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Corporate Finance and the San Francisco Mining Share Market, 1860-1877

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Corporate Finance and the San Francisco Mining Share Market, 1860-1877

by

Glenda Oskar

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Professor Barry Eichengreen
Professor J. Bradford DeLong
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Abstract

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Throughout history, capital markets have been central to innovation and the development of new industries, job creation, low unemployment, wealth accumulation, reducing income inequality, improving living standards, and promoting economic growth. In perfect capital markets, firms can easily raise funds for profitable investments. However, market frictions, such as agency costs, liquidity constraints, and asymmetric information, can lead to underinvestment. In this dissertation, I study the financing decisions of firms in a young industry in an environment where securing capital was difficult.

Following the 1859 discovery of gold and silver in Nevada, mine owners incorporated in San Francisco and issued stock. Interestingly, firms had the right to levy assessments on their shareholders. An assessment is a request for additional capital and failure to pay resulted in the loss of shares. Firms relied heavily on assessments to finance their operations. I claim that assessments were more than a peculiar feature of stock ownership; the method of financing addressed particular challenges, making it easier to secure capital. To evaluate my claim, I construct a dataset of assessments levied, daily stock prices, and other relevant data. I use regression analysis and narrative evidence from a credible local newspaper to determine which variables influenced levies and how assessments addressed financing frictions. Collecting capital over several periods and limiting the loss to share ownership helped in reducing the agency costs of free cash and making mining securities attractive investments. I present the detailed analysis and results in Chapter 1.

For investors of the San Francisco mining share market, private information and assessments may also affect stock ownership. Because firms voluntarily provided reports to local newspapers, some investors may have information on the prospects of the mine prior to publication. An investor's willingness to pay assessments may also influence the timing of purchase or sale. I use stock transfer data from a major mining company to measure the effect that assessments and private information had on the propensity to sell. Share ownership was geographically diverse, the propensity to sell varied across investors, and there is some evidence that the timing of sales by investors from the Bank of California may be driven by private information. I present the detailed analysis and results in Chapter 2.

In Chapter 3, I examine whether the market predicted reasonable returns in a setting where active trading in mining securities was fairly new and investors are more likely to speculate. One interesting feature of the firms in my sample is that they owned adjacent mining claims along the vein of the Comstock. I consider the effect of reported strikes on the stock price of firms with adjacent and non-adjacent mines. The results suggest that, on average, the market predicted returns consistent with rational behavior. A detailed description of how I constructed the dataset, a timeline, and additional background information on the San Francisco mining market is available in the Appendix to the Dissertation. I include a bibliography of references and works consulted the end of the manuscript.

To my parents,
Saint Louis and Rose Oskar.

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All errors and omissions are my responsibility.

Chapter 1

Corporate Finance with Assessments

In the modern corporation, shareholders do not provide additional capital beyond the stock price. Historically, this was not always the case. In California, an 1861 statute gave firms the right to levy assessments on its shareholders; failure to pay resulted in the loss of shares. Assessments were more than a peculiar feature of stock ownership. Stock with assessments addressed particular market frictions, allowing mining firms to raise enough capital to finance their operations. Studying the use of assessments in a young industry in an environment where securing capital was difficult deepens our understanding of shareholder contributions and liability regimes.

Mining firms faced several challenges in attracting capital. Deep-shaft mining was a new and risky enterprise. Payoffs were uncertain and, for some mines, it was several years before a discovery was made. In addition, market frictions, such as transactions costs, agency costs, or limited access to credit, placed constraints on a firms' financing choices. I claim that firms relied on assessments because the method of financing addressed some of these challenges, making it easier to attract capital to mining enterprises. To evaluate my claim, I construct a dataset of assessments levied, daily stock prices, and other relevant data. I use regression analysis and narrative evidence from a credible local newspaper to determine which variables influenced levies and how assessments addressed financing frictions.

Of the possible financing frictions, agency costs would seem to loom large. At its core, the agency costs framework holds that investors distrust managers and believe that excess cash will lead to waste or theft. Firms can choose to request capital upfront or finance operations over time. Investors prefer stock with assessments because it allows them to supply funds over several periods, thus limiting the resources under the manager's control. Evidence consistent with this view includes constant or regular levies, low cash holdings, increased frequency of assessments following increases in costs, and no announcement effect of regular levies. This proves to be what I find in the data. I also find that firms with greater profitability are less likely to have a decrease in stock price following an unanticipated levy. This is also consistent with the agency costs framework.

The option value of waiting to reinvest, the uncertainty of the capital market, liquidity constraints and transactions costs are alternative explanations to the agency costs hypothesis.

Under the waiting hypothesis, investors enjoy an option to provide additional funds or default as information is revealed. I find evidence that investors did view stocks with assessments as possessing an option value. Under the uncertainty of the capital market framework, stock with assessments can be used to hedge against the uncertainty. However, it is also optimal to hoard cash to address the uncertainty and available data do not show large cash reserves across firms. Allowing shareholders to effectively provide capital in "installments" would be useful if investors have liquidity constraints. There is some evidence to suggest that local capital was insufficient to finance the mines, but increased local wealth, low interest rates, the expansion of credit, and reduction in share denomination did not affect subsequent levies. Overall, the empirical evidence is most consistent with the agency costs hypothesis and some narrative evidence supports the option value framework.

The paper is organized as follows. I provide information on the background and history of assessments in Section I. I flesh out the agency costs framework in Section II, while Section III includes a description of the data and summary statistics. Section IV contains an empirical analysis of the agency costs framework. In Section V, I discuss alternative explanations and the limitations of the data. Concluding remarks are presented in the final section.

I. Background

The Comstock Lode discovery of 1859 was the first major silver discovery and the second largest gold discovery in the history of the United States.[1] Extraction was labor and capital intensive: "Informal associations with no strong ties of union and no (means) of insuring persistent work or equal apportionment of expenses were clearly ineffective. To supply the recognized need, mine owners began to unite and incorporate in companies" (Crowell, 1941, p. 27).[2] Many of the mine owners sought capital in San Francisco and the desire to trade in mining claims led to the formation of the San Francisco Stock and Exchange Board in 1862.

The number of mining incorporations increased dramatically by 1863. A total of 2,933 gold, silver, and copper mining companies were organized in California (*Mining and Scientific Press*, January 30, 1864). San Francisco became a major capital market for mining securities, attracting investments from outside the city.

> The city is unquestionably the greatest market in the world for the sale of shares in silver mines. ... All these regions consider San Francisco as the spot to which they are to look for help. ... As the prosperity of a company depends greatly upon the market value of the stock, and the stock, except under extraordinary circumstances, could not be sold unless the company had its office here (*Daily Alta California*, August 3, 1863).

[1] Mining for silver, and the management of silver mining companies, were as yet, comparatively new, and people did not know what to expect or believe" (Hittell, 1978, p. 20).

[2] "The necessary funds for carrying on the development work were supplied by the levy of assessments or by the sale of reserved shares of the capital stock" (Crowell, 1941).

As with modern corporations, mining companies were managed by a board of directors (or trustees). The directors were elected annually by shareholders and were required to hold stock in an amount fixed by the by-laws of the corporation.[3] See the Appendix for detailed information on California Corporate Law. Not all members of the board of directors received compensation.[4] The directors hired a superintendent to supervise the miners and manage the activities of the mine. Ownership rights of shareholders included the right to vote on a change in the capital stock, to elect corporate directors, share in the distribution of profits, and an obligation to pay assessments.

According to various estimates, the mines of the Comstock produced about $320,000,000 from ore tailings and paid $147,000,000 in dividends from 1859 to 1882; the assessments levied were not not less than $92,000,000 over the period (Smith, 1943, p. 230).[5]

> It can scarcely be doubted that the extraordinary progress here made evident is largely due to the system of mine ownership. The wide distribution of the mine share, the comparatively light burden of assessments upon individual holders, and the daily revival of interest in the mines, through the agency of the stock exchanges, have united to maintain a rate of development hitherto without parallel in mining history (Lord, 1959, p. 354).

Assessment Statute

On March 5, 1861, "An Act in Reference to Corporations in this State Organized for the Purpose of Mining out of this State," was passed in California.[6] The Statute read:

> §1. That it may be lawful for any corporation organized in this State, under the laws of this State, for the purpose of mining, or carrying on mining operations, without this State, whose business office is in this State, to levy assessments upon the capital stock thereof to pay the debts future, or present of said corporation; *provided*, the same shall be equal and uniform, and at no one time exceed five percent of the capital stock, and such levy, or assessment, shall constitute a valid and binding obligation upon the holders of such stock to pay the sum so assessed against the stock so held.

Notice of delinquency was given personally or published for four weeks in a local newspaper, and default resulted in shares being sold for payment. Sale was made at a public auction to

[3] California Civil Code, 1872, §302, §305, §308, §312

[4] For example, the 1863 By-Laws of the Yellow Jacket Silver Mining Company stated that only the President shall receive compensation for his services.

[5] All figures are in nominal dollar values unless otherwise stated.

[6] A few firms were levying assessments prior to the passing of this Statute. Notice of assessments were found in the San Francisco *Daily Evening Bulletin* for the Chollar Silver Mining Company on November 2, 1860, the Savage Mining Company on December 16, 1860, the Gould and Curry Silver Mining Company on December 22, 1860, and the Potosi Silver Mining Company on January 2, 1861.

the person willing to pay the assessment, the expense of advertisement and other expenses of sale for the smallest number of shares. Payment was made in United States gold coin.

Several revisions were made in subsequent years. The law was expanded to give any corporation formed in California the right to levy and the maximum allowable amount increased to ten percent of the capital stock. In addition, no assessment could be levied while any portion of a previous one remained unpaid. Shareholders were given from thirty to sixty days before being declared delinquent. The names of delinquent shareholders had to be published for ten days at least fifteen days prior to sale. A notice of delinquency had to specify every certificate of stock, the number of shares it represented, along with the name of the shareholder, and the amount due. "By the publication notice, the corporation acquires jurisdiction to sell and convey a perfect title to all of the stock described in the notice of sale upon which any portion of the assessment or costs of advertising remains unpaid at the hour appointed for the sale, but must sell no more of such stock than is necessary to pay the assessments due and costs of sale."[7] If at the sale of stock, no bidder offered the amount of the assessment and costs due, the corporation could purchase the shares of the stock.[8]

History of Assessments

Requiring additional funds from shareholders was common in the nineteenth century. For example, the railway industry and other mining companies levied assessments.

> Failure to build within estimates, calls for assessments to put in proper condition the inferior work turned over by contractors, and delays in the payment of dividends, eventually led investors to regard railroad shares as of uncertain value, and to put their savings into railroad bonds (Chandler, Jr., 1965, p. 53).

Assessments were also used in the Michigan copper mining industry in the 1850s.

> None of the companies of this period issued fully paid stock; the assessment system was a recognition of uncertainty as to what capital requirements would be, as well as a 'come-on' device in dealing with a flighty capital market. The prevailing method of opening a mine was to keep initial assessments as low as possible and to rely on raising enough copper during the first two years to pay exploration and developmental expenses (Gates, Jr., 1951, p. 33).

The term "call" is often used interchangeably with "assessment," but calls were distinguished from assessments in California. If shareholders paid only a fraction of the stock price, calls could then be made upon unpaid sums (Son, 1901). On the other hand, assessments were contributions beyond the subscription price "to raise a sum of money beyond

[7] 1863-64, 492, §1; 1865-66, 458,459 §4, 459 §6, 460 §8 to §13, 461; 1868, 540, §3; 1870, 229, §1; 1873-74, Chapter 612, §72, Stats 1929 ch 711 §17, and repealed Stats 1931 ch 862 §1.

[8] Corporation, having no possession of certificate of stock, has no seller's lien thereon and can have no general lien except for assessments under this section. Lankershim Ranch Land & Water Co. v. Herberger (1890) 82 Cal 600, 23 P 134, 1890 Cal LEXIS 608. Source: Cal Corp Code §14303.

the amount of subscription for the use of the corporation to sustain its existence, to carry into use its corporate powers, and to enable it to exercise its corporate duties."[9] Legally, "the power of directors of a corporation to levy and collect assessments is wholly statutory, but the power to make calls, as distinguished from assessments, exists in corporations at common law. The unpaid part of the purchase of a stock is a simple contract debt owning to the corporation" (Son, 1901). The economic difference between calls and assessments is that the liability of stock with calls is fixed by the terms of the subscription. Double liability, which was common in banking, was similar to calls (Marquis and Smith, 1937). Under double liability, corporations could request additional capital on up to twice the price of the stock.[10]

II. Agency Costs Framework

Consider the following. An owner has no personal assets and requires external financing to prospect the mine. He issues stock and a board of directors is elected to manage the firm. Managers and shareholders are risk neutral. Excavation is a long-term project. The lifespan of the mine is T, and there are $T+1$ periods, i.e. $t = 0, 1, ..., T$. The firm requires $I \in [0, \infty)$ to prospect the mine. There is no rate of time preference. The firm can can choose between two methods of finance. The firm can collect I in the first period, $t = 0$, or divide the cost of investment over several periods, i.e., $I = \sum_{t=0}^{T} I_t$. Investment is non-negative in each period ($I_t \geq 0$). Prospecting the mine at 100 feet below the current level is one way to think of investment in each period. Let $X_t \in [0, \infty)$ denote the realized earnings of the firm in each period beginning with $t = 1$.

Suppose that managers are imperfect agents of investors. Assume there are no other market frictions in the model. The distance between investors and the mines made it difficult to confirm whether managers were making decisions to maximize shareholder value. Investors were concerned about wasteful and fraudulent behavior, e.g., excessive mill building, extravagant offices, and theft (Lord, 1959; King, 1977). "More economy and a higher standard of morality must be introduced into management of mining operations" (*Mining and Scientific Press*, July 23, 1864). Heavily capitalized mining companies, especially in states where assessments were prohibited, were viewed with great suspicion (King, 1977, p. 119, 122). If agency costs are too severe, the result can be underinvestment.

Collecting capital over several periods can reduce the threat of agency problems by limiting available funds. Investors can demand that cash beyond what is required to invest in each period be paid as dividends, D_t, i.e., $D_t = (X_{t-1} - I_t)^+$, for $t = 2, ..., T$ (Easterbook,

[9]Santa Cruz R. Co. v. Spreckles (1884) 65 Cal 193, 3 P 661, 1884 Cal LEXIS 488. In addition, "the procedure for levying and collecting an assessment and for the sale of delinquent stock was the same whether it was a 'call' for subscription, or an 'assessment' on paid-up stock to pay debts and expenses. Bottle Mining & Milling Co. v. Kern (1908, Cal App) 9 Cal App 527, 99 P 994, 1908 Cal App LEXIS 92.

[10]For firms for which I have a complete history of assessments, the sum of assessments levied was not more than the price of the stock subscription.

1984; Rozeff, 1982). Analogously, assessments, A_t, are levied in each period to cover the shortfall, $A_t = (I_t - X_{t-1})^+$. Generally, shareholders require managers to minimize cash holdings and satisfy the following identity in each period: $D_t - A_t = X_{t-1} - I_t$. The right hand side is net cash flows from operating the mine and the left hand side is the net dividend. If the cost of investment is less than the actual returns, the dividend will be positive. If the cost of investment is greater than the actual returns or cash flow from the previous period, the dividend will be negative. This is equivalent to the firm seeking financing or levying an assessment (Miller and Rock, 1985).

Evidence consistent with the agency costs hypothesis include the following. Because the cost of investment is divided into several periods, we should observe frequent levies. If the cost of investment and earnings are fairly constant, we should observe regular assessment amounts. Changes in the cost of investment or the yield of the mine should favor limiting assets under the manager's control. An increase in costs should favor an increase in the frequency of levies. An increase in the yield of the mine should result in a decrease in assessment amount. Because excess cash reserves are discouraged under the hypothesis, managers levy assessments following unexpected changes in costs.

III. Data and Descriptive Statistics

I construct a dataset of mines located on the vein of the Comstock. Each firm typically had one mining claim that was the namesake of their company. To be included in the study, the corresponding firms had stocks that were actively traded on the San Francisco Stock and Exchange Board. I collect daily sales data from the San Francisco Stock and Exchange Board as published in the *Daily Alta California*, the *Daily Evening Bulletin*, and the *Daily Stock Report*. I also collect data on assessments, dividends, company meetings, and special meetings proposing a change in the capital stock from the local newspapers. See the Appendix for details on how the data was collected. There were 24 firms in the sample.

I focus on assessments levied between 1872 and 1877 for two reasons. First, mining methods were more standardized and available data were more consistent and complete by 1872.[11] Second, trading in mining shares began to decline in 1877. I include only assessments confirmed by at least two sources. Table 1.1 provides summary statistics for assessments. The average dollar per share per assessment was \$2.64, while the average amount collected by each firm per assessment was \$82,921.59.[12] On average, the amount levied as a share of capital stock did not reach its maximum; the largest levy was 5% of the current capital stock and the legal limit was 10%. This suggests that firms could reduce the frequency of levies by increasing the assessment amount. The assessment yield, measured in dollars per share

[11]For example, by March 15, 1873, the *Mining and Scientific Press* began publishing assessments in the following manner: "Ophir S.M. Co., Washoe, No. 24, Amt. \$3.00, Levied Date Jan. 27, Delinquent Date March 4, Sale Date March 24."

[12]All figures are presented in nominal terms unless otherwise stated.

divided by the closing price of the day prior to the levy, was approximately 11%. Most firms had a larger assessment yield in 1877, reflecting declining stock prices by 1877.[13]

Firms levied assessments frequently, especially when the mine is not yielding paying ore. The median number of days between assessments is 100 and the average is 189. The maximum number of days is 1830, reflecting the fact that firms are not likely to levy assessments when the mine yields enough ore to cover expenses. The average number of assessments levied by a firm in a given year was 2.7 and the median number was 3. The maximum number of assessments per year was 6. The data is presented in the top panel of Table 1.2. The bottom panel of Table 1.2 shows the distribution of assessments across quarters and years. Assessments were fairly evenly distributed across quarters, with slightly more levies in the fourth quarter, 26.58%. Slightly more assessments, 10.36%, were levied in October. These results are consistent with the claim that assessments occur more frequently as preparations were made for winter (*Mining and Scientific Press*, October 26, 1872).[14] There were fewer assessments in 1872 and by 1877 many of the mines were no longer yielding paying ore. Many firms were levying assessments by 1877.

Many firms levied the same amount per assessment; total amount changes following an increase in capital stock. Of the 198 observations, 70% (141 observations) were levied at a dollar amount equal to the previous amount per share. The results are presented in Table 1.3. An increase in the capital stock allowed firms to collect more per assessment. Following an increase in the capital stock, firms continued to levy assessments and the total amount increased on average. Table 1.5 reports the pattern in assessments following changes in capital stock.

IV. Empirical Analysis and Results

To prevent waste or theft, investors limit the resources under the manager's control. The cost of investment is divided into several periods and shareholders provide exactly enough funds to cover the net cost of investment in each subperiod. Evidence consistent with the agency costs framework includes frequent levies and changes in assessments driven only by changes in the cost of investment or earnings from the previous period.

I consider several regression models. To determine what drives the frequency of levies, I use the number of days between assessments as a dependent variable. To test how changes in costs and discoveries, controlling for other relevant variables, affect the level of assessments, I consider assessment per share as a dependent variable. Following the agency costs hypothesis, an increase in the cost of investment is correlated with an increase in assessments and an increase in the discoveries, which can be used to finance the mine, is correlated with a decrease

[13]The Imperial Silver Mining Company is included in the sample from 1872 to 1876. Utah Consolidated Silver Mining Company is included from April 1872 to 1877. Union Consolidated Silver Mining Company is included from January 1875 to 1877. The Mexican Gold and Silver Mining Company is included from December 1874 to 1877.

[14]Many assessments, 27.48%, were levied on Tuesday.

in assessments. I assume that the investment decision is fixed throughout my sample period and that firms finance their operations only through retained earnings or assessments.

Detailed information on revenue and the cost of investment is not available for all mines. I address the incompleteness of the data in several ways. The average daily ore, as reported in the *Mining and Scientific Press*, is used as a measure of profitability. Absent complete information on the receipts of the mine, average daily ore partially captures the increase in excess cash. Because firms incurred more costs as greater depths were reached, I use shaft level as a proxy for costs.[15] I include lagged values of the measures in the regression analysis. I also include firm-specific variables such as age and size and year-specific dummy variables to capture aggregate time effects.[16]

The Bank of California had a controlling interest in several of the firms in my sample; the Bank owned a sizeable number of shares or was known to influence the decisions of the firm. See the Appendix for more information on how these firms were identified. The cost of collective action are minimized for institutional investors. They can monitor and discipline managers more effectively, reducing the threat of agency costs. Firms with an association with the Bank of California, do not need to levy assessments as frequently. I include a dummy variable identifying these firms in the model.

Results

In Table 1.7, I report the results of the regression model of frequency. In Column (1), I present the estimates and the robust standard errors. Shaft level, the proxy for costs, is statistically significant at the 99% confidence level. Firms with greater shaft depth levy assessments with greater frequency. When I cluster the standard errors by firm, shaft depth is statistically significant at the 95% confidence level and the magnitude remains the same at -0.03. The result is reported in Column (2). The magnitude decreases when I limit the sample to assessments that were levied within 200 days of the previously levied assessment and include firm-specific dummy variables. The results are reported in Column (3) and Column (4). Similar results are found for the effect of the size of the mining claim. The coefficient is statistically significant at the 95% confidence level, but the significance and magnitude decreases as I cluster standard errors by firm, limit the sample, and include firm-specific dummy variable. Overall, the results suggest that greater costs, controlling for other relevant variables, lead to greater frequency of levies. Average daily ore, age, and the dummy variable for the Bank of California are not statistically significant. Furthermore, the signs

[15]The probability of flooding increased and ventilation became more challenging as greater depths were reached (Crowell, 1941).

[16]In 1872, many mining companies increased their capital stock and fewer assessments were levied. Of the 34 changes in capital stock between 1872 and 1877, 35.29% were in 1872. In 1873, the Fourth Coinage Act was passed and a financial panic in September of 1873 temporarily closed the New York Stock Exchange. Silver sold at a premium from 1859 until demonetization in 1873, when it would no longer be coined free at \$1.29 an ounce, $\frac{1}{16}$ the value of gold. The market price was \$1.36 an ounce in 1859, from which it declined slowly to \$1.32 early in 1873, although the coinage value was \$1.2929 an ounce (Smith, 1943, p. 143).

of the effect of the Bank of California and age are not consistent across specifications. The year-specific dummy variables were not statistically significant in any of the specifications.[17]

In Table 1.8, I report the regression model of assessment per share. The variables in the regression model are similar to the variables included in the regression model of frequency. Average daily ore and the dummy variable for the Bank of California are statistically significant at the 95% confidence level. Greater average daily ore, controlling for other variables, lowers the assessment per share. Firms with an association with the Bank of California levy assessments at greater amounts relative to other firms. The coefficient of the Bank of California remains significant when I cluster standard errors, include some firm-specific dummy variables, and limit the sample to assessments levied from 1876 to 1877. I limit the sample for those years to exclude changes in capital stock and because most firms were levying assessments by those years. Firms associated with the Bank of California are more likely to levy a greater assessment per share than other firms, controlling for other variables. The result is consistent with the claim that institutional investors can reduce the threat of agency problems.

The results for shaft depth and average daily ore are mixed. The statistical significance and magnitude change when standard errors are clustered, firm-specific dummy variables are included, and the sample is limited. However, the sign of the effect of both variables is negative. Combining the results, an increase in costs leads to an increase in frequency but reduces the amount per share. Greater profitability and yield reduces the amount per share. The results imply that costs, profitability and yield are primarily driving the observed pattern of assessments.[18]

[17]To further examine the frequency of levies, I compare the behavior of firms before and after unexpected increases in costs. The data include reports of flooding, accidents, purchases of new machinery, and litigation. The Appendix includes details on how the data were identified. Of the 222 assessments levied between 1872 and 1877, 19 were levied following a report of an unexpected increase in costs from the previous quarter. Of the 19 assessments, 13 assessments were levied within 90 days of the previously levied assessments. When I consider a regression of log days as the dependent variable, limit the days between assessments as 90, and include a variable or costs shocks, the effect of unexpected increases in costs on the frequency of levies is negative, but not statistically significant.

[18]I also consider actual measures of the costs and yield as reported in the quarterly Storey County Mining Assessments of the Ores from Mines. See the Appendix for information on the contents of the Storey County Assessments. Only firms that discovered bullion filed quarterly reports. Because firms are less likely to levy assessments in periods when the mine is yielding ore, the cost and yield information is limited. However, I consider a regression model with assessment per share as the dependent variable and the reported cost and yield information, controlling for age, size, association with the Bank of California, and year-specific dummy variables. Cost and yield are both statistically significant at the 99% confidence level. There are only 29 observations. The standardized estimate of the yield of the mine, as measured in logs, is -0.72 and the standardized estimate of the costs of the mine, as measured in logs, is 0.78. A one standard deviation change in the yield or costs changes the assessment per share by about the same magnitude, but with different signs. The dummy variable for 1872 is positive and statistically significant at the 99% confidence level. Assessment per share was greater, overall, in 1872.

Announcement Effect

To study the announcement effect of unexpected assessments, I need to control for movements in prices that are affected by cash flows. An unexpected assessment is one that differs in amount from the previously levied assessment.[19] In a frictionless market, if shareholders are required to pay the assessment on the date of delinquency, then one should observe a sharp increase in price, reflecting more assets in place. However, the date of notice was typically the first day that an assessment was payable. Figure 1.1 shows the change in stock price following notices of assessments. The figure shows a greater negative price reaction around announcements of assessments that are greater than the previously levied assessment compared to assessments that were less than the previously levied assessments. The overall negative effect on prices may simply reflect the increased cost to shareholders.[20]

I consider a regression model with the cumulative return as the dependent variable. The cumulative return is the sum of the return beginning 2 days prior to the notice of levy, the date of levy, and 4 days following the notice.[21] I control for the size of the assessment and include dummy variables indicating whether the assessment as greater than the previous assessment, whether the firm reported a positive average daily ore in the quarter prior to the assessment notice, whether the firm had unexpected changes in costs, and year-specific dummy variables. I also interact the dummy variable for profitability, average daily ore, with the dummy variable for a greater assessment than previous. I do this to determine if a firm's profitability reduced the negative effect on assessments that were levied at a greater amount than previous levy. The positive effect on prices would reflect an increase in expected future profits.

The results are reported in Table 1.9. When I consider a model of cumulative returns as the dependent variable, all the variables have a negative effect on the 5-day return. The dummy variable on average daily ore is statistically significant at the 95% confidence level. The interaction between average daily ore and greater than previous is not statistically significant. There is not much evidence to support an announcement effect on changes in assessments.

V. Discussion

The results of the empirical analysis are consistent with the empirical implications of the agency costs hypothesis. Mining firms levied assessments frequently. Changes in the cost of

[19] I assume that investors could predict the timing of assessments and were only surprised by changes in the amount levied. There is some evidence to support this view. "Assessment was double what was expected and caused a great deal of growling" (*Mining and Scientific Press*, April 15, 1876). "Assessment just levied was one hundred percent more than what used to be levied" (*Mining and Scientific Press*, May 20, 1876).

[20] When the Sierra Nevada Gold and Silver Mining Company levied a $15 assessment in the week of January 19, 1863, the *Mining and Scientific Press* reported that the depreciation of the stock price was about equal to the assessment.

[21] I chose this date range to account for the information technology during this period.

investment or yield favored limiting assets under the manager's control. Greater costs lead to greater frequency of levies. Unexpected changes in costs also lead to greater frequency of levies. Increases in the profitability and revenue of the firm are correlated with lower assessments. Furthermore, firms with an association with the Bank of California levied a higher assessment per share relative to other firms. If the Bank of California monitored and disciplined management more effectively, then assessments could be levied less frequently and for greater amounts. More detailed information on the management of firms and shareholders would also for a more comprehensive study with sharper results.

Compensation schemes and debt are alternative ways to address agency problems. Because the mine's payoff was uncertain and not necessarily correlated with the actions of the managers, compensation contracts may not be effective. Debt is an also effective way to reduce agency costs because it is legally binding (Jensen, 1986). Failure to honor obligations results in a transfer of the firm to debtholders. However, mining firms did not rely on debt for long-term financing. Although bonds were used to finance railroad and utility companies in San Francisco, there is no evidence that mining firms issued bonds in the public market. Available annual reports show that short-term loans were likely used when the mine was yielding paying ore.[22] The uncertainty of payoffs may explain low leverage rates. In fact, firms in metal and mining industries generally have low leverage compared to other industries (Harris and Raviv, 1992; Creamer et al., 1960a; Creamer et al., 1960b).

A few editorials and narratives claim that assessments actually encouraged waste and fraudulent behavior. "Unscrupulous operators on the inside utilized this device as a weapon in their stock manipulations, and assessments kept inefficient companies afloat, supported spendthrift company officials, and were even used sometimes to pay 'dividends' to naïve stockholders" (King, 1977, p. 120). Asymmetric information makes issuing stock with assessments a less effective way of minimizing agency problems. If managers had private information on the costs of investment or the profitability of the firm, then it would be difficult for shareholders to distinguish between necessary and unnecessary levies. As assessments were levied, many mines reached deeper levels. However, continuing to invest in mines with a negative net present value is wasteful. Given the limitations of the data, it is difficult to test the claim of wasteful investment.

Shareholders could call meetings or default on assessments when they suspected wasteful investment. "A number of special meetings of mining companies were called for the purpose of adopting a code of by-laws for the management of the company" (*Mining and Scien-*

[22] Available annual reports show that short-term loans were likely used when the mine was yielding paying ore. For firms that reported bank interest on overdrafts in select annual reports, an average 72% of receipts came from discovered bullion. Absent discoveries, firms used assessments or short-term debt with recourse to assessments: "for as long as the Bank only gets the price of crushing, it matters not to them *whether the ore pays or not*, since in the latter case the deficiency is made up in *assessments* levied on stockholders" (Sutro, 1874). Select annual reports show an average of 84% of receipts used to cover expenditures came from discovered bullion and assessments. Figures are from 64 annual reports found at the Bancroft Library, the California State Library, the University of Nevada, Reno, and printed reports in the Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains from 1868 to 1876.

tific Press, March 8, 1873). "Overthrows of management continue" (*Mining and Scientific Press*, November 27, 1875). Distrust and lack of confidence in management also led to unpaid assessments and a depression in stock prices (*Mining and Scientific Press*, June 16, 1877). Furthermore, managers, as shareholders, were required to pay assessments, providing incentive to limit wasteful behavior.[23]

The agency costs framework does not include other features of stock with assessments, such as limiting the penalty of default to share ownership or why assessments were preferred over waves of equity. Moreover, the previous literature has suggests that periodic capital requests were used to address investor liquidity constraints. I evaluate these and other claims in the remaining section.

Option Value

An alternative explanation for why mining companies relied on assessments is the option value hypothesis. Investors are concerned about the financial contribution in the face of uncertainty. Providing capital in installments as new information arrives and limiting the loss to share ownership helps investors mitigate losses. Investors interested in mining securities value the flexibility.

Suppose the lifespan of the mine is $T = 2$ and there are three periods, $t = 0$, $t = 1$, and $t = 2$. Payoffs are not known at the time of investment, $t = 0$, and actual payoffs are realized at $t = 2$. Shareholders have the option to provide the capital upfront or finance the mine in installments. Shareholders can observe a signal about expected payoffs at $t = 1$. A stock with an assessment allows the shareholder to provide only a fraction of the total cost of investment in the first period. After a signal is observed in the second period, a shareholder can decide whether to reinvest or default. The option value of waiting is positive, so a stock with the right to default upon assessments should be worth more than a stock without an assessment. Because an increase in the uncertainty of payoffs increases the value of waiting, firms with greater uncertainty prefer stocks with assessments. This would explain why assessments were more commonly used in the mining industry (e.g., Michigan copper mines, Gates, Jr., 1951). Payments over several periods and default following a clearly negative signal is evidence consistent with the option value hypothesis.

There is evidence that investors recognized the option value of shares with assessments. "The disposition to sell on the part of those who hold stock of intrinsic value is constantly diminishing, and so far as they are able to, all such are regularly paying up their assessments, and closely watching the development of their mines" (*Mining and Scientific Press*, June 22, 1863). "The delinquent assessment lists now published are assuming large proportions, showing an intention on the part of stockholders to let the stock go by default in preference

[23] "Stockholders gradually wearied of paying assessments, the more especially when they began to find that the insiders contrived to dodge that part of the business and let outsiders do it all" (*Mining and Scientific Press*, May 5, 1877).

to paying assessments" (*Mining and Scientific Press*, May 19, 1877). There is also evidence that investors exercised the option to default.[24]

Uncertainty in Securing Future Capital

Suppose that firms could not forecast the capital need at the initial date of investment. Firms underestimate the cost of investment or misvalue the mine because the technology is evolving. With small, new, or unfamiliar types of production, many expensive and wasteful procedures were attempted before sound techniques and efficient machinery was developed. Firms may need to secure funds in the future, but searching for additional capital is costly and could delay work. Assume that investors have access to capital and are not liquidity constrained.

Evidence suggests that it was difficult to secure additional funds from shareholders and outside investors in states without assessments. Mining securities were risky and new and confidence in mining securities as a sound investment wavered.[25] "It is hard to get men to pay any money for having work done when the money paid for the stock is once spent" (*Mining and Scientific Press*, March 31, 1884). An editorial in the September 17, 1881 issue of the *Mining and Scientific Press* discussed how a milling company had lost $150,000 "for mere want of $10,000." In a non-assessable system, the result could be underinvestment. "If an assessment had been possible, many of the stockholders would gladly have protected their stock in this manner, the delinquents would have been sold out, and work would have gone ahead without delay" (*Mining and Scientific Press*, March 10, 1883).

Shareholders commit to future outlays by purchasing stock with assessments, giving firms access to additional capital. The right to levy is comparable to a line of credit available to the firm. Additionally, managers should hoard cash to protect against the uncertainty of the capital market. However, available data suggest that firms were not holding large cash reserves. The average reported cash balance as a share of capital stock from 1863 to 1877 was 0.026.[26] Uncertainty in the capital market does not fully explain frequent levies.[27]

[24]However, it is not rational for investors to default if the stock market is liquid and the trading price is strictly greater than the assessment levied.

[25]The following were reported in the *Mining and Scientific Press*: "outsiders have no incentive to invest because of lack of confidence" (July 23, 1864); "restoration of confidence" (June 17, 1865); "confidence in market is shaking" (December 9, 1865); "apathetic feeling in stock mining circles" (January 8, 1870); "there has been nothing like the present excitement in the stock market" (May 10, 1873); "public has doubts" (January 24, 1875), "continues in state of uncertainty" (July 21, 1877).

[26]Some firms reported accounting figures to the *Mining and Scientific Press*. There were 126 reports by 13 firms. 33 of the 126 reports were of negative cash balances.

[27]Stock with assessments should perform better than stocks without assessments when macroeconomic shocks make it difficult to raise capital.

Liquidity Constraints

Alternatively, the cost of investment was divided into installments because investors could not provide the required capital immediately. Local capital could not initially meet the needs of the mining industry; the required capital investment was greater than aggregate savings.

> Now it is evident that they cannot be worked to any extent short of an assessment of at least 25 cents per month to the share. This would give us an average of $1,500,000 per month, required to prospect our mines. ... It is moreover estimated that this amount will soon be increased (*Mining and Scientific Press*, January 30, 1864).

Based on the estimates from the *Mining and Scientific Press*, at least $18 million was required each year to prospect the mines. As a measure of available capital, consider the aggregate deposit in savings banks in San Francisco. According to Hittell (1878), the total deposit was $10 million (in nominal terms) in 1866 and reached $22 million by 1868. The need to attract capital from the East also suggests that local investors were liquidity constrained. For example, on March 18, 1865, the *Mining and Scientific Press* reported that "Eastern parties have recently been buying largely without much regard to current quotations thereby relieving the market of considerable stock which might otherwise not have met purchases here."[28]

Improved access to credit and lower share denomination did not reduce levies. Following legislative changes, banks supported investment in mining securities by becoming shareholders and accepting mining stocks as collateral on loans.[29] The *Mining and Scientific Press* reported on how the ease of the money market encouraged investment in mining securities (September 24, 1864; May 11, 1867). In addition, the increased competition among money lenders reduced interest rates (*Mining and Scientific Press*, September 30, 1865). Low interest rates and the willingness of banks to make loans upon mining stock collateral encouraged many to purchase mining stocks (*Mining and Scientific Press*, August 20, 1864; May 11, 1867).

Rather than levy assessments, firms had the option to issue more shares with a lower par value. Over time, firms issued shares in smaller denominations, some with the intention of attracting shareholders of modest means. "It was the policy of the management to keep the price of the stock at a moderate figure – to broaden the market and 'give the little fellows a chance,' as Flood expressed it – which was accomplished by increasing the number of shares

[28] Additional evidence of investor liquidity constraint is the claim that most of the sales of the San Francisco Stock and Exchange Board was done on a margin basis. "There was not sufficient cash available to transact such a volume of business otherwise" (Hittell, 1978, p. 57).

[29] The years 1862 and 1864 brought the first constructive bank legislation in the form of two measures of outstanding historical importance. The act definitely legalizing and strengthening corporations for the accumulation and investment of funds and savings. An amendment to this act, passed two years later, providing that such corporations having a paid-in capital, or capital and reserve fund, of $300,000 might accept ordinary deposits without interest and deal in certain classes of securities, including evidences of debt, public and private (Armstrong and Denny, 1916, p. 20; Cross, 1927, p. 255).

from time to time and declaring stock dividends" (Smith, 1943, p. 153).[30] However, firms continued to levy assessments even when share price was reduced and the number of shares increased. See Table 1.5.

Transactions Costs

An important feature of assessments is that additional capital did not require issuing new shares. Issuing equity in waves can also limit the cash available to managers. However, the costs of increasing the capital stock were greater than levying assessments. Required attendance at a special meeting, majority vote, and printing new certificates made increasing the capital stock more costly than levying assessments. Notice was given at least four weeks prior to the meeting. Four-fifths of the capital stock was required to attend the meeting in person or by proxy. Dispersed share ownership made collective action challenging.[31] Assessments did not require shareholder approval and avoided the costs of printing new certificates. Furthermore, the infrequent increase in the capital stock relative to the use of assessments is consistent with the transactions cost framework. I can confirm 34 changes in capital stock. However, firms continued to rely on assessments following these changes.[33] See Table 1.5. The transactions costs framework does not make predictions on the frequency of levies.

VI. Conclusion

I claim that firms relied on assessments because they addressed some of the challenges and market frictions faced by mining firms. I find evidence in support of the agency costs framework to explain why we observe financing over several periods. This includes the frequency of levies and the changes in assessment use driven by changes in cost and yield. Narrative evidence from the *Mining and Scientific Press* also supports the option value framework.

There are several limitations of my study. First, all the firms in my sample levied assessments, making a comparison of stocks with and without assessments difficult. Second, I

[30] In the 1860s, the median par value was $500, while the minimum and maximum values were $100 and $2,000, respectively. By the late 1870s, the minimum and maximum number of shares of the actively traded principal mining firms were 30,000 and 540,000 respectively. The typical stock price was $100.

[31] For example, the Belcher Silver Mining Company initially proposed an increase in the capital stock from $1,040,000 to $10,400,000 on April 23, 1872. The meeting was adjourned twice because they did not meet the attendance requirement (*Daily Alta California*, May 24, 1872, June 25, 1872). A vote of at least two-thirds of the capital stock in favor of the change was required for approval. If approved, notice of change had to be filed with the County and the State. New stock certificates were then printed.[32] The proposal was finally approved during the July 25, 1872 meeting.

[33] For many mining companies, the increase in capital stock might have been for the purpose of increasing assessments. For example, on November 30, 1867, the *Mining and Scientific Press* reported that the Hale and Norcross Silver Mining Company increased their capital stock to enable them to levy a larger assessment.

lacked detailed information on investment, cost, yield, debt financing, ownership of shares, management, and company by-laws for all of the mines in the sample. Although I found a proxy for missing cost information, performed empirical analysis on a subset of firms with more complete information to confirm my findings, and used supporting evidence from a credible local newspaper, detailed information would allow for a more comprehensive study of assessments.

A third limitation is that my study focused only on mining firms from 1872 to 1877. By 1872, the assessment notice was more uniform and there were fewer discoveries. From 1860 to 1868, some mining companies provided explanations in their assessment notice, such as "to cancel indebtedness" or "litigation expenses." Moreover, some firms were more likely to report accounting information, such as balances and actual yield, in the 1860s. I end the dataset in 1877 because interest in mining began to decline. However, I surveyed assessment notices printed in the *Daily Evening Bulletin* from 1882 to 1887. Recall that all incorporations in California had the right to levy assessments by 1872. Although coal, iron, steel, manufacturing, cable railroad, water, tobacco, publishing, and insurance companies levied assessments, mining companies levied with greater frequency. Expanding the dataset and including non-mining companies would also allow for a more comprehensive study of assessments.

My study focused on financing with assessments, but banks and bankers did play an important role. Bankers and banks were shareholders, treasurers, provided credit, and accepted shares as collateral for loans. Much has been written on the role of banking institutions in mining (Armstrong, 1916; Cross, 1927; Doti and Schweikart, 1991; Doti and Schweikart, 1994; Hunter, 1950; Odell, 1987). By 1876, the Bank of California and the Nevada Bank were major shareholders in most of the firms with mining claims on the Comstock.

An assessable stock system has many disadvantages and advantages not discussed in the paper. Assessments were also considered a source of stock price manipulation. Managers were accused of freezing out and continually assessing until small shareholders dropped out, allowing insiders to purchase shares at a low price before discoveries were made public (*Mining and Scientific Press*, March 31, 1884). Acheson, Turner, and Ye (2012) claim that stocks with similar features limited diversification, by forcing shareholders to keep funds in liquid accounts for future assessments. On the other hand, the right to levy assessments assured creditors of payment, even when mines did not yield paying ore. "Western merchants and mine laborers naturally hesitated to furnish goods or services to a nonassessable company, since it might not honor its obligations, thus encumbering a new enterprise with an entirely avoidable credit problem" (King, 1977, p. 121).

For San Francisco, the benefits of an assessable system outweighed the costs. Stock with assessments limited agency costs, gave shareholders the option to reinvest, and assured creditors. As a result, firms were able to attract capital to mining enterprises. In spite of its location, isolation, and initial local wealth, San Francisco was able to attract savers with capital, limit capital flight, and establish a reputable mining share market (Odell, 1987).

San Francisco owes her prosperity to the mines of California and Nevada. Her

> rapid growth in a commercial way, is due in great measure, to them. Depopulation would ensue were these mineral resources removed. Mechanical ingenuity has done much to develop them. The powerful rock-drills that have but recently been employed, have penetrated the mountains of granite. The monster engines that propel the hoisting machinery, could not be dispensed with. The untiring stroke of the pump piston whose power diverts rivers of water from their natural course, performs an invaluable work; but the prime motor in the whole complication has been the mining share market (Lloyd, 1876, p. 42-43).

The connection between shareholder liability and the development of the capital market, by reducing market frictions, has not been emphasized in the previous literature. Previous research on shareholder liability in England and the United States has highlighted the following advantages: to provide capital in the case of insolvency; to attract more investors through installment payment (Jefferys, 1946); to provide derivative-like features prior to the development of such securities (Shea, 2007; Campbell, 2013); to screen investors and improve corporate governance (Acheson, Turner, and Ye, 2012; Baskin and Miranti, Jr., 1997); and to minimize risk-taking behavior by banks (Esty, 1988). Furthermore, the corporate finance literature has focused on resolving such market frictions with debt, dividends, and other methods.

Assessments were used in other markets following my period of study. By the late 1890s, Colorado law gave mining companies the option to issue assessable shares (King, 1977, p. 120; *Mining and Scientific Press*, July 7, 1900). According to the documentation available at the Center for Research in Security Prices, at least four different companies levied assessments in the 1920s.[34] According to Brennan and Dunlop (1991), modern Australian prospecting and mining companies use a similar institutional policy; firms have the option to use calls or issue contributing no-liability shares. Australian companies also have the right to sell delinquent shares.[35] In California, water companies continue to have the right to levy assessments on shareholders.[36]

[34]http://www.crsp.com/documentation/kb/data/stock/stk-0013.html. In addition, the term "assessable stock" appears in the Securities Act of 1933, Title 17, Commodities and Securities Exchanges. It defines an assessable stock as a "stock which is subject to resale by the issuer pursuant to the statute or otherwise in the event of failure of the holder of such stock to pay any assessment levied thereon" (*Securities Act of 1933*).

[35]See Bruce, McKern, Pollard, and Skully (1989) for more information on Australian corporate finance.

[36]"A corporation organized for or engaged in the business of selling, distributing, supplying, or delivering water for irrigation purposes for domestic use, and not as a public utility, may levy assessments upon its shares, whether or not fully paid, unless otherwise provided in its articles or bylaws" (California Corporation Code, §14303).

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Appendix

Data

See Appendix for detailed information on the firms included in the sample. Sales data was collected from the daily local papers of San Francisco and Nevada from 1862 to 1877. Companies purchased advertisement space for notices regarding assessments. Beginning in 1868, the *Mining and Scientific Press* provided a summary of the assessments printed in the local papers of San Francisco and Nevada. I include assessments printed in the *Mining and Scientific Press* and confirmed the data with available annual reports, the *Daily Alta California*, and the *Daily Evening Bulletin*. I exclude assessments that were later rescinded. I used the date printed on the bottom of the advertisement as the date of notice or levy. I also collected delinquency and default information. If delinquency data was missing, then 30 days following the date of notice was used. If only the month of levy is known, the first day of the month was used as the date of notice. Dividend data was collected using the same method as assessments. Six firms paid dividends during my sample period. They include: Belcher Silver Mining Company, California Mining Company, Chollar and Potosi Mining Company, Consolidated Virginia Mining Company, Crown Point Gold and Silver Mining Company, and Imperial Silver Mining Company.

I assumed, the owner of the stock at the time of levy was responsible for payment.[37] If the shareholder had fallen into arrear and continued to own the stock in whole because the firm was not able to sell shares or purchase them, then future dividends were forfeited up to the amount of unpaid assessments and associated costs.[38]

I also consider unexpected changes in costs. Examples of costs shocks reported in the *Mining and Scientific Press* include "water impedes operations," "accident has reduced crushing capacity," "operations suspended due to retimbering shaft," "mill idle due to bad condition of weather," "cave problems," "accident," "trouble with water," "lack of ventilation in lower level," "break in machinery," "work suspended," and "fire has been reached." I also consider cost and yield information from the Storey County Mining Assessments of the Ores from Mines from 1871 to 1877. Total Cost, Actual Cost of Extraction, Actual Cost of Transportation, Actual Cost of Reduction, Tons Extracted, Value per Ton, and Gross Yield

[37]The By-Laws of the Yellow Jacket Silver Mining Company, did not allow transfers to be made when assessments were unpaid. Son (1901), Chapter XII, Section III, states the following: "Until the transfer, or after demand and refusal of the corporation to transfer, the transfer remains personally liable to the corporation for all calls and assessments. ... If, however, assessments are levied or calls are made between the time of transfer and of registration, the transferor, after paying the same, has recourse to his transferee. As between the parties, the latter is the true owner, and the one on whom the burden rests." However, the By-Laws of the San Francisco Stock and Exchange Board state that following the notice of levy, the buyer was responsible for non-delinquent assessments.

[38]Not stated in the Statute was whether the shareholder lost his right to receive future dividends if ownership remained in whole following the delinquency of assessment. Dividends are paid from surplus profits. The right to receive future dividends is an incident of ownership of stock and passes, by implication, with the transfer of legal title.

information are from the quarterly Storey County Mining Assessments, Ores from Mines Report, from 1871 to 1877. Data was available for the first quarter of 1871, first, third, and fourth quarters of 1872, first and fourth quarters of 1874, and third quarter of 1875 to fourth quarter of 1877, inclusive.

Bank of California

The Bank of California had a controlling interest in many of the mines, owned many of the mills under the Union Mill and Mining Company, built the Virginia Truckee Railroad, established a branch in Virginia City, and purchased an interest in the Virginia and Gold Hill Water Company, which controlled the water supply to the Comstock (Smith, 1943, p. 120).[39] The Bank's refusal to help finance the Sutro Tunnel, proposed by Adolph Sutro to address drainage and underground transportation, led Sutro to file suit against the California Bank Ring.[40] Bancroft (1892) and legal documents from the lawsuit were used to determine which mines may have been controlled or influenced by the Bank of California.[41] I identify Belcher Silver Mining Company, Chollar and Potosi Mining Company, Crown Point Gold and Silver Mining Company, Hale and Norcross Silver Mining Company, Kentuck Mining Company, Savage Mining Company, and Yellow Jacket Silver Mining Company as firms with an association with the Bank of California. An association includes ownership of shares, majority ownership, serving on the Board of Trustees, e.g. Treasurer, or mere influence. I do not know the extent to which the Bank of California played a role in each firm.[42]

[39]Further evidence of their dominance in the mining industry is provided in the annual report of the Ophir Silver Mining Company, Report of the Superintendent of the Ophir Mine, December 15, 1872: "The railroad thus far seems to be rather a misfortune than an advantage to outside companies, as it has driven, nearly all the teams out of the country, and it is now next to impossible for us to get wood and lumber through from any point, owing chiefly to a want of disposition on their part."

[40]The effect of the Sutro Tunnel is not considered in the analysis as it was not completed until July 8, 1878, after the sample period ends.

[41]The California Bank Ring Against the Sutro Tunnel (1874) are from Bancroft Library, University of California, Berkeley. "The result is, that when the annual elections for officers in these mining companies comes off, it is found that the *Bank of California*, without necessarily owning a single share, *has managed*, in the manner indicated, *to get hold of a majority of the stock*, thus controlling the election, and permitting it to elect a board of trustees entirely *in its own interest and willing to do its bidding.* In this manner the Bank of California secures the management of the mines and manipulates them *for its own benefit* (p. 7-8).

[42]Further evidence of their control is provided in the annual report of the Ophir Silver Mining Company, Report of the Superintendent of the Ophir Mine, December 15, 1872: "The railroad thus far seems to be rather a misfortune than an advantage to outside companies, as it has driven, nearly all the teams out of the country, and it is now next to impossible for us to get wood and lumber through from any point, owing chiefly to a want of disposition on their part."

Figures and Tables

Table 1.1: Summary Statistics, Assessments, 1872-1877

Variable	Median	Mean	Std Dev	Min	Max
Total Amount	$82,000	$87,922	$56,602	$3,000	$345,600
Dollars per Share	$2.00	$2.64	$2.45	$0.20	$15.00
Share of Capital Stock	0.01	0.02	0.01	0.002	0.05
Assessment Yield	0.09	0.11	0.07	0.01	0.40
Frequency	100	189	283	42	1830
Count	19.5	21.45	13.92	0	57
Obs (Firm * Month)					222
Number of Shares				2,000	500,000
Capital Stock				$400,000	$50,000,000
Age, Years	12.53	10.57	1.70	15.21	4.79
Length of Claim, Feet	612	785	705	90	3,300
Firms					24

Notes: The top panel shows summary statistics of assessments levied by the principal mining firms between 1872 and 1877. Total Amount is the total collected per assessment. Dollars per Share is the Total Amount divided by shares outstanding. Share of Capital Stock is the Total Amount divided by the capital stock. Assessment Yield is the dollars per share of the assessment divided by the closing share price on the day the assessment was levied. Frequency is the number of days between assessments. Count is the numbered assessment. For example, a mean of 21.45 implies that by the sample period, a firm would have levied, on average, about 21 assessments. In aggregate, $19,518,660 in assessments were levied for the 24 firms during the sample period. The average amount levied per share is $497.95. The bottom panel shows summary statistics across the 24 firms in the sample. The number of shares ranged from 2,000 to 500,000. In 1877, the average age is 10.57 years and the average length of the mining claim is 785.28 feet. The California Mining Company did not levy assessments during my sample period. I excluded the Challenge Mining Company. The figures include both the Imperial Mining Company and the Consolidated Imperial Mining Company.

Table 1.2: Pattern of Levies, 1872-1877

Levies per Year, Firms	Median	3
	Mean	2.70
	Std Dev	1.31
	Min	1
	Max	6
Distribution of All Assessments	1st Quarter	24.77%
	2nd Quarter	24.77%
	3rd Quarter	23.87%
	4th Quarter	26.58%
	1872	9.46%
	1873	15.32%
	1874	14.41%
	1875	17.57%
	1876	18.47%
	1877	24.77%
	Obs	222

Notes: The top panel of the table shows the summary statistics on the number of levies by firms between 1872 and 1873. Firms levied, on average, 2.7 assessments per year. The median number of levies per year for the firms in my sample is 3. Two firms in the sample levied 6 assessments in one year. The bottom panel shows the distribution of levies across quarters and years. There was slightly more levies in the fourth quarter of the year and more assessments in 1877. Fewer discoveries were made in 1877 and most firms were levying assessments. In 1872, 9 of the 24 firms levied assessments and 17 of the 24 firms levied assessments in 1877.

Table 1.3: Regularity of Assessments

Dollars per share (t) - Dollars per Share ($t-1$), Dollars	Median	\$0.00
	Mean	\$0.01
	Std Dev	\$0.78
	Min	- \$5.00
	Max	\$5.00
	Obs	198
Dollars per share (t) = Dollars per Share ($t-1$)	Obs	141

Notes: The table presents data on the regularity of assessments. Dollars per share ($t-1$) is the previous assessment that was levied by that firm. Of the 198 levies, 141 were levied in at an amount equal to the previous amount. I refer to these assessments as regular levies.

Table 1.4: Propensity to Levy Regular Assessments

	Quartile			
	1	2	3	4
Assessment per Share, Mean	\$28.75	\$54.25	\$29.68	\$5.75
Age, Years	13.9	12.1	9.57	13.72
Bank of California	5	2	0	0
Number of Shares (1875), Mean	62,000	28,500	66,800	67,760
Length of Claim (1875), Mean	802.83	773.50	1,533.33	800.10
Virginia City	2	3	2	2
Firms	6	4	5	5

Notes: Firms are ranked according to the share of assessments that had the same dollar value as the previous assessment. A firm in Quartile 1 had a larger share of assessments that were equal to the previous assessment. To be included in the analysis, firms had to levy at least 3 assessments during the sample period. There are 20 firms. The figures do not include changes in costs or discoveries. The Bank of California firms are more likely to have regular levies.

Table 1.5: Assessments and Increases in Capital Stock, 1872-1877

	Median	Mean	Std Dev	Min	Max
Total Amount, Dollars					
Prior to the 1st Change	50,000	54,535	26,616	18,000	125,000
Following the 1st Change	100,000	95,111	42,511	7,500	201,600
Following the 2nd Change	100,000	95,360	54,715	3,000	345,600
Following the 3rd Change	100,800	130,357	91,293	80,000	345,600
Following the 4th Change	112,000	105,000	35,889	56,000	168,000
Amount Per Share, Dollars					
Prior to the 1st Change	2.00	2.96	3.01	0.20	15.00
Following the 1st Change	3.50	3.67	2.67	0.25	10.00
Following the 2nd Change	1.00	1.40	0.88	0.50	5.00
Following the 3rd Change	3.00	3.16	1.86	1.00	5.00
Following the 4th Change	1.00	0.94	0.32	0.50	1.50

Notes: The table shows the pattern of levies around increases in capital stock. The minimum number of changes in capital stock was 0 while the maximum was 4. Of the 34 approved changes in capital stock, 12 were made in 1872, 6 were made in 1873, 6 were made in 1874, 6 were made in 1875 and 4 were made in 1876. Assessments continued to be levied following changes in capital stock.

Table 1.6: Variables used in Empirical Analysis

	Median	Mean	Std Dev	Min	Max
Total Assessment	\$80,000	\$87,297.97	\$57,071.06	\$3,000	\$345,600
Amount per Share	\$2.00	\$2.70	\$2.45	\$0.25	\$15.00
Total Assessment/Capital Stock	0.01	0.176	0.125	0.0015	0.05
Days between Assessments	94.50	132.49	130.36	42.00	957.00
Shaft Depth	16.00	15.31	4.58	3.98	22.00
Average Daily Ore	0.00	0.16	0.60	0.00	4.25

Notes: The data is from 1872 to 1877. There are 217 observations. I excluded assessments levied by the Consolidated Imperial Mining Company; there were 5 in total. The company did not incorporate until April 1876. I identified 7 firms as having an association with the Bank of California. There are 23 firms in total.

Table 1.7: Regression Model of Frequency

Dependent Variable: Days Since Previously Levied Assessment, Log				
	(1)	(2)	(3)	(4)
Shaft Depth	-0.03***	-0.03**	-0.02*	-0.01
	(0.02)	(0.02)	(0.01)	(0.02)
Average Daily Ore	0.07	0.07	0.02	0.05
	(0.07)	(0.06)	(0.05)	(0.05)
Market Capitalization	0.08**	0.08	0.05	-0.003
	(0.04)	(0.05)	(0.03)	(0.04)
Size of Mining Claim	-0.02***	-0.02***	-0.01	-0.01
	(0.01)	(0.01)	(0.00)	(0.04)
Age	0.0002	0.0002	0.000	-0.02
	(0.01)	(0.01)	(0.01)	(0.02)
Bank of California	-0.06	-0.06	0.01	
	(0.11)	(0.14)	(0.08)	
Constant	Yes	Yes	Yes	Yes
Clustered Standard Errors	No	Yes	No	No
Heteroskedasticity Consistent Errors	Yes	No	Yes	Yes
Firm Dummy Variables	No	No	No	Yes
Days between Assessments ≤ 200	No	No	Yes	Yes
Observations	191	191	176	176
R-Squared	0.13		0.07	0.18
Adjusted R-Squared	0.08		0.01	0.06

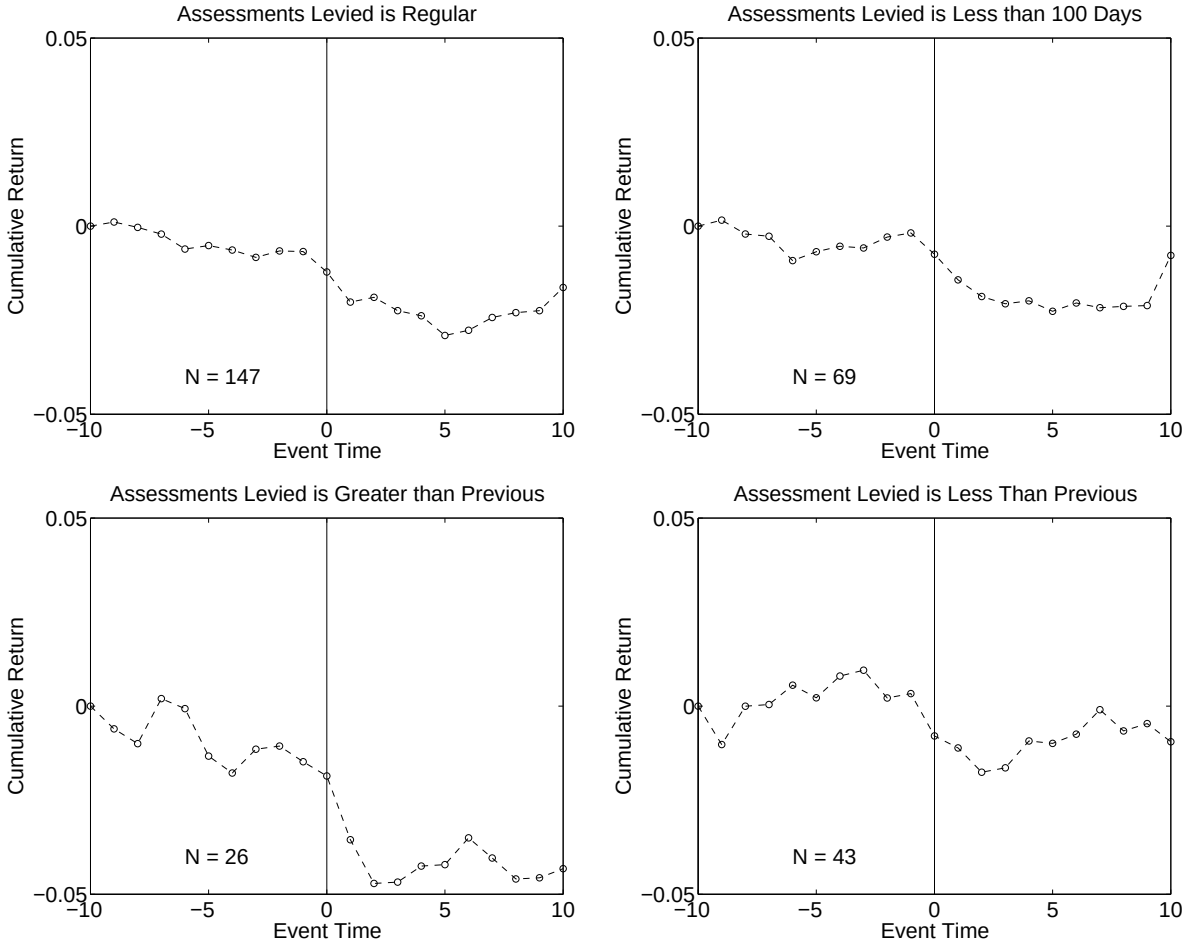
Notes: The table shows regression results from the frequency of assessments between 1872 and 1877. The dependent variable is number of days between assessments, measured in logs. Shaft Depth data is from the previous quarter in which the assessment was levied. It is measured in 100 feet. The reported Average Daily Ore is from the previous week from the assessment notice. It is measured in 100 tons. Age is reported in number of years. I include the log of the market capitalization of each firm. I include dummy variables for 1872, 1873, 1874, 1875 and 1876, but they were not statistically significant in any of the specifications. I report the results of OLS regression with robust standard errors in Column (1). Column (2) shows results using clustered standard errors. Column (3) shows results when the sample is limited to assessments levied no more than 200 days since previous levy. Column (4) shows results when firm-specific dummy variables are included and excluded levies that were greater than 200 days. I include 15 firm-specific dummy variables. I exclude levies that were greater than 200 days. I also considered a model of firms that did not pay dividends from 1872 and 1877 and found similar results. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Table 1.8: Regression Model of Assessment Amount

Dependent Variable: Assessment, Dollars per Share				
	(1)	(2)	(3)	(4)
Shaft Depth	-0.04	-0.04	-0.01	-0.15***
	(0.05)	(0.09)	(0.01)	(0.05)
Average Daily Ore	-0.44**	-0.45*	-0.16	-0.10
	(0.21)	(0.23)	(0.19)	(0.19)
Market Capitalization	0.25*	0.25	0.05	0.09*
	(0.13)	(0.19)	(0.16)	(0.14)
Age	0.03	0.03	-0.06	0.03
	(0.03)	(0.05)	(0.16)	(0.03)
Bank of California	1.55***	1.55***		0.51*
	(0.34)	(0.43)		(0.27)
Constant	Yes	Yes	Yes	Yes
Clustered Standard Errors	No	Yes	No	No
Heteroskedasticity Consistent Errors	Yes	No	Yes	Yes
Firm Dummy Variables	No	No	Yes	No
Assessments levied from 1876-1877	No	No	No	Yes
Observations	210	210	210	90
R-Squared	0.46		0.55	0.23
Adjusted R-Squared	0.44		0.49	0.18

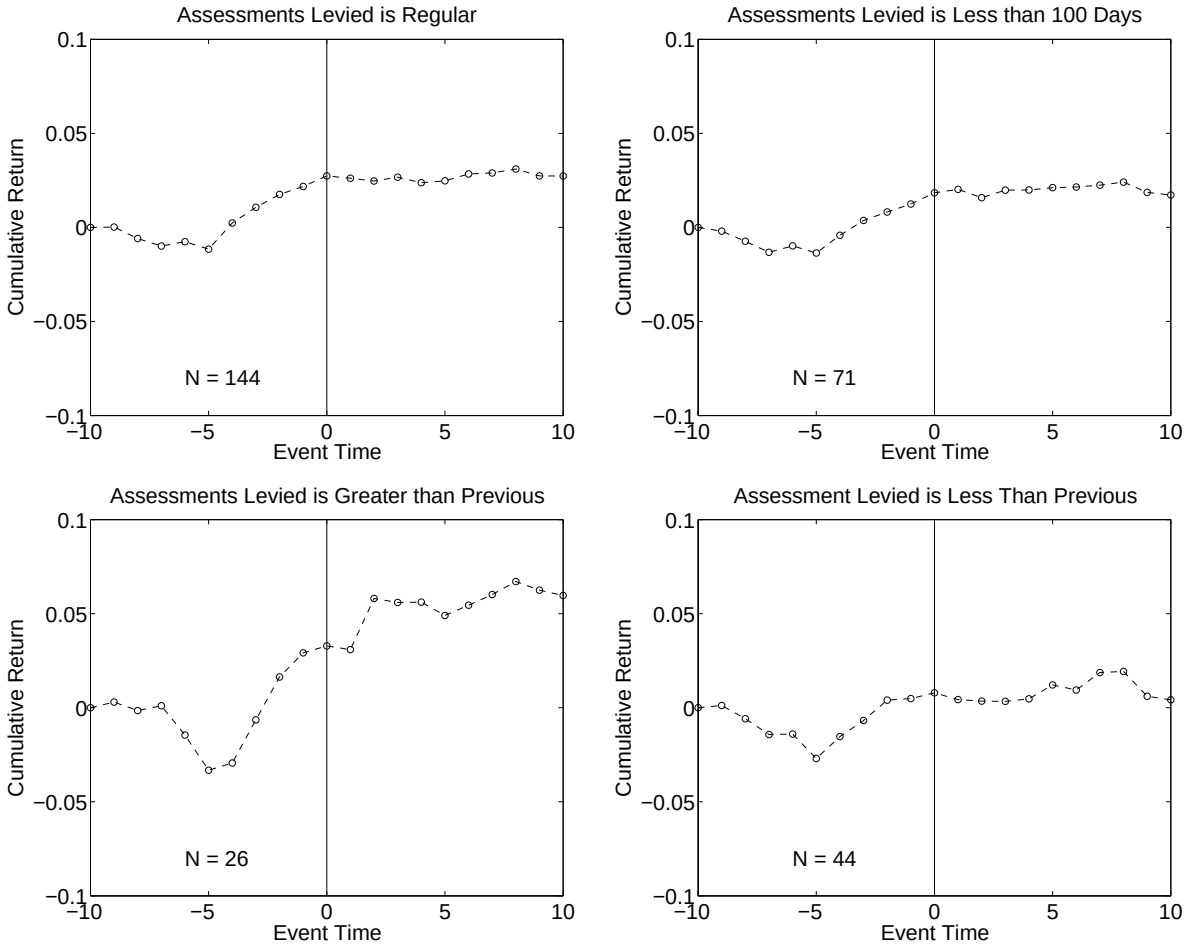
Notes: The table shows regression results from the frequency of assessments between 1872 and 1877. The dependent variable is number of days between assessments, measured in logs. Shaft Depth data is from the previous quarter in which the assessment was levied. It is measured in 100 feet. The reported Average Daily Ore is from the previous week from the assessment notice. It is measured in 100 tons. Age is reported in number of years. I include the log of the market capitalization of each firm. I include dummy variables for 1872, 1873, 1874, 1875 and 1876, and all but 1876 were statistically significant. I report the results of OLS regression with robust standard errors in Column (1). Column (2) shows results using clustered standard errors. Column (3) shows results when firm-specific dummy variables are included. I include 15 firm-specific dummy variables. I also limit the sample to variables levied in 1876 and 1877. The results are reported in Column (4). '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Figure 1.1: Announcement Effect of Assessments, 1872-1877



Notes: Event Time is date of notice. Raw, unadjusted returns are presented.

Figure 1.2: Returns Around Delinquency, 1872-1877



Notes: Event Time is date of delinquency. This was typically 30 days following date of levy. Raw, unadjusted returns are presented. The average return is non-negative following by the date of delinquency.

Table 1.9: Regression Model of Cumulative Return

Cumulative Return, 5 Days		
	(1)	(2)
Greater than Previous	-0.01	-0.01
	(0.02)	(0.02)
Average Daily Ore	-0.05**	-0.05**
	(0.02)	(0.02)
Greater than Previous * Average Daily Ore	-0.01	-0.01
	(0.03)	(0.03)
Size of Assessment	-0.07	-0.07
	(0.15)	(0.15)
Constant	Yes	Yes
Year Dummy Variables	Yes	Yes
Clustered Standard Errors	No	Yes
Heteroskedasticity Consistent Errors	Yes	No
Observations	66	66
R-Squared	0.17	
Adjusted R-Squared	0.02	

Notes: The table shows results from the regression cumulative return for assessments levied between 1872 and 1877. The cumulative return is the sum of the return beginning 2 days prior to the notice of levy, the day of levy, and 4 days following the notice. I chose this date range to account for the information technology of the period. Cumulative returns that were greater than 0.2 or less than -0.2 were not included in the regression. I exclude assessments levied between August 26, 1875 and October 5, 1875. A run on the Bank of California caused the suspension of the Bank and the San Francisco Stock Exchange. I do not have price information for stocks during this period. Greater than Previous is a dummy variable that was equal to 1 if the assessment levied was greater than the previously levied assessment, in dollars per share. Average Daily Ore is a dummy variable indicating that a positive average daily ore was reported in the quarter before the assessment was levied. Size of the Assessment is the assessment per share divided by the trading price one the day before levy. The regression also includes age and dummy variables for 1872, 1873, 1874, 1875 and 1876. I also interact the dummy variable for profitability, average daily ore, with the dummy variable for a greater assessment than previous. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Chapter 2

Dynamics of Stock Ownership

A Case Study of the Stock Transfers of the Yellow Jacket Silver Mining Company, 1863-1868

Many factors influence an investor's decision to purchase or sell shares. These factors include wealth, access to credit, and liquidity concerns. For investors of the San Francisco mining share market, private information and assessments may also affect stock ownership. Because firms voluntarily provided reports to local newspapers, some investors may have information on the prospects of the mine prior to publication.[1] If investors are heterogeneously informed, then informed investors gain by selling shares to uninformed investors. Beginning in 1861, firms had the right to levy assessments on its shareholders and failure to pay resulted in the loss of shares. An investor's willingness to pay assessments may also influence the timing of purchase or sale.

I use stock transfer data to measure the effect that assessments and private information had on the propensity to sell. I use a logit model where the dependent variable equals one if the investor chooses to sell in a particular period and zero otherwise. To analyze the role of assessments on the propensity to sell, I consider periods when assessments were levied following a dividend payment. To analyze the role that private information played on the propensity to sell, I examine the timing of sales by informed investors. Members of the board of trustees and investors from Nevada are more likely to have private information on the prospects of the mine relative to other shareholders. I also include investor-specific, stock-specific, and market-specific variables such as location, occupation, social ties, the average return of the stock, the average return of the market index, dividends received and assessments paid.

Bankers and early investors were less likely to sell their shares when the company was levying assessments, while employees of the Bank of California were more likely to sell.

[1] For example, the *Mining and Scientific Press* complained of the Yellow Jacket Silver Mining Company's delay in reporting developments of the mine in several issues (e.g., September 24, 1865; May 12, 1866; November 24, 1866; March 2, 1867). "Only the management knew when assessments were to be levied or dividends paid, and the price of the stock rose and fell accordingly" (Smith, 1943, p. 91-93).

Although employees of the Bank of California were more likely to sell following assessments, those who served on the board or resided in Nevada were more likely to sell prior to public notice.

I focus on the propensity to sell in the empirical analysis, but I also discuss buying behavior. One interesting observation is that most of the investors made their first purchase in 1865. Alternative explanations for the peak in new purchases include the improved prospects of the mine, low interest rates, or an increased interest in mining shares. I find evidence to support the view that new purchases were driven by the improved prospects of the mine. Moreover, the timing of purchases suggests that news of the prospective dividend was especially important to investors.

The paper proceeds as follows. In Section I, I provide background information on the Yellow Jacket Silver Mining Company, a description of the data, and summary statistics. The empirical analysis is presented in Section II and a discussion of the results is presented in Section III. Concluding remarks are presented in the final section.

I. Background and Data

I construct a dataset of stock transfer records from the Yellow Jacket Silver Mining Company.[2] The Yellow Jacket Silver Mining Company was incorporated in California on February 16, 1863.[3] The company had an initial capital stock of $1,200,000, divided into 1,200 shares, in proportion to the size of the mining claim.[4] Ore discoveries were made in the Yellow Jacket mine beginning in 1863. The company paid 13 dividends, levied 11 assessments, held 5 shareholders' meetings, and made no changes to its capital stock between 1863 and 1868. See Table 2.1 for more details of these events.[5]

According to the *Mining and Scientific Press*, the Yellow Jacket Silver Mining Company did not always report information in a timely manner.[6] "Only the management knew when assessments were to be levied or dividends paid, and the price of the stock rose and fell accordingly" (Smith, 1943, p. 91-93). The company's decision to keep its main office in Nevada may have contributed to its delay in reporting (Carmany, 1867, p. 15).

[2]According to Article 14 of the company by-laws: "shares in the company may be transferred at any time, by the holder thereof, or by attorney, legally constituted or by their legal representatives; but no transfer shall be valid until the surrender of the certificate, and the acknowledgement of such transfer on the books of the company." See also California Corporate Law, April 22, 1860, Chapter 1, §12.

[3]The Yellow Jacket mine of Gold Hill, Nevada, was claimed on May 1, 1859 (Smith, 1943, p. 90).

[4]At initial discovery, the mining claim was 1,200 feet. By 1866, the size of the mining claim was reported as 957 feet.

[5]To my knowledge, there were no significant changes in the by-laws of the Yellow Jacket Silver Mining Company and California Corporate Law during my period of study. In 1869, the company increased its capital stock to $2,400,000, divided into 24,000 shares.

[6]The newspaper reported the following on September 24, 1864, May 12, 1866, July 7, 1866, March 2, 1867, and September 7, 1867, respectively: "looking for reliable information," "information sought in vain by stockholders, reflects poorly on management," "no data due to delinquency of officials," "most tardy company in giving information," and "no bullion reported on July and August."

Each transfer record includes the date of sale, the number of shares, a certificate number, the name of the seller, the name of the seller's attorney, the name of the buyer, the name of the buyer's attorney, and the new certificate number.[7] The transfers were made between July 21, 1863 and May 26, 1868. There are 3,310 transfer records in total. I determined that the 3,310 transactions were made by 828 investors.

I present a graph of shares transferred in Figure 2.2 and descriptive statistics in Table 2.7. Most transfers were made in 1865 (37.48%). Of the stock certificates that were sold by May 1868, the average holding period across all investors and transfers is 7.71 months. The average number of shares represented by each transfer is 1.94. When I consider the average holding period conditional on the year the stock was purchased, the overall pattern is a decrease in the average holding period. However, the average holding period for stocks purchased in 1865 is less than those purchased in 1866. Of the 828 investors, 32% had only one purchase and one sale transaction within my sample period.

I use several sources to determine the location, occupation, age, and gender of each investor. Sources include the San Francisco Directories for the years 1863, 1864, 1865, 1867, and 1868 compiled by Henry G. Langley, the Nevada Directory for 1868-1869, the Mercantile Guide for Virginia City, Gold Hill, and American City, Nevada, 1864-1865, the San Francisco Index to the Great Register of Voters for 1867 and 1869, and the 1870 United States Federal Census. I present a detailed description of the method used to match names in the Appendix. I assume there was little mobility in residence and occupation.

Share ownership was geographically diverse. I identify the residence of 465 of the 828 investors. Most (69%) of the shareholders were from San Francisco. There were 71 investors from New York and 64 from Nevada. The remaining shareholders were from Europe, Alameda, San Jose, San Mateo, and Oakland. I present graphs of the number of shares transferred by location in Figure 2.3. Most of the New York investors made transfers in 1865. The increased number of purchases and sales by New York investors in 1865 was not limited to the Yellow Jacket Silver Mining Company. On March 18, 1865, the *Mining and Scientific Press* also reported that "Eastern parties have recently been buying largely without much regard to current quotations thereby relieving the market of considerable stock which might otherwise not have met purchases here."[8] When I consider the average holding period conditional on the year of purchase, New Yorkers who purchased their stocks in 1863 and 1865 had a greater average holding period relative to investors from San Francisco and Nevada.

Merchant, stockbroker, and banker are among the most represented occupations.[9] I identified the occupation of 299 investors. Of the individuals with a listed occupation, 69 were

[7] I confirm that this is a reliable and complete source of stock transfers by comparing the names and certificate numbers to the published assessment delinquency lists.

[8] On March 11, 1865, the *Mining and Scientific Press* also reported large Eastern orders.

[9] Mercantile wealth was an important source of capital for mining companies. "The city merchants, from the time of the gold discovery in 1849, had derived their business profits directly and indirectly from the mines; conditioned as they were to their past experience, they would not, out of habit consider in the late 1860s other investment alternatives (Decker, 1978, p. 151).

merchants, 42 were stockbrokers, 17 were bankers, and 171 had other occupations.[10] Figure 2.4 presents a graph of transfers over time by occupation.

I include data on whether the investor was a company, gender, age, whether the transfer was made by a trustee, and whether the investor served on the board of trustees. If the name of the investor was followed by a "Co" or included "&," the investor was considered a company. If the name included the prefix "Miss," "Mrs.," or "Mme," the investor was identified as female. I identified 51 companies and 12 women in the sample. I also used the 1870 United States Federal Census to identify age. The average age of an investor of the Yellow Jacket Silver Mining Company in 1870 is forty. In some instances, brokers and trustees made transfers on behalf of individuals, e.g., "A E Hill for William W Wakeman." Of the 828 shareholders, 60 made transfers using a broker or trustee. Of the 71 shareholders who were located in New York, 14 had brokers or trustees trade on their behalf. Of the 828 shareholders, 17 served on the board of trustees of the Yellow Jacket Silver Mining Company.

Social ties and social interaction may also influence stock ownership and transfer activity (Hong, Kubik, and Stein, 2004, 2005). I collect data on whether individuals served as officers of gas, insurance, savings or water companies, homestead associations, and societies or were members in one of the 24 masonic organizations. The societies included benevolent, masonic, Independent Order of Oddfellows (I.O.O.F.), literary, historical, protective or social.[11] There were 106 individuals who served as officers and 46 masons. Thirty-six of the masons served as an officer of an organization between 1863 and 1868. The average holding period for officers of organizations and masons is 8.55, slightly above the sample average.

The Bank of California and its employees were an important class of investors. A clerk with the Bank had the highest share of transfers (15%). Throughout the years, the founders and associates of the Bank served as board members. The Bank of California was authorized to receive assessments beginning in 1864 and served in the position of treasurer in 1867 and 1868. The Bank held a controlling interest in the Yellow Jacket Silver Mining Company beginning in 1865 (Bancroft, 1890, p. 55).

II. Empirical Analysis

I use a logit model to determine which factors influence an investor's decision to sell his shares. The dependent variable is equal to one if an investor sells his shares in a given period and is equal to zero otherwise. I assume that shareholders are risk neutral and choose to sell shares when the benefit exceeds the cost. Of particular interest is how assessments and private information affect an investor's decision to sell his stock.

[10]Men of high-status occupations who owned $50,000 or more were commission merchants, bankers, money, stock, or real estate brokers, or professionals (Decker, 1978, p. 88).

[11]According to Stansel (1975), they exclusive, fraternal organizations played a major role in the growth of California (p. VIII, 23). See the Appendix for more information on these organizations.

Assessments may affect the timing of sale.[12] To analyze the role of assessments on the propensity to sell, I consider two particular periods. Between the specified dates, assessments were levied following a dividend payment. The first period is between May 5, 1865 and March 12, 1866. The third dividend was paid on May 5, 1865 and assessments were levied on November 14, 1865 and February 12, 1866. The second period is between July 10, 1867 and February 22, 1868. The 13th dividend was paid on July 10, 1867 and assessments were levied on October 12, 1867, November 15, 1867, and January 22, 1868. The dependent variable is equal to one if the investor sold shares during the period when the firm began levying assessments and zero otherwise. I look for differences in the propensity to sell across investors. For example, evidence that bankers are less likely to sell shares following assessments would suggest that bankers were an important class of investors for mines that were not yielding ore.

To analyze the role that private information played on the propensity to sell, I examine the timing of sales by informed investors. For the model of private information, I keep the same periods discussed above, but I restrict the sample to sales made by March 12, 1866 or February 22, 1868. The dependent variable is equal to one if the investor sold shares prior to the assessment notice and zero if the investor sold his shares thereafter. Because the company did not provide information in a timely manner, investors are likely to be heterogeneously informed. Members of the board of trustees were more likely to have current information on the prospects of the mine. Board members met often and received frequent reports from the superintendent of the mine. Proximity to the mines might also be evidence of an information advantage. For investors who were more likely to sell shares when the company was levying assessments, selling prior to public notice of an assessment would be profitable. Evidence that board members or Nevada residents were more likely to sell prior to assessments is consistent with privately informed investors.

I include investor-specific variables such as location, occupation, and social ties in the logit regression. For location, I include dummy variables indicating whether the investor was from Nevada or New York. For occupation, I include separate dummy variables that are equal to one if the investor is a merchant, stockbroker, or banker. I also include a dummy variable for employees of the Bank of California. For social ties, I include a dummy variable that is equal to one if the investor had a position as an officer of an organization in San Francisco in any year between 1863 and 1868 or if the investor was a member of a masonic or fraternal organization.

Market-specific variables include the market value of the firm's common stock, its average return, and the returns on a market index. Daily stock price data was listed in the San Francisco Stock and Exchange Board and published in the local newspapers, such as the *Daily Alta California*, the *Daily Evening Bulletin*, and the *Daily Stock Report*. For the market index, I create an equal value-weighted index of securities in San Francisco. The

[12] Article 14 of the By-Laws includes the following on the Transfer of Stock. No transfer shall be made on which there is an assessment due and unpaid, and all transfers so made shall be subject to the remaining calls for assessments as heretofore provided.

index includes the 25 companies with mines on the Comstock, 35 other mining companies of California, Nevada, Idaho, and Arizona, and 11 stocks of rail, gas, water, and insurance companies. For all returns, I calculate the average return in the 5 days prior to the date of sale. I use lagged values of all price and average return variables.

I include the sum of assessments levied, and presumably paid, and dividends received while the investor held his shares.[13] I do not have a complete record of demographic information for all investors. Unless otherwise stated, I limit the observations to those records for which I could identify the relevant information.

I present the results of the probability of sale when the company is levying assessments in Table 2.8. In each column, I report the coefficients and standard errors. There is some evidence that employees of the Bank of California were more likely to sell their shares following assessments. On the other hand, the results of the matched sample suggests that bankers are less likely to sell following assessments. The result is statistically significant at the 90% level. There is also evidence that investors who made their initial share purchase in 1863 or 1864 were less likely to sell their shares when assessments were levied.

In Table 2.9, I present the results of the probability of sale prior to public notice of an assessment. Although having a position on the Board or residing in Nevada had a positive effect on the probability of sale prior to the assessment notice, the result is not statistically significant. Employees of the Bank of California were less likely to sell shares prior to assessments. This is consistent with the earlier result. However, Bank of California employees who either served on the Board or resided in Nevada were more likely to sell prior to the notice. The result is statistically significant at the 95% level of confidence.

III. Discussion

The Bank of California was an important investor of the Yellow Jacket Silver Mining Company. Although employees of the Bank of California were more likely to sell following assessments, those who served on the board or resided in Nevada were more likely to sell prior to public notice. I present a graph of purchases and sales by all known associates of the Bank of California in Figure 2.6.

There are three important limitations of the data. First, I was not able to match the names of all the investors with information from the local directories. This is especially important for the results that include an investor's occupation. The matched sample is not a random sample and the results may be biased. For location data, I used the company's ledger as the primary source of information. Records of investors from New York and Nevada usually included notes indicating their residence. If the company records are consistent, then the unmatched sample is of investors that are primarily from San Francisco. Nevertheless, I present results that include location for the matched and the unmatched samples. A second limitation of the data is more detailed information on the wealth, income, and portfolio

[13] I do not consider delinquency and default information in the analysis. See the Appendix for a summary of assessment delinquency and default.

holdings of each investor. Investors may choose to sell their shares because of an immediate need for cash or to rebalance his portfolio to limit his exposure to risk. Another important limitation is that the records did not include the price of the shares. With price data, I can measure the capital gain or loss from the timing of sales. Additional information would allow for a more comprehensive study.

Buying Behavior

Most investors (47.3%) made their first purchase of shares in 1865.[14,15] One explanation for the peak in new purchases is the improved prospects of the mine. Between 1863 and 1864, the company did not pay dividends. A strike was reported in the *Mining and Scientific Press* on December 21, 1863, but the firm levied several assessments. Favorable news was reported from October 1864, but the February 4, 1865 report was the first to comment on the dividend account: "large deposit of splendid ore will cancel all obligations and enable them to accumulate fund for dividend account." Between February and May of 1865, 30.1% of all investors made their first purchase. The pattern of stock purchases of 1866 provides further evidence that new investors were mainly driven by the prospects of the mine. On March 30, 1866, the *Mining and Scientific Press* reported a "newly discovered, favorable" body of ore, and a dividend soon followed. Between March and July of 1866, 7.7% of all investors made their first purchase.

Alternative explanations include low interest rates or an increased interest in mining shares. In 1864, legislation was passed to expand bank capitalization.[16] On September 24, 1864, *Mining and Scientific Press* reported on how the ease of the money market encouraged investment in mining securities. Although assessments weren't levied between September 1864 and October 1865, less than 3% of the investors made their first purchase between October 1864 and December 1864. To further examine the effect of changes in credit conditions, data on shares purchased with credit would be required. Speculation in gold can be used as a proxy for increased interest in mining shares (Markham, 2002, p. 243). However the peak period of speculation in gold is 1864, while peak investment in the Yellow Jacket Silver Mining Company is 1865.

[14]Because I do not have original share information, the earliest share purchase of my sample, may not be the initial purchase of company shares.

[15]Of the 63 investors who made purchases in 1863, 7 were board members and 13 were officers of organizations in San Francisco. The occupation of early investors include merchants, stock brokers, real estate, engineering, and book and printing.

[16]The years 1862 and 1864 brought the first constructive bank legislation in the form of two measures of outstanding historical importance. The act definitely legalizing and strengthening corporations for the accumulation and investment of funds and savings. An amendment to this act, passed two years later, providing that such corporations having a paid-in capital, or capital and reserve fund, of $300,000 might accept ordinary deposits without interest and deal in certain classes of securities, including evidences of debt, public and private (Armstrong and Denny, 1916, p. 20; Cross, 1927, p. 255).

IV. Conclusion

The prospect of dividends and levies affected the timing of shareownership. Bankers and early investors were less likely to sell their shares when the company was levying assessments. Although employees of the Bank of California were more likely to sell following assessments, those who served on the board or resided in Nevada were more likely to sell prior to public notice. My paper and its results contribute to the history of the development of American capital markets (e.g., Chandler, Jr., 1954; Lamoreaux, 1986).

Share ownership was geographically diverse. Investors from New York comprised 15.3% of the shareholders, and their average holding period was slightly above the sample average. Detailed information on New York investors would allow for a more comprehensive study on the role that access to the market and proximity to the mines had on the determinants of share ownership.

Several sources claimed that California was among the first site of broad public ownership. Buyers and sellers included "the millionaire and the mendicant; the modest matron and the brazen courtezan; the prudent man of business and the reckless gambler; the maid servant and her mistress; the banker and his customers" (*Pacific Coast Annual Mining Review and Stock Ledger*, 1878, p. 3). My data and analysis is limited to one firm and its high par value may have attracted a wealthier class of shareholders relative to other firms. Although the limited data makes it difficult to examine claims of broad ownership in the early 1860s, investors were certainly from a broad class of professions.

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Appendix

Data

I collected data from the transfer records of the Yellow Jacket Silver Mining Company. Transfer certificates issued between July 21, 1863 and May 10, 1865 are stored in the collections of the Bancroft Library of the University of California, Berkeley. The ledger detailing transfer of ownership between May 10, 1865 and May 26, 1868 is stored at the California State Library. Each transfer record includes the date of sale, the number of shares, the ledger folio number, the certificate numbers, the name of the seller, the name of the seller's attorney, the name of the buyer, the name of the buyer's attorney, the transfer number, and the new certificate numbers. I cannot confirm if the transfer was made directly between the seller and buyer or through an intermediary.

Some records had missing information. For example, there were no purchase dates for certificates numbered between 1396 and 1624. Given that certificates were typically assigned in numeric order, i.e., from 4 to 6170, certificates numbered between 1396 and 1624 were likely purchased between April 1, 1865 and May 10, 1865. For these missing certificates, I used April 30, 1865. If a record was missing the number of shares, I used the number of certificates.

Methodology for Transcribing and Matching Names

The transfer records were handwritten in script. I transcribed the handwritten records from the stock certificates and ledger. I allowed for alternative spellings and abbreviations. These included: Jno, Jn, Geo, Jm, Jas, Richd, Chas, Sam, Th, Thos, Theo, Danl, Ed, Jos, Pat, Patk, Saml, Stuart, Stewart, Lewis, Louis, Frank, Francis, and Wm. I also matched names using the certificate number at date of sale to the certificate number at the date of purchase. During this period, firms had the right to levy assessments on shareholders. The names and certificate numbers of delinquent shareholders were published in local newspapers such as the *Daily Evening Bulletin*, the *Daily Alta California*, the *Territorial Enterprise*, and the *Gold Hill News*. I used the names and certificate numbers from the published delinquency lists to further identify the list of investors. In the end, I identified 828 different investors.

I used several sources to determine the location, occupation, age, and gender of each investor. Sources included the San Francisco Directories for the years 1863, 1864, 1865, 1867, and 1868 compiled by Henry G. Langley, the Nevada Directory for 1868-1869, the Mercantile Guide for Virginia City, Gold Hill and American City, Nevada, 1864-1865, the San Francisco Index to the Great Register of Voters for 1867 and 1869, and the 1870 United States Federal Census. I adopted an algorithm similar to Ferrie (1996) to match individual names. To be considered a match, the last name and the first two letters of the first name had to be identical. If the name was common (as measured by popularity in the 1870 U.S. Federal Census) and the individual had a middle name, then the first two letters in the first name, the middle initial and the last name had to be identical.

Some certificates included location and trustee information. If the transfer record included location information, such as New York or Virginia City, I used that information in the analysis. If there was a conflict between the location stated in the transfer record and another source, I used the information from the transfer record. Brokers and trustees made transfers on behalf of individuals. For example, "A E Hill for William W. Wakeman." Unless otherwise stated, I used the investor's information, e.g., William W. Wakeman, in the analysis. Female shareholders were identified by the prefix "Miss," "Mrs.," "Mme," or "Ms." For names preceded by "Dr.," the individual was considered a physician. I removed "Gen." and "Rev.", but did not remove "Jr." If the name included an "&" or "Co.," the investor was considered a company. If the investor was sometimes listed as a company, I considered it a company throughout the analysis.

The investors with the greatest share of transfer records were Andrew E Hill (clerk, Bank of California), Barron and Company (commission merchants and agents), Howard Havens (book keeper and cashier), Robert Morgenstern (book and printing, Bank of California), and William T Coleman and Company (importing, shipping, and commission merchants). A E Hill had the greatest share of all the transfer records (15%). Using the San Francisco directories of 1864, 1865 and 1867, and the Nevada directories, I identified the following associates of the Bank of California: William H. Blauvelt (agent, cashier), Andrew E Hill (clerk), Frederick W Hutchinson (clerk), D O Mills (president), Robert Mortgenstern (book keeper), Thomas Henry Morrison (bank teller), James C. Norris (clerk), William Sharon (agent), and Edney S Tibbey (note clerk).

Officers of Organizations and Masons

I also matched the names of investors with the names of individuals who served as officers of gas, insurance, savings or water companies, homestead associations, societies, and freemasons listed in the San Francisco Directories of 1863, 1864, 1865, 1867, 1868. The societies include benevolent, masonic, Independent Order of Oddfellows (I.O.O.F.), literary, historical, protective, or social. There were a total of 369 companies, associations, and societies. I did not distinguish between positions, such as president or secretary, in my analysis.

I also obtained membership information for 24 masonic and fraternal organizations in San Francisco.[17] The organizations include the following (date of document is in parentheses): the California Chapter No. 5 of Royal Arch Masons (March 6, 1867), the California Commandery No. 1 of Knights Templar (June 8, 1867), the District Grand Lodge No. 4 Independent Order B'Nai B'rith California Lodge No. 163 (1873), the Excelsior Lodge No. 166 of Free and Accepted Masons (May 1, 1870), the Fidelity Lodge No. 120 of the Free and Accepted Masons (1868), the subordinate lodges of the Grand Lodge No. 4 of the Indepen-

[17]Masons were exclusive, fraternal organizations. An application and recommendation letters from current members were typically required. Dues were required and expulsion was at the discretion of current members. Meetings were held regularly. Some subordinate lodges had ethnic affiliations, e.g. Hermann Lodge No. 127 and La Loge Parfaite Union No. 17. The organizations were also known for their acts of charity and played a major role in the growth of California (Stansel, 1975, p. 23, VIII).

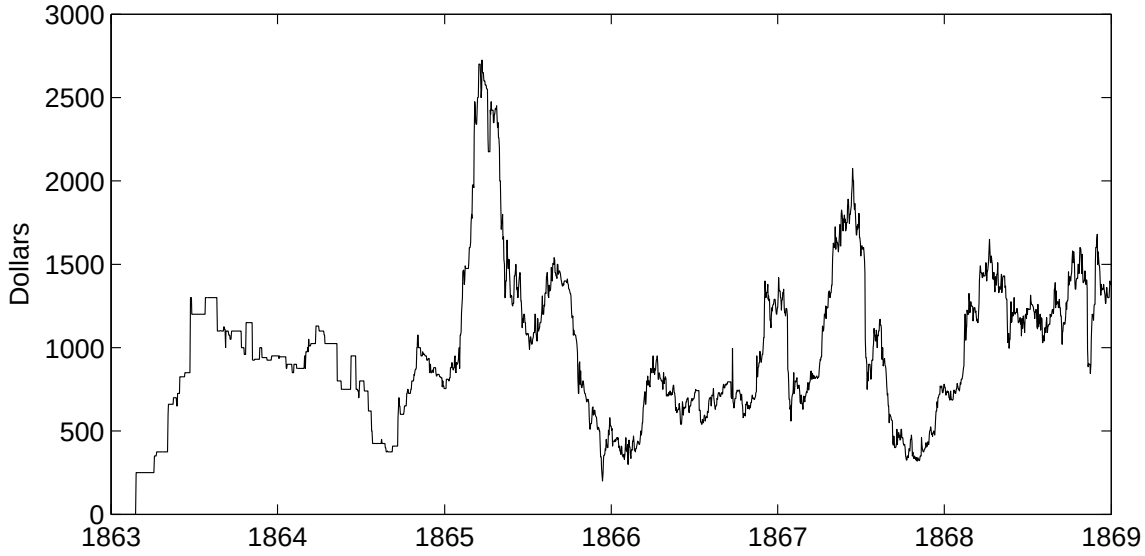
dent Order B'Nai B'rth (January 16, 1870), the Hermann Lodge No. 127 (1868), the Marin Lodge No. 191 of the Free and Accepted Masons (June 11, 1868), the Mission Lodge No. 169 Free and Accepted Masons (January 6, 1869), the Occidental Lodge No. 22 Free and Accepted Masons (April 1, 1880), the Oriental Lodge No. 144 Free and Accepted Masons (1868), the Pacific Lodge No. 136 Free and Accepted Masons (1874), and the San Francisco Chapter No. 1 of Royal Arch Masons (June 30, 1872). The subordinate lodges of the Grand Lodge No. 4 of the Independent Order of B'Nai B'rth include the Columbia Lodge No. 127, the Etham Lodge No. 37, Garizim Lodge No. 43, Golden Gate Lodge No. 129, Hope Lodge No. 126, Miriam Lodge No. 56, Modin Lodge No. 42, Montefiore Lodge No. 51, Nevada Lodge No. 52, Ophir Lodge, Oregon Lodge No. 65 and the Pacific Lodge. Membership information is available up to the date specified in the parentheses. Some organizations listed members' past and current numbers or the date they were admitted. I used the same algorithm for matching names.

Assessments

By an 1861 Statute, the Board of Trustees had the right to levy assessments. Assessments typically became delinquent 30 days after the notice was first published. The names of delinquent shareholders were printed in the local newspapers. Failure to pay resulted in the sale of shares. The Yellow Jacket Silver Mining Company levied 11 assessments between 1863 and 1868. The average rate of delinquency was 42%. The figures include Assessments Number 3, 6, 7, 8, 9, 10, and 11, an average 42% of the 1,200 shares were delinquent. The highest rate of delinquency was the assessment of $150 levied on February 12, 1866. It was the highest dollar amount requested to date. Although 874 shares were delinquent, only 6 shares were sold for failure to pay. Default was low on average, with no more than 6 shares sold at each auction. Of the 13 shareholders who defaulted on Assessment Number 8, 9, 10, or 11, only 1 resided in New York.

Figures and Tables

Figure 2.1: Share Price of Yellow Jacket Silver Mining Company, 1863-1868



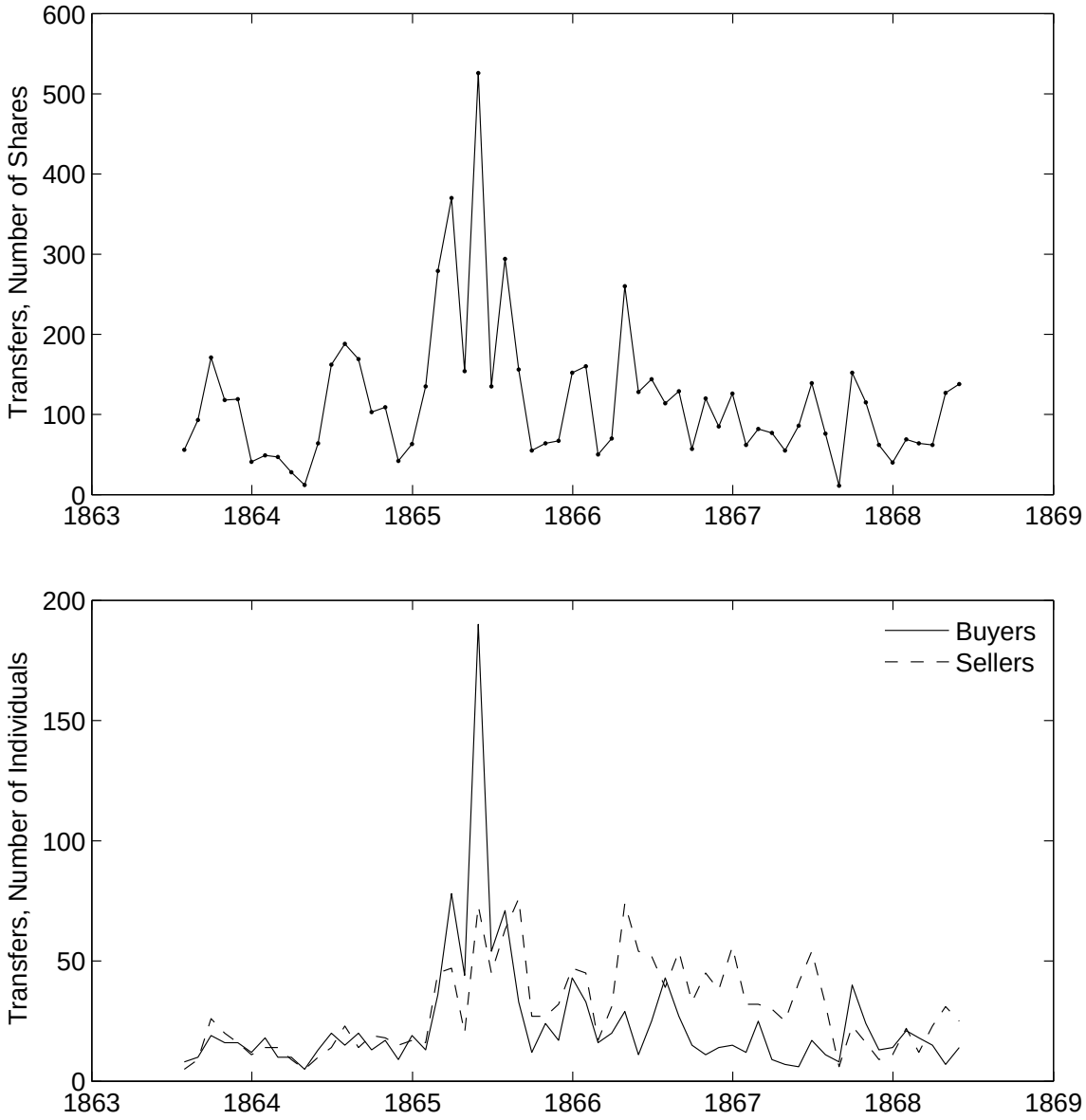
Notes: The figure presents the daily closing share prices of the Yellow Jacket Silver Mining Company as quoted on the San Francisco Stock and Exchange Board. The Company was incorporated in California on February 16, 1863. The initial par value of the company was $1,000 and 1,200 shares were originally issued. The stock price increased from January to March of 1865, achieving a peak of $2,725 on March 14, 1865. On August 29, 1865, the stock traded at $1,540 and reached a low of $200 by December 13, 1865. Prices moved from $560 on January 30, 1867 to $2,075 on June 14, 1867. By November 2, 1867, the stock was trading at $320 a share. Daily figures are presented from 1863 to 1868.

Table 2.1: Notable Events of the Yellow Jacket Silver Mining Company

Date	Event	Date	Event
August 11, 1863	Assessment No. 1	July 9, 1866	Shareholders' Meeting
August 11, 1863	Assessment No. 2	July 15, 1866	Dividend No. 4
October 3, 1863	Shareholders' Meeting	August 15, 1866	Dividend No. 5
October 26, 1863	Litigation	September 15, 1866	Dividend No. 6
December 10, 1863	Assessment No. 3	October 15, 1866	Dividend No. 7
December 21, 1863	Report of a Strike	November 15, 1866	Dividend No. 8
January 23, 1864	Assessment No. 4	December 15, 1866	Dividend No. 9
January 23, 1864	Assessment No. 5	January 15, 1867	Dividend No. 10
August 1, 1864	Shareholders' Meeting	May 10, 1867	Dividend No. 11
August 4, 1864	Assessment No. 6	June 10, 1867	Dividend No. 12
January 28, 1865	Litigation	July 10, 1867	Dividend No. 13
March 6, 1865	Dividend No. 1	July 13, 1867	Report of a Strike
April 5, 1865	Dividend No. 2	July 15, 1867	Shareholders' Meeting
May 5, 1865	Dividend No. 3	October 12, 1867	Assessment No. 9
July 10, 1865	Shareholders' Meeting	October 26, 1867	Report of a Strike
November 14, 1865	Assessment No. 7	November 15, 1867	Assessment No. 10
February 12, 1866	Assessment No. 8	January 22, 1868	Assessment No. 11
March 30, 1866	Report of a Strike		

Notes: There are 35 notable events: 4 reports of strikes, 11 assessments, 13 dividends, 2 litigation related events, and 5 shareholders' meetings. Strikes are discoveries of silver and gold. The dates of the shareholders' meetings, assessments and dividends were from the *Daily Evening Bulletin* and the *Daily Alta California*. News of strikes and litigation were from the weekly *Mining and Scientific Press* Mining Summaries. Assessment No. 1 and Assessment No. 2 were both levied on August 11, 1863, but Assessment No. 1 was due by September 10, 1863 and Assessment No. 2 was due by October 10, 1863. Assessment No. 4 and Assessment No. 5 were both levied on January 23, 1864, but Assessment No. 4 was due by February 1, 1864 and Assessment No. 5 was due by March 1, 1864. The dividend dates are date of payment. The *Mining and Scientific Press* reported "favorable issue of suit with Union" on October 26, 1863 and that the Supreme Court of Nevada consented to hear the motion of the Union vs. Yellow Jacket on January 28, 1865. Attendance at annual shareholders meetings were poor. Twenty shareholders attended the August 1864 meetings and subsequent meetings had no more than 3 shareholders in attendance.

Figure 2.2: Transfers from the Yellow Jacket Silver Mining Company, 1863-1868



Notes: The figures present transfers of stock certificates of the Yellow Jacket Silver Mining Company. There were 3,310 transfers made between July 21, 1863 and May 26, 1868. Monthly data are presented. The top figure shows the number of shares transferred in each month. The bottom figure shows the number of investors who made transfers in each month. Many of the transfers occurred in 1865 (37.48%). The top five months with the greatest number of recorded transfers are May 1865 (7.6%, share of total), March 1865 (5.4%), July 1865 (4.3%), February 1865 (4.1%), and April 1866 (3.8%). Data was collected from the Bancroft Library of the University of California, Berkeley and the California State Library.

Table 2.2: Summary Statistics: Holding Period

	Median	Mean	Std Dev	Min	Max	N
Number of Months Held	5.13	7.71	7.49	0.03	44.4	2,707
Number of Shares	1	1.94	2.47	1	40.0	2,706
Number of Months Held, by Year of Purchase						
1863	13.33	13.15	9.69	0.10	44.40	150
1864	7.17	9.15	8.47	0.07	43.40	347
1865	4.80	7.52	7.63	0.07	39.47	1,178
1866	5.13	7.78	6.68	0.03	24.87	716
1867	3.77	4.39	3.31	0.07	16.23	288
1868	1.12	1.43	1.00	0.27	3.60	28

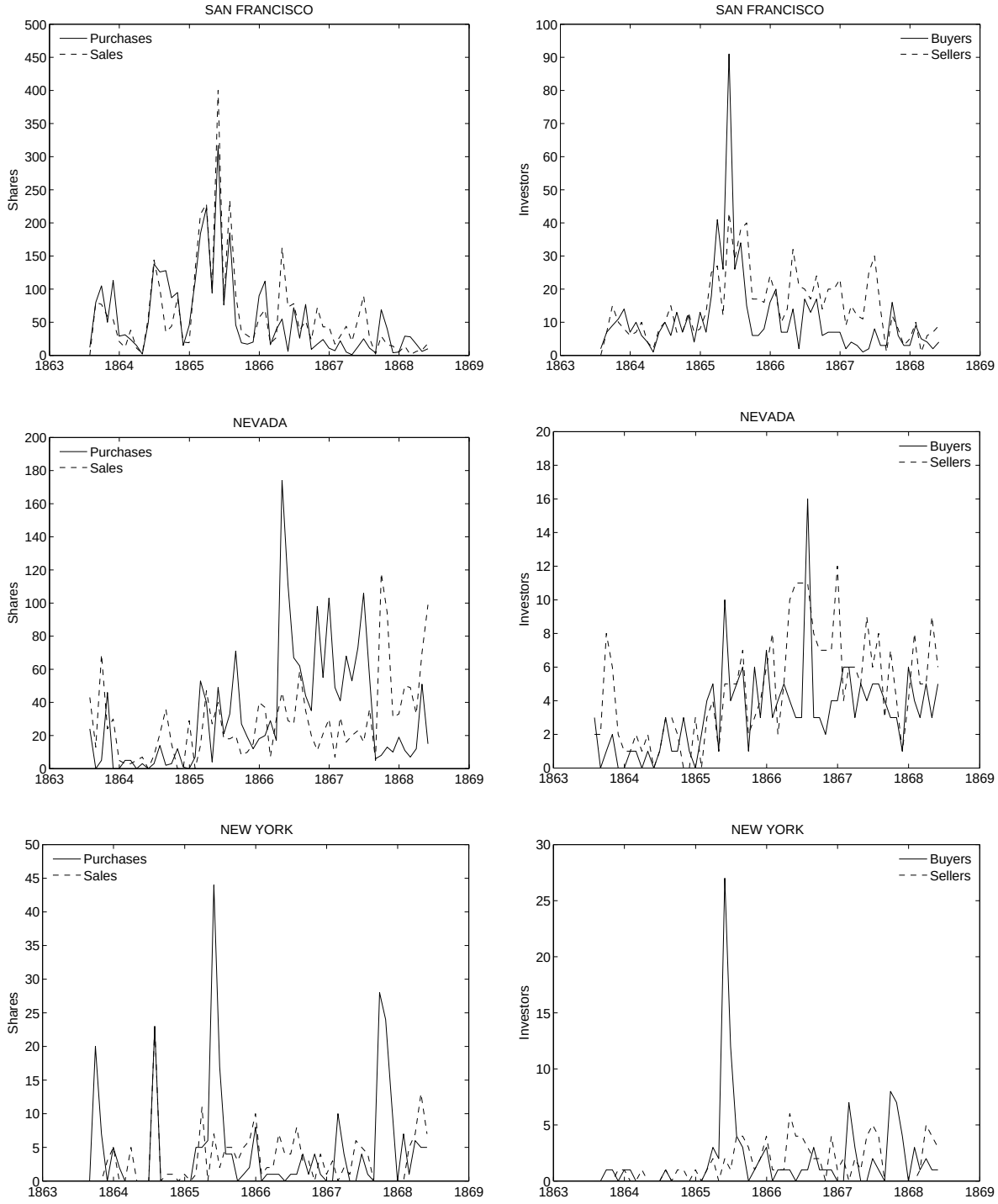
Notes: The table presents data on the holding period for stock certificates of the Yellow Jacket Silver Mining Company. Figures are presented for stock certificates that were sold between 1863 and 1868. Stock certificates numbered between 1396 and 1624 had missing purchase dates. Given that certificates were typically assigned in numeric order, i.e., from 4 to 6170, certificates numbered between 1396 and 1624 were likely purchased between April 1, 1865 and May 10, 1865. For these missing certificates, I used April 30, 1865. The holding period is the number of days between the date of sale and the earliest purchase date of the certificates that were sold. Number of Months Held is the holding period divided by 30. In the bottom panel, I present the descriptive statistics for holding period, in months, by the year of purchase. There are 2,707 transfer records in total.

Table 2.3: Summary Statistics: Investors of the Yellow Jacket Silver Mining Company

	Individuals Matched
San Francisco	345
Nevada	64
New York	71
Other Location	9
TOTAL	465
Merchant	69
Stockbroker	42
Banker	17
Other Occupations	171
TOTAL	299
Officer of Social Organization	106
Masonic or Fraternal Organization	46
Served as Trustee for Other Individuals	5
Served on Board of Trustees	17
Number of Total Investors	828

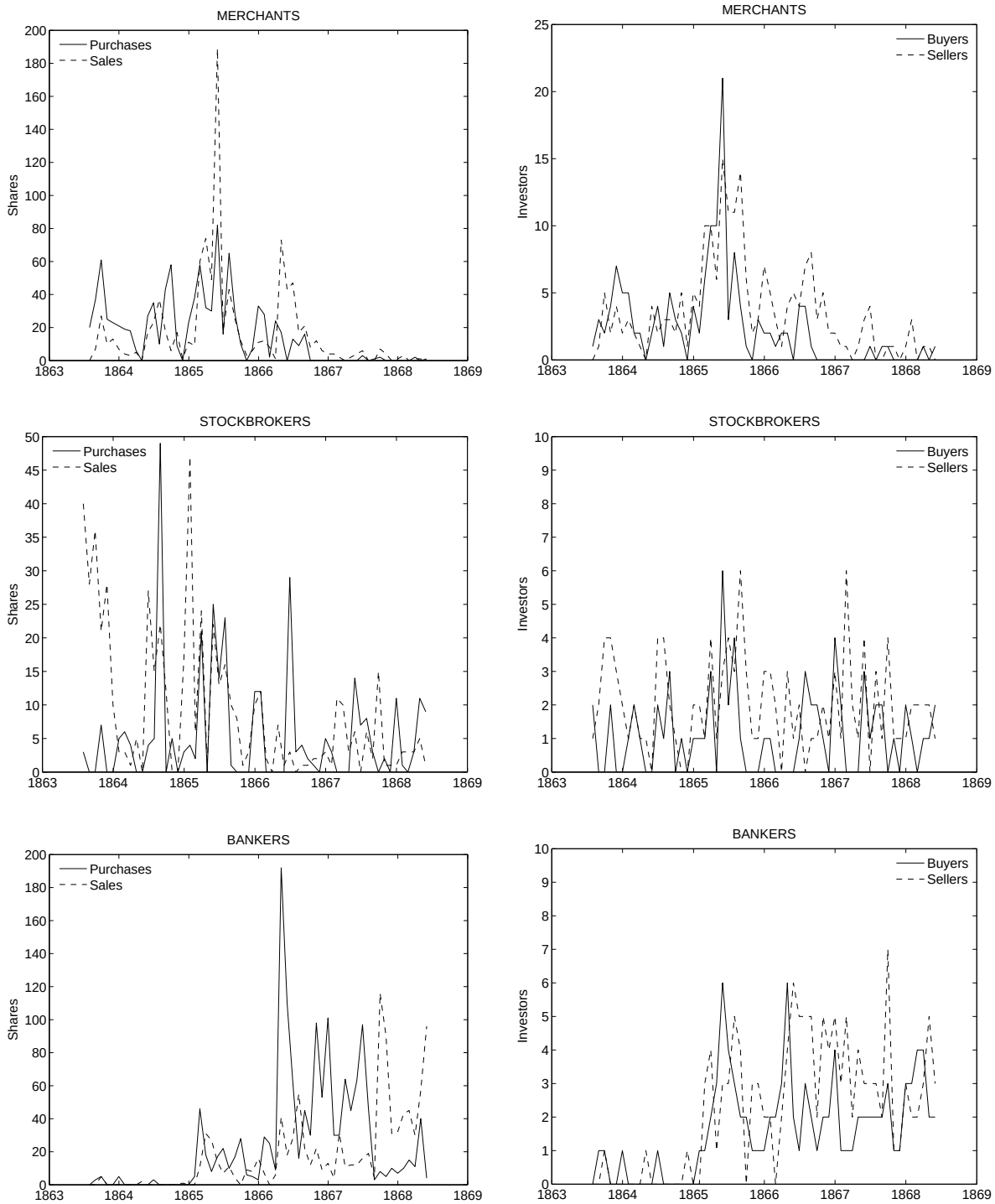
Notes: The table presents information on the investors in the sample. To determine location, occupation, and social ties, I used the San Francisco Directories for the years 1863, 1864, 1865, 1867, and 1868, the Nevada Directory for 1868-1869, the sam Mercantile Guide for Virginia City, Gold Hill, and American City, Nevada, 1864-1865, the San Francisco Index to the Great Register of Voters for 1867 and 1869, the United States Federal Census, and notes from the stock certificates and transfer ledger. There are 828 investors in the sample. I matched the location of 465 of the 828 investors. New Yorkers were primarily identified from notes in the transfer records. Other Location includes Alameda, Europe, Oakland, San Jose and San Mateo. I matched the occupation of 299 of the 828 investors. Merchants include any occupation described as commercial merchant, commission merchant, clothing and gents', exporter, furniture goods, dollar store, dry goods, importer, jobber, shipping, wholesale liquor, or grocer. A banker includes any occupation described as banker, bank teller, cashier, or capitalist. Agents and clerks of banks were also considered bankers. Stockbrokers were described as brokers and stockbrokers. Other occupations include porter, bookkeeper, actor, carpenter, attorney, judge, real estate, printer, soap manufacturer, engineer, secretary, notary public, architect, physician, and druggist. 106 investors served as officers of organizations in San Francisco at some point between 1863 and 1868. The organizations include gas, insurance, savings or water companies, homestead associations, or benevolent, masonic, Independent Order of Oddfellows, literary, historical, protective, or social societies. 46 of the investors were members of masonic or fraternal organizations. 5 individuals served as a trustee for other investors. 17 of the investors served on the Board of the Trustees of the Yellow Jacket Silver Mining Company at some point between 1863 and 1868.

Figure 2.3: Transfers by Location: San Francisco, Nevada and New York



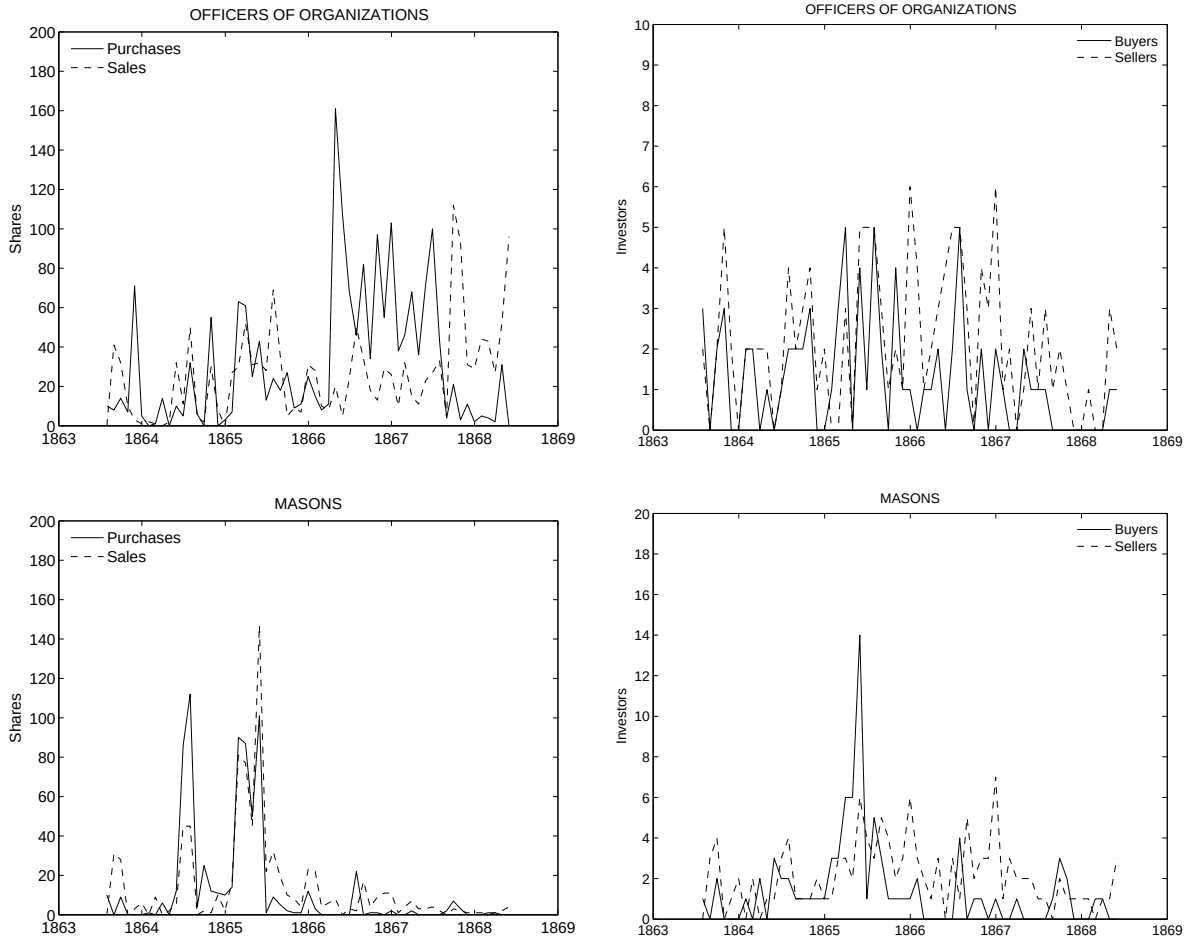
Notes: The figures present transfers of stock certificates of the Yellow Jacket Silver Mining Company by location. I matched the location of 465 of the 828 investors using local directories from San Francisco and Nevada. Only the transfer records of San Francisco, Nevada, and New York investors are presented. Monthly data are presented.

Figure 2.4: Transfers by Occupation: Merchants, Bankers, Stockbrokers



Notes: The figures present transfers of stock certificates of the Yellow Jacket Silver Mining Company by occupation. I matched the occupation of the 299 investors using local directories from San Francisco and Nevada. Only the transfer records of merchants, stockbrokers and bankers are presented. These occupations comprise 128 of the 299 investors. Monthly data are presented.

Figure 2.5: Transfers: Masons and Officers of Organizations



Notes: The figures present transfers of stock certificates of the Yellow Jacket Silver Mining Company. The local directories of San Francisco and records from the Bancroft Library at the University of California were used to identify the officers and members of masonic and fraternal organizations. Monthly data are presented.

Table 2.4: Summary Statistics, Holding Period by Location

Variable	Median	Mean	Std Dev	Min	Max
Number of Months Held	5.07	7.41	7.07	0.03	44.40
Number of Months Held, by Location					
San Francisco	4.97	7.09	6.99	0.03	44.40
Nevada	4.77	7.77	7.15	0.03	32.80
New York	7.67	9.71	8.04	0.20	44.20

Notes: The table presents data on the holding period for stock certificates of the Yellow Jacket Silver Mining Company. Figures are presented for stock certificates that were sold between 1863 and 1868. The holding period is the number of days between the date of sale and the earliest purchase date of the certificates that were sold. Number of Months Held is the holding period divided by 30. I only present figures for the investors whose location was identified from the local city directories and notes from the transfer records.

Table 2.5: Average Holding Period, in Months, by Location

	San Francisco	Nevada	New York
1863	12.55	9.60	18.31
1864	7.98	6.18	6.24
1865	6.90	6.06	10.11
1866	5.79	10.29	7.95
1867	3.40	5.10	5.55
1868	2.38	1.08	1.73

Notes: The table presents the average holding period by date of purchase. I only present figures for the investors whose location was identified from the local city directories and notes from the transfer records. The holding period is number of months between the date of sale and the earliest purchase date of the stock certificates that were sold.

Table 2.6: Summary Statistics, Holding Period by Occupation

Variable	Median	Mean	Std Dev	Min	Max
Number of Months Held	4.77	7.07	6.73	0.03	44.40
Number of Months Held, by Occupation					
Merchant	5.33	6.79	6.02	0.13	44.20
Stockbroker	2.68	3.94	3.78	0.20	17.03
Banker	6.23	8.82	7.69	0.07	32.10

Notes: The table presents data on the holding period for stock certificates of the Yellow Jacket Silver Mining Company. Figures are presented for stock certificates that were sold between 1863 and 1868. The holding period is the number of days between the date of sale and the earliest purchase date of the certificates that were sold. Number of Months Held is the holding period divided by 30. I only present figures for the investors whose occupation was identified from the local city directories.

Table 2.7: Summary Statistics, Holding Period of Officers and Masons

Variable	Median	Mean	Std Dev	Min	Max
Number of Months Held	6.50	8.55	7.52	0.03	44.40
Number of Months Held, by Year of Purchase					
1863	15.65	15.00	11.55	0.50	44.40
1864	7.97	9.26	7.05	0.07	39.20
1865	3.17	6.05	6.92	0.17	35.97
1866	10.57	10.89	7.37	0.03	24.87
1867	4.37	5.79	3.94	0.40	14.73
1868	1.08	1.17	0.69	0.43	2.07

Notes: The table presents data on the holding period for stock certificates of the Yellow Jacket Silver Mining Company. Figures are presented for stock certificates that were sold between 1863 and 1868. The holding period is the number of days between the date of sale and the earliest purchase date of the certificates that were sold. Number of Months Held is the holding period divided by 30. I only present figures for the investors whose position in an organization was identified from the local San Francisco directories. Records from the Bancroft Library at the University of California were used to identify member of masonic and fraternal organizations.

Table 2.8: Logit Model: Probability of Sale following Assessments

Dependent Variable: "Sell following Assessments" Equals 1					
	(1)	(2)	(3)	(4)	(5)
Bank of California	0.628**	0.628	0.549***	0.452	0.186
	(0.291)	(0.232)	(0.505)	(0.501)	(0.666)
Early Investors	-0.602**	-0.602***	-0.603*	-0.036	-0.604
	(0.299)	(0.301)	(0.366)	(0.436)	(0.609)
1865	3.127***	3.127***	3.137***	2.982***	3.254***
	(0.511)	(0.537)	(0.517)	(0.574)	(0.664)
Social			0.003	0.156	0.353
			(0.475)	(0.476)	(0.617)
Nevada			0.100	0.581	1.138*
			(0.455)	(0.493)	(0.607)
New York			-1.310	-0.816	
			(1.327)	(1.331)	
Merchant					-1.020
					(0.678)
Stockbroker					-0.870
					(0.882)
Banker					-1.458*
					(0.779)
Clustered Standard Errors	No	Yes	No	No	No
Matched Sample	No	No	No	Yes	Yes
Observations	1,053	1,053	1,053	881	746

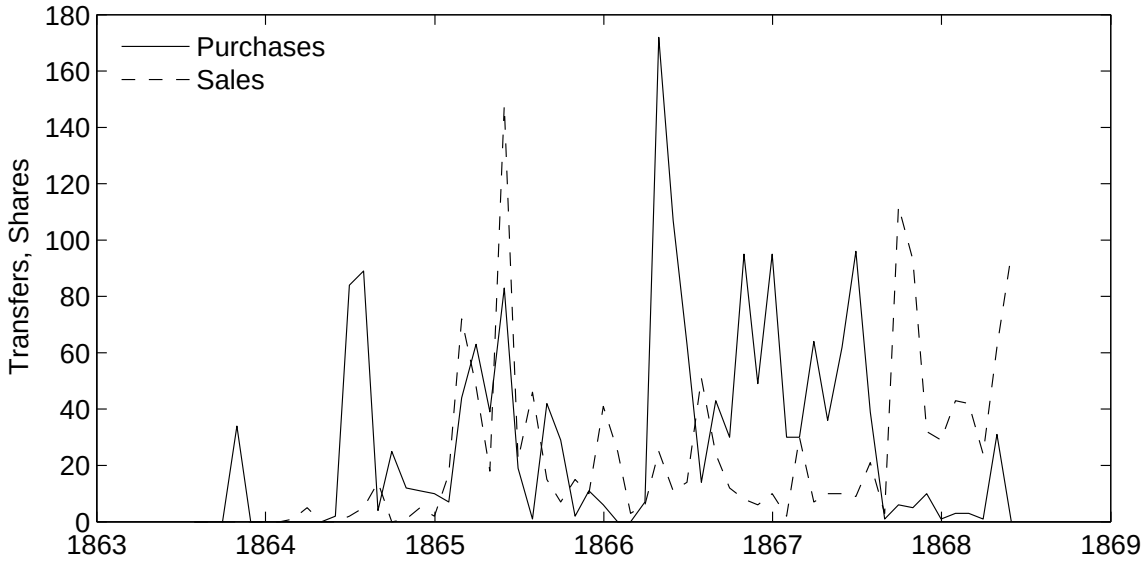
Notes: The table presents results from a logit model. I limit the sample to stock certificates that were purchased before the third dividend was paid on May 5, 1865, and sold thereafter. The data include purchases made before May 5, 1865 and sold thereafter and purchases made before July 10, 1867 and sold thereafter. The dependent variable is equal to one if the investor sold shares during the period when the firm began levying assessments and zero otherwise. Coefficients are estimated with maximum likelihood procedures. Early investor is dummy variable that equals one if the investor made his first purchase of shares in 1863 or 1864. The model also includes a constant, the share price, average return, the average return of a market index, number of shares, assessments paid and dividends received. In Column (3), standard errors are clustered by firm. "Matched Sample" implies that observations were limited to those records for which I could identify location or occupation. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Table 2.9: Logit Model: Probability of Sale prior to Assessments

Dependent Variable: "Sell Prior to" Equals 1					
	(1)	(2)	(3)	(4)	(5)
Informed Investors	0.650	0.650	0.480	0.295	-0.020
	(0.606)	(0.712)	(0.627)	(0.682)	(0.991)
Bank of California	-0.807	-0.807	-1.187*	-1.138*	0.155
	(0.495)	(0.574)	(0.633)	(0.620)	(1.021)
Early Investors	0.496	0.496	0.392	-0.102	1.123
	(0.493)	(0.542)	(0.508)	(0.590)	(0.895)
1865	-2.394***	-2.394***	-2.551***	-1.954***	-3.206***
	(0.668)	(0.707)	(0.695)	(0.718)	(0.999)
New York			0.588	0.114	
			(1.539)	(1.504)	
Social			0.589	0.289	-1.250
			(0.588)	(0.609)	0.887)
Merchant					2.364*
					(1.014)
Stockbroker					1.525
					(1.126)
Banker					2.104
					(1.119)*
Clustered Standard Errors	No	Yes	No	No	No
Matched Sample	No	No	No	Yes	Yes
Observations	790	790	790	683	588

Notes: The table presents results from a logit model. I limit the sample to shares that were purchased prior to the fourth dividend which was levied on July 15, 1866 and sold thereafter. The data include purchases made before May 5, 1865 and sold thereafter and purchases made before July 10, 1867 and sold thereafter. I restrict the sample to sales made by March 12, 1866 or February 22, 1868. The dependent variable is equal to one if the investor sold shares prior to the first assessment notice and zero if the investor sold his shares thereafter. Coefficients are estimated with maximum likelihood procedures. Informed Investor is a dummy variable that equals one if the investor was on the Board or resided in Nevada. Early investor is dummy variable that equals one if the investor made his first purchase of shares in 1863 or 1864. The model also includes a constant, the share price, average return, the average return of a market index, number of shares, assessments paid and dividends received. In Column (2), standard errors are clustered by firm. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Figure 2.6: Transfers by Associates of the Bank of California



Notes:
The figures present transfers of stock certificates of the Yellow Jacket Silver Mining Company between 1863 and 1868. Monthly data are presented. Of the 828 investors, 9 had an association with the Bank of California. The investors served as agent, president, clerk, cashier, bank teller, or book keeper with the Bank of California. One clerk had 19.9% of the total purchase records and 10.7% of the total sales records. The Bank of California served as treasurer on the Board of Trustees in 1867 and 1868.

Chapter 3

The Adjustment of Stock Prices to News

In a frictionless market with rational investors, the price of a security is equal to the present value of the expected future cash flows. Movements in stock prices are the result of changes in the value of the firm. Furthermore, news of the fundamental value of firm k should only affect the value of firm l if firm k's news reveals information on the value of firm l. Empirical evidence has shown that markets move more than can be justified by a change in fundamentals (Shiller, 1981).

In a setting where active trading in mining securities is fairly new and investors are more likely to speculate, does the market predict reasonable returns and are investors easily moved by frenzies?[1] To determine whether the market predicted reasonable returns, I study stock price movements surrounding news of strikes. I focus on news of an ore discovery because it has an unambiguously positive impact on the price of the reporting firm.

One interesting feature of the firms in my sample is that they owned adjacent mining claims along the vein of the Comstock. To further examine whether the market predicted reasonable returns, I consider the effect of reported strikes on the stock price of firms with adjacent and non-adjacent mines. Because mining claim boundaries were arbitrarily chosen, discoveries may extend to neighboring mines. However, in a frictionless market with rational investors, news of ore discoveries should have either (i) no price impact on non-adjacent claims or (ii) a positive, but smaller in magnitude, impact on the stock price of non-adjacent claims.[2] One explanation for a positive return is that the discovery reveals information that affects the value of all mining claims, e.g., the possibility of discovering ore at deeper levels.

[1]Lord (1959) claimed that "the great body of holders bought their shares to sell at an advanced price" (p. 318). "Nearly everybody gambled in mining stocks in those days – and they knew they were gambling. The aim of all was 'to beat the game' " (Smith, 1943, p. 63).

[2]Sources claim that news of discoveries had a positive price impact on all mines."Appreciation of price based upon developments made in Savage mine" (regarding the Gould and Curry Silver Mining Company, *Mining and Scientific Press*, June 15, 1867).

> In the case of a lode like the Comstock, there was no reason why the development of an ore-body in the section owned by the Crown Point Company should cause the section of the Ophir Company to become more valuable, except that the bonanza in the Crown Point was a convincing proof of the possible occurrence of the rich ore-bodies at a deep level, which had been openly doubted (Lord, 1959, p. 284).

I use a regression model, with cumulative returns as the dependent variable. The cumulative return is measured over three weeks: the week prior to the reported strike, the week of the reported strike, and the week following the reported strike. I include dummy variables specifying whether the firm's mining claim was adjacent, adjacent to the adjacent mine, etc. I also include dummy variables for each reported strike and a set of firm-specific characteristics, such as age, volume, and size. My methodology is similar to the approach used in the literature on the intra-industry effects of announcements and event studies.[3]

The results suggest that, on average, the market predicted returns consistent with rational behavior. News of reported strikes has a positive effect on the firm's returns. Owning an adjacent or non-adjacent mine relative to the mine of the reported discovery increases the return and the effect on the cumulative return decreases as the mine is more distant. However, the results on the stock prices of adjacent and non-adjacent mines are not statistically significant.

The paper is organized as follows. In Section I, I describe the data set and present summary statistics. The empirical analysis can be found in Section II. A discussion and concluding remarks are presented in Section III. Concluding remarks are presented in the final section.

I. Data

I construct a dataset of firms with stock that was actively traded on the San Francisco Stock and Exchange Board between 1862 and 1877. Each firm typically had one mining claim on the Comstock that was the namesake of the company. See the Appendix and Table 3.1 for more information on the firms. The dataset also includes stock prices, as reported in the *Daily Evening Bulletin* and the *Daily Alta California*.

I collect reports of ore discoveries from the *Mining and Scientific Press* because the periodical provided the most comprehensive, consistent, and credible coverage on the activities of the mines. Strikes were described in the following way: "new body of ore," "favorable strike," "struck rich ore," "marvelously rich strike," "good quality ore discovery," "a strike is reported," "bona fide ore," or "important ore development." There were 29 reports between

[3]Foster (1981) and Han and Wild (1990) consider earnings announcements and find that the negative or positive impact of an earnings announcement influenced the price of non-announcing firms within the same industry. Lang and Stultz (1990) study bankruptcy announcements and find that the negative price impact for non-announcing firms within the same industry are greater for more highly levered firms.

December 29, 1862 and November 14, 1874.[4] I provide a detailed list of the reported strikes in Table 3.2.

The outcomes of reported strikes varied. Firms did not always report the yield of the mine or monthly balances. Of the 29 reported strikes, 16 included a report on the product of the mine in the same quarter and 21 included yield information in the following quarter. Some of the reported strikes led to dividends. Dividends were paid in the same quarter as the reported strike for 6 of the 29 reported strikes. Dividends were paid in the following quarter for 9 of the 29 reported strikes. See Table 3.3 for more details.

II. Empirical Analysis

To examine the effect of reported strikes on stock prices, I use a regression model. The dependent variable is the cumulative unadjusted return for each firm surrounding each reported strike. The cumulative return is measured over three weeks. It includes one week prior to the reported strike, the week of the reported strike, and one week following the report. I include dummy variables indicating the location of each firm's mine relative to the mine of the reported discovery. I also include dummy variables for each reported strike, the number of weeks since last reported discovery, and firm-specific characteristics, such as age, volume, and size. I do not include reports of ore discoveries simultaneously made in more than one mine.

I present the results in Table 3.4. News of reported strikes has a positive effect on the firm's returns. Controlling for other factors, the coefficient is 0.025 and is statistically significant at the 90% confidence level. Owning an adjacent or non-adjacent mine relative to the mine of the reported discovery increases the return and the effect on the cumulative return decreases as the mine is more distant. However, the results on the stock prices of adjacent and non-adjacent mines are not statistically significant. An increase in the number of weeks since the last reported discovery has a positive effect on the cumulative return. The coefficients on other firm-specific variables such as size, volume, and age are not statistically significant.

I also consider a regression model of the cumulative abnormal returns. The abnormal return is the difference between the actual return and the return on a market index, i.e., $AR^m_{it} = r_{it} - r_{mt}$, where r_{it} is the actual return of firm i in week t, r_{mt} is the return on the market index, and AR_{it} is the abnormal return. For the market index, I construct an equal value-weighted index of the securities in the San Francisco market. The index includes the 25 companies with mines on the Comstock, 35 other mining companies of California, Nevada, Idaho, and Arizona, and 11 stocks of rail, gas, water, and insurance companies. The results are consistent. See Table 3.5. The coefficient is 0.039 and is statistically significant at the 90% confidence level. The coefficients of the adjacent and non-adjacent mines are not statistically significant.

[4]Strikes were distinguished from rumors. Although some rumors did precede news of an actual ore discovery, I do not include rumors in the original list of strikes.

III. Discussion and Extensions

The results suggest that, on average, the market predicted returns that are consistent with rational behavior. I consider several variations of the baseline regression to examine the robustness of the results. Including firm-specific dummy variables does not change the results. When the sample is limited to discoveries made in the 1870s, the results are consistent and older firms are more likely to have greater returns relative to other firms in the 1870s. I extend the cumulative return to include two weeks following the reported discovery. Although the estimates on adjacent and adjacent to adjacent mines are no longer smaller than the estimate on the actual mine, the results are not statistically significant. Additional data is required for more robust results on the effect of reported strikes.

There are several interesting extensions to consider. First, I could extend the analysis to to examine the effect, if any, a reported strike had on the stock price of firms with mines outside of the Comstock. According to the *Mining and Scientific Press*, "mere listing of a stock in the (San Francisco Stock and Exchange) Board insured its sale" in the early years of the market (August 11, 1877). To date, the dataset does not include firm-specific data, such as age and size, for firms with mines outside of the Comstock.

Empirical evidence has shown that news coverage affects trading behavior and investors incorporate linguistic communication into stock prices (Barber and Odean, 2008; Tetlock, Saar-Tsechansky, and Macskassy, 2008). The dataset only included strikes as reported by the *Mining and Scientific Press*. Other local newspapers, such as the *San Francisco Chronicle*, the *Daily Evening Bulletin*, and the *Territorial Enterprise*, also reported mining discoveries. According to Smith (1943), the *San Francisco Chronicle's* coverage of the discovery in the Ophir mine led to a rise in prices.

> The 'San Francisco Chronicle,' then the leading newspaper of the Pacific Coast and boasting the largest circulation, led the rest in extolling the riches of the bonanza and the virtues of its managers. ... He (Philipp Deidesheimer) gave a sensational interview on the bonanza mines to the 'San Francisco Chronicle' on December 21, 1874, reprinted in the 'Chronicle' of December 23, 1874, in which he asserted that the bonanza in the Consolidated Virginia, the California, and the Ophir will yield $1,500,000,000.
>
> The stock brokers were almost exhausted by the rush of business. ... The market had reached the top and could go no further (Smith, 1943, p. 169, 171, 174, 176).

In contrast, the *Mining and Scientific Press* was cautious in reporting rumors and unconfirmed information. Reports of rumored strikes typically used the following language: "rumors of rich strike," "unconfirmed reports," "impression that company has suppressed information," "conflicting information," or "contradictory reports of ore discovery." I compare the change in stock price surrounding strikes and rumored strikes in Figure 3.1. Investors

may not have distinguished between rumors and confirmed reports. Expanding the data to include reports from other local newspapers would allow for a more comprehensive study.[5]

IV. Conclusion

The results imply that, on average, the market predicted returns that are consistent with rational behavior. The results do not suggest that pricing booms did not occur. There are two documented episodes of pricing booms. According to Smith (1943), "150 stocks on the board made such remarkable advances from January to May 1872" (p. 132).[6] Between December 1874 and January 1875, share prices rose dramatically.[7]

Short-run movements in prices that are not driven by changes in fundamentals may have long-run implications. For example, financing decisions may be driven by mispricings, leading to an inefficient allocation of available resources. Empirical evidence suggests that firms are more likely to issue initial public offerings or new securities during periods of price appreciation (Tirole, 2006). If firms increase their capital when the price appreciation cannot be justified by a change in fundamentals, they are drawing resources away from more productive uses. This is especially important in markets where the supply of capital is limited. One view of the history of the mining share market is that overinvestment in mining delayed the growth of and investment in other industries.[8] Whether the claims of overinvestment, which were not the focus of my study, are true, the mining share market was central to the growth and development of San Francisco.

[5]Identifying false reporting and stock price manipulation is challenging. The Savage Mining Company was accused of knowingly reporting false information about a mining discovery in 1872. "The so-called 'Boom of 1872,' when 150 stocks on the board made such remarkable advances from January to May 1872, was a man-made affair, manipulated by Alvinza Hayward, who deliberately and openly boosted Savage stock from $62 to $725 a share on the pretense that a rich discovery had been made in the mine" (Smith, 1943, p. 132). "A development in the Savage Mine, which at the time was thought most promising, proved to be of small importance when the extent of the ore-body was more fully determined, and the inflated stock began at once to sink in spite of the frantic efforts of the bulls in the San Francisco Exchange to stay the tide" (Lord, 1959, p. 292).

[6]The *Daily Evening Bulletin* of May 7, 1872 reported the following: "The excitement in mining stocks and mining claims during the past few months had been without precedent in the history of our mines. Mining incorporations have been multiplied like the leaves of autumn. The capital of existing incorporations have been increased in the most lavish manner. Prices have gone up like a rocket, and in some cases have reached altitudes never dreamed of even by the most enthusiastic. Yet it is noteworthy that out of the 150 claims offered to the public through the stock boards, only four are paying dividends" (Smith, 1943, p. 132-133).

[7]"The stock brokers were almost exhausted by the rush of business... The market had reached the top and could go no further" (Smith, 1943). "On January 8, 1875, the 'San Francisco Bulletin' reported: Ten leading Comstock mines depreciated $17,814,800 in value in the last twenty-four hours" (Smith, 1943, p. 176).

[8]Interest in mining began to decline in 1877 and by 1882, the San Francisco Stock and Exchange Board was formed to promote the exchange of non-mining securities.

> The beautiful mansions that ornament the residence part of the city are the offspring of stock speculations. The stanch business that greet the eye at every turn, stand as monuments to successful ventures in this line. The dense cloud that mantles the manufacturing district of the city would drift far out to sea, and its stead would droop upon the foundry walls the gloom of quick decay, were this source of speculation cut off. By it capital is attracted. The wealth of the old world seeks investment here. Capital has made a San Francisco (Llyod, 1876, p. 43).

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Appendix

Data

I include firms with mines on the Comstock because they had sizeable market capitalization, fairly active trading on the San Francisco Stock and Exchange Board, greater coverage in the daily local newspapers, and were more likely to make discoveries. The firms owned adjacent mining claims along the vein of the Comstock. The sales data from these mining companies comprised 225,358 of the 381,241 total observations (59.11 percent of the total observations) from the San Francisco Stock and Exchange Board.

The principal mining companies, by geographic location, include the Utah Consolidated Silver Mining Company, Sierra Nevada Gold and Silver Mining Company, Union Consolidated Silver Mining Company, Mexican Gold and Silver Mining Company, Ophir Silver Mining Company, California Mining Company, Consolidated Virginia Mining Company, Best and Belcher Mining Company, Gould and Curry Silver Mining Company, Savage Mining Company, Hale and Norcross Silver Mining Company, Chollar Silver Mining Company, Potosi Gold and Silver Mining Company, Chollar and Potosi Mining Company, Bullion Gold and Silver Mining Company, Exchequer Mining Company, Alpha Consolidated Mining Company, Imperial Silver Mining Company, Consolidated Imperial Mining Company, Confidence Silver Mining Company, Challenge Consolidated Mining Company, Yellow Jacket Silver Mining Company, Kentuck Mining Company, Crown Point Gold and Silver Mining Company, Belcher Silver Mining Company, Segregated Belcher Mining Company, Overman Silver Mining Company, and Caledonia Silver Mining Company.

Most of the data was gathered from the local daily newspapers of San Francisco. These newspapers include the *Daily Alta California*, the *Daily Evening Bulletin*, the *Daily Stock Report*, and the *Mining and Scientific Press*. All daily sales data are from reported transactions of the San Francisco Stock and Exchange Board. The data begins on February 2, 1863 and ends on December 29, 1877. By 1878, interest in mining stocks declined. Sales data from August 27, 1875 to October 4, 1875 was not available as the San Francisco Stock and Exchange Board closed for six weeks following a run on the Bank of California.

Additional firm-level information was gathered from a variety of sources. Date of incorporation, number of shares, par value, capital stock and changes in capital stock, and bullion information were found in the Incorporation State Filings at the California State Archives; the *Mining and Scientific Press*, Lord (1959), Smith (1943) and Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains from 1868 to 1876. The Pacific Coast Annual Review (1878) was used to determine district and geographical location on the Comstock lode, while latitude and longitude coordinates of the associated mines were from Becker (1882).[9] The number of feet in the mines, reported shaft level, average daily

[9]For the Chollar and Potosi Silver Mining Company the coordinates of the Chollar mine was used and for the Consolidated Imperial Mining Company, the coordinates of the Imperial mine were used. The same coordinates were used for the Challenge and Confidence mines. For the Kentuck mine, the same coordinates as the Yellow mine were used, but the latitude second was 25.

ore and other important mining and market information was collected from the *Mining and Scientific Press*.

Figures and Tables

Table 3.1: Summary Statistics of Firms

	Median	Mean	Std Dev	Min	Max
Age, Years	12.53	10.57	4.70	1.70	15.21
No. of Shares, 1865	2,450	3,292.25	3,763.63	800	16,800
No. of Shares, 1875	38,400	56,374.40	39,271.35	6,400	108,000
Length of Claim, Feet	612	785.28	690.32	90	3,300
Yield	$1,288,260	$9,260,386.39	$15,103,710.28	$0	$61,125,757
Aggregate Dividend	$39,000	$4,304,511.61	$9,880,780.11	$0	$42,930,000

Notes: There are 28 firms in the sample. Age is the difference between the last observation in the sample and the incorporation date; if the incorporation date is not available, I use the date of the first observation. No. of Shares, 1865 and 1875 are for the mining firms that incorporated by 1865 and 1875, respectively. Length of Claim, Feet, is the length of the mining claim as of 1875. Yield is the value of discovered ore between 1863 and 1877.

Table 3.2: Reported Strikes between 1862 and 1877

Date	Name of Mine
December 29, 1862	Ophir
April 13, 1863	Gould and Curry*
June 22, 1863	Gould and Curry
August 17, 1863	Ophir
December 21, 1863	Yellow Jacket
April 30, 1864	Chollar
October 14, 1865	Hale and Norcross
January 13, 1866	Savage
February 24, 1866	Hale and Norcross*
October 13, 1866	Gould and Curry
January 4, 1867	Savage
May 25, 1867	Confidence
July 6, 1867	Hale and Norcross
October 19, 1867	Gould and Curry
November 28, 1868	Gould and Curry
January 30, 1869	Belcher
July 31, 1869	Belcher*
November 13, 1869	Hale and Norcross
January 22, 1870	Sierra Nevada
February 11, 1871	Crown Point
April 15, 1871	Kentuck
June 3, 1871	Ophir
July 29, 1871	Gould and Curry
February 17, 1872	Ophir
September 14, 1872	Crown Point
December 5, 1872	Chollar and Potosi
March 22, 1873	Consolidated Virginia
January 10, 1874	Belcher*
October 24, 1874	Ophir

Notes: The table presents a list of ore discoveries in the mines of the Comstock. The reports are from the *Mining and Scientific Press*. A strike was described as "new body of ore," "favorable strike," "struck rich ore," "marvelously rich strike," "good quality ore discovery," "a strike is reported," "bona fide ore," or "important ore development." The dataset includes only the first reported strike of each firm. There were 51 reported strikes in the original dataset. Only 29 observations remain after excluding reports of strikes within 28 days of the last reported strike. A "*" indicates that the report included discoveries simultaneously made in more than one mine.

Table 3.3: Summary Statistics of Strikes

	Median	Mean	Std Dev	Min	Max	N
Days since Last Strike	102	145	123	35	532	28
Dividend (Q)	\$230,000	\$426,667	\$561,379	\$120,000	\$1,560,000	6
Dividend (Q +1)	\$120,000	\$277,778	\$483,711	\$20,000	\$1,560,000	9
Dividend (Q+2)	\$150,000	\$271,373	\$363,427	\$7,500	\$1,248,000	11
Report (Q)						16
Monthly Balance	\$140,058	\$230,480	\$263,484	\$12,300	\$1,000,000	14
Monthly Receipts	\$340,000	\$801,333	\$1,047,208	\$64,000	\$2,000,000	3
Receipts	\$75,843	\$120,744	\$146,154	\$17,521	\$375,000	5
Weekly Receipts	\$58,000	\$151,731	\$185,221	\$6,689	\$433,680	5
Product						13
Report (Q+1)						21
Monthly Balance	\$118,212	\$262,477	\$296,835	\$8,280	\$912,311	14
Monthly Receipts	\$500,855	\$500,855	\$581,886	\$89,400	\$912,311	2
Receipts	\$96,000	\$200,873	\$267,744	\$14,603	\$700,000	10
Weekly Receipts	\$127,525	\$246,564	\$329,106	\$14,000	\$717,206	4
Report of Product	2	4	3	1	11	15
Observations						29

Notes: The table presents summary statistics on the reported strikes from the *Mining and Scientific Press*. Days since Last Strike is the number of days since the last reported strike in any of the principal mines of the Comstock. Dividend (Q) is the total amount of dividends paid by the firm in the same quarter of the reported strike. Dividend (Q+1) is the total dividends paid by the firm in the quarter following the reported strike. Dividend (Q+2) is the total dividends paid by the firm in the subsequent quarter, following Dividend (Q+1). Report (Q) is the number of reported strikes that also included information on the yield of the mine in the same quarter that the strike was reported. Report (Q+1) is the number of reported strikes that also included information on the yield of the mine in the following quarter. Relevant information on the yield of the mine includes Monthly Balance, Monthly Receipts, Receipts, Weekly Receipts, or a general Report of Product. Receipts are distinguished from Monthly Receipts and Weekly Receipts in that a time period was not specified.

Table 3.4: Regression Model of 3-Week Cumulative Return

Dependent Variable: Cumulative Return		
	(1)	(2)
Size	0.008	0.006
	(0.007)	(0.005)
Volume	0.016	0.009
	(0.012)	(0.014)
Age	0.003	0.002
	(0.002)	(0.002)
Actual Mine	0.025	0.025*
	(0.021)	(0.013)
Adjacent Mine	0.022	0.023
	(0.020)	(0.015)
Adjacent to Adjacent Mine	0.016	0.018
	(0.024)	(0.023)
Adjacent to Adjacent to Adjacent Mine	0.007	0.008
	(0.015)	(0.015)
Firms with Many Discoveries	0.015	0.018
	(0.014)	(0.012)
Weeks Since Last Reported Discovery	0.000	0.006***
	(0.000)	(0.001)
Heteroskedasticity Consistent Errors	Yes	No
Clustered Standard Errors	No	Yes
Observations	325	325
R-Squared	0.31	
Adjusted R-Squared	0.24	

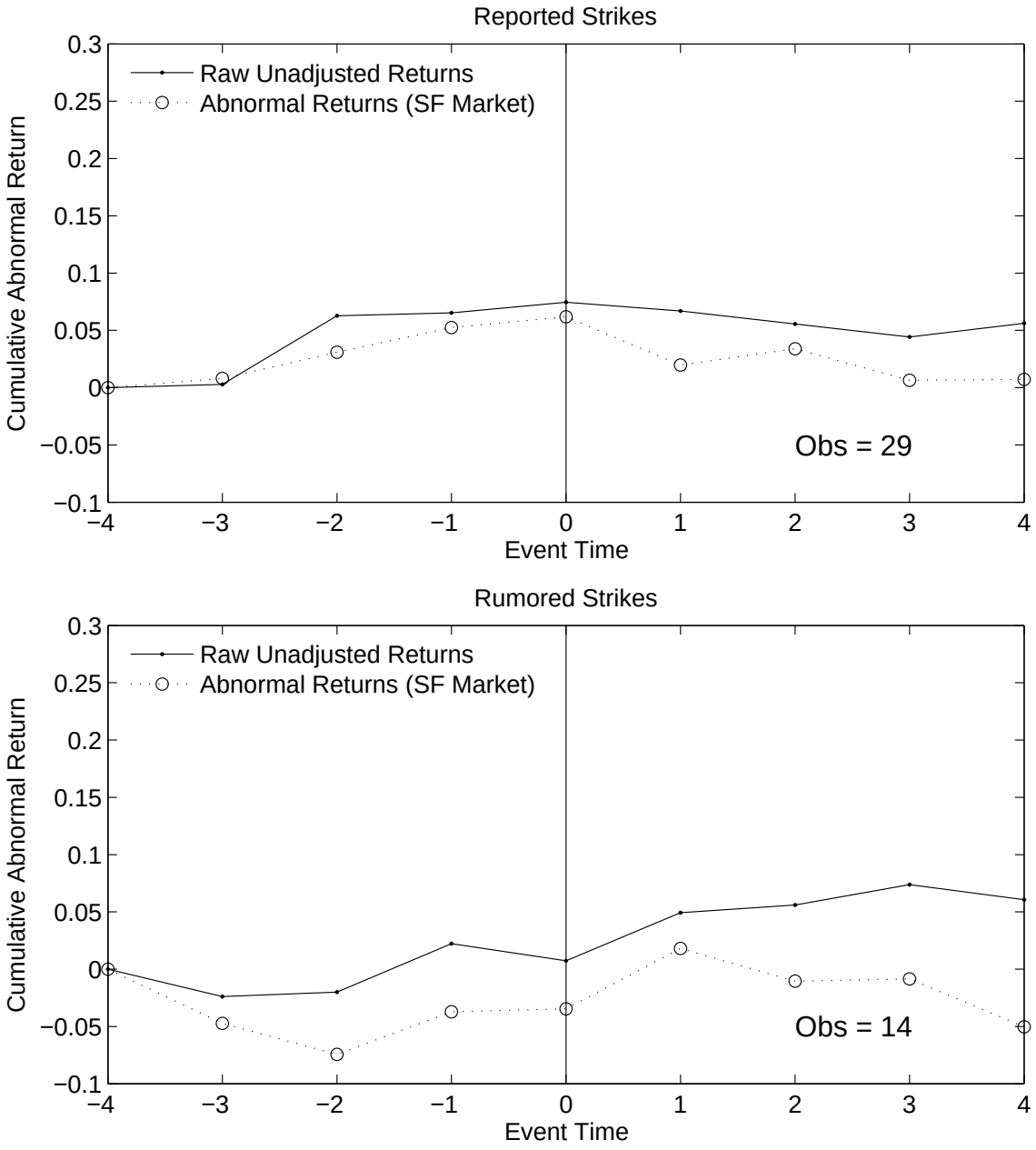
Notes: The table presents results from a regression model with the cumulative raw, unadjusted return as the dependent variable. The cumulative return is from one week prior to the reported strike, the week of the reported strike, and one week following the report. The model also includes dummy variables for the reported strikes and whether the report included yield of the mine. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Table 3.5: Regression Model of 3-Week Cumulative Abnormal Return

Dependent Variable: Cumulative Abnormal Return		
	(1)	(2)
Size	0.004	0.004
	(0.008)	(0.006)
Volume	-0.007	-0.007
	(0.016)	(0.017)
Age	-0.001	-0.001
	(0.002)	(0.002)
Actual Mine	0.039*	0.039**
	(0.021)	(0.016)
Adjacent Mine	0.018	0.018
	(0.021)	(0.013)
Adjacent to Adjacent Mine	0.022	0.022
	(0.024)	(0.033)
Adjacent to Adjacent to Adjacent Mine	0.002	0.002
	(0.018)	(0.020)
Firms with Many Discoveries	0.015	0.015
	(0.016)	(0.011)
Weeks Since Last Reported Discovery	0.004***	0.005***
	(0.001)	(0.001)
Heteroskedasticity Consistent Errors	Yes	No
Clustered Standard Errors	No	Yes
Observations	242	242
R-Squared	0.24	
Adjusted R-Squared	0.14	

Notes: The table presents results from a regression model with the cumulative abnormal return as the dependent variable. The cumulative abnormal return is from one week prior to the reported strike, the week of the reported strike, and one week following the report. The market index is an equal value-weighted index of securities in the San Francisco market. The model also includes dummy variables for the reported strikes and whether the report included yield of the mine. '***', '**', and '*' indicates significance at the 99%, 95%, and 90% confidence levels, respectively.

Figure 3.1: Announcement Effect of Strikes and Rumored Strikes



Notes: The top figure presents the announcement effect of reported strikes on a firm's stock price. For the market model, the abnormal return during the week of the report is 0.01 with a standard deviation of 0.06. The bottom figures presents the announcement effect of rumored strikes. Reports of rumored strikes typically used the following language: "rumors of rich strike," "unconfirmed reports," "impression that company has suppressed information," "conflicting information," or "contradictory reports of ore discovery."

Appendix A

Data Collection

The earthquake of April 18, 1906, followed by the great four days' fire, likely destroyed the early records of the San Francisco Stock and Exchange Board (King, 1910, p. 8). As a result, I relied on contemporary newspapers and periodicals, available annual company reports, booklets, and books from the Bancroft Library of the University of California, the San Francisco Public Library, the California State Archives, the California State Library, the California Historical Society, the Special Collections at the University of Nevada, Reno, the Nevada Historical Society and the archives of the New York Stock Exchange. I used a digital camera, data entry services, and optical character recognition software to collect and digitize the data.

Daily sales data of the San Francisco Stock and Exchange Board were reported in the the *Daily Alta California*, the *Daily Evening Bulletin*, and the *Daily Stock Report*. Data was also collected from the *Mining and Scientific Press*, a weekly periodical considered to be the most credible source of information on mining activities.[1] Weekly sales data was available from October 18, 1862 to February 1863. Daily sales data was available from February 2, 1863 to December 29, 1877. I ended the sample in 1877 because interest in mining declined by 1878. Because the San Francisco Stock and Exchange Board closed for six weeks following a run on the Bank of California, sales data was not available from the San Francisco Stock and Exchange Board between August 27, 1875 and October 4, 1875. I also collected information regarding dividends, assessments, company meetings and special meetings proposing a change in the capital stock. Assessment information included levies, delinquency, and default. For notices, I also used *The Territorial Enterprise* of Virginia City and *The Gold Hill News* of Nevada. I also collected bid and asked prices for some companies for select periods.

I select firms that owned mining claims on the vein of the Comstock (latitude 39 degrees,

[1]The stocks were listed on other local regional exchanges, such as the California Stock Exchange and the Pacific Stock Exchange, but the San Francisco Stock and Exchange Board had the greatest trading volume. The Committee on Stock List of the New York Stock Exchange, which "prescribed requirements and regulations for admitting securities to the trading list," did not list any of the leading mining companies from my sample period. Source: New York Stock Exchange Archives, February 1866 to February 1883.

longitude 119 degrees) in Virginia City and Gold Hill in Storey County, Nevada. Initial capitalization for the firms was greater than $100,000. Their shares were actively traded on the San Francisco Stock and Exchange Board, they had greater coverage in the daily local newspapers, and they were more likely to discover silver or gold. The sales data from the principal mines comprised 225,358 of the 381,241 total observations (59.11 percent of the total observations) from the San Francisco Stock and Exchange Board. I refer to these firms as principal mining firms.

Additional firm-level information was gathered from a variety of sources. Date of incorporation, number of shares, par value, capital stock and changes in capital stock were found in the Incorporation State Filings at the California State Archives. The *Mining and Scientific Press*, Lord (1959), Smith (1943) and Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains from 1868 to 1876 were also used to confirm the incorporation information. The Pacific Coast Annual Review (1878) was used to determine district and geographical location on the Comstock lode, while latitude and longitude coordinates of the associated mines were from Becker (1882).[2] The number of feet in the mines, reported shaft level, average daily ore and other important mining and market information was collected from the *Mining and Scientific Press*.[3] I also used the *Mining and Scientific Press* to collect additional information on reported receipts, current balance, litigation, disputes, purchase of mill, machinery or equipment, work impairment due to flooding, cave-ins, fire, broken machinery, accidents, repair work, strikes and ore discoveries. Bullion information was found in Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains from 1868 to 1876 and the *Mining and Scientific Press*.

The Storey County Mining Assessments of the Ores from Mines had some information on the cost and yield of the mines between 1871 and 1877. Total Cost, Actual Cost of Extraction, Actual Cost of Transportation, Actual Cost of Reduction, Tons Extracted, Value per Ton, and Gross Yield information are from the quarterly Storey County Mining Assessments, Ores from Mines Report, from 1871 to 1877. Data was available for the first quarter of 1871, first third and fourth quarters of 1872, first and fourth quarters of 1874, and third quarter of 1875 to fourth quarter of 1877, inclusive. Only firms who discovered bullion filed quarterly reports. The Annual and Biennial Reports of the State Mineralogist from 1867 to 1878 were also used.

[2]For the Chollar and Potosi Silver Mining Company the coordinates of the Chollar mine was used and for the Consolidated Imperial Mining Company, the coordinates of the Imperial mine were used. The same coordinates were used for the Challenge and Confidence mines. For the Kentuck mine, the same coordinates as the Yellow mine were used, but the latitude second was 25.

[3]For shaft level data, intermediate values were linearly interpolated. In some cases, firms were simultaneously prospecting the mine at different levels. If the subsequent shaft level was lower than the previous one, then the shaft level remained the same. I considered a reported shaft level that was greater than the previously reported shaft level by more than 500 feet to be an outlier. Outliers were removed. If there was no shaft level reported, I assume that the mine was inactive. For example, there was no reported shaft level for the Best and Belcher Mining Company, the Challenge Consolidated Mining Company and the Confidence Silver Mining Company for some periods, but there was also no report of assessments during those periods. There is no variation in the shaft level of the Segregated Belcher Mining Company.

I found 61 annual company reports from the sample of principal mining companies (the fiscal year ending dates are in parentheses): Belcher Silver Mining Company (February 1, 1871; January 1, 1872; January 1, 1873; December 31, 1873), California Mining Company (December 15, 1875), Chollar and Potosi Mining Company (May 31, 1868; June 1, 1869; May 31, 1870; May 31, 1871; May 31, 1872; May 31, 1873; May 31, 1874), Consolidated Virginia Mining Company (December 31, 1874; December 15, 1875), Crown Point Gold and Silver Mining Company (May 1, 1868; May 1, 1869 May 1, 1871; May 1, 1872; May 1, 1873; May 1, 1874), Gould and Curry Silver Mining Company (December 1, 1868; November 30, 1869; November 30, 1870; November 30, 1871; November 30, 1872; November 30, 1873; January 9, 1875), Hale and Norcross Silver Mining Company (February 29, 1868; March 1, 1869; March 1, 1870; March 1, 1871; March 1, 1872; March 1, 1873; February 28, 1873), Imperial Silver Mining Company (May 31, 1865), Kentuck Mining Company (November 21, 1868; November 1, 1869; November 1, 1870; November 1, 1871), Ophir Silver Mining Company (December 18, 1868; December 15, 1869; December 15, 1875), Overman Silver Mining Company (July 1, 1869), Savage Mining Company (July 10, 1867; June 30, 1868; July 1, 1869; July 11, 1870; July 11, 1871; July 10, 1872; June 30, 1873; July 11 (30), 1874), Sierra Nevada Gold and Silver Mining Company (January 1, 1870; January 1, 1871), and Yellow Jacket Silver Mining Company (June 30, 1866; June 30, 1868; July 1, 1869; July 1, 1870; July 1, 1871; July 1, 1873; July 1, 1874).

The Principal Mining Companies

Tables A.1 and Table A.2 include detailed information on the firms included in the sample. The boldface text refers to the name of the mining claim. Most mining claims along the Comstock were discovered by 1861 (Land, 1973, p. 20). The firms and their mining claims are presented in order of geographical proximity. For example, the nearest neighbors of the Ophir mining claim are Mexican and California. The Initial Capitalization is reported below the Incorporation Date as Total Value (Number of Shares; Par Value). An "*" symbol implies that there are additional notes in the following paragraphs on the mining company. Assessment and Dividend data are from 1860 to the close of the Census year June 30, 1880 (Lord, 1959, p. 419-421). The number below the Assessment and Dividend amounts are the number of assessments and dividends levied or paid, respectively. Assessment and Dividend data are not presented for the Imperial Silver Mining Company. The "+" symbol indicates that dividends were paid although exact figures are not known.

By 1877, many smaller claims were consolidated or merged with (neighboring) claims. The Mexican Gold and Silver Mining Company was originally incorporated on August 31, 1863. "It was segregated from the Ophir as recently as 1874, and has been prospected through the shaft of that company, having neither shaft nor machinery of its own" (*Pacific Coast Annual Review and Stock Ledger*, 1878, p. 218). The Chollar Silver Mining Company and the Potosi Gold and Silver Mining Company merged in 1865. The last available trading price for the Chollar Silver Mining Company and the Potosi Gold and Silver Mining Company were on

November 8, 1865 and November 3, 1865, respectively. California Silver Mining Company segregated from Consolidated Virginia Mining Company and stock holders were given $\frac{7}{12}$ of a share in California in 1873. Assessment and Dividend data are from 1860 to the close of the Census year June 30, 1880 (Lord, 1959, p. 419-421). The number below the Assessment and Dividend amounts are the number of assessments levied and dividends paid. Assessment and dividend information is not provided for Chollar and Potosi, as the consolidated company segregated in 1878 and figures are reported from 1878 to 1880.

I did not find the exact date of incorporation for the Challenge Consolidated Mining Company, the Overman Silver Mining Company and the Caledonia Silver Mining Company, so the date of the earliest observation on the San Francisco Stock and Exchange Board was used. The Consolidated Imperial Mining Company was formed in 1876 and included Imperial Silver Mining Company along with several smaller companies and claims. I could not find more details on the incorporation information of the Consolidated Imperial, so I assume a par value of $100, which was typical of firms incorporated during the 1870s. "The Little Gold Hill mines were very prosperous, but being private enterprises no information was published of production or dividends, until the Empire and the Imperial began to pay dividends" (Smith, 1943, p. 33).

Table A.1: Principal Mines of the Comstock Lode, Virginia City

Company Name	Incorporation Date Initial Capitalization	Assessments	Dividends
Utah Consolidated	April 9, 1872	$1,030,000	
Silver Mining Company	$400,000 (20,000; $200)	(30)	
Sierra Nevada Gold	July 6, 1860	$3,850,000	$102,500
and Silver Mining Company	$1,500,000 (3,000; $500)	(63)	(11)
Union Consolidated	January 23, 1875	$860,000	
Silver Mining Company	$2,000,000 (20,000; $100)	(14)	
Mexican Gold and	December 1, 1874	$1,243,000	
Silver Mining Company*	$10,080,000 (100,800; $100)	(11)	
Ophir Silver	April 28, 1860	$2,689,400	$1,595,800
Mining Company	$5,040,000 (16,800; $300)	(35)	(24)
California	December 31, 1873		$31,320,000
Mining Company*	$10,800,000 (108,000; $100)		(34)
Consolidated Virginia	June 7, 1867	$411,200	$42,390,000
Mining Company*	$2,320,000 (1,160; $2,000)	(15)	(51)
Best and Belcher	November 8, 1862	$942,590	
Mining Company	$224,000 (448; $500)	(17)	
Gould and Curry	June 25, 1860	3,152,000	$3,826,800
Silver Mining Company	$2,400,000 (4,800; $500)	(37)	(36)
Savage	October 11, 1862	$4,964,000	$4,460,000
Mining Company	$1,600,000 (800; $2,000)	(42)	(52)
Hale and Norcross	March 19, 1861	$3,306,000	$1,598,000
Silver Mining Company	$400,000 (800; $500)	(64)	(36)
Chollar Silver	July 11, 1860		+
Mining Company	$1,500,000 (5,000; $300)		
Potosi Gold and	January 3, 1861		+
Silver Mining Company	$1,400,000 (2,800; $500)		
Chollar and Potosi	April 17, 1865		+
Mining Company*	$2,800,000 (28,000; $100)		

Table A.2: Principal Mines of the Comstock Lode, Gold Hill

Company Name	Incorporation Date Initial Capitalization	Assessments	Dividends
Bullion Gold and	July 26, 1861	$3,352,000	
Silver Mining Company	$500,000 (2,500; $500)	(14)	
Exchequer	July 20, 1865	$530,000	
Mining Company	$2,400,000 (8,000; $300)	(15)	
Alpha Consolidated	March 20, 1868	$330,000	
Mining Company	$1,500,000 (6,000; $250)	(12)	
Imperial Silver	March 23, 1863		+
Mining Company	$2,000,000 (4,000; $500)		
Consolidated Imperial	April 13, 1876	$1,125,000	
Mining Company*	$50,000,000 (500,000; $100)	(11)	
Confidence Silver	August 11, 1865	$256,320	+
Mining Company	$780,000 (1,500; $520)	(11)	
Challenge Consolidated	December 13, 1873	$10,000	
Mining Company*	$5,000,000 (50,000; $100)	(1)	
Yellow Jacket	February 16, 1863	$4,638,000	$2,184,000
Silver Mining Company	$1,200,000 (1,200; $1,000)	(37)	(25)
Kentuck	August 22, 1865	$300,000	$1,252,000
Mining Company	$400,000 (2,000; $200)	(13)	(39)
Crown Point Gold and	February 3, 1861	$2,373,370	$11,588,000
Silver Mining Company	$120,000 (1,200; $100)	(41)	(50)
Belcher Silver	November 2, 1868	$1,990,000	$15,397,200
Mining Company	$1,040,000 (10,400; $100)	(22)	(38)
Segregated Belcher	July 18, 1865	$264,000	
Mining Company	$1,920,000 (6,400; $300)	(16)	
Overman Silver	April 30, 1863	$3,162,800	+
Mining Company*	$600,000 (1,200; $500)	(45)	
Caledonia Silver	May 15, 1871	$1,935,000	+
Mining Company*	$2,000,000 (20,000; $100)	(31)	

Stock Sales Data

Daily sales data includes the number of shares traded, the name of the company, the price of the shares and additional notes. I consider an observation that was eight times greater than the monthly standard deviation to be an outlier. Outliers that could not be confirmed by narratives were omitted. As the volume of sales increased, the newspapers adopted the "@" symbol. In the analysis, I use the last quoted price that appeared before the "@" symbol. For weekly prices and returns, I use the sales data reported on Saturday. Because some securities were not traded each day, I use the last quoted price to fill in missing values. In the analysis, the price included any changes in par and capital stock. Log returns, i.e. $\log(1 + r_t)$, were used throughout the analysis. In the analysis, prices are not adjusted for cash flows.

For many of the quoted sales prices, there is an additional note, e.g., "b30" or "s10." The notes referred to buying or selling using time options. The buyer or seller had the option to call for or tender the stock at the price named, at any time within the period limited by the contract. For example, to "buy 30" meant that the seller had thirty days to deliver the stock. The buyer had the right of calling for the delivery of the stock upon any that he chose before the date of expiration. To "sell 30" meant that the buyer has thirty days credit. The seller had the right to deliver and demand payment for the stock any time in the period designated (King, 1910, p. 118). The analysis does not include sales data with such notes.

Appendix B

Timeline

January 19, 1848. Start of the California Gold Rush. California became a state in 1850.

June 1, 1859. Discovery of silver and gold deposits in the Comstock Lode in Nevada.

September 11, 1862. First day of trading on the San Francisco Stock and Exchange Board.

November 6, 1862. Direct telegraphic communication established between New York and San Francisco (Hansen, 1995).

October 31, 1864. The State of Nevada is admitted to the Union.

February 12, 1873. The Crime of 1873 and the demonetization of silver.

1873-1879. The Panic of 1873 triggered a severe international economic depression in both Europe and the United States (Business Cycles and Depressions, an Encyclopedia, 1997).

1882. The San Francisco Stock (and Bond) Exchange is formed, with a focus on non-mining stocks (Cote, 1922, p. 7-8).

August 15, 1967. The San Francisco Mining Exchange (formally the San Francisco Stock and Exchange Board) closes.[1] Lack of business and charges by the Securities and Exchange Commission of excessive speculation, fraud and lack of management are cited as reasons for its closing (Fracchia, 1969).

1957-2006. The San Francisco Stock and Bond Exchange merged with the Los Angeles Oil Exchange (founded December 1899) on January 2, 1957 to form the Pacific (Coast until 1973) Stock Exchange. The Pacific Stock Exchange was purchased by the owner of the ArcaEx

[1]The name was changed in 1927.

platform, Archipelago Holdings in 2005. In 2006, Archipelago Holdings was purchased by the New York Stock Exchange.

Narrative Timeline

The following is a narrative timeline of events regarding the mining stock market and San Francisco between 1859 and 1877. Sources for the narrative timeline include local newspapers, Smith (1943), Fracchia (1969), Crowell (1941), Carlson (1942), DeQuille and Wright (1974), Church (1879), Elliot (1959), and the San Francisco Almanac (Hansen, 1995).

Mines were quickly claimed by the fall of 1859. Systematic work began in the Ophir and Mexican mining claims by 1860 (Crowell, 1941).

1860s. Hundreds of new mining companies were formed, with a majority formed by 1863. Many mills were built in 1861 (Smith, 1943). Ore discoveries were made in Ophir, Gould and Curry, Potosi, Chollar, Savage and Mexican mines.

In 1863, ore discoveries were made in the Yellow Jacket and Belcher mines. There was a boom that was largely driven by the Gould and Curry Silver Mining Company (Smith, 1943). There was a slump in business in May of 1864. An ore discovery was also made in the Crown Point mine. The Bank of California opened in San Francisco on July 5, 1864. The Bank also opened a branch in Virginia City, Nevada.

There were serious declines in stock prices from 1865 to 1866 following a panic in October 1865 (Smith, 1943). As a result, many mills and properties became the possession of the Bank of California. In 1867, the Bank of California formed the Union Mill and Mining Company and had a controlling interest in many of the mines by 1869. The Kentuck mine was among the new and unexpected bodies of ore in 1866. Land and real estate speculation was active in 1866.[2]

There was a renewed interest in mining from 1867 to 1869. The San Francisco Stock and Exchange Board passed a resolution on June 6, 1868 limiting the denomination of stock prices to shares.[3] The year 1868 was the most prosperous year to date. In 1869, there was a slump in the stock market (Smith, 1943).

[2] "Land sales in San Francisco had reached an unprecedented high of $27,000,000 in 1868" (Carlson, 1942, p. 25). "Many San Francisco and Virginia City people had purchased at comparatively low prices, making large fortunes by their operations. They invested their profits in San Francisco real estate" (King, 1910, p. 173). "The opportunity for investments in the early years was limited, and nearly all of the profits from the Comstock were invested in San Francisco real estate in the erection of fine buildings" (Smith, 1943, p. 289).

[3] Prices were originally denominated in shares and feet. The changes appear as early as June 2, 1868.

A fire broke out in the 800-foot level of the Yellow Jacket mine in Gold Hill on April 7, 1869. The Virginia and Truckee Railroad was completed in 1869 and ran between Virginia City and Reno, via Carson City. The Sutro Tunnel was started in October of 1869 and was completed after 8 years, 8 months, and 19 days.

1870s. There were a few major ore discoveries. "San Francisco's depression from 1869 to 1872 was brought about primarily by speculation in real estate and people having overestimated the benefits to be derived from the completion of the overland railroad" (Carlson, 1942). The mining share market was dull in 1870. Investors were losing confidence in the ability of Comstock mines to continue production since there had been no new rich ore discoveries for many years. Many men left the Comstock in 1870 for the silver camp of Pioche and Eureka in Nevada (Smith, 1943). Stocks improved by the end of 1871.

A boom in stock prices occurred in 1872. Ore discoveries were made in the Crown Point and Belcher mines. Mining incorporations multiplied and the capital stock of many mining companies had been increased (Smith, 1943). The California Stock Exchange opened on February 1, 1872 (also reported as January 20, 1872).

The greatest mining bonanza occurred in 1874 following the Big Bonanza discoveries in the Consolidated Virginia and the California mines. The Big Bonanza discoveries were made in 1873, below 1,100 feet. The *San Francisco Chronicle*, then the leading newspaper of the Pacific Coast and boasting of the largest circulation, led the rest in extolling the riches of the bonanza and the virtues of its managers. ... The stock brokers were almost exhausted by the rush of business. ... The market had reached the top and could go no further. ... On January 8, 1875, the *Daily Evening Bulletin* reported: Ten leading Comstock mines depreciated $17,814,800 in value in the last twenty-four hours (Smith, 1943, p. 169, 171, 174, 176).

The Pacific Stock Exchange opened on June 5, 1875. Its volume rivaled, though never surpassed, the San Francisco Stock and Exchange Board. A run on the Bank of California caused the Bank and the San Francisco Stock and Exchange Board to close on August 26, 1875. The Board reopened on October 5, 1875. A fire broke out in Virginia City on October 26, 1875. Although hundreds of families were left homeless and $10,000,000 in property was destroyed, it took less than thirty days to repair most of the damages (DeQuille and Wright, 1974).

There was a rapid decline in mining interests beginning in January of 1877 and San Francisco soon experienced its most serious depression since 1855.

Appendix C

Background Information, 1860-1877

San Francisco Stock and Exchange Board

After a meeting on September 8, 1862, the San Francisco Stock and Exchange Board was formed and a constitution was adopted on September 11:

> For the purpose of facilitating the purchase of sale of stock, and *mutual security*, we, the undersigned propose to organize a San Francisco Stock and Exchange, on the plan of the New York Stock and Exchange Board, in furtherance of which object, we do each agree to pay into the hands of the Treasurer, when chosen, the sum of $100.

The first day of transactions was on Friday, September 26th. The Board also included non-mining stocks such as federal, state, and city bonds, transportation stocks, stocks from banks, insurance, gas and water companies, as well as currency. There were other exchanges, but the Board handled most of the volume of business in mining stocks.[1] The San Francisco Stock and Exchange Board quickly became a leading mining exchange with securities listed from California, Nevada, other western states, e.g., Idaho, Utah, and Oregon, and Mexico. "So far as direct ownership and investment go, San Francisco is interested far more in the silver mines of Washoe than in the gold mines of California. The people of this city own ten times more stock in silver mines than in gold mines" (Smith, 1943, p. 33).

[1] According to (Sears, 1973), other stock exchanges formed in San Francisco, California included: Board of Brokers (before 1861), Washoe Stock Exchange (1862), The Stock Exchange (March 4, 1863 - April 23, 1864), The Stock Exchange Board (1863), The San Francisco Board of Brokers (April 15, 1863), which merged with The Stock Exchange, The Pacific Board of Brokers (August 18, 1863 - October 12, 1866), City Stock Exchange, and Public Exchange (1864). Outside of San Francisco included: Sacramento Stock Board (1863) and Stockton Mining Exchange Board (1863). In Nevada: Washoe Stock Exchange (March 6, 1863) and Virginia City Stock Board (1863), both in Virginia City, Nevada. In New York: New York Gold Exchange (Gilpin's 1862) and New York Mining Stock Board (1864). The most successful of these rival exchanges include the California Stock Exchange (February 1, 1872) and the Pacific Stock Exchange (June 5, 1875). Some of these boards were great feeders for the San Francisco Stock and Exchange Board, sending it orders for thousands of shares (King, 1910).

Table C.1 provides a comparison of the New York Stock Exchange and the San Francisco Stock and Exchange Board. Deposits on contracts and fees for misbehaving were slightly higher in San Francisco. Volume on the New York Stock Exchange was far greater. However, "for two months (in 1872) the San Francisco Stock Exchange was more active than its New York counterpart, as a gold mania based on reports and rumors of new strikes ran its course" (Sobel, 1965, p. 94).

Table C.1: Comparison of the New York Stock Exchange and the San Francisco Stock and Exchange Board

	NYSE	SF Board
Eligibility	Broker, apprentice	*None stated*
Fee for placing Mining Stocks	*None stated*	$100
No Contract to be made over	60 days	90 days
Deposit on Contracts	10%	20%
Fines for misbehaving*	$0.0625 - $0.12	$0.25 -$5.00
Max Penalty for Doing Business for Less than Commission	Suspended	Expelled

Notes: Constitutions and by-laws of the New York Stock Exchange (1792, 1817, 1856, 1865) and San Francisco Stock and Exchange Board (1862, 1865, 1867, 1870, 1874). Misbehaving included: indecorous language, interrupting the President, leaving the room; the New York Stock Exchange also included standing on chairs and smoking.

The price formation process is as follows.

> On the regular call members would make their bids or offers to sell, as each stock was called, and should a transaction be made it became the duty of the seller to call the transaction to the president, who would repeat it to the secretary, and it would then be entered (King, 1910, p. 44).

Table C.2: San Francisco, 1863-1877

Year	Population	Deposits	Board
1860	78,083		
1861	83,233		
1862	91,825		
1863	103,400		15.5
1864	112,700		25.8
1865	119,100		49.2
1866		10	32.8
1867	131,100	17	66.3
1868	147,950	22	115.9
1869	170,250	27	69.1
1870		31	51.2
1871	172,750	37	127.9
1872	178,276	42	189.2
1873	188,323	52	146.4
1874	200,770	55	260.5
1875	230,132	56	220.2
1876	272,345	60	225.8
1877			119.7

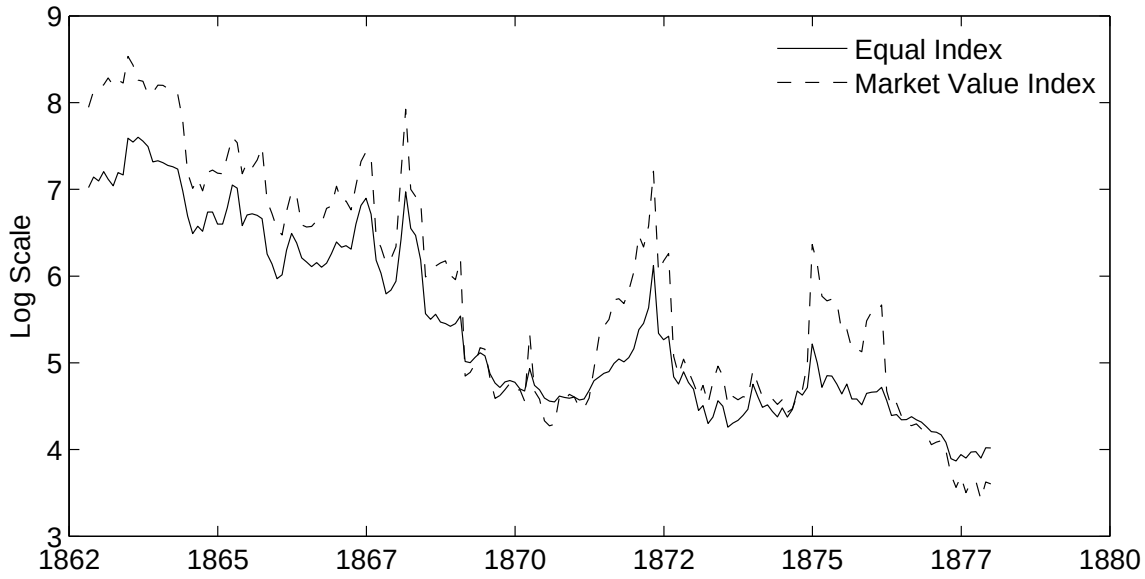
Notes: Population figures are from the Langley City Directories. The data was published in June of 1859, July of 1860, September of 1861, August of 1862 to 1865, July of 1867 and 1868, September of 1869, January of 1871, and March of 1872 to 1876. The US Census reported population figures of 56,802 in 1860, 149,473 in 1870 and 233,959 in 1880. According to Hittell (1878) immigration increased following the completion of the railroad and economic recession in the East. San Francisco Market information is from Hittell (1878). Deposit is Deposit in Savings Banks for the County of San Francisco. Board is Mining Stock Transactions from the San Francisco Stock and Exchange Board. Deposit and Board figures are in Millions of Dollars.

San Francisco Capital Market

For the principal mines on the Comstock, I construct both an equal weighted and a market value weighted index of prices. See Figure C.1.

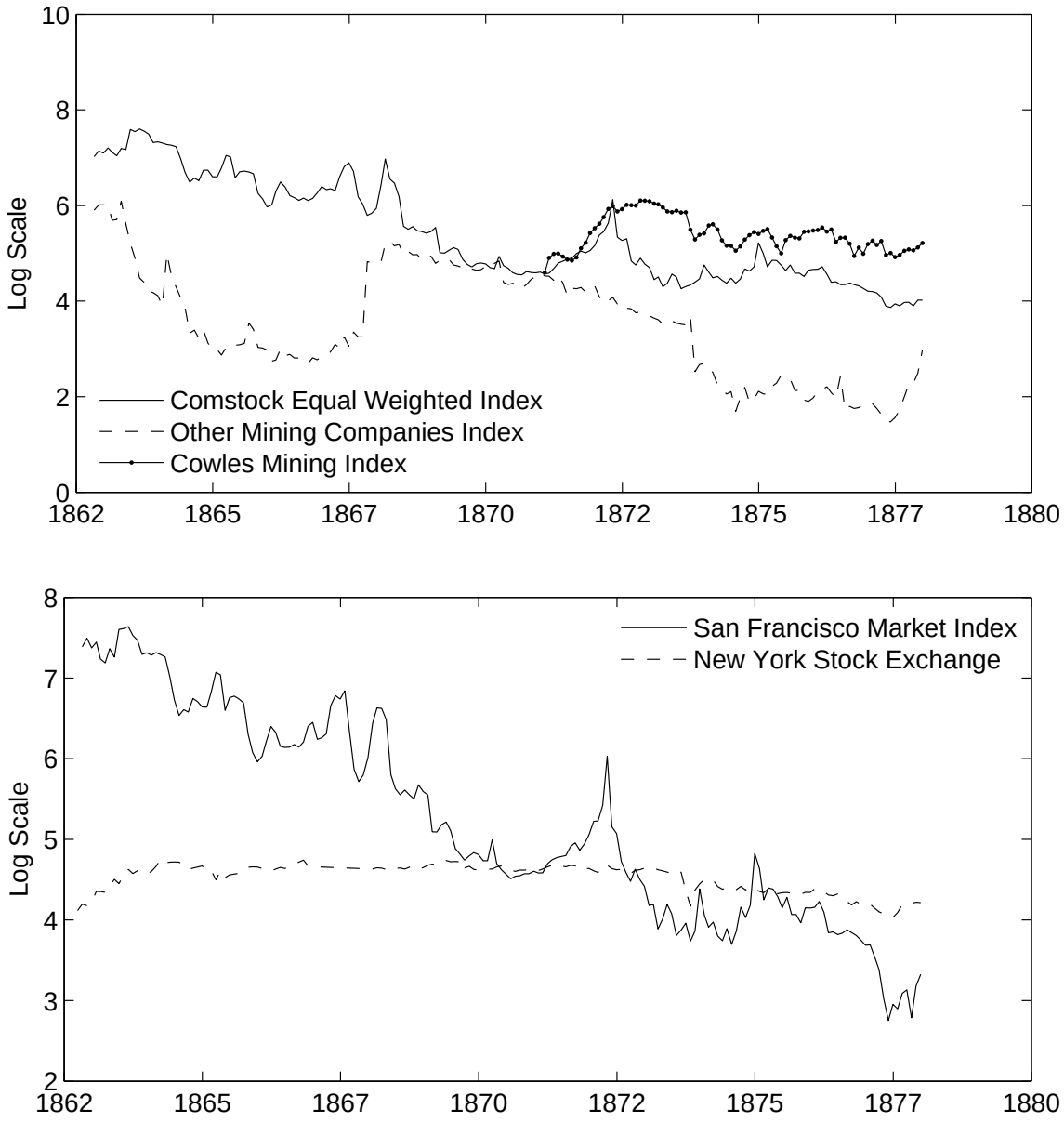
For the San Francisco market, I construct an equal value weighted index that includes the 25 principal mining companies of the Comstock, 35 other mining stocks, and non-mining securities. The 35 other mining stocks include: Adams Hill Consolidated (Eureka District, Nevada), American Flag Mill and Mining Company (Ely District), Alps Mining Company, Alta Silver Mining Company (Gold Hill Mining District), Amador Mining Company, Amazon Consolidated Mining Company (Devil's Gate, Lyon Country, Arizona), Andes Silver Mining Company (Virginia Nevada), Arizona and Utah Gold and Silver Mining Company (Globe District, Arizona), Baltimore Consolidated Mining Company (American Flat, Storey Country, Nevada), Belmont Mining Company (Philadelphia Nye Country, Nevada), Blue Ledge Mining Company (El Dorado County), Buckeye Gold and Silver Mining Company (Devil's Gate, Lyon County, Nevada), Coso Mining Company, Coso Consolidated Mining Company (Inyo County, California), Daney Gold and Silver Mining Company (Lyon Country, Washoe, Nevada), Eureka Consolidated Mining Company, Globe Consolidated Mining Company, Golden Chariot Mining Company (French, Idaho Territory), Ida Elmore (Idaho Territory), Jefferson Silver Mining Company (Jefferson, Nevada), Kossuth Mining Company (Devil's Gate, Lyon County, Nevada), Leo Mining Company, Mahogany Mining Company, Mammoth Mining Company (Lake, Mono County, California), Meadow Valley Mining Company (Ely District, Pioche, Nevada), Mint Gold and Silver Mining Company (Virginia District, Storey County, Nevada), New York Consolidated Mining Company (Storey County, Nevada), Northern Belle Mill and Mining Company (Esmeralda County, Nevada), Original Hidden Treasure, Pioche Silver Mining Company (Ely District), Poorman Mining Company, Prospect Mining Company, St. Patrick Mining Company (California) Succor Mining and Milling Company Mill and Mining (Gold Hill, Nevada), Washington and Creole Mining Company, and Woodville Consolidated Silver Mining Company (Gold Hill, Storey County, Nevada). Detailed information on the selected mines can be found in *Pacific Coast Mining Review* (1878). Figure C.2 provides and equal valued weighted index of these mines. For the non-mining stocks, I include the following 11 securities: California Steam Navigation Company, Central Railroad, Spring Valley Water Company, State Telegraph Company, San Francisco City Water Works, San Francisco Gas Company, City Gas Light Company, Firemans' Fund Insurance Company, Pacific Insurance Company, Union Insurance Company, and National Insurance Company. Some stocks were not frequently traded. I use the last traded price to fill in missing observations. The equal weighted market index is plotted in Figure C.2. I also present data from the New York Stock Exchange in Figure C.2. The data is from the New York Stock Exchange History Research Project (Goetzmann, Ibbotson, and Peng, 2001).

Figure C.1: Equal Value Weighted and Market Value Weighted Indices of Principal Stocks of the Comstock



Notes: Index is scaled to January 1871. Month end values are used in the figure. Principal mining companies owned claims on the vein of the Comstock lode.

Figure C.2: Mining and Other Stock Indices



Notes: In the top figure, I present a comparison of mining stock indices. The Comstock index is the equal value weighted index of the principal mining companies. Other Mining Companies include the 35 mining companies listed on the San Francisco Stock and Exchange Board. The Cowles Common-Stock Index of Mining Securities is also included. The series begins in 1871. In the bottom figure, I present a comparison of the equal value weighted market index and a value weighted index of the New York Stock Exchange. Month end values are used to construct the index. Indices are scaled to January 1871.

Mining the Comstock

Labor, timber, lumber, drills, acid and explosives were required to prospect the mines of the Comstock. Ore had to be hoisted to the surface, transported to mills, crushed, processed and shipped.[2] By the 1870s, mining and milling methods and the costs of labor became more standardized. Most mines used Phillip Deidesheimer's square-set shaft timbering method to prevent cave-ins. Underground transportation was developed for removing ore and waste rock (Crowell, 1941, p. 10).[3] Construction of cages for hoisting material to the surface were simplified (Crowell, 1941, p. 13). By 1870, the Washoe Pan Amalgamation method was used for milling (Crowell, 1941, p. 22). In earlier years, wages varied from $4 to $6 per day for miners and mill hands and "the working time had often been extended for ten hours, particularly by the smaller companies and individual owners" (Crowell, 1941, p. 25; Lord, 1959, p. 225). By the 1870s, the average wage was $4 for eight hours work (Crowell, 1941, p. 26; Lord, 1959, p. 225).[4] The Virginia Truckee Railroad, which connected Gold Hill to Carson City, was completed by 1869. It was used to transport ore to the mills and supplies to the mines, such as fuel and timber. As greater depths were reached, costs and the probability of flooding increased and ventilation became more challenging for miners (Crowell, 1941). "But by far the greatest obstacle has been the heat, which increases about 3 degrees Fahrenheit for every additional hundred feet sunk" (Department of Interior, 1882, p. 3).

[2] "The ore, as it is worked out or broken down by the miners in the stope, is thrown down to the track level of the station below, either falling upon the floor of the drift or into a receiver or bin, whence it is loaded into the drift car and carried to the shaft. There the car, containing its load, either of ore or waste rock, is placed upon the cage or platform in the shaft and raised to the surface, where it is run from the cage on to another track, and so conveyed to the appropriate ore bin or waste dump, according to its character, and thus delivered of its load without any intermediate handling. The car in general use in the Comstock Mines is made of wood, and has a capacity of about one thousand six hundred or one thousand eight hundred pounds" (1871-1872 Biennial Report).

[3] Ore was initially hauled by wagon and "was subject to the condition of the roads in winter and early spring" (Smith, 1943, p. 124).

[4] Over half a million dollars are paid out on the first of every month along the Comstock, to miners, mechanics, and other who are employed in and about the mines. The monthly payrolls of some of the leading companies are as follows: Consolidated Virginia, $90,000; Crown Point, $90,000; Belcher, $65,000; Ophir, $33,000; Savage, $22,000; Chollar-Potosi, $25,000; Hale and Norcross, $20,000; and a long list of companies whose payrolls amount to and from $10,000 to $15,000 per month. Even at mines where they are merely sinking a prospecting-shaft, from ten to fifteen men are employed and there is paid out per month in the shape of wages from $1,500 to $2,000 – as mechanics, carpenters, blacksmiths, and engineers, receive from five to seven dollars per day (DeQuille, 1974, p. 444).

Legislation

Nevada Mining Laws

Prior to the General Mining Act of 1872, mining districts established mineral rights and regulated social behavior. As most of the pioneer Comstock miners came from California, the mining codes used in Nevada were adapted from the California Gold Rush mining customs. The Virginia Mining District Laws, adopted on September 14, 1859, soon became the law of the land. Of particular note are the following rules (Lord, 1959, p. 91-92):

1. All quartz claims hereafter located shall be 200 feet on the lead, including all its dips and angles.
2. All quartz claims shall be worked to the amount of $10, or three days work per month to each claim, and the owner can work to the amount of $40 as soon after the location of the claim as he may select, which amount being worked shall exempt him from working on said claim for six months thereafter.[5]
3. All quartz claims shall be designated and known by a name and in sections.
4. All claims shall be properly recorded within 10 days from the time of location.
5. All claims not worked according to the laws of this District shall be forfeited and subject relocation.

California Corporate Law

Corporations were recognized by the 1849 Constitution, Article IV, §31-36.

> §33. The term corporations as used in this article shall be construed to include all associations and jointstock companies, having any of the powers or privileges of corporations not possessed by individuals or partnerships. And all corporations shall have the right to sue, and shall be subject to be sued, in all courts, in like cases as natural persons.

Incorporation in California required a statement submitted to the County Clerk that included the corporate name, the purpose of the company, the amount of its capital stock, the number of shares of which the capital stock consisted, the time of existence (not to exceed fifty years), the names of the trustees and the principal place of business. "The issuance of printed stock certificates facilitated the sale and transfer of ownership in a mine; formerly, each transfer of ownership required a new legal certificate of ownership which had to be notarized and recorded" (Land, 1973, p. 30).[6]

Whenever the capital stock of any corporation is divided into shares, and certificates thereof are issued, such shares may be transferred by endorsement and delivery of the certificates thereof, such endorsement being by the signature of the proprietor or his attorney,

[5]Placer mining required 20 days work in each month.

[6]Also Stats, 1861, 614, Section 14.

or legal representative; but such transfer shall not be valid, except between parties thereto, until the same shall have been so entered on the books of the corporation as to show the names of the parties by and to whom transferred, the number of designation of the shares, and the date of transfer (California Corporate Law, April 22, 1860, Chapter 1, §12).

Each stockholder had as many votes as he held shares of stock; if there is no capital stock, each member has one vote (California Civil Code, 1872, §301). The directors of a corporation were elected annually by the stockholders or members (California Civil Code, 1872, §302), and a majority of the directors had to be citizens of the State. The Directors elected a President, Secretary, and Treasurer (California Civil Code, 1872, §308). Directors of corporations for profit were required to hold stock in an amount fixed by the by-laws of the corporation (California Civil Code, 1872, §305). All by-laws adopted, including changes in capital stock, had to be certified by the officers of the corporation, and filed in the Recorder's office of the county where the principal place of business of the corporation is located. A two-thirds vote of all the subscribed capital stock, or of the members, was necessary to change the by-laws (California Civil Code, 1872, §304).

Changes in capital stock required: (i) a special meeting convened for the purpose of increasing (or decreasing) the capital stock; notice to be given at least four weeks prior to the meeting, (ii) attendance requirement: four-fifths of all the capital stock had to be represented (in person or by proxy) in order to approve the increase, (iii) voting requirement: two thirds of the capital stock had to vote in favor of the increase, and (iv) if approved, the change had to be filed with the County and the State (California Civil Code, 1872, §359).

California had proportional unlimited liability. "Each stockholder of a corporation, or jointstock association, shall be individually and personally liable for his proportion of all its debts and liabilities" (1849 Constitution, Article IV, §36). In the "Report of the Debates in the Convention of California of the Formation of the State Constitution," the legislators refer to the constitutions of New York and Iowa in their discussion of corporation law. The use of proportional unlimited liability in the original 1849 Constitution (Article IV, §36) was similar to the 1846 New York Constitution (Article VIII, §7) and the 1846 Iowa Constitution (Article, §9).[7] Although many states adopted limited liability by the end of the nineteenth century, California adopted limited liability in 1931.[8]

Legislation was proposed to prohibit margin sales (Sand Lot Constitution of California, 1879, Article IV, §26; rescinded November 3, 1908 by state legislature).

[7]The debate on corporations largely centered around banks and the issuance of coin.

[8]The amendment did not take away from the corporation the right to assess its stockholders, but merely required as a basis for assessment that the articles confer authority therefor. (Schroeter v. Bartlett Syndicate Bldg. Corp, 1936, 8 Cal 2d 12, 63 P2d 824, 1936 Cal LEXIS 714).

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