

Insurance without Kin? Private-Order Institutions in Gold Rush California

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During much of history, the primary form of insurance against negative health shocks and the related income shocks has been the extended family. What, if anything, emerges in settings such as the California gold rush where individuals desire insurance but neither kin nor markets are able to provide it? We show that during the California gold rush, multilateral, private-order institutions supported the formation of implicit contracts within (typically all-male) households regarding care for household members who became sick or disabled. Alternative hypotheses such as altruism and markets for nursing and alternative institutional forms have limited abilities to explain observed patterns of care for the sick. Finally, the solutions to the problems of adverse selection and moral hazard in California foreshadowed the ways in which early insurance markets would address these problems.

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1. Introduction

The primary form of insurance against negative health and income shocks during much of history, and in many parts of the world today, has been the extended family (Townsend 1994, Udry 1994, Gertler and Gruber 2002, Fafchamps 2003). In this context, insurance often has two related components – physically caring for the sick individual and transfers to ensure that basic needs for food, shelter and clothing are met. Insurance through kin is, however, neither optimal nor always available. It is not optimal, because extended families have different incidences of sickness and disability and different resources available to meet the needs of family members who are sick or disabled. Further, insurance through kin is problematic for individuals living relatively far away from the kinship network. In some settings, these factors have provided the impetus for the development of markets for sickness insurance and later markets for health and disability insurance.

What, if anything, emerges in settings where individuals desire insurance but neither kin nor markets are able to provide it? To examine this issue, we study the California gold rush – a setting in which men desired insurance but neither kin nor markets were able to provide it.¹ Specifically, we use historical evidence from diaries and letters together with data from the 1850 Census of Population, which was taken at the height of the gold rush, to examine how miners addressed the issue of sickness and disability. Miners in the Gold Rush were very concerned about falling ill. Many, but by no means all, sick gold miners were cared for by male companions with whom they lived and

¹ Others settings in which this arises include the military and prisoner of war camps. See Costa and Kahn (2003, 2007).

mined for gold. We show that altruism or a market for nursing services do not explain the patterns of observed care.

Despite the challenges for institutional emergence posed by the growing number of miners and their high mobility, we find that institutions did emerge, and they took the form of multilateral private-order institutions. These institutions provided participants with incentives to comply with implicit contracts of assistance when miners fell ill by tying past behavior to the ability to obtain insurance in the future. Much of what we know about multilateral institutions comes from studies of the institutions that supported pairwise interactions among merchants (Greif 1989, Milgrom, North, and Weingast 1990, Greif 1993, Clay 1997a, Clay 1997b).² The multilateral institutions that emerged in California differed from the merchant institutions in that members of the household were collectively responsible for providing care to sick companions. Thus, the incentives not to cheat on the implicit contract applied not to a single merchant but to healthy gold miners within the household. In general, multilateral institutions dominated bilateral private-order institutions, because they provided both better insurance and better incentives for compliance with the implicit contract. Adverse selection was mitigated by choosing healthy individuals to live and work with. One implication is that not all miners would be insured. Sick miners lived with the individuals who provided the insurance, which mitigated problems of moral hazard.

Our findings contribute to three literatures – the historical literature on the California gold rush, the literature on economic institutions, and the literature on insurance.

Historians have noted that sickness and care were issues during the California gold rush,

² Some important exceptions include Ellickson (1989 and 1991) on whaling and property rights among cattle ranchers.

but have had little to say about why individuals cared for sick companions.³ This research explicitly addresses the issue of why. The literature on institutions, particularly private-order institutions, has focused almost exclusively on merchants.⁴ This work expands the focus beyond merchants and shows that the multilateral institutions that emerged during the California gold rush differed in important ways from the multilateral institutions that governed merchants. Finally, this research contributes to the literature on the emergence of markets for insurance.⁵

The organization of the paper is as follows. Section 2 describes kinship-based insurance in more detail. Section 3 documents that miners were concerned about sickness and that sick miners were often, although not always, cared for. It then evaluates six hypotheses regarding how incentives for care were maintained. Section 4 provides detailed historical evidence that the key elements necessary for the operation of multilateral, private-order institutions were in place. Section 5 discusses the emergence of organizations in the United States during the nineteenth century from which workers could obtain insurance. Section 6 concludes.

2. Insurance with Kin

As we noted in the introduction, the primary form of insurance against negative health and income shocks during much of history, and in many parts of the world today,

³ See Bancroft (1888), Paul (1947), Rohrbough (1997), Johnson (2000), Roberts (2000) and Owens (2002).

⁴ See, for example, Greif (1989, 1993), Milgrom, North, and Weingast (1990), Greif, Milgrom, and Weingast (1994), Landa (1994), Clay (1997a, 1997b), McMillan and Woodruff (2000). More generally, see North (1990, 2005).

⁵ See Pollak (1985), Townsend (1994), Udry (1994), Gertler and Gruber (2002), and Fafchamps (2003) on insurance through kin. See Emery and Emery (1999), Fishback and Kantor (2000), Thomasson (2002), Gottlieb (2006) and Murray (2007) on early insurance markets.

has been the extended family.⁶ Suppose an adult male is sufficiently sick or disabled that he requires both nursing care and resources to insure that his and his dependents' basic needs for food, shelter, and clothing are met. The solution has most often been, and in many locations continues to be, an implicit contract under which female relatives provide nursing care and male relatives provide the resources necessary to meet basic household needs. The first line of nursing care is provided by the spouse and older female children, but additional services are frequently provided by other female relatives. Fathers, brothers, older sons and other male relatives make transfers of food, labor, or money. Because caring for the sick is costly, the implicit contract of mutual assistance is typically confined to the kinship group.

The most common problem in insurance markets – adverse selection – is mitigated by birth into a particular family. Individuals are born into a multi-generational structure governed by the implicit contract of mutual assistance. Repeated interaction together with the threat of ostracism or other punishment for violation of the implicit contract provides the incentives for family members to adhere to the implicit contract over time. It is worth noting that the incentives have never been sufficient to guarantee the adherence of all family members in all families to the implicit contract of mutual assistance. That said, historically most family members in most families have provided assistance to sick or disabled family members.

A second major problem in insurance markets is moral hazard. Families mitigate moral hazard through monitoring by both male and female relatives. Family visits to sick

⁶ See Townsend (1994), Udry (1994), Gertler and Gruber (2002), Fafchamps (2003). Pollak (1985) has a detailed discussion of insurance through families, which addresses many of the issues mentioned here. Ellickson (2008, p. 290-292) has an intriguing discussion of the determinants of household size. For example, in periods when law and order is limited, household size is larger. This may be in part a reflection of the increased cost of insurance with kin when kin are not co-resident.

members clearly serve a number of purposes including the transfer of resources, comfort and socialization, and monitoring. Moral hazard is also mitigated by the low level of transfers of resources. In most families, resource transfers are only sufficient to meet the most basic needs of the male and his dependents for food, shelter, and clothing. This gives the male the appropriate incentives to return to work at the earliest opportunity.

The fact that the family or kinship unit has historically provided insurance against sickness and disability does not imply that this arrangement has been optimal. Some families have a higher percentage of sick or disabled individuals than other families. Moreover, some families have a greater resource base on which to draw to meet the needs of sick or disabled members than other families. Indeed, variation in families' ability to self-insure was one of the factors that led to the development of broader insurance markets. Another factor was that insurance through kin is not very effective if individuals live far from other family members.

3. Insurance without Kin

Given that the family was historically the dominant, and typically the exclusive, provider of insurance, what will happen if men fall ill in a setting where kin are absent? This raises a number of distinct questions. Will institutions emerge to enforce implicit contracts of mutual assistance? And if institutions emerge, what form will they take? Finally, how will these institutions mitigate problems of moral hazard and adverse selection?

We use the California gold rush as a case study in which to examine institutional emergence and operation. The California gold rush is a rich setting in which to discuss

these issues for a number of reasons, including its historical importance, the fact that a very large number of men traveled from many different locations to a virtually undeveloped location and so had to confront a variety of issues including insurance without kin, and the fact that the California gold rush is relatively well documented.

Below we will show that miners often were sick and that many – although not all – sick miners were cared for, despite the high cost of care. The question is why. We evaluate six hypotheses – two non-institutional hypotheses and four institutional hypotheses – that can explain why sick miners were cared for. Care may have been supported by:

- Altruism
- A market for nursing services
- Public institutions
- Centralized private-order institutions
- Bilateral, decentralized private-order institutions
- Multilateral, decentralized private-order institutions

Sickness in the Gold Rush

The evidence that we draw on in this paper comes from the 1850 Census of Population and the hundreds of surviving letters and diaries. These letters and diaries provide direct evidence on various aspects of miners and mining.⁷ The 1850 Census provides detailed data that supplements the information in the diaries in important ways.

⁷ While these sources are invaluable in many respects, it is important to keep in mind that most writers were drawn from a select group – white, middle-class Easterners. Historians have advanced some further hypotheses about the nature of the bias including the fact that writers were often married or engaged, which gave them a reason to write. (See Owens (2002) and Roberts (2000).)

Unlike the diaries and letters, it covers virtually everyone who was present in a particular location on a particular day.⁸ We use newly collected 100-percent samples for five mining counties – El Dorado, Mariposa, Sutter, Tuolumne, and Yuba. The area covered by these counties is shown in Figure 1. The data includes 43,866 people who were living in 12,178 households. Eighty percent of the individuals in these counties were gold miners. The total number of California gold miners recorded in the 1850 census was about 60,000, so this sample represents 59 percent of all miners. The census contains detailed information on household structure, earnings from mining (in El Dorado county), and real estate wealth.

Miners frequently fell sick or were hurt. Nearly every diarist and letter writer mentioned illness, typically more than once.⁹ In October 1849, William Miller recorded in his diary that Cousin Charles was sick with a fever. He added “Mr. Tinkum is also laying sick in the same tent, which makes 4 out of the eight sick and disenabled.”¹⁰ James De Pue wrote to his wife in January of 1850 ““I do believe I have friends here that would not see me suffer if I should be sick but I hope I may not have to trouble them. But I do not know how soon I may be sick. I have seen more sickness since I have been here than I ever saw before.”¹¹ In March 1850 S. Shufelt wrote to his cousin: “Wm Ramsdell & Cooke of our party were sick with the scurvy & could not work. This is the worst disease that we have to contend with here ... Some are also troubled with diarreah, others with ague & fever & various other diseases incident to all new countries. It is quite sickly here

⁸ Native Americans were not enumerated. See Clay and Jones (2008) for a detailed discussion of data quality in the 1850 Census.

⁹ In some cases, overland companies would stop for a day or two to allow the sick person to recover. Spooner (1849), p. 11. Headley (1849), p. 11. Cone (1849), p. 33

¹⁰ Miller (1849).

¹¹ De Pue (1850).

& every person ought to be very careful & not expose himself more than is necessary.”¹²

The physician Israel Lord wrote in his diary in May 1850 that “Mr. B. states that the Granville (Ohio) Company, to which he was attached, had 32 members, all of whom came through safe, and now more than one-third are dead.”¹³ Later that year, Lord wrote “The mortality among the immigrants is much greater than last year, and hundreds of the sick.”¹⁴ Another physician, James Tyson, wrote “A good deal of sickness prevailed, and my services were in great demand. The principal diseases that afflicted the miners were scurvy, rheumatism, dysentery; and brain, intermittent remittent, and continued fevers; these latter, in many cases, early assuming a typhoid character.”¹⁵

The importance of sickness is underlined by evidence from sources other than letters and diaries.¹⁶ The first source is mining district constitutions, which were established to govern property rights in specific geographic areas. Of the 60 mining district constitutions written between 1850 and 1854 in the data set compiled by Clay and Wright (2005), fifteen constitutions explicitly exempted sick miners from work requirements. Given that miners were not required to mine every day to maintain property rights, additional provisions for sick miners suggest sickness was common and frequently prolonged. Further these provisions indicate that the miners were willing – at least in principle – to protect the property rights of the sick.¹⁷ The second source is the surviving written bylaws of mining companies (groups of miners who entered into partnership together). Stillman Churchill recorded the laws of the Oskaloosa Company. These laws

¹² Shufelt (1944), p. 17.

¹³ Lord (1999), p. 251.

¹⁴ Lord (1999), p. 294.

¹⁵ Tyson (1850).

¹⁶ See also James Pratt’s December 1849 letter in Cumming (1974), p. 71; D. C. Downer and D. T. M’Collum’s letters in September 1849 and October 1849 in Bidlack (1960) and Baur (1949).

¹⁷ See also Zerbe and Anderson (2001, p. 132), who consider this both fair and efficient.

were written in California after the company had been mining and so were likely to reflect actual practice. “Article 6th in case any member of the Co-y shall be sick while the Co-y are mining, he shall draw from the treasure one ounce a day until the Co-y can procure a hand to fill his place said hand shall be paid out of the members funds for who he shall labour & said member shall receive an equal propotion of all the earnings of the Co-y after such hand is procured.”¹⁸

Caring for sick companions was costly. Caregivers faced high opportunity costs in terms of lost wages or earnings from mining. Losing even a half of a workday was significant, especially in light of the high costs of food.¹⁹ Further, the caregiver faced the risk of catching whatever the sick person had. According to the mortality statistics from the 1850 Census, the most common killers were cholera, diarrhea, fever, and dysentery.²⁰ All were communicable.

Sick miners strongly desired care. What we know, both from the foregoing evidence and from evidence that we present later, is that men wanted to have someone to care for them when they were sick. Although there is no direct evidence on this point, if a miner had someone to nurse him when he was sick, his probability of survival would likely have been increased. For example, individuals with caregivers may have been less likely to have experience dehydration or starvation. Even if it had no effect on survival, having someone to provide care made the experience less unpleasant for the sick miner.

¹⁸ Churchill (1849), p. 44

¹⁹ Clay and Jones (2008) discuss earnings and the ratio of earnings to the cost of food in California. In comparison, the average miner in El Dorado County made 1.80 times the cost of board, which is substantially less than what the average day laborer made in the United States.

²⁰ Only 905 individuals are listed as having died within the last year in California by the census. This number almost certainly understates the overall death rate, however, since the question only asked about individuals who died in that location during the year ended June 1, 1850. Of these, 596 of the dead are listed as having lived in Sacramento county. Further, many of the mining counties list zero deaths, despite evidence from diaries and newspapers of sickness and death being common. On dysentery, see Bonniwell (1850).

Despite the high cost of providing care, men typically cared for sick male companions. In his social history of the mines, Malcolm Rohrbough states, “The mining company as a unit of work and living offered support in case of sickness and even in case of death. Here were the companions who would sit up with the ill miner, fetch the doctor, and make the soup.”²¹ Evidence from diaries supports Rohrbough’s statement. When Gordon Cone contracted typhus fever “I directed one of my men how to make some gruel and ... [told them] feed me once in fifteen minutes during the night.”²² George Evans noted that one of his friends “Mr. Parker, [was] an excellent and attentive nurse in sickness.” John Gish wrote to his wife May in December 1850 about the deaths of his friends Joseph Hill and John Hodge. “They both lay sick nearly six weeks and I attended on them all of that time except the last six days that time John knew nothing and the last three days Joseph knew nothing. I never had such a job before. I was up day and night with them until I was entirely dunout and was taken sick the next day after they was buried and was sick one week but have got tolerable stout.”²³ Jean-Nicholas Perlot in 1852 records in considerable detail his sickness, the sickness of several companions and neighbors, and nursing services that he and his companions provided for one another.²⁴

Altruism and a Market for Nursing Services

We begin by addressing the two alternative hypotheses. Altruism – defined here as the “unselfish regard for or devotion to the welfare of others” – appears not to have been

²¹ Rohrbough (1997), p. 77.

²² Cone (1849), p. 187.

²³ Gish (1850), December 29th, 1850.

²⁴ Perlot (1985), p. 142.

common.²⁵ William Daingerfield hints in a letter to his mother of the problem: “I pity the poor devil who is sick here without money. All come here to make money and the kindly sympathies are left behind them.”²⁶ The historian Milton Quaife describes the situation as follows “The principle of “every man for himself” was most strictly followed out, and a sick man seemed to be looked upon as a thing to be avoided, as a hindrance.”²⁷ William Taylor, a Methodist minister, spent time caring for the sick and dying in the San Francisco City Hospital in 1849. His description was grim: “There [at the hospital] are husbands and sons and brothers thousands of miles from sympathizing kindred and friends dying in destitution and despair.”²⁸ These quotes and many other letters and diary entries suggest that altruism was not the norm. In a setting where the majority of men were altruistic, all of these men would have found individuals to nurse them.

The market for nursing services to a first approximation did not exist. Harvey Chapman’s letter to his wife illustrates this point. Chapman wrote that when he was sick, “I had no one to stay with me in the tent and could hire no one.” Desperate, he enquired if there was a Mason in the crowd at the eating house and one man, being a fellow mason, agreed to nurse him until breakfast the next morning.²⁹ Some doctors existed in the mines, but their knowledge was limited and their prices were high.³⁰ Further, doctors would not take on the tasks of a nurse such as feeding, cleaning, and comforting the patient. Miners could also go to a hospital, but there were relatively few hospitals.

²⁵ Merriam-Webster Online.

²⁶ Quoted in Rohrbough (1997), pp. 319-320.

²⁷ Quaife (1949), p. 63.

²⁸ California Council of Humanities (1997), p. 238.

²⁹ Quoted in Rohrbough (1997), p. 77.

³⁰ Lord (1999), p. 195

Crowded and hugely understaffed, the hospitals may well have increased the probability of death by exposing the sick to a variety of other diseases.³¹

The most obvious candidates to act as nurses were women, but they were in extremely short supply. Women represented about 3 percent of the population in the mining counties. Although we do not have an accurate count, a decent number of these women were probably prostitutes. Further, most other women – even married women with children – worked as cooks, seamstresses, laundresses, or boarding house owners.³² Given their high earnings, they were unwilling to act as nurses for anyone other than their immediate family.

Given the high value of women's skills, including nursing skills, one question is why there weren't more women in California during the gold rush. In the initial stages, the high cost, the rigorous nature of the trip, and the fact that the rush was expected to be temporary were all limiting factors. A few hearty women traveled overland with their husbands and children, but the trip was long and very physically demanding. The trip by sea was easier, but privacy was almost nonexistent, the cost of a ticket was high, and the risk of sexual assault may have been substantial. Few women wanted to endure these conditions if they were likely to have to return home within a year or two. As prices fell, conditions improved, and it was clear that the rush would continue, women began to make the trip in much greater numbers. Some went at the behest of husbands or suitors. Others went to find husbands, for the adventure, or to make their own fortune. By 1860, the gender imbalance – while far from equal – had eased somewhat.

³¹ Lord (1999), pp. 292, 296. On hospitals, see Bancroft (1884) and Lovell (1943).

³² Hurtado (1999) has a nice discussion of women in the gold rush. He reports that white males per female in California as a whole fell from 12.2 in 1850 to 2.4 in 1860. Johnson (2000) and Levy (1990) also cover important aspects of women's lives in the gold rush.

Thus, altruism and the existence of a market for nursing services have a limited ability explain the observed patterns of care for sick miners.

Public and Centralized Private-Order Institutions

Public (governmental) institutions could in theory have supported care for miners. They could have done so in two ways – directly through provision of services and indirectly through enforcement of contracts concerning care when sick. As we discussed previously, there were a small number of public hospitals, where sick miners could go for care. Few actually received care in these locations, because capacity was extremely limited and the risk of death was high. The extremely limited provision of health services is not surprising, given that California did not become a state until 1850. County government was in its infancy, and county revenues were low. Hence, government had neither the institutional capacity nor the revenue necessary to provide more extensive health services.³³

Courts could also have supported care through contract enforcement. There is no evidence that courts were used for this purpose on any scale. That is, we cannot rule out the possibility that a court enforced a written contract concerning care at some point, but the lack of evidence on this point suggests that it must have been uncommon. The reasons for this are fairly straightforward. There were a limited number of operational courts, and they were often distant from the mines. Further, a sick miner was in no position to seek the involvement of the courts. The courts could be used ex post to seek damages for breach of contract, if a sick miner did not get care and happened to survive.

³³ See Clay and Wright (2005) for a discussion of governmental authority in the mines.

But it is more likely that a surviving miner punished potential caregivers directly or simply went back to mining.

Given the limited ability of public institutions to explain observed patterns of care, we turn to private-order institutions. Individuals in the mines faced a commitment problem. It was costless to promise *ex ante* to take an action such as to care for a sick companion. When faced with a sick companion, however, caregivers may have wanted to break the promise, because of the opportunity cost of taking care of the sick companion and the increased probability of getting sick if the disease was communicable. Private order institutions overcame the commitment problem by tying past behavior to current and future outcomes such as the ability to find new individuals to mine and work with or social acceptance when a miner returned home.

We begin by discussing centralized, private-order institutions. Such institutions could do one of two things. Typically for merchants such institutions maintain information on reputation. In essence they act as a formal or informal credit bureau.³⁴ This type of institution, for example, supported trade at the Champagne fairs.³⁵ Their role as collectors and transmitters of information gives merchants an incentive to behave honestly. Analogously, if such an institution existed in California, miners could have obtained information on the past behavior of potential partners. Most critically, they could obtain information on potential partners' adherence to implicit contract. In practice, such a system would have been difficult to operate for a number of reasons. First, although in principle the contracts could have been written, in practice the contracts were typically implicit. Second, sick miners who were not cared for were likely to die.

³⁴ Trade associations have also served similar functions.

³⁵ Milgrom, North, and Weingast (1990).

Thus, they were unlikely to report breach of contract. Third, the cost of obtaining information in time and money was very high.

There is no historical evidence to suggest that this type of centralized, private-order institution arose in California. Had they arisen, we would have expected them to have been mentioned in the surviving letters and diaries. The failure of centralized, private-order institution to emerge was probably in part due to the high cost of acquiring information from a centralized location. In the Champagne fairs, merchants were physically present at the fair, so the cost of checking on a trading partner's status was low. The cost was higher if the inquiring individual did not happen to be physically located near the place where information was recorded. In the nineteenth century United States, the reliability of the mail and the telegraph and their relatively low cost made it feasible to check on trading partners with distant credit bureaus and trading associations. In California during the gold rush, however, mail was expensive and unreliable and the telegraph was nonexistent.³⁶

A different type of centralized, private-order institution could in principle have delivered services. Religious or cultural organizations often provide some insurance for members, typically informally through the provision of meals and other assistance to the sick, elderly, or poor. Incentives for helping others arise from a number of sources – the religious mandate itself, the threat of ostracism or punishment by other members including the religious leader, and the potential need to access services in the future.

During the early years of the gold rush, we do not observe the formation of formal religious or cultural organizations. The reasons were relatively straightforward. Miners

³⁶ On June 25th 1851, James Burr wrote to his wife that he had just received three of her letters dated February, March and April 28th. Burr (1851), June 25th, 1851. Rohrbough (1998), p. 134. California Council of Humanities (1997), p. 215. Du Boff (1980).

were extremely busy – most worked six days a week and used the seventh day for chores, rest, and entertainment. To be sure, some miners were religious. They read the Bible alone or in small groups on Sundays. But from all accounts, in California most previously religious men did not maintain their religious outlook once separated from friends and family. Even had there been enough men to form a religious organization, there were relatively few priests, ministers, and rabbis in the gold rush counties.³⁷ Further, women – and not men – traditionally provided most of the meals and other assistance to the sick, elderly, or poor.

Having argued that public and centralized private-order did not emerge to provide or support the provision of insurance without kin, we consider the remaining two hypotheses. They are that multilateral private-order institutions or that bilateral, private-order institutions emerged to support the provision of insurance without kin.

Decentralized Private-Order Institutions: Multilateral vs. Bilateral

Under what conditions are decentralized private-order institutions likely to emerge? Game theory tells us cooperative behavior among pairs or groups of individuals is more likely to emerge if the following conditions hold: the number of players is small, interaction is frequent, the relationship is expected to continue, others' actions are observed at low cost and with a high degree of precision, and the expected cost of punishment is high enough (Kandori 1992a, Kandori 1992b, Dal Bo and Frechette 2007). Empirically, cooperative behavior is also more likely to emerge if the players are more similar. For example, most trading groups consist of merchants from a single ethnic background (Greif 1993, Landa 1981, Clay 1997a, Yarbrough and Yarbrough 2000)

³⁷ Maffly-Kipp (1994).

In the California gold rush, the population was very diverse and increased extremely rapidly. We know something about the size and diversity of population, because the 1850 Census of Population was conducted early in gold rush. The population of California increased dramatically from about 10,000 in 1846 to about 165,000 in late 1850 or early 1851 and to about 261,000 in 1852.³⁸ Table 1 shows the number and share of individuals (nearly all men) ages 20-40 in California in 1850 that were from the top nine states and the top nine countries. New Yorkers were 11 percent of the population and Mexicans were 7.4 percent. Overall, 28 percent of the people in California were foreign-born. By any standard, California was extremely diverse.

Neither of these factors, onto itself would necessarily preclude the formation of decentralized private-order institutions. For example, suppose individuals as they arrived were assigned to towns of 1,000 with a new town opening up as each town was filled. Although population was increasing, at the level of each town, once the town was filled, the arrival of more people would have little impact. Diversity might have little impact or, if it did, then sorting could occur among towns. Once towns filled up, information networks could form, and cooperation would seem likely to ensue.

The problem was that miners were highly mobile. As individuals and groups, they were frequently moving from place to place, hoping to strike it rich.³⁹ Groups tended to dissolve as some members chose to stay in the current location while others chose to move on to other locations. Thus interaction was not necessarily frequent, the relationship was not always expected to continue, and others' actions could be difficult to observe.

³⁸ The 10,000 estimate is from Langum (1987). It excludes the Indian population living in towns and ranches, which he estimates was 7,000. Joseph Kennedy, head of the 1850 Census, estimated California's population to be 165,000 at the time of the census (Anderson 1988, p. 46).

³⁹ Clay and Wright (2005).

The main conclusion to be drawn is that the California gold rush was a challenging setting for the formation of private-order institutions. Despite this, we argue that institutions did emerge to provide insurance without kin for many miners and that these institutions were predominantly multilateral. Why would multilateral, as opposed to bilateral, institutions emerge? It is useful to begin by describing the difference between multilateral and bilateral institutions. Multilateral institutions differ from bilateral institutions in several ways. One critical difference is in punishment. In a bilateral institution, one of the participants in the original transaction or relationship punishes the other participant, often by refusing to interact with that person in the future. In multilateral institutions, people who were not involved in the original transaction also punish the transgressor, often by refusing to interact with that person in the future.

We will briefly discuss the existing work on multilateral institutions as a context for understanding the nature of the institutions that emerged during the gold rush. In multilateral institutions, *pairwise* interactions, often among geographically dispersed merchants, were supported by threat of punishment by a larger group.⁴⁰ These threats were viewed as credible, and so multilateral institutions were able to successfully provide incentives for cooperation among members.

For threats to be viewed as credible, several conditions needed to hold. Group membership needed to be well-defined; norms needed to be commonly understood; interaction with other group members needed to be frequent; information networks needed to provide accurate information at low cost; and the expected cost of punishment needed to be sufficiently high. The last three conditions are evident from our discussion of game theory. The first two conditions need to hold as well, although they tend to

⁴⁰ See Greif (1989, 1993) and Clay (1997a, 1997b).

receive little discussion in the game theory literature. Game theory models typically assume that the number of players is fixed, and so by definition group membership is well defined. Further in game theory models, one typically makes a discrete choice to cooperate or defect. In reality, individuals needed to have a common understanding of who was a member and which of the many possible actions were in accordance with, or were violations of, group norms. In the next section, we will document that the conditions outlined above held.

The institutions in gold rush California were multilateral as well, but there were important differences between these institutions and the multilateral institutions that governed merchants. Specifically, in the next section, we show that in California *small-group*, as opposed to *pairwise*, interactions appear to have been supported, at least in part, by the threat of punishment by a larger group. The small group seems to have been the household.⁴¹ Households typically numbered three to eight people, and they tended to coincide with the economic unit of production. Similar to the merchants, group membership tended to be determined by the state or country of last residence. For example, men from Michigan tended to live and work with other men from Michigan. Men from Michigan who failed to care for a sick companion faced a number of possible punishments. Men from Michigan could refuse to live and work with them in the future in California, and friends and family could refuse to interact with them or otherwise punish them if they went home to Michigan. Thus, the institution provided incentives for members of the household to care for the sick member.

⁴¹ We should note that although we focus on households as units of economic production and insurance, household production extended to a variety of other services including food, shelter, companionship, and protection. Miners undoubtedly valued these aspects as well and may have chosen households in part based on these attributes. On these issues, see Robert Ellickson's forthcoming book The Household (2008), pp. 304-321. On households as units of protection against violence, see Umbeck (1981).

If multilateral institutions were the dominant institutional form – and it appears that they were – it implies that bilateral institutions were in some sense suboptimal. Why might bilateral institutions have been suboptimal? That is, why not just pair up with a friend and promise to care for one another if you get sick? There were three reasons. The first, which we have discussed, is that the natural unit of production and residence was a group of three to eight men. So a bilateral relationship was unlikely to emerge in this context. The second is that larger groups provided better risk sharing. If the implicit contract of mutual assistance only involved two people, there was a nontrivial chance that both individuals might fall sick at the same time and be unable to care for one another. As the group size grew, it was less likely that all miners would be very sick at the same time.

The third is that larger groups probably had stronger incentives to comply with the implicit contract. The risk in a bilateral relationship is that as the sick person gets sicker the future value of the relationship falls. If the cost to the caregiver of caring for the sick companion is high, in the absence of other incentives, he may prematurely abandon the sick miner, i.e., cease care even though there is a significant chance of recovery. The incentive to abandon may have been even stronger if the very ill miner had assets that the caregiver could appropriate. If the information network is dense and the caregiver plans to re-match, he may have an incentive to give optimal care. But in many settings, it may be difficult to evaluate a miner's efforts to save a sick companion, and not all caregivers may have planned to rematch.

With larger household units, incentives for premature abandonment were likely more limited. Other members may have been able to punish the caregiver, if he appeared to be

taking insufficient care of their sick companion. They may have been willing to do this, because even if the caregiver did not plan to rematch, other household members may have planned to rematch. Taking care of sick companions was a household level responsibility, so other household member could be punished even if they were not directly responsible for a sick companion's care. Information networks may also have been denser for larger households, because more people may have been in contact with household members through visits, verbal networks, and letters.

4. How Insurance Was Provided

Having argued that the institutions that emerged were multilateral, decentralized, and private-order, in the subsections that follow, we document these institutions. Specifically, we show the necessary conditions for the operation of multilateral institutions were met in Gold Rush California.

Group Membership

Coalition membership seems to have been related to birthplace or more likely to the state or country of last residence.⁴² This is not surprising given that travel companions were often from the place of last residence. This pattern is not, however, entirely explained by continued interaction with the original travel group. Re-matching with individuals outside the original travel group was common for a variety of reasons including personality, preferred location, preferred occupation, decision to return home, and death. We begin by presenting examples from diaries and then use data from the

⁴² There was very likely additional sorting based on other characteristics such as town or county of last residence, ethnicity, religion, and age.

1850 Census of Population to show that individuals were much more likely to live with individuals from their state or country of birth than we would expect if household formation were random.

Although some men would mine with their traveling companions, it was quite common to find new companions once in California. Usually the process began by dissolving the existing group. One recently arrived Argonaut wrote that his company "has all smashed up . . . I believe that every company that came out here has broke up."⁴³ Benjamin Dinsmore noted that of his group "Four of the boys stopped at the City and the rest all started for the northern mines but James and I. We left the City at 4 o'clock p.m. for the south mines on the steamer S .B. Wheeler." Charles Ross Parke and two companions from the overland trip, Captain Sampson and William Lorton, worked together for a while until Parke and Sampson decided to return to Illinois, leaving Lorton behind in California.⁴⁴ Horace Ladd wrote to his wife in late 1849, shortly after his arrival, "Our company are most of them scattered up and down this river at work mining."⁴⁵

Social historian Malcolm Rohrbough writes: "Not surprisingly, the 49ers once again tended to seek companions from the same town or county or, if necessary, the same state." He provides two examples, a man from Boston who went to the mines with two others from Massachusetts whom he had met in California and a man from New York who found new companions from New York.⁴⁶ William Swain, a Michigan man, wrote

⁴³ Rohrbough (1997), p. 75.

⁴⁴ Parke (1989), p. 86.

⁴⁵ Cumming (1974), p. 68. See also, Boyle (1949).

⁴⁶ Rohrbough (1997), p. 76.

to his brother George on January 6, 1850 of his mining companions. Three were from the group he had traveled with and two more were new additions.

He [Mr. Hutchinson], Mr. Bailey, myself, and Mr. Samuel J. Moore of Calhoun County, Michigan, a Methodist preacher; and Lt. Franklin Cannon of Manchester, Michigan, have agreed to work in the mines on the joint principle.^{47 48}

We now turn from the diary evidence to the 1850 Census of Population, which recorded the birthplace of the men by household. Households were defined as individuals who lived in the same dwelling.⁴⁹ It is useful to begin by discussing about the determinants of household size. During this period, the available evidence suggests that household size was usually determined by the size of the mining company. Mining companies were most often groups of men who worked together as partners. Partnerships tended to include three to eight men with the optimal size being determined by technology and contracting costs. As early as 1848, miners began to use a “rocker” or “cradle,” with which three or four men working together could process a larger volume of “dirt” in a day. During the winter of 1849-50, the “long tom” was introduced. This instrument was an outgrowth of the cradle, but still larger, with two twelve-foot sections operated by three to eight men, and requiring a continuous stream of water.⁵⁰ Larger groups had multiple cradles or long toms or had taken on tasks such as turning a river.⁵¹

Men in mining companies frequently lived together in a single dwelling or, if the group

⁴⁷Swain (1850).

⁴⁸ Additional evidence on the dispersion of old groups and formation of new groups will be presented when we discuss the information network.

⁴⁹ In some locations, there were multiple households living in the same dwelling, such as an apartment building. This was extremely rare in California.

⁵⁰ This discussion draws on Paul (1947), pp. 50-66. Quartz mining began as early as 1849, and enjoyed a speculative boom during 1850-52, followed by a collapse in 1852-53. As placer deposits became exhausted, quartz mining gained as a share of the total; but even in the 1860s, 90 percent of the state’s gold production derived from placers. *Ibid.*, pp. 286-7.

⁵¹ Umbeck (1977) has a nice discussion of the influence of contracting costs on group size. Larger groups reduced the variance of earnings, but at some point the marginal contracting costs exceeded the marginal benefits of more members.

was large, in multiple dwellings. More successful miners sometimes lived in hotels, which offered amenities such as food and a greater degree of privacy.⁵²

Table 2 confirms that household sizes generally corresponded to the sizes of economic groups. The average person lived in a household with nearly seven people. The median person in the sample lived in a household that had five people and 90 percent lived in households that had twelve or fewer people. The numbers are somewhat skewed by the fact that some people lived in very large residences (hotels). The effect of hotels shows up if we examine occupants per dwelling. The median dwelling had three occupants and 90 percent of dwellings had seven or fewer occupants.

These households were quite homogeneous. Although only 14 percent of people lived in completely homogenous households (where everyone had the same birthplace), 59 percent of people in the sample lived in households where at least half of the people were from the same birthplace.

Another way to measure homogeneity is through the household HHI, which is the sum of the squares of the shares of each birthplace within a household. It is useful to say something about the predicted range for the household HHI. If sorting were complete and we could observe the place of last residence, we would expect all HHIs to be 1. If sorting were random and we could observe the place of last residence, at the mean household size (6.8), the HHI would be close 0.14.⁵³ The probability that two or more people from any state would randomly live together, given that the largest state had only a 11 percent share, was relatively small. The fact that we can only observe birthplace and not the

⁵² Groups of miners within hotels might have insured one another, particularly if they were part of the same economic unit. We have very little information on what happened to miners in hotels who fell ill.

⁵³ In a seven person household, if all of the members were born in different states, the HHI would be $7 \cdot (0.14^2) = 0.14$. If they were all born in the same state, the HHI would be 1.

place of last residence will tend to depress HHIs, since even perfect sorting on place of last residence will not uniformly generate households where all individuals are from the same birthplace.

The mean and median HHIs (0.48, 0.39) indicate that individuals were sorting into fairly homogenous households. In Table 3, we explore household homogeneity further. Specifically, we regress an individual miner's household HHI on his personal characteristics, the characteristics of his household, and in some instances his mining district. It is necessary to control for household size, because HHI is negatively related to household size.⁵⁴ We restrict attention to the 32,751 individuals who were male, reported their occupation as miner, and lived in households with at least one other person. In these and all later regressions, we use robust standard errors and cluster standard errors by mining district. In column 1, we see that younger miners and foreign born miners lived in statistically significantly more homogeneous households. At the median household size (5), being foreign born increased HHI by about six-tenths of one standard deviation. The magnitude of the coefficient on foreign-born miners from English speaking countries is roughly the same as the magnitude to the foreign-born coefficient but of opposite sign. This implies that foreign born miners from English speaking countries were similar to native born miners in terms of their household homogeneity.

In column 2, we add controls for the share of individuals in these counties who were from the miners same place of birth and a dummy variable for whether the household was all male to the variables in column 1. Having a greater share of individual from your place of birth could have made it marginally easier to form a homogeneous household.

⁵⁴ For example a two person household with 2 people from different states would have an HHI of 0.50, while a ten persons household with 10 people from different states would have an HHI of 0.10.

For all but the very smallest birthplaces, however, individuals could have formed a homogeneous household if they were so inclined. Both suggest that the coefficient on share birth is likely to be positive but small. Indeed, the coefficient is positive and statistically significant, but small. A one standard deviation increase in share birth at the median household size (5) yields one-tenth of a standard deviation increase in HHI. The coefficient on the dummy variable for an all male household was positive and significant, but small.

In column 3, we add controls for district fixed effects to the variables in column 2.⁵⁵ The effects are qualitatively similar. In column 4, we divide the share of birth variable into two variables, the share that came directly from their state of birth and the share that came indirectly via another state or country.⁵⁶ The effect of a one standard deviation increase in direct at the median household size (5) was about two-tenths of a standard deviation increase in HHI. The effect of a one-standard-deviation increase in indirect at the median household size yields less than a one-tenth of a standard deviation decrease in HHI.

Thus, data from both diaries and the census suggest that individuals tended to sort into relatively homogeneous households based on state of last residence. Foreign born miners who did not speak English were even more likely to sort into homogeneous households than other miners.

Norms

⁵⁵ A district is the county for Mariposa County and a geographic district within a county for the other four counties.

⁵⁶ These shares are imputed based on the transition paths reported in the 1852 Census of Population, which asked individuals to report their state of birth and their state of last residence. For further details, see Clay and Jones (2008).

The norms regarding care for sick miners appear to have been fairly clear. Miners were expected to care for companions if they were too sick to care for themselves. This norm is alluded to by James de Pue in his discussion of friends taking care of friends. It was also hinted at in some written contracts. A Wisconsin company wrote in their bylaws prior to departure for California “In case of sickness or accident, it shall be the duty of every other member of the company to take care of the sick or otherwise disabled member.”⁵⁷ William Ryan, an Englishman in the American military who happened to be in California in the fall of 1848 gold rush listed in his journal the rules by which the various groups of former military men agreed to be governed. “7. That no sick man shall be abandoned, but every possible means adopted to restore him to health.”⁵⁸

The norm was also illustrated fairly forcefully by the following incident. In December 1849 a group of miners from the Sandwich (Hawaiian) Islands tried to offload the care of a sick miner in their group onto another miner, William Miller, who was also from the Sandwich Islands and lived nearby. Miller refused, telling them that the sick man was their responsibility. He wrote in his journal in December “It is DD hard I said to him if people more especially those that are in partys together and have sick men amongst them that they should be unwilling to take care of them and try to push their sick upon strangers. ... [Now talking to Green, previously talking to drunk member of party] I told him I was not willing as there was men upon the hill and belonging to the same party as the sick man did but they wanted to get rid of taking care of him and concluded that this was their opportunity of putting into strangers.”⁵⁹

⁵⁷ Herrmann (1940), p. 172

⁵⁸ Ryan (1850), p. 212.

⁵⁹ Miller (1849), December 20th and 21st, 1849.

Frederick Gerstäcker, a German who arrived in California in 1849, describes both the norm of care for sick companions and the fact that the norm was not always followed. In 1850 while felling a tree, Gerstäcker accidentally drove the axe into his foot. He could not work at all for two weeks and was limited in his ability to work for some time after that. He wrote: “I shall never forget the friendly care which Hays, my faithful tent-companion, took of me. He cooked, baked, washed, and worked, in the meanwhile, for both of us, never tired, and always cheerful; and even insisted on sharing with me the earnings of all the time during which I was unable to assist. This, indeed, was diggers' custom; and had he been in my situation, I should been quite ready to act in the same manner. But all people do not act similarly; and it has happened more than once, that unprincipled men have most heartlessly deserted even their best friends, just when their help was most required.”⁶⁰

Two norms appear to have made it easier to support care. The first norm was financial transfers from healthy miners in the group to the caregiver. These transfers took place in the context of group profit sharing. The caregiver, and sometimes the sick man, continued to have a claim on group profits. Often the weakest man was chosen to be the caregiver, because his absences had the least impact on group productivity.⁶¹ These transfers did not fully mitigate the cost to the caregiver, however, because total profits were lower and the caregiver still faced an increased risk of infection. The second norm was financial transfers from the sick miner to the caregiver. Much of the evidence for the second norm comes from claims against dead miners' estates for nursing and other

⁶⁰ Gerstäcker (1854), p. 259.

⁶¹ Johnson (2000), p. 128. Miners may also have taken turns as caregivers, by alternating who took days off or by alternating based on the time of day. Men were usually not severely ill for long periods of time – they either died or recovered – so alternating may not have been necessary.

expenses. These transfers almost certainly did not fully mitigate the cost either, since many of these bills probably went unpaid. Finally, it is worth noting that neither norm was universal – the terms of the implicit contract varied regarding issues such as the sick miner’s share of the earnings and who should pay for the doctor and any extended nursing.⁶²

Interaction with other Group Members

If individuals stayed with the same household unit for long periods of time, the threat of punishment by the larger group would not be necessary or credible. That is, the threat of exclusion from the household economic unit would be sufficient to induce cooperation if re-matching were impossible or extremely costly. Further, the larger group would have limited ability to impose sanctions.

The high mobility of miners together with the need to rematch for other reasons such as the death or departure from California meant that future interaction with members of the larger group was likely. Some examples have already been discussed, but it is worth considering a few more. George Applegate wrote in an April 23rd, 1850 letter “No companies remain long together.” J. M. Letts described his personal experience with this. “We adjourned to dinner, and learned that a team had just arrived and was to return to Sacramento city the next day. Harry, Sam, and Bent [his companions] immediately resolved to take passage. . . . The next morning the teamster had every individual that accompanied our mule-team up, excepting a young man who had been sleeping on the ground near our tent and myself.” In April 1850 Daniel Woods decided to leave his current companions and join some friends from Philadelphia to mine near Jacksonville.

⁶² Rohrbough, pp. 77-78. Gish, February 4, 1851.

“To-day have walked over to Jacksonville, where I was greeted with a cordial welcome. We have spent much of the night in conversing on our plans, and I have determined to remove to this place. My friend, Mr. A., invites me to share with him his tent.⁶³

Thus, it was common for men to need to rematch with other members of the larger group.

Information network

For a reputation mechanism to link past behavior and future payoff, an information network must be present. The information network that transmitted information among miners – including information about how miners treated sick companions – operated at a minimum of three levels: within a mining district in California, between mining districts in California, and between California and miners’ home states. Within the mining district, miners could often directly observe how the sick were treated or would hear about it firsthand.

Although miners could not observe what happened across mining districts, the information networks among men who were from the same state of last residence were strong. Historian Malcolm Rohrbough describes the process by which information flowed. “The seasonal relocation of Argonauts in response to the arrival of winter in the diggings further dispersed camps and local mining companies. That men circulated from one camp to another, and sometimes in the winter into the growing villages and cities of the gold country, including San Francisco, created random encounters with other

⁶³ Woods (1851), April 2nd 1850, pp 120-121.

members of the home community. These chance meetings led to letters of collective information.”⁶⁴

The extent of the information network both among miners in California and between California and friends and family back home is suggested by a letter that S. A. Colvin wrote to his wife back in Missouri on October 6th, 1850 which was reprinted in the Louisiana, Missouri Democratic Banner.

I found here a number of my old acquaintances who came out last year; to wit: ROBERT SHAW, DUDLEY PHEARS, HARVEY WILSON, ISAAC and JOEL RIPERDAN, MARCUS OCHEL TREE and C. F. KIRTLEY, of Palmyra, Mo. I also saw GEORGE OGLE, D. J. ALMOND, HENRY CROW AND DR. B. F. TODD, who came this year. They were all in good health, except Ogle, who looked quite badly, but he was able to work. George told me he had seen T. FORD a few days before on the Yuba River, he was well, but had had bad luck; he bought some cattle to sell again and had them driven off by Indians.

As there are many here who had relations and friends in Pike and adjoining counties, who may be anxious about them, I wish you to send a copy of this to THE BANNER and RECORD, at Louisiana, and have it published, and keep the original yourself. I will tell you their names and places of abode at present, so far as I know: Mr. Crow & Co. are at the mouth of Feather River with their cattle. J. Z. & T. H. JAMESON of Lincoln County, Mo. are on Yuba river, 25 miles distant, Z. W. and ROBERT BROWN, all of the same county, are on Bear River, 15 miles; EPHRAIM CULLOP, DENNIS GRANDFIELE, B.A. WILLIAMS, H. C. REEDS, JOHN F. MCNUTT, WM. COFFEE, GEORGE HAMMOCK and J. T. MYERS, of Lincoln, on the Yuba. I will now give the names from Pike; J. P. PATTERSON, of Paynesville is here, JOHN WORTHLEY and WILLIAM F. JACOBS, are on Bear River, 15 miles. LEONARD PECK went on with CROW to Mt. Vernon at the mouth of Feather river, also JAMES T. EASTIN, T. C. JOHNSON, WILLIAM DOAKE, and RICHARD FICKLIN. FRANCIS and WILLIAM MCMANAMA, from Scotland County went with CROW. J. W. GILLUM of Lincoln is at Steep Hollow.⁶⁵

⁶⁴ Rohrbough, p. 85.

⁶⁵ S. A. Colvin letter reprinted in the Louisiana, Missouri Democratic Banner, December 30, 1850. Available at http://freepages.genealogy.rootsweb.com/~crow2000/CAgold_rush.htm#colvin. See also James C. Cooper letter of June 6, 1850. Available at http://www.tngennet.org/lewis/gold_rush_letters.htm F. E. Weston letter of December 13, 1849, reprinted in the Chester Herald and Commercial Advertiser, Chester (Randolph County) Illinois on March 2, 1850. Available at <http://www.cagenweb.com/cpl/letter1.htm>. Russell K. Roger's letter of May 23, 1852 mentions the large number of Vermonters in California (Bonfield (2006), p. 8).. E.S. Camp letter of February 1850 listing the activities of many men from Marshall Michigan in Cumming (1974), p. 119.

The letter went on to mention several other friends and acquaintances as well. Colvin's letter was unusual for the number of people mentioned. This probably reflected the fact that he had asked his wife to have the letter published.⁶⁶

Another Missourian, Edward Murphy sent a letter from California dated September 2nd, 1849, which was reprinted in the Missouri Whig, Palmyra. Murphy also passes along much information on friends and acquaintances:

I have heard that Mr. Muldrow's company broke up and went home--that their oxen were too young to stand the trip; and again, that he traded all his young oxen off for older ones, and that he was still on the road. I hear of Jas. Dudley and his mess. They are far, far behind, with the finest and fattest cattle on the route; but I am afraid they will suffer a great deal before they get through. Hazelip, Hart and Winlock are now in California; However I have not seen them. I beat them through. James Morell, with the Hannibal company, are here. I have not seen Morell, Gen Willock I saw but a few days ago at Suter's Mill. ... Gen W. has been a little unwell within the last few days, but is now much better. I heard from him to-day. Hiram Taylor is within twelve miles of me. I heard of him through Gen. W. He is sick at present at a place he owns at Green Springs. Taylor is the son of Colonel Taylor, who lives near Palmyra. He has plenty of gold.⁶⁷

Many other surviving letters provide information on friends and acquaintances.⁶⁸ Not all of the information was positive – some letters reported misdeeds.⁶⁹

Thus, information networks appear to have been dense, both within California and between California and states or countries of last residence.

Punishment

⁶⁶ It was common for newspapers to reprint miners' letters home. Local newspapers also printed lists of departing miners and the death notices of miners who died in California.

⁶⁷ Edward Murphy letter September 2, 1849, published in Missouri Whig, Palmyra November 29, 1849. Available at: http://www.rootsweb.com/~momarion/sept2_a.htm. The Missouri Whig reprinted many letters, which are available at <http://www.rootsweb.com/~momarion/goldrush.htm>

⁶⁸ See Rohrbough pp. 84-6. Fairchild (1931), pp. 120-121. Palmer (1947), p. 256. Delano (1952), pp. 42-43. Spooner (1849), pp. 26.

⁶⁹ Rohrbough, p. 321. Applegate, July 13, 1851.

For a multilateral institution to work, the threat of punishment must be credible. That is, the threat of punishment by household members, other men from the state of last residence, or both, must be credible. How and why would household members be willing to punish a caregiver? How and why would men from the state or country of last residence be willing to punish members of a household that did not care for a sick companion? Household members had a number of possible ways to punish an errant caregiver, including physical punishment, reduced financial transfers, or exclusion from the household. Their motivation to carry through on these punishments was likely twofold. Failure to care for a sick companion suggested that they would not be insured if they fell sick. Further, to the extent that rematching was a possibility, they preferred to maintain a reputation as having helped care for sick companions. The reason was that individuals who were rematching preferred to choose individuals with good reputations. Given the large number of individuals in California, discriminating against those with bad reputations was costless. Taken together, these threats of punishment seem to have been viewed as credible by most miners.

One of the most significant problems for documenting punishment is that on the equilibrium path, if the threat of punishment is credible, we will see very little actual punishment. One of the few instances of attempted abandonment of a sick companion that we observe is the case in which the group of miners from the Sandwich Islands tried to force William Miller to take care of the sick companion. Miller refused, but we know nothing about the subsequent fate of the sick miner.

Another example is discussed by Dame Shirley (Mrs. Louise Amelia Knapp Smith Clappe) in a letter to her sister. Two men “informed the expressman that they had left

their *friend* (?) three miles back, in a dying state; that the cold had been too much for him, and that no doubt he was already dead. They had brought away the money, and even the *blankets*, of the expiring wretch! They said that if they had stopped with him they would have been frozen themselves. But even if their story is true, they must be the most brutal of creatures not to have made him as comfortable as possible, with *all* the blankets, and, after they had built their fire and got warm, to have returned and ascertained if he were really dead.”⁷⁰ Friends of the man accused these companions of murder, but ultimately let them go for lack of evidence.

There is also indirect evidence from the 1850 Census of Population that is consistent with miners caring for their friends. What we show is that individuals in more homogeneous households (higher HHIs) had slightly lower levels of earnings and wealth. This may have arisen in two ways. First, individuals who had lower wealth or earnings may have sorted into more homogenous households to mitigate the risk of having low earnings or being unable to work due to sickness or accident. Second, because they sorted into more homogenous households, individuals in these households may have had to expend both time and money helping household members, which could have adversely affected their earnings and possibly their wealth.

Table 4 examines the relationship between household composition and average daily earnings from mining and the relationship between household composition and real property holdings. In columns 1-3, we examine the determinants of daily earnings from mining. These data were collected by the enumerator for El Dorado County, California and were not part of the standard set of census questions. About 40 percent of individuals in El Dorado County reported positive earnings. In Clay and Jones (2008),

⁷⁰ Clappe (1922), December 15, 1851, p. 160.

we examine the characteristics of those likely to report earnings and do not find any evidence of selection biases. Those not reporting earnings appear to have been recent arrivals who had not mined for very long. The median individual who reported positive earnings stated that they were making \$4 per day. This value is in line with other contemporary evidence on earnings from mining.

In column 1 of Table 4, we examine the determinants of earnings. The coefficient on HHI is statistically significant and negative. A one-standard deviation increase in household HHI translated into earnings that were about 4 percent (\$0.16) lower. One thing to keep in mind is that although the magnitude of the relationship between HHI and earnings is relatively small, the increased utility associated with a greater likelihood of care when sick may have been large. None of the coefficients on the other variables is statistically significant, and the fit is poor. In column 2, we add district fixed effects to the variables that we used in column 1.⁷¹ The coefficient on HHI remains statistically significant and negative, but the effect is considerably smaller. A one-standard deviation increase in household HHI translated into earnings that were about 1.6 percent (\$0.06) lower. In addition to the coefficient on HHI, the coefficient on foreign born is negative and statistically significant. Controlling for HHI, individuals who were foreign-born had average daily earnings from mining that were about 7 percent lower than individuals who were native born. In column 3, when we control for household size in addition to the variables in column 2, the coefficient on HHI remains negative, but is no longer statistically significant.

⁷¹ In an unreported regression with district fixed effects, the effect of HHI on real property was negative but insignificant.

In columns 4-6, we examine the determinants of reporting positive real estate wealth. Because real estate wealth was a standard question on the 1850 Census of Population, the sample covers all five counties.⁷² Only about 10 percent of the sample reported positive real estate wealth, so the question is not as much how HHI affected the level of real estate wealth, but rather how HHI affected the probability of reporting a positive value. The coefficient on HHI in column 4 is, surprisingly, positive and statistically significant. In column 5, when we control for district fixed effects in addition to the variables that we controlled for in column 4, coefficient on HHI remains positive, but is now small and statistically insignificant. In column 6, when we control for household size in addition to the variables that we controlled for in column 5, the coefficient on HHI is now negative, small, and marginally statistically significant ($p=0.135$).

In sum, Table 4 shows that living in a household with a higher HHI – that is, living in a less diverse household – may have been associated with slightly lower earnings and wealth. This is consistent with individuals using household homogeneity to insure against risk, particularly health risks in which a member of the household would forgo work in order to nurse the sick individual.⁷³ Although the magnitudes of the effect were relatively small, the increase in utility associated with the insurance may well have been large.

⁷² Ideally, we would have a more relatively precise measure of wealth, but the 1850 Census of Population only asked about the gross value of real estate holdings. What was real estate wealth really measuring? Real estate wealth is a complicated metric in this context, for a number of reasons. First, it was almost certainly true that individuals who owned real estate were less likely to migrate. Second, those who owned real estate may have sold it to finance trip. Third, if the holding was in California, prices were fluctuating daily, so the accuracy of the reported value was likely to be lower than in other parts of the U.S. Fourth, much of the real estate that individuals reported owning in California may have represented ownership of use rights to mining claims.

⁷³ Because the census's measures of earnings and wealth do not capture the value of household production in many areas – including insurance – more homogeneous households may well have had higher actual wealth and income.

Adverse Selection and Moral Hazard

Unlike families, where one is born into a family and cannot readily change family affiliation, miners could select who they wished to mine and live with. Thus, they could avoid individuals who seemed weak or sick when choosing men to mine with.

Conditional on all individuals being healthy at the outset, some would still fall ill, so the implicit contract of mutual assistance was still valuable.

Men also wanted to mine and live with individuals who were likely to adhere to the implicit contracts. Adherence was apt to depend in large part on incentives. If other attributes such as altruism or religion affected adherence, miners may have been able to screen on both health and other attributes. Screening on other attributes was particularly likely if prospective mining partners had been travel companions. Miners had observed traveling companions behavior over a long period time, often under stressful conditions. This allowed them to make inferences about how a individual would behave if a companion fell sick.

Thus, adverse selection was mitigated by choosing to mine with and insure healthy individuals who were likely to adhere to the implicit contract. One implication of this is that some individuals would not find groups to live and mine with. A number of these individuals may have chosen to live and mine alone or with just one other person. Or they may have moved out of mining into an occupation with lower risk of illness or disability.

Moral hazard was addressed by the fact that the sick man lived with and was cared for by the insurers. As a result, sick miners were subject to a high level of monitoring. As

soon as they were able, the sick were put to work doing household chores such as cooking and washing.⁷⁴ Mining also offered the right incentives for recovery. Miners wanted to strike it rich, not stay in bed.

5. Historical Emergence of Markets for Insurance

In the late nineteenth century in the United States, we observe the rise of private organizations such as friendly societies, fraternal organizations, and other groups that provided sickness insurance. The exact numbers of these organizations is unknown. By 1890, the census found “1,259 [nonfraternal] mutual assistance societies that offered cash or medical benefits or both to their members.”⁷⁵ In his book on the origins of American Health Insurance, Murray writes: “Many of these funds, especially those founded before 1870, were organized for men of particular ethnicities, religions, or crafts. ... The highest numbers were in the most heavily industrialized states of the Northeast and Midwest.” In Connecticut in 1891, 42 percent of the men in nonagricultural occupations were covered by sickness funds. Insurance was provided by 308 sick and funeral societies and 21 trade union funds. According to Murray “In California, nearly three-fourths of insured workers were covered by their fraternal society.”⁷⁶ In Ohio and Illinois that proportion was closer to two-fifths.

In these organizations, sickness insurance was frequently based on the kinship model. It offered partial replacement of wages. In addition, in 1890, “about 18 percent of

⁷⁴ Having sick miners cook may not have been the wisest choice, but how disease are transmitted was not yet well understood.

⁷⁵ Murray (2007), p. 66. There is some evidence that this number is an underestimate. Murray, p. 84.

⁷⁶ Murray (2007), p. 87.

sickness funds offered cash medical benefits or in-kind nursing assistance.”⁷⁷ In other cases, in-kind nursing services were offered on an ad hoc basis depending on need. Since many of these men were married and some had family in the area, nursing services were a less essential part of the insurance package than they were in the gold rush. Members of the organizations had a written contract, paid specific monetary amounts on a schedule, and drew specified benefits when sick.

These organizations were important precursors to the emergence of more formal and extensive markets for insurance. We have already discussed how the multilateral institutions in the California gold rush mitigated adverse selection and moral hazard. Interestingly, the private organizations that provided sickness insurance in the late nineteenth and early twentieth century took many of the same approaches to mitigating these problems. Adverse selection was addressed by refusing to let the sick and the old participate.⁷⁸ If they were allowed to participate, pre-existing conditions were not covered.⁷⁹ Further, waiting periods applied. If a claim was made, benefits were typically low, with replacement rates averaging around 60 percent, and were only guaranteed for a fixed number of weeks, usually 13 weeks.⁸⁰

Moral hazard was addressed through monitoring and exclusions. Members or physicians frequently monitored patients to guarantee that they were not malingering or

⁷⁷ Murray (2007), p. 77.

⁷⁸ Emery and Emery (1999) argue that participation in fraternal insurance was a life-cycle phenomenon. Younger men with young families tended to participate, because they had not yet built up enough assets to self insure, nor were their children old enough to provide substantial income. These two explanations are not mutually exclusive.

⁷⁹ Much of this discussion draws on Murray (2007).

⁸⁰ Low benefits may have been one reason why even at firms with sickness insurance, in 1908 only 48 percent of employees chose to participate. Murray (2007), pp. 93, 118. The low participation rate may also reflect the fact that men in some states were covered for industrial accidents through workmen’s compensation. See Fishback and Kantor (2000).

engaging in activities likely to prolong their illness (such as going to bars). Coverage was also limited to sickness and in many cases excluded certain types of sicknesses or accidents.

Today, many employers in the United States (and many governments in other countries) provide disability and medical insurance. Required participation mitigates many of the adverse selection problems for both types of insurance. Monitoring continues to be used to mitigate the moral hazard problem.

Hence, the multilateral institutions that supported the provision of insurance without kin can be thought of as an intermediate form between insurance with kin and early organizations that provided sickness insurance.

6. Conclusions

In this paper, we used detailed historical evidence to document the multilateral, private-order institutions that supported the provision of insurance without kin in the California gold rush. These institutions enabled miners to credibly commit *ex ante* to care for sick companions *ex post*, despite the high cost of doing so. Group membership was defined based on the state or country of last residence. Norms were that household members cared for one another if they fell ill. Miners often lived in multiple households during their time in California, so they cared about their reputation within the larger group. Information networks were dense and transmitted information on group members within California and between California and the state or country of last residence. Punishment in California took the form of group members refusing to live or work with individuals who violated the norm. Punishment could also occur if the individual

returned home. Friends and family might impose social or economic sanctions for violation of norms.

The historical evidence suggests that not all sick miners received care. This is not inconsistent with the existence of multilateral institutions. Adverse selection meant that healthy individuals would prefer to select individuals to live and work with who were also healthy. Thus, sick and weak individuals were unlikely to be insured. Further, some individuals may have entered into bilateral relationships only to have both individuals fall sick simultaneously or to discover that bilateral relationships did not provide adequate incentives for care. Finally, it is possible that multilateral institutions failed to provide sufficient incentives for some households.

An understanding of the institutions that supported the provision of insurance without kin contributes to three literatures. First, to the extent that sickness is discussed in the historical literature on the California gold rush, the default answer to why miners cared for sick companions would seem to have been altruism. Drawing on data from diaries, letters, and the 1850 Census, we show that that institutions, and not altruism, seem to account for the observed patterns of care. Second, much of the institutional literature has focused on merchant-based institutions. We examine institutions that emerged to address a distinct commitment problem and show that the implicit contract governed a small group – the household – and not just two individuals, as was typically the case in merchant transactions. By investigating the reasons for the emergence of these types of institutions and documenting their operation, we shed new light on institutions more broadly. Finally, we add to the literature on the emergence of market-based insurance. The gold rush institutions predate the emergence of organizations that provided sickness

insurance in other parts of the United States during the nineteenth century. And the gold rush institutions are closer in form to insurance with kin. Thus, these institutions help illuminate the transition from insurance with kin to market based insurance.

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Figure 1: Map of Area Covered by
El Dorado, Mariposa, Sutter, Tuolumne and Yuba Counties

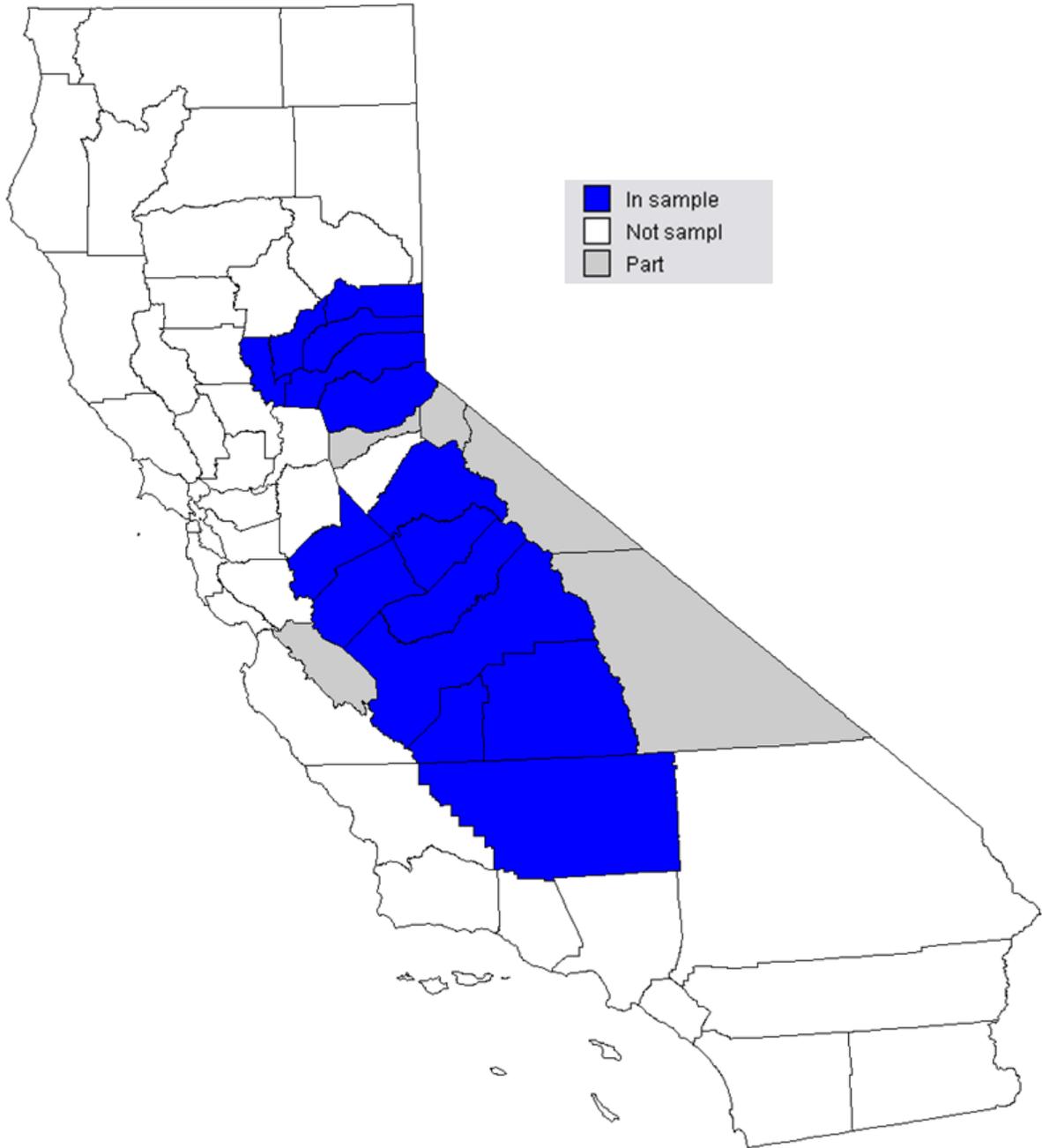


Table 1: Birthplaces of Men Ages 20-40 in California in 1850

State	Number from birthplace in CA	Country	Number from birthplace in CA
Maine	3,582 (0.031)	Chile	810 (0.007)
Virginia	4,469 (0.039)	China	842 (0.007)
Tennessee	4,474 (0.039)	Scotland	998 (0.009)
Missouri	4,765 (0.042)	Canada	1,293 (0.011)
Penn.	5,485 (0.048)	England	3,010 (0.026)
Kentucky	5,701 (0.050)	France	3,336 (0.029)
Ohio	7,492 (0.066)	Germany	3,691 (0.032)
Mass.	7,793 (0.068)	Ireland	4,064 (0.036)
New York	12,712 (0.112)	Mexico	8,480 (0.074)

Notes: All statistics are for free men ages 20-40. The percentage of the California population that various birthplaces represent is listed in parentheses. Details on the computation of these numbers are available in Clay and Jones (2008).

Table 2: Households of two or more in El Dorado, Mariposa, Sutter, Tuolumne and Yuba Counties

	Observations	Share of sample	Mean Household size	Share living in homog. birthplace household	Share in hhlds where ≥ 0.5 from the same birthplace	Household HHI
All	40,629	0.94	6.8	0.14	0.59	0.47
Male	39,113	0.90	6.8	0.14	0.59	0.47
Male miner	32,707	0.75	6.7	0.14	0.60	0.47
Native born male miner	25,472	0.59	6.6	0.11	0.57	0.45
Foreign-born male miner	7,235	0.17	7.1	0.26	0.70	0.57
FB male miner, English-speaking	2,480	0.06	5.7	0.16	0.60	0.48
FB male miner, non English-speaking	4,755	0.11	7.9	0.31	0.75	0.62

Notes: The sample includes 43,866 people in total. Of these, 3,237 (= 43,866-40,629) lived alone.

Table 3: Determinants of the HHI of an Individual's Household

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	HHI	HHI	HHI	HHI	HHI
Age	-0.000798*** (0.00025)	-0.000782*** (0.00025)	-0.000970*** (0.00023)	-0.000529** (0.00024)	-0.000568*** (0.00019)
White	0.0206 (0.025)	0.0162 (0.021)	0.00379 (0.019)	0.00389 (0.016)	-0.00293 (0.016)
Fborn	0.183*** (0.023)	0.193*** (0.021)	0.201*** (0.023)	0.197*** (0.018)	0.190*** (0.019)
Fbornenglish	-0.165*** (0.024)	-0.158*** (0.022)	-0.162*** (0.022)	-0.123*** (0.019)	-0.119*** (0.019)
Shbirth		0.632*** (0.092)	0.727*** (0.084)		
All male household		0.0410** (0.016)	0.0335* (0.019)	0.0281 (0.017)	0.0190 (0.015)
Direct				2.212*** (0.28)	2.198*** (0.29)
Indirect				-0.654*** (0.22)	-0.635*** (0.21)
Household size FE	Yes	Yes	Yes	Yes	Yes
District FE	No	No	Yes	Yes	Yes
Occupational FE	Only miners	Only miners	Only miners	Only miners	Yes
Constant	0.299*** (0.032)	0.259*** (0.033)	0.203*** (0.026)	0.184*** (0.023)	0.181*** (0.022)
Observations	32,751	32,751	32,751	32,401	38,424
R-squared	0.21	0.22	0.29	0.30	0.30

Notes: The sample includes all male miners living in households of at least 2, except individuals who did not report age (311 individuals). The standard errors are reported in parentheses. All regressions use robust standard errors clustered by mining district. The level of significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Average Daily Earnings from Mining and Real Estate Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	larnings	larnings	larnings	posprop	posprop	posprop
HHI	-0.191*** (-0.061)	-0.065* (-0.035)	-0.059 (-0.040)	0.090*** (-0.027)	0.0009 (-0.0065)	-0.018** (-0.0077)
Age	0.00077 (-0.00088)	0.000376 (-0.00068)	0.000277 (-0.00073)	0.00693*** (-0.00150)	0.00714*** (-0.00150)	0.00710*** (-0.00150)
White	-0.0416 (-0.1000)	0.0969 (-0.0630)	0.0933 (-0.0560)	0.0771*** (-0.0180)	0.0630*** (-0.0170)	0.0615*** (-0.0170)
Fborn	0.029 (-0.032)	-0.0694*** (-0.0190)	-0.0706*** (-0.0190)	-0.0772*** (-0.0200)	-0.0429*** (-0.0120)	-0.0410*** (-0.0120)
Fbornenglish	-0.0688 (-0.0610)	-0.00776 (-0.03200)	-0.00623 (-0.03400)	0.0701*** (-0.0200)	0.0204* (-0.0120)	0.0171 (-0.0110)
District FE	No	Yes	Yes	No	Yes	Yes
Household Size FE	No	No	Yes	No	No	Yes
Observations	9,040	9,040	9,040	32,751	32,751	32,751
R-squared	0.01	0.29	0.30	0.05	0.16	0.16

Notes: Earnings were only collected for El Dorado County, and only individuals reporting positive levels of earnings are included. Positive property includes all male miners living in households of at least 2, except individuals who did not report age (311 individuals). The standard errors are reported below the coefficient. All regressions use robust standard errors clustered by mining district. The level of significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

This article examines the private-order institution that facilitated intermerchant trade. The hypothesis is that a particular type of private-order institution, a coalition, a reputation mechanism mitigated the commitment problem inherent in having individuals handle goods that they did not own by linking a merchant's past behavior and his future payoff. Evidence from the merchants' business correspondence supports the hypothesis. A game-theoretic model of a coalition is presented. The model provides insight into the punishment merchants imposed on cheaters, the expansion of the coal

Overview of the California Gold Rush, the rapid influx of fortune seekers in California that began after gold was found at Sutter's Mill on the American River in early 1848. The Gold Rush reached its peak in 1852. According to estimates, more than 300,000 people came to the territory during the Gold Rush. Although it was estimated that some \$2 billion in gold was extracted, few of the prospectors struck it rich.

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