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Gender Discrimination in Property Rights: Six Centuries of Commons Governance in the Alps

MARCO CASARI AND MAURIZIO LISCIANDRA

Starting from the Medieval period, women in the Italian Alps experienced a progressive erosion in property rights over the commons. We collected documents about the evolution of inheritance regulations on collective land issued by hundreds of villages over a period of six centuries (thirteenth-nineteenth). Based on this original dataset, we provide a long-term perspective of decentralized institutional change in which gender-biased inheritance systems emerged as a defensive measure to preserve the wealth of village insiders. This institutional change also had implications for the population growth, marriage strategies, and the protection from economic shocks.

In many societies women are discriminated against in economic life. We contribute to the economic explanations of gender discrimination by focusing on the discrimination in property rights. In particular, we study the structure of property rights on the common pastures and forests of hundreds of small peasant villages in the Italian Alps from the late-Medieval to the modern period (i.e., thirteenth-nineteenth century). Our systematic analysis of the original documents reveals a clear trend of erosion in women's inheritance rights. In the thirteenth century, women enjoyed extended rights on collective land, but by the end of the eighteenth century inheritance of the collective properties was nearly everywhere patrilineal.

This research presents three qualifying aspects. First, it considers institutional changes over a very long time span. Second, this investigation

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comprises hundreds of villages in the alpine region of Trentino, each of which could independently adopt a variety of inheritance rules. One can exploit variations in village characteristics to infer the drivers of institutional change. Third, the increasing gender discrimination in property rights with the advent of the Modern period provides the opportunity to study economic factors behind this process.

We describe the historical evolution towards inheritance rules that favored men over women and provide an interpretation about the underlying mechanism. We claim that an egalitarian inheritance system on the commons could encourage immigration to such an extent that villagers wanted to better protect the common resources. This could be achieved through a discriminatory inheritance system. We then discuss reasons on why, in this historical setting, a patrilineal system was preferred to a matrilineal one.

When commons are overexploited, the ecological balance can be compromised (Hardin 1968; Netting 1981). The villages of Trentino developed formal protective measures to limit "the tragedy of the commons" in the form of local *charters* (Casari 2007; Tagliapietra 2013). The charters regulated access to the commons by both insiders and outsiders. The most immediate form of appropriation by outsiders was trespassing, which was avoided by establishing property rights on the common land through the demarcation of land borders, establishment of legal rights, and hiring of guards to patrol the land.[1] Even when the resource was no longer open-access, opportunistic behavior over the commons could still occur in other ways. Outsiders could move in, settle down in the village and claim the use of common land and resources. To restrict access to the commons, insiders created a special legal status, called membership right, which granted only to the original members of the village a full belonging in terms of rights and duties. Such regulations and entitlements were widespread in many areas of Europe (Ostrom 1990; De Moor 2008, 2009; Alfani 2011). Outsiders could oftentimes gain access to the commons by marrying a member. If left unchecked, this would effectively increase the size of the group. Hence, here is where the inheritance system intervened. Under an egalitarian inheritance system, in which both men and women enjoyed membership rights, outsiders from poor villages could indeed enter a rich village by marrying an insider. Most

[1] Similar protective measures discussed by Neeson (1993) in eighteenth century England were also intended to regulate usage and reduce or solve the tragedy of the commons. Both Neeson (ibid.) and Casari (2007) see management of the commons as a long-term interaction between individuals of small, close-knit groups living in the same village, who succeeded to establish and enforce an efficient system of property rights.

likely, this had distributional consequences on rich villages as it could contribute to depleting the per capita amount of common resources. On the contrary, a patrilineal inheritance system could have discouraged outsider men from marrying insider women. Thus, inheritance systems of membership rights could play an important role in determining group size, because they shape the incentives for migrations and fertility. We focus on migration because it can modify group size more quickly than can changes in fertility rates.

At the outset, we will provide an overview of the management of the Trentino commons as well as an outline of their property rights structure. We then discuss the preference given to a patrilineal over a matrilineal inheritance system on the commons. Our central thesis will build upon an institutional analysis based on original documents, a theoretical analysis of the economic incentives in relation to alternative inheritance systems, and quantitative models supported by evidence from hundreds of villages.

PROPERTY RIGHTS IN TRENTINO FROM 1200 TO 1800

The Environmental and Historical Setting

Trentino is a mountainous region in Northern Italy with a few hundred small villages. Environment and climate are typical for the region of the Alps with steep slopes, rugged forests, harsh winters, and mild summers. The altitude across the region varies between 67m and 3,764m above the sea level. Land at lower altitudes, where the slope is gentle, was typically used as plow land, vineyards, and meadows; whereas, the land above 1,600m is characterized by long periods with snow and can only sustain pastures or forests. The land owned in common consisted of mostly forest, alps, and pastures at high altitudes, while individual land was mostly made up of cropland and meadows at low altitudes. Hence, the share of land owned in common varied by land type: it ranged from about 11.0 percent for plow land, vineyards, orchards, and vegetable gardens, to about 25.5 percent for the meadows at low altitudes, up to 72.5 percent for forests, grazing land, and alps.[2] Commons were very important for the peasants' survival. Forests were a precious source of firewood to warm up houses during the long and harsh winters, timber to build houses and craft furniture, and underbrush material for animal bedding. Logging was also a valuable activity, which was mostly performed by males. Hunting

[2] Estimates of land ownership are expressed in terms of surface by land type and are based on a sample of 32 villages from the 1780 cadastral register. See the Data Appendix for more details.

was also available on the common land, though rarely mentioned in documents. There were complementarities in production between individual and collective land. Consider, for instance, the activity of cattle grazing: the collective land was mostly at high altitude and, hence, best used during summertime, while the individual land was mostly at low altitude and, best used during wintertime. In particular, during summer, cattle grazed on the high mountain pastures and peasants mowed the hay on the lowest meadows. Summer grazing activity was often organized collectively through appointed herdsmen. As the summer season drew to an end, the cattle were moved onto the low pastures and, after harvest, onto the arable land. During winter, cattle were kept inside stalls and fed with the hay stored during summertime in barns. Both men and women engaged in hay mowing and, more generally, in farming. The commons were not open access resources, to wit, available for everyone to use. Instead, they were collective property of a well-defined group of individuals living in the same village or group of villages with legal entitlement to use the resources (Casari 2007).

The Prince-Bishops of Trento ruled over the region for almost eight centuries: from 1027 until 1796 (Figure 1). From the thirteenth century, peasants gradually started to codify a set of rules for the management of their resources into charters (*carte di regola*). Charters were official deeds enacted by the assembly vote of *pater familias* of a village or group of villages and engrossed by a notary in the presence of external witnesses. Subsequently, charters were confirmed by the Prince, who granted self-government on the commons and other local economic affairs, and certified that the charters were compatible with existing laws. Such documents regulated (i) the right to establish appropriation rules of the collective resources, (ii) the right to hold local assemblies and appoint a governor (*regolano*) and other officials, (iii) the right to locally enforce the appropriation rules by levying cash fines, and (iv) the protection of common resources from external encroachment. The statute of the capital town, Trento, had a special status because its regulations could apply to the whole region. More precisely, the statute of Trento applied in case an issue was missing from a village charter.

The charters mainly contained restrictions intended to preserve the commons from overuse or improper use by insiders and to limit access by outsiders. Charters typically sanctioned trespassing and limited access to the collective resources by insiders through regulations on harvest quotas, appropriation times, and zoning. An example of a regulation was the "wintering rule." A villager had to feed his cattle with grass from his own

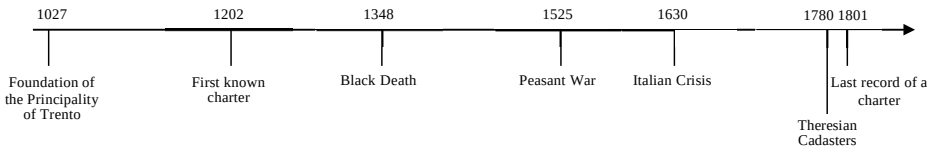

FIGURE 1
TIMELINE OF EVENTS IN TRENTINO

Source: Drawn by the authors.

meadows during the winter months, to be permitted to place the cattle on the common pastures in the summer.[3] The village of Civezzano was the first to write a charter in 1202. The charter system collapsed because of an exogenous political event at the beginning of the nineteenth century. Napoleon invaded the region in 1796, and the charter regime was definitively abolished in 1807.[4] The most ancient charters did not provide a systematic discipline for all aspects of village life or the management of common resources. Occasionally, rules were updated by the addition of new chapters annotated on the same document of an existing charter, or by enacting an entirely new charter. Over the six-century period, some villages adopted more than one charter. The charters appear as pragmatic instruments adopted by uneducated peasants revolving around actual litigation cases. The charters reflected specific responses to external challenges or contingent problems, which can be noticed in the sequence of isolated tweaks to the rules observed in some cases, often listed as additions to a pre-existing charter. Thus, the charters summarized in writing the way peasants resolved critical controversies that arose in the past. If an issue was not present in a charter, most likely it had not been a controversial matter.

Villages generally consisted of houses grouped together around the church and the main square. According to the 1810 census, the median village population was 394. The population dynamics in the region during the period under scrutiny are shown in Figure 2. Overall, the population in Centre-North Italy grew by 32 percent between 1300 and 1800

[3] For example, the charters of Vigolo Vattaro (1496), Comun Comunale (1544), and Mortaso (1558) explicitly mentioned this regulation.

[4] In 1802, the Paris Treaty abolished the Principality of Trento. The Austrian government in 1805 forbad the gatherings of village members in the assemblies, and in 1807, the Bavarian government, which had taken power in Trentino through the Peace of Pressburg (1805), abolished the *Carte di Regola* and subjected Trentino towns and villages to the central government (Rizzoli 1903).

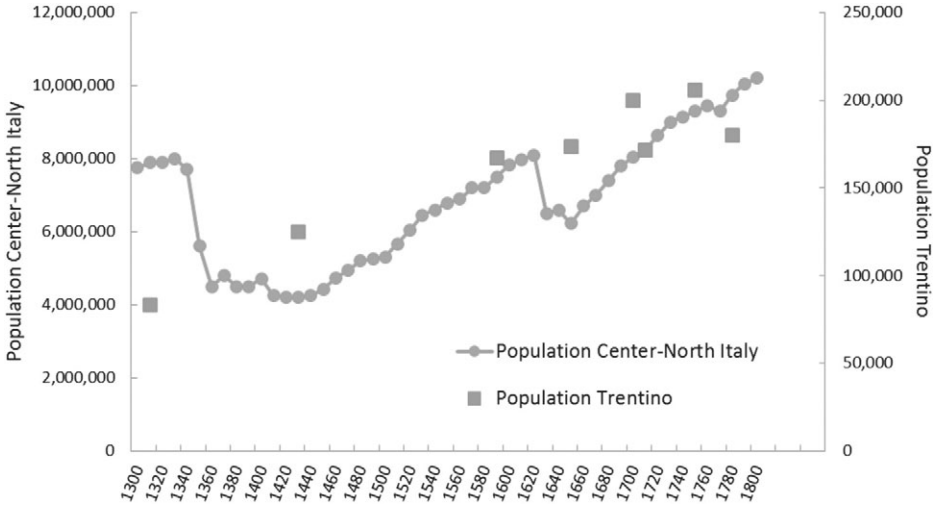

FIGURE 2
POPULATION ESTIMATES IN THE CENTRE-NORTH OF ITALY AND TRENTINO

Notes: The Centre-North of Italy includes Piedmont, Val d'Aosta, Nice, Monaco, Lombardy, Veneto, Trentino-Alto Adige, Friuli, Istria, Liguria, Emilia-Romagna, Tuscany, Umbria, and Marche. Fiebiger (1959) estimates that Trentino made up 34.7 percent of the entire Tyrol population in 1754. We applied this fraction to the estimates of Tyrol population in Wopfner (1954) for antecedent dates. The Trentino population estimates in Franceschini (2009) refer to the 1573–1615 and 1685–1723 time intervals, for which we considered the median years 1594 and 1704, respectively.
Source: Malanima (2002) for the Centre-North of Italy. Cole and Wolf (1974) for Trentino in years 1312, 1427, 1650, 1754. Further Trentino estimates: Debiasi (1953) in 1700; Franceschini (2009) in 1594, 1704; Chiocchetti and Chiusole (1965) in 1780.

(Malanima 2002); whereas, in Trentino, it grew by 131 percent between 1312 and 1754–1780.[5] More precisely, population estimates for Trentino are 83,373 units in 1312, 167,000 units in 1594, 206,000 in 1754, and 180,000 in 1780 (Chiocchetti and Chiusole 1965; Cole and Wolf 1974; Franceschini 2009). The population estimates for Trentino are scattered but are coherent with the patterns of population for Centre-North Italy. In particular, from the more systematic data of the entire Centre-North of Italy, one can identify some focal dates that marked a change in the direction of population growth, such as the Black Death of 1348 and the Italian crisis of 1630.

[5] According to Malanima (2002), the population in the Centre-North Italy in 1300 was 7,750,000; whereas, in 1800 it was 10,120,000. The 131 percent increase in Trentino population is based on the average between the estimates of 1754 and 1780.

Gender Discrimination in Property Rights

Rights to Access Collective Resources

This section provides a taxonomy about the possible ways to access the collective resources and to participate in the village life. The focus in this article will be on the membership right (*vicinia*), which defined the most complete belonging to a community. We refer to those with membership rights as members or insiders (*vicini*). The family was the unit of reference for membership rights and consisted of all relatives living under the same hearthstone (*fuoco*). The legal representative of the family was usually a male—the *pater familias*—who had the right to participate in and vote at assemblies. If husband and wife were both members, they were entitled to the same benefits and duties as if only one spouse was a member. If at least one living individual of the family was a member, then the benefits from the commons were extended to all members of the family. People without membership rights were outsiders, a category that also includes those with the simple right to reside in the village, or with some right to appropriate the commons (Casari and Lisciandra 2011).[6]

The *membership right* gave full access to all benefits and duties. The membership right was a personal right not related to the size and nature of private land. An insider enjoyed four categories of rights: (1) residence rights—the right to live in the village and thus have a stable domicile; (2) full appropriation rights—the right to access and exploit the common resources; (3) participation and voting rights in the assembly, in particular, rights to participate and speak at assemblies, to appoint officers, and to vote on decisions concerning management and alienation of collective resources, inheritance systems, acquisition of residence, appropriation, and membership rights; and finally, (4) inheritance rights, and more specifically, the right to transmit the membership to offspring according to regulations.

Sometimes, outsiders could live in the village with limited or no rights to access the commons. The most widespread entitlements were the appropriation right and the residence right. A holder of the *appropriation right* could enjoy the right for at most his lifetime but could not pass it on to descendants through inheritance. The appropriation right granted some or all of the following entitlements: grazing, mowing grass, cutting

[6] The aim of this study is neither to provide a legal classification of rights nor to map in detail all cases. On the contrary, we aim at analyzing the documents through a parsimonious taxonomy, which reflects economic property rights, that is, those rights that an individual can actually exploit, regardless of what the formal or legal definitions might be.

timber, collecting firewood and litter, hunting and fishing, and transforming forests or pastures into arable land. In addition, it also entailed the residence right. Conversely, the simple *residence right* did not *per se* entitle the right-holder to use the collective resources. To acquire the residence right, outsiders often had to formally introduce themselves to the village and give assurance about their integrity and economic welfare. Typically, residence rights were granted to artisans, shopkeepers, and servants. The resident population of a village could be larger, sometimes considerably so, than the group of people with membership rights.

How to Acquire the Membership Right

The membership right could be acquired in three ways: by purchase, by inheritance from a partner, or by inheritance from parents.

Purchase. A single member could not transfer or alienate his or her individual membership right. Only the assembly could sell a membership right. Generally, the assembly granted its formal consent to accept new members with a vote requiring a simple majority of the participants. Some charters required the unanimity. Generally, prospective members also had to fulfill a few requirements such as (i) having a good reputation, (ii) paying the village treasury a certain amount of money, and (iii) having held stable residence in the village for a certain period of time. The membership right gave equal rights and duties to newcomers as to pre-existing members. This provision was mainly mentioned in the charters but was sometimes documented in contracts of membership purchase.

Inheritance from partner. In the case of marriage between an insider and an outsider, the insider spouse kept his or her status through marriage and could sometimes pass it on to their children. As a consequence of the marriage, the outsider spouse could receive—depending on the charter rules—the membership right, the appropriation right, or no right at all. Whereas, in the case of marriage between two insiders, membership rights could not be cumulated since the unit of reference was the family. One spouse's membership right, typically the wife's, remained dormant while she was married and became active only with widowhood.

Inheritance from parents. The membership right became manifest when the heir left the parents to form a new family, or alternatively, at the rights-holder's death. We have identified four basic inheritance systems for collective resources from parents: egalitarian, soft-patrilineal, patrilineal, and Erbhof systems. These inheritance systems encompass all the systems encountered in the Trentino charters. *Egalitarian*: all sons and all daughters of insiders inherited the membership rights. *Soft-Patrilineal*:

all sons of insiders inherited membership rights whereas daughters did not, unless daughters had no brothers. In the latter case, one daughter or all daughters could inherit membership. If only one daughter inherited the membership, she was usually designated by the father or by the relatives; alternatively, the charters usually gave the rights to the first-born or the last-born. *Patrilineal*: all sons of insiders inherited the membership rights whereas daughters did not, even if they had no brothers. *Erbhof*: a variant of the primogeniture system in which only one child of an insider family inherited the membership rights (Rösch 1994). Ordinarily, the heir was a son chosen by the father's last will or, if lacking, by the closest relatives. If there was no son, or the son was not considered suitable and fit, one (and only one) daughter could inherit the membership (along with the private assets) conditionally to marrying a man, who could be an outsider.

INSTITUTIONAL EVIDENCE

The charters are the main source of information about property rights on the commons. Not all charters are available either in their original form or as a later copy. Some charters were lost or destroyed and we have only indirect evidence about their existence and date of promulgation from other sources.

For the purpose of this study, we define as formalized inheritance regulation the written description or modification of rules about the inheritance of the membership rights on the commons. This written evidence comes from charters or originates from other documents such as membership purchase contracts, which were endorsed by a notary; these contracts sometimes mentioned the customary inheritance rule currently in force. Some charters also described the inheritance system previously in force, which constitutes another piece of information that allows tracing the evolution of inheritance systems.

The diffusion of charters in Trentino is shown in Table 1. We divided the six centuries of interest (1202–1801) into four intervals of at least 100 years each. The end years of the intervals were the following: 1348, which marks the European-wide plague; 1525, which records the revolt that involved peasants in Germany and also in Trentino; 1630, which denotes the beginning of a period of declining population in Northern Italy and of crisis related to epidemic diseases; 1801, which was the last date for which a record of charter adoption or modification exists, shortly after Napoleon's invasion of Trentino.

The diffusion of the formalized inheritance regulations on the commons followed different patterns from the charter adoption. In 1525, villages

TABLE 1
CHARTERS SYSTEM IN TRENTINO

	Year			
	1348 Black Death	1525 Peasant War	1630 Italian Crisis	1801 Napoleon Invasion
Area in hectares with charters	159,771	414,351	506,167	542,482
Percent of the Trentino surface (625,143 hectares)	25.6	66.3	81.0	86.8
Number of villages with charters	54	210	268	301

Notes: The surfaces are in hectares and cover the villages with a charter in force during a specific year considering the extension of the villages according to the 1897 cadastral register. Both charters available and charters no longer available but with a known date are considered. The total number of villages considered in our dataset as belonging to Trentino was 366.
Source: Elaboration on our charters database and on the 1897 cadastral register.

that had a charter already covered about two-thirds of the region (Figure 3). Conversely, in the same year, only four villages covering about 2.5 percent of the region had formally introduced inheritance regulations over their commons. Formalized inheritance regulations became more widespread later in time, often when the village enacted its second or third charter. By 1801, more than four-fifths of Trentino, in terms of territory, had adopted a charter while villages with formalized inheritance rules covered only 25 percent of the region.

Three main findings about inheritance systems on the commons in Trentino emerge from the documental evidence in our possession. *First*, inheritance systems for the transmission of membership rights on the commons changed over time. *Second*, almost all changes eroded women's rights to inherit collective resources. *Third*, the majority of the charters did not formalize any inheritance regulation of membership rights on collective resources.

During the six centuries under scrutiny, the patterns of inheritance changed substantially (Table 2). We divided the regional area by type of inheritance system based on all available documental evidence. At any given point in time, three or four different inheritance systems in the region coexisted given that each charter could independently shape local institutions. The erosion of women's rights is visible from the shift from egalitarian to soft-patrilineal systems, between 1525 and 1630, and the shift toward a patrilineal system by 1801. A process of gradual convergence to a unique system can be observed, and in particular, a clear later dominance of the patrilineal system, which acted as an attractor. Initially, in 1348, the patrilineal system covered 24 percent of the encoded charters with a known

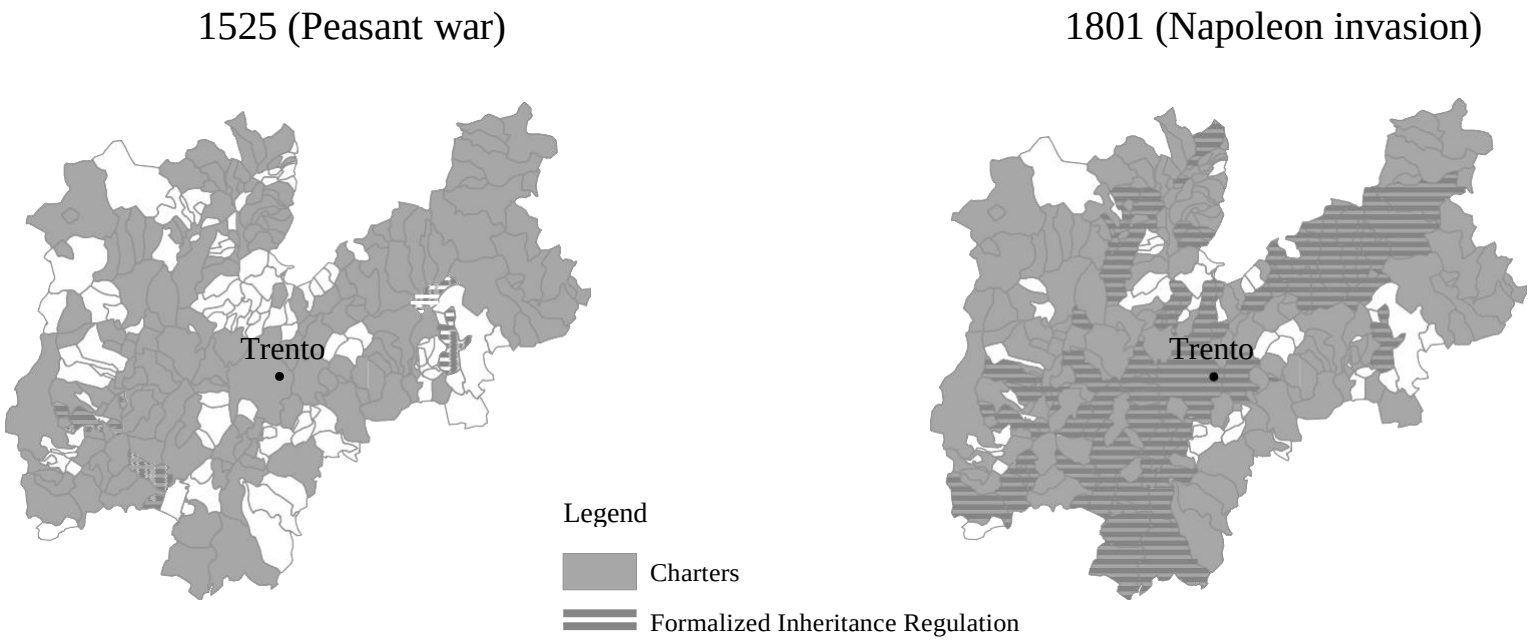

FIGURE 3
MAPPING CHARTERS AND FORMALIZED INHERITANCE REGULATIONS IN TRENTINO

Notes: Areas with solid gray identify the presence of a charter that we know existed, while areas with striped gray identify the presence of formalized inheritance regulations on the commons. As reported in Table 2, in 1525 the inheritance system is known for 27 villages; however, the above map shows only the four villages that actually formalized their inheritance system (striped gray). In the remaining villages, the information comes from later documents that formalized inheritance regulations. Areas in white had neither a charter nor inheritance regulations. A geographical unit in the map is colored when most of its surface satisfies the condition of having a charter and/or formalized inheritance regulations by 1525 and 1801. The figure maps the areas covered by the charters using the geographical units of the current cadastral registers for the Trentino.
Source: Drawn by the authors.

TABLE 2
INHERITANCE SYSTEMS ON THE TRENTINO COMMONS

Type of system (surface in hectares)	Year			
	1348 Black Death	1525 Peasant War	1630 Italian Crisis	1801 Napoleon Invasion
Egalitarian inheritance	43,845	43,845	0	0
Soft-patrilineal inheritance	6,420	6,420	54,305	2,449
Patrilineal inheritance	16,643	21,472	68,592	151,306
Erbhof inheritance	2,623	2,623	2,623	2,623
Area with inheritance rules (A)	69,531	74,360	125,520	156,378
(A) in percent of area with a charter in 1801	13.2	14.1	23.8	29.7
Number of villages with known inheritance rules	25	27	59	80

Notes: The surfaces are in hectares and cover the villages with a charter in force during a specific year considering the extension of the villages according to the 1897 cadastral register. Evidence for the inheritance system has been retrieved from all available sources. In 1801, the total area of villages in Trentino that had adopted a charter amounted to 527,281 hectares; we considered only charters whose text was available. Notice that this area differs from the 542,482 hectares reported in 1801 (Table 1), which also includes the villages with charters that are not available but whose existence is known and whose date can be traced.
Source: Elaboration on our charters dataset and on the 1897 cadastral register.

system, and by 1801, the percentage had risen to 97. Thus, the evolution of inheritance rules is essentially unidirectional, going from equal membership rights for men and women toward increasing gender discrimination.[7]

As an illustrative case, consider the 1583 reform of the inheritance system that took place in the Fiemme Valley. Their Governor explains to the Prince the motivation by stating:

> Up to now in our Fiemme Community we followed the rule that when outsiders married women who were members of our Community, they inherited membership rights and used the commons and the woods as much as any other member who was born in the Community. Lately, since many outsiders have been marrying women of the Fiemme Community with the sole purpose of acquiring membership rights […] our Community has consensually convened that from now on women members of our Community shall not have nor inherit membership rights should they marry outsiders.[8]

Hence, the inheritance system switched from egalitarian to soft-patrilineal. The village of Fondo, for its part, switched from a soft-patrilineal

[7] A similar pattern of erosion of women's general property rights on the commons was observed by Alfani (2011) in other parts of Northern Italy.

[8] Translated by the authors from Italian from the original manuscript, AST, lat. sect., C.12, f. 69 and 72. This provision was also reported in the 1613 charter of Fiemme, chapter 117 (Sartori-Montecroce 2002). The Fiemme Valley grouped together a cluster of villages.

to a patrilineal system in 1777 by restricting women's right to access the commons. Those women who in a soft-patrilineal system enjoyed the membership right lost it in favor of the appropriation right, hence losing the possibility to transmit access to the commons through inheritance:

> In the future, we do not want to obey the ancient custom with regard to community members who have no son but only one or more daughters; [*according to the new rule, the youngest daughter of an insider can use the commons*] only during her lifetime, and when she dies, the right to use the commons shall be extinguished; and her heirs shall be foreigners in the same way as if they had never been community members…[9]

After listing all documental instances of inheritance regulations, we trace the evolution of inheritance systems village by village over six centuries. Overall, 80 Trentino villages (out of 290 with accessible charters) mentioned inheritance rules in their charter or other related documents by the end of the period (see Table 2 and Data Appendix). A flowchart of the institutional changes between 1202 and 1801 is shown in Figure 4, providing a bird's-eye view of all recorded modifications to inheritance rules across villages. The initial explicit introduction of inheritance rules in the 80 villages appears as an arrow from left to right. Following changes in the *type* of inheritance system are represented as an up or down arrow connecting the four "system" boxes on the right side. Simple restatements and clarifications of membership rights that took place *within the same type* of inheritance system are indicated through curly arrows that originate and end within the same box. Figure 4 depicts a story of relentless weakening of women's inheritance rights on the commons. According to our data, in the late-Medieval period women enjoyed the highest levels of equality in property rights on the common property resources. From that period on, a steady process of convergence took place towards a patrilineal system, without backtracking. At the end of the period, 75 villages had a patrilineal system, three had a soft-patrilineal system, two had the Erbhof system, and none had an egalitarian system. By the time Napoleon invaded Trentino and forcefully removed the charter regime, the process of erosion of women's rights on the commons was already complete.[10]

[9] Translated by the authors from Italian from the original manuscript: Fondo 1777 (Inama 1931, p. 24).

[10] We identified only one exception to the general tendency to restrict the inheritance of membership rights for women with one of the villages comprising Comun Comunale, which was a cluster of villages. In 1544, Comun Comunale adopted a patrilineal system and kept it that way until the end of the charter regime. In 1786, the small village of Piazzo adopted its own integrative charter, in addition to the "supra-charter" of Comun Comunale, thereby introducing a soft-patrilineal system. Plausibly, Piazzo did not intend to apply this system on the commons of Comun Comunale, but only to Piazzo's commons.

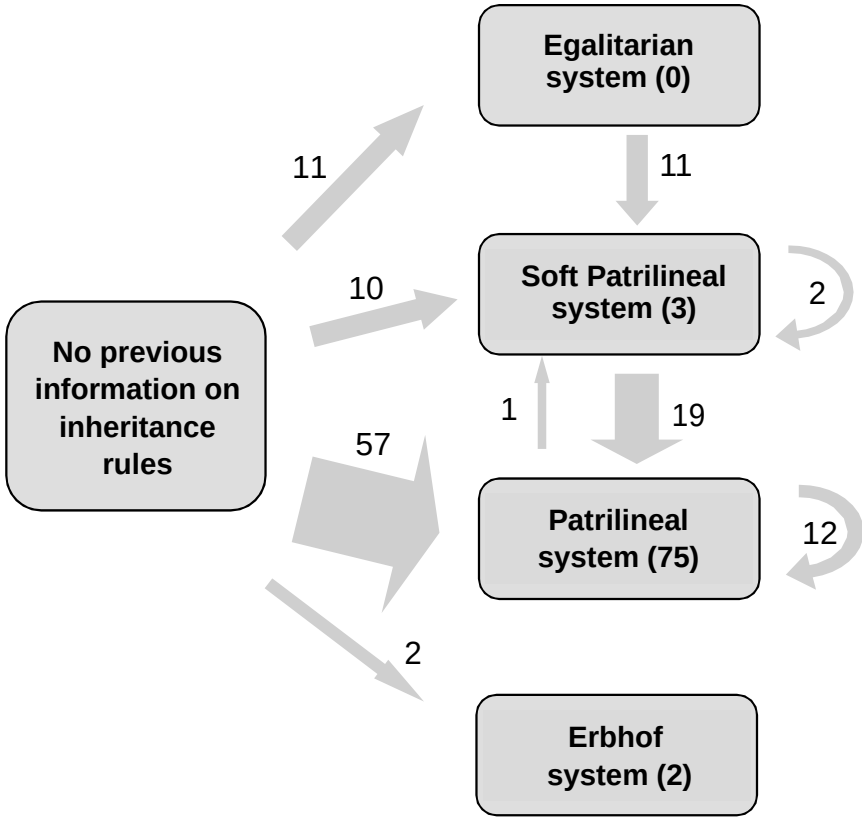

FIGURE 4
CHANGES IN INHERITANCE REGULATIONS OVER SIX CENTURIES

Notes: Period 1202–1801. One observation consists of one village according to the geographical unit employed in the 1897 cadastral register. Some villages changed only marginally their inheritance rules. These changes are illustrated by curly arrows that originate and end in the same box. One village restricted the soft-patrilineal system from all daughters to one daughter only (Cavedine 1764). Some villages belonging to clusters of villages restated the rules either of the patrilineal system (Cimone 1768; Isera 1656; Marano 1796; Villa Lagarina 1759) or the soft-patrilineal system (Castello di Fiemme 1605) in their village charter. Other villages restated their previous regulations (Nago-Torbole 1628; Costa Savina 1739, 1792; Vigalzano 1739, 1792; Vervò 1757). Two villages with patrilineal systems specified the rules in more detail (Pieve Tesino 1628; Aldeno 1662). Curly arrows also include modifications to appropriation rights (Mezzolombardo 1777; Aldeno 1753).
Source: Elaborations on the authors' database of charters and other documents.

A separate mention should be made of the Erbhof system, which remains as an isolated cluster in the flowchart. This system was prevalent in the nearby German speaking villages of South-Tyrol (outside the Trentino) and in the two villages of Stramentizzo and Trodena, which were on the linguistic border between the German and Romance speaking territories. These two villages did not modify their inheritance system,

and interestingly, no other Trentino village ever adopted the Erbhof system (Cole and Wolf 1974).

The third main finding is that more than 70 percent of the villages did not formalize their inheritance system on the commons. As shown in Table 2, the area without inheritance regulations decreased substantially between 1348 and 1801, but most charters still never mentioned inheritance rules. What was the system in place in these villages? The evidence about inheritance systems on the commons in the thirteenth century is scant. Nevertheless, based on four leads, we argue that in the late-Medieval Trentino the egalitarian system on the commons was likely to be widely followed though not formalized. The first lead comes from the 1425 statute of Trento. This statute applied to the whole Principality for those aspects that were not regulated in the local charters. The 1425 statute disciplined the inheritance of private assets but not that of collective properties. It stated that, in the absence of a dowry for the daughters, both sons and daughters inherited the private assets of the parents, though the daughters inherited a lower share. On this subject, the older statute of 1307 devoted little attention. Second, the institutional history of Fiemme, a large cluster of villages that has existed as an entity since 1111 (Sartori-Montecroce 2002), reports an explicit description of the egalitarian inheritance system applied to its commons, which was in place until 1583. In that year, inheritance regulations became soft-patrilineal. Third, the inheritance systems for private and collective properties in Fiemme were identical before 1583 (Sartori-Montecroce ibid., *Le consuetudini di Fiemme - Libro II del civil*, 1613 charter, Ch. 114, p. 278). Fourth, the oldest documental description of the egalitarian system is not a charter but a 1583 letter of the governor to the Prince-Bishop. This suggests that many other villages may have followed it as a custom, explaining why it was not explicitly written in the charters. Only 30 years later, the 1613 charter of Fiemme included the transcript of a portion of the letter of the governor.

To put this documental evidence into a broader context, it should be recalled that charters usually encoded only problematic aspects, especially those that had generated controversies in the past. The Fiemme Governor's letter offers a vivid illustration: when the frequency of marriages between local women and foreign men was low, or did not cause conflicts, little pressure was exerted to encode the inheritance rule into the charters. Another illustration of how charters encoded regulations comes from the explicit norms about the purchase of membership rights by outsiders. One would expect that those villages with immigration pressure would be more inclined to regulate both membership

purchase and membership inheritance. In fact, among the villages that mentioned membership purchase, about 68 percent also had inheritance regulations at some point. Whereas, among the villages with no mention of membership purchase, only 10 percent had inheritance regulations. One way to read this regularity is that field controversies were generating the formal regulations.

One can put together the non-systematic codification of inheritance systems on the commons, especially in the early period, with the pragmatic spirit of the charters. If all marriages were between insiders, it was practically irrelevant for a village to be under an egalitarian or patrilineal inheritance system. A marriage between an insider and an outsider had different consequences under the two inheritance systems only if the outsider was the husband and the new family wanted to live in the village of the wife. When there was no immigration pressure on the village, then the two systems were observationally equivalent. The charter would be changed only when the attempts to immigrate through marriage were frequent or controversial.

PATRILINEAL VS. MATRILINEAL INHERITANCE SYSTEMS

We argue that gender discrimination in inheritance regulations emerged as an attempt to limit the size of the village and to protect insiders' wealth. In Trentino, we observe a shift from an egalitarian toward a patrilineal system, but a similar protection of common property could be achieved through a shift toward a matrilineal system. In this sense, our economic arguments can be considered as gender-neutral. In the remainder of this Section, we illustrate a proximate and an ultimate cause for the adoption in Trentino of a patrilineal inheritance system instead of a matrilineal system.

The proximate cause was the institutional mechanism for decision-making within a village. The decision-making power rested with the village assembly. With few exceptions, the assembly participants were all men, who were the head of their families (*pater familias*). An exception in some villages was the presence of widows without sons or with underage sons. Moreover, in all observed villages, the officers were elected and were only men, regardless of the inheritance system in place. Offices included the *scàrio* (i.e., the assembly chair), the *regolàno* (i.e., the governor), the *massàro* (i.e., an administrative officer), and the *saltàro* (i.e., a guardian). Thus, active and passive voting rights were clearly leaning towards men, even in villages with egalitarian inheritance systems (see, for instance, 1533 Charter of Fiemme). Hence, men's personal interest would have been to vote for a patrilineal inheritance

system. A patrilineal system guaranteed a lifelong asset to widowers and single men, who otherwise had no access to the commons except by marrying a village member. It could also grant a larger set of marrying partners to choose from, especially spouses coming from external villages with a lower per-capita endowment of commons. In short, men possessed an institutional advantage that granted them the power to shape property rights on the common land.

The ultimate cause was in relation to the widespread bias against women in property rights in societies across the world, as evident from the low frequency of matrilineal inheritance. Summarizing the field work of numerous anthropologists, George Murdock's Ethnographic Atlas classifies societies along several dimensions, including inheritance systems. Among the sample of 186 well described clusters of societies—the Standard Cross-Cultural Sample—about 17 percent follow a matrilineal system (Murdock and White 1969). This classification considers a broad definition of matrilineal inheritance systems, which includes also systems in which assets are transmitted through the sister's son (*avunculate*). Murdock (1967) also considered a more detailed breakdown of 1267 societies presented in the Ethnographic Atlas and found that only four (0.3 percent) had a mother-to-daughter land inheritance rule. This database has no evidence about inheritance rules over land for more than half of societies (Gray 1998).

The presence of a patrilineal inheritance system in a given society systematically correlates with some social, technological, and ecological factors. The main factors identified in the anthropological literature are paternity certainty, men presence at home, the presence of animal husbandry, lack of horticulture, or presence of plough agriculture. Low levels of paternity uncertainty have been given as an explanation of the preference for patrilineal systems because families can invest in patrilineal heirs to whom relatedness is highly likely (e.g., Gaulin and Schlegel 1980; Flinn 1981; Hartung 1985). Another factor that favors patrilineal systems is the presence of men at home, which is generally due to the lack of external warfare or migrations (Ember and Ember 1971; Divale 1974; Jones 2011). The presence of animal husbandry or pastoralism appears to be positively correlated with patrilineal inheritance systems (Aberle 1961; Mace and Holden 2005). In particular, adopting cattle, or other large domestic livestock, leads in many societies to the loss of matriliny whereas stability is found with patriliny (Holden and Mace 2003). In terms of production technologies, Douglas R. White, Michael L. Burton, and Malcom M. Dow (1981) argue that women's productive activity is mainly focused in secondary processing activities such as crop

tending, while men are relatively more involved in the beginning stages of production sequences such as soil preparation and the acquisition of raw materials. In particular, patrilineal systems are strongly associated to the presence of plough agriculture (Aberle ibid.; Boserup 1970; Alesina, Giuliano, and Nunn 2013). On the contrary, matrilineal systems are associated with horticulture productions (Aberle ibid.; Keesing 1975).

According to these factors, one would predict a patrilineal choice of inheritance in Trentino. Paternity had a high degree of certainty because of monogamous marriages that were monitored by the Christian Church and because of the social sanctions on out-of-wedlock births. Men were rarely absent from home due to external warfare, which was infrequent. They could be absent for seasonal migrations to the Italian cities. The Ethnographic Atlas does not specify if inheritance is on private or common land but one must consider the specific technological factors at play. The commons were mostly pastures and forest: cattle grazing as well as cutting, processing, and transporting timber were important tasks. Men were favored over these tasks, especially those related to timber, which required significant body strength due to the heavy manual labor and the use of handheld tools. Over the private land, the peasants practiced to a limited extent horticulture, and to a larger extent plough agriculture.

INHERITANCE SYSTEM AS A PROTECTIVE MEASURE FOR THE COMMONS

Insiders shaped inheritance regulations on the commons to preserve their share of wealth, which shrank as a consequence of a population increase. In fact, inheritance regulations affected the population level of a village through at least two channels: one that altered migration patterns across villages and the other that modified incentives for internal population growth. In the dynamics of village size, migration was a short-run factor, while internal population growth was a long-run factor.

Migrations alone could increase or decrease the size of single villages. Consider a stable regional population where everyone gets married. If the spouses are from different villages they can decide to settle down in either the village of the husband or the wife. If private assets are mobile, the family will want to settle in the village that is “richer” in terms of collective resources. The young generation of a rich village could attract spouses from poorer villages. Consider a situation where every family has two children. Under an egalitarian inheritance system, if every member of the young generation marries an outsider, the number of families in a village may double. Hence, the per capita collective wealth in a rich village may halve within the period of one generation; whereas, the

poorer villages observe an increase.[11] Thus, the inequality in per capita collective wealth is expected to decline over time.

Conversely, a unilineal inheritance system, such as the patrilineal system that occurred in Trentino, can effectively prevent net immigration via marriage, which would maintain the same level of per capita collective wealth. This system does not forbid marriages with outsiders, but it ensures that the number of families in the next generation will remain the same. In particular, women who marry men who are outsiders will move to their husbands' villages since the new family has no access to the commons of the wife's village. Hence, under a patrilineal inheritance system on the commons, the village will maintain its size, the inequality in per capita collective wealth will persist, and some genetic mixing will still be possible (Casari and Lisciandra 2015).[12] In case both egalitarian and unilineal inheritance systems co-exist in the region, what matters is the type of system adopted by the villages that are better endowed in terms of per capita collective wealth. To avoid reductions in their share of collective resources, insiders of rich villages tend to adopt gender-biased inheritance systems. In contrast, the choice about inheritance rules of insiders of poor villages is irrelevant: migratory patterns would be unaffected by their type of inheritance system, whether or not it is formalized. This can explain why we observed many villages with no available information on their inheritance regulations (Table 2). A formal model of migratory pressure along these lines is presented in Casari and Lisciandra (2015).

The choice of inheritance system on the commons can make a difference also in terms of fertility rates, and consequently, on internal population growth. This phenomenon has been known at least since Hardin (1968). When the subsistence of a family lies exclusively on its own private resources, the family bears the full costs of having an additional child. But if the family relies also on the collective land, the incentives to have children are higher because of the externality of appropriating collective resources. A portion of the cost of the additional child falls on the village at large, whose resources are subject to the typical mechanism of the tragedy of the commons. In an egalitarian inheritance system, "everyone born has an equal right to the commons" and this would "lock the world into a tragic course of action" (Hardin 1968). One solution to the tragedy about population control is a change in the inheritance system.

[11] One must also consider that cross-village marriages may present some benefits from a collective point of view: small villages—like those in Trentino—run into severe risks of consanguinity if all marriages are between insiders, and cross-village marriages reduce this risk.

[12] The same outcome as the patrilineal system can be achieved through the Erbhof system, while it is easy to show that the outcome under a soft-patrilineal inheritance system is in-between that of an egalitarian and a patrilineal system.

The adoption of the Erbhof system on the commons fully removes the "tragedy" because additional children after the first one do not impose negative externalities on the commons. Compared to the egalitarian system, in the long-run, a patrilineal system provides a partial solution because it lessens individual incentives to have additional children since only about half of the children (the boys) can count on the commons. The patrilineal system attenuates, but does not solve, the tragedy about population control because for every additional child, some probability exists that the cost will be shifted to the village at large.

Migration mainly occurs because individuals from poor villages may want to move into a rich village. Therefore, a high inequality in per capita collective wealth across villages gives rise to this course. Unfortunately, we lack systematic data about migratory flows, size, and wealth at the village level over the six centuries, but we have been able to construct an inequality index for 32 villages using 1780 cadastral data and 1810 population census data.[13] The resulting Gini index in per capita *collective* wealth shows a high level of inequality across villages (0.61, N=32). The corresponding index in per capita *total* wealth denotes a lower level of inequality (0.27, N=32). The difference in the two indices could denote how commons were more unequally distributed than individual properties. This suggests that villages with a higher commons endowment may have acted to prevent the leveling-off in commons wealth among the villages in the region.

We conjecture that the persisting inequality across villages in the value of per capita collective wealth originated from the occurrence of a series of shocks on population and wealth in the form of fires, landslides, flooding, famines, and plagues. These shocks plausibly hit villages in an asymmetric fashion. As a consequence, perfect equality was unlikely even in a society that universally adopted an egalitarian system. We also conjecture that the frequency and magnitude of the asymmetric shocks dominated the speed of population adjustments.[14]

A regional population increase is another factor that induces migratory pressure. The population patterns, as depicted in Figure 2, could be the

[13] This sample from the 1780 register corresponds to 37 villages in the 1897 cadastral register (10 percent of all villages). See the Data Appendix for further information.

[14] After centuries under an egalitarian inheritance system, one would expect that both migrations and internal population growth should have brought about a situation of near equality. Direct support for this view requires evidence that we cannot provide on the inequality levels at the time when villages started to restrict women's inheritance rights. Nevertheless, as documented previously, restrictions occurred over time without a clear-cut switch. Furthermore, if migrations and internal population growth had indeed generated convergence in per capita collective wealth by, say, the end of the sixteenth century, one needs to explain what produced the inequality observed two centuries later. Consider that long-run convergence in per capita collective wealth should have occurred also after women's inheritance rights started to be restricted, assuming that fertility was positively related to per capita wealth.

triggers for the institutional changes that are observed in inheritance regulations. The frequency of inheritance regulations on the commons in the documents increases in periods of population growth. For instance, one can compare two adjacent periods, one with a population decline (1348–1430) and another with a population increase (1431–1600). The fraction of documents reporting inheritance regulations out of the encoded charters was 4.5 percent and 11.9 percent, respectively. What followed was a period of further population increase associated with an intense activity of inheritance regulations (1601–1630, 38.1 percent) and then a period of population decline associated with a less intense activity of inheritance regulations (1631–1650, 25.0 percent).[15]

Hence, we observe two factors triggering internal migrations: inequalities in the values of per capita collective wealth and regional population growth. In particular, wealth inequalities help to explain why some villages adopted inheritance regulations whereas others did not.

EMPIRICAL EVIDENCE

This section uses a regression analysis to test the hypothesis that inheritance regulations served as a protective measure to limit the overexploitation of the commons. One prediction is that villages rich in terms of common land and close to the main trading routes were more exposed to migratory flows and, consequently, were more likely to regulate inheritance. Another prediction is that population pressure led to greater regulations on the use of the commons.

The quantitative analysis will be carried out according to two models: a static model and a duration model. The static model studies why a village ever adopted an inheritance regulation before 1801 and, hence, presents the factors that influenced the decision at any point before this date. The duration model studies whether and when a village adopted an inheritance regulation. We perform a survival analysis aiming at explaining—during the entire period under scrutiny—which factors influenced the occurrence of the first formalization of inheritance systems. The unit of observation is the village and corresponds to a geographic entity in the 1897 cadastral register. The dataset considers the 289 villages that had adopted at least a charter by the year 1801 and for which we were able to encode the charter content.[16]

[15] For further details see Table 2 in Casari and Lisciandra (2014).

[16] The number of villages with at least one charter is 301 in total (see Table 1). For 11 villages, we know they had a charter, but we do not possess information on their content. For 290 villages, at least one charter was encoded. Trento, the capital town, was dropped from the original 290 village dataset because of its peculiar role as the seat of government.

Static Model

Proxies are built for the size of the village, its remoteness, and wealth. The proxy for village size is the village population taken from the 1810 census.[17] Proxies for village remoteness are the walking distance in km and the altitude difference from Trento, the regional capital, which has a central position in the region (Figure 3). The two proxies are weakly correlated (q=0.38).

Proxies for wealth include the per capita value of the collective land and the per capita value of all land. The total value of *all* the land in the village is the sum over the surface of each land type in the village multiplied by its per hectare value.[18] We employed the 1897 cadastral data to estimate the surfaces by land type of each village and the 1780 cadastral data to estimate the average per hectare value *in the region* by land type. The value of the collective land in a village required information about the shares of collective ownership by land type, which was taken from the 1780 cadastral registers. Finally, the per capita values of the collective land and of all land derive from dividing the total value of the collective land and of all land, respectively, by the 1810 village population.

An additional wealth variable provides the ratio between collective and individual land, which is computed for each village by dividing the value of collective land by the value of individual land. This ratio can capture the presence of production complementarities between collective and individual land. Each village needed both types of land for efficient agricultural production. This is also shown by the high correlation existing between collective land and individual land in terms of surface (q=0.97) and in terms of value (q=0.78).[19] Table 3 summarizes the statistics of all the variables mentioned above.

Since villages that adopted formal inheritance regulations could have different population dynamics, compared to villages that did not adopt any regulation, issues of endogeneity are likely to occur for the village size variable. In other words, the adoption of inheritance regulation

[17] The census data is in Andreatta and Pace (1981). As in Casari (2007), when break-downs at the village level are not available, we use the proportions from the 1897 data (Consiglio provinciale d'agricoltura pel Tirolo 1903) as shares.

[18] Notice that, by construction, the variable *total value of all the land in the village* does not capture the benefits of good land management at the village level because the per hectare value is not derived from village-specific estimates but from the average value in the region of each type of land.

[19] The variables *ratio between the value of collective and individual land* and *per capita value of collective land* are also correlated (q=0.79).

TABLE 3
SUMMARY STATISTICS

	Mean	Std. Dev.	Min	Max
Dependent variables				
Inheritance regulation (yes/no)	.277	.448	0	1
Inheritance or membership purchase regulation (yes/no)	.398	.490	0	1
Independent variables				
Village population in 1810 in thousands inhabitants	0.633	0.719	0.052	7.069
Walking distance to Trento in 100 km	0.49	0.29	0.03	1.29
Altitude difference from Trento in thousand meters	0.483	0.289	–0.121	1.385
Per capita value of collective land in carantani	2.47	1.96	.08	19.45
Per capita value of all land in carantani	7.42	3.56	.80	31.11
Ratio between the values of collective and individual land	.48	.27	.092	1.67

Notes: The number of observations (villages) is 289. "Inheritance or membership purchase regulation" is a dependent variable coded as 1 if a village either had inheritance regulation or gave outsiders the possibility to purchase membership or both, and as 0 if otherwise.
Source: Dataset constructed by the authors.

could have affected the population dynamics itself. As a consequence, the per capita variables concerning the value of collective and of all land could suffer from the same problem. For this reason, the model estimation employs an instrumental variable probit.[20] Given the small set of variables available, we use as instruments the total value of the collective land in the village and the total value of *all* land in the village, respectively, for their corresponding per capita variables. The correlation between the per capita value of collective land and its instrument is 0.50, and between the per capita value of all land and its instrument is 0.26. The correlations do not appear strong, especially the latter one. We then performed a test on the relevance of the instruments by considering the robustness of the F-statistics in the first-stage of the two-stage least-squares linear probability models. The coefficients for the value of collective land in the village and for the value of all land in the village are

[20] To obtain consistent estimates, we used the Stata command *ivprobit*, which fits probit models with continuous endogenous regressors, as in our case, and uses maximum likelihood estimation. Notice, however, that a Wald test is unable to detect whether the variables *per capita value of collective land* and *per capita value of all land* suffer from endogeneity (Table 4).

statistically significant at 5 percent and at 10 percent levels, respectively. We claim that the instruments are uncorrelated with the regression's error term because the value of collective land in the village and the value of all land in the village should have no direct impact on the attractiveness of the village to outsiders. This would occur only through the per-capita values. Therefore, the instruments meet the exclusion restriction because they should not affect the decision to adopt some protective regulations.

The static model shows four specifications (Table 4). Two specifications include the per capita value of common land as wealth proxy, while two specifications include the per capital value of all land. The two variables appear in separate specifications because they are highly correlated (q=0.90), and hence, can be used as alternatives. In all specifications, a Wald test confirms the presence of endogeneity in the structural equation, and consequently, the desirability of adopting the instrumental variable technique.[21] In particular, specification (1) uses two proxies of remoteness as regressors, and the per capita proxy for common land.

The per capita value of collective land positively influenced the introduction of formal inheritance rules. This supports the interpretation that villages more endowed in per capita collective wealth were induced to formalize inheritance regulations to protect their wealth. In addition, more remote villages, in terms of altitude had a lower probability to formalize inheritance rules. A village with a per capita value of collective land higher by one standard deviation than the average village has higher chances to introduce inheritance regulations on the commons by 13 percent (Table 4, column 1). The same probability increase of adopting inheritance regulations occurs in villages that are 248m more elevated or 45km more distant from the capital town than the average village. These results are consistent with the interpretation that geographically accessible villages formalized inheritance systems more often, compared to remote ones, because they were more subject to migration that threatened their commons. Furthermore, due to their less productive land, high mountain villages may have been less attractive to foreigners, and therefore, barriers against them may have been raised less frequently.

In specification (2), the per capita value of all land removes issues about incorrect estimates of ownership shares. The higher the per capita value of all land, the more likely it was that the village had inheritance

[21] A rejection of the null hypothesis of exogeneity means that the error terms in the structural equation and the reduced-form equation for the endogenous variable are correlated. Thus, instrumenting the endogenous variable was correct.

TABLE 4
REGULATIONS ABOUT INHERITANCE ON THE COMMONS BY 1801
(STATIC MODEL)

Dependent Variable: 1 = Regulation, 0 = Otherwise	Inheritance Regulation (1)	Inheritance Regulation (2)	Inheritance or Membership Purchase Regulation (3)	Inheritance or Membership Purchase Regulation (4)
Walking distance to Trento	–0.2882 (0.1755)*	–0.2448 (0.1689)	–0.5028 (0.2026)**	–0.3365 (0.1806)*
Altitude difference from Trento	–0.5204 (0.1161)***	–0.2999 (0.1224)**	–0.6327 (0.1230)***	–0.2836 (0.1269)**
Per capita value of collective land	0.0659 (0.0337)**		0.0806 (0.0374)**	
Per capita value of all land		0.0896 (0.0153)***		0.1005 (0.0101)***
Ratio between the values of collective and individual land		–0.6893 (0.1615)***		–0.7896 (0.1538)***
Wald test of exogeneity (Prob>32)	0.0125	0.0022	0.0044	0.0002
Log likelihood	–637.8	-821.4	–666.7	–847.9
Number of observations (villages)	289	289	289	289

* = Significant at the 10 percent level.
** = Significant at the 5 percent level.
*** = Significant at the 1 percent level.
Notes: Marginal effects of instrumental variable probits (*ivprobit* in Stata) using MLE and robust standard errors. To control for geographical fixed effects, 12 area dummies are included among regressors; they are not reported in the table. Trento, the capital town, has not been included. The coefficients are the average marginal effects. The figures in parenthesis are standard deviations.
Source: Database constructed by the authors.

regulations. Moreover, a higher ratio between the value of collective vs. individual land is associated with a lower frequency of inheritance regulations: villages relatively more endowed with collective, rather than individual land, did not feel threatened by newcomers.

As a robustness check, specifications (3) and (4) replicate the static model using an alternative dependent variable that incorporates the presence of regulations about membership rights purchase. Because of archival issues or destroyed documents, we may have missed documents that regulated inheritance. For this reason, we have also considered the villages that regulated membership purchase. The introduction of a regulation on

the purchase of membership rights points toward a pressure coming from people who wanted to move into the village. Regulation on membership purchase could be seen as another instrument to regulate migratory pressures. Depending on the village, accepting outsiders through membership purchase required the consent of a majority of insiders. This alternative variable takes value one if the village either regulated inheritance or gave outsiders the possibility to purchase membership or both, and zero if otherwise. The number of occurrences goes from 80 villages with inheritance regulation to 115 villages with either inheritance or membership purchase regulations. Both the inheritance and membership regulations were proxies for the village closure against migratory pressures. Specifications (3) and (4) confirm all results emerging from specifications (1) and (2).

Duration Model

A duration model can exploit both whether and when a village formalized its inheritance regulations. The timing of inheritance regulations varied considerably across villages (Figure 3). A discrete version of a duration model is used to obtain the estimates presented in Table 5. This estimation technique is widely used in medicine, where it is called survival analysis. It relies on an event or transition, which in our case is the time of adoption of written inheritance regulations on the commons in a given village. The dataset for the duration model is based on the same 289 villages as in the static model, with observations at five-year time intervals between the years 1200 and 1800. As long as no transition occurs, the dependent variable is set to zero; if the event occurs, the dependent variable is set to one, and the village is then deleted from all subsequent time intervals of the dataset. The duration model estimates the probability that the event occurs in the time interval between t and $t+5$, conditional on the village not having experienced the event at or before time t (*risk set*).[22] The equation used to estimate the duration model is the following probit equation:

$$8^{-1}[P(t)] = a(t) + b_1X_1 + b_2X_2(t) + u(t), \qquad (1)$$

where 0 is the standard normal cumulative distribution function, $P(t)$ is the hazard rate consisting of the ratio between the number of events that

[22] This approach is *not* a panel data analysis. Following a survival analysis, the dependent variable is constructed around the year of the change: each village enters the dataset with a different number of "observations." This model does not allow for the inclusion of village fixed effects.

TABLE 5
REGULATIONS ABOUT INHERITANCE ON THE COMMONS
(DURATION MODEL)

Dependent Variable: *Event*=1 If Adopted Regulation in the Time Period, =0 If Not Yet Adopted	Inheritance Regulation (1)	Inheritance Regulation (2)	Inheritance or Membership Purchase Regulation (3)	Inheritance or Membership Purchase Regulation (4)
Village population	0.1441 (0.0638)**	0.1653 (0.0642)**	0.1451 (0.0603)**	0.1695 (0.0605)***
Dummy—Regional population growth	0.3108 (0.1432)**	0.3052 (0.1432)**	0.3684 (0.1263)***	0.3648 (0.1264)***
Walking distance to Trento	–0.2448 (0.3083)	–0.1299 (0.3176)	–0.4107 (0.2961)	–0.3073 (0.3004)
Altitude difference from Trento	–0.5935 (0.2401)**	–0.5650 (0.2413)**	–0.6056 (0.2118)***	–0.5603 (0.2129)***
Per capita value of collective land	–0.0015 (0.0277)		–0.0103 (0.0248)	
Per capita value of all land		0.0207 (0.0155)		0.0190 (0.0131)
Ratio between the values of collective and individual land		–0.3487 (0.2500)		–0.3938 (0.2150)*
Fraction of nearby villages that already had inheritance regulations	0.7256 (0.2741)***	0.7348 (0.2757)***	0.7673 (0.2023)***	0.7808 (0.2032)***
Dummy—Italian crisis 1600–1650	0.4444 (0.1244)***	0.4430 (0.1247)***	0.4047 (0.1066)***	0.4063 (0.1067)***
Dummy—Council of Trento 1545–1565	0.7486 (0.1049)***	0.7497 (0.1051)***	0.6113 (0.0979)***	0.6121 (0.0981)***
Dummy—Peasant War 1525–1535	–0.1510 (0.3231)	–0.1377 (0.3190)	0.0468 (0.2077)	0.0506 (0.2073)
Constant	–3.1616 (0.2004)***	–3.2281 (0.2172)***	–2.8963 (0.1693)***	–2.9439 (0.1821)***
Pseudo-R2	0.1312	0.1335	0.0944	0.0969
Log likelihood	–485.0	–483.7	–683.8	–681.9
Number of observations	31,618	31,618	30,122	30,122

* = Significant at the 10 percent level.
** = Significant at the 5 percent level.
*** = Significant at the 1 percent level.
Notes: The duration model is based on a probit function (see main text). To control for geographical fixed effects, 12 area dummies are included among the regressors; they are not reported in the table. The Black Death dummy is omitted because it is a structural zero: during that period no village changed its inheritance system or membership purchase regulations. All villages are in the dataset at the starting date. Trento, the capital town, has not been included. The figures in parenthesis are standard deviations.
Source: Database constructed by the authors.

occurred in time t (i.e., formalization of inheritance regulation on the commons) and the number of "surviving" villages in time t (*risk set*);[23] $a(t)$ is the time trend; X_1 is the vector of time-invariant variables; X_2 is the vector of time-variant variables; $u(t)$ is the *i.i.d.* error term such that $E[u(t)]=0$ and $Var[u(t)]=o^2$.

The time-variant regressors $a(t)$ include dummies to control for important historical events in the area such as the Black Death (1350–1400), the Peasant War (1525–1535), the Council of Trento (1545–1565), and the Italian Crisis of the first-half of the seventeenth century (1600–1650). The time-invariant regressors are the walking distance from Trento, the difference in altitude with Trento, and the ratio between the value of collective and individual land as in the static model. In addition, five time-variant regressors are used. The village size estimate at time t is built by taking the 1810 village population and scaling it using the ratio between the Centre-North Italy population at time t and in the year 1800.[24] The per capita value of all land and the per capita value of the collective land are built by taking the corresponding static model variables and dividing them by the village population estimate at time t. The regional population growth is a binary variable that takes value zero when the population in the Centre-North of Italy decreased and one when it increased over the time intervals presented in Figure 2. Finally, the model includes a variable about contagion, which consists of the fraction of villages around the same reference center that have already adopted inheritance regulations at time t.[25] Notice that the population variable and the per capita variables are no longer endogenous as in the static model and are now included. This is the peculiarity of the duration models since, once the event (i.e., adoption of regulation) has occurred, the village is dropped from the dataset for the remaining time intervals.

The results from the duration model presented in Table 5 are in line with those of the static model. In specifications (1) and (2), the dependent variable is the adoption of inheritance regulations in a given

[23] Put differently, $P(t)$ is the probability that a village adopts a regulation of the inheritance system on the commons at time t.

[24] For the population of Centre-North Italy, see Malanima (2002). The data in Malanima does not cover the thirteenth century. The population data available for Italy in Bellettini (1987) have been used to rescale the village populations in 1300 backwards to 1200. The variable that proxies population that is called *village size estimate at time t* is built under the assumption of an identical population growth rate in all villages.

[25] The 17 reference centers are: Borgo, Canale S. Bovo, Canazei, Cavalese, Cles, Condino, Fondo, Levico, Malè, Mezzolombardo, Pergine, Pinè, Riva del Garda, Rovereto, Stenico, Tione, Trento.

five-year interval. The coefficients of remoteness and wealth proxies have the correct sign. While the coefficient of remoteness, in terms of altitude, is significant, the coefficients of wealth proxies are non-significant. We believe that the lack of significance of the coefficient of the wealth proxies could originate from the inaccuracies of the variables. We have neither cadastral data nor regular population census data for each time interval along the six centuries considered. During such long horizons, villages could have sold or purchased individualized collective properties, or changed their village boundaries through mergers and fissions.

Three additional findings come from the time-variant regressors in specifications (1) and (2), whose estimated coefficients are statistically significant. First, in those periods when the regional population growth was positive, villages were more likely to adopt inheritance regulations, which is consistent with our view of regional population growth as a trigger for institutional change. Second, inheritance regulations seem to spread by contagion. The more widespread the adoption of inheritance regulations in nearby villages, the more likely the village was to adopt a regulation. Contagion from neighbors may come as a cultural imitation or as a defensive measure. We favor the latter interpretation, because the contagion proxy is defined locally: restrictions in the inheritance systems of nearby villages seem to shift the migratory pressure onto other close villages. In response, those villages could then decide to formalize or restrict inheritance rules to fence off the increased migration, which they may not have done otherwise. In short, if an adjacent village adopted a patrilineal system, it restricted the set of available destinations for migrants, who would have sought residence in those nearby villages that remained egalitarian. Table 5 shows that this pressure seems to be a statistically significant force in making them change as well.[26] Third, larger villages, in terms of population, were more likely to adopt inheritance regulations. This finding builds on Casari (2007), who showed that the largest villages were more likely to adopt a charter, and to have more ancient charters. The existing correlation between group size and inheritance regulations is not the consequence of a selection bias, because villages that did not adopt a charter were excluded from the regressions.

[26] The contagion process for charter adoption was different from that for inheritance regulations. Casari (2007) found that a similar local contagion variable did not explain the adoption of charters but a regional contagion variable did. Contagion regressors may create econometric issues which we do not consider in this article. We thank the co-editor for pointing this out.

For the duration model, we have also performed a robustness check using an alternative dependent variable. Specifications (3) and (4) in Table 5 explain the adoption of inheritance or membership purchase regulations, or both. This robustness check confirms and reinforces all the results emerging from specifications (1) and (2).

CONCLUSIONS

Between the late medieval period (thirteenth century) and the modern period (nineteenth century), women in the Italian Alps gradually lost their property rights on collective land. This finding comes from a systematic study of inheritance systems on the commons in approximately 300 villages. Economic forces drove institutional change. In particular, the erosion in women's rights emerged as a protective measure to preserve the per capita endowment of collective properties. Egalitarian inheritance systems on the commons were evolutionarily unstable because they allowed immigration from outside through marriage, which threatened the common resources. Members of richer villages could preserve their share of commons by introducing a gender-biased inheritance system. The patrilineal system contributed to keep the village size stable by limiting net migration through marriage. This interpretation is supported by three key elements: the narrative in the original documents of Trentino, the theoretical analysis of the economic incentives of inheritance systems, and the quantitative analysis based on hundreds of villages.

A matrilineal system would have served the same purpose as a patrilineal one. Under this alternative path, men—and not women—would have lost their property rights. There were specific factors that led the Trentino villages to prefer a patrilineal over a matrilineal inheritance system. We identified a proximate cause in the institutional mechanisms for decision-making, and an ultimate cause in social, technological, and ecological factors, such as low paternity uncertainty, the steady presence of men at home, the importance of animal husbandry and plough agriculture.

At the regional level, this institutional change was spread by contagion. Left alone under decentralized decision-making, villagers engaged in a progressive closure towards outsiders. The process was characterized by path-dependency: the earlier decisions of some villages to change the inheritance system in favor of men effectively set the direction for subsequent adjustments in other villages, which moved the whole region toward a patrilineal system.

Gender Discrimination in Property Rights

The inheritance system on *common resources* turned out to be a cornerstone of the social and economic structure of Trentino because of its effect on migration patterns, economic inequalities, population growth, and gender discrimination.

Data Appendix

CHARTERS DATASET

The *Carte di Regola* dataset has 878 entries. An entry could be either a charter (n.480), a charter's change as additional chapters to the original charter after its official promulgation (n.339), or any other relevant document (n.59). Entry dates range from 1202 to 1801, while the dates of charters range from 1202 to 1796. For some entries, the dataset records only the date and the village of reference, while for others, it directly codes the content of the document, or it indirectly codes the content by relying on the comments of those who read the document. The entries based on the encoded contents of documents are 680; whereas, the entries based on the simple existence of documents are 198.

To construct the dataset about the charters and the inheritance systems, we mapped the information onto the 366 geographical units existing in the 1897 cadastral register. The cadastral register covers a wider area than the present-day province of Trento. The 366 units considered also include three villages that are only partially in the province of Trento and exclude 12 units that are fully outside the present-day province (a total of 378 units are in the 1897 cadastral register).

In 1801, the situation was as follows: Out of the 366 villages, the charter system covered 301 villages. Among them, 290 had at least one charter that was directly or indirectly encoded while another 11 villages had charters, but we have no information about their content.

The charters dataset includes published and unpublished sources.

Published Sources

Rizzoli (1901), Fontana (1907), and Nequirito (1988) provide the main lists of references of published charters. Giacomoni (1991) is the most important source for published charters, with 183 documents. Another 108 charters have been published by various authors (reference list available upon request), among them the following *laurea thesis*: Chiocchetti (1983), Epiboli (1977), Framba (1978), Motta (1978), Pederiva (1985), Piva (1981), and Sartori (1979). These sources account for 291 of the 480 charters entered in the database. The remaining 189 entries come from unpublished sources.

Unpublished Sources

A useful guide to the Trentino archives is Casetti (1961). The regional government allows public online access to the electronic scanning of original parchments, so that the text of 15 charters can be retrieved from http://www.trentinocultura.net/catalogo/

cat_fondi_arch/pergamene/cat_pergamene_h.asp. For another 14 charters, we know of their existence but not their exact date. The remaining 160 charter entries contain the village or cluster of villages of reference and the date, but nothing more, because the text is unavailable or has been lost.

The charter dataset also includes other unpublished documents with information on inheritance systems: 18 contracts of membership right purchase (*vicinia*) by outsiders, from a pdf file version of parchments, which are available online at http://www.trentinocultura.net/catalogo/cat_fondi_arch/pergamene/cat_pergamene_h.asp, and whose content has been coded; two letters from the local governor to the Prince of Trento, dated 1583 and 1584, concerning the reformation of inheritance system in Val di Fiemme, AST, lat. sect., C.12, f. 69 and 72.

CADASTRAL REGISTERS

1780 Cadastral Register, unpublished. Data have been collected only for a subset of the villages. More precisely, the data refer to 32 geographical units, which correspond to 37 villages in our dataset. In terms of population, they comprise about 7.9 percent of the regional population (1810 census). The geographical units are Bleggio, Bollentina, Caldes, Carciato, Castello, Castelnuovo, Cavizzana, Celledizzo, Cellentino, Cogolo, Comasine, Commezzadura, Croviana, Dimaro, Levico, Magras, Malé, Menas, Mezzana, Monclassico, Montes, Ortisé, Ossana, Peio, Pellizzano, Predazzo, Presson, Rabbi, Samoclevo, Termenago, Terzolas, and Vermiglio. Data were collected by Goio (1978) for the village of Levico, by Varesco (1981) for the village of Predazzo, and directly from the manuscript volumes of the *Catasti Teresiani*, which can be found in the APTN (Archivio Provinciale di Trento). Specifically, they were taken from the "*estratti tabellari*" of the Catasti (2/1, 13/1-4, 34/1-2, 89/2, 90/1, 91/1, 92/1, 93/1, 94/1, 95/1, 96/1, 97/1, 98/1, 99/1, 100/1, 101/1, 102/2, 103/1, 105/1, and 162/1). Most likely, this sample over-represents some areas (e.g., Val di Sole). For each village, we have the total surface of common land, the total surface of private land, and the surface breakdown by land use and quality; moreover, we have the data about land income (i.e., rent subject to taxation). When not available, land rents were estimated by attributing the rents for land of similar type and quality that could be found inside and outside the village. In these villages, 58.5 percent of the surface was common property, which represented 24.5 percent of the total in terms of rent.

1897 Cadastral Register, published. Land registers data as reported in Consiglio provinciale d'agricoltura pel Tirolo (1903–1904). The 1897 register comes from a new land survey carried out in the mid-nineteenth century with different criteria from those guiding the 1780 Theresian Cadastral Registers (*Catasti Teresiani*) and with the addition of maps (*Mappe Napoleoniche*). The 1897 land register included 378 geographical units; however, 12 units have been excluded because they were fully outside the present-day region. The remaining 366 villages had a total area of 6,251.43 km^2, which is 0.6 percent larger than the current area of the province of Trento. The dataset divides the surface into different uses, such as plow land, meadow, fruit garden, vineyard, grazing land, alp, forest, lake and pond, wasteland and houses, and total surface in hectares. Nonetheless, this source does not report rents or distinguishes between common and individual land.

POPULATION DATA

1810 Census. It is reported in Andreatta and Pace (1981). The census divides Trentino into 365 geographical units with a total population of 226,253 inhabitants.

1897 Census. It is reported in Consiglio provinciale d'agricoltura pel Tirolo (1903–1904). The 366 geographical units that were considered had a total population in 1897 of 356,423 inhabitants. With respect to the 1810 census, the 1897 census included the village of Piazzo, which in 1810, was originally merged with another geographical unit.

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Archives

APTN (Archivio Provinciale di Trento).

AST (Archivio di Stato di Trento - Trento Archive), lat. sect., C.12, f. 69 and 72.