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The Origins and Dynamics of Agricultural Inheritance Traditions*

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Abstract

In this paper, we analyze the origins of agricultural inheritance traditions. Our case study is the German state of Baden-Württemberg, for which we have data on 3,382 municipalities. It is the first to test systematically a wide array of prevalent hypotheses about the Roman, medieval, and early modern roots of inheritance traditions and their change during the industrialization period and the early 20th century. We also analyze data on village desertion, parts of which we can attribute to the lack of flexible adaption. We find that rural inheritance traditions are primarily determined by geographic factors, especially soil quality, but also Germanic traditions, pre-historical land-abundance, Roman activity and the rise of feudalism during the Middle Ages. The politics of particular states like Imperial cities or the Duchy of Württemberg also mattered. Change in inheritance practices occurring primarily after industrialization took-off was mainly driven by access to railways, increasing population concentration and imitation and social interactions with people from areas with other traditions.

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What explains modern agricultural inheritance traditions? Were inheritance practices subject to "self-induced modernization" of premodern Western Europe (Kuran 2012, 81)? And if so, did these informal institutions adapt rapidly, or evolved "gradually without anyone fully understanding how and why they work" (Henrich 2015, 33)? We will present some empirical evidence from the state of Baden-Württemberg suggesting that the traditions of agricultural inheritance, dominantly primogeniture and equal partition, can here be explained by four main channels. First, various aspects of geography in some places rendered an explicit or implicit equal right over inherited land impossible, and forced individuals into accepting primogeniture. Second, cultural

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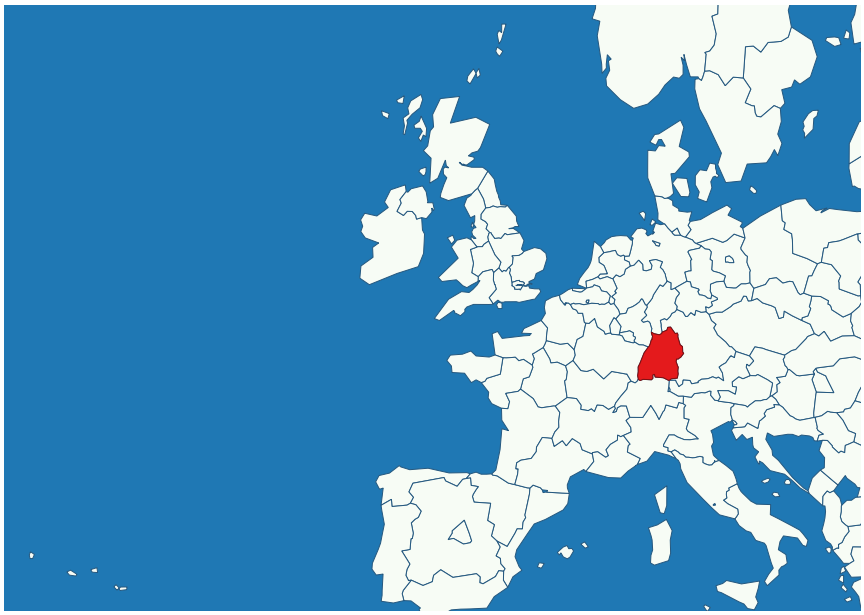


Figure 1: *The position of Baden-Württemberg among the NUTS-2 regions of Western Europe*

evolution then turned these mechanisms, equal partition and primogeniture, into norms that have been copied by imitation (Henrich 2015). Third, political actors of the middle ages expanded the spread of either primogeniture or equal partition, depending what reduced their risks and maximized their rents. Forth, the Industrial Revolution changed second nature (or human) geography, led to more cultural exchange, and also created outside options, again changing the geographic pattern of inheritance traditions. We find that the geographic patterns of equal partition can be explained better by geography and early historical factors, medieval and early modern politics were in comparison less important. The Industrial Revolution can then explain the emergence of traditions that are a mix between equal partition and primogeniture, such as using the first for large farms and the latter for small farms, but did plausibly not alter the general geographic pattern of inheritance traditions altogether.

Inheritance is the largest re-allocation of assets outside of markets. The implications of differences in the details of this allocation have inspired several branches of the literature. There is a wide literature on the consequences of inheritance tradition. Kuran (2012) argues that the Islamic Law that provides inheritance rights to many relatives led to asset fragmentation, and fostered the emergence of despotic regimes in the Middle East. Ekelund, Hébert, and Tollison (2002) conduct a descriptive cross-country analysis and argue that Protestantism could spread easier into the equal partition area because of their more flexible, heterogeneous and unstable societies. For more modern outcomes, Menchik (1980) studied the influence of inheritance traditions for the wealth distribution in the United States. Rink and Hilbig (2018), also in a study on Baden-Württemberg, find that in areas of equal partition, are more gender-equal (more women are in political power), and a more egalitarian wealth distribution. In a companion paper, we exploit a spatial discontinuity design, and find that inheritance tradition can explain more than a third of inter-regional income differences. Results suggest that more than a third of the overall inter-regional difference

in average per capita income in present-day Baden Württemberg, or 597 Euro, can be explained by equal partition. (Huning and Wahl 2019a)

We are interested in how rural areas contributed to cultural change (Alesina and Fuchs-Schündeln 2007; Bazzi, Fiszbein, and Gebresilasse 2017; Giuliano and Nunn 2017) in pre-modern Europe. Our dataset on the German state of Baden-Württemberg features 3,382 municipalities, and data ranging from their geographic disposition, their Germanic and Roman history, medieval institutions, deserted villages, exposure to urbanization pressure, to railway connectivity. We derive four main hypotheses on the origin and evolution of inheritance traditions from the literature, outline their economic intuition, to then test them systematically. We also present evidence for the idea that local traditions were relatively rigid. Rather than breaking with tradition, villages were deserted, which spurred urbanization as an unintended consequence.

I. HOW GEOGRAPHY, CULTURAL EVOLUTION, POLITICAL ECONOMY, AND THE INDUSTRIAL REVOLUTION SHAPED AGRICULTURAL INHERITANCE TRADITIONS

This section presents four theories that can explain the geographic prevalence of inheritance tradition. We will also deduce testable predictions for each of these theories.

1. Geography as the Ultimate Cause

Why is there more than one inheritance tradition, anyway? Should there not be one that is more efficient than the other? To understand the ultimate cause of primogeniture and equal partition, we rely on a simple functionalist model. Inheritance traditions exist because they reduce conflict over the testator's property among the heirs (compare Kuehn 1985). Historically, this inheritance was passed over while the testators were still alive, and came with the promise to care for them in their old age. Agricultural inheritance, the distribution of land among heirs, historically marked the point in the heirs' lives at which they stopped working on land that was not theirs, and started working on their own land. Which rule reduces conflicts most effectively depends decisively on the nature of the land.

Equal partition is a rule that grants land to all heirs, in equal shares, and should therefore on first sight be a fair mechanism. If inheritance is plenty, and the partition of land grants all heirs a share on which they can farm and thrive, equal partition is efficient. But if we split ten hectares of land between each three surviving children for five generations, this might, or might not solve the conflict among the heirs. Each plot would be little more than $400m^2$, which could or could not be enough for the heirs' future. The land could be very fertile, yielding a highly profitable cash crop (think wine, for example), or close to markets, allowing to plant expensive goods such as vegetables, or it could be infertile and far away from markets. In the latter case, when the land's state of geography is low, there will be conflict. The first column of Table 1 visualizes this. We can only speculate on how the idea of the alternative mechanism, primogeniture, was born. The heirs could have mutually agreed that the survival of the kin can only be secured if some renounce. Interviews conducted by Krafft (1930) in the 1920s suggest this channel. He found that the majority

Table 1: *Geography as the Ultimate Cause of Inheritance Tradition. + Indicates that the rule solves conflicts among heirs with success, - indicates the failure of doing so*

	State of Geography	
Inheritance Rule	High	Low
Equal Partition	+	-
Primogeniture	-/+	+

of the non-inheriting children accepted and support primogeniture, arguing that "it guarantees that the farm as a whole remains in the property of the family" or that only primogeniture prevents that the farm "becomes too small to feed the family". This that non-inheriting children would be morally compensated, by the feeling that they allowed the survival of the kin alone. Other compensations however are also plausible, namely that younger siblings were prepared for a life outside of the farm from their first steps onward. The alternative theory of forcing younger siblings into renunciation by either the parents or their oldest brother is also not absurd. What we know is that primogeniture was invented, and it solves conflicts which first arise if the state of geography is low, as outlined in the lower right cell of Table 1.

Whether primogeniture also solves the conflict where the state of geography is high is a question we turn to later. For now, if we think of primogeniture as an emergency break to avoid over-fragmentation, think for example that there has been an exceptional number of heirs for some generations but afterwards equal partition would yield adequate plot sizes, then we should expect discussions over the just rule in any generation.

Western Europe did not experience institutional change that disentangled inheritance tradition from geographic circumstances, unlike in for example, the Islamic world (see Kuran 2012, for discussion). The Qu'ran grants a share of a deceased inheritance to a large set of relatives. The spread of Islam across the globe therefore disentangled the inheritance tradition from the geographic factors. As such, geographic variation should be able to explain large-scale cultural differences in inheritance tradition, but also small-scale differences within modern Germany can be explained with the theory of cultural evolution. This leads us to our first hypothesis,

Hypothesis 1 *Inheritance traditions are shaped by geography. Where the state of geography is low, equal partition leads to insufficiently small plot sizes, and conflict. Primogeniture can potentially solve these conflicts, and is therefore more prevalent where the state of geography is low.*

1.1 Predictions

To formulate some testable predictions, we can expect to find

Prediction 1a *Equal partition is more prevalent in areas were measurements of the state of geography indicate a better agricultural suitability.*

It is especially favorable for equal partition if the soil is especially suitable for wine or fruits of high value (Schröder 1980). For example, the labor productivity of winery was unchanged between the early Middle Ages and 1950 at around 4 people per hectare of produce, the harvest period is short and labor intensive. Also, the high yield per acre allowed more family members to subsist on

the same area. Primogeniture here could have been harmful if the helping hands of the younger brothers were missing. (Schröder 1980).
Prediction 1b *We expect the suitability for wine and fruits to be higher in areas of equal partition compared to areas of primogeniture.*

The above factors can be subsumed under first nature (or physical) geography, but also second nature (or human) geography might have left its trace. Plausible candidates are the Roman settlements within Germany. Economic theory on the spatial structure of agriculture going back to von Thünen (1826) suggests that proximity to either Roman streets and being in the immediate surroundings of a Roman fortress that later became Imperial cities increases its productivity (see also Kopsidis and Wolf 2012). The Romans, not by bringing their culture, but by leaving behind their infrastructure could have shaped inheritance tradition to the day.
Prediction 1c *We expect more equal partition in proximity to Roman infrastructure.*

Over-fragmentation should have left some traces, when conflict potentially led to the breakdown of societies. We have evidence for communities that have been left behind during the Middle Ages, the phenomenon of deserted villages (see Abel 1953). We should expect, ceteris paribus, more of these deserted villages in areas of equal partition, because farms became too small to subsist on—and peasants were inclined to leave the little land in favor of a future elsewhere.
Prediction 1d *Ceteris paribus, we expect more deserted villages in areas of equal partition.*

2. Cultural Evolution

When farmers were questioned why they rely on tradition when passing down their property, one of their most important economic decisions of their lives, generations of them has given a single answer, "that it was always like this" (Krafft (1930), see also Rink and Hilbig (2018)). Scholars at the crossroad between economics and anthropology identify this reasoning as a central aspect of the persistence of culture, proposed under the framework of 'cultural evolution'. Henrich (2015) argues that the advantage of homo sapiens over other apes does not lie in intelligence, but in its outstanding ability to imitate behavior. Human children, so his argument goes, when presented a sequence of steps to gain a reward in experiments, imitate exactly the steps, even superfluous ones. In contrast, other apes reflect the way to reward, and intuitively apply shortcuts. The inefficient human behavior of unreflected repetition is called over-imitation and portrayed by Henrich as "the secret of our [homo sapiens'] success". If we assume that inheritance traditions stem from the same mechanism, then his theory would predict that they emerged as follows. Assume a world in which there is one way of passing down one's property, call this way A. Now assume that a small subgroup of individuals experience a change in their behavior, and call this new way of doing things B. In Henrich's view, this change can be induced by chance, but could also have a known cause, such as interaction with other groups. There is of course no reason for all other groups to give up A (yet). Imitation would lock-in each groups' behavior by copying it across generations without further reflection, turning behavior into tradition. Then, geographic shocks come in, and happen by coincidence to reduce the survival probability of anyone applying tradition A. Such shocks could be continuous harvest failures, or some periods of colder or warmer weather. We can say tradition B is dominant under these geographic conditions. As a consequence, tradition B becomes more widespread where it is geographically favorable. This can be because the group

that did not apply *A* becomes relatively smaller, or because individuals from the *B*-group are more attractive on the marriage market. To conclude, the theory of cultural evolution links geography to culture via imitation. We cannot say in general that *A* is primogeniture and *B* is always equal partition, or the other way round. It first depends on geography, and then second which tradition is accepted as the right one, the tradition that is imitated.

The literature linking culture with inheritance traditions often starts with a comparison between Germanic tribes and the Romans (e.g. Röhm 1957; Kuehn 1985). We view the origin of this divide in culturally transmitted position towards land, Romans putting relatively more emphasis on land compared to Germanic tribes. As outlined by Temin (2017, Ch. 7), "the market for land in the Roman Empire worked approximately like the land market today" (p. 139). He argues that land was used as collateral for mortgages, and that land on the Italian peninsula became an increasingly scarce resource, also because of Senate regulations. Temin quotes Tacitus how the Senate encountered a coin crisis with directing "that every creditor should have two-thirds of his capital on estates in Italy" (p. 142). The geographic position of Italy as a peninsula naturally restricts its expansion. Furthermore, its monocentric nature with Rome at its center plausibly shaped a cultural attitude towards land ownership, strengthening the importance of land inheritance. This is evident for example since land was a central part of wills, which have been a central aspect of a Roman man's passing.

From the readings of Tacitus, who left us with the first accounts of Germanic inheritance traditions, we can learn that the differences between Roman and Germanic traditions were already culturally embedded in his times. When he visited the Germanic lands and found weakly defined inheritance traditions there, he was bewildered by the Germanic way of passing down assets. To provide a representative quote: "every man's own children are his heirs and successors, and there are no wills" (Ch. XX.) (cited after Church and Brodribb 1876). In contrast to the Italian peninsula, land in Germanic territories was often not scarce at all. It was loosely settled, there was room to slash-and-burn new fields, and we can expect that a culture of land ownership like in Italy therefore did not emerge. This was not because the Germanic tribes had no interest in gifting, inheriting, or property in general. They evidently had well-defined inheritance traditions for goods that were of high value to them, but land was none one of these. We can see this when Tacitus describes inheritance for the tribes of Usipii and Tencteri "next to the Chatti on the Rhine", who "excel in the organization of cavalry". Hence horses must have been of value and inheritance should have been regulated. Tacitus again,

> "Horses are bequeathed along with the slaves, the dwelling-house, and the usual rights of inheritance; they go to the son, not to the eldest, as does the other property, but to the most warlike and courageous." (Ch. XXXII.)

Where land was scarce because of geographic conditions, like in Italy,regulated ways of handing down land were imitated, became self-evident (culture), and lastly set in stone (law). Where land was relatively abundant, like in parts of Germania, land inheritance did not become an important part of culture or law. The above shows how large-scale geographic differences between Italy and the formerly Germanic territories explains some cultural differences.

We find a strong correlation between the location of Neolithic settlements in South West Germany and the soil suitability around them (Table A.2 of the Appendix). This indicates that humans

were sufficiently informed of their environment and chose the right places, or alternatively were forced to abandon less fertile areas. Hence, population density increased in the most suitable areas, inducing variation in land scarcity. Land as a whole however did not become scarce before the 'long economic boom 950–1300' Wickham (2016, 125), when large areas were deforested (Ellenberg 1990). Only this boom resulted in the tremendous population growth, around 50% in the Holy Roman Empire, and land became overall scarce.

The Black Death of 1348 however reduced population again. Scholars have argued that it reduced the population pressure, and decreased the wages of the rural population relative to their urban counterpart (Voigtländer and Voth 2013). Historians provide evidence for the idea that this reduction of land scarcity had consequences for inheritance traditions.

For those areas in which primogeniture was culturally established, the increasing urbanization of the 1400s could have provided younger brothers found outside options, predominantly the city, but one should also test whether monasteries or armies stabilized the tradition of disinheriting younger brothers. Where equal partition was still prevalent, the decline of the population freed land, and again allowed those with insufficient inheritance to leave for the city. As such, the Black Death could have led to the persistence of different cultural traditions rather than changing them.

Röhm (1957) also supports the idea of cultural evolution, arguing that there was a strong preference of equal partition in some areas that was only adjusted when repeated harvest failures made it unsustainable. During the early modern period, a lot of municipalities transitioned from primogeniture to equal partition and then back again. He argues that before 1800, almost all of these changes were short-term in nature and eventually, the regions returned to their original practices.

Hypothesis 2 *Inheritance traditions are a consequence of unreflected imitation, and culture.*

2.1 Predictions

If geography was the only cause of the modern geographic pattern of inheritance traditions, we should expect that the problem of over-fragmentation arose first where the population density was high. If we find paradoxically that equal partition is more prevalent in areas that have been historically densely populated, we have to assume that the original form here was indeed equal partition, which has been imitated, and other areas imitated primogeniture although over-fragmentation was not an issue in all areas imitating it. Primogeniture here solved a conflict that would not have been arisen, by establishing a culture in which younger brothers accepted to be left without land inheritance. This even though, equal partition would have been, by means of population density, feasible.

Prediction 2a *We should find more equal partition today in areas which were densely populated, indicated by early settlements.*

The strength of the outside option as proxied by the presence of Imperial cities and Black Death exposure should have strengthened primogeniture. We expect that equal partition is less likely further away from Imperial cities. The Black exposure could be positively associated with equal partition, as it reduced land-scarcity.

Prediction 2b *There should be a negative relationship between equal partition and distance to Imperial cities, and exposure to the Black Death.*

3. Political Economy

Inheritance is a transfer of huge wealth, and should have attracted powerful people to interfere. This is an alternative theory. Not unreflected imitation, but historical actors shaped inheritance tradition to maximize their rents, where they had the power to do so.

A telling quote from this literature comes from Adam Smith. He saw the origins of primogeniture in the Early Middle Ages, "when the German and Scythian nations overran the western provinces of the Roman empire, the confusions which followed such great a revolution lasted for several centuries", from there to hypothesize that

> "The towns were deserted, and the country was left uncultivated, and the western provinces of Europe, which had enjoyed a considerable degree of opulence under the Roman empire, sunk into the lowest state of poverty and barbarism. During the continuance of those confusions, the chiefs and principal leaders of those nations acquired or usurped to themselves the greater part of the lands of those countries. A great part of them was uncultivated; but no part of them, whether cultivated or uncultivated, was left without a proprietor. All of them were engrossed, and the greater part by a few great proprietors. This original engrossing of uncultivated lands, though a great, might have been but a transitory evil. They might soon have been divided again, and broke into small parcels either by succession or by alienation. The law of primogeniture hindered them from being divided by succession: the introduction of entails prevented their being broke into small parcels by alienation." (Smith 1776,1991)

In a nutshell, medieval lords faced a trade off between efficiency (fragmenting their territory would increase the fix cost of tax collection) and the fear of creating quasi-noble subordinates with large landholdings. Individual lords, but also increasingly cities controlling their surroundings and food supplies, potentially found different levels of fragmentation among their peasants optimal. In areas where small historical states were prevalent during the Middle Ages, we should expect more equal partition (to break the influence of large land holders), and in areas where states were large, we should expect more primogeniture (to increase the efficiency of taxation). A necessary condition for a visible effect today was however that lords had the power to affect their subjects' tradition. In areas of high political fragmentation, lords might have less power to affect their parents way of doing things, as they could always threaten to leave (see Volckart 2002). Only if lords realized their trade off and they had the power to affect traditions would modern inheritance tradition be correlated with historical political fragmentation.

A specific, and historically well-documented example for the political economy of agricultural inheritance was Württemberg (see Röhm 1957; Schröder 1980; Rösener 1985). The Duke here felt overall threatened by the large landholdings of his subjects, and therefore advocated equal partition wherever possible. Given he had the power to do so, we should find a significantly higher share of equal partition in former Württemberg.

As summarized by Wickham (2016, 125), the increasing wages after the Black Death were not left

with the peasants, but strengthened their lords. While the authorities found it hard to affect the inheritance tradition in densely inhabited territories, in newly deforested areas they were strong enough to enforce primogeniture (Rösener 2012). Such deforestation was prevalent in Baden-Württemberg during the late Middle Ages as a consequence of rising urban demand for produce of extensive agriculture, such as meat (Wickham 2016; Ellenberg 1990).

Christianity might not have shaped inheritance tradition directly, but the church was an important actor of the political economy of the Middle Ages. Ekelund, Hébert, and Tollison (2002) argue that primogeniture is linked to the distribution of the Protestant faith after 1517. Their argument relies on the assumption that primogeniture leads to a more unequal distribution of wealth. They model the Catholic church as a price-discriminating monopolist, selling a highly price inelastic good, redemption, exclusively to the elites. The new incumbents, the Protestant churches, cut the price and were willing to sell to the middle class, and were therefore especially successful in regions in which equal partition provided a large enough market.

Hypothesis 3 *Inheritance traditions are an outcome of political economy. They have been actively and successfully shaped by various political actors, especially of the Middle Ages, including secular and ecclesiastical lords, and Imperial cities.*

3.1 Predictions

Our predictions derived from the political economy of the Middle Ages therefore view modern inheritance traditions as a consequence of bargaining between secular and ecclesiastical lords and city states, who usually advocated primogeniture because it reduced the fixed costs of tax collection, and their subjects, who wished to pass down their property equally. Assuming that lords faced less resistance in sparsely populated areas, and least resistance where peasants received freshly deforested land under the condition of primogeniture, this yields

Prediction 3a *We expect a negative correlation between the prevalence of primogeniture and indicators of population density before the Middle Ages. We also expect more primogeniture where land was deforested during the Middle Ages.*

Our second prediction builds upon the first, but takes into consideration that even though medieval lords generally favored primogeniture, lords of smaller states feared resistance from peasants with large landholdings. Therefore, in areas with a lot of historically small states, we should find more equal partition.

Prediction 3b *On average, and controlling for the above, we predict a positive correlation between historical political fragmentation and equal partition.*

We test historians' case study of Württemberg in this direction with a separate prediction,

Prediction 3c *Specifically, we should find more equal partition in the territory of the historical state of Württemberg.*

and will also test the influence of Imperial cities. Note that this prediction will be in opposition to our geography hypothesis. Cities, as aspect of second nature geography, should there have a positive effect on equal partition, here we assume a negative sign,

Prediction 3c *We assume a positive relationship between the distance to former Imperial cities to today's prevalence of equal partition.*

We conclude our predictions on the political economy of the Middle Ages with the influence of the church,

Prediction 3d *We expect a positive correlation between the occurrence of equal partition and the prevalence of the Protestant faith, and less equal partition in formerly ecclesiastical territories.*

4. The Industrial Revolution

Several historians have taken a longer-term perspective on the development of inheritance traditions in Germany with a special emphasis on their persistence and change, and have highlighted the role of the Industrial Revolution (e.g., Karg 1932; Röhm 1957; Sering and von Dietze 1930; Straub 1977; Strobel 1972).

The Industrial Revolution changed the structure of society, and might have affected inheritance traditions in several ways. Most prominently, through technological progress in agriculture, better knowledge of farmers, demographic change or the spread of modern transport infrastructure (especially railways). Increasing market integration and better outside options coming with higher wages in urban industries and lower travel costs affected the attitudes of farmers toward inheritance too. (Straub 1977; Strobel 1972, offer detailed case studies of the effect of population growth on farmers and inheritance traditions in historical Baden).

The Industrial Revolution also changed second nature geography through better transport infrastructure, in particular railways. Because it made migration from rural to urban areas easier and more attractive, it fostered urbanization and thereby agglomeration of markets.

Concerning cultural evolution, declining transport costs increased mobility and the frequency of social interactions with people from other areas and regions. Because of this, the Industrial Revolution altered the pool of potential traditions to imitate, and might have led to more flexible forms that combine advantages of primogeniture and equal partition. That we observe still small-scale differences in inheritance traditions however indicates that the role of tradition has not generally eroded. The political economy of feudalism was replaced by market forces searching for workers and consumers in the rural areas. We are interested in how much this affected the geography of inheritance traditions, and if it altered the traditions altogether or just led to minor adjustments.

An interesting case here is that, as visualized in Figure 2, history has left Baden-Württemberg with a relatively closed area of equal partition and another of primogeniture, but there are ample enclaves of one tradition in the area of the other. If the Industrial Revolution lead to market integration, and increased exchange of ideas through easier travel and more interactions with people from the outside, then we should expect change to happen here first. In such enclaves, it is also possible that while farmers stick with the traditional mechanism for some farms, they allow more flexible ways of dealing with, for example, small farms, leading to mixed traditions. Similarly, change should also happen early in areas at the border between equal partition, and, it should be spatially clustered.

The literature has outlined these as originally from the 19^{th} century, and we should be interested if we can quantitatively tie them to changes to the second nature geography that came with the Industrial Revolution.

Hypothesis 4 *The Industrial Revolution shaped the geographic pattern of inheritance traditions into the pattern we observe today.*

4.1 Predictions

This leads us to our final predictions,
Prediction 4a *We expect transitional inheritance traditions, assuming they were established after 1800, to be more prevalent in border regions between primogeniture and equal partition and in "inheritance exclaves". They should be more likely in municipalities surrounded by other municipalities with mixed and transitional forms.*

and
Prediction 4b *There should be a positive correlation between access to the railway networks, population density and the probability of transitional forms.*

II. DATA

In the following paragraphs we elaborate on our data on inheritance traditions and introduce the definition and sources of the variables used to analyze the origins and change of equal partition later on.

1. Inheritance Traditions

Our empirical approach relies on the data by Röhm 1957. After World War II, the federal state of Baden-Württemberg was founded with 3,382 municipalities, each on average only 10.56km^2 in size.[1] In 1953, Röhm sent a one-page questionnaire to each municipality's major. Questions included the predominant inheritance tradition in the municipality at the time, but also whether it had changed in the last 100 years, and if yes, what was the original form.[2] Respondents had to decide between a 'main form' (*Hauptform*), primogeniture or equal partition, but could also choose from different transitional and mixed forms. A mixed form could be that small farms are subject to equal partition, while primogeniture applies for large farms.[3] An outcome of Röhm's research is that there existed almost no transitional or mixed forms in 1850.

Röhm then drew a sharp historical border between the main forms. To do so, he assigned all municipalities to their original main form, based on the practice in 1953, and if a municipality was not using a main form but some mixed form, he grouped the municipalities according to the 'original form' they had in 1853. We use the border to code a dummy variable "historical equal partition area" that we will use to investigate empirically the origins of equal partition. This assumes that before the 19$^{\text{th}}$ century the inheritance traditions remained stable over time. In light of

1. The following paragraphs draw heavily from Huning and Wahl (2019a) a companion paper of ours in which we introduce the inheritance data in more detail.
2. The vast majority of the changes were from an original main form to a transitional or mixed form. Only 22 municipalities (0.7 % of all municipalities) experienced a change in the main form between 1850 and today. This suggests that the traditions were relatively persistent.
3. He also inquired about further details, for example, if the oldest or youngest son inherits.

case study evidence showing temporary changes in inheritance traditions in small regions during the medieval period (e.g. in response to the Black Death), this cannot be taken for granted. Systematic data on inheritance traditions for earlier periods does not exist to the best of our knowledge. Another (maybe less eminent) downside of Röhm's approach is that it relies on the best knowledge of the majors, and to a minor extent on the honesty of the majors[4]. We will compare his data with other data collected earlier, to reduce these biases. The questionnaire allowed also free comments.

The survey resulted in a map depicting for each municipality, one of nine predominant inheritance traditions each with a different color or shading (the original map is printed in the Online Appendix, Figure A.1). The map distinguishes nine inheritance practices as listed in Table 2:

Table 2: *Inheritances Traditions Identified by Röhm (1957)*

1.	*Primogeniture*, i.e. the farm as a whole is given to one son (mostly the oldest but sometimes the youngest) and the other children were compensated with (comparatively small amounts of) money and were allowed to stay on the farm, living for free and working there. The parents were also allowed to stay on the farm and live there for free. Daughters usually do not inherit the farm.
2.	*Equal Partition*, i.e. the land owned by the parents is equal split among all children, daughters and sons alike. The buildings and capital goods belonging to the farm were often given to one of the children only.
3.	*Transitional Form of Primogeniture*, where the large farms were given to one son but smaller farms where partitioned equally among all children.
4.	*Transitional Form of Equal Partition*, where one son inherited the largest part of the farm and only the rest is equally partitioned among the others.
5.	Municipalities in which both form 3 and 4 existed (municipalities with mixed form)
6.	Municipalities with predominantly primogeniture but notable prevalence of form 3
7.	Municipalities with predominantly equal partition but notable prevalence of form 3
8.	Municipalities with predominantly primogeniture but notable prevalence of form 4
9.	Municipalities with predominantly equal partition but notable prevalence of form 4

Forms 3, 6 and 8 are transitional forms of primogeniture. Forms 4, 7 and 9 are transitional forms of equal partition and form 4 stands for mixed traditions. We will use information on those transitional and mixed forms to investigate the determinants of changes in inheritance practices in the period from 1853 to 1953.

The application of one or the other tradition was importantly not restricted by any laws. The German inheritance laws allowed farm owners to pass their property almost as they wished. If they wanted to apply primogeniture however, they had to register this fact in the "Höferolle" (a register like trade register for firms). Local laws of primogeniture (which varied only in minor aspects) then applied. If the inheritor changed his mind, he still could choose to pass his farm in another way. Farms were predominantly passed down to the children during the life time of the parents. A usual age to do so was around 60, so that the the oldest son would be around 25 years old (Karg 1932)—therefore, the inheritance from a deceased was relatively rare.

Table 3 gives a descriptive overview of the prevalence and distribution of these five inheritance

4. Eight years after the Nazi time, this could be a bias, because the political debate emphasized primogeniture as the 'true' Germanic, and therefore superior, tradition.

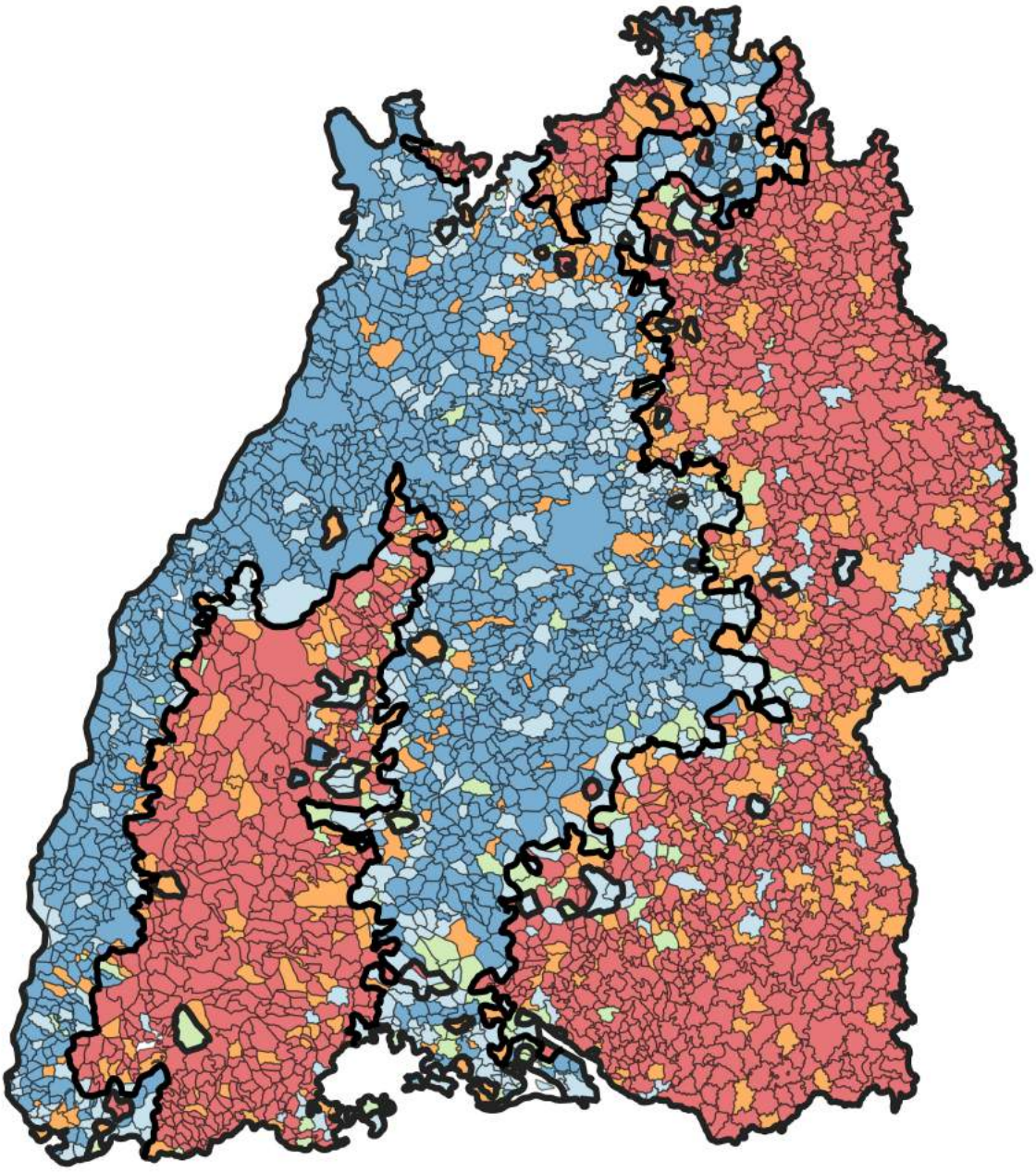
traditions across Baden-Württemberg and Figure 2 shows the digitized version of Röhm's map were each of the five different traditions is depicted by a different color, i.e. blue is equal partition, light blue are municipalities with transitional form of equal partition, red is primogeniture, orange represents transitional forms of primogeniture, and green are mixed traditions. As reported in Table 3, Primogeniture is the most frequent inheritance tradition and is applied in around 38% of all municipalities. Transitional and mixed forms are predominant in around 1/3 of all municipalities, which makes them a relevant field of study.

The black line depicts the border of the equal partition and Primogeniture areas. To check further whether transitional forms were less prevalent the beginning of the 20th and to check the validity of Röhm's map, we use maps on the prevalence of inheritance traditions from 1905 as printed in Krafft (1930) and Sering and von Dietze (1930). The map of inheritance traditions in 1905 as printed in Krafft (1930) is depicted in Figure 3. The map is based on a survey of the ministry of law of Württemberg which asked notaries about the inheritance traditions prevalent in their jurisdiction. According to Röhm (1957) the 1905 map is less detailed than his own map. This is valid because it only distinguishes between the two basic forms of equal partition and primogeniture and mixed traditions (where both is applied). The 1905 map does not only largely confirm the location of the border but also that in 1900, only a few areas at the border of both basic tradition showed mixed inheritance. We cross-checked with the maps from Huppertz (1939) and Karg (1932) to validate Röhm's map and found that it is the most accurate and detailed one available.

Figure 2 also shows that there are several exclave municipalities that historically applied primogeniture or equal partition surrounded by the other tradition. We will try to empirically explain these enclaves later, but we will exclude them from the sample for the rest of this analysis.

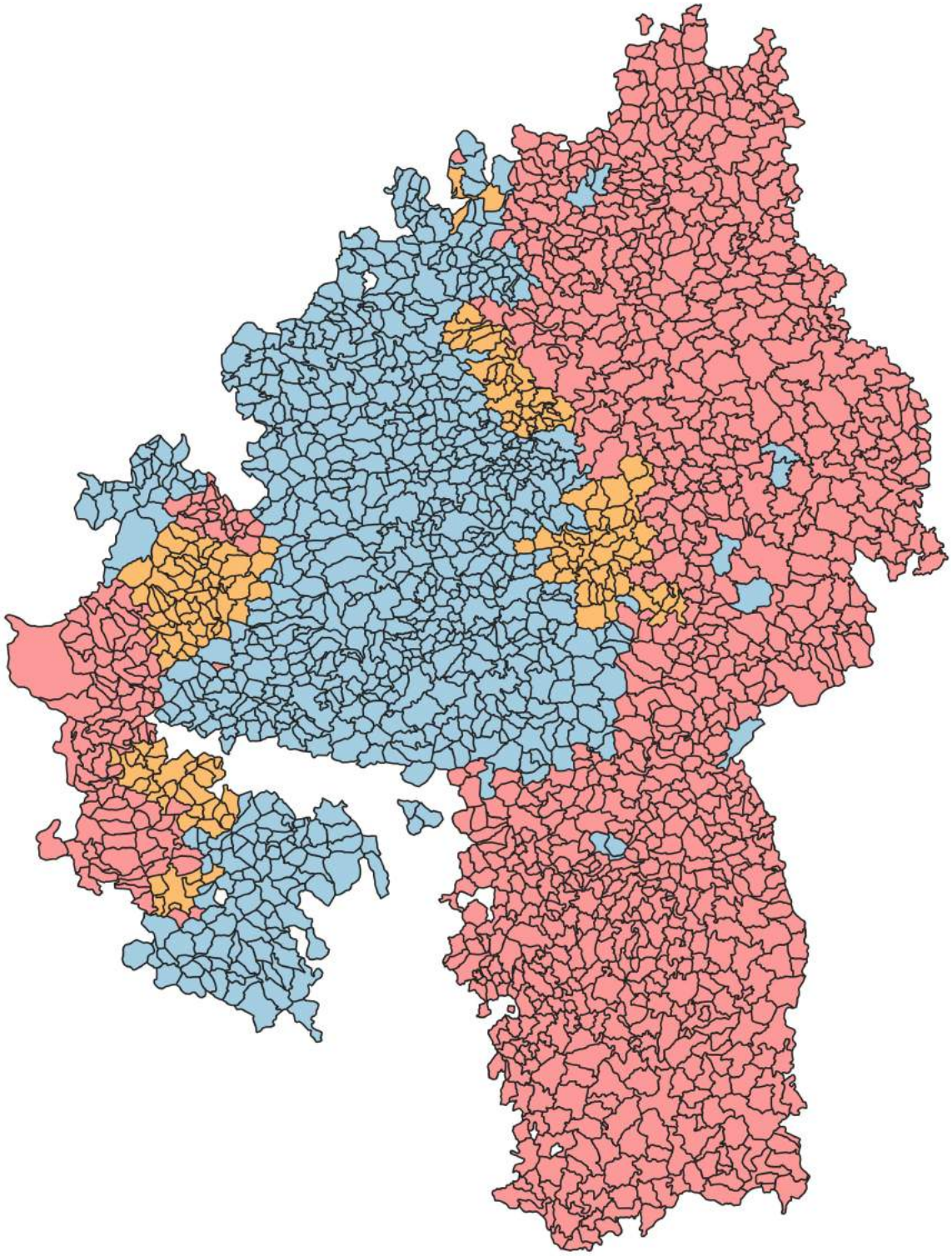
Table 3: *Prevalence of Inheritance Traditions in Baden-Württemberg*

Inheritance Tradition	Frequency	Percent	Cumulative
Primogeniture	1,279	37.82	37.82
Equal Partition	1,044	30.87	68.69
Transitional Form of Primogeniture	409	12.09	80.78
Transitional Form of Equal Partition	519	15.35	96.13
Mixed Form	131	3.87	100
Total	3,382	100	



Note: Blue municipalities predominantly apply equal partition, light blue are municipalities with transitional form of equal partition, red is primogeniture, orange represents transitional forms of Primogeniture, and green are mixed traditions. The black line denotes the historical border of the equal partition area. Map is based on results from Röhm (1957).

Figure 2: *Inheritance Practices and the Historical Main Border of the Equal Partition (with Exclaves) in 1953*



Note: Blue municipalities predominantly apply equal partition, red is primogeniture, and orange represents mixed traditions (application of both equal partition and primogeniture).

Figure 3: *Inheritance Practices in Württemberg in 1905 (according to Krafft (1930))*

2. Predictors

Our predictors of equal partition originate from a large variety of data sources. To outline our main variables, the share of a municipality's area used to grow wine or fruits with intensive agriculture we take from the official municipal statistics of 1961 as systematic data on this is not available for historical periods on a sufficiently small level of aggregation (Statistical Office of Baden-Württemberg 1964). From there we also take information on each municipalities share of Protestants from which we calculate a dummy variable "Protestant" if the share is large than 50 %.[5] Municipal population density we also take from the official municipal statistics of 1950 (Statistical Office of Baden-Württemberg 1952). We also take the area of each municipality in km^2 and in hectare from there.

Our measure of soil suitability is based on the agricultural suitability measure of Zabel, Putzenlechner, and Mauser (2014). The measure used in the paper is average agricultural suitability in the period 1961–1990. Zabel, Putzenlechner, and Mauser (2014) measure agricultural suitability by considering climate (temperature, precipitation, solar radiation), soil (pH value, texture, salinity, organic carbon content, etc.), and topography (elevation and slope) of a grid cell of 30 arc seconds*30 arc seconds (0.86 km^2 at the equator) size. We calculate municipal averages of this measure by overlaying their raster data with the municipal borders. Mean elevation of each municipality is measured in meters above sea level. We base our variable on the Digital Elevation Model (DEM) of the U.S. Geological Survey's Center for Earth Resources Observation and Science (EROS), the GTOPO30 dataset. Following Riley, DeGloria, and Elliot (1999), we calculate average ruggedness of a municipality's territory as the negative value of the derivative of the ruggedness index of a digital elevation model.

Data on the location of pre-medieval forest areas were digitized from a map by Ellenberg (1990). Most historical variables stem from Huning and Wahl (2019b), namely distance to the closest Imperial city and the share of each municipality located within an Imperial city, historical political instability and fragmentation, share of each municipality located in church territories and a dummy equal to one if a municipality was located within the historical Duchy of Württemberg. Talbert (2000) provides a shapefile of the Roman road network that we can use to calculate the density of Roman roads for each municipality (km of certain Roman roads per km^2). Data on the location of Celtic graves, and 19^{th} railway lines, early medieval settlements and Neolithic settlement area comes from maps of the "Historischer Atlas von Baden-Württemberg" (Historical Atlas of Baden-Württemberg) which we have digitized (Kommission für geschichtliche Landeskunde in Baden-Württemberg 1988). We use the atlas maps to compute a dummy variables equal to one if at least one Celtic grave was found there, at least one early medieval, Germanic settlement was within the municipality and if a municipality intersects with at least one major or minor railway line build in the 19^{th} or early 20^{th} century. Furthermore, we calculate the share of each municipality that was settled during the Neolithic period. As measure of railway access we compute a dummy variable equal to one

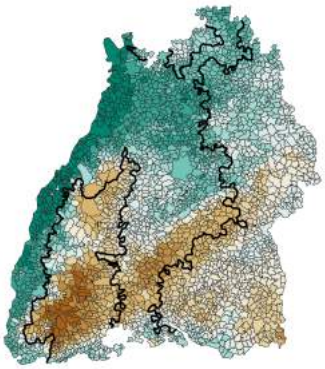
We calculate Black Death mortality potential based on city-level Black Death mortality rates from

5. If we were to code the Protestant dummy according to information on the historical denomination of the territory, a municipality belonged to, we would come to almost the same result as the area with a historical Protestant majority are almost identical to the areas with Protestant majority in the 1950s and even today.

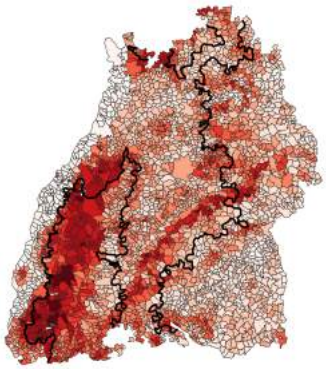
Christakos et al. (2005). We calculate the mortality potential as sum of the mortality rates of all the cities in the dataset inversely weighted by the distance of those cities to the centroid of the municipality under consideration (in km).

The Online Appendix provides a descriptive overview of all the variables used in the empirical analysis, alongside a short description. There, we also have a table of bivariate correlations between all the variables used in the empirical analysis (Table A.2). In most of the cases, the correlations between the predictor variables are modest, and they are never larger than 0.41 (between the share pre-medieval forest area and terrain ruggedness).

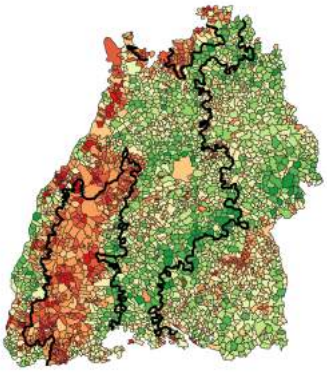
Figures 4 and 5 show the spatial distribution of several of geographic and historical variables among the municipalities of Baden-Württemberg and the historical inheritance border. According to the maps, the equal partition areas is characterized by lower elevation and terrain ruggedness and better soil quality—although without the Black Forest in the south-west the association between soils and equal partition is less apparent. The equal partition are shows considerably more municipalities in which wine or fruits are grown, it has more intersecting Roman roads, less pre-medieval forest, less ecclesiastical territories and Imperial cities, and more Protestants. It also shows more early medieval settlements, although, again, without the Black forest area the association is much weaker here. The positive relationship between political stability and equal partition visible in Figure 5(e) is also only there because of the green area in the middle, which is more or less identical to the Duchy of Württemberg, which is also responsible for the equal partition area having more Protestant municipalities (Figure 5(f)).



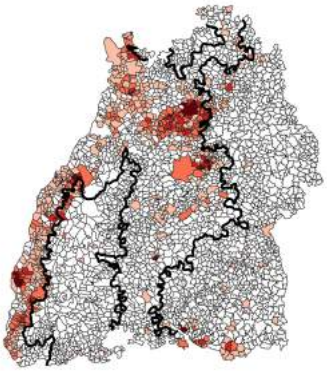
(a) *Elevation (mean)*



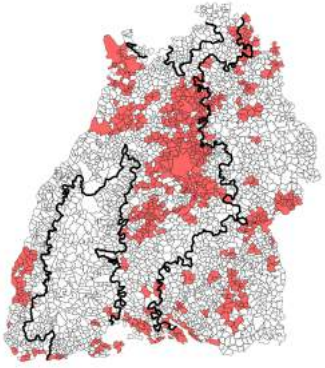
(b) *Terrain ruggedness (mean)*



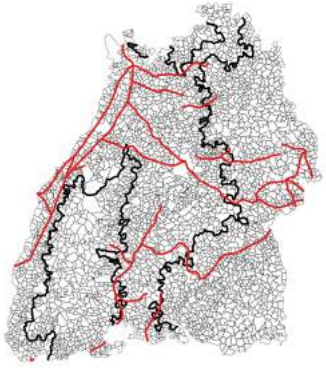
(c) *Soil Suitability*



(d) *Share Wine & Fruits*



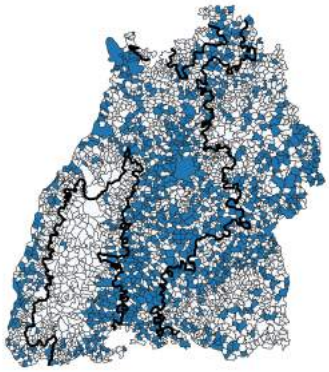
(e) *Neolithic Settlement Area*



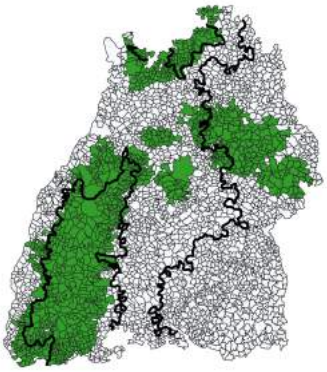
(f) *Certain Roman Roads*

Note: In Panel (a), elevation increases from dark green to dark brown. In Panel (b), terrain ruggedness increases from light to dark red. Panel (c), shows average soil suitability in a municipality, with the dark green indicating high soil suitability and red low suitability. In Panel (d), the darker red the municipality is colored the higher is it share of agricultural land used to grow wine or fruits, white indicates a share of zero.

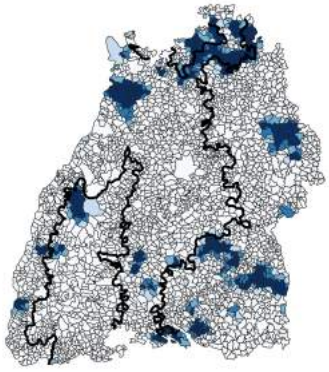
Figure 4: *Potential Geographic and Early Historical Determinants of Equal Partition and the Historical Inheritance Border*



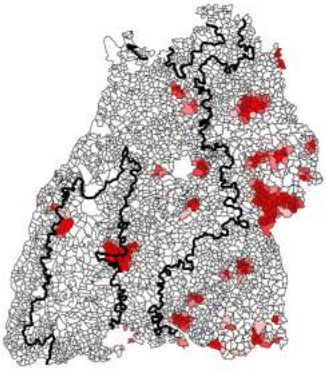
(a) *Early Medieval Settlement*



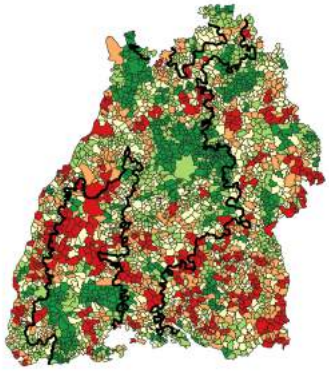
(b) *Pre-Medieval Forest Area*



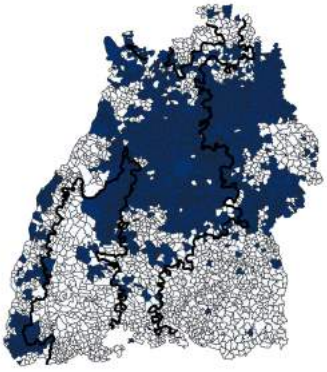
(c) *Share Ecclesiastical Territory*



(d) *Share Imperial City*



(e) *Historical Political Instability*



(f) *Protestant*

Note: In Panel (c), the darker blue the municipality is colored the more of its territory was located in an ecclesiastical state, white indicates a share of zero. In Panel (d), the darker red the municipality is colored the more of its territory was located in an Imperial city, white indicates a share of zero. In Panel (e), the dark green indicates high political stability and red high political instability.

Figure 5: *Potential Medieval and Early Modern Determinants of Equal Partition and the Historical Inheritance Border*

III. EXPLAINING EQUAL PARTITION IN BADEN-WÜRTTEMBERG

In the following we present results from regression estimations enabling us to test whether empirical evidence confirms the predictions made in the section before.

1. Explaining the Origins of Equal Partition

To explain the origins of equal partition in Baden-Württemberg before 1850, we run probit models of the following form:

$$\begin{aligned} &\Pr(EP_i|\mathbf{G}_i, \mathbf{EARLY}_i, \mathbf{MED}_i, \mathbf{EMOD}_i) \\ &= \Phi(\alpha + \beta'\mathbf{G}_i + \gamma'\mathbf{EARLY}_i + \delta'\mathbf{EMED}_i + \zeta'\mathbf{EMOD}_i + \epsilon_i) \end{aligned} \tag{1}$$

EP_i is a dummy variable equal to one if municipality i is located the historical (pre-1850) equal partition area. $\mathbf{G_i}$ is a set of variables measuring potentially relevant geographical factors (elevation, terrain ruggedness, soil suitability and the share of a region's agricultural land used to grow wine or fruits). $\mathbf{EARLY}_i$ are historical factors capturing the early and ancient settlement history of a municipality, namely whether archaeologists found at least one Celtic grave there, the share of a municipality's area located in the Neolithic settlement area and Roman road density (km of Roman road per km^2 of municipal area). $\mathbf{EMED}_i$ is a set of medieval factors potentially influencing the formation of inheritance traditions. Among them is a dummy variable if a municipality was settled during the early medieval period (before 800) but a Germanic tribe and the share of a municipality's area that was forested until the high middle ages (and then often deforested). $\mathbf{EMOD}_i$ Is a set of late medieval and early modern predictors. We consider historical political fragmentation, historical political instability, the share of a municipality's areas that was part of an ecclesiastical state or an Imperial city, a dummy equal to one if a municipality was located in the duchy of Württemberg in 1789, and distance to the closest Imperial city. Finally, we include Black death mortality potential and the share of Protestants to this set of variables. ϵ_i is the error term. We cluster the standard errors on county level and report average marginal effects in the regression tables.

At first, we analyze the effect and explanatory power of geographic variables and deep-rooted, early historical factors (predictions 1a,1c,1b, 2a, and 3a). Those are most likely to be exogenous to equal partition itself, unlike variables from later time periods. Table 4 shows the average marginal effects resulting from estimating probit models with these variables. We start by only including geographic variables, then we only include pre-historic/ancient variables and afterwards early medieval ones. In column (4), all the different variables are included simultaneously in the regression. All the variables but Celtic graves and terrain ruggedness show robustly significant coefficients. As presumed before, equal partition is significantly more likely in areas with good natural conditions (low elevations and high soil suitability) and were farmers are engaged in intensive agricultural activities like growing wine and fruits. Prediction 1a is fully confirmed. Equal partition is also more like to occur in areas with Roman activity and that were settled in the Neolithic period, also confirming our predictions. Thus, being settled early, when land was free and abundant land alongside Roman activities are important to understand the emergence of equal

partition. Equal partition is more likely to occur in municipalities already inhabited during the early medieval period. This implies that equal partition might indeed root in Germanic inheritance practices that were determined by natural conditions and the abundance of land in their area. We also learn that equal partition is significantly less likely in pre-medieval forest areas, providing suggestive evidence for prediction 3a. In combination, the latter two results support Röhm's hypothesis that equal partition has Germanic roots and primogeniture emerged during the middle ages in areas newly deforested by territorial rulers and settled with serfs. The insignificance of the Celtic grave dummy however implies that it is not settlement history per se that matters but really, who settled when, meaning the effect is because of settlements in the early medieval period and the maybe also the specifically Germanic type settlements. To further study this aspect, we leave to further research. It might also suggest that the significant effect of being in the Neolithic settlement area reflects more the favorable nature of this area—over and above the geographical variables included—than the effect of Neolithic cultures. Regarding the Pseudo-R^2, geography explains 20% of variation in historical equal partition, substantially more than the other factors (which explain around 4 to 5% of the variation in the dependent variable).

In conclusion, natural factors matter a great deal for the historical prevalence of inheritance traditions alongside Germanic traditions, Roman presence and the emergence of feudalism.

Next, we consider factors and phenomena from the late medieval and early modern period (Table 5). Therefore, we test whether we can confirm our predictions 2b,3b, 3c, 3d and 3c. The coefficients of these factors are potentially already endogenous to inheritance traditions and hence should be interpreted with caution. In column (1) we add variables for the average levels of medieval and early modern political fragmentation and instability, Black Death exposure in 1348 and for Protestant municipalities. Of these, only being a Protestant municipality significantly and robustly increases the probability of equal partition by around 10 to 20%. In column (2), we study the effect of particular type of states, implied by the political economy hypothesis, like ecclesiastical states, Imperial cities, or the Duchy of Württemberg. Here, distance to Imperial city, as measure for the strength of the outside option of non-inheriting children is robustly significant yet, only shows a comparatively small effect (increase in the probability of equal partition by roughly 1%). Being in the Duchy of Württemberg also seems to matter a great deal, although the variable turns insignificant when all medieval and pre-modern factors are included jointly. When comparing the Pseudo-R^2 values of these regressions to the ones in Table 4 it turns out that all medieval and early modern factors together only explain around 6% of the variation in the dependent variable. Thus, compared to earlier factors, especially geography, these factors do not explain a lot. Based on this, it is fair to conclude that early history is much more important for the understanding of the origins of equal partition than the medieval or early modern period. Equal partition was determined, it seems, a long time ago, and has shown a considerable amount of stability since then.

In column (4) we include the variables from both tables jointly in one regression. Geography and early historical factors remain significant and especially Roman road density (0.442) but also Neolithic settlement and pre-medieval forest area show large impacts on the probability of equal partition prior to 1853. Terrain ruggedness remains insignificant but Celtic graves now become significant like Black Death exposure does, distance to the closest Imperial city, the duchy of Württemberg dummy and the Protestants. Prediction 2b is therefore confirmed, but th effect of the Black Death is not very robust. However, evidence for prediction 3b and 3c is weak as nei-

ther political fragmentation and instability, nor location in a ecclesiastical territory or Imperial city show a robust influence on inheritance traditions. All in all, this regression suggest that geography, Germanic traditions and Roman presence, the emergence of feudalism, the outside option provided by Imperial cities, Protestantism and the policy of the dukes of Württemberg explain around one third of the historical prevalence of equal partition. Two thirds however remain unexplained by these factors and may result from regional idiosyncrasies random cultural drift or unobserved factors not considered by anyone until now.

Table 4: *Explaining Equal Partition with Geography and Pre-Medieval Factors*

	(1)	(2)	(3)	(4)
Dep. Var.	Historical Equal Partition Area			
Elevation (mean)	-0.0009***			-0.0009***
	(0.000)			(0.000)
Terrain Ruggedness (mean)	0.0005			0.0009**
	(0.000)			(0.000)
Soil Suitability (mean)	0.0084***			0.0045*
	(0.003)			(0.002)
Share Wine and Fruits	0.0255***			0.0211***
	(0.008)			(0.008)
Roman Road Density		0.7590***		0.4888***
		(0.171)		(0.139)
Celtic Grave		0.0376		0.0430
		(0.044)		(0.027)
Share of Neolithic Settlement Areas		0.8584***		0.2739*
		(0.194)		(0.142)
Early Medieval Settlement			0.0727**	0.0673**
			(0.034)	(0.027)
Share Pre-Medieval Forest Area			-0.2481***	-0.1502**
			(0.075)	(0.068)
Pseudo-R^2	0.19	0.054	0.036	0.228
Observations	3,377	3,382	3,382	3,377

Notes. Standard errors clustered on county (Landkreis) level are in parentheses. Coefficient is statistically different from zero at the ***1 %, **5 % and *10 % level. The table shows Probit estimates and the coefficients report average marginal effects. The unit of observation is a municipality in 1953. All regressions include a constant not reported.

Table 5: *Explaining Equal Partition—Adding Medieval and Early Modern Factors*

	(1)	(2)	(3)	(4)
Dep. Var.	Historical Equal Partition Area			
Historical Political Fragmentation	-0.0000		-0.0000	0.0000
	(0.000)		(0.000)	(0.000)
Historical Political Instability	-0.0277*		-0.0169	-0.0021
	(0.016)		(0.015)	(0.010)
Protestant	0.2432***		0.2229***	0.1057**
	(0.066)		(0.060)	(0.051)
Black Death Mortality Potential	0.0469		0.0425	0.0600*
	(0.043)		(0.038)	(0.035)
Share Ecclesiastical Territory		-0.0098	0.0614	-0.0083
		(0.085)	(0.084)	(0.064)
Share Imperial City		-0.1288	-0.1736	-0.0959
		(0.113)	(0.128)	(0.106)
Distance to Imperial City		0.0082**	0.0071*	0.0097***
		(0.004)	(0.004)	(0.002)
Duchy of Württemberg		0.2045**	0.0932	0.1820***
		(0.082)	(0.081)	(0.047)
Elevation (mean)				-0.0008***
				(0.000)
Terrain Ruggedness (mean)				0.0005
				(0.000)
Soil Suitability (mean)				0.0052***
				(0.002)
Share Wine and Fruits				0.0170***
				(0.007)
Roman Road Density				0.4423***
				(0.111)
Celtic Grave				0.0461**
				(0.023)
Share Neolithic Settlement Area				0.2162*
				(0.127)
Early Medieval Settlement				0.0748***
				(0.023)
Share Pre-Medieval Forest Area				-0.2417***
				(0.062)
Pseudo-R^2	0.05	0.053	0.064	0.317
Observations	3,375	3,382	3,375	3,371

Notes. Standard errors clustered on county (Landkreis) level are in parentheses. Coefficient is statistically different from zero at the ***1 %, **5 % and *10 % level. The table shows Probit estimates and the coefficients report average marginal effects. The unit of observation is a municipality in 1953. All regressions include a constant not reported.

2. Medieval Deserted Villages and Equal Partition

Prediction 1d implies an association of equal partition with the abandonment of villages during the Middle Ages. We test whether this is true by estimation the following equation using probit:

$$\begin{aligned}&\Pr(DV_i|EP_i, \mathbf{G}_i, \mathbf{EARLY}_i, FOREST_i) = \\ &\Phi(\alpha + \beta EP_i + \gamma' \mathbf{G}_i + \delta' \mathbf{EARLY}_i + \zeta FOREST_i + \epsilon_i)\end{aligned} \tag{2}$$

Where DV_i is a dummy variable equal two one if in municipality i there was at least one deserted village in the medieval period. EP_i is the historical equal partition area dummy.$\zeta FOREST_i$ is the share of pre-medieval forest area. The rest being equal to equation 1. We include only variables determined before medieval period to rule out that the regressors are influenced village desertion. The only exception is the Black Death Mortality Potential, as the Black Death and the rural-urban migration movements it caused is considered being one of the major causes for the abandonment of villages in the Middle Ages—the other most prominent reason being the agricultural crisis (Abel 1943; Rösener 2010; Schaab 1985). As before, we cluster standard errors on county level. Table 6 reports the results. The impact of equal partition is positive and marginally significant providing suggestive evidence for our prediction. Black Death Mortality Potential is insignificant, however, it shows a large and positive coefficient suggesting that measurement error prevents significance here. In line with the literature, deserted villages are found in mountainous areas and in areas with high soil quality. This means that both favorable and detrimental natural conditions gave rise to village desertion. The former via fostering settlement concentration in larger villages and the latter because these areas were more affected by the agrian crisis and colder climate of the late Middle Ages (Abel 1943; Rösener 2010; Schaab 1985). It is up to future research to more systematically and elaborately investigate the causes of village abandonment in historical periods.

Table 6: *Equal Partition and Deserted Villages in the Middle Ages*

	(1)	(2)	(3)
Dep. Var.	Medieval Deserted Village		
Historical Equal Partition Area	0.0560**	0.0398*	0.0382*
	(0.023)	(0.021)	(0.022)
Elevation (mean)	0.0001**		0.0001*
	(0.000)		(0.000)
Terrain Ruggedness (mean)	-0.0007***		-0.0005***
	(0.000)		(0.000)
Soil Suitability (mean)	0.0095***		0.0078***
	(0.001)		(0.001)
Share Wine and Fruits	0.0004		0.0003
	(0.002)		(0.002)
Roman Road Density		0.0923	0.0622
		(0.062)	(0.056)
Celtic Grave		0.1473***	0.0875***
		(0.018)	(0.019)
Share Neolithic Settlement Area		0.0683	0.0259
		(0.048)	(0.050)
Share Pre-Medieval Forest Area			-0.0800**
			(0.034)
Black Death Mortality Potential			0.0089
			(0.011)
Pseudo-R^2	0.056	0.028	0.069
Observations	3,377	3,382	3,377

Notes. Standard errors clustered on county (Landkreis) level are in parentheses. Coefficient is statistically different from zero at the ***1 %, **5 % and *10 % level. The table shows Probit estimates and the coefficients report average marginal effects. The unit of observation is a municipality in 1953. All regressions include a constant not reported.

3. Explaining Change of Inheritance Traditions

Table 7 presents the results of probit models studying the determinants of changes in inheritance traditions that occurred between the 1850s and the 1950s. We define change is define as change of the basic form (e.g., from primogeniture to equal partition) or the emergence of a transitional or mixed form. We include the variables from the previous analysis in the regressions alongside others proxying for cultural diffusion through social interactions and imitation and important 19th developments especially the railway. However, as industrialization of Baden-Württemberg also started-off after the 1850s and we do not now the exact date of the changes, those variables could at least be partly endogenous. We estimate probit models as before, with standard errors clustered on county level and report average marginal effects. Table 7 reports the results of estimating the following equation:

$$\begin{aligned}&\Pr(Change_i|\mathbf{G}_i, \mathbf{EARLY}_i, \mathbf{MED}_i, \mathbf{EMOD}_i, \mathbf{CDIFF}_i, \mathbf{IND}_i)\\&= \Phi(\alpha + \beta'\mathbf{G}_i + \gamma'\mathbf{EARLY}_i + \delta'\mathbf{EMED}_i + \zeta'\mathbf{EMOD}_i + \eta'\mathbf{CDIFF}_i\\&+ \theta'\mathbf{IND}_i + \epsilon_i)\end{aligned} \tag{3}$$

$Change_i$ is a dummy variable equal to one if between 1853 and 1953 municipality i changed its inheritance tradition. $\mathbf{CDiFF}_i$ is a vector of proxies for cultural diffusion, imitation and the degree of social interactions. It comprises a dummy variable for exclaves of equal partition and primogeniture, the share of municipalities with changes in inheritance traditions within a 10km radius and distance to the historical inheritance tradition border as depicted in Figure 2. $\mathbf{IND}_i$ is a vector of industrialization measures comprising two dummy variable for intersection with minor and major railway lines and the natural logarithm of population density in 1939. The rest of the equation is equal to the previous ones. These variables enable us to investigate the validitiy of predictions 4a and 4b.

We start with considering only geographic factors (column (1)) and find that terrain ruggedness and soil suitability are positively and significantly correlated to change in inheritance practices. Then we look at early historical and medieval factors and find that being in an area that was settled already during the Neolithic period and in the early Middle Ages is also positively associated with change in inheritance practices. Among the late medieval and early modern factors the duchy of Württemberg dummy and the share of ecclesiastical territory are positively significant. In sum the results of the first five columns suggest that change occurred in areas with good natural conditions and a long settlement history. They also indicate a certain role of politics as municipalities in church territories and the historical duchy of Württemberg are more likely to experience change. This could be because the areas of the former duchy are more developed today and thus, experience faster changes in cultural traditions and social norms. It could also mean that only the vanishing political influence of the church during the 19$^{\text{th}}$ century allowed individuals in ecclesiastical territories to change their tradition towards the more efficient one.

However, none of these variables but the share of ecclesiastical territory remain significant when we add proxy variables for cultural transmission and industrialization in column (6). Both sets of variables are highly statistically significant and account for most of the, nevertheless low, Pseudo-R^2 of 0.106. Change is more likely to occur close to border, in exclaves municipalities that are surrounded by places applying another tradition. In the same spirit, it is more likely to occur in municipalities that have more municipalities with changing inheritance practices in the 10km neighborhood around them. These results suggest that change is more likely to happen in areas where people are in contact with the other traditions and thus are potentially also in more frequent interaction with people from the other area. Consequently, social interaction, imitation and the exchange of ideas seem to be a major factor driving cultural change. Results indicate that these factors are more crucial in explaining cultural change than economic incentives or historical experiences, e.g. political instability.

The same holds true for measures of industrialization, like railway access and population density. When looking at those, we see that change is more likely to occur in municipalities intersecting minor (regional) railway lines, connecting smaller places in the countryside with major railways. Closeness to railways, especially to those minor railway lines might proxy for industrialization but also higher mobility and therefore more social interactions with people from other areas.

Table 7: *Explaining the Change of Inheritance Traditions*

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Change in Inheritance Rule between 1850 and 1950					
Elevation (mean)	-0.0001			-0.0001	-0.0001	0.0001
	(0.000)			(0.000)	(0.000)	(0.000)
Terrain Ruggedness (mean)	0.0003**			0.0004**	0.0003**	-0.0000
	(0.000)			(0.000)	(0.000)	(0.000)
Soil Suitability (mean)	0.0048***			0.0041***	0.0045***	0.0018*
	(0.001)			(0.001)	(0.001)	(0.001)
Share Wine and Fruits	0.0012			0.0009	0.0009	-0.0015
	(0.004)			(0.003)	(0.003)	(0.002)
Roman Road Density		0.0339		-0.0035	-0.0169	-0.0814
		(0.070)		(0.063)	(0.063)	(0.057)
Celtic Grave		0.0258		0.0114	0.0151	0.0189
		(0.028)		(0.024)	(0.025)	(0.021)
Share Neolithic Settlement Area		0.1612*		0.0750	0.0732	0.0371
		(0.083)		(0.063)	(0.066)	(0.042)
Early Medieval Settlement			0.0513***	0.0413**	0.0401**	0.0270
			(0.019)	(0.018)	(0.018)	(0.016)
Share Pre-Medieval Forest Area			0.0116	0.0307	0.0320	0.0209
			(0.035)	(0.041)	(0.041)	(0.021)
Historical Political Fragmentation				0.0851**	0.0759*	0.0460*
				(0.040)	(0.044)	(0.027)
Historical Political Instability				-0.0546	-0.0592	-0.0115
				(0.058)	(0.058)	(0.033)
Protestant				0.1088***	0.1226***	0.0284
				(0.034)	(0.037)	(0.023)
Duchy of Württemberg				-0.0020	-0.0021	-0.0009
				(0.002)	(0.002)	(0.001)
Black Death Mortality Potential					-0.0000	-0.0000
					(0.000)	(0.000)
Share Ecclesiastical Territory					-0.0026	-0.0024
					(0.008)	(0.005)
Share Imperial City					-0.0280	-0.0308
					(0.032)	(0.022)
Distance to Imperial City					0.0171	0.0026
					(0.019)	(0.008)
Share of Municipalities with Change in Inheritance Traditions (within 10km)						0.6656***
						(0.046)
Exclave Equal Partition						0.2882***
						(0.055)
Exklave Primogeniture						0.0827
						(0.063)
ln(Population Density)						0.0453***
						(0.013)
Intersects Minor Railway						0.0455***
						(0.016)
Intersects Major Railway						0.0373*
						(0.022)
Distance to Inheritance Border						-0.0024***
						(0.001)
Pseudo-R^2	0.008	0.002	0.002	0.023	0.025	0.108
Observations	3,377	3,382	3,382	3,377	3,374	3,371

Notes. Standard errors clustered on county (Landkreis) level are in parentheses. Coefficient is statistically different from zero at the ***1 %, **5 % and *10 % level. The table shows Probit estimates and the coefficients report average marginal effects. The unit of observation is a municipality in 1953. All regressions include a constant not reported.

IV. CONCLUSION

This paper studies the origins and change of agricultural inheritance traditions in the German state of Baden-Württemberg. It finds that a combination of historical and geographical factors is responsible for the emergence and persistence of these traditions until today. Deep-rooted historical factors like settlement history, Germanic tradition and Roman activities but also wine-growing and soil quality prominently explain part of their prevalence. The role of political aspects seems to be more limited, but the rise of feudalism during the Middle Ages and the decisions of individual actors, like the dukes of Württemberg to foster equal partition in their realm, played a certain role. Nevertheless, geographic factors matter much more for explaining the historical prevalence of the inheritance traditions than all the other factors. Our results imply that traditions of the Germanic people, settling the area after the breakdown of the Roman Empire and the Romans themselves played a significant role in the making of agricultural inheritance traditions. The Germanic tradition of giving the father complete freedom in inheriting its agricultural property resulted from the fact that land was free and abundant and that the land in these areas was good enough to allow for small farms. Thus, it seems that geography and natural conditions imprinting cultural practices and social norms, like argued by Henrich (2015) and also sign responsible for the documented large persistence of these practices until the period of industrialization and even today.

The Roman impact might result from persistence in economic prosperity, higher urbanization of the previously Roman area or more social interactions between people from cities connected by the Roman road network. To more systematically analyze this aspect is, however, up to future research. As the findings of this study imply Roman legacy of agricultural inheritance traditions, it contributes to still small but growing literature documenting persistent effects of the legacies of ancient civilizations on various economic outcomes (Dalgaard et al. 2018; Flückiger et al. 2019; Wahl 2017).

Changes in these traditions are explained mostly by imitation and social interactions with people from areas with other traditions or in which also change occurred. Industrialization, faster and cheaper transport through railways also contributed to change in these, otherwise historically highly persistent traditions. There is not a lot of economic research focusing on the determinants of cultural change, and therefore this result could motivate future research to understand better the causes of changes in economic and social phenomenon rather than persistence. Questions tackled by this future research could evolve around a comparison of causes for cultural persistence and change, and explaining why some cultural traits are more persistent than others (Ichino and Maggi 2000; Voigtländer and Voth 2012).

We would like to emphasize that more research and the collection of data on inheritance traditions for earlier periods is necessary to get a full understanding of the origins and long-term evolution of agricultural inheritance rules. Hopefully, our results, while suggestive, can guide such future research attempts into avenues of general interest for scholars studying the origin, persistence and change of cultural practices in an economic context.

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Appendix (For online publication only)

A.1. The Map of Inheritance practices of Röhm 1957

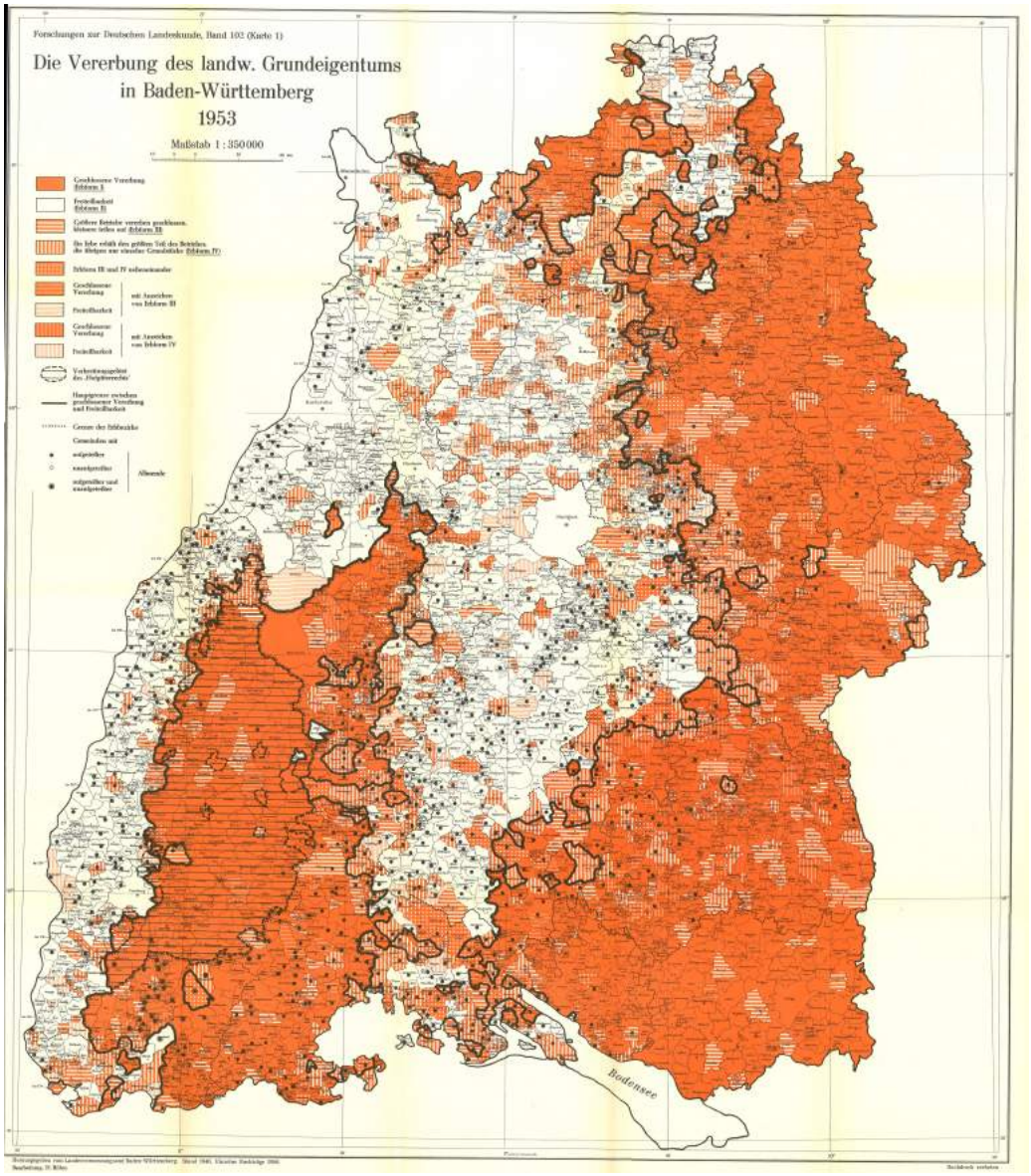

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Figure A.1: *Map of Inheritance Practices and Partitioned Common Land in 1953 according to Röhm (1957).*

A.2. Data Set and Variables Description

Table A.1: *Descriptive Overview of the Data Set for Municipalities as of 1953*

Variable	Obs	Mean	Std. Dev.	Min	Max
Black Death Mortality Potential	3,382	19.2	1.026	17.841	35.522
Celtic Grave	3,382	0.428	0.991	0.000	13.000
Change in Inheritance Tradition	3,382	0.279	0.448	0	1
Distance to Inheritance Border	3,382	10.921	12.015	0	71.204
Distance to Imperial City	3,382	11.331	9.843	0.000	51.745
Early Medieval Settlement	3,382	0.274	0.446	0	1
Elevation (mean)	3,380	474.774	200.677	96.333	1216.923
Historical Equal Partition Area	3,382	0.488	0.500	0.000	1.000
Exclave Equal Partition	3,382	0.012	0.107	0.000	1.000
Exclave Primogeniture	3,382	0.012	0.111	0.000	1.000
Historical Political Fragmentation	3,379	20075.080	27898.930	71.574	118850.000
Historical Political Instability	3,382	3.724	1.438	0.000	10.000
Intersects Major Railway	3,382	0.17	0.376	0	1
Intersects Minor Railway	3,382	0.304	0.46	0	1
ln(Population Density)	3,370	4.436	0.779	0	7.986
Share Ecclesiastical Territory	3,382	0.124	0.3	0.000	1.000
Share Imperial City	3,382	0.069	0.225	0.000	1.000
Share Neolithic Settlement Area	3,382	0.04	0.12	0	1
Share of Municipalities with Change in Inheritance Tradition (within 10km)	3,382	0.280	0.167	0	0.875
Share Pre-Medieval Forest Area	3,382	0.234	0.4	0	1
Protestant	3,382	0.446	0.497	0.000	1.00
Share Wine and Fruits	3,381	1.765	4.078	0.000	36.500
Roman Road Density	3,382	0.05	0.124	0	1.112
Soil Suitability (Mean)	3,380	22.258	8.282	0.000	52.000
Terrain Ruggedness (Mean)	3,380	100.496	71.543	2.366	460.234
Württemberg in 1789	3,382	0.231	0.421	0.000	1.000

Table A.2: *Bivariate Correlations of the Predictor Variables of Historical Inheritance Traditions I*

Variables	Historical Equal Partition Area	Elevation (mean)	Terrain Ruggedness (mean)	Soil Suitability (mean)	Share Wine and Fruits	Roman Road Density	Celtic Grave	Share Neolithic Settlement Area	Early Medieval Settlement	Share Pre-Medieval Forest Area
Historical Equal Partition Area	1.000									
Elevation (mean)	-0.440	1.000								
	(0.000)									
Terrain Ruggedness (mean)	-0.070	0.297	1.000							
	(0.000)	(0.000)								
Soil Suitability (mean)	0.103	-0.004	-0.271	1.000						
	(0.000)	(0.795)	(0.000)							
Share Wine and Fruits	0.298	-0.382	0.029	-0.015	1.000					
	(0.000)	(0.000)	(0.091)	(0.379)						
Roman Road Density	0.187	-0.149	-0.077	0.036	0.063	1.000				
	(0.000)	(0.000)	(0.000)	(0.037)	(0.000)					
Celtic Grave	0.047	0.046	-0.173	0.260	-0.075	0.009	1.000			
	(0.006)	(0.008)	(0.000)	(0.000)	(0.000)	(0.621)				
Share Neolithic Settlement Area	0.186	-0.220	-0.122	0.087	0.183	0.038	0.059	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.029)	(0.001)			
Early Medieval Settlemen	0.104	0.007	-0.130	0.216	-0.008	0.062	0.205	0.132	1.000	
	(0.000)	(0.675)	(0.000)	(0.000)	(0.651)	(0.000)	(0.000)	(0.000)		
Share Pre-Medieval Forest Area	-0.210	0.211	0.447	-0.410	-0.115	-0.075	-0.214	-0.139	-0.194	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Table A.3: *Bivariate Correlations of the Predictor Variables of Historical Inheritance Traditions II*

	Share Ecclesiastical Territory	Share Imperial City	Duchy of Württemberg	Distance to Imperial City	Historical Political Fragmentation	Historical Political Instability	Protestant	Black Death Mortality Potential
Share Ecclesiastical Territory	1.000							
Share Imperial City	-0.093	1.000						
	(0.000)							
Duchy of Württemberg	-0.223	-0.124	1.000					
	(0.000)	(0.000)						
Distance to Imperial City	0.083	-0.353	-0.059	1.000				
	(0.000)	(0.000)	(0.001)					
Historical Political Fragmentation	-0.161	-0.141	-0.185	0.162	1.000			
	(0.000)	(0.000)	(0.000)	(0.000)				
Historical Political Instability	0.028	0.031	-0.142	-0.153	-0.010	1.000		
	(0.108)	(0.070)	(0.000)	(0.000)	(0.579)			
Protestant	-0.242	0.027	0.459	-0.058	-0.315	-0.145	1.000	
	(0.000)	(0.120)	(0.000)	(0.001)	(0.000)	(0.000)		
Black Death Mortality Potential	-0.117	-0.032	-0.191	0.183	0.327	0.052	-0.253	1.000
	(0.000)	(0.062)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	

A.2.1. Definitions and Sources of the Variables

The spatial datasets were each converted into ETRS89 UTM 32N projection. GIS computations were performed with the QGIS software. Variables from the official statistics of Baden-Württemberg are explained in detail in the main text and are not included in the list below.

Black Death Mortality Potential. Black Death mortality potential is calculated based on city-level Black Death mortality rates from Christakos et al. (2005). We calculate the mortality potential as sum of the mortality rates of all the cities in the dataset inversely weighted by the distance of those cities to the centroid of the municipality under consideration (in km).

Celtic Grave. Dummy variable equal to one if in a municipality archaeologists have found at least one Celtic grave. Variable calculated using a digitized version of the following map from Kommission für geschichtliche Landeskunde in Baden-Württemberg (1988): `https://www.leo-bw.de/media/kgl_atlas/current/delivered/bilder/HABW_03_02.jpg` (accessed latest on 27th March 2019).

Distance to Imperial City 1556. Distance to city states is calculated as follows: Points with random location were generated until 1,000 points fell in into each municipality. In a second step, the Euclidean distance from each of the 1,000 points per municipality to the closest Imperial city was calculated. In a last step, these distances were aggregated by municipality. The location of city states follows the maps of territories of the HRE in 1556 by Wolff (1877) but we have corrected/ supplemented them—if necessary—with information from Köbler (1988), Keyser and Stoob (1939–1974) and Jacob (2010).

Elevation (mean). Mean elevation of each municipality in meters. Data is based on the Digital Elevation Model (DEM) of the U.S. Geological Survey's Center for Earth Resources Observation and Science (EROS), namely the GTOPO30 dataset, which can be downloaded here `https://lta.cr.usgs.gov/GTOPO30` (last accessed May, 30th 2016). The GTOPO30 has a spatial resolution of 30 arc seconds.

Early Medieval Settlement. Dummy variable equal to one if in a municipality there was at least one early medieval, Germanic settlement. Settlements are identified by a map of villages with the name endings "-ingen" "-heim" or "ingheim". These name endings indicate that the villages originates from an early medieval settlement. The variable is based on a digitized version of the map from Kommission für geschichtliche Landeskunde in Baden-Württemberg (1988): `https://www.leo-bw.de/media/kgl_atlas/current/delivered/bilder/HABW_04_01.jpg` (accessed latest on 27th March 2019)

Historical Political Fragmentation. Historical average state size of the states intersecting the municipality in km^2. Variable is calculated using digitized versions of the maps of the HRE printed in Wolff (1877).

Historical Political Instability. The variable reports the number of different historical states intersecting a municipality. Variable is calculated using digitized versions of the maps of the HRE

printed in Wolff (1877).

Intersects Major Railway. Dummy Variable if a major railway line ("Haupteisenbahnlinie") intersects the area of a municipality. The Variable is based on a digitized version of the following map from Kommission für geschichtliche Landeskunde in Baden-Württemberg (1988): `https://www.leo-bw.de/media/kgl_atlas/current/delivered/bilder/HABW_10_04.jpg` (accessed latest on 27th March 2019). The map shows the railway network after its last wave of expansion in 1934.

Intersects Minor Railway. Dummy Variable if a minor railway line ("Regionale Eisenbahnlinie"or "Nebeneinsenbahnlinie") intersects the area of a municipality Variable is based on a digitized version of the following map from Kommission für geschichtliche Landeskunde in Baden-Württemberg (1988): `https://www.leo-bw.de/media/kgl_atlas/current/delivered/bilder/HABW_10_04.jpg` (accessed latest on 27th March 2019). The map shows the railway network after its last wave of expansion in 1934.

Roman Road Density. km of certain Roman Roads per km^2 of municipal area. Locations of Roman roads (minor and major) originate from a shapefile included in the "Digital Atlas of Roman and Medieval Civilizations" (McCormick et al. 2013). The shapefile is based on the map of Roman roads in the Barrington Atlas of the Greek and Roman World (Talbert 2000). It can be downloaded here: `http://darmc.harvard.edu/icb/icb.do?keyword=k40248&pageid=icb.page601659` (last accessed September, 24th 2015).

Share Ecclesiastical Territory. Variable is the share of a municipality's area that was located in an ecclesiastical state in 1556. The map of territories within the current state of Baden-Württemberg originates from Huning and Wahl (2019).

Share Imperial City. Variable is the share of a municipality's area that was located in the territory of an Imperial city in 1556. The map of territories within the current state of Baden-Württemberg originates from Huning and Wahl (2019).

Share Pre-Medieval Forest Area. The share of each municipality's area that is located in pre-medieval forest area. Variable is calculated based on a digitized version of a map by Ellenberg (1990).

Share Neolithic Settlement Area. The share of each municipality's area that is located in Neolithic settlement area. Variable calculated using a digitized version of the following map from Kommission für geschichtliche Landeskunde in Baden-Württemberg (1988): `https://www.leo-bw.de/media/kgl_atlas/current/delivered/bilder/HABW_03_01.jpg` (accessed latest on 27th March 2019).

Soil Suitability. Soil Suitability is based on the agricultural suitability measure developed in Zabel, Putzenlechner, and Mauser (2014).[1] The measure used in the paper is average agricultural suit-

1. The data set is described further here: `http://geoportal-glues.ufz.de/stories/globalsuitability.html` (last

ability in the period 1961–1990. Zabel, Putzenlechner, and Mauser (2014) measure agricultural suitability by considering climate (temperature, precipitation, solar radiation), soil (pH, texture, salinity, organic carbon content, etc.), and topography (elevation and slope) of a grid cell of 30 arc seconds*30 arc seconds (0.86 km^2 at the equator) size. They consider rain-fed conditions as well as irrigation (what could, among other things, give rise to endogeneity issues). To compute agricultural suitability, they contrast these factors with growing requirements of 16 plants (Barley, Cassava, Groundnut, Maize, Millet, Oilpalm, Potato, Rapeseed, Rice, Rye, Sorghum, Soy, Sugarcane, Sunflower, Summer wheat, Winter wheat).

Terrain Ruggedness (Mean). Following Riley, DeGloria, and Elliot (1999) average ruggedness of a municipality's territory is calculated as the negative value of the derivative of the ruggedness index of a digital elevation model. The calculations are based on the elevation raster of Nunn and Puga (2012) (see above).

Württemberg 1789. Dummy Variable equal to one if the majority of a municipality was located in the Duchy of Württemberg in 1789. Assignment of municipalities to the historical duchy is based on the map of territories in 1789 from Huning and Wahl (2019).

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