From Land Grants to Loan Farms:
Property Rights and the Extent of Settlement
in Dutch South Africa, 1652-1750

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This paper examines a paradox in the formation of property rights in land in the early settlement of the Dutch Cape Colony. In 1652, the Dutch East India Company (VOC) established an outpost at the Cape of Good Hope to serve VOC ships sailing between Europe and Asia. Over the next 75 years, the outpost expanded into a full-fledged VOC colony. As a thin but growing population expanded land claims to graze sheep and cattle. The VOC initially promoted settlement by extending well-specified and enforced land grants in restricted zones. But by 1714 it transitioned to accommodate rapidly expanding settlement with a more loosely specified form of property rights, the loan farm. We develop a profit-maximizing monopsony model to explain the VOC choice to transition from land grant to loan farm. We conclude that the decline in the population size and ability of the Khoikhoi, a first people who inhabited the Cape, to resist Dutch incursion was critical to the transition, as it lowered the government costs of enforcement and enabled the rapid expansion of the pastoral economy.

JEL codes: N47, N57, P48, Q24

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Theories of the colonial origins of institutions highlight the 'neo-Europes' as places where 'good' institutions emerged, where sparse indigenous populations and natural environments favorable to European settlement reproduced the liberal labor, market and landholding institutions found in Western Europe. Confrontations with or resistance from the first peoples who pre-inhabited these regions play no role in these theories. The widely-cited works of Stanley Engerman and Kenneth Sokoloff, and Daron Acemoglu, Simon Johnson, and James Robinson (hereafter AJR) incorporate local populations when they are relatively dense, where they provide a source of labor and incentivize the adoption of extractive or coercive institutions.[1] But these works treat the presence or opposition of local indigenous populations in the sparsely-populated breeding grounds of the neo-Europes as insignificant.

Yet research has shown that resistance of first peoples to the encroachments on their traditional lands existed and mattered for the institutional development in the neo-Europes exhibits certain differences. Alan Dye and Sumner La Croix show how resistance influenced the institutional foundations of colonial settlements.[2] In a comparison of Australia and Argentina, they find that differences in the intensity and effectiveness of the indigenous resistance had an effect on how original property rights to land emerged on the frontiers of settlement. This paper extends that work by examining this question in the context of the early settlement of the Dutch Cape Colony, showing how indigenous resistance helps to explain early institutional development of property rights in the colony leading eventually to its extension over much of the southwestern Cape.

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[1] Engerman and Sokoloff, 'Factor endowments'; Acemoglu, Johnson and Robinson, 'Colonial origins', and 'Reversal of fortune'.

[2] Dye and La Croix, 'Political economy of land privatization'.

In their comparison of Australia and Argentina, Dye and La Croix explain a paradox: Why were property rights to land in the Province of Buenos Aires, Argentina, originally set up in relatively well-defined *de jure* form; whereas as in New South Wales, Australia, they originated as less well-defined *de facto* squatters' rights, without government authorization or enforcement, when Spanish colonizers are generally known for transferring weaker property rights than English colonizers. Dye and La Croix develop a model that explains why fiercer and more effective indigenous resistance in the Argentine *pampa*, relative to the aboriginal resistance in Australia, created a preference for *de jure* rights in the former case but *de facto* rights in the latter.

This paper contributes to the literature by adding a new variant to the comparative studies of how original property rights emerged on the frontiers of neo-European settlements. We show that incorporating the indigenous opposition helps to explain a similar paradox in the history of South African property-rights formation. Although the colonial government initially allocated land to farmers by issuing grants within a tightly restricted area of settlement, between 1700 and 1714 it transitioned to a new, more loosely specified form of property rights ('the loan farm') that allowed settlers to expand settlement more than 400 miles from Cape Town and establish claims to millions of acres of land. In effect, property rights in land underwent a counterintuitive transition from more well-defined to less well-defined rights. We extend the Dye-La Croix model to explain why the government chose to create a weaker class of property rights in land to accommodate (and constrain) settlers' claims to large tracts of land in a rapidly expanding frontier.

The model shows how the extent of the indigenous threat on the frontier can explain the rapid expansion of settlement and the government's choices of property-rights institutions. The

Dutch East India Company (Vereenigde Oostindische Compagnie, hereafter VOC) originally

established an internally operated farm to produce and sell supplies to passing ships, but the

company farm was unsuccessful. Fairly quickly, the company ceded lands to former employees

as free burghers from whom it procured provisions. For the first fifty years, these remained

within 250 km from Cape Town, contained by official settlement boundaries drawn by the VOC.

But over the next fifty years, the small trading outpost was transformed into a vast colony. In

1677, twenty-five years after the outpost was founded, lands under VOC control encompassed

only 200-250 square miles. Over the next twenty-five years, the area controlled by the VOC

expanded into the areas around Paarl and Stellenbosch, roughly 900 square miles. By 1750, the

geographic expanse of the colony had increased roughly tenfold, with a thin but growing

population of free European settlers, Khoikhoi attached to settler households, and slaves brought

from other parts of Africa and Asia. These free settler households were primarily engaged in

grazing large herds of sheep and cattle to be sold to the Company. Evidence from the colony's

population history indicates that the rapid expansion of settlement coincided with a sharp decline

in the indigenous capacity to resist.

The analysis thus highlights certain unique features that distinguish property-rights

formation in the Cape Colony from other neo-Europes. Prominent treatments of the institutional

foundations of the neo-Europes overlook such differences. For example, AJR propose that neo-

Europes uniformly emerged as European immigrants in these colonies 'demanded rights and

protection similar to, or even better than, those they were familiar with in their home countries'.[3]

Engerman and Sokoloff propose similarly that Europeans set up institutions of free labor and

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[3] Acemoglu, Johnson and Robinson, 'Colonial origins', p. 1370; 'Reversal of fortune', p. 1266;
'Institutions as a fundamental cause', pp. 414-16.

broad property ownership to attract European immigrants because they found fewer rents to extract in the sparsely inhabited temperate lands of North America. Neither accounts for differences between neo-Europes.[4]

There is, however, a related literature that does account for differences. Lee Alston, Edwyna Harris, and Bernardo Mueller (hereafter AHM) find that first-possessor rights on the frontiers of three neo-Europes—the western United States, Australia and Brazil—originated out of the land-taking *de facto* claims of squatters rather than from sale or grant of surveyed land with *de jure* rights. They find that *de facto* claims typically transitioned into government-sanctioned *de jure* rights; although, whether governments chose to acknowledge or challenge the *de facto* claims of squatters differed from one case to the next. John Weaver's comprehensive study of colonial United States, Australia, New Zealand, and the Cape Colony supports their view. He finds that local colonial governments often lost control of the settlement process, and rights to land emerged out of the 'rule-breaking conduct of land-seeking individuals and consortia.' Weaver notes that land-taking was often met with 'a grudging official toleration for [these] defiant acts', while AHM explain why colonial governments sometime choose to resist the land takings.[5]

Dye and La Croix develop a model that extends the AHM framework to explain how indigenous opposition to European encroachments can have an effect on the original formation of property rights.[6] Comparing Argentina (the province of Buenos Aires) and Australia (New South Wales), they predict that the gradual transitions from *de facto* to *de jure* property rights, as

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[4] Engerman and Sokoloff, 'Factor endowments', pp.263-75.

[5] Alston, Harris and Mueller, 'Development of property rights', p. 744; Weaver, *Great land rush,* pp. 5-6.

[6] Dye and La Croix, 'Political economy'.

described in AHM, should take place only when the capacity of the indigenous population to mount a resistance is fairly limited. It therefore occurs in the case of New South Wales, where aboriginal resistance, though not insignificant, could be managed by the settlers themselves. But it does not occur in the case of Buenos Aires, where the resistance of the *pampa* Indians presented a much greater threat. There settlers demanded, or at least accepted, government provision of *de jure* property rights and settlement boundaries in exchange for military protection, and rights to public land were acquired by sale or grant. The implication of the Dye-La Croix analysis is that the usual transition from *de facto* squatters' rights to government provision of *de jure* property rights only happened when the indigenous resistance was not strong enough or effective enough to deter squatters from going out on their own.

The Cape Colony is especially interesting because it provides a case where the frontier transitioned over a period of about 70 years from a high-risk environment, in which threats from the indigenous opposition were a deterrent to squatting, to a low-risk one, in which threats virtually vanished and squatting expanded the territory of settlement with little or no constraint.

I

Most theories of the emergence of property rights focus primarily on the demand for property rights. Harold Demsetz's pioneering study, for example, argues that the demand for property rights emerges as the gains from internalizing rent dissipation from open access exceed the costs of defining the property right.[7] The AHM explanation extends the Demsetz approach by arguing that first possessors on a frontier initially prefer to create and enforce their own *de facto* property rights; the demand for *de jure* property rights and third-party government enforcement

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[7] Demsetz, 'Toward a theory', p. 350.

emerges only as land values rise.[8] Such demand-side factors played an important role in the

Cape Colony, but we argue that supply-side factors were also important, as the profit-

maximizing behavior of the VOC government and its decisions regarding the form of property

rights are equally central to the story of Cape settlement. In particular, we note as key events the

VOC's decision to transform its outpost into a settlement; the expansion of settlement after 1679;

and the gradual establishment of the loan farm system between 1692 and 1714.

In 1652, the VOC sent three ships under the command of Jan van Riebeeck and 80

employees to occupy the territory surrounding Table Bay, a natural inlet overlooked today by

Cape Town. The VOC outpost near the Cape of Good Hope was the first permanent European

settlement in southern Africa (see Figure 1). Like other 17th-century European colonies, the

Cape Colony was a semi-private, joint-stock trading company chartered by the Dutch

government to carry out the lucrative East-West trade. The VOC administration controlled all

dimensions of local government at the Cape, had tight controls over the religious establishment,

and was a monopsony purchaser of the colonists' grain, meat and wine.[9]

By all accounts, the VOC had no intention of colonizing the southern tip of Africa when

it established its outpost. Its mission was to set up a company farm to provision VOC ships

sailing between Europe and Asia and serve as a waystation for the ships' crews *en route*. The

original farm was worked exclusively by VOC employees. Its boundaries, which extended less

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[8] See also Alston, Libecap and Mueller, 'Property rights and land conflict', 'Model of rural conflict', and *Titles, conflict and land use*, pp. 81-97; Alston, Libecap and Schneider, 'Determinants and impact of property rights'; Barzel, *Theory of the state,* chs 1 and 11. On violence and property rights, see Umbeck, 'Might makes rights', and North, Wallis and Weingast, *Violence and social orders*.

[9] For more detailed treatments, see de Kock, *Selected subjects*; Ross, 'Cape of Good Hope' and *Beyond the pale*; Guelke, 'Land tenure'; Guelke and Shell, 'Landscape of conquest'; Thompson, *History of South Africa*; and Penn, *Forgotten fronti*er.

than a kilometer from the VOC's fort ('the Castle') in Cape Town, were defined by the planting

of the 'Hawthorne Hedge' for protection. All employees lived in company housing inside the

hedge. Setting up company employees to grow the colony's food mirrored practices of other

seventeenth-century European trading companies, including the Virginia Company, the

Hudson's Bay Company, and the Royal Africa Company. As in other European trading

colonies, VOC company farms performed poorly.

Figure 1: The Cape Colony in 1750
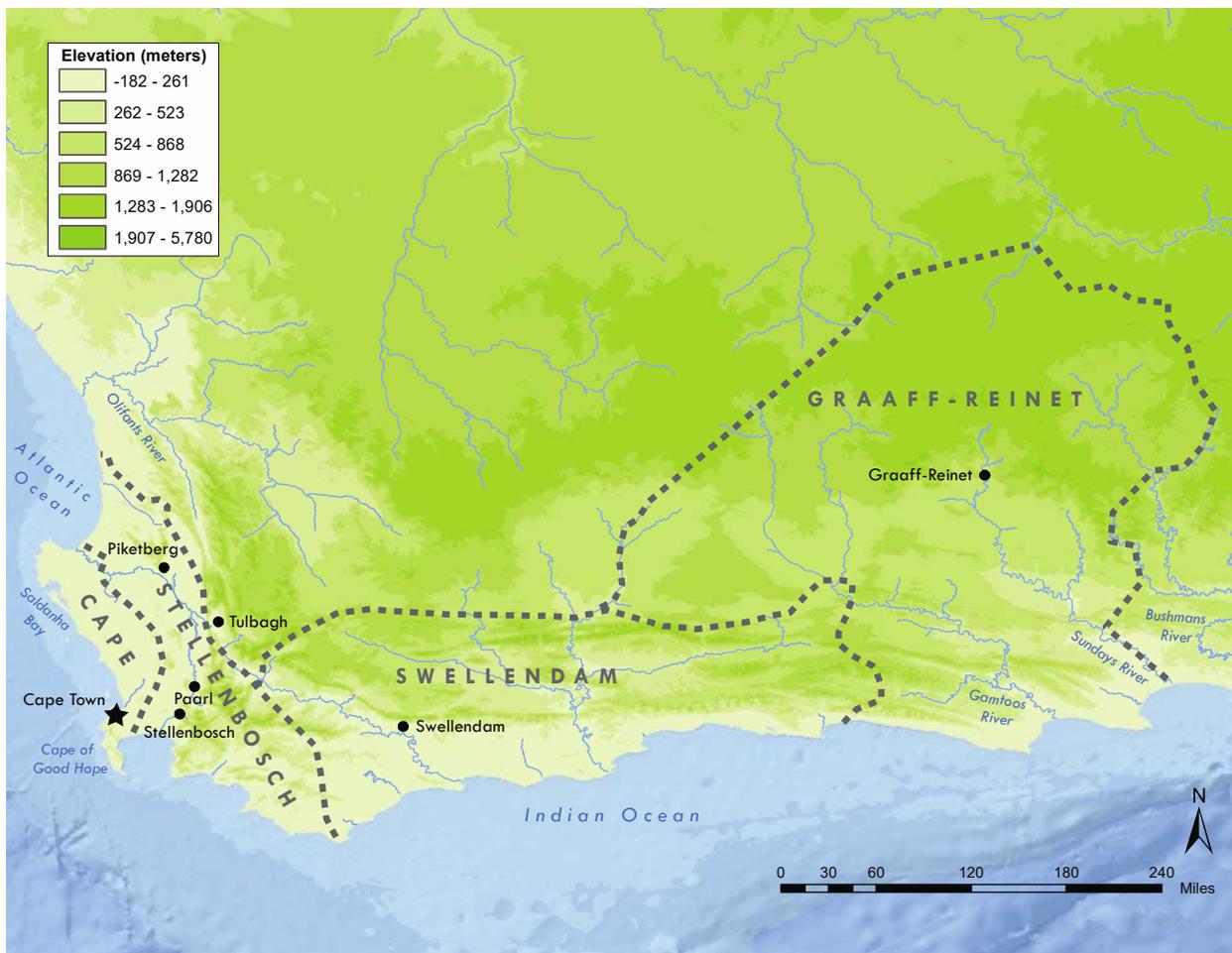
Note: Map Credit to Adele Balderston.

In 1657, the VOC abandoned company production of provisions and took actions to

establish independent farms. It released nine employees from their employment contracts, bestowed them 'free burgher' status and grants of land outside the Hawthorne Hedge, each averaging 29 acres. The land grants required settlers to turn over ten percent of their harvested grain to the government and obligated them to sell the remainder (minus personal consumption) to the VOC at prices fixed to grain prices in Europe. Farm labor was provided by family and slaves imported by the VOC from other parts of Africa and Asia. The free burgher farms were much more productive than the state farms, but the sector grew slowly. Leonard Guelke notes that '[i]n the Census of 1679, the [male] freeburghers numbered only 142 adults, of whom fewer than 40 were engaged in agriculture'.[10]

The VOC farms were established on traditional grazing lands of a nomadic pastoral people, known as the Khoikhoi (or the Khoi), who began to resist displacement by the Dutch settlements as the colony expanded beyond the Hawthorn Hedge. In 1659, Khoi groups on the Cape Peninsula fought an effective guerilla war against Dutch farmers. Marks notes that a peace agreement was reached in April 1660, 'perhaps in response to pressure from other [Khoi] groups for a resumption of the [disrupted cattle] trade'.[11] In response to the First Dutch-Khoi War, a wooden fence and three guardhouses were built along the Cape Peninsula's settlement border at the Liesbeek River, and mounted guards monitored both Khoi intrusions and settlers going

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[10] Guelke, 'Land tenure,' p. 13; and 'Freehold farmers', p. 70. As cited by Guelke, 'Early European settlement', from National Archives of South Africa, Cape Town, C499, Uitgaande brieven, p. 477.

[11] Elphick, *Khoikhoi,* pp. 110-16; Marks, 'Khoisan resistance', p. 64. Van Riebeeck reported in his journal (5/6 April 1660) that Khoi leaders 'dwelt long upon our taking every day for our own use more of the land, which had belonged to them from all ages, and on which they were accustomed to depasture their cattle, &c. They also asked, whether, if they were to come into Holland, they would be permitted to act in a similar manner, saying, ... "have we then no cause to prevent you from procuring any cattle? for, if you get many cattle, you come and occupy our pasture with them, and then say the land is not wide enough for us both! who then can be required, with the greatest degree of justice, to give way, the natural owner or the foreign invader?"' See Moodie, *Record*, p. 205.

beyond the borders.[12] The fence and guardhouses established new boundaries and expanded the colony's land claims. In the 1660s and 1670s, the boundaries of livestock grazing lands were extended beyond the original plots into the Cape Flats southeast of Cape Town. But further expansion of settlement came to a halt during the mid-1670s when the Second Dutch-Khoi War (1673-77), prompted by conflicts among rival Khoi groups over the cattle trade with the VOC, acted as a deterrent.

Attempts to expand the land area under the VOC's control did not resume until 1679 when a new commander, Simon van der Stel, arrived with instructions to make the Colony more self-sufficient in grain. Van der Stel expanded the colony's land claim into what became the Stellenbosch district and established a new policy allowing burghers to acquire freehold land claims there of typically 80 to 160 acres, if brought into cultivation within three years. In 1685, the Colony extended its territorial claims into what became the Drakenstein district and the Tulbaugh Valley.[13] Garrison troops, and occasionally VOC-sponsored commandos, were used to defend settlers in these newly claimed territories or to retaliate against Khoisan operations that took settler livestock or killed slaves.[14]

Throughout the 1680s, the burghers of the Cape Colony and Khoisan sporadically engaged in violence. Khoi groups resisted settler encroachment on grazing lands and retaliated against burghers who raided Khoi *kraals* to rob them of cattle. VOC officials discouraged skirmishes between free burghers and Khoi to limit deployment of garrison troops to the frontier to defend land claims or suppress violence. Despite the government's instructions to remain

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[12] Van der Merwe, *Migrant farmers*, p. 22; Roux, *Verdediginstelsel aan die kaap*, pp. 111-24

[13] Drakenstein roughly encompassed the Paarl and Franschhoek areas.

[14] 'Khoisan' is a term used to refer to both Khoi and San populations.

inside official boundaries, farmers regularly grazed livestock beyond the boundaries, and deployment of garrison troops or commandos to protect them invited increased Khoi resistance and increased costs of protection. In 1692, the VOC issued an ordinance to restrict burgher use of land outside the boundaries:

> All free peoples outside the boundary posts, or borders of the Cape territory, and that of Stellenbosch, together with those settled at Drakenstein, or settled round about there with their livestock, should break up their camps as quickly as possible within the next six months, and by this date have settled themselves within the proper limits with good and chattels, on pain of corporal punishment as deserters and vagrants, and their houses, herds, and cattle pens subject to confiscation at their own expense.[15]

Through the end of the seventeenth century, official policy pronouncements railed against settlement 'outside the boundary posts', and settlers ignored them, grazing livestock on lands just outside the boundaries.[16]

As we see in other neo-Europes, and as our model predicts, VOC restrictions on settlement both inside and outside the frontier were aimed at preventing violence between burghers and Khoikhoi and containing the government's cost of protecting settlements. Yet from 1702, fifty years after the initial settlement, the VOC changed its policy, lifting restrictions on settlement of land outside official boundaries and implementing the loan farm system. The population of European immigrants living in the Cape Colony had gradually increased from 142 people in 1679 to 5,925 in 1701, with 2,029 settlers working in arable agriculture in an area under VOC control of about 850 to 950 square miles encompassing areas around Stellenbosch and Paarl.[17] Indigenous resistance was falling because continual declines in Khoikhoi population

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[15] National Archives of South Africa, Cape Town, C2271, Original Ordinance Book, 19 October 1691.

[16] Penn, *Forgotten frontier*, p. 28; Jeffreys and Naudé, *Kaapse plakkaatboek*, Vol. 1, pp. 4, 34, 39, 43-45, 100, 105, 143, 167, 168, 228, 282, 300, 302, 308, 326, 340.

[17] According to Fourie and von Fintel, 'Settler skills', the 156 French Huguenot refugees who arrived in 1688 and 1689 established vineyards in the Stellenbosch area. From 1685, free passage was offered to

size reduced their ability to resist encroachment. With time, the Khoikhoi integrated and worked

as domestic servants and shepherds in the white settlers' households.[18] By 1750, the European

population increased to 30,368 people, with 11,648 people working in arable agriculture (see

Figure 2), thinly populating an area of land that had expanded to encompass some 6000-8000

square miles in the districts of Swellendam and Graaff-Reinet (see Figure 1).
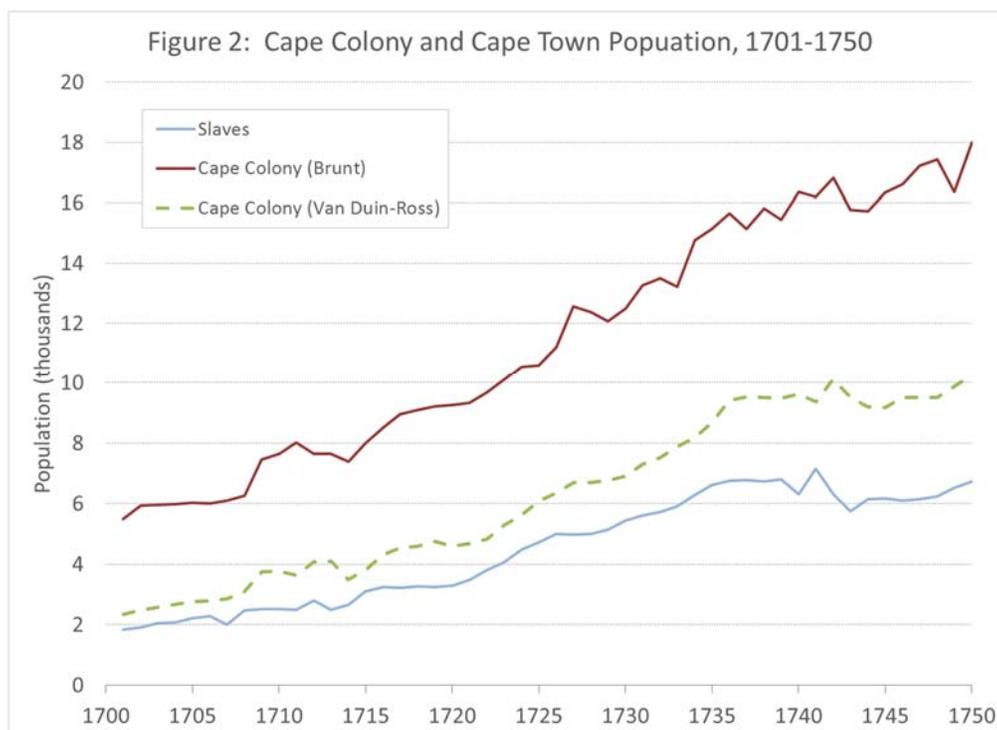
Sources: Free population and Cape Town population: van Duin and Ross, *Economy of the Cape Colony*, pp. 114-25, based on Beyers, *Kaapse patriotte*, pp. 240-49, and Brunt, 'Property rights, pp. 29-32. Slave population is from Shell, *Children of bondage*, pp. 444-47. Separate estimates for the Khoi population are displayed in Figure 8.

Fertile lands with adequate water for wheat and maize farming or vine cultivation became

harder to find as settlement expanded beyond Stellenbosch, and settlers gradually occupied more

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immigrants from Europe, but as few took advantage, it was eliminated in 1707.

[18] Settlers hired Khoi to tend livestock; slaves were imported from other regions. Adkihari, *Anatomy of a South African genocide*, p. 40. Guelke and Shell, *Landscape of conquest*, pp. 819-20; Fourie and Green, 'Missing people'.

distant grasslands with low and variable rainfall for seasonal grazing of stock. From 1701 to 1750, according to estimates of van Duin and Ross, stocks of both sheep and cattle more than tripled, as the area encompassed by European settlement multiplied by almost a factor of ten. Estimates of sheep numbers increased from 53,000 to 166,000 head, while cattle increased from 9,800 to 33,500 head (Figure 3). The period's expansion was interrupted from 1712 to 1723 by sharp drops in stock numbers brought on by drought and disease, but resumed thereafter.
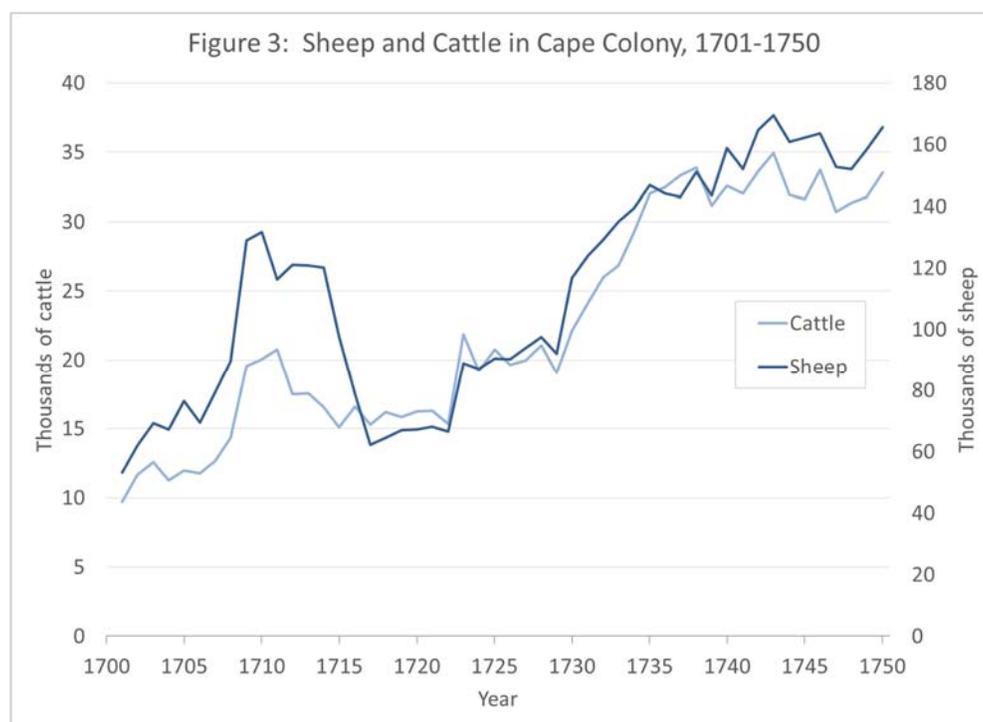
Source: van Duin and Ross, *Economy of the Cape Colony*, pp. 150.

The increase in grazing activity was mirrored by increases in the Colony's gross domestic product (GDP). Fourie and Van Zanden estimate that over the 1701-50 period, the real GDP of the Cape roughly expanded by a factor of three, closely following the three-fold increase in the free burgher and slave population.[19] While real per capita GDP was roughly the same in 1701 as in 1750, it registered wide swings, rising between 1701 and 1710, declining between 1710 and

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[19] Fourie and Van Zanden, 'GDP in the Dutch Cape Colony'.

1735, and then in 1750 recovering to its 1701 level. Remarkably, in 1750, real per capita GDP of the Cape was comparable to that of the two world leaders, Holland and Great Britain.

II

Growth in population, economic activity, and rising land values went hand-in-hand with territorial expansion and the institutional transition to a more loosely defined system of property rights in land, the loan farm system. Loan farm claims were usufruct rights defined by a single point—a beacon or a shelter, with each farm specified as at least an hour walk from another farm's center. What explains the VOC's decision to adopt this new form of property rights? Demsetz's model of property rights formation posits that as the value of land increases, settlers demand greater security for their land claims, and property rights to land become more well-defined and enforced more vigorously.[20] This strictly demand-side model fails to explain the VOC's decisions in the 1690s and 1700s to abandon the land grant institution in new settlements and replace it with the loan farm institution, moving from more to less well-defined property rights in new settlements even as land value rose. In this section, we extend the model in Dye and La Croix and adapt it to the Cape Colony to offer an explanation for why the VOC took these decisions.[21] The model focuses on government provision of property rights on the frontier, and accounts for possible conflict with first peoples.

The demand side of our model builds on the approach used by Alston and coauthors, in which the key assumption is that the net present value of frontier land to settlers falls with distance from the Cape Town market, r, as overland transport costs rise and the cost of bringing

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[20] Demsetz, 'Exchange and enforcement of property rights'.

[21] Dye and La Croix, 'Political Economy'.

goods to market increases.[22] Shown in Figure 4, the annualized value of an acre of land, $v(r)$, is

determined by the expected annual profits from the land by grazing livestock, which declines as r

increases.[23] If property rights are insecure, the value of the land is reduced to $(1-\theta\rho)v(r)$,

where ρ is the risk of losses caused by theft, violence, or other insecurities $(0 \leq \rho \leq 1)$, and θ is

an institutional parameter ($0 \leq \theta \leq 1$) that indicates the degree of government protection against

acts of encroachment, theft or violence.

Figure 4. The Market for Public Land on the Frontier
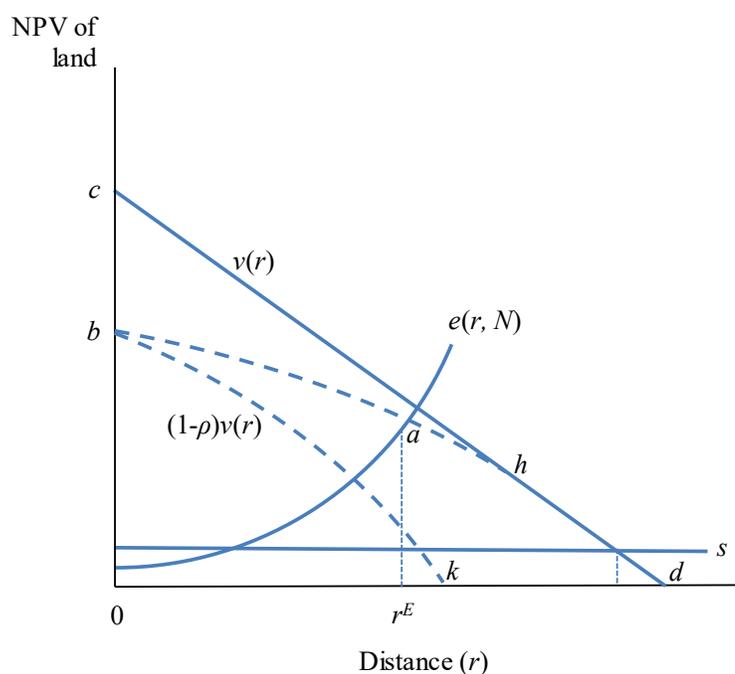
Note: The dotted curves *bd* and *bk* represent two possible values of $(1-\rho)v$, the latter drawn under the assumption that the risk of violence rises as one moves farther out into the frontier.

Unlike previous treatments, we identify two sources of risk on insecure land, which we

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[22] Alston, Libecap and Mueller, *Property rights and land conflict*; Alston, Harris and Mueller, 'Development of property rights'.

[23] See Guelke, 'Early European settlement', for a discussion of the difficulties transporting stock or goods to Cape Town.

distinguish as *inside risk* and *outside risk*. Inside risk refers to risk caused by disputes between or

encroachment by intruding or neighboring settlers. Following Alston, Harris and Mueller, we

argue that this source of risk gradually falls to zero as *r* increases because land farther from the

port is more sparsely settled and settlers' competition for it diminishes. Outside risk refers to the

risk of conflict with indigenous people defending land they had traditionally occupied. The risk

factor, ρ, which combines the two sources of risk, is decreasing in *r* on lands near Cape Town

where insider risk is more heavily weighted, but it is increasing in *r* on lands more distant from

Cape Town as long as settlements encroach more on indigenous claims. Outside risk is positively

related to the size of the indigenous population, *N*, as a larger population can mount greater

resistance. The risk factor is expressed as $\rho = \rho(r, N)$; it increases in *N* and is U-shaped in *r*.

Dye and La Croix show that outside risk can have a powerful influence on the

government's choice of property-rights institutions. Taking *v*(*r*) as the annual value of secure

land, two possibilities of the effects of outside risk on the value of unprotected land,

$[1 - \theta\rho(r, N)]v(r)$, assuming no government protection, $\theta = 1$, are depicted in Figure 4. Curve *bh*

depicts the value of unprotected land when outside risk is small or non-existent. In this case, only

inside risk applies, and it falls to zero at point *h*. In contrast, curve *bk* depicts the value of

unprotected land when the outside threat is large and therefore the value of unprotected land at

the frontier can fall quickly to zero, depicted at point *k*.

In settlements without government protection, $\rho > 0$. Government protection can

eliminate dissipation of value caused by this risk. Any action taken by government to enforce

settlers' property claims reduces $\theta \geq 0$. The model considers two types of property rights: land

grants, which receive the full protection of troops from the garrison, such that $\theta = 0$, and loan

farms, which receive only limited protection ($0 < \theta \leq 1$) against intruding settlers and Khoisan

raids through the VOC's assignment of field coronets, who could coordinate private second-party enforcement but could not summon garrison troops.

Because enforcement costs rise with distance r from the garrison, the VOC tried to limit its enforcement commitments on the frontier. Accordingly, the function $e(r)$, the marginal cost of enforcement, increases at an increasing rate as r increases, as shown in Figure 4. [24] As Weaver finds, most neo-European governments, including the Cape colony, tried to control settlement by setting an official settlement boundary.[25] Dye and La Croix argue that the principal motivation was to contain costs of protecting and enforcing settlers' property claims. In the model, we assume that the VOC sets an official settlement boundary at distance $r = r^E$, beyond which burghers were instructed not to settle and no land grants were authorized. Inside r^E, $\theta = 0$ as land grants inside the 'enforcement boundary' were given secure *de jure* property-rights protection, whereas outside the boundary, prior to the introduction of the loan farm, $\theta = 1$, as no protection was given to *de facto* claims.

A simplified version of the boundary policy is illustrated in Figure 5, which displays a featureless plain with possible areas of settlement depicted as Von Thünen bands around Cape Town.[26] Setting an official settlement boundary is equivalent to announcing a distance r^E, defining a circle within which the garrison enforces and protects land grants for approved settlement, but outside of which settlement is not authorized and garrison protection is not provided.
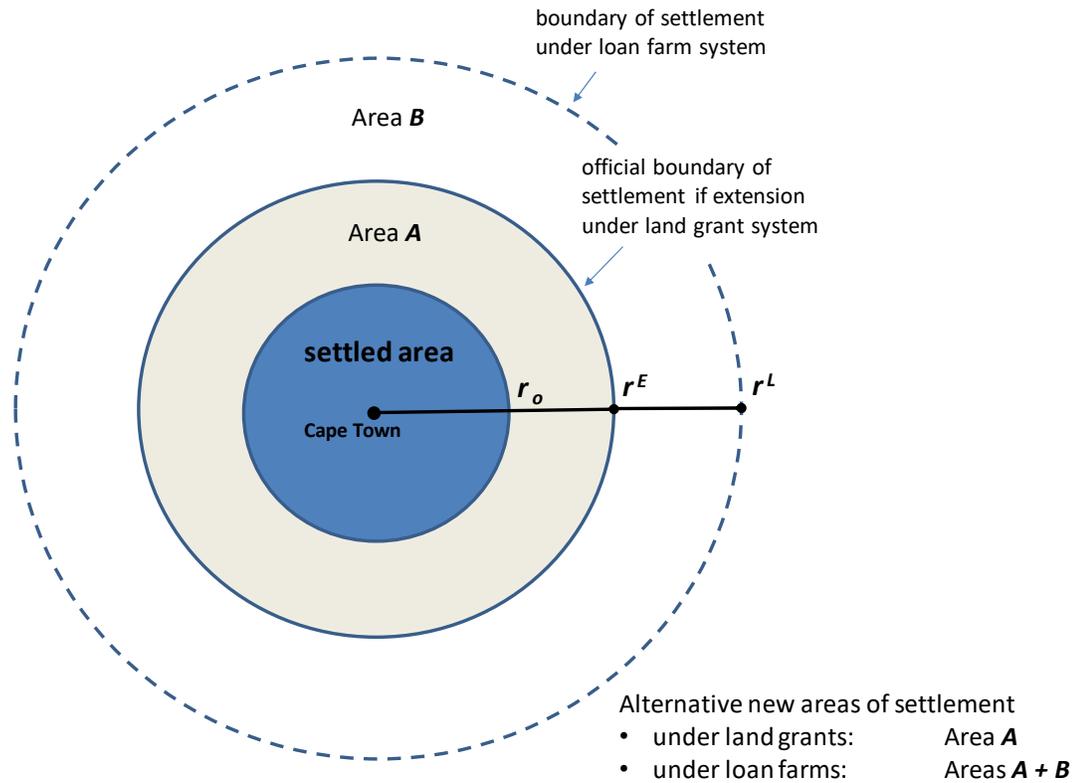
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[24] The VOC's costs of collecting in-kind taxes (e.g., wine, sheep, and cattle) and transporting the goods to Cape Town increased with distance from Cape Town. The cost of monitoring illegal trade between settlers and Khoi also increased with dispersion over a larger area.

25 Weaver, *Great Land Rush*.

26 Von Thünen, *Isolated State*.

Figure 5. Von Thünen Bands around Cape Town

Burgher compliance with the policy depends on whether their cost of compliance is lower than the opportunity cost of ignoring the policy and settling beyond the boundary. On a land grant inside the boundary, burghers pay an annual rent, q, and receive government enforcement. Alternatively, they may evade the rent by squatting on lands outside the boundary and forgoing government enforcement. As a necessary condition for settling inside the boundary, the value of the land grant net of rental payment must be at least as great as the value of an unprotected land claim outside the boundary. This participation constraint, which the VOC had to meet to establish an effective land grant policy, is: $v(r) - q \geq [1 - \rho(r, N)]v(r) - s$, where s represents the burgher's spending on arms and other means of providing private security, which simplifies to

$$q \leq \rho(r, N)v(r) + s . \tag{1}$$

A similar participation constraint applies to the loan farm system. The potential loan farm registrant would choose to squat instead unless $[1-\theta\rho(r,N)]v(r)-\phi \geq [1-\rho(r,N)]v(r)-s$, where partial and imperfect provision of protection is captured by θ as defined above and ϕ is the annual license fee. It simplifies to

$$\phi \leq (1-\theta)\rho(r,N)v(r)+s \tag{2}$$

Essentially, either constraint says that the VOC cannot set the rent higher than the net opportunity cost of squatting relative to acquiring a land grant or registering for a loan farm, respectively.

A third necessary condition is that land inside the boundary must be available for settlement. Between 1660 to 1692, the VOC chose from time to time to extend the boundaries of settlement. As the attractive land within the authorized area was claimed, the VOC responded to new demands by extending the boundary to open new lands for settlement. In Figure 5, as the area inside the circle defined by r_o, the *ex ante* authorized boundary of settlement, became fully occupied, growing demand for land could be satisfied by extending the official boundary to r^E, thereby opening new land beyond r_o. In lieu of this, settlers would squat outside r_o anyway, as long as $[1-\rho(r,N)]v(r)-s > 0$.

III

The model's key insight is that in some cases the choice of the loan farm system involved lower enforcement costs, but its success in generating enough livestock to meet VOC demand depended on the willingness of the burghers to settle in remote areas without garrison protection. (See the Appendix for a more complete description of the model.) As elaborated in Section V, after 1692, the commitment to enforce the official settlement boundary began to show signs of erosion, but after a period of transition the VOC reasserted *de jure* control by introducing new

practices, incomplete forms of property rights, which ultimately became institutionalized as the loan farm system around 1714.

Between 1692 and 1714, a period of experimentation and discovery ensues, during which various approaches to issuing permits and licenses were tried. Our model extrapolates from this experimentation and considers a dichotomous choice between the pre-existing land grant institution, which provided garrison-protected *de jure* property rights, and the institution born from experimentation, the loan farm, which provided only limited *de jure* property-rights guarantees. Although a central registry of loan farms was kept, their boundaries were not measured by survey, and the government provided only limited protection. Consequently, loan farm districts were less costly to enforce but more risky for the settler than land grant districts.

To specify the difference in enforcement costs for the two types of property rights, we distinguish between, *h,* the administrative costs of providing a regulatory framework for defining property rights, and *m,* the military costs of deploying garrison troops to protect settlers from violence or property loss. The land grant institution provided for both types of enforcement, so the marginal cost of enforcement, *e*, of a claim at distance *r* is $e(r, N) = h(r, N) + m(r, N)$. The loan farm system provided only for the administrative function, and thus the marginal cost of enforcement to the government $e(r, N) = h(r, N)$, with the cost of stationing field coronets incorporated into *h*. Note that settlers' use of local militias only partially replaces garrison protection.

The relative costs of the two types of property rights depended on the degree of risk on the frontier and how it changed with distance *r* from the garrison at Cape Town. The marginal cost of military deployment, sending troops from the garrison, increased with distance from Cape Town and with the size and threat capacity of the Khoi population. In comparison, the

administrative costs of the loan farm system involved primarily only maintenance of a central registry and deployment of local field coronets to manage claims, settle disputes, and organize responses to Khoi or San raids. They were either constant or rose slightly with distance and size of the Khoi population, and smaller than the corresponding marginal cost of military deployment. In lieu of the government, the settlers bore the brunt of increased costs of protection either in private security expenses or losses of persons, livestock and other property. Thus, whether the loan farm system generated enough livestock to meet VOC demand depended on whether the condition in Equation (2) is satisfied for a large enough area of the frontier. If risk on the frontier, $\rho(r, N)$, is too high, burghers preferred to settle in areas under garrison protection. The savings from weaker property rights, therefore, depended critically on whether a larger Khoi population increased outside risk significantly at greater distances, r.

IV

As a monopsonist, the VOC shaped institutions and made policy decisions to maximize the profitability of territorial expansion. Profits are defined as revenues on sales of livestock, S, net of livestock procurement costs, $K(x^K) + p(x^B)x^B$, and property-rights enforcement costs, G:

$$\pi^j = S(x^B + x^K) - K(x^K) - p(x^B)x^B - G(x^B) + T(x^B) \tag{3}$$

Procurement costs include payments, K, for livestock purchased from the Khoikhoi, an alternative fringe market for provisioning in the Cape Colony, and payments, $p(x^B)x^B$, for livestock from free burghers. Also incorporated into revenues are the earnings from leases or license fees on land, T. We focus on the choice between property-rights institutions j, where $j = E$ indicates the land grant system, and $j = L$ indicates the loan farm system.

Although variably enforced, the VOC issued ordinances that restricted settlement of lands beyond official settlement boundaries and prohibited livestock trading between burghers and

Khoikhoi. These prohibitions served to separate burgher and Khoi sellers to enable price discrimination. A *plakat* (order) against the trade was issued in 1652, which was widely violated by burghers who exchanged guns, trinkets, knives, tobacco, arrack, and other goods, for cattle. The VOC periodically re-issued *plakats*, usually after reports of illicit trades or violence against Khoi groups.[29] These policies supported VOC rents from the cattle trade by establishing two independent sources of supply for their cattle. The cooperative trade arrangements between the VOC and Khoi communities would otherwise have been imperiled by burghers' purchases of Khoi cattle, sometimes by force, at lower prices, or with the threat of violence against the Khoikhoi.

As shown below, in the half century from 1680 to 1730, the number of ships stopping at Cape Town to provision increased steadily. In the short run the VOC could procure additional supplies by offering higher prices for Khoi livestock, but in the longer run it had the option of extending the Colony's settlement boundaries to procure more supplies. For its new lands, the VOC would prefer to implement the type of property-rights that offered the smallest marginal increase in procurement expenses. As a price-discriminating monopsonist, it would balance its purchases of Khoi and burgher livestock so as to equalize marginal costs of procurement from each source. Combining the first-order conditions for maximizing Equation (3) with respect to x^B and x^K gives this condition:

$$K'(x^K) \geq p'(x^B)x^B + p(x^B) + G'(x^B) - T'(x^B). \qquad (4)$$

which is satisfied as an equality when the VOC traded with both burghers and Khoikhoi.

To make the choice between these two bright-line property-rights bundles, we assume

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[29] Penn, *Forgotten frontier,* p. 28; Jeffreys and Naudé, *Kaapse plakkaatboek*, Vol. 1, pp. 4, 34, 39, 43-45, 100, 105, 143, 167, 168, 228, 282, 300, 302, 308, 326, 340.

that the VOC picked the one with the smaller marginal cost of procuring livestock from

burghers—the right-hand side of Equation (4). The procurement cost from burghers has two

components: (1) marginal outlays to burghers, $p'(x^B)x^B + p(x^B)$, and (2) the net marginal cost of

enforcement, $G'(x^B) - T'(x^B)$. By revealed preference, we infer that before 1692 the net marginal

enforcement cost *ex ante* was smaller under the land grant system. We propose that before 1714

outside risk fell and almost vanished crossing a threshold risk level beyond which net marginal

enforcement costs were smaller under the loan farm system. Incorporating enforcement costs

directly into Equation (4), which is laid out in the Appendix, this threshold is:

$$h(r,N) + m(r,N) - q \geq \frac{h(r,N) - \phi}{[1 - \theta\rho(r,N)]} \ . \tag{5}$$

One implication of this condition is that if outside risk on the frontier, $\rho(r,N)$, declined

substantially, then the loan farm system would become more profitable for the VOC, all else

equal.

To procure more livestock from the burgher population, the VOC had to compensate the

burghers for higher transportation costs and greater risk exposure to induce them to occupy land

farther from Cape Town. Pricing decisions were sensitive to outside risk on the frontier because

of the dissipation effect of property loss on the burgher supply of cattle, which enters the

burghers' participation constraints (Equations 1 and 2). If before 1692 outside risk was high, the

marginal change in VOC revenues with respect to distance, r, would be greater under the loan

farm than the land grant institution; but this relationship would be reversed when outside risk

vanishes. This implies a transition from rising risk, $\frac{\partial\rho}{\partial r} > 0$, to falling risk, $\frac{\partial\rho}{\partial r} \leq 0$. The two

effects worked together, therefore, to make the loan farm system a more attractive choice.

To connect these propositions of falling risk to historical events, we emphasize two

complementary effects of the decline in the Khoi population, discussed below, on outside risk.

First, a downward shock or a long-term decline to the Khoi population caused the supply of Khoi

livestock to become more inelastic, which interrupted the availability of Khoi supplies of

livestock (making Equation 4 a strict inequality) and pushed the VOC toward greater territorial

expansion to increase burgher supplies. Second, a fall in Khoi population caused outside risk to

fall. This may seem to have come directly from diminished numbers, but evidence shows that

population decline led to social or political fragmentation of Khoi society, which must have

impaired Khoi groups' ability to mount an effective resistance to the colony's territorial claims.

Population decline thus had a dual effect: it eliminated outside risk as an obstacle to unrestricted

burgher settlement on the frontier, and induced the VOC to promote the proliferation of loan

farms because it had to rely more on burgher supplies.

V

Our model predicts a switch between two bright-line property-rights bundles but the

actual reorganization of rights was a bit more gradual. As Khoi population and resistance

declined and procurement of livestock from settlers became increasingly important, the VOC

took a Hayekian course by experimenting with various regulations for governing the extent of

settlement, grazing, and trade, which gradually took the shape of the loan farm system.

Experimentation with different approaches to regulation and enforcement of claims

beyond the settlement boundaries began around 1692. Before this date, farmers were allowed to

use lands outside the official boundary to graze but were expected to return their flocks to their

farms inside the boundary each night. As the Khoi population had fallen by roughly 19 percent

over the previous forty years, our model predicts that the VOC would shift toward burgher-

supplied livestock. To meet burghers' demand for land, the VOC initially permitted farmers to

graze their cattle on more distant lands provided prior written consent of 'the Honorable Lord Governor' and proper registration.[30] The permits allowed farmers to disperse further out from the settlement boundaries with their flocks. As distance traveled from the home farm increased, a nightly return became infeasible, and 'grazing licenses' emerged as extended official or unofficial settlement on these lands became the norm.

The first records of grazing licenses appearing in 1703 were 'common property' licenses containing 'only a vague indication of a locality', with multiple farmers assigned the same location, with duration ranging from three months to a year.[31] Typical descriptions of claims included such vague terms as 'near the Piketberg' or 'between the Paardeberg and the Berg River'.[32] By 1706, the Dutch ideal of mixed farming began to give way as more distant settlers specialized strictly in grazing activities with farming concentrated in the older areas of settlement. The government began to grant licenses to individuals who were not farmers, possessed no freehold land, and had no place to return at night.   Licensees moved their livestock from one grazing or watering post to another within their assigned territories.[33] But within just a few years, some farmers began to occupy posts for longer periods and make permanent improvements.

Gradually, licenses evolved so as to convey exclusive rights to specific lands, although,

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[30] National Archives of South Africa, Cape Town, C 2271. 1692. Original Ordinance Book, 19 October 1691 [date signed], 22 January 1692, p. 104.

[31] Van der Merwe, *Migrant farmer*, pp. 54-55, notes that the first 15 grazing licenses varied between 3 and 12 months in length, with two licenses not stating a duration.

[32] Guelke, 'Early European Settlement', pp. 181-82.

[33] See Guelke and Shell, 'Landscape of conquest', for a full discussion of the importance of water in settlers' decisions to make *de facto* and *de jure* land claims.

this was not their initial form. In 1708, the Widow Elbertsz, who had a grazing license at the Vier-en-Twintig River, complained to the authorities that two intruders had received conflicting licenses that overlapped with her claims. The VOC responded by withdrawing the intruders' licenses, declaring 'that individuals were to be given exclusive rights to specific areas' albeit with 'the actual area that an individual was entitled to use … [remaining] undefined'. [34] Opposition from excluded graziers was typically muted, as they had a viable alternative: move to unoccupied lands just beyond the established licensees. Many sought exclusive rights only to essential water sources. Granted, moving to lands at greater distances entailed additional costs of transporting supplies and animals to market, but it also enabled operations on a larger scale, as claimants regularly grazed cattle and sheep on unclaimed lands around them.[35] These behaviors provide evidence that both inside and outside risk were low on the frontier at this time.

The first steps to move from the *ad hoc* licensing arrangements to the loan farm system were taken in 1714. In that year, the VOC allowed free burghers to establish 'first possession' claims to lands in the frontier districts of Swellendam and Tulbaugh. Settlers could claim 'loan farms' (*leningplaats*) of up to 6,000 acres. Registration of the claim with VOC authorities in Cape Town was required. Authorities initially charged a monthly fee (*recognitiegeld*) of one rix-dollar per loan farm; the fee increased to two rix-dollars per month in 1732. A loan farm could be bought, sold, and inherited, but could not be rented to others, a provision sometimes violated.[36] Unlike pre-1714 grazing licenses, loan farm leases allowed cultivation of wheat and

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[34] Guelke, 'Early European settlement', p. 182. See Office of the Surveyor General, pp. 170, 172 (12 October and 24 October 1708).

[35] Van der Merwe, *Migrant farmer*, pp. 55-56.

[36] Inheritances were indivisible,.The VOC reserved the right to reclaim land at the end of the lease period with compensation for immobile fixed assets on the land.

other cereals, which, as with freehold land, was taxed a ten-percent tithe.

Loan farm claims were usufruct rights defined by a single point—a beacon or a shelter, with each farm specified as at least an hour walk from another farm's center. The center and rough dimensions of the circular claim were self-defined by the holder, 'provided that he not be a bother to someone already herding there'.[38] Authorities had some discretion over approvals, but there is no evidence that applicants were turned down. This claim mechanism used minimal administrative resources to define a claim.

Figure 6 shows the entry of new loan farm claims, which occurred in waves with peaks in 1712-14 and 1729-30 and a steady, prolonged ascendance after 1739, implying extensive claims of territory. The loan farm system proliferated as a simple, imprecise method to facilitate first possession claims of large tracts of grazing lands by settlers. More complete definition of land claims by a formal survey would have been more costly and potentially infeasible due to the availability of vast tracts for squatting without payment of survey costs. Consequently, the VOC's introduction of loan farms likely averted widespread squatting.

The primary contribution of the government to frontier defense was to provide administrative assistance to sanction or coordinate second-party measures of security and retaliation undertaken by settlers themselves. The VOC's sole agent in outlying districts—the field coronet (*veldkornet*)—could, on his own authority, organize an armed militia (commando) composed of men from the district.[39] Or loan farmers could organize unofficial commandos and notify the field coronet later. Official and unofficial commandos regularly responded to

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[38] Van der Merwe, *Migrant farmer*, p. 64.

[39] For discussions of the commando system, see Adhikari, *Anatomy of a South African genocide*, ch. 2, p. 40; and Penn, *Forgotten frontier*, pp. 108-54.

Khoikhoi and San raids by killing their males, taking females and children as prisoners, and confiscating livestock. For the northern frontier, Penn found that, of several hundred commando raids organized during the eighteenth century, the majority were conducted before notifying the VOC.[41]

Figure 6: Number of Loan Farms
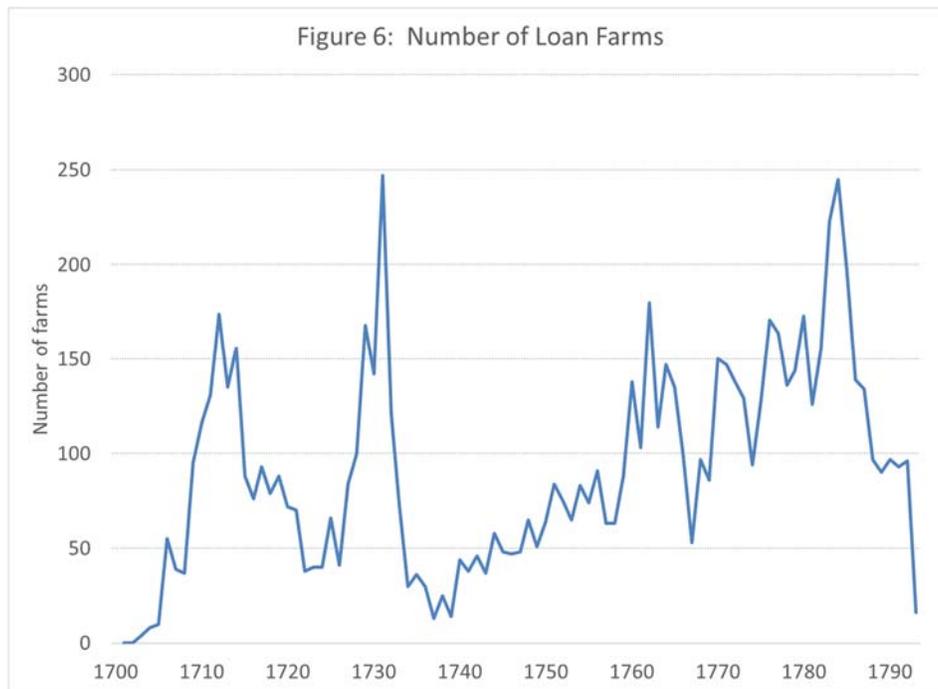
Source: National Archives of South Africa, Cape Town, Receiver of Land Revenue Books, Vols. 1-13.

Consistent with our observations, Alston, Harris, and Mueller, and Anderson and Hill find that second-party enforcement of *de facto* property rights is often observed when specification and enforcement of property rights are under the control of claimants.[42] Second-party arrangements are more common when claimants are relatively homogenous and can benefit from provision of a collectively produced good, such as enforcement against outside claimants,

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[41] Penn, *Forgotten frontier*, pp. 27-78, 66.

[42] Alston, Harris and Mueller, 'Development of property rights', pp. 747-50; Anderson and Hill, *Not so wild, wild West*, ch. 2.

which exhibits economies of coordination. Privately organized commando raids by stock farmers with contiguous herds met both criteria.

VI

Hand-in-hand with the change in land rights came a rapid expansion of European settlement, with settlers moving up to 400 miles east from previous Cape Colony boundaries into Swellendam and, later, Graaff-Reinet. The introduction of the loan farm system corresponds with a new government sanction and promotion of vast territorial expansion, a sharp turnabout from pre-1692 settlement restrictions. What explains it? Increased demand for provisions or revenue may explain the drive for territorial expansion, but it cannot explain the VOC's experimentation with new forms of property rights.

First, demand for provisions increased due to a growing population, as shown in Figure 2, and a rising number of Dutch and foreign ships passing through Cape Town between 1680 and 1730. Figure 7 shows the annual number of ships stopping and the average number of days spent per ship in port from 1652 to 1790. Boshoff and Fourier examine the relationship between ship traffic and agricultural production and find a strong correlation with wheat and wine production nearer to Cape Town and a weak correlation with stock raising farther from Cape Town.[43] Pressure to remit additional revenues to help finance the eighteenth-century Dutch wars with European rivals may have contributed to the drive. As recurrent war with European rivals nearly doubled VOC losses at sea and diminished demand for spices from the East Indies, the Herren XVII directed its outposts, such as the Cape Colony, to improve their fiscal positions.

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[43] Boshoff and Fourie, 'Significance of the Cape trade route', p. 31.

Figure 7. Ship Arrivals and Days in Port (All Nationalities)
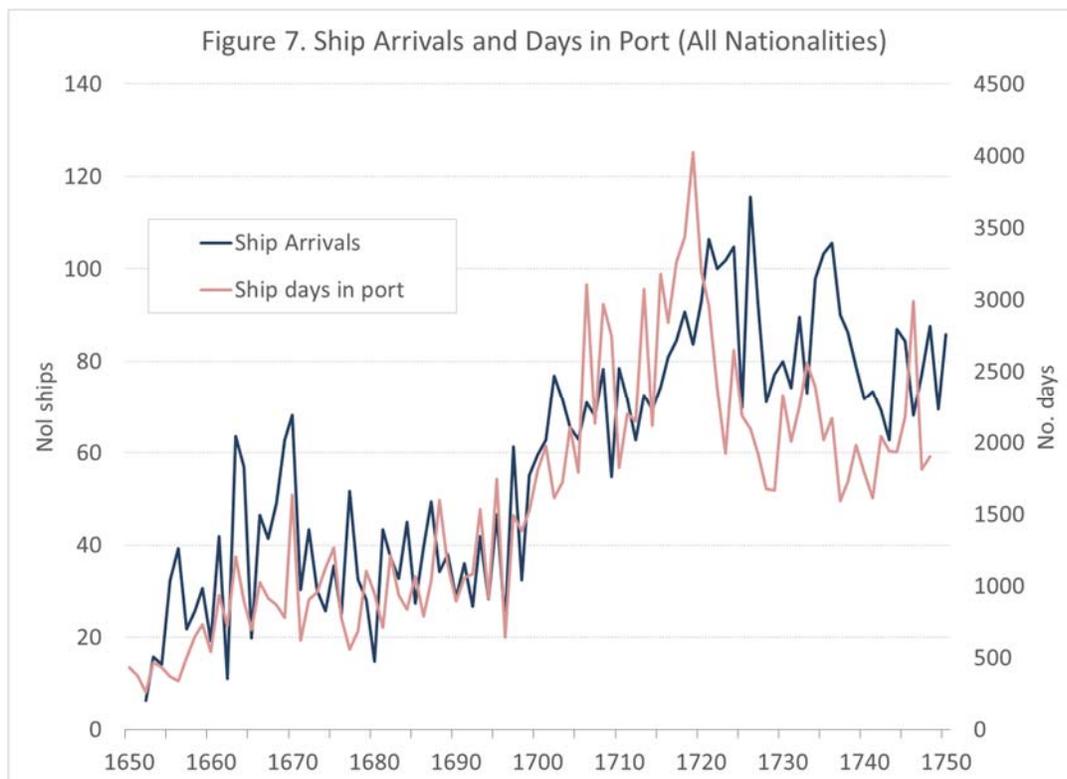
Source: Boschoff and Fourie, 'Explaining ship traffic'. Data from Johan Fourie.

Livestock procurement and revenue needs, however, cannot explain the institutional experimentation and innovation because these factors do not directly enter into the threshold condition determining choice of frontier property rights systems (Equation 5). The prominent factors that determined the VOC's incentives for institutional change were risk and enforcement costs on the frontier. The driving force in our model and the principal historical event was the indigenous population decline, which removed outside risk as a deterrent to the expansion of burgher settlements. A persistent long-run decline in the Khoikhoi population from 1652-1750 explains the VOC's shift in preference to the loan farm system. La Croix surveys the literature on the Khoikhoi and San populations over the 1652-1780 period. Following Fourie and Green,

he concludes that the best estimate of the Khoi population in 1652 is 50,000 people.[44] Recent

consensus holds that Khoi population trended downward over the 1652-1712 period due to

introduction and periodic outbreaks of European diseases, violent conflict between Khoisan

groups and with Dutch settlers, and loss of Khoi grazing lands and cattle. Estimates of this trend

are shown in Figure 8.

In 1713, a smallpox epidemic punctuated the ongoing population decline. Ross, Fourie

and Green, and La Croix conclude that the population decline from the smallpox epidemic most

likely did not exceed 20 percent of the Khoi population; although, there is evidence for a

stronger localized impact in Cape Town and some outlying areas.[45] The smallpox epidemic was

followed by outbreaks of cattle disease and severe drought that affected their herds until at least

1720; many took their cattle to the north and east, leaving traditionally grazed lands vacant.[46] In

1717, the Stellenbosch landrost reported to the VOC governor that the Khoi threat had

evaporated, so much so that the posting of soldiers at the frontier was no longer necessary.[47] By

1727, the VOC reported to the Herren XVII that there were no Khoikhoi settlements within 250-
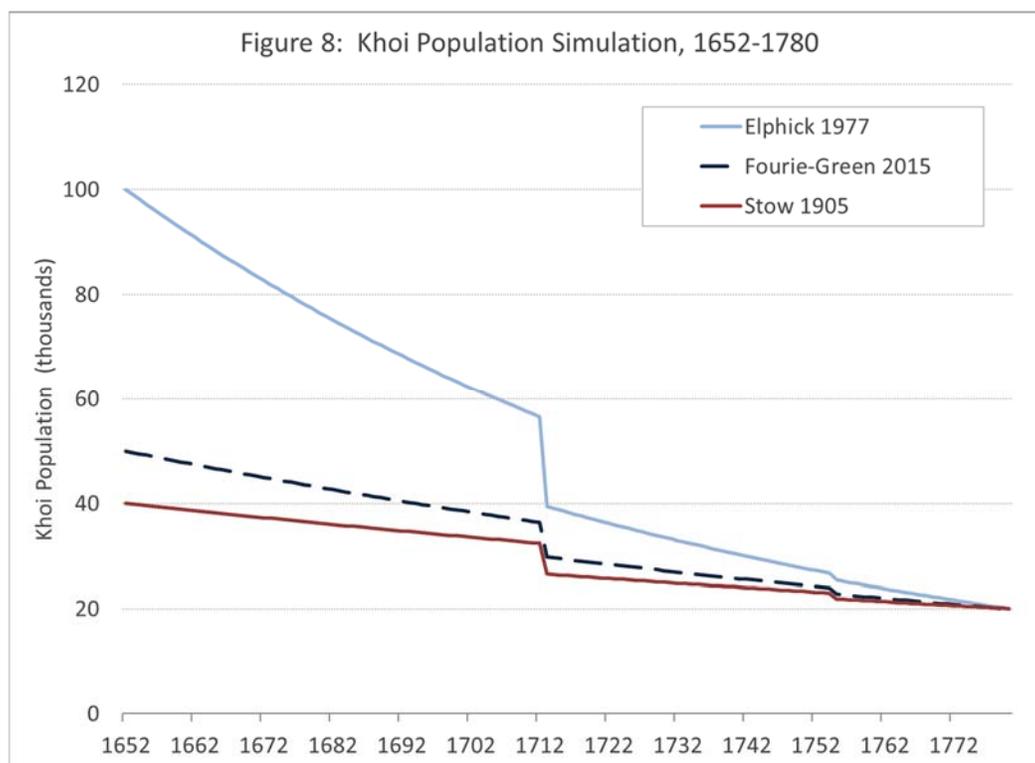
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[44] La Croix, 'Expansion of the Cape Colony'; Fourie and Green, 'Missing people, p. 17.

[45] Ross, 'Smallpox at the Cape', p. 421; Fourie and Green, 'Missing people', p. 203; La Croix, 'Decline of the Khoikhoi population', pp. 10-17. Elphick, *Kraal and castle*, p. 233, finds a much larger decline, and Elphick and Malherbe, 'Khoisan to 1828', p. 21, conclude the effects of the epidemic continued after 1713, and that the Khoi could have suffered a 90 percent decline in population over the following decade, corroborated by a surviving Khoi account from the Piketberg area. Recent quantitative scholarship questions the plausibility of such virulence of a single disease as an explanation for population decline. Livi Bacci, 'Demise of the American *indios*', p. 164, finds in Paraguay only small population declines from smallpox epidemics, and Carlos and Lewis, 'Smallpox and Native American mortality', conclude that population losses in the Hudson Bay epidemic of 1781-1782 did not exceed 20 percent.

[46] Mentzel, *Complete and authentic geographical and topographical description*, p. 37.

[47] 1/STB 20/1, Letters Disp., 3 August 1717, as cited in van der Merwe, *Migrant farmer*, pp. 113-14.

300 miles of the Cape.[48]

Figure 8: Khoi Population Simulation, 1652-1780

Sources: La Croix, 'Expansion of the Cape Colony'; Fourie and Green, 'Missing people'.

The 1713 smallpox epidemic affected decisions of the VOC government and frontier settlers because the decline in the Khoi population led to a punctuated drop in outside risk (positively correlated with N) and the overall level of risk, $\rho(N,r)$. In the six decades leading up to the epidemic, the Khoi population had already fallen by about 27 percent (using an estimate of 50,000 for 1652). Smith and other scholars observe that the Khoi had already suffered from at least eight other documented bouts with infectious disease, which may account for substantial population decline before the 1713 epidemic.[49] The loss of grazing lands contributed further to a

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[48] See C 1469, Letters Disp., Cape Government to Lords XVII, 25 February 1726, p. 246.

[49] Smith, 'Khoikhoi susceptibility', p. 25, and Moodie, *The Record,* Vol. 1., pp. 272, 291,336, 363, 370, 386, 420.

breakdown in the Khoi's social fabric and governance structure.

The decline in outside risk was one force behind the VOC's series of experiments from 1692 governing extent of settlement, grazing, and trade. A high level of outside risk is consistent with a profit-maximizing government's choice of a land grant institution; as outside risk diminished, the overall risk gradient changed sign to $\frac{\partial \rho}{\partial r} \leq 0$, rendering the loan farm system more attractive, all else equal. Once the government has chosen the loan farm system, this magnified the effects of lower overall risk on settler dispersion, as they not only faced lower risk but also reaped benefits from the specification and enforcement of rights provided by the loan farm system.[50]

The decline in the Khoi population meant that VOC provision of intensive protection services would not be as necessary to induce distant settlement; although threats continued from the small but still viable San population who were less severely affected by the smallpox epidemic. Distant settlement could more readily supply increased pastoral and arable products and reduce the marginal increase in the prices the VOC had to pay for burgher livestock. Once the VOC realized that provision of defensive services or other public goods was less necessary to encourage settlement of distant lands, it moved to reaffirm its policy of allowing settlers to enter lands where some Khoi groups might still be encountered. As procurement from the Khoikhoi decreased, VOC administrators in Amsterdam relaxed prohibitions on settlers bartering with natives for cattle or other goods as the importance of discriminatory pricing diminished.[51]

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[50] Information gained from groups of hunters searching for game about locations with sufficient water to support grazing may have also been a factor.

[51] The reduced supplies of Khoikhoi livestock reduced the gains to the VOC from enforcing a price-discriminating monopsony forbidding burgher purchases of livestock from Khoikhoi. In 1695, the Herren XVII in Amsterdam sent a letter (of 14 July 1695) ordering the opening of free burgher cattle trade with the Khoikhoi; although,Governor Simon van de Steele delayed compliance for almost 5 years. His

With the decline of outside risk, the drive for territorial expansion and experimentation with licensing and loan farms are plausible responses to the demands from headquarters for new revenue, as the stream of fees that could be collected from new loan farms could not have been collected from squatters.

The interaction between the European conflicts during 1700-14 may have added another incentive for Dutch territorial expansion. Khoi depopulation, on its own, encouraged more settler dispersion due to lower risk of property loss on the frontier, a decline in ρ. Increased threats of English and French intrusions in these thinly populated lands may have further compelled VOC authorities to permit and promote unrestricted dispersion of settlers loyal to the Dutch Colony to reduce the threat of English or French invasion.[52] Analogously, in another time and another frontier economy, the colonial governor of New South Wales authorized a temporary settlement at Port Philip—quite a distance from the main settlement near Sydney—during the Napoleonic Wars after the sighting of French ships off shore in 1803.[53]

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successor, Governor Wilhelm van der Stel, reimposed the ban in 1702, after reports of burgher theft and violence against the Khoihoi. In 1704, the, Herren XVII repeated the order to restore free trade. Expansion into lands at the frontier coincided with spikes of violence against the Khoikhoi and in 1717, the Herren XVII reimposed a trade ban. See Extract from the Memorial of Commissioner C.J. Simons' in Valentyn, *Description of the Cape of Good Hope*, Part 2, p. 227 and n. 276; Penn, *Forgotten frontier*, p. 39; Böeseken, *Suid-Afrikaanse argiefstukke*, Vol. 3, 17 Feb. 1700, pp. 364-65, 777-78.

[52] Simon van der Stel, the Governor of the Cape Colony from 1679 to 1699, argued that settlement at the Cape should be geographically concentrated, as least 2,000 people concentrated around Cape Town would be capable of 'defending against all landings, hostile attacks, and suchlike, from European rulers, in such a way that the people here should have no fear of enemy assault, or attack from some European sovereign or potentate.' Despite construction of fortifications, artillery batteries, and magazines and a large garrison of troops, there were three British attacks on the Cape, with the latter two in 1795 and 1806 succeeding. Instructions from Simon van der Stel to Willem Adriaan van der Stel, 30 March 1699. See Potgieter, 'Maritime defence'; and for a related analysis of the western United States, Allen, 'Homesteading and property rights'.

[53] Shaw, *History of the Port Phillip District*.

VII

The evolution of property rights in the Cape Colony provides another deviation from the familiar progression of property rights in frontier settlement in neo-European colonies from open access to *de facto* private claims to *de jure* titled land.[54] The familiar progression from less to more well-defined property rights depends on a peaceful frontier, where the original claimants could settle without significant challenge to their claims. If the opposition from indigenous people was sufficiently organized to pose sufficient risk of violence or property loss, settlers relied more heavily on government-provided military protection to defend their claims. In such cases, settlers tended to comply with official boundaries; and the extent of settlement remained confined to areas where government authorized settlement, maintained military presence, and provided for *de jure* property rights.

The early settlement of the Cape Colony provides an example of the latter pattern of property-rights formation. The colony during its first fifty years was confronted with effective resistance from the Khoikhoi, against Dutch encroachments into their traditional grazing grounds. The VOC restricted settlement within fixed boundaries and used land grants to distribute property rights to free burghers. As the VOC's provisioning trade and the colony's population grew, the colonial authorities occasionally extended territorial claims to allow additional burgher settlements using land grants.

Comparing with other neo-Europes, the frontier risk environment in the Cape Colony before, say, 1692, in key respects resembled the province of Buenos Aires.[55] Yet by 1714 the Cape Colony frontier had transitioned to a relatively low risk environment. Formation of

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[54] As in Alston, Harris and Mueller, 'Development of property rights'.

[55] Dye and La Croix, 'Political economy of land privatization', pp. 916-21.

property rights in post-1714 loan farm districts more resembled the common linear progression observed in the majority of neo-Europes, as burgher claimants on the frontier were satisfied with less well-defined property rights and first or second-party enforcement; although, over time, as land values rose, those property rights would evolve to become better defined and more secure property rights.[56] After 1714, Cape Colony settlers trekked out to claim grazing lands far beyond the reach of the garrison at Cape Town because the risk of violence from the Khoikhoi had fallen greatly owing to the dramatically diminished population and breakdown of their institutional capacity to mount effective resistance. While Khoikhoi were still able to offer some resistance, settlers were much more capable of defending their claims by using private force and second-party cooperation. Decades later, as the colonial economy grew and land values in these districts rose, the weaker form of property rights associated with the loan farm evolved to become more well-defined with third-party government enforcement.

While Cape Colony governance exhibited certain unique institutional features, such as the corporate nature and monopsonist behavior of the VOC colonial government, we find that the early emergence of property rights on the Cape frontier had much in common with other neo-Europes. As in other neo-Europes, in early phases of settlement, the VOC government attempted to restrict settlement by defining strict settlement boundaries to contain costs of protection and enforcement of rights on the frontier. As elsewhere, such restrictions were not easily enforced when ineffective resistance from competing indigenous claimants on the frontier invited squatting.

Institutionally, however, the Cape Colony's response was exceptional. As the frontier opened up to relatively unconstrained settlement in the two decades after 1701, the VOC

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[56] Alston, Harris, and Mueller, 'Development of property rights', pp. 744-50.

experimented and developed an innovative class of property rights—the loan farm—to accommodate rapid territorial expansion. This was, as far as we know, unique among neo-Europes. One can contrast it with, for example, New South Wales, where the discovery of rich grazing lands resulted in a massive land rush of squatters making widespread *de facto* claims of public lands, which the authorities tried, but failed, to control. By contrast, the Cape Colony's creation of the loan farm provided for a weaker class of property rights, as a *de jure* vehicle to accommodate settlers' incentives to squat in the vast lands far beyond the boundaries of the early settlements. The cost to the government of providing the loan farm type of property rights was lower because land was so abundant that there was little reason for land competition between loan farmers, and outside risk had fallen to the point that they could suppress Khoisan resistance themselves. In most neo-Europes, Weaver finds that private demands outpaced state responsiveness, but in the Cape Colony this new class of property rights not only permitted but encouraged rapid expansion of settlement. The process of settlement on the Cape frontier was more orderly and more compliant with official regulations than in other settler colonies.

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APPENDIX
A Profit-Maximizing Model of the VOC's Limits on Settlement
and Choice of Property-Rights Institutions

(intended for online publication only)

This model of Cape Colony settlement policies captures three distinctive features of the Colony. First, the VOC is a private trading company, operating the colony with a profit-making objective and a monopsony on burgher livestock purchases. Second, besides buying livestock from the burgher settlers, it could tap a fringe market by purchasing cattle from the nearby Khoikhoi people who were displaced from lands claimed by the VOC. To assert a monopsony over the burghers, the VOC officially prohibited the burghers from trading with the Khoikhoi. Third, the model distinguishes between the two types of property-rights institutions highlighted in the paper: land grants, which conveyed well-defined, secure, third-party government-enforced property rights to land, and loan farms, which provided government registration of land claims that were less precisely defined and relied on coordination of settlers for defense rather than third-party government protection.

To conceptualize the spatial dimension of settlement in a simple way, we consider a featureless plain, shown in Figure 5 in the paper, with Cape Town as a point at the center. The size and extent of settlement is measured simply by the length of the radius r, which is the distance from Cape Town to the boundary of settlement. We use the following notation: the existing *ex ante* boundary of settlement is r_o. As the colony's demand for livestock increases, the VOC may extend the official settlement boundary to accommodate increased demand for land. If it chooses to extend the land grant system, as exists inside r_o, the new boundary is denoted r^E. The E superscript denotes the colony's enforcement boundary, as the assumption is that the VOC extends garrison-backed enforcement to all lands inside r^E but not outside this boundary.

As the demand for land expands, the VOC may choose to alter the form of property rights as it extends boundaries. To keep the analysis simple, we consider a bright-line choice between two types of property-rights institutions: (1) it can extend the official boundary of land grants to distance $r^E > r_o$, or (2) it can innovate with the less costly, but less secure, loan farm system. The potential benefit to the VOC is that this weaker form of property rights may be supplied at lower enforcement cost. If, alternatively, the VOC chooses to implement the loan farm system beyond r_o, then, given the conditions required to incentivize the adoption of the loan farm, the settlement area will be larger, and the extent of settlement r^L will extend farther than its alternative, $\underline{r^E}$, as explained below.

Expected value of land and risk of property loss

The annualized value of an acre of land that enjoys the full protection of the government, as in the land grant, is $v(r)$. Following the Alston, et al., (2012) framework, $v'(r) < 0$. The risk of property loss to settlers on the frontier is lower if the government provides protection of property rights, as in the land grant system. For simplicity we assume that, under the land grant system, there is no risk of property loss. The risk is, of course, higher for squatters and loan farmers, who must provide their own private or second-party protection. The risk to squatters is expressed as

$\rho = \rho(r, N)$, where N is the size of the Khoi population, assuming that $\dfrac{\partial \rho}{\partial N} > 0$ and $\dfrac{\partial \rho}{\partial r}$ first

declines with distance due to diminishing inside risk and then it rises as outside risk increases with r, making ρ U-shaped. The risk of property loss to loan farmers is higher than for land grant holders, but is lower than for squatters because loan farmers benefit from official registry of their claims, which facilitates legal settlement of disputes, and from field coronets' ability to coordinate second-party defense against attack. The risk of property loss for loan farmers is,

therefore, $\theta\rho$, where $0 \leq \theta \leq 1$. Correspondingly, the expected annual value of an acre of land for a squatter is $[1-\rho(r,n)]v(r)-s$ and for a loan farmer is $[1-\theta\rho(r,n)]v(r)-s$, where s is the cost to the settler of private or second-party security. A loan farm is more valuable than squatting because the settler receives a benefit from government administration and coordination of enforcement of property rights. Figure 4 in the paper provides a visual depiction of these relationships.

Settler Participation Constraints

As it establishes property-rights institutions and asserts control over the frontier, the VOC faces a participation constraint from burgher settlers, who may choose to ignore application or registration requirements or any other restrictions imposed by the VOC and to squat on land beyond the official boundaries. For the land grant institution, the participation constraint is: $v(r)-q \geq [1-\rho(r,N)]v(r)-s$, which simplifies to:

$$q \leq \rho(r,N)v(r)+s \qquad\qquad\qquad\qquad (A.1)$$

where q is the annual rental fee paid by the land grant holder to the VOC. Analogously, the participation constraint under the loan farm system is $[1-\theta\rho(r,N)]v(r)-\phi \geq [1-\rho(r,N)]v(r)-s$, which simplifies to:

$$\phi \leq (1-\theta)\rho(r,N)v(r)+s \qquad\qquad\qquad (A.2)$$

where ϕ is the annual license or registration fee for the loan farm. In either case, settlers will participate in government-provided property rights as long as the fee for the service does not exceed the net expected value of the land.

As a related necessary condition, if land satisfies the participation constraint it must also be available for settlement. Consider a district where settlement is expanded and all attractive grants are claimed. Inside the official boundary, r_o, settlers seeking land will compare the

benefits of the government's offer to extend property rights, either under the land grant or loan

farm system, to the benefits of squatting. Settlers are willing to squat outside the boundary only

if $[1 - \rho(r, N)]v(r) - s \geq 0$. Similarly, loan farmers are willing to establish loan farms at distance

r^L only as long as $[1 - \theta\rho(r, N)]v(r) - s - \varphi \geq 0$.

Enforcement Costs

The total cost to the government of providing enforcement depends on the total area

occupied by settlers and the type of property-rights institution in effect in each district.[57] In the

area outside of the circle defined by r_o, the VOC has the option of extending land grant,

effectively, freehold rights in the band from r_o to r^E, or providing loan farm rights. The

marginal cost of enforcement with distance $e(r, N)$, along any radius r in the Von Thünen

diagram, shown in Figures 4 and 5 in the paper, rises with r and with the size of the Khoi

population, N, i.e., $\dfrac{\partial e(r, N)}{\partial r} > 0$, and $\dfrac{\partial e(r, N)}{\partial N} > 0$. The total cost of enforcement after territorial

expansion under an extension of the land grant system is:

$$G = g + F\left(\int_0^{r^E} e(r, N)\, dr\right) \tag{A.3}$$

where g is the fixed cost of maintaining the garrison at Cape Town. The function, F, converts the

components of enforcement costs along a radius, $\int_0^{r^E} e(r, N)\, dr$, into the enforcement costs of an

area.

To specify the difference in enforcement costs of the land grant and the loan farm, we

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[57] As for the area inside r_o, where conventional freehold rights have already been granted to settlers there, we assume the VOC does not change the property rights in this inner circle an attempt to expropriate or attenuate the security of previously awarded grants could provoke resistance.

distinguish between two types of enforcement costs: h is the administrative costs of providing for property rights, e.g., registration, stationing local officials, etc., and m is the military costs of protecting settlers from violence or property loss. The land grant institution provides both types of enforcement, so the marginal cost of enforcement, e, of a claim at distance r is $e(r, N) = h(r, N) + m(r, N)$. The loan farm system provides only the administrative function, which includes the costs of stationing field coronets, so the marginal cost of enforcement consists only of the administrative cost, $h(r, N)$, where $h(r, N) < h(r, N) + m(r, N)$. To compensate for the absence of m, loan farm claimants incur private expenses (captured in s) similar to squatters. We assume the expense to settlers is the same, but the outside risk of property loss is lower for the loan farmer than for the squatter (as specified by $\theta \rho$, $0 \leq \theta \leq 1$) due to the greater security provided by registration and the coordinating influence of field coronets.

Accounting for the two types of enforcement cost, the total cost of enforcement under the land grant system in Equation (A.1) may be rewritten as

$$G = g + F\left(\int_0^{r_o} [h(r, N) + m(r, N)] \, dr \right) + F\left(\int_{r_o}^{r^E} [h(r, N) + m(r, N)] \, dr \right) \qquad (A.4)$$

which distinguishes administrative costs, h, and military costs, m. It separates two areas corresponding to those inside and outside the initial settlement boundary, r_o, and indicates subsequent territorial expansion under the land grant system from r_o to r^E as shown in the last two terms on the right-hand side of equation A.4. The last two terms on the right-hand side of Equation (A.4) thus represent the enforcement costs incurred in the two corresponding von Thünen bands in Figure 5.

By contrast, the total cost of enforcement if the loan farm, instead of the land grant, system were established beyond r_o would be:

$$G = g + F\left(\int_0^{r_o} [h(r,N) + m(r,N)] \, dr\right) + F\left(\int_{r_o}^{r^L} h(r,N) \, dr\right). \tag{A.5}$$

Notice that $r^L \geq r^E$. As it turned out, the VOC placed no binding official outer settlement boundary on the registration of loan farms as it had done in expansions of the land grant system.[58] If it had, under the conditions on the frontier in which the loan farm was established, the free burgher settlers would probably not have respected it in any case, as we describe in section 4 of the paper. To be sure, the VOC could not have expanded land grants over an unlimited area; as claims became more remote and settlers more scattered over a vast territory, the cost of military protection and third-party enforcement of claims would have become prohibitively costly. As a consequence, the area settled under the loan farm system would inevitably be larger than under the land grant system. Which regime would have been more costly depends on the relative magnitudes of the additional military expenses of expansion under the land grant system versus the additional costs of administering a larger settlement area under the loan farm system. (See the second terms of Equations (A.4) and (A.5)).

Taking the difference between the two equations shows that the land grant system is more costly if:

$$F\left(\int_{r_o}^{r^E} m(r,N) \, dr\right) - F\left(\int_{r^E}^{r^L} h(r,N) \, dr\right) > 0. \tag{A.6}$$

That is, if the military costs of securing the new land grant area are greater than the additional administrative costs incurred in the loan farm system on lands beyond r^E which would be without protection from the garrison, unlike under the land grant system. As discussed in section 2.3 of the paper, these relative costs depend on the degree of risk on the frontier and how the risk

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[58] Settlement expansion in the 1750s and 1760s runs into lands used by the Xosa, a more organized first people capable of very effective resistance against encroachment on their lands. The VOC responds by setting explicit limits on the extent of settlement.

changes with distance *r*, the size of the indigenous population *N*, and the intensity and

effectiveness of its resistance.

Conditions for the Choice of Property-Rights Institutions

    The choice of property-rights institutions depends not just on the cost of enforcing each

type of property right but also on other factors affecting the profitability of territorial expansion

under each of the two property-rights institutions, such as insecurity on the frontier. A

dissipation of settlers' livestock in the land farm regime, through theft or slaughter, affects the

supply of livestock available to the VOC, and, therefore, VOC profits. Defining VOC profits

under property-right institution *j* , where *j* = *E* indicates the land grant system and *j* = *L* indicates

the loan farm system, we specify   :

$$\pi^j = S(x^B + x^K) - K(x^K) - p(x^B)x^B - G(x^B) + T(x^B) \tag{A.7}$$

where *S* is revenue from VOC sales of livestock in Cape Town, *T* is revenue from land leases or

licenses, *K* is VOC expenses for procuring livestock from the Khoikhoi, $p(x^B)x^B$ is the expense

of procuring livestock from burghers, and *G* is the cost of protection and enforcement of property

rights. We assume for simplicity that the VOC does not differentiate between burgher cattle, x^B,

and Khoi cattle, x^K, which implies that sale revenues *S* are a function of $x = x^B + x^K$.

    According to the theory of monopsony pricing, a necessary condition for maximizing

profits is that the VOC equalize the marginal costs of procuring livestock from burghers with

those of procuring livestock from Khoikhoi. The first-order conditions for maximizing Equation

(A.7) with respect to x^B and x^K are:

$$S'(x^B) - p'(x^B)x^B - p(x^B) - G'(x^B) + T'(x^B) = 0 \tag{A.8}$$

$$S'(x^K) - K'(x^K) = 0. \tag{A.9}$$

Since $S'(x^B) = S'(x^K) = S'(x)$, then combining the conditions yields:

$$K'(x^K) \geq p'(x^B)x^B + p(x^B) + G'(x^B) - T'(x^B) \ . \tag{A.10}$$

Equation (A.10) shows that in equilibrium, if the VOC purchases both burgher and Khoikhoi

cattle, the marginal increase in procurement outlays to the burghers, $p'(x^B)x^B + p(x^B)$, will be

less than those to the Khoikhoi, $K'(x^K)$, by the difference between the marginal increase in

enforcement costs and revenues from land settlement, $G'(x^B) - T'(x^B)$, which is positive since

the revenues from lease rents and license fees were small items in VOC accounts.

Identifying the property-rights institution used for land settlement allows us to express

the last two terms in Equation (A.7) more precisely. For the land grant system, combining

Equation (A.7) with Equation (A.1) yields the necessary condition:

$$K'(x^K) \geq p'(x^B)x^B + p(x^B) + \frac{1}{b}[h(r,N) + m(r,N) - q] \tag{A.11}$$

and for the loan farm system, combining Equation (A.7) with Equation (A.2) yields the

necessary condition:

$$K'(x^K) \geq p'(x^B)x^B + p(x^B) + \frac{h(r,N) - \phi}{b[1 - \theta\rho(r,N)]} \tag{A.12}$$

where b is the yield per acre of burgher supplies of livestock to the VOC. Noting that

$G'(x^B) = \dfrac{\partial G}{\partial r}\dfrac{dr}{dx^B}$ and similarly for T', we assume for convenience that b is a constant, measured

in head of cattle or equivalent; thus $x^B = F\int_0^{r_i} b\,dr = F(br_i)$, and $x'(r) = F'b$. By the inverse

function rule, we obtain $r'(x^B) = \dfrac{1}{F'b}$.

In the land grant system, $\dfrac{\partial G}{\partial r} = F'[h(r,N) + m(r,N)]$ and $\dfrac{dr}{dx^B} = \dfrac{1}{F'b}$; therefore, the

increase in enforcement costs of an increase in the supply of burgher livestock by one head is

$\frac{1}{b}[h(r_o,N)+m(r_o,N)]$ as in Equation (A.11). Similarly, $\frac{dT}{dr}=F'q$, and since $T'(x^B)=\frac{dT}{dr}\cdot\frac{dr}{dx^B}$,

then by substitution, $T'(x^B)=F'q\cdot\frac{1}{F'b}=\frac{q}{b}$ $T'(x^B)=\frac{q}{b}$. In the loan farm system, $\frac{\partial G}{\partial r}=F'h(r,N)$

, and $\frac{dr}{dx^B}=\frac{1}{F'\big(b[1-\theta\rho(r,N)]\big)}$, as in Equation (A.12). Intuitively, this means that under the

loan farm system, more acres are required for a marginal increase in procurement because a

fraction $[1-\theta\rho(r,N)]$ of the yield produced on the additional acreage will be dissipated by

property loss. The same logic applies to T'.

A threshold condition for the adoption of the loan farm system may be obtained by taking

the difference between Equations (A.11) and (A.12). It is convenient to break the evaluation of

this difference or threshold into two components: (1) marginal outlays to burghers,

$p'(x^B)x^B+p(x^B)$, and (2) the net marginal cost of enforcement, $G'(x^B)-T'(x^B)$. Taking the

second component first, the enforcement costs for the loan farm system are no higher than for the

land grand system if the last term in Equation (A.12) is less than or equal to the last term in

Equation (A.11), which after simplification yields the condition:

$$h(r,N)+m(r,N)-q\geq\frac{h(r,N)-\phi}{[1-\theta\rho(r,N)]} \qquad\qquad (A.13)$$

which corresponds to the threshold condition presented in the paper in Equation (5). The

implication is that, if outside risk on the frontier, $\rho(r,N)$, should decline substantially, the

threshold would be crossed, and the loan farm system would become less costly for the VOC to

administer and enforce, all else equal.

Evaluating the marginal outlay to burghers, $p'(x^B)x^B+p(x^B)$ under the two systems, we

compare constraints on the VOC monosponist pricing decision from extending territory under

the land grant with those from extending territory under the loan farm system. In the land grant system, the difference in the annual value of a plot of land just inside the boundary r_o and one just outside the boundary is the difference in transportation costs to the port, since the plot just outside the boundary is marginally farther from the port. Suppose $v(r) = (p - c - tr)b$, where c is a constant cost per head of raising livestock, and t is the cost of walking the livestock across an acre (about 0.4 mile). If the VOC wants to compensate burgher settlers at the margin to incentivize them to incur the higher transportation expense, it must increase p; that is, $p = p(r)$, and at the margin $v'(r) = [p'(r) - t]b = 0$. Solving for p' gives $p'(r^e) = t$, where r^e indicates extension under the land grant system.

In the loan farm system, the difference in the annual value of a plot of land just inside the boundary r_o and one just outside the boundary must include the difference in transportation costs to the port, as in the above analysis, and the increased risk of property loss to the loan farmer, which goes from $\theta = 0$, since property is fully enforced in the land grant system, to $0 < \theta < 1$ under the loan farm system. The price offer needed to compensate the settler for the increase in transportation cost and the increase in risk to incentivize him to settle in the loan farm district just outside the land grant district is non-differentiable because θ is discontinuous at r_o. The expression is, nevertheless, easy to evaluate. The increase in transportation cost will be no different than if the expansion were implemented under the land grant system, that is: $p'(r^e) = t$.

In addition, the risk jumps from 0 to $\theta\rho > 0$ at the boundary r_o. Therefore, $p'(r^l) = t + \theta\rho(r, N)$, where r^l represents a plot of land just across the border r_o established under the loan farm system.

At the margin, therefore, the marginal outlay to burghers must be higher under the loan farm system than under the land grant system by the amount $\theta\rho(r, N)$.

This difference in marginal outlays to burghers under the two systems raises the bar

which must be crossed in Equation (A.13) by an additional amount $\theta\rho(r, N)$. The threshold is thus revised to:

$$h(r,N)+m(r,N)-q \geq \frac{h(r,N)-\phi}{[1-\theta\rho(r,N)]}+\theta\rho(r,N) \tag{A.14}$$

to account for the necessary difference in pricing under the two systems. Yet the logic remains the same: If outside risk on the frontier, $\rho(r,N)$, should decline substantially, the difference in marginal outlays between the two system diminishes, causing the difference in enforcement costs to dominate the threshold outcome. As the outside risk falls, the loan farm system would become more profitable for the VOC, all else equal. As we argue at the end of Section 2.3 and Section 4 in the paper, the secular decline in the size of the Khoikhoi population, punctuated by its sharp decline in 1714 due to the smallpox epidemic, explains the substantial decline in outside risk and offers the most pronounced explanation for why the threshold condition came to favor the loan farm system.