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Numeracy or Enumeration?

The Uses of Numbers by States and Societies

Quantification is often taken to be a hallmark of modern society and science. This is perhaps nowhere more obvious than in social science disciplines, marked by often heated debates about whether quantitative methods illuminate or obscure social reality. Quantification itself depends upon numeracy, that is, the ability to count, keep records of these counts, and make rational calculations. Thus, numeracy, like its more frequently studied counterpart, literacy, is central to modern life, both inside and outside of academia.

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Examining numeracy is a daunting task. With respect to literacy, numeracy is not only understudied, it is also more difficult to measure. Unlike literacy, for which signatures, though a poor measure, provide some baseline, there is no good measure of the level of numeracy (Thomas 1987: 104–5). Numeracy is much more a matter of degree than is literacy, because oral language always includes some basic quantitative comparisons and information (*ibid.*: 105; Menninger 1969: 7–8). As Patricia Cline Cohen (1982: 6–12) wisely pointed out, it is actually impossible—ironically enough—to measure numeracy quantitatively. In addition, insisting on a quantitative definition of numeracy creates insurmountable threshold problems in drawing the line between the numerate and the nonnumerate. Despite these definitional difficulties, the rise of numeracy can be considered to be a social process with two components. The first, its spread, is the way in which more people become numerate at any given level, and thus more people are able to perform any given numerical task. The second, its development, is the way in which individuals become numerate at higher levels and are thus able to engage in more complicated numerical calculations and representations.

The study of numeracy comprises a small but growing component of the social science literature. One important strand of this research points to the relation between government bureaucracies and the rise of numeracy (Appadurai 1996: 116–17; Desrosières 1998: 324–27; Espeland and Stevens 1998: 338; Goody 1986: 63–64; Hacking 1982: 279–82, 1990: 3; Porter 1995: 22–48; Szreter 1986: 522–24; Woolf 1984: 88–90, 167–69). Numeracy can be thought of as an outcome of the interaction between states and societies over time: as one side becomes more numerate, the other reciprocates. A higher level of knowledge by one party necessitates a higher level by the other. For example, tax assessments and population statistics required the existence of numerical categories and the ability to record quantities within them. Once the official information is available, individuals make use of it in everyday life, thus spurring the need for more thorough information gathering.

Sometimes, the growth of numeracy occurs in a “top-down” manner.¹ It may spread as government officials collect information that forces individuals to categorize and to think quantitatively. Sometimes the collection of this information requires individuals to keep more detailed records and thus contributes to the development of their numeracy.

Below, however, I present a “view from below.” In particular, I argue that states, instead of contributing to the development of individuals’ numeracy,

may simply respond to the rise of numeracy in the population and thus collect more detailed records in reaction to this spread and development of numeracy. A top-down explanation, though not incorrect, may be incomplete or over-emphasize the power of states to extract information and shape thought.² Furthermore, I do not contradict all of the “top-down” literature. To a large extent, either a top-down or a bottom-up perspective can be used to view the rise of numeracy as an interactive social process that is driven by the interplay of states and societies. The bottom-up view is also largely in agreement with those authors who argue that a low level of numeracy may be widespread even without state intervention (e.g., Porter 1995: 22–23). However, in contrast to a top-down view of the rise of numeracy, I highlight society’s—as opposed to the state’s—role in driving this interactive process by pointing to the existence and uses of numeracy in everyday life and by explicitly examining the directionality of this process. I argue that society, not the state, drives this interactive process of the rise of numeracy, perhaps starting from a low, widespread level. In making this argument, I concur with Harvey Graff (1987: 12–13) and Stephen Kowalewski and Jacqueline Saindon (1992: 111–12, 135–36) that there is no universal route to literacy, and I extend this argument to numeracy.³

Using the example of rural Tuscany in the late medieval and early modern period, I argue that the rise of numeracy was an interactive process between state and society. As already indicated, instead of presenting a “top-down” view, that the spread and development of numeracy was driven by the government’s collection of official statistics, I present a “bottom-up” view. The state may have taken advantage of preexisting levels of numeracy, thereby capitalizing on the rise of numeracy in the general population. Indeed, as I show below, rural Tuscans used numeracy for a variety of their own purposes. Shopkeepers kept records of their customers’ debts; tenants and landlords kept records of rents; husbands, wives, and fathers kept records of dowries; parents and offspring recorded the transfer of property in testaments and donations; religious institutions and the faithful kept records of gifts. Numeracy made all of these transactions possible. As Bruce Carruthers and Wendy Nelson Espeland (1991: 42–43) pointed out, record keeping is extremely useful for ensuring honest transactions, especially when several parties are involved. Also, of particular importance for the spread and development of numeracy in this case was the existence of what Karl Polanyi (1957 [1944]) called local markets because they required some numerical knowledge of assets and prices.

To gain insight into the directionality of the interaction between states and societies in the rise of numeracy, I intersect it in the first part of the fifteenth century, making use of several sets of fiscal and legal documents, as I explain in more detail below.

In addition to directly addressing the argument about the role of states in spreading numeracy, I place the evidence from Tuscany in the context of other explanations about the causes of the rise of numeracy, including formal education and market capitalism. Thus, this article surveys some of the uses of numeracy in rural Tuscany and addresses their implications for these explanations.

Explanations of Numeracy

Three common explanations for the rise of numeracy are formal education, government bureaucracies, and market capitalism. Cohen's pathbreaking book (1982: 205–26) on the rise of numeracy in England and the United States emphasizes the role of mass education, especially at the primary level, in creating a numerate populace that easily accepted official statistics and quantitative arguments and explanations. Capitalism (or the market economy) also is cited as another important factor in the rise of numeracy (*ibid.*: 41, 210; Starr 1987: 20–23). This argument suggests that capitalist practices require minimal skills of record keeping and calculation (Weber 1978: 90–100). Such demands encourage individuals to become numerate or to develop their skills, especially if they hope to be economically mobile or successful. Another common explanation of numeracy is that it spreads and develops as a result of states' efforts to collect official records, statistics, taxes, or censuses of its population. As a result, individuals must learn not only to keep account of the amounts of various items, but also to adopt and to think in terms of the quantitative categories presented by state officials (Espeland and Stevens 1998: 338; Hacking 1990: 3; Woolf 1984: 88–90, 167–69).

Alain Desrosières (1998) offered a fascinating account of the differences in the institutionalization of statistical reasoning in France, Germany, Great Britain, and the United States. Despite these differences, however, Desrosières (1998: 324–27) adopted an essentially top-down view of this process in all four cases by arguing that the interplay between academic science (or formal education) and the state bureaucracy shapes the adoption of a public discourse of statistical reason. The widespread use of statistics is made possible

only because of the existence of a “space of common mental representations borne by a common language, marked mainly by the state and the law” (*ibid.*: 324). Although Cohen (1982: 150–204) emphasized the role of education as the prime mover of the rise of numeracy, she also examined how the collection of statistics by states (and also by other public and private agencies) contributed to the rise of numeracy. Similarly, Theodore Porter (1995) focused on the rise of quantification among professionals and academics.

The influence of the state in the rise of numeracy is apparent also in discussions of the effects of census taking by colonial administrations and, more generally, in arguments about the way in which Western forms of statistical reasoning and knowledge altered preexisting epistemological systems (Asad 1994: 78–79; Spyer 1996: 191–92). Bernard Cohn (1987) argued that British censuses of India, far from being passive exercises in collecting data, created new political, cultural, and religious tensions over the classification of the population. As Arjun Appadurai (1996: 114–35) also recognized, although census taking was undoubtedly linked to colonial rule and domination, these bureaucratic practices often sparked communitarian and nationalist identities that eventually undermined colonial rule. Numeric information collected by the state was put to all sorts of local uses that were not necessarily linked to colonial rule (*ibid.*: 116–17). Thus, Appadurai brought in more of a bottom-up perspective, with his emphasis on nonelites and his important reminders that the effects of censuses can be diverse and contradictory. Though Appadurai recognized the role of the governed in reorienting the use of official statistics once they had been collected, he nonetheless viewed the process of the rise of numeracy as essentially top-down. He argued that native functionaries were instilled with numerical habits as they became involved in the process of colonial administration and that these habits evolved into complex sets of roles and practices (*ibid.*: 124). Thus, although this literature points to the complex interaction between states and societies in the rise of numeracy, it emphasizes a top-down view.

Toward a New View of Numeracy

This literature clearly illustrates that numeracy can spread through top-down processes initiated by the state, but it generally ignores nonelite instances and uses of numeracy, focusing instead on the receptive role of this segment of society. To develop an alternative, bottom-up argument, I draw inspiration

from two, quite distinct, theoretical sources, the literature on the development of states and ethnomethodology. In particular, I will argue that numeracy may spread and develop when “local markets,” to use Polanyi’s term (1957 [1944]), exist. In these settings, there are local markets for land, labor, and commodities in economies primarily integrated by generalized reciprocity or householding, not market exchange. While these local markets are not fully capitalist, and thus price and profit may not be motivating individuals’ behavior, in both local and capitalist markets, individuals use quantitative attributes to record transactions.⁴ In the context of local markets—to borrow the ethnomethodological term—numeracy may be part of “members’ methods,” part of their everyday practices that help to order the world. In these settings, states may simply take advantage of the preexisting levels of numeracy when collecting official statistics, rather than giving rise to numeracy in the wake of their information-collecting activities.

The first literature that I draw on discusses the relationships between states, economic development, and taxation. Neo-institutional economists, such as Douglass North and Robert Paul Thomas (North and Thomas 1973; North 1981), assume that forms of taxation shape economic development. They argue that efficient forms of taxation—and in particular, forms of taxation that ensure that individuals will profit from activities that increase productivity—lead to economic growth. When states excessively tax their populations or adopt inefficient forms of taxation, economic growth suffers. Thus, states should implement rational forms of taxation, based on assets or income, not tax farming or decree. Such rational forms of taxation spur the economy by providing incentives for businesses.

Other scholars of state-making, however, such as Gabriel Ardant (1975) and Charles Tilly (1992), made the astute observation that the reverse argument is more plausible: states must take advantage of existing forms of economic organization when implementing methods of taxation. Governments use taxes on income or assets when there is a market economy, thereby making this form of taxation not only efficient, but also feasible. It would be incredibly inefficient, not to mention impossible, to base taxation on assets where methods to evaluate the value of such assets do not exist (Ardant 1975: 176–92; Tilly 1992: 87–91; M. Levi 1988: 180–81 presented a similar argument from a different theoretical perspective). Thus, rather than the form of taxation spurring economic growth, it is more likely that the form of taxation reflects

the type of economy and the level of economic development. Thus, the work of Ardant and Tilly suggests that states must take advantage of preexisting economic conditions when assessing taxes.

I draw on this insight from the state-making literature, that centralized bureaucracies must take advantage of, not create from anew, the resources necessary for their administration, and extend this argument to numeracy. It is implausible that states could command individuals to keep records of their income or assets if the basic information or knowledge to do so was missing. The skills needed to keep accounts could not be developed immediately in response to bureaucratic demands. Of course, there must have been some interaction between numeracy and the information-collecting activities of states. Record keeping, by both residents and states, must have had a self-reinforcing effect that increased accuracy: as one party kept accounts more accurately, the other was obliged to reciprocate. Nevertheless, in collecting census data or assessing taxes, central authorities must have been forced to rely on the preexisting level of numeracy to a large extent. Roberta Iversen, Frank Furstenberg, and Alisa Belzer (1999: 123), for example, argued that the collection of accurate census data in the United States depends upon the widespread existence of literacy. Thus, applying the sociological argument of Tilly and Ardant to general arguments discussed above about the role of centralized bureaucracies, I argue that previous explanations may have overemphasized the effect of states' information-collecting activities on the rise of numeracy. Instead, governments may have simply taken advantage of preexisting levels of numeracy when collecting information instead of spreading and developing numeracy as a consequence of their demands for information.

I also draw theoretical insight from a quite different perspective, ethnomethodology, to show how numeracy can be a part of everyday life. Ethnomethodologists focus on commonsense, indigenous practices for accomplishing the activities of everyday life. Thus, the ethnomethodological literature draws attention to, as the term coined by Harold Garfinkel (1974: 16–17) suggests, “folk” or “commonsense methods” or the rules and techniques that are used in everyday life to order the world, experience, interactions, and knowledge. As work in this genre clearly illustrates, one of these methods is counting, or more broadly stated, numeracy. For example, David Sudnow's (1967) classic work showed how hospital staff counted the number of different types of medical events and how those counts were central to the interactions in

this institutional setting. Similarly, Harvey Sacks (1988–89) analyzed what he called “the measurement systems of members,” that is, the particular ways in which individuals use times, dates, and quantitative comparisons in concrete groups or settings. As he pointed out, such measurement systems are context specific and are not necessarily derivative of some “scientifically correct system.” The ethnomethodological literature draws attention to unofficial or everyday uses of numeracy in another way as well, by providing a critique of the demographic literature on censuses and the registration of vital statistics. Aaron Cicourel’s (1974: 9–10) study of Argentine fertility points out how aggregate demographic information misses how members of a particular population receive, store, ignore, or misunderstand information and how they create accounts to represent their everyday experiences.

The literature from cross-cultural and cognitive studies in psychology and anthropology makes a complementary point by drawing attention to indigenous numeracy or everyday mathematics. Studies show that skills of numeracy are widespread among ordinary people engaged in everyday activities, including those without formal education (Gay and Cole 1967; Lave 1988; Nunes et al. 1993; Rogoff and Lave 1984). Geoffrey Saxe’s (1985, 1988) studies of indigenous mathematics show that children develop novel strategies, based on their practices in everyday life (such as participation in agriculture or the informal economy), when faced with new numerical problems. In fact, their basic cognitive skills and everyday practices often provide the basis for generating new solutions to numerical problems in school, formal, or informal contexts, rather than the reverse. Thus, numeracy and the use of quantitative categories are part of everyday life. Ordinary individuals display considerable skill at generating problem-solving skills independently of formal education or formal representational systems.

To preclude any misunderstanding, I emphasize that this article is neither ethnographic nor ethnomethodological in the classic sense of the literature discussed above. Historical ethnography (Comaroff and Comaroff 1992) is, by both necessity and design, different from classic observational techniques, because historical work requires different sources. I am, however, making use of two insights from the ethnomethodological tradition. First, the everyday use of information may be quite different from official or scientific uses of information. Members, to borrow the ethnomethodological term, have their own methods of classifying and processing information. Second, counting,

quantification, and most broadly, numeracy may be one aspect of members' methods, even though the form of this activity may take quite a different shape from that of official numeracy. In this light, numeracy, instead of being an exotic system of imposed domination, may, in some contexts, be an ordinary part of everyday life. Finally, I combine these two points with the insight from the literature on state building, that tax collection efforts, rather than contributing to the rise of numeracy, may take advantage of the everyday uses of numeracy that already exist. Thus, I am combining macro-historical research on state-making with insights from ethnomethodology in a way that is quite distinct from either of these separate traditions.⁵ I do so, however, because it provides a useful theoretical motivation for the argument that numeracy develops out of an interactive social process between states and societies. The state-making literature shows how states follow, rather than lead, society in this interactive process; while the ethnomethodological literature (and complementary cognitive and cross-cultural studies) shows that this interactive process could originate from the widespread numeracy that stems from everyday practices and cognition.

Methods and Evidence

The presentation of empirical material below consists of three types of evidence from fifteenth-century rural Tuscany. First, I review the existing historical evidence to provide a broad overview of rural numeracy. In addition to providing the historical context, this overview offers some evidence about the extent of formal education. Second, I present examples of the different uses of numeracy by rural residents. This evidence illuminates the everyday uses of numeracy in economies characterized by local—as opposed to capitalist—markets, drawing on the insights from the ethnomethodological literature. These two sets of evidence will show that a base level of numeracy, which includes the ability to count, conduct basic arithmetic operations, and keep records, existed during this period.

Third, and most important, I intersect the interactive relationship between the state and society in the spread and development of numeracy to gain insight into its directionality. In particular, I provide evidence to distinguish between two possibilities: (a) the state's requests for information were contributing to the rise of numeracy among the population or (b) the state

was merely taking advantage of whatever level of numeracy already existed. If the state's demands for information were spreading numeracy (that is, causing more people to be numerate at any given level) or developing numeracy (that is, causing individuals to become numerate at higher levels), it is reasonable to expect that the information provided by individuals would, in general, lag behind or perhaps just equal what was expected of them by state officials. In addition, their knowledge would be dramatically shaped by the expectations and incentives embodied in the state's request for information. After all, according to this top-down model of the interactive effect of states and societies on numeracy, individuals know less than what is required of them and thus must gain this knowledge in response to the state's demands. However, if my argument is correct and states, in contrast, take advantage of whatever individuals already know, then it is reasonable to expect that individuals would actually know more than what is required of them. Furthermore, this knowledge would not be shaped by the particular nature of the state's request. This bottom-up interactive model suggests that states respond to the increased information available to them and adjust their activities accordingly.

Thus, to examine the directionality (i.e., top-down, bottom-up) of this interactive effect, as I explain in more detail below, I compare the same transaction as recorded in two different documents (and, as a consequence, from two different perspectives or by two different authors), in which there would have been two different sets of incentives for reporting the same information. In particular, I examine the patterns of reporting of assets and debts in a set of fiscal documents collected for the purposes of assessing taxes. The differences in the reports will help to assess the relation between states' information-collecting activities and numeracy and thus to address the argument about the directionality of the rise of numeracy.

In contrast to my method of comparing transactions, previous studies examine the spread of numeracy first by assessing its level and then by comparing these levels across regions or time (Cohn 1996: 156; Herlihy and Klapisch-Zuber 1985: 164, 179–82). This method has validity, and I draw on these studies. However, I purposefully do not use this tactic, because, as I argue below, such studies did not resolve the question of the directionality. My method of matching records makes it possible to examine explicitly the directionality of the interactive effect of states and societies on numeracy.

For the second and third types of evidence, one group of documents I use is the *Catasto* of 1427, a set of fiscal documents redacted in Florence, Italy,

for the purposes of taxation. The Catasto of 1427 is particularly useful for two reasons. First, it makes it possible to examine a relatively early point in the relationship between states and numeracy. Other studies begin at a much later time and reflect a much later stage in this process (Cohen 1982; Desrosières 1998; Woolf 1984), when capitalist markets, nation-states, and educational institutions were widespread or at least common. In contrast, I examine early stages in the process of numeracy, in which individuals, organizations, and governments were beginning to record information in numerical form and to use official statistics systematically.

During the fifteenth century, Tuscany was becoming a territorial state but was not, of course, a modern nation-state (Becker 1968; Benadusi 1996: 12–13; Chittolini 1979; Kirshner 1995). Like many northern Italian regions, Tuscany was originally a city-state with a high capital concentration (Jones 1997; Tilly 1992). Throughout the late medieval period, Florentines dismantled local governments and administrative units in the *contado* (the region surrounding Florence and tied most closely to its jurisdiction) and in the district (the parts of Tuscany outside the *contado*) and subjected them to Florentine law, administration (Stern 1994: 1–19), and taxation (Herlihy and Klapisch-Zuber 1985: 1–27). Throughout the fourteenth century, the amount of information contained in tax documents increased (Conti 1966: 3–19) along with the fiscal demands of the government and the level of bureaucracy. As the state-making literature would predict (Braun 1975; Tilly 1992: 84–87), Florentine taxation in the first part of the fifteenth century was shaped by the military's revenue demands, in this case, a costly war with Milan (Herlihy and Klapisch-Zuber 1985: 4). The Florentines overhauled their system of taxation in 1427, moving to a method based on assets and capitalized income. Because the sequence of events leading to the redaction of the Catasto fits well with the predictions of the state-making literature, it provides a useful example to consider whether this state-building exercise spread and developed numeracy or merely took advantage of preexisting levels. Thus, these centuries of Tuscan history nicely exhibit an early stage in the interaction between states and societies in the rise of numeracy and, consequently, the early origins of numeracy. Therefore, an examination of the Catasto helps to assess one of the central claims of the literature about the relationship between states and numeracy, that states' attempts to collect information shape the basic categories of individuals' thought.

The second reason why the Catasto of 1427 is particularly useful for

this analysis is its thoroughness. As one of the first systematic and comprehensive European cadastral surveys, the Catasto of 1427 facilitates a highly detailed examination of the directionality of the rise of numeracy. In addition, its imposition represented a change in the nature of taxation. Although the Catasto certainly grew out of earlier forms of Tuscan taxation, it required several changes in both the information collected and the reporting procedures, and these changes greatly increased the amount of detail that individuals had to supply directly to tax officials (Herlihy and Klapisch-Zuber 1985: 6–7). Thus it provides a particularly useful point from which to examine whether the knowledge of the populace exceeded or fell short of the tax collectors' demands. Finally, it is worth remembering that fifteenth-century Tuscany was the birthplace of the Renaissance, one of the key historical periods for subsequent developments. An examination of numeracy during this period of time, therefore, is particularly important.

Tuscan Numeracy

To begin, I review the historical literature on numeracy and literacy in Tuscany to provide the general context for the more specific documentary analyses that follow. Urban Tuscany, and especially Florence, is frequently discussed as an important example of a society that was highly numerate from an early date in history (Hyde 1993: 112–35). The same can be said of much of northern and central Italy. The literacy rate in northern Italy between 1000 and 1600 may have been the highest in all of Europe (Burke 1987: 112). Literacy was useful in Florentine businesses, family life, the church, and the government (*ibid.*: 110–31). Business transactions were recorded in letters, account books, and legal documents (*ibid.*: 114–16). Most Florentine guildsmen were able to read, write, and keep accounts (Brucker 1993: 17). Family members wrote letters to one another and kept records of family accounts (Burke 1987: 116–20). The Florentine government generated massive amounts of documentation for taxation, legal proceedings, and official government business. Schools were common in small towns and cities in northern Italy during this period and were funded by a combination of student fees and government sources (Denley 1990). Approximately one-third to one-half of all Florentine boys during the late medieval and early Renaissance period may have attended school (Burke 1987: 111; Graff 1987: 78;

Grendler 1989: 77). Some of these schools specialized in teaching the mathematical techniques used in commercial enterprises (Carruthers and Espeland 1991; Goldthwaite 1972; Grendler 1989: 75–77; Swetz 1987: 21–24). There were three to six *scuola d'abbaco* (abacus schools) in Florence during the fourteenth and fifteenth centuries in which boys learned mathematics (Grendler 1989: 72–78; Swetz 1987: 21–23). Florence was an important site for the development of double-entry bookkeeping (Carruthers and Espeland 1991; Mills 1994). By the fifteenth century, the use of Hindu–Arabic, as opposed to Roman, numerals was more widespread in Italy than in other parts of Europe (Swetz 1987: 183).⁶ In the Catasto of 1427, for example, Hindu–Arabic numerals are widely used in both the *Campione* (the official versions recopied by the tax officials) and the *Portata* (the original versions submitted by households) declarations (Roman numerals and numbers written out as words also are used, though less frequently).⁷ Even individuals who could not read or write were constantly exposed to a literate and numerate culture. A wide variety of legal contracts (for example, for marriages, emancipation, dowries, leases, and testaments) were recorded by professional notaries (Burke 1987: 113).

Much less is known about literacy and numeracy in rural areas, where, even in a highly urbanized region like Tuscany, the vast majority of the population lived. As Duccio Balestracci (1984: 18) argued, however, rural numeracy and literacy were common. Armando Petrucci (1995: 67–68) estimated that during the eighth century, in the territory of Lucca, the rate of lay literacy among relatively high-status males in the city of Lucca was approximately 43%. For the countryside, the rate was 25.5%. While these estimates suggest that urban literacy was higher than rural literacy, what is perhaps more remarkable is the relatively high rate of rural literacy from such an early point in history. In the late medieval and early modern period there also were schools in rural regions (Balestracci 1984: 22; Conti 1966: 85). Some schools were affiliated with churches, though lay students also attended (Petrucci 1995: 74).

In the countryside, as in Florence, legal contracts were widespread, again ensuring that many inhabitants were familiar with written formats (Balestracci 1984: 23–24). Balestracci (*ibid.*: 23) argued that rural inhabitants had to arrange their own business transactions, perhaps occasionally with the help of a notary or priest. Neighbors were also enlisted to assist those who could not write (*ibid.*: 24–30). There were many rural notaries; in fact, notaries

from rural regions were common among the staff of the Catasto (Herlihy and Klapisch-Zuber 1978: 82–83; 1985: 21). Rural towns often had their own local notaries (e.g., Archivio del Catasto [hereafter AC], vol. 270, ff. 128v–130v; vol. 272, ff. 542r–543r). The number of notaries from rural regions or small towns is apparent also from an examination of their names as listed in the series of documents known as the *Notarile antecosimiano* (hereafter NA). Individuals who migrated to another town were commonly referred to by their name and a toponym; thus, rural notaries living in Florence would have been called by their name followed by *da* (from) and the rural place name; for example: Antonio di Giusto da Bruscoli (NA, vol. 792), Giovanni di Martello da Campi di Mugello (NA, vol. 9668), Giovanni di Biagio da Monterappoli (NA, vol. 9479), and Iacopo di Filippo da Lutiano (NA, vol. 11083). Books and other written works were found among the inventories of rural households (Mazzi and Raveggi 1983: 210–11). *Ricordanze* or *ricordi* (perhaps best translated as “memoranda,” as Peter Burke [1987: 118] suggested), which were family or individual records of all sorts of events from personal notes to financial transactions, also exist for rural inhabitants, either written by them or written for them by others (Balestracci 1984; Mazzi and Raveggi 1983: 277–78).

Even the most cursory glance at the Catasto of 1427 quickly dispels the idea that the tax officials could have redacted such a survey without a largely numerate populace. These tax records were based on individuals’ written accounts of assets, debts, and household members, the *Portate* (literally, “things brought”), to the tax officials. The tax officials then recopied the information from the *Portate* onto the official versions of the records, the *Campioni*, adding the tax calculations and assessments.⁸ Thus, these records were not, as in other places or in earlier forms of Tuscan taxation, originally based on the tax official’s estimates or reports. Furthermore, the *Portata* declarations exhibit many varieties of handwriting, so they must have been written by a number of different individuals (e.g., AC, vol. 142, ff. 548r–629v; vol. 144, ff. 512r–573v; vol. 237, ff. 1r–478r). Smallholders and sharecroppers sometimes wrote their own *Portata* declarations (Conti 1966: 84–85; AC, vol. 142, ff. 589r–v). Of course, not everyone had to be able to write, because *Portata* declarations were submitted by households, not by individuals. Some *Portate* were signed by a household member or by a neighbor from the same rural parish or community (e.g., AC, vol. 237, ff. 54v, 178v, 179v, 180r, 187r; vol. 142,

f. 582r). Some of these declarations have notes indicating that they were written at the request of the head of the household, who did not know how to read or write. The ability to write, however, may have been even more widespread than the Portata declarations suggest. Other documents, including letters, leases, and official records, were written or signed by inhabitants of rural parishes and communities (e.g., Mediceo avanti il principato [hereafter MAP] filza XI, numero 110; filza CXLIX, numero 10; filza LXXXIV, numero 78, carta 156; filza V, numero 277; Ospedale di San Matteo vol. 326, f. CXXIV; vol. 125, ff. 6r–7r).

Even more important for the redaction of the Catasto than the ability to write, however, was the considerable knowledge that Tuscans had to have of their assets and incomes. Rural and Florentine Catasto declarations consisted primarily of lengthy descriptions of pieces of land, which, at the minimum, generally gave the location of the property, its boundaries, and the return from the property, either the rent or the yield. Yields, as well as rents in kind, are listed crop by crop, with the amount and the measure (e.g., six *staia*, or bushels, of grain). Most declarations give either the size or the value of the property, and often both, in numerical terms. The descriptions of land in rural regions submitted by rural inhabitants tend, in fact, to be more detailed than the accounts submitted by Florentines. In regions of smallholding, rural inhabitants held many small pieces of land, all of which generally were listed in detail (AC, vol. 241, ff. 1035r–1224r; vol. 272, ff. 467r–554v). Florentines, even in their Portata declarations, tended to summarize their holdings, often by describing them as a farm (*podere*), and not to list them in detail as separate pieces of land (e.g., AC, vol. 49, ff. 1140r–1200r; vol. 60, ff. 82r–125r; see Conti 1966: 28).

It is important to note that the Catasto of 1427 changed the system of assessing taxes. Taxation was common throughout all of Tuscany by the fifteenth century, and all regions had been assessed some sort of tax on goods, services, or property by either local authorities or Florentines (Conti 1966; Fiumi 1957, 1959: 440–65; Herlihy and Klapisch-Zuber 1985: 6–8). In all of these regions, however, the Catasto of 1427 represented a substantial increase in the amount of information required from individuals. In the Florentine contado and district, the previous systems of taxation (the *estimi* and other local surveys) were based on a system of tax farming in which the tax officials either determined individual tax assessments directly or asked local officials

to distribute a predetermined tax burden among the inhabitants of a town or region (Conti 1966: 3–19; Herlihy and Klapisch-Zuber 1985: 6–8). Like the Catasto of 1427, the *estimi* required that the value and size of property be declared, but unlike the Catasto, the declarations in the *estimi* were sometimes submitted by the local administrative unit, not necessarily by households. The Catasto required households to submit declarations, and in addition to value and size, households were required to submit property rents and yields for the first time.

With respect to yields and rents, the reports in the Catasto of 1427 were not influenced by individuals' experiences with earlier tax assessments. Furthermore, whereas size and value were relatively fixed (size could be changed only by reconfiguring plots; value, only by inflation or deflation), yields and some rents (share rents in kind) were highly variable and changed every harvest. The Catasto officials in fact recognized this problem and requested that yields be averaged over three years (Herlihy and Klapisch-Zuber 1985: 14). Thus, to report yields, individuals had to be able to conduct, even if not formally, basic mathematical operations. Finally, size and value could have been recorded by the local administrative unit because this information was often given in notarial documents that recorded land sales.⁹ Yields, though, were not recorded in a similar fashion. Yields had to be reported by individuals on the basis of their harvests; they were not reporting this information simply because they had learned to do so in a previous round of tax assessment by Florentine state officials. In other parts of rural Tuscany (in the Val di Cecina discussed below, for example), the Catasto of 1427 departed even more sharply from previous practice, as *estimi* were never assessed there. While the subject cities did collect taxes, their local systems of taxation were considerably less systematic than the Florentine one (Herlihy and Klapisch-Zuber 1985: 8). Thus, throughout Tuscany, the Catasto of 1427 represented new demands by tax officials for information that was more detailed than in the previous assessments. The collection of the Catasto of 1427 is itself evidence for both the development and the spread of numeracy: the ability to think in terms of averages must have been widespread among agricultural producers for the officials to be able to collect such information.

The Catasto of 1427, therefore, is an excellent example of the interactive process of the rise of numeracy; over the course of the fourteenth century and into the early fifteenth century, local systems of taxation (e.g., the *estimi* and

the Catasto) became increasingly complex, containing more detailed information, as the literature on state-making and numeracy would predict. However, the government must have capitalized on the increased knowledge of the populace rather than encourage numeracy as a result of collecting information. In fact, the Tuscan population's knowledge overwhelmed the tax officials. Although the Catasto of 1427 was supposed to be finished within one year, it took three years to complete. Furthermore, only the first part, that of the inhabitants of the city, was completed according to the regulations. Although the original intent was to complete a catasto every three years within Florence and every five years in the countryside, officials were never able to meet this schedule or to conduct another survey containing the amount of detail as the original (Herlihy and Klapisch-Zuber 1985: 11, 26).

In discussing the Catasto, David Herlihy and Christiane Klapisch-Zuber (1985) presented the standard top-down perspective on the rise of numeracy. They compared the degree of age rounding in the Catasto by residents of the cities as compared to residents in the rural regions. They found that residents of the countryside were less likely to report accurate ages (*ibid.*: 179–80) and concluded that numeracy was more widespread in Florence than in the countryside. They also argued that inhabitants learned to keep accurate records of their ages over time in response to Florentine demands for this information for tax purposes. They showed that age reporting was more accurate in the regions that had been subjected the longest to taxation according to age (*ibid.*: 180–82). They also showed that age reporting improved over time, as tax surveys continued to be collected over the late-fourteenth and fifteenth centuries (*ibid.*: 164). Indeed, both urban and rural Tuscans responded to requests for fiscal information and to tax incentives. They frequently altered their declarations to try to lower their tax assessment (*ibid.*: 16–18, 25–26, 141–42, 258–59; de Roover 1963: 25). Thus, Herlihy and Klapisch-Zuber concluded that numeracy spread from urban to rural regions and in response to government demands for taxes. Similarly, Harvey Graff (1987: 76–90) emphasized elite literacy in Tuscany, even though he searched for the contradictions inherent in literacy and argues against a top-down model of literacy.

Again, however, while the evidence provides some support for the top-down argument, it is one-sided and incomplete. In fact, Samuel Cohn (1996: 156) showed that peasants who lived in the mountains, which were farther from Florence, reported their ages with more accuracy than did either the

peasants who lived in the Tuscan plains or the residents of the city of Prato, both of which were closer to Florence. Cohn's evidence suggests that numeracy did not simply spread from the cities to the countryside.

Furthermore, inaccuracies in age reporting may not necessarily reflect lack of numeracy *per se*; it may reflect a somewhat narrower lack of knowledge of biological age. Knowledge of assets may have been more developed, for example, than knowledge of biological age. Indeed, other historical research shows that a narrow focus on tax incentives can be misleading, because other motivations were also important. For example, some of the distortion in age reporting of women in the Catasto results not from tax incentives, ignorance, or neglect but from cultural expectations that women should marry at a young age (Molho 1988: 194). Similarly, neither the tax regulations nor tax incentives explain why landlords' and tenants' Catasto declarations agreed with respect to transactions about loans but widely diverged with respect to transactions about livestock (Emigh 1996). The pattern of reporting of loans and livestock may be more directly related to landlords' and tenants' interests in their assets than to taxation. Because previous studies that compared levels of numeracy between Tuscan regions or across time have not resolved the question about the directionality of the rise of numeracy, I examine these issues in more detail with a methodological technique that compares sets of transactions.

The Uses of Numeracy

In this section, I examine some common uses of numeracy in everyday life in rural Tuscany. I also consider how numeracy may have been related to tax collection. I use evidence from two small towns in rural Tuscany. The first of these towns, Castelnuovo di Val di Cecina, is located south of Volterra, in the region of Tuscany called the Val di Cecina, which by the fifteenth century had been a part of the *contado* of Volterra, the portion of the countryside under its domination, for a long time. Both Volterra and its *contado* came under direct Florentine control in 1427, after the Florentines suppressed a small armed uprising in Volterra resulting from the introduction of the Catasto. The other small town, Montecatini di Valdinievole, is northwest of Florence. The Valdinievole was one of the more urbanized and prosperous regions of rural Tuscany, with a number of towns, such as Pescia (Herlihy and Klapisch-Zuber 1985: 350–51). Montecatini was part of the Florentine district and had been

under Florentine control since 1339, after a series of wars with Lucca (Brown 1982: 14–21; Repetti 1969 [1839]: 354–56).

The local economies of both towns were similar. These economies are well described by Polanyi's (1957 [1944]: 57–64) term, local market. Some attributes of market economies were found there, but market exchange was not the primary basis of the economy. In particular, there were local markets for labor, land, and commodities (cf. Szelényi and Kostello 1996: 1087), but the economy as a whole was based on subsistence production or, in Polanyi's terms (1957 [1944]: 53), by householding or reciprocity, which constituted the principal mechanism that integrated the economic system.¹⁰ These households participated in a generalized system of reciprocity, in terms of exchanges of labor and commodities, as well as in exchanges of property through dowries and inheritance. There was an active market for land and houses in Castelnuovo and Montecatini. For example, the majority of notarial documents found for Castelnuovo record sales of land and houses (e.g., NA, vol. 11269). Neighbors and relatives often bought and sold land among themselves (cf. G. Levi 1988: 66–99; Sabeau 1990: 16). Plots of land were relatively small and inexpensive and could be purchased with relatively small amounts of money.

Local markets for labor and commodities were also common, but evidence for them is thin because these sorts of transactions were rarely documented. Labor contracts were frequently oral and often not recorded in notarial documents. For example, though Catasto declarations from Montecatini and Castelnuovo indicate that fixed-term and share-term leasing (both labor contracts) were common, leases are rarely found in the extant notarial documents for these towns. One exception is a document for a common form of rental contract called *terratico* (Diplomatico, Strozzi Galletti, 6 December 1421). Wage labor is even more difficult to document because it was not generally recorded even in Catasto declarations. Households were not taxed differently for land worked by family members than for land worked by wage laborers, so the two types of labor were not recorded separately, though wage labor was frequently used in the Tuscan countryside.¹¹ In Castelnuovo, for example, Iacopo di Francesco declared that he owed a salary (*salario*) to several workers (AC, vol. 272, f. 56r). It is equally difficult for evidentiary reasons to document local markets for commodities, though they were also common throughout towns in rural Tuscany.¹² There is also some indirect evidence for local markets for commodities in the Catasto declarations. In virtually all

the Catasto declarations for Castelnuovo and Montecatini, there are lists of debts and credits, sometimes for grain and sometimes in monetary amounts. Although many of these debts and credits were loans, some recorded sales arranged on credit. Some declarations indicate that the households had cash in their possession (e.g., AC, vol. 272, f. 525v).

The Catasto declarations indicate that most individuals were smallholders who worked their own plots of land (Castelnuovo: AC, vol. 241, ff. 1035r–1224r; vol. 272, ff. 467r–554v; Montecatini: AC, vol. 237, ff. 1r–478r; vol. 270, ff. 1r–157v). A light plow or hoe was used to till the most common crops of grain, grapes, and olives. Rural inhabitants commonly leased small plots of land from their neighbors. The same general cultural features existed in Castelnuovo and Montecatini as in other regions of Tuscany, including the dowry system, relatively late marriage for men, early marriage for women, and partible, post-mortem inheritance. Property rights were secure. Unlike peasants in other parts of late medieval Europe, rural Tuscans were not subject to feudal or customary fines and fees, limits on heritability, or prohibitions on marriage (Jones 1968; Wickham 1994: 259).

I chose these towns primarily because they serve as examples of typical Tuscan smallholdings that illustrate uses of rural numeracy that were relatively unaffected by Florentine influences. The Val di Cecina was some distance from Florence and was not influenced by the penetration of this major urban market. The notarial documents and Catasto declarations in the Val di Cecina rarely mention Florence or Florentines, in sharp contrast to declarations in regions of sharecropping where Florentines are frequently mentioned as landlords, creditors, and relatives (Emigh 1997, 1999). Montecatini was somewhat more integrated into the market economy than was Castelnuovo. Florentines are mentioned slightly more frequently in the documentary record of Montecatini and the wine from this region was a high quality, market crop (Emigh 2000: 124–25, Melis 1984: 150–52). Nevertheless, both were small, unimportant, and unremarkable towns.

I did not choose regions of sharecropping, because they were more heavily influenced by the Florentine market. In Castelnuovo and Montecatini, the form of sharecropping found in regions heavily influenced by the Florentine market and characterized by consolidated farms was rare. Although sharecropping was important—and was spreading at that time (Emigh 1997)—smallholding was the most common form of land tenure. Her-

lihy and Klapisch-Zuber's (1985: 115–17) data for all of rural Tuscany show that in 1427, 56.6% of rural families were smallholders (they may have leased a few, additional plots), 18.9% were sharecroppers, and 4.3% were fixed-term lessees.

In addition, the documentary record for these towns is useful for several evidentiary reasons. The declarations from the Val di Cecina are useful because the Florentines had never assessed direct taxes there before the Catasto of 1427. Although the Volterranean commune had been assessed Florentine taxes (though they infrequently paid them) (Fabbri 2000: 229–30), even the *estimi* had never been redacted in the Val di Cecina. Thus, the Catasto of 1427 represented the first time the Florentines requested the information in this format.¹³ Finally, the declarations from Montecatini report rents in a unique way that I use below.

In addition to the Catasto registers, I also use notarial documents. These legal documents were drawn up by notaries, in Latin, who were licensed by the commune and members of a guild. The notaries had to know Latin, but the documents were formulaic: the notaries were not composing Latin text, merely recopying well-known legal terminology that could be found in each town's notarial formulas. Notarial documents gave legal effect to a transaction. Of course, neither notarial documents nor the Catasto declarations are necessarily accurate representations of the actual transaction.¹⁴

The examination of a range of legal transactions illustrates how numeracy was intrinsic to everyday life in these towns in rural Tuscany and, in particular, how it was related to the Polanyian local markets for land. First, as noted above, there was an active land market and sales of houses and land were common. Rural inhabitants purchased and sold property for many reasons: to consolidate holdings dispersed by partible inheritance, to invest extra income or the proceeds from a legacy or inheritance, to arrange for dowries, to repay debts, or to dispose of unwanted properties. Participation in economic action necessitated these transactions, which required that individuals be numerate. They had to know the value and size of their property, which were recorded in the notarial documents, to engage in these transactions.

Second, numeracy was evident in testaments of individuals from Castelnuovo and Montecatini. Testators often specified the monetary amounts left as small legacies to religious institutions,¹⁵ relatives, or neighbors (NA, vol. 3865, ff. 22v–23r; vol. 11270, ff. 32v–33r; vol. 11269, no pagination [hereafter n.p.],

27 March 1425;¹⁶ *Diplomatico*, Agostiniani di Montecatini, 18 August 1418, 4 September 1412).¹⁷ These testaments were written by professional notaries, so the testators did not necessarily have to know how to write, but they did need to be numerate to specify the amounts of the legacies and to give accounts of their property and its value.

Third, dowries were another aspect of social and economic life that required numeracy. The content and value of the goods, property, or cash that constituted the dowry were usually given in three sets of transactions, dowry receipts, testaments, and dowry restitutions (e.g.: NA, vol. 3863, n.p., 19 December 1426; vol. 3863, n.p., 23 September 1426; vol. 11269, n.p., 27 March 1425; vol. 3865, ff. 22v–23r; vol. 11270, ff. 46r–47r). It is plausible that women's property was more precisely recorded than men's property because careful documentation would be required in the event that the dowry had to be restored by heirs remote from the original transaction (e.g., NA, vol. 11273, n.p., 4 April 1425; vol. 11269, n.p., 1 August 1427; and vol. 11155, ff. 20r–v).

Finally, most rural inhabitants had debts, which they recorded in their *Catasto* declarations. Some individuals were deeply indebted to money lenders or urban landlords, but others simply owed a small amount to a local shopkeeper or neighbor (e.g., AC, vol. 272, ff. 477v–478r, 482r–483r, 484v–485r, 487v–488v, 519v–521v). Business transactions must have been conducted, at least to a large extent, on credit. The *Catasto* declarations of shoemakers and blacksmiths in small towns are easily identifiable because they contain long lists of individuals who owed them money (usually summarized by the tax officials in the *Campioni*) (e.g., AC, vol. 272, ff. 483r–484v, 498r–v, 518r–519v, 523v–524v, 530r–v). The shopkeepers kept these accounts as part of their businesses, yet the declarations clearly show that this record keeping was not one-sided. It was also in the interest of the purchaser of the goods or services to know the amount of the debt, and numerous *Catasto* declarations list debts to the local shoemaker or blacksmith (e.g., AC 272, ff. 467r–468r, 471r–472r, 473v–474r, 474r–475r, 477v–478r, 478v–479v, 482r–483r, 484v–485r, 487v–488v).¹⁸

A more detailed examination of some of these notarial documents, and in particular ones describing property that was also listed in the *Catasto* declarations, provides some additional evidence about numeracy. The examples of these matched documents suggest that individuals had numerical knowl-

edge in advance of tax officials' request for it and that this knowledge was not necessarily shaped by these official requests, thereby illustrating how tax officials must have taken advantage of preexisting levels of numeracy. Several of the pieces of land, for which a notarial document recorded the sale, can be found in the Catasto declarations. For example, Salvatore di Cerbone bought a piece of land in Castelnuovo for five lire (NA, vol. 11269, n.p., 21 August 1427). This piece of land appears in his Catasto declaration, valued at a slightly lower amount, four lire (AC, vol. 272, ff. 498v–500r). This example is interesting because the notarial document gives the surface measure of the land, 10 *staiora*, although the Catasto declaration does not. The notarial document would have been redacted before the Catasto declaration in this region (in Volterra and its former contado, the Catasto was redacted between 1429 and 1430 [Herlihy and Klapisch-Zuber 1985: 24]). Thus, the evidence provided by the notarial document illustrates that Salvatore knew the size of his property but omitted this information from his Catasto declaration. He also knew the value of his property before the redaction of the Catasto. Clearly, the request for information by the Catasto officials did not induce him to keep records of his property. He already knew this information because he needed to make use of it in other transactions.

Similarly, Antonio di Domenico Cambiuzzi bought a piece of land in Castelnuovo for seven lire (NA, vol. 11269, n.p., 21 October 1427). This piece of land appears in his Catasto declaration valued at the same amount (AC, vol. 272, ff. 495v–496v). In this example, like the preceding one, the size of the land, two *staiora*, is given in the notarial document but not in the Catasto. Again, the land sale occurred before the redaction of the Catasto, suggesting that the value of the asset had been known before tax collectors requested this information. Other examples also illustrate this point.¹⁹

The comparisons between the values of the assets given in the notarial documents and the Catasto declarations highlight another issue. They suggest that the values of property given in the notarial documents recording land sales and the Catasto declarations either were identical or were slightly lower in the Catasto declarations. This pattern is consistent with the interpretation that some individuals may have slightly underestimated the value of their property in their Catasto declarations to try to lower their tax assessment (Herlihy and Klapisch-Zuber 1985: 18; de Roover 1963: 25). In conjunction with evidence from these examples suggesting that individuals knew the value

of their property before the tax assessment, this pattern of reporting slightly lower values in the Catasto declarations suggests that individuals did respond and react to the process of tax collection but that their knowledge predated the redaction of the Catasto.

The notarial document recording the restitution of the dowry of Iacopa, the widow of Girolamo di Piero Giannini, provides another opportunity to compare the values of land given in the Catasto declarations with another source. The dowry restitution lists 10 pieces of land, which are combined into 9 pieces of land in the Catasto declaration (AC, vol. 272, ff. 534r-v; NA, vol. 11270, ff. 46r-47r). One piece of land is valued at the same price of 60 lire in both documents. Two pieces of land were given a lower value in the Catasto declaration than in the dowry declaration.²⁰ However, six pieces of land were given a higher price in the Catasto declaration than in the dowry declaration.²¹ Thus, the comparison between the dowry restitution and the Catasto declaration yields a different pattern than the comparison of the Catasto and the land sales. The land tends to be undervalued in the dowry restitution as compared to the Catasto declaration. This pattern does not conform to the pattern that would be expected on the basis of the tax incentives. Although it is not entirely clear what incentive might have produced this pattern, it suggests, as do the examples given above of women's ages (Molho 1988) and loans and livestock (Emigh 1996), that different transactions had different incentives for misreporting attached to them. It may be misleading to assume that the incentive to underreport assets for the purposes of taxation was always the most salient. In addition, though there were incentives for avoiding taxes by lowering the value of pieces of land, the rent, or the yield, there were also incentives for recording the full value of the property. Failure to declare a piece of land in the Catasto could call into question legal ownership (Herlihy and Klapisch-Zuber 1985: 18).²²

In summary, this evidence points to the usefulness of numeracy in the lives of these rural Tuscans. It allowed them to record assets and debts in many common transactions, including property sales, testaments, dowries, and payment for services. The local markets or economies of these towns depended on transfers of property through these mechanisms, which, in turn, required numeracy. Thus, numeracy was an essential aspect of economic life in these towns, even though they did not have market or capitalist economies. Numeracy was central to members' methods of ordering everyday life in these

towns. The economy in Montecatini was more marketized than in Castelnuovo, but both were characterized primarily by subsistence production. The comparison between the notarial documents and Catasto declarations illustrates that the use of numeracy often preceded the redaction of Catasto declarations, suggesting that individuals—especially in Castelnuovo, where the Catasto of 1427 represented the first time Florentines collected taxes in that format (estimi had not been collected there)—were not learning to be numerate because of tax officials' requests for information. Like the historical literature, these examples illustrate that individuals did respond to tax incentives; in particular, they may have underestimated the value of assets on their Catasto declarations. Nevertheless, the evidence also illustrates that tax incentives were not always the primary motivation in reporting. Thus, this evidence suggests that the Catasto officials capitalized on existing levels of numeracy, not that numeracy spread or developed solely through tax assessment and collection. The following section discusses this issue of incentives for reporting in a more systematic way.

Landlords and Tenants

In this section, I use a unique feature of the Catasto declarations in Montecatini. As in other declarations from the Valdinievole, tenants often listed the amount they paid in rent in the section of the Catasto declaration in which the debts were listed (*incharichi*), though this was not required by the tax regulations (and was not common in other regions). There was obviously some systematic confusion in this region about the tax assessment procedures; and while it is not entirely clear why tenants listed their rents in this manner, it is quite possible that they hoped the practice would lower their tax assessment. Many debts were allowable tax deductions; thus tenants might have thought that by listing rents under the *incharichi*, these amounts would be subtracted from their taxable worth. Agricultural rents, however, were not allowable deductions; only rents from houses were allowable deductions.

The practice provided little tax relief, but it does provide useful historical evidence. Because landlords were required to report the rent from their land, the same information, the amount of the rent, given in both the landlords' and the tenants' declarations, can be compared. This comparison will provide information about how individuals responded to tax incentives and requests

for tax information and thus can address the question of whether numeracy spread and developed as a result of government requests for information. I use the comparison in two ways. First, I consider whether the declarations provide more or less information than required for tax purposes. If information crucial to the tax assessment was missing (such as ages or yields), it may be an indication that individuals were not able to provide it. However, if more information was provided than necessary, it suggests that individuals were not merely responding to the requests of the tax officials, but in fact had the information available already.

Second, I compare the information given in landlords' and tenants' declarations to try to determine whether the differences between the amounts correspond to tax incentives or to some other set of incentives. As some of the other examples given above show, individuals did adjust their Catasto declarations in response to tax incentives. Other patterns of reporting, however, and, in particular, ones that do not match tax incentives, provide evidence that individuals had used the information on the tax registers for other purposes, ones that predated tax assessment and were not shaped by it. Such evidence suggests that numeracy was not necessarily a result of tax assessment. As I discussed above, a top-down view of the rise of numeracy suggests that individuals' knowledge of numeracy was shaped by the collection efforts of states and that, in general, the information individuals had was either inadequate or just enough to respond to officials' demands. Furthermore, according to the top-down view, the content of this information should be highly dependent upon the form of these requests or on the incentives embodied within them. Conversely, the bottom-up view suggests that individuals had more information than was requested by officials, that the content of this information was not highly influenced by these requests, and that the incentives embodied in these requests had relatively less influence on the shape of that knowledge.

To consider the rent declared by landlords and tenants, I matched pieces of land listed in both the landlords' and tenants' declarations in Montecatini, making note of the amount of the rent and the terms of the rental contract. Thus, a piece of land is the unit of analysis below. I used all of the declarations and matched all of the pieces of land for which it was reasonably certain that the match was correct. I matched cases in which both the tenant and the landlord gave the name of the other party and in which the pieces of land in question seemed to be the same. I also matched pieces of land for which one

of the parties gave the name and I could identify the piece of land on the other party's declaration with a reasonable degree of certainty. This matching process yielded 65 pieces of land. In three of these cases, there was not enough information to determine the amount or terms of the rent. Thus, there were 62 cases for which the rent given on the landlord's declaration could be compared to the tenant's declaration. These 62 cases are analyzed in more detail below.

In matching land, I relied primarily on the Campione versions of the Catasto. Although the Portate would have yielded more matches, they also might have provided inconsistent information in this case. There were two sets of Portata declarations for much of the Valdinievole (Herlihy and Klapisch-Zuber 1985: 22–23), making it difficult to determine, for any pair of landlord and tenant, which, if either, set of declarations matched. Thus, using the Campione provided more systematic information. However, when the Campione was ambiguous, I did refer to the Portata, making sure to select the Portata that matched the Campione.

I emphasize that the results reported here are only for pieces of land that could be matched with reasonable certainty. There were, of course, many other pieces of rental property listed on the declarations from Montecatini that could not be matched, either because not enough information was given or because the individuals did not live in Montecatini (I did not search for individuals living in other locations). The results here are not intended to illustrate how often land could be matched but, rather, to suggest how individuals listed their rents, whether they followed their own incentives or those of the tax collectors.

It is important to note that in the vast majority of the cases discussed below, in 56 of the 62 cases, the tenants were providing more information than requested by the tax officials. Tenants were not required to declare any information about agricultural property they rented; they were not taxed on the income from rental property, nor were they allowed to deduct any expenses incurred by renting land. Six cases representing individuals who rented their houses were the only exceptions. The rent for a house was an allowable tax deduction; therefore, tenants were allowed to deduct the rent, capitalized at 7%, from the total amount of their taxable wealth. The other 56 cases of rented agricultural property, however, illustrate that individuals were not just responding to requests for information by tax officials but had the information available already for some other purpose.

In the majority of the cases, 37 of the 62 (almost 60%), the amount of the rent declared by the landlord and the tenant matched. To determine whether the rent, which was often in kind, declared by the landlord and tenant matched, I calculated the monetary value of the rent by assigning the standard prices to the crops used by the Catasto officials. For virtually all of the cases that matched using the criteria of the total monetary value of the crops, the type and amount of crop declared as rent matched as well. For example, Nanni di Mazzeo Barruci was a smallholder in Montecatini and owned about 10 pieces of land in the town, some of which he worked himself and some of which he leased to other individuals. He also leased several pieces of land, one of which was owned by another inhabitant of Montecatini, Antonio di Guaspere. Both declarations indicate that the land was leased for an annual fixed rent of two *staia*²³ of grain (AC, vol. 270, ff. 91r, 126v). Thus, the monetary value of the rent declared by both parties would have been 28 soldi, using the standard price of 14 soldi per *stajo* that Catasto officials used for grain in the region. Religious institutions, such as churches, confraternities, and monasteries, owned and rented out land in Montecatini. Nanni di Mazzeo rented land from one such institution, the company and the altar of the Virgin Mary.²⁴ Both of their Catasto declarations list a fixed annual rent of three lire (AC, vol. 198, f. 698r; vol. 270, f. 91r).

Similarly, Nanni di Cecco Natarelli leased property from the company and the altar of the Virgin Mary. Both declarations list the same annual fixed rent of four *staia* of grain, 10 *barili* of wine, and four *libbre* of olive oil (AC, vol. 198, f. 698r; vol. 270, f. 8v). Both parties also listed a loan made to Nanni in the amount of nine florins (AC, vol. 182, f. 38v; vol. 270, f. 8v). Another inhabitant of Montecatini, Antonio d'Agnolo, declared that he rented a piece of land from ser Cortese di Giunta, who was a local notary. Ser Cortese listed Antonio as his tenant, and both of them listed an annual fixed rent of eight *staia* of grain (AC, vol. 270, ff. 12r, 129v). Manieri di ser Giovanni was also a smallholder living in Montecatini with a number of pieces of property of his own. He leased several pieces of property, including a house from the religious institution, the works (*opera*) of San Michele of Montecatini (AC, vol. 182, f. 28v; vol. 198, f. 702v; vol. 270, f. 13r). Both declarations report an annual fixed rent of three lire.

Another example given in the Catasto is of Puccio di Pagolo. He declared that he owned one piece of property of his own and that he rented several

other pieces of land, one of which he rented from the works of San Michele of Montecatini. The declaration of San Michele lists Puccio as a tenant, and both he and the religious institution indicated that the annual fixed rent was five staia of grain (AC, vol. 270, f. 14r; vol. 198, f. 702r). Puccio also declared that he rented a piece of land from the hospital of the Misericordia of Montecatini for an annual rent of five staia of grain (AC, vol. 270, f. 14r). The declaration of the Misericordia also lists the piece of land rented to Puccio for five staia of grain (AC, vol. 182, f. 264r; vol. 198, f. 773r). Finally, Masino di Chiaro's declaration states that he owed 1.5 staia of grain, which was a fixed rent for a piece of land, to Agnola d'Albizzello Landi (AC, vol. 270, f. 3v). Agnola's Campione declaration does not list the name of the worker, but it does list a piece of land with the same place name of approximately the same size for the same rent of 1.5 staia of grain (AC, vol. 270, f. 28r). Agnola did, however, list Masino di Chiaro as her tenant on her Portata declaration (AC, vol. 237, f. 102r). The majority of cases were similar to the above examples: The monetary value of the rent, based on the standard prices used by the Catasto officials in the region, matched.

There were also seven cases of share rents in which the tenant did not give the monetary amount of the rent but listed the same terms as the landlord. Thus, the information given by the landlord and tenant match, although the information given by the tenant is not as detailed in the cases cited above as examples. For example, Giacomello di MingoZZo rented two pieces of land from ser Piero di ser Tommaso. Both Giacomello and ser Piero indicated that Giacomello paid one-third of the harvest as rent, although Giacomello did not specify the amount of the harvest that he paid (AC, vol. 270, ff. 62r, 150r-v).²⁵

The preceding pattern, in which either the monetary amount of the rent or the terms of the contract declared by the landlord and tenant matched, would be expected if, as Carruthers and Espeland (1991: 42–43) suggested, record keeping is used to ensure honest transactions. This pattern of reporting matching rents suggests that landlords and tenants knew the amount of the rent that they had arranged and reported this amount in their Catasto declarations.

In a minority of the cases, 18 (about 29%), however, the rent declared by the landlord and tenant did not match. There were 7 cases in which the tenant declared more rent than the landlord, but this category comprised the smallest number of cases. It is this pattern of reporting that corresponds to

the tax incentives. Landlords would have had incentives to underreport the rent because doing so would have lowered the amount of the tax for which they were liable. Thus, on the basis of the tax incentives alone, it would be expected that landlords would report a lower amount of the rent than would tenants. The amount of rent paid by the tenants of agricultural property was not an allowable tax deduction. Nevertheless, it is possible, because of the tax incentives, that tenants might have exaggerated the amount of rent they owed, perhaps hoping that the tax officials would have lowered their tax assessment. As noted above, these rents appear under the section of the Catasto declarations listing debts, which if allowable, would have been tax deductions. Thus, on the basis of the tax incentives, the tenant might be expected to report a higher rent than the landlord. The capitalized rent for a house was an allowable tax deduction, and therefore, again, it would be expected on the basis of the tax incentives that tenants would report a higher rent than the landlords. Although it might be expected that the incentive to overreport the rent would be stronger for tenants leasing houses as opposed to land, all of the seven cases in which the tenant declared more rent than the landlord were instances of agricultural property, not houses.

For example, Antonio d'Agnolo's declaration indicates that he worked a vineyard for the religious institution, the Carmine,²⁶ and that he paid them a fixed rent of four barili of wine each year (AC, vol. 270, f. 12r). The declaration of the opera of Santa Maria del Carmine of Montecatini reports that Antonio worked a vineyard of theirs for a fixed rent of four lire each year (AC, vol. 198, f. 701r). The value of the four barrels of wine declared by Antonio, calculated at the standard price the tax officials used, 26 soldi for each barile, would have been about five lire and four soldi. Thus, the monetary value of the rent declared by Antonio was slightly higher than the monetary value of the rent declared by the religious institution. Similarly, Meo di Agostino declared that he rented a piece of land of Papo di Benintendi for an annual rent of seven staia of grain (AC, vol. 270, f. 35r). Papo declared Meo di Agostino to be one of his tenants, who paid an annual rent of one staio of grain (AC, vol. 270, f. 116r).

Papino di Niccolo was also a smallholder in Montecatini who owned one piece of land. He also rented several pieces of land, one of which he rented from another inhabitant of Montecatini, ser Cortese di Giunta, a notary. Both declarations state that the land was leased in share terms, for half of the crop,

although Papino di Niccolo declared that his rent was 14 barili (seven *some*) of wine for a year (AC, vol. 270, f. 158r), while ser Cortese listed his share of the yield as 10 barili of wine for a year (AC, vol. 270, f. 128v). Both Papino and Cortese, however, listed a loan (*prestanza*) made to Papino for working the land in the amount of two florins (eight lire) (AC, vol. 270, ff. 130r, 158r).

Another example is found in the declaration of Dino di Stefano. He declared that he owed rent in the amount of three staia of grain to the altar of the Virgin Mary (AC, vol. 270, f. 45r). The declaration of this religious institution lists a piece of property that Dino rented and lists an annual rent in the amount of two staia of grain (AC, vol. 182, f. 39r; vol. 198, f. 698r). In this case, it is possible to speculate about the reasons that the declarations differ. It is plausible, of course, that this difference corresponded to the tax incentives. However, Dino's declaration does not specify that the amount was an annual rent, so the amount listed may include rent that he owed in arrears. Pacino di Pino was also a tenant of the religious institution, Santa Maria del Carmine, and leased two pieces of land from it. He stated on his Catasto declaration that he paid an annual rent of 3 staia of grain for one piece of land and 2.5 staia of grain for the other (AC, vol. 270, f. 63r). Both pieces of land are also listed in the declaration of Santa Maria del Carmine, although they both list a rent of 2.5 staia (AC, vol. 198, f. 701r). As in the preceding example, Pacino listed the amount of rent he owed but did not specify that it was an annual rent. Thus, the amount he declared may have included arrears, which, again, may explain why he declared a higher amount than the landlord. In addition, Pacino listed the yield from two pieces of land, which was 15 staia of grain and 12 staia of lupine (*lupini*) for the piece of land rented at 3 staia of grain and 15 staia of grain and 10 staia of broad beans (*fave*) for the piece of land rented at 2.5 staia of grain. Not only did Pacino list the rent, which was irrelevant to the tax officials, he also provided the yield. Although listing the rent may have been an attempt to lighten his tax burden, listing the yield certainly was not. Although this type of income was not taxable, he certainly gained no tax advantage by providing this information.²⁷

In some cases, the amount declared by the landlord and tenant may not match because of different redaction dates. This is particularly true for the relatively small number of cases in which the landlord was Florentine. The Catasto registers were completed earlier in Florence than in the Valdinievole

(Herlihy and Klapisch-Zuber 1985: 22–23). Thus, individuals in the Valdinievole were reporting rents from a slightly later point in time than were Florentines. All declarees, however, were supposed to report average yields and rents over a three-year period, which would have reduced the differences between the reported rents. For example, Manieri di Giovanni was a smallholder in Montecatini who owned eight pieces of land, which he both worked himself and leased to others. He also leased several pieces of land, including a piece of land from the heirs of maestro Ugolino, whose declaration was among the Florentine registers. Manieri listed an annual rent of seven staia of grain and six barili of wine for this land (AC, vol. 270, f. 13r). He also listed a debt to the heirs of maestro Ugolino in the amount of three florins (12 lire). The declaration of the heirs of maestro Ugolino lists the debt of three florins as well as the rent of six barili of wine but only lists four staia of grain (AC, vol. 77, f. 136v).

Thus, it is clear that some reports of landlords and tenants did not match, and in some cases, the tenant declared more rent than did the landlord, as would be expected on the basis of the tax incentives. Yet these were a small minority of the cases, and there may be alternative explanations for the discrepancies. Indeed, from the point of view of the rental contract, there is little reason a tenant would overreport, or a landlord underreport, the amount of the rent, especially if there was any chance the other party in the contract might discover the inaccurate report. The tax incentives may have been irrelevant with respect to the landlord's interest in receiving the entire rent; after all, in the end, the amount saved by lowering the amount of the tax would not, in most cases, have made up for the loss of income because households were taxed at a relatively small percentage of the total amount of their taxable wealth. Similarly, if tenants declared a larger rent than they had paid to try to lower their tax burdens, would they be discovered by their landlords, who might demand this higher rent?

In fact, in the cases in which the amount declared by the landlord did not match the amount declared by the tenant, there was a tendency for the tenant to underreport the rent in comparison to the landlord. Of the total 62 cases of matching pieces of land, there were 11 cases in which the amount of rent declared by the landlord was larger than the amount declared by the tenant. This is the direction of the difference that would be expected on the basis of the incentives of the rental contract. Indeed, if the most important incentive

for individuals was the maximization of their own incomes, tenants generally would have had an incentive to underreport the rent, while landlords would have had an incentive to overreport the rent. For example, Antonio di Lorenzo Cosi was an inhabitant of Montecatini who declared that he rented a piece of land from Piero di Lorenzo for one staio of grain (AC, vol. 270, f. 74v). Piero di Lorenzo Costi, who, despite the variant spelling of his family name, must have been the brother of Antonio, declared that Antonio was his tenant and that his annual rent was 1.5 staia of grain (AC, vol. 270, f. 55r).²⁸ Antonio di Lorenzo Cosi also declared that he leased a piece of land from the religious institution, the altar of the Virgin Mary, and that he owed an annual fixed rent in kind of 1 staio of grain (AC, vol. 270, f. 74r). The declaration of this religious institution lists Antonio as their tenant but gave the rent as 1.5 staia of grain (AC, vol. 182, f. 39v; vol. 198, f. 698v). Similarly, Giovanni di Antonio declared that he rented a piece of land from the works of San Michele for an annual rent of .5 staio of grain (AC, vol. 270, f. 82r). Giovanni is listed as a tenant in the declaration of this religious institution, but the rent is given as 1.5 staia of grain each year (AC, vol. 198, f. 702r). Another example is given in the declaration of Bertino Lemmi, who declared that he rented a piece of land from Cecco di Bertino, his brother,²⁹ and gave the rent as 1.5 staia of grain (AC, vol. 270, f. 103r). The declaration of Cecco di Bertino Lemmi lists the rent for the piece of land that was leased to Bertino Lemmi (although it does not specifically mention his name) as an annual rent of 10.5 staia of grain (AC, vol. 270, f. 46r).³⁰

As already noted, some of these discrepancies may result from a difference in redaction dates. Giacomello Mingozzo rented three pieces of land from ser Ferrantino di Niccolao and declared that he owed 8.5 staia of grain (AC, vol. 270, f. 61v). The declaration of ser Ferrantino also lists Giacomello as a tenant and gives a rent of 10.25 staia of grain (AC, vol. 79, f. 602v). Ser Ferrantino, though he was originally from Montecatini, was registered in Florence (AC, vol. 79, f. 601v). As has been noted, most of the Florentine registers were redacted somewhat earlier than those from Montecatini (Herlihy and Klapisch-Zuber 1985: 22). Salduccio di Lenzo was also a tenant of ser Ferrantino. Salduccio declared that he owed 6 staia of rent, while ser Ferrantino declared that Salduccio paid him an annual rent of 7.75 staia of grain (AC, vol. 79, f. 602v; vol. 270, f. 19r).

Similarly, Antonio d'Agnolo leased a vineyard from the heirs of maestro

Ugolino, who lived in Florence, and declared that he paid an annual fixed rent of 10 barili of wine (five some) (AC, vol. 270, f. 12r). At the standard price of 26 soldi for each barile, the monetary value of the rent would have been 13 lire. The declaration of the heirs of maestro Ugolino, Piero and Giovanni, also lists Antonio d'Agnolo as a tenant but gave the rent as eight barili of wine and .5 libbra of olive oil (AC, vol. 77, f. 137r). At the standard price of 5 lire for each libbra and the standard price for wine, the monetary value of the rent declared by the heirs of maestro Ugolino would have been 12 lire and 18 soldi. This was only slightly less than the monetary value of the yield declared by Antonio, though the types of crops and the amounts also differed between the two declarations.

These documents provide a final piece of evidence. As noted above, much of the information I analyzed in this section was listed on the Catasto declarations even though it was unnecessary for the purposes of taxation. One other pattern of reporting is worth noting. In a number of cases, the tax officials did not recopy the list of properties and rents declared by tenants but simply noted that the individuals owed rent to many other people, all listed in detail on their Portate. For example, the Portata declaration of Cola di Nardo lists information about rental property, which the scribes did not recopy onto the Campione. His Portata declaration lists in detail 13 pieces of property that he rented, providing the rent, the yield, the boundaries, the size, and the name of the landlord (AC, vol. 237, f. 352r–353r). This Portata was written by Antonio di Cola, who was living with him. Antonio noted on the Portata that he wrote the declaration for his father, at his request. Antonio also noted that his father was old and unable to write or read (AC, vol. 237, f. 353r). The property rented by Cola di Nardo is not listed in detail on the Campione. The scribes simply indicated that he rented land from a number of individuals (AC, vol. 270, ff. 125v). Again, tenants were providing more information than requested by the tax officials. In fact, the amount of information was overwhelming, and the scribes did not bother to record it on the Campioni.

Comparing the amounts of the rent and the terms of the contracts declared by both landlords and tenants illustrates several important points about numeracy and incentives for reporting. First, many individuals provided more information than was required by the tax officials, including information not used for taxation. This suggests that rural inhabitants had more information than the tax officials requested and that their knowledge of these transactions—and thus, more generally, the level and extent of numeracy—

preceded tax assessment. Second, the pattern of reporting did not, in the majority of cases, conform to tax incentives but, rather, to landlords' and tenants' interests in the rental transaction itself, either by ensuring that the two parties agreed upon the amount of the rent or by attempting to maximize their incomes. Again, as the preceding section also illustrates, this evidence suggests that numeracy was useful to rural inhabitants for a variety of reasons and thus supports the bottom-up rather than the top-down view of the interactive effect of states and societies on numeracy. Individuals were providing more information than was required by the tax officials and their reports of this information were not primarily determined by tax incentives (though of course such incentives were not irrelevant). Tax officials must have capitalized on the preexisting level and extent of numeracy rather than spread and developed numeracy in the wake of their activities.

Conclusions

In the social science literature, the most common explanations of numeracy are formal education, market capitalism, and government bureaucracies. While these explanations are often plausible, they may ignore the everyday uses of numeracy. This article redresses this imbalance by providing a view from below.

To provide a theoretical motivation for this interpretation of numeracy, I drew on two distinct literatures. First, the sociological literature on state-making shows that governments must take advantage of preexisting levels of marketization when assessing taxes (Ardant 1975; Tilly 1992; see also M. Levi 1988: 180–81). Taxes on assets or incomes are feasible only when there is some preexisting marketization. This argument can be extended to suggest that states often take advantage of the preexisting level and extent of numeracy to collect information, such as official statistics, tax assessments, or censuses. Second, the ethnomethodological literature illustrates how and why governments might be able to take advantage of an already numerate population and suggests that numeracy can be a part of everyday life, part of “members’ methods” used to make sense of the world. This article addressed these two points by describing the many uses of numeracy by rural inhabitants apart from tax assessment and by showing how patterns in matched documents illustrate that individuals’ numerical knowledge exceeded tax officials’ demands and that the content of this knowledge was not necessarily determined by tax collection.

Notarial documents and Catasto declarations point to the many uses of numeracy. A wide range of transactions was recorded in these documents, including loans, dowry declarations and restitutions, sales of land and houses, and testaments, transactions that were central to economic life in many regions of rural Tuscany in this period. The rural economies in these regions were based on smallholding, partible inheritance, and local markets for land, labor, and commodities. Rural inhabitants were engaged in a variety of transactions for relatively small amounts of money. Participation in this type of economy required numeracy. Thus, as the ethnomethodological literature suggests, numeracy may be a part of the everyday attempts to organize, classify, and interpret information. It is not necessarily imported from the elite segments of society.

To address the argument about the relation between tax assessment and numeracy, I matched documents. These documents show that rural inhabitants responded to tax incentives but that tax incentives were not always the primary motivation for reporting. The pattern of reporting suggests that individuals had knowledge of the information that was to be requested by tax officials in advance of this request; they were not attempting to learn it in response to the redaction of the Catasto. Matching notarial documents and Catasto declarations illustrates that, in the case of sales of land, rural inhabitants may have underestimated the value of their assets, as would be expected on the basis of the tax incentives. However, as some of the sales predate the Catasto declarations and provide more information than the Catasto registers, it is clear that rural inhabitants knew about the quantitative aspects of their property before tax officials' requests for information. Other patterns of reporting, however, illustrate that tax incentives were not always paramount. In particular, matching landlords' and tenants' Catasto declarations shows that few cases followed the pattern of reporting that would be expected on the basis of tax incentives. In fact, most declarations matched; landlords and tenants declared the same amount of rent. As Carruthers and Espeland (1991) argued, numeracy must have been useful for ensuring honest transactions. These documents show not only that individuals often provided much more information than was required, but also that their numerical knowledge of their assets predated tax officials' requests for information. These findings extend the argument of Ardant and Tilly, that states capitalized on preexisting information when assessing taxes. In particular, it shows that the Florentine tax officials made use of preexisting levels of numeracy when assessing taxes.

I argued that the rise of numeracy is a process with two components, its spread (more individuals becoming numerate at any given level) and its development (individuals becoming competent at higher levels of numeracy). Instead of assessing the rise of numeracy by defining any given level and comparing these levels at points of time or in different regions, I used the results from the matching documents to assess the directionality of the interactive process between states and societies. On one hand, if the state's information-collecting activities contributed to the rise of numeracy, that is, if more individuals became more numerate at any given level and more individuals became numerate at higher levels of numeracy, then it is reasonable to expect that individuals would know less than, or perhaps just equal to, what was required from them. Furthermore, the content of the information would be strongly shaped by the incentives embodied in the state's requests. On the other hand, if the state was merely taking advantage of whatever level and extent of numeracy already existed, then it is reasonable to expect that individuals would know more than what the state requested from them and that the content of the information would not be strongly influenced by the state's agenda. The Tuscan evidence supports the latter interpretation. Individuals either had more information than was requested from them or knew the information in advance of the state's request for it. Furthermore, although individuals knew of the tax regulations and responded to them, the content of their knowledge was not solely determined by these incentives. Thus, the evidence suggests that the state took advantage of the preexisting extent and level of numeracy but did not necessarily contribute to its rise. Of course, the rise of numeracy was an interactive process, because as one party kept more careful records, the other party was obliged to do so as well. Nevertheless, I emphasize the role of society, and not the state, in this interactive process of the spread and development of numeracy.

Although I focused on one variant of a top-down explanation, the impact of government bureaucracy on numeracy, some of the other explanations can be addressed, at least in passing. The historical literature suggests that there were schools in rural regions, which may have contributed to the overall relatively high levels of both numeracy and literacy. The reputation of some Florentine schools in teaching mathematics is well known, but it is not clear whether this particular type of school existed in rural regions as well or whether rural residents ever attended the Florentine schools. School attendance in Florence was probably high enough to have had a general impact on

literacy and numeracy, but there is simply not enough evidence available to make this assessment for rural regions. Although the social science literature makes it clear that numeracy and literacy can spread even in the absence of formal education, detailed archival research would be needed to examine this argument for rural Tuscany.

The effects of a capitalist or market economy can be addressed more directly, especially in the rural regions that were the focus of this article. The two towns from which much of the detailed archival evidence comes were characterized primarily by subsistence agriculture based on smallholding. This was especially true for Castelnuovo, which was located in a relatively remote rural region of Tuscany, distant from the urban markets of both Florence and Volterra. The economy of Montecatini was closer to Florence and was more marketized. Nevertheless, though both economies had local markets for land, labor, and commodities, neither had a capitalist or market economy. Even in Castelnuovo, however, numeracy was widespread and served a variety of purposes. Again, this evidence does not suggest that capitalist markets had no influence on numeracy, but it does illustrate that numeracy was useful economically even in an economy characterized by local markets.

Thus, by drawing theoretical inspiration from the sociological literature on state building and ethnomethodology, this article provides a view of numeracy from below. It provides a critique of approaches that focus on the ways that numeracy spreads because of states' attempts to collect information from its population. Although numeracy can spread in this way, this top-down approach often ignores the everyday uses of numeracy and the ways that governments must capitalize on preexisting levels of numeracy. Explanations of numeracy—and literacy as well—should include serious considerations of their uses at all levels of society.

Notes

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- 1 “Top-down” explanations of literacy are also common. For some examples of different variants see Clanchy 1993 [1979]; Furet and Ozouf 1982: 149–52; Hoggart 1957; Kowalewski and Saindon 1992: 110–11; and Soltow and Stevens 1981.
- 2 See Tilly 1999 for an excellent critique of top-down accounts of power, including numeracy. Michel Foucault (1990 [1978]: 139–41) makes a related point about measurement, power, and discipline.
- 3 This article does not discuss the literature on the consequences of literacy or of numeracy (see Crosby 1997; Goody and Watt 1963; Scribner and Cole 1981).
- 4 For example, in ancient Mesopotamia, expectations about workers’ performances could be made equivalent to silver, barley, fish, or workdays through a complex system of bookkeeping in largely quantitative language without reference to price (Englund 1991).
- 5 Steven Clayman and John Heritage (in press) provide another interesting way to combine historical analysis of institutions with a micro-level approach.
- 6 Roman numerals, however, were often required by law or preferred legally. It was considered to be easier to tamper with Hindu-Arabic numerals illegally (de Roover 1963: 18; Menninger 1969: 428–31; Swetz 1987: 182).
- 7 In the Catasto, the digit zero was used as a placeholder (e.g., 500 or 1,000) but rarely, if ever, to indicate the quantity zero. Instead, usually a blank was left or a line was drawn (——) to indicate an amount of zero. See Rotman 1987: 7–14 on Hindu-Arabic and Roman numerals and the slow adoption of zero in Western Europe.
- 8 Curiously, though the Catasto contains many different kinds of mistakes in recopying, naming individuals, or applying the regulations (e.g., Herlihy and Klapisch-Zuber 1985: 7), I cannot recall ever finding a mistake in a mathematical calculation, though they were complicated, requiring scribes to convert between currencies, find the monetary value of crop yields, and capitalize incomes (Herlihy and Klapisch-Zuber 1985: 15).
- 9 Public land-measurers (the *mensurator terrarum*) were also known in Tuscany (Wickham 1998: 154).
- 10 In *The Great Transformation*, Polanyi (1957 [1944]: 43–55) seemed to suggest that householding was different from reciprocity, but in the essay “The Economy as Instituted Process” (Polanyi 1957), which was a later work, he seemed to have subsumed householding under the category of reciprocity. In the later work, he may have recognized that householding can be treated as one specific form of reciprocity.
- 11 See AC, vol. 270, ff. 26r and 31r for examples of the use of wage labor in Montecatini.
- 12 For example, personal correspondence of the Medici family mentions grain sold in the Mugello (MAP, filza VIII, numero 36) and more specifically at Scarperia (MAP, filza XX, numero 74).

- 13 See Brown 1982: 126–76 for a discussion of taxation in the Valdinievole and Fiumi 1957 for Volterra.
- 14 Notarial documents were redacted in three stages. The notary first took notes, then rewrote the contract out in full (the *protocollo*). Finally, if one of the parties requested it, the notary could write a somewhat more official version (*instrumentum publicum*) of the document on parchment (Petrucci 1995: 153). The documents discussed below come from each of these three stages.
- 15 See Cohn 1992; Henderson 1997; and Banker 1988: 130–32 for discussions of Tuscan charitable bequests, which were often quite detailed numerically, for example, specifying exact monetary amounts and numbers of masses, prayers, candles, and priests. Many of these bequests were for relatively small amounts of money.
- 16 Where the notarial documents are not paginated, I provide the redaction date.
- 17 It is interesting, however, that the value of the property left to the principal heirs, which presumably was larger than the amounts left as small legacies, was not generally specified. In addition to the examples given in the text, see also Diplomatico, Agostiniani di Montecatini, 13 April 1429.
- 18 The use of credit for businesses was common elsewhere in Tuscany (Marshall 1999: 21, 71–88).
- 19 Francesco (Cecco) di Cennino bought a piece of land in Castelnuovo for 10 lire (NA, vol. 3863, n.p., 15 December 1426). This piece of land appears in the Catasto declaration of Guglielmo and Francesco di Cennino and is valued at a slightly lower amount, eight lire (AC, vol. 272, ff. 468r–469r). Michele di Domenico Righetti bought a piece of land in Castelnuovo for eight lire (NA, vol. 11269, n.p., 25 August 1427). This piece of land appears in the Catasto declaration of Domenico di Domenico Righetti valued at a lower amount, two lire. Michele was the son of Domenico and was listed as a member of his household (AC, vol. 272, ff. 514r–515v).
- 20 The prices were 48 lire and 100 lire, and 50 lire and 60 lire, respectively.
- 21 The prices were 24 lire and 8 lire, 24 lire and 12 lire, 10 lire and 8 lire, 20 lire and 12 lire, 6 lire and 3 lire, and 4 lire and 3 lire, respectively.
- 22 Rural inhabitants were also aware of the necessity for declaring property to preserve their rights. See AC, vol. 241, f. 6v for an example from another small town in the Val di Cecina.
- 23 Throughout this article, I use the measures given in the original documents. The units of money used are florins, lire, soldi, and denari. In the Catasto of 1427, 4 lire were equal to 1 florin (*fiorino*), 20 soldi were equal to 1 lira, and 12 denari were equal to 1 soldo. The measure of volume used for most varieties of grain was the *stajo* (bushel). The measure of volume for wine was either the *barile* (barrel) or the *soma* (plural *some*) (literally, “load” [Istituto della enciclopedia italiana 1969: 323]). The measure of volume for olive oil was the *libbra* (pound). In this article, I have standardized the spelling of these measures given in the original documents. In all instances where currency or measures had to be converted, I used information given on the original documents,

- as much as possible, to make these calculations. The standard prices for agricultural commodities are also taken directly from the Campioni.
- 24 These institutions had various names in Italian, and I have simply translated them as literally as possible, such as *altare* (altar), *compagnia* (company or confraternity [Henderson 1997: 1]), and *opera* (work or works). Some were charitable organizations for the poor; others were commissions to tend to the material well-being of the church. Following Herlihy and Klapisch-Zuber 1981b, I use *institution* as the general term to designate all of them.
- 25 It is also interesting that Giacomello's declaration uses *fitto* for the share rent in this case, although this term usually refers to fixed rent, not a share rent.
- 26 In the documents, this is always spelled Charmino or Santa Maria del Charmino.
- 27 Other examples of declarations giving the income from rental property include AC, vol. 270, ff. 62v–64r, 89v–91v.
- 28 The spelling of these names causes some difficulties. The spellings given in the text of this article are from the Campioni. Herlihy and Klapisch-Zuber (1981a) gave different spellings of these individuals' names: Piero di Lorenzo Tosci and Antonio di Lorenzo Tori. It is not clear whether the differences between my transcription and Herlihy and Klapisch-Zuber's are because of a different reading of the letters on the document or because Herlihy and Klapisch-Zuber standardized the spellings.
- 29 Although it is not clear from the names that these individuals are brothers, the declaration of Bertino Lemmi explicitly states this (see also the Portata, AC, vol. 237, ff. 438r–440r).
- 30 In this case, the name of the tenant is not given on the Portata (AC, vol. 237, f. 187r), but the match seemed unambiguous.

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