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AGRICULTURAL PRODUCTIVITY IN THE CAPE COLONY: A STORY OF NETWORKS OR PROPERTY RIGHTS?

Sophia du Plessis, Eldridge Moses and Dieter von Fintel¹

1 Introduction

The origins and rise of the 'landed gentry' at the Cape has received much scholarly attention in recent times. Evidence recently presented by Fourie and von Fintel (2011) has suggested that wine farming at the Cape came to be dominated by families of French origin due to their specific skills set and knowledge of wine-making that they brought with them from their region of origin. Agricultural productivity at the Cape, particularly in the wine industry, has been attributed largely to the skills sets French Huguenot farmers had and their unwillingness or inability to share those wine-making skills outside of tight familial networks. Therefore it seems as if network subscription, based on kinship, region of origin or perceived cultural affinity, was vital for agricultural success at the Cape.

The skills hypothesis is echoed by Hornung (2011) who proposes that the French Huguenots were highly skilled individuals who made positive economic contributions to whichever country they settled in. In addition to their own productive capabilities, the diffusion of knowledge amongst local inhabitants through the building of schools and on-the-job training was highly prized by their adoptive countries. It was for this reason that the *Heren XVII* (the managing body of the Dutch East India Company) decided to recruit Huguenots for settlement at the Cape Colony. The commander of the Cape at the time, Simon van der Stel, was keen to attract Huguenots to develop the ailing agricultural industry in the outpost colony.

This paper presents an alternative perspective on differences in agricultural productivity between groups of farmers at the Cape. We support the notion that network subscription (amongst the Huguenots) may have played some part in initial differences in agricultural productivity and the eventual domination of the wine industry by families of French origin. However, it is our contention that the evolution of property rights for farmers at the Cape must be considered alongside network subscription to explain the growth and changing composition of the agricultural sector in the eighteenth century. Increasing security felt by farmers due to changes in property rights significantly changed *what* and *how* farmers

¹ All authors are lecturers at the Department of Economics, Stellenbosch University, South Africa. Corresponding author Sophia du Plessis (sophia@sun.ac.za)

could produce. We specifically consider how changes in property rights affected diversification or specialisation of agricultural output and whether this ability to diversify (or specialise) allowed for some convergence in agricultural productivity between groups of farmers.

In the first section of the paper we consider theoretical reasons for higher agricultural productivity due to network subscription, followed by an investigation of possible ways in which Huguenots from wine-producing regions may have benefited from network externalities at the Cape. In the second section of our paper we discuss the possible ways in which defined property rights can improve agricultural productivity and how changing property rights at the Cape Colony affected the performance of the economy in a number of ways.

We estimate Cobb-Douglas production functions using the *opgaafrolle*, production data collected for tax purposes by the VOC, over time for the various network groups. The presence of network externalities is investigated by considering the differences in total agricultural value by settlers' region of origin and their district of settlement at the Cape. This classification provides a crude measure of networks, with geographic proximity defining the extent to which settlers had potential contact with each other; however, the further division by settlers' origin reflects the potential "cultural networks" within which settlers may have operated.

The impact of changes in property rights is shown by dividing the *opgaafrolle* data into periods which coincide with significant property rights modifications in the eighteenth century. We show that in the early eighteenth century better-defined property rights allowed farmers the space to diversify agricultural output and therefore hedge against risk of crop failure. In later years, as the VOC releases its stranglehold on produce markets and agricultural markets became more interconnected and sophisticated, diversification of agricultural output became less important to farmers. Specialisation rather than diversification of agricultural output, regardless of network subscription, emerges as the more successful agricultural productivity strategy in the later period under consideration.

2 The Impact of Networks on Agricultural Productivity at the Cape

Cape society was characterised by high levels of inequality (Fourie & von Fintel, 2010), driven in part by the presence of a landed gentry (Guelke & Shell, 1983). One element of this success has been ascribed to cultural heritage, with the French Huguenots descending from wine-making regions in Europe being superior winemakers (Fourie & von Fintel, 2011). While the authors attribute this phenomenon specifically to skills that were kept within the lineage, it is necessary that the cultural *network* preserved this knowledge transmission over time. This paper therefore considers whether cultural and geographic networks benefited the broader agricultural community (rather than only winemakers) at the Cape, and under which conditions. The focus turns away from specific skills and winemaking, but tests whether network effects emerge when property rights are well- or ill-defined, and how farmers within networks responded with specialisation. In essence, we explore whether elite effects noted elsewhere were a function of network formation.

2.1 Networks and agricultural productivity: an institutional perspective

Shirley (2003), among others, focuses attention on two sets of institutions that create the appropriate incentives for entrepreneurs to invest in productive activities: those that foster exchange by lowering transaction costs and encouraging trust, and those that influence the state to protect private property rather than expropriate it². Both these sets include what Rodrik (1999) describes as “institutions for high quality growth”.

One of the simplifying assumptions in the neoclassical theory is that information is costless. If this is the case, role-players in an economy can engage in transactions without incurring costs. Parties to an exchange can continue bargaining until all misallocations are eliminated and the economy is in equilibrium. Game theory illustrates this possibility of reaching self-enforcing cooperative solutions, but only under the strict assumptions of perfect information, that the game lasts indefinitely into the future, and that it continues to be played between the same parties. Under these perfect conditions decisions regarding the application of scarce resources in the production process, and the production decision itself, will depend on the price mechanism. For example, if the price of labour decreases relative to the cost of capital, labour would be substituted for capital and more labour intensive products will be produced until the price of labour once again equals the price of capital (North 1990).

² The first set of institutions describes the protection of property rights and includes contract and contract enforcement mechanisms, commercial rules, norms, habits and beliefs favouring the accumulation of physical and human capital. The second set of institutions forces a government to support the first set of institutions and include electoral rules, laws governing freedom of speech and education, constraints on powerful groups from exploiting their position, and the management of conflict.

Without transaction costs there are no constraints on the trading volume. But, realistically, the effect of positive transaction costs is pervasive in an economy. Niehans (1987) suggests that the higher the transaction costs, the greater becomes the incentives for individuals to economise on transactions. In such high transaction-cost situations incomplete or even missing markets are to be found. In the absence of organized capital markets, for example, people in developing countries may devise "social" means of pooling savings through credit rings or savings societies. In the absence of secure contracts, they mobilize family ties, religious groups or ethnic associations in support of commerce and trade. In the absence of effective states, capable of providing public goods, people are likely to join religious associations, fundamentalist groups or revolutionary parties in an effort to secure them (Bates 1995). Missing markets, and the means people find to overcome their absence, makes it complicated for developed countries to invest in or trade with these countries.

Avner Greif (2006) discusses the institutions that originate under these uncertain conditions in his work on the Maghribi traders. He describes it as "a business network of members who belonged to the same ethnic and religious community". It is the outcome of a belief that people from a particular social identity, who belong to the same community, would share information and collectively punish a cheater. Coalitions arise that may lower transaction costs.

Reasons for missing markets and how they are dealt with, vary according to circumstances. In simple agricultural societies the absence of rental markets for productive resources such as draft oxen are, for instance, explained by the existence of compensation and incentive problems (Kohler and Hammel, 2001: 35). The compensation problem arises in primitive agriculture because the rented resource is at least as productive on the lessor's land as on the lessee's land. However, the lessor would generally have to supervise the use of the animal, which implies forgone output for the lessor which the lessee would be unlikely to compensate him for. A second problem arises when contracts are used to alleviate supervision costs for the lessor. The principle here would be to ensure that animals or tools are not mistreated if left unsupervised by the lessor in the lessee's care. However, agricultural societies are unlikely to have the institutions to make contracts legally enforceable, again rendering the existence of a rental market unfeasible.

Being part of a family structure or network with close ritual (religious) ties or common countries of origin, i.e. working towards a collective goal, could overcome the aforementioned compensation problem. Common ties strengthen the network's ability to exert social pressure (such as refusal to help in future or expulsion from the network) when shared or rented resources are mistreated or broken, thus overcoming the incentive problem. Households who are part of an extended kinship network are therefore able to overcome resource constraints of a temporary or permanent nature through altruism and solidarity and access higher levels of production than would be the case in the absence of informal rental markets.

Insurance markets are absent for the same reasons in preindustrial societies (Fafchamps, 1992). For families without networks who survive at subsistence levels, crop failure could prove fatal. To reduce the risk of total crop failure, these subsistence farmers could use risk-reduction strategies such as crop diversification and spreading resources across scattered tracts of land. Households subscribing to familial or other types of networks could engage in risk-pooling strategies where output is shared jointly between households who are part of the network³. This type of insurance contract could theoretically lead to fewer crops being planted per farm and a reduction in average fixed costs. It is possible that farmers who are unfamiliar with local conditions would want to experiment with different types of crops or different varieties of the same crop type in order to maximise the yields from land with unknown cultivation potential. Being part of a closely-knit network could afford members of that network the opportunity to specialise with the assurance that crop failure would not be devastating to individual farmers.

2.2 Agricultural productivity at the Cape: the power of networks?

The agricultural success of Huguenot families, and by extension, the Cape Colony, and growing inequality between farmers at the Cape has been well-documented. Recent investigations of differences in agricultural productivity between groups of farmers at the Cape, suggest that network subscription may be instrumental in explaining why families of French origin dominated the agricultural industry in the eighteenth century. It would therefore be instructive to consider how cohesive farmers of French origin were and whether group cohesion or collective identity (as perceived by the group or parties external to the group) may have explained their superior agricultural performance.

Against the background of sufficient economic opportunities for Huguenot refugees in more populated, developed European regions, the VOC competed for highly skilled Huguenots by offering them as much land as they could tend to along with the promise of material help in the form of farming implements, grain seed and cattle (Wijsenbeek, 2007: 87). They were also allowed to bring personal effects and money along with them. The aim was to attract between 600 and 700 families to the Cape, but the ill health of refugees in Germany's refugee centres dissuaded religious leaders in Frankfurt from encouraging their emigration. Ultimately, approximately 200 immigrants would leave the Republic for the Cape. Their regions of origins were varied: the majority came from the coastal regions such as Dauphine and La Rochelle, while smaller groups came from Provence, the north of France, the area around Calais and the Netherlands.

³ Kohler and Hammel (2001) unsuccessfully test the theory that kinship networks would encourage risk-pooling. They posit that the associated moral hazard and imperfect information about other households' efforts might have discouraged risk-pooling strategies.

The first group of Huguenot settlers arrived at the Cape in 1688 and settled in the Drakenstein region. Although the Cape authorities added some Dutch farmers in between the French farmers in the Drakenstein to prevent the formation of a 'state within a state', the French settlers were allowed to have their own churches and schools. Reverend Simond's request to have a French-speaking congregation was granted in 1691 by the Heren XVII and the first French-speaking Reformed Church congregation was founded in Drakenstein in that same year (Coertzen, 2011).

Initial conditions in the Drakenstein were harsh for the new settlers, which prompted authorities to give them additional subsidies to survive. This privilege granted to the Huguenots and the insistence on French education and worship was the cause of some resentment amongst the Cape's other inhabitants (Coertzen, 95). After their arrival the French were also not viewed favourably by the governor of the Cape at the time, Simon van der Stel, who was asked in 1688 and 1689 by the French to be resettled on other land (Coertzen, 2011). He expressed his disdain for the group as early as 1691⁴ (State Archives, 1691) and in 1700 the Heren XVII officially halted the immigration of Huguenots to the Cape.

Despite internal problems within the Huguenot congregation in the early years of the church, by 1715 more than 80 percent of the Drakenstein congregation had French last names (Wijsenbeek, 2007: 88). However, the survival of French as a spoken language or language of worship had all but disappeared by 1726 (Denis, 2003: 293), due in large part to focused policies to suppress the use of the language. The Drakenstein church had in fact become a Dutch Reformed Church quite early in the eighteenth century. The salient point in the literature available on Huguenot immigrant experiences is that their status as a distinct social group had expired within three generations. The last official evidence of the French referring to themselves as a group distinct from other local inhabitants is in the request from Rev Beck and others in 1703 for services to be conducted in French every second Sunday as very few of the Drakenstein congregation members could understand French (Coertzen, 2011).

Wijsenbeek (2007) advances a number of possible reasons for the loss of a distinct Huguenot identity in South Africa and North America. Many Huguenot refugees of middle and lower class status⁵ had joined the Dutch Reformed Church in The Hague years before the first French settlers arrived at the Cape, possibly in order to avoid the social conflict which had plagued them when they were an identifiable group in their home countries. It is

⁴ In 1691 Simon van der Stel requested that the Heren XVII not send any more Huguenots of the kind initially sent to the Cape. He cites their lack of farming knowledge, poor behaviour and dependence on the Company for survival as the key reasons for his request.

⁵ At the end of the seventeenth century and in the first half of the eighteenth century the Dutch elite displayed a strong preference for French culture. French came to be the preferred language of the Dutch upper class, with many children from wealthy homes sent to French boarding schools. French refugees might have rationally decided to avoid the resentment of the Dutch lower and middle classes by assimilation.

therefore possible that Huguenots had already abandoned at least some of their unique cultural heritage before remigrating to the Cape.

There were also institutional factors in Europe and locally which conspired to substantially diminish the importance of French as a spoke language at the Cape. Out of 47 book retailers and editors in The Hague in 1715, 35 were of Huguenot origin (Wijsenbeek, 2005). Their main business was producing illegal literature (in France) for export, but when Louis XIV clamped down on the import of these books in 1723, many of these book producers ceased production in The Hague. Thus, the availability one of the core tools one could use to promote French literacy in pre-industrial settler societies was drastically reduced. The VOC also made clear its preference for the Huguenot settlers to adopt Dutch culture and language. Given the initial harsh conditions in the Drakenstein⁶, the new settlers were dependent in large part on the VOC's good graces which might have induced them to be less willing to fight against the Dutch naturalisation policy. The concerted efforts by Dutch authorities to discourage the formation of a Huguenot enclave at the Cape and their rapid assimilation into societies elsewhere, weakens the argument somewhat that it was Huguenot network or group externalities which explained their superior productivity in the 18th century at the Cape. It is possible that there were other drivers of differences in agricultural productivity between Huguenots and non-Huguenots at the Cape. In the next section of our paper we discuss the possible impact that property rights can have on agricultural productivity. Property rights at the Cape evolved as the needs of the VOC, the colony and its inhabitants expanded. Increasing demographic pressure and changing market conditions also possibly encouraged the opening up of the interior to aspirant farmers. As the next section will reveal, the fact that some of the existing farmers could diversify production by acquiring some of this new land might have led to initial differences in productivity between groups.

3 Property Rights and the Possible Impact on Cape Agricultural Productivity

3.1 Property rights and agricultural productivity: the New Institutional Economics perspective

Douglass North and Robert Thomas (1973), among many others, have argued that the establishment of secure and stable property rights have been a key element in the rise of the West and the onset of modern economic growth. The reason for this can be traced back to the previous discussion of transaction costs. Transaction costs increase as economies develop and in effect cause trading partners to become more unfamiliar with each other.

⁶ In 1689 Simon van der Stel writes to the Chamber of Middelburg that the unimproved land in the Drakenstein area would be expensive and time-consuming to cultivate wheat and vines of the magnitude required for it to be profitable to the Company (Coertzen, 2011: 45).

An important way of lowering transaction costs in exchange is through the creation of property rights, because they make it possible for people to trade with unfamiliar partners while expecting them to honour their agreements. If this were not possible, the cost of finding familiar trading partners will in most instances obstruct the transaction. Therefore, property rights can contribute to economic growth through the lowering of transaction costs, because everyone in a transaction will have a reasonable expectation of the reaction of the other participants. The existence of property rights will result in an increase in the number of transactions and consequently contribute to economic growth.

Because property rights play such an important role in the economic growth and development of a country, the protection or negligence thereof provides evidence in the explanation of growth differences between countries. And it is for this reason that the NIE pays much attention to the origins and nature of property rights.

Four categories of property rights (which can either be a fixed asset or labour) are distinguished. Firstly, there are user rights, which provide the owner the right to use, transform or even destroy an asset. Secondly, there is the right to transfer ownership of an asset, i.e. to alienate or sell an asset. Thirdly, there is the right to earn an income from an asset and negotiate the terms with other individuals (Eggertsson 1990). Therefore, the protected property can be sold for a profit, improved through investment, or destroyed by the rights holder.

Property rights impact on the performance of an economy in a number of ways. It determines who the players in the economic game are because it determines who gets what and when. In other words: which individuals have access to what scarce resources. Once this is established, the players have the opportunity to decide what to do with their economic goods, in other words “it establishes the incentives that determine human behaviour in the economy” (Furubotn and Richter 2000: 31).

Furthermore, individuals are willing to maximise the value of the property if they can control, sell and earn an income from that property. Kasper and Streit (1998: 205) explain that people are better motivated to make use of their assets by “toiling, labouring and experimenting with them, precisely because they could have confidence that they would appropriate the rewards of their efforts and their risk taking”. In other words, to be persuaded to make an investment, role-players have to be sure that they have control of their property and the benefits thereof. No entrepreneur will have the incentive to accumulate or innovate if there is no certainty that they will be able to control the return to that asset (Rodrik 1999).

The development of a manufacturing sector, for instance, necessitates fixed capital in plant and equipment, uninterrupted production, a disciplined, appropriately trained labour force, and a developed transport network. To make sure these factor and product markets

function smoothly, property rights need to be secured. And if they function well, a surplus will be produced that will benefit those in society with a deficit (North 1991).

3.2 *Property rights at the Cape between 1657 and 1773*

Property rights in farming at the Cape between 1657 and 1773 are defined by five broad periods, the first three of which explain the eventual domination of arable farming at the Cape and the latter explaining the growth of stock farming at the Cape. The first period is between 1657 and 1680 when freeburghers were given tracts of land of unrestricted and then fixed sizes to cultivate; the second between 1680 and 1682 when freehold land was allocated to *freeburghers* in the Stellenbosch area with no restriction on size, the third period beginning in 1687 when the Drakenstein area was opened and large farms of fixed sizes (still freehold) were allocated; in the fourth period, after 1703 the *leeningsplaatsen* (loan farm) system was introduced to regularise grazing. This section of our paper considers the factors which prompted these modifications to the tenure system at the Cape and how these changes manifested themselves in agricultural output and diversity.

In 1657 some VOC employees were released from service to start farming and in so doing, assume much of the Company's responsibility for farming. The long-term goal was for the Cape to eventually become self-sufficient in the production of wheat. These budding farmers were divided into two groups and could lay claim to as much land as they could cultivate within 3 years, after which they had the right to sell, lease or dispose of their ground. These conditions were modified slightly when a VOC official, Rijkloff Van Goens, visited the colony. The new conditions were that each free burgher would be given 29 acres of land to cultivate and would be exempted from taxes for 12 years instead of 3 as originally stipulated by the VOC (Guelke and Shell 1983: 11).

However generous this allocation of land was in van Riebeeck's eyes (Guelke, 1976: 27), this newly acquired land was not fertile enough to be conducive to the intensive farming methods practicable in Holland. In addition, the Heren XVII decided to set the price of wheat in accordance with the low prices which prevailed in Europe at the time. Given the distance of the Cape from European markets, it was nigh on impossible for Cape goods exported to Europe to compete with produce cultivated in Europe itself, which would be nigh on impossible given the extremely high cost of oceanic transport at the time. Loans extended by the VOC also had to be serviced, which also made farming profits an unlikely prospect.

This initial agricultural experiment failed spectacularly, with many of the erstwhile Dutch and German farmers deserting their farms and settling close to the Fort of Good Hope in order to ply various trades and selling alcohol (Groenewald, 2007: 127). Faced with the lack of incentives and capital to concentrate on arable farming, the remaining farmers

redirected at least part of their effort to raising livestock which they traded with the Khoikhoi (Guelke, 1976).

A few other prospective farmers joined the original group in small numbers after 1657, but it was not until 1680 that another major allocation of land would be done. In a bid to increase Cape wheat and wine production and becoming less dependent on the Khoikhoi for meat, the new governor of the Cape, Simon van der Stel, opened the Stellenbosch area to freehold claims on a first-come, first-serve basis. The new land policy was open-ended, allowing 20 new landseekers to claim large tracts of the most fertile land (between 80 and 160 acres each) in Stellenbosch between 1680 and 1682 (Guelke and Shell, 1983: 266). Although there were no restrictions on the sizes of the land claims, all of the land claimed had to be cultivated within three years or be ceded back to the Company. The unfortunate consequence of this policy was that large areas of unclaimed, potentially fertile land were excluded from access to rivers and streams, a fact lamented by Commissioner van Reede in his inspection of the area in 1685 (Guelke and Shell 1983: 14). The Stellenbosch settlement showed impressive returns in a relatively short period of time – 3865 muids of grain were harvested as early as 1687.

Van der Stel subsequently amended the previous land allocation procedure when he opened the Drakenstein area for settlement in 1687 to Dutch and German settlers in full ownership (Horner and Wilson, 2008). In direct contrast to the open-ended policy adopted in Stellenbosch, rectangular plots of 125 acres each were allocated randomly to new settlers. The plots were surveyed beforehand and included at least some marginal land which was not suitable for crop growing. The Huguenots who arrived in the area in 1688 were settled amongst Dutch and German farmers in an area known interchangeably as Le Coin Francais, La Petit Rochelle or Quartier Francais (Leigh, 2003: 33).

Many of the wealthier freehold farmers moved their cattle to these new frontier districts from 1703 onwards when grazing permits were first issued by Willem Adriaan van der Stel (Simon van der Stel's son and his successor as governor). These grazing permits were free to any farmer who applied for them and allowed the holder exclusive grazing rights for a three to four month period. The validity of the permit was eventually extended to six months and a new rule was introduced which stipulated that new grazing permits would only be issued for areas which were further than one hour's walking distance from the centre of an existing grazing plot. This continued until 1714 when the first recognition was imposed on these grazing permits (which by then had become known as *leeningsplaatsen* or loan farms). Although these loan farms were originally designed to formalise grazing and hunting rights, this form of tenure was also an important source of revenue for the Company. The annual fee for the loan farm was initially 12 dollars which allowed the applicant use of approximately 6 000 acres of land for 12 months at a time, after which the license would have to be renewed. Concessions to grow wheat on these *leeningsplaatsen*

were granted within the same year, which contributed to the use of these landholdings as areas for permanent settlement.

The *leeningsplaatsen* had increasingly started resembling freehold farms in practice, and the leases had become secure to the extent that many farmers on these farms invested heavily in fixed improvements to these loan farms (Guelke, 1976: 32). The incentive to invest came from the Company's policy that when the farmer vacated the loan farm, they could sell any fixed improvements made.

Although many farmers on the *leeningsplaatsen* failed to pay their annual rents, they in fact became the de facto owners of the 'loan' farms, evidenced by the fact that when fixed improvements to the land were sold, their value included the land on which the improvements were made (Guelke, 1989: 88). Until 1813 loan farm land could also be bequeathed in the same way that freehold land could. The security of tenure on these farms is substantiated by the average length of time that individuals remained on one property – by 1731 many principal loan farms had been occupied by the same family for 20 years (Dooling, 2007: 22).

There are a number of possible reasons why arable farming was a particularly unattractive investment and why expansion of settlement far away from Cape Town continued. The land in the interior of South Africa was more suited to livestock farming which also required less capital investment than arable farming to be profitable. The monopolies held by the Company in the wheat and wine markets, the low prices set for produce and the capture of the wine and wheat market by elites are all possible contributors to the expansion of settlement into the interior. Gainful employment prospects in the Colony were few or unpleasant - wages for Company soldiers were low and the promotion for the uneducated sons of farmers was unlikely, the market for fishing was dominated by descendants of slaves and the idea of manual labour on farms alongside slaves was viewed with disdain. The high fertility rate amongst *freeburghers* also allowed for more marriages and the consequent desire for new household formation.

4 Estimation and results

4.1 Descriptive analysis

The evolution of household production in the Cape economy follows an upward trend in the first half of the 18th century for most groups, as shown in Figure 1. It is notable, however, that both groups in the Cape Town district (on average) display a remarkable increase in agricultural value over time. As explored below, this effect is linked to property rights which allowed individuals in the non-frontier regions to catch up to frontier farmers who benefitted from initially sparsely populated lands, which could be cultivated freely and production could be diversified. Figure 2 explores exactly this by repeating the figure for

only farmers with diverse production portfolios. While it is evident that there were initial dividends to diversification, the onset of more secure property rights in the form of *leeningsplaatsen* muted these returns dramatically. As we posit below, the lack of property rights and the free reign of farmers allowed them to farm expansively, diversely and not intensively. Specialists, on the other hand (Figure 3), exhibited a steady increase in production as the economy developed. Hence, as property rights became more secure, farmers could establish themselves and invest in profitable farming enterprises that would reap long-term returns.

Figure 1 Local Polynomial Smoother: $\log(\text{Total Agricultural Value})$, by group and district

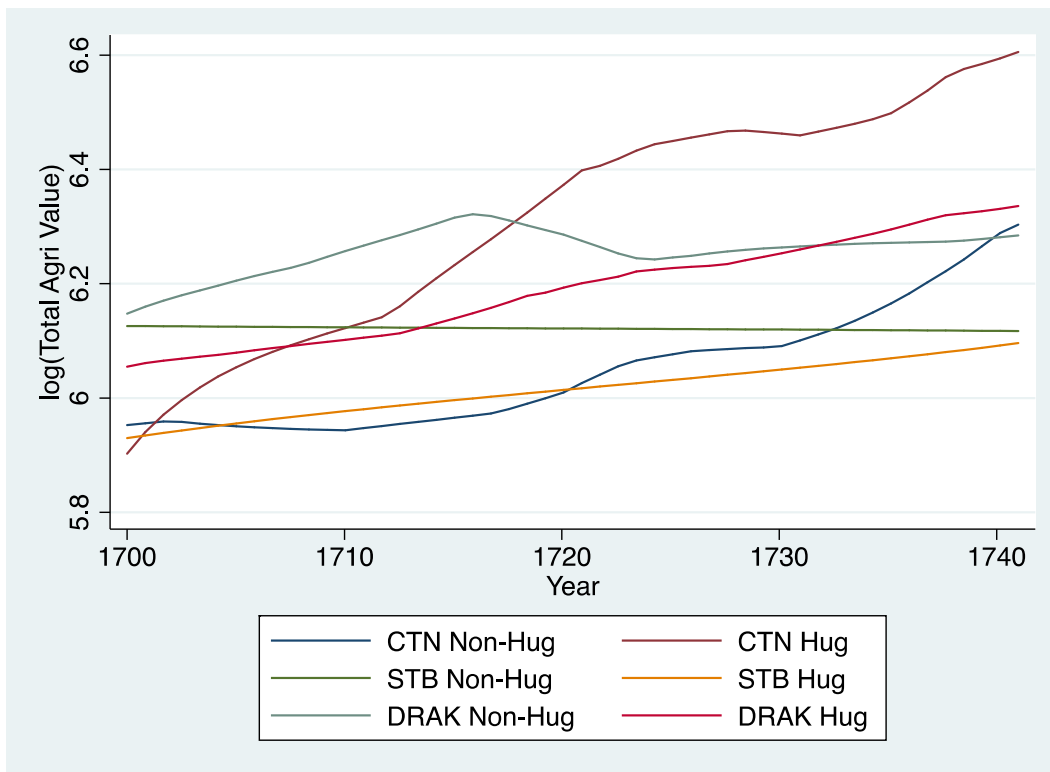


Figure 2 Local Polynomial Smoother: $\log(\text{Total Agricultural Value})$, by group and district, for diversified farmers (diversity > 0.75)

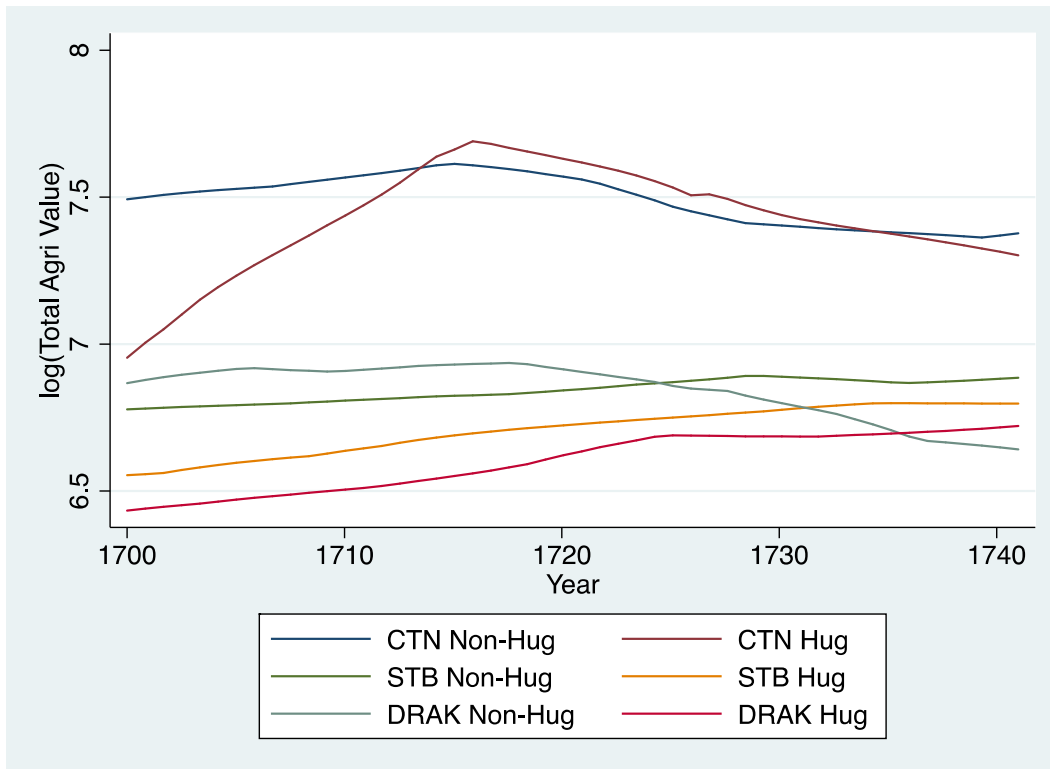
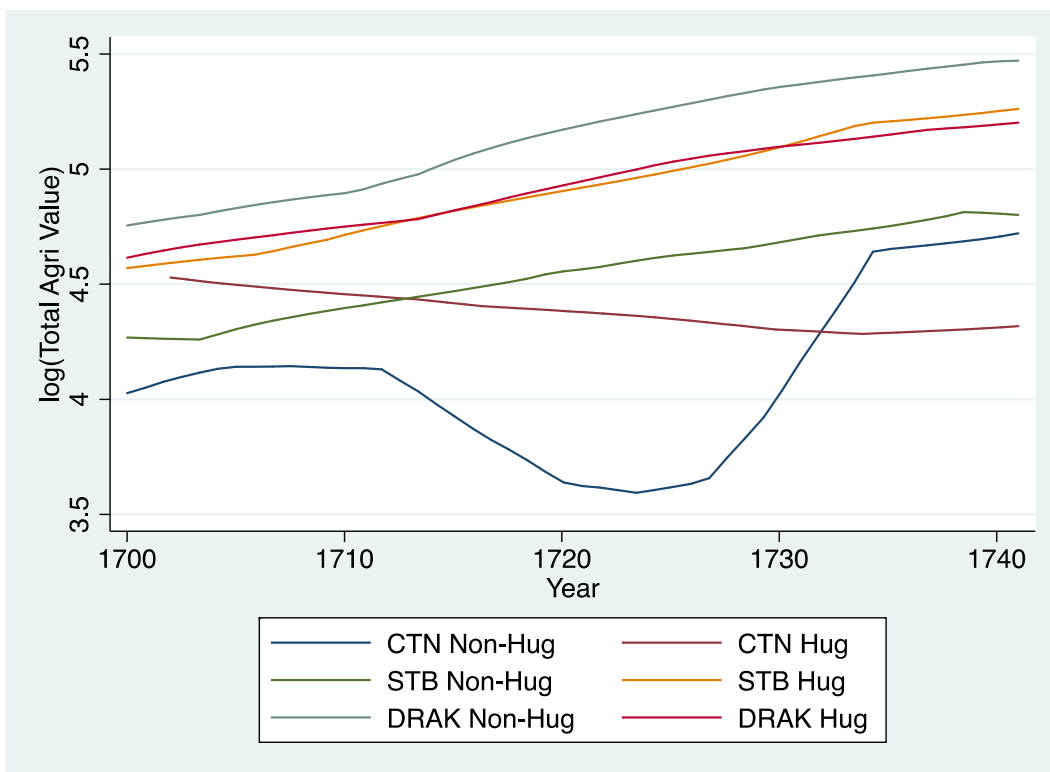


Figure 3 Local Polynomial Smoother: $\log(\text{Total Agricultural Value})$, by group and district for specialist farmers (diversity < 0.25)



4.2 Model-based analysis

We now turn to estimation of production functions at the household level for various periods, to illustrate the role of property rights and network effects. Periods are defined by changes in property rights and cultural landmarks, which would have an influence on production differences across groups. Most specifications do not control for production inputs, but introduce network dummies and interact with product diversity. Where inputs are included, the Cobb-Douglas form of the production function is assumed; as is noted, these specifications do not alter our results.

We test for the presence of network externalities in Tables 1 and 2 which present estimates of sending and receiving region differences in the total value production across various periods. The total value of production uses prices from auction rolls in relevant years to convert quantities from the *opgaafrollen* to total values, which are then deflated by a price index (as in Du Plessis and Du Plessis 2012). Networks are defined geographically, by both the sending region (whether individuals were Huguenot or not) and by settling region (the district at the Cape where they settled). The assumption is that common cultural origins and skills sets would be defined by ancestry (as in Fourie & von Fintel, 2011) and that households would maintain ties within this cultural network, but that close proximity defined the group with whom households could interact with directly in the colony. Regressions are run for various periods: from 1703 grazing permits were introduced, adding more secure property rights to a greater range of households; from 1714 payment was required for these permits, thereby entrenching a more permanent and secure right to so-called *leningsplaatsen* (loan farms). From 1723, French book imports were discouraged and cultural assimilation was aggressively promoted by VOC officials, so that networks were less likely to be defined along lines of descent in this time; furthermore, by 1726 no trace of the French language was left at the Cape, so that this period represents a breakdown of formal ties to French culture and associated network effects. Product diversity is constructed by calculating a normalized Herfindahl-Hirschmann index for each farmer, based on the total market value of each agricultural product, as was also done by Von Fintel, Du Plessis and Jansen (2013). While Fourie & von Fintel (2013) document strong Huguenot advantages for *wine* farming at the Cape, this study broadens the scope to include all production types, and to understand the role of specialization in any particular product at the Cape.

5 Discussion of results

Specification 1 highlights initial average production advantages of the various networks over non-Huguenots in Cape Town in the era before any form of broad property rights were assigned to farmers; residents of both ancestry groups in Stellenbosch and Drakenstein

(which was the frontier of the colony at that time), both enjoyed production advantages. F tests suggest that within the same region, the different groups did not have different production levels (except that Stellenbosch non-Huguenots had a premium over non-Huguenots), so that the effects noted are generally defined by local regions and not defined by European sending region. This is different to the results found by Fourie & von Fintel (2011), where the focus falls on wine production, for which specific skills from home regions provided clear benefits at the Cape.

Based on specifications 1-4, therefore, it appears that no network effects are present for the average farmer from each group, but that property rights diminished the benefits of the select few who moved to inland regions early. However, it is necessary to account for the fact that certain farmers within each group could potentially exploit network advantages, conditional on adequate resources. We particularly investigate the role of farmers' need to diversify or the ability to specialize in one type of production. As noted below, this does indeed reveal network and property rights effects.

Specifications 5-8 in Table 1 introduce controls for product diversity. The coefficient on this variable represents the increase in production if a farmer moved from complete specialization to complete diversification (equal shares in all types of production). Column 5 highlights that the initial frontier benefits (as in column 1) can be accounted for by high levels of diversification, which itself carried a high premium. As noted above, this small group in Stellenbosch and Drakenstein (at that stage at the frontier of the colony) did not initially have fixed property rights, but had free reign to farm large tracts of land, enabling diversification and larger yields at the frontier. Given that the newly proclaimed lands in Stellenbosch and Drakenstein were not limited by size, it allowed farmers to experiment with various crops and stocks, enabling them to produce greater outputs. Furthermore, without the benefits of diversification, the farmers in these regions would have been at a disadvantage relative to Cape Town in the subsequent period (column 6), after grazing permits were introduced. Farmers in other regions therefore appeared to benefit from the semblance of property rights that were granted them. Put differently: the benefits of diversification on large, sparsely populated farms in the interior were extended to other regions by means of better defined property rights. The value of the diversification coefficient declines with time, suggesting that as the economy developed, it was no longer necessary to hedge against risks with many crops, but farmers could specialize as property rights became more secure. The grazing rights did not incentivize larger production levels at the frontier, as these regions already had the benefit of sparsely populated farmlands, which they could more freely cultivate or use for stock breeding. Where there was more established farming (in the Cape Town district), and greater density and less freedom to move, the limited property rights allowed them to catch up with frontier production levels. In columns 7 and 8 (when land was paid for on lease) no benefits are traced for the average farmer in each network, product diversification is still important for yields, but this declines. This suggests that for the average farmer, progressively more secure property

rights removed any regional differences in production, and as land was used more intensively and divided into limited units, diversification carried less value. Farmers derived greater benefit from specialization.

This is not to say that network effects were *not* present. Table 2 expands the specification by interacting the regional-ancestry networks with diversity. Now the “main effects” of district and Huguenot status represent the production premia of product specialists (in other words, for farmers who had diversity of zero, or only produced one product).

It is apparent in columns 9-12 that specialists in Stellenbosch and Drakenstein had distinct premia over their counterparts in Cape Town. Is this again a regional effect? Partially it is (because non-Huguenots in these regions also enjoyed premia over Cape Town), but it is apparent by comparing the Huguenot premia with those of the non-Huguenots, that there is also a network effect (in that Huguenot specialists were better agricultural producers than non-Huguenots judging by coefficient sizes). F Tests do not reveal, however, that the coefficients are significantly larger for Huguenots, though some imprecision may be driving this result. Given the characteristics of these regions, these specialists represent the wine producers who attained great wealth, and whose skills were maintained within their networks (as per Fourie & von Fintel, 2011). A time element is, however, important to note: column 10's premia for specialists approximately halve in most cases once grazing rights are introduced, suggesting that individuals that could diversify to stock farming could catch up with wine specialists. However, once the leningsplaatsen were fully paid for and offered more secure property rights (column 11), we notice that the premium for specialization escalates for most network groups, most notably for Stellenbosch Huguenots (this premium is statistically greater than non-Huguenots in this region). After the period of cultural assimilation (column 12), the beneficial combination of secure property rights and specialization persist (especially in Stellenbosch): however, the differences across network groups in Drakenstein become less pronounced. This suggests that there is some merit in the argument that the French benefitted from their cultural roots and cultural networks.

Can we account for the benefits of specialization by means of superior production inputs? Specifications 13-16 introduce controls for the main inputs into the production process. In the pre-1714 period, these inputs do not explain “away” the benefits that specialists enjoyed. This emphasizes that this was a network effect enjoyed by an elite, rather than the benefits of productive endowments. However, once property rights become more permanent (post-1714), the benefits to specialization are more apparent. Statistically significant network differences arise in column 15 and 16 (particularly for non-Huguenots in Drakenstein), suggesting that it is a relative lack of production inputs that explains why their advantage is not significant (in columns 11 and 12). Property rights therefore enhanced this particular networks' ability to specialize in an industry that was maturing.

6 Conclusion

The paper supports the notion that network subscription amongst the Huguenots played some part in initial differences in agricultural productivity and the eventual domination of the wine industry by them. However, the network effects experienced in the eighteenth century Cape Colony do not fully explain the growth and changing composition of the agricultural sector. We find that the evolution of property rights for farmers at the Cape contribute significantly to the explanation. Increasingly better protected property rights significantly changed what and how farmers could produce. We found that changes in property rights affected diversification or specialisation of agricultural output. As farmers moved to the interior parts where there were very little limits to the size of their farms, they benefited from diversification of production as this acted as a hedge against agricultural shocks. The benefit for these farmers diminished over time as property rights became more secure. More secure property rights removed any regional differences in production, and as land was used more intensively and divided into limited units, diversification carried less value. Farmers derived greater benefit from specialization.

The network effects do not, however, totally disappear. Once the *leeningsplaatsen* offered more secure property rights, the premium for specialization for Stellenbosch Huguenots is statistically greater than for non-Huguenots. The beneficial combination of secure property rights and specialization persist in Stellenbosch: however, the differences across network groups in Drakenstein become less pronounced. This suggests that there is some merit in the argument that the French benefitted from their cultural roots and cultural networks.

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Table 1 OLS Estimates of Total Production

<i>log(Total Value)</i>		1	2	3	4	5	6	7	8
Period		1700-1702	1703-1713	1714-1722	1723-1741	1700-1702	1703-1713	1714-1722	1723-1741
Non-Huguenot	Cape Town (base)	0	0	0	0	0	0	0	0
	Stellenbosch	0.499**	0.033	0.139	-0.075	-0.039	-0.252**	-0.264	-0.051
	Drakenstein	0.357*	0.047	0.578***	0.103	-0.003	-0.236***	0.162	0.148**
Huguenot	Cape Town	-0.202	-0.066	0.194	0.327	0.144	0.047	0.323	0.322
	Stellenbosch	-0.426	-0.129	0.139	0.08	-0.178	-0.422*	0.264	0.056
	Drakenstein	0.329*	-0.054	0.288	0.12	-0.16	-0.496***	-0.077	0.007
Diversity						3.474***	3.289***	3.340***	2.677***
Constant		5.552***	6.296***	5.664***	6.177***	3.974***	4.743***	4.324***	4.845***
R-squared		0.026	0.001	0.025	0.004	0.62	0.494	0.508	0.372
N		485	794	327	1768	485	794	327	1768
P-value: H_0 : HugxStb = NonHugxStb		0.002***	0.521	1	0.293	0.427	0.443	0.088*	0.373
P-value: H_0 : HugxDrak = NonHugxDrak		0.862	0.389	0.091*	0.776	0.178	0.005***	0.094*	0.008***
F statistic		2.828	0.24	2.15	1.517	130.417	150.044	51.254	135.629

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

Table 2 OLS Estimates of Total Production

<i>log(Total Value)</i>		9	10	11	12	13	14	15	16
Period		1700-1702	1703-1713	1714-1722	1723-1741	1700-1702	1703-1713	1714-1722	1723-1741
Non-Huguenot	Cape Town (base)	0	0	0	0	0	0	0	0
	Stellenbosch	0.279	0.405**	0.154	0.710***	0.272**	0.239	0.199	0.316**
	Drakenstein	0.720***	0.289*	1.323***	1.367***	0.600***	0.399**	0.575**	0.781***
Huguenot	Cape Town	0.783	0.327**	0.882***	0.212	0.629	0.375***	1.126***	-0.052
	Stellenbosch	0.499*	0.683*	1.305***	1.221***	0.364**	0.723***	0.760**	0.550**
	Drakenstein	0.891***	0.430*	0.796**	1.186***	0.405**	0.430**	0.185	0.486***
Diversity		4.272***	4.078***	4.528***	4.168***	0.836***	0.846***	0.831***	0.888***
Non-Huguenot x Diversity	Cape Town (base)	0	0	0	0	0	0	0	0
	Stellenbosch	-0.725**	-1.297***	-1.076**	-1.529***	-0.497***	-0.567***	-0.599*	-0.608***
	Drakenstein	-1.444***	-1.062***	-2.490***	-2.482***	-0.995***	-0.527**	-1.010***	-1.126***
Huguenot x Diversity	Cape Town	-1.578*	-0.576	-1.417	0.217	-0.457	-0.165	-2.403***	0.444
	Stellenbosch	-1.620***	-2.093***	-2.739***	-2.326***	-0.572**	-1.207***	-1.602***	-0.861***
	Drakenstein	-1.954***	-1.701***	-1.963***	-2.301***	-0.706***	-0.812***	-0.426	-0.796***
log(hssize)						-0.087***	-0.142***	-0.144***	-0.092***
log(slaves)						0.101***	0.130***	0.128***	0.063***
log(knechts)						0.001	0.015	0.032	0.127***
log(vines)						0.029***	0.006	-0.007	-0.001
log(grain seed)						0.428***	0.362***	0.265***	0.200***
log(horses)						0.087***	0.096***	0.019	0.072***
log(cattle)						0.262***	0.231***	0.407***	0.435***
Constant		3.611***	4.370***	3.847***	4.103***	4.291***	4.881***	4.389***	4.289***
R-squared		0.648	0.516	0.550	0.427	0.887	0.852	0.859	0.793
N		485	794	327	1768	485	794	327	1768
p-val: H0: Hug_Stb = NonHug_Stb		0.410	0.458	0.001***	0.036**	0.557	0.033**	0.134	0.273
p-val: H0: Hug_Drak = NonHug_Drak		0.514	0.592	0.119	0.152	0.258	0.873	0.064*	0.000***
F statistic		134.099	109.839	34.412	83.676	259.135	262.409	120.418	252.334

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

