initial colonial inequality would result in institutions that protect the position of the elite (through restricting immigration, for example) and ultimately leading to persistent inequality, seems to prove true in the eighteenth century Cape Colony, although the conditions for its emergence – a tropical crop and a large native population – did not exist (Fourie and Von Fintel 2010). The wine elite continued to permeate Cape society well into the nineteenth century and were later perhaps reinforced by the diamond and gold-mining elites. South African inequality today can – indirectly, at least – trace its roots to the arrival of the Huguenots in South Africa and the skills and secrets they brought from France.

VIII. CONCLUSIONS

The institutional literature does not suggest a link between settler's origin and the development of settler regions. In fact, the seminal contributions nearly all reflect on the environmental conditions the settlers experienced on arrival to explain why certain regions developed growth-inducing versus growth-inhibiting institutions. We posit that this neglects an important component of migration and development theory. The French Huguenots that arrived at the Cape Colony in 1688/89 possessed uniquely different skills than the incumbent farmers that allowed them to become more productive wine-makers.

None of the standard factors of production explain these differences, nor any "institutional" difference between the French and the Dutch. In fact, we control for the unquantifiable cross-group differences by showing that Huguenots that originated from wine-producing regions were more productive in viticulture than the Huguenots from non-wine producing regions and also all other countries. We posit that the Huguenots from wine-producing areas possessed "specialised skills" in viticulture that could not be easily (cheaply) acquired, as was possible for the "general skills" of wheat farming. In fact, we see that an elite of Huguenot descendants from wine-producing regions maintained their advantage in wine-making at the Cape. This disparity cannot be satisfactorily explained through first-mover advantage in production, ownership or social capital, or the Cape inheritance laws. Specialised skills – trade secrets – gave the Huguenots from wine-producing regions a sustainable competitive advantage.

Our results point to strong evidence that settler capabilities – specific skills acquired in the land of origin – matter in colonial development and should be considered an important element – together with environmental conditions and resource endowments in the destination region – in explaining why countries follow different development paths.

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