Firms, Fires, and Firebreaks: The Impact of the 1906 San Francisco Disaster on Business Agglomeration

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Abstract

Is the spatial distribution of urban business establishments sensitive to large, temporary shocks? This paper studies the impact of the 1906 San Francisco earthquake and fire on the agglomeration of 71 industries in the city. The disaster rejiggered location patterns as firms moved after the destruction of thousands of buildings. Using addresses gathered from city business directories between 1900 and 1930, this study asks whether industry agglomeration patterns were permanently affected by the large shock of 1906. While firms had dispersed after the disaster, they largely reformed their previous clustering patterns by 1915. The distribution of firms across neighborhoods, however, was more susceptible to the shock: evidence suggests that some areas of the city changed considerably. The results suggest that industry clustering within a city is resilient to shocks, even if ties to certain neighborhoods are not.

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1 Introduction

Large disasters wreak havoc in cities. Their destructive nature disrupts normal economic activity and temporarily redirects it toward other pursuits, such as relief. After the dust settles, however, periods of recovery provide opportunities to make changes to buildings, land use, and resident and business location patterns. In San Francisco, firms had an opportunity to relocate after an immense earthquake and fire in 1906. The disaster uprooted business establishments through the destruction of thousands of buildings, forcing many to move to different areas. Did the disaster permanently change agglomeration outcomes in San Francisco, or were old patterns re-established upon recovery? This paper answers this question using historical location data for 71 individual industries measured in five separate years between 1900 and 1930, with a focus on the impact of the 1906 disaster on industry location patterns in 1915 and 1930.

Two theories help inform the analysis. The theory of natural advantages suggests a single equilibrium outcome in the location patterns of firms and residents, and hence a return to the previous state following a large shock. In this case, the 1906 disaster would have had a temporary impact on the spatial organization of economic activity in the city as firms eventually re-established their former location patterns. On the other hand, the location of economic activity may have multiple equilibria, and so a large shock could permanently change agglomeration patterns. In San Francisco, the fire may have shifted such patterns to a new equilibrium, and thus had a lasting impact on the spatial distribution of firms and industries. To test these theories, I use historical location data to construct two variables that reflect the degree of industry agglomeration in the city: (i) an index that reflects the degree of clustering among firms in an industry, and (ii) the share of industry-firms located across seven of the city's prominent neighborhoods. Each outcome provides unique insight into the spatial organization of economic activity in early twentieth-century San Francisco.

Clustering is focused on the geographic concentration of firms in various industries, while neighborhood-industry shares reflect the geographic locations of firms in these industries. A permanent impact on clustering suggests that it may take a variety of beneficial forms, while a temporary effect implies that agglomeration benefits give rise to a single outcome in firm clustering patterns. A permanent impact on neighborhood locations suggests that firms are subject to (or even drive) the winds of change that cities experience across time, while a temporary effect suggests that permanent neighborhood characteristics are key determinants of broad industry locations.

Urban research on large shocks has often focused on city systems and growth. Following World War II, Japanese cities that were heavily bombed by the U.S. had recovered lost growth within a couple of decades (Davis and Weinstein, 2002).[1] The same is true for Japanese industries, which had recovered in the same cities in which they existed prior to the war (Davis and Weinstein, 2008). Similar effects of the war bombings hold in West Germany, while East Germany experienced a more permanent impact due to institutional reasons (Brakman et al., 2004).[2] Overall, the evidence regarding the impact of wartime destruction on urban systems supports the idea that patterns of agglomeration are determined by fundamental elements (such as geography), since these large-scale shocks had only temporary effects and thus did not shift urban growth paths to new equilibria.[3] However, cities may also thrive due to self-reinforcing agglomeration economies (i.e., local increasing returns) that are generated over time, beginning with some historical shock. Evidence from a variety of large, temporary shocks suggests that they often have permanent effects on urban growth (Bosker et al., 2008; Bleakley and Lin, 2012; Jedwab and Moradi, 2015; Berger and

[1]Miguel and Roland (2011) find similar results following the bombings in Vietnam.

[2]Evidence for multiple equilibria is stronger, however, when taking spatial interdependencies into account (Bosker et al., 2007).

[3]Natural disasters have also had little effect on county-level population growth in the U.S. over the 1960-2000 period (Wang, 2019). Boustan et al. (2020) find a similar result with respect to population growth at the county level, although they find that severe disasters encouraged out-migration and declines in housing prices/rents.

Enflo, 2017; Hanlon, 2017; Jedwab et al., 2017; Michaels and Rauch, 2018; Cermeno and Enflo, 2019; Ager et al., 2020). The results are thus mixed regarding the competing roles of fundamentals and history in determining the location of economic activity in urban systems.

History has certainly played a large role in shaping individual cities. After a large fire in 1872, Boston experienced higher land values for lots near and within the burnt district and was rebuilt with higher quality buildings (Hornbeck and Keniston, 2017). Qualitative evidence further suggests that businesses in the city seemed to change their locations upon redevelopment, an outcome also apparent in Chicago after its own large fire in 1871 and somewhat visible in Baltimore following a relatively small fire in 1904 (Rosen, 1986). Redevelopment of burned ares in San Francisco following the 1906 disaster led to a long-lasting increase in residential density (Siodla, 2015). Land-use also changed permanently after redevelopment, leading to less land for housing and more land for nonresidential uses (Siodla, 2017).[4] In Japan, the 1923 Great Kanto Earthquake had a lasting impact on industrial employment growth trends across wards and counties in the Tokyo prefecture (Imaizumi et al., 2016), and even boosted overall productivity through technology adoption and the weeding out of inefficient firms (Okazaki et al., 2019).[5] Historical legacies of a different type are present in Los Angeles, where modern-day density is greater near defunct streetcar stops (Brooks and Lutz, 2019). Urban industries and structures can also be heavily impacted by changes in political institutions, as they were in Berlin after reunification (Redding et al., 2011; Ahlfeldt et al., 2015). Cities have often been transformed by historical shocks.

This study adds to the literature on shocks and persistence by focusing on business location patterns in San Francisco following the 1906 earthquake and fire. While Rosen

[4] Other studies of fires in cities have focused largely on short-run outcomes rather than the causal effects of the disasters and their long-run implications. For instance, Fales and Moses (1972) study the distribution of population and industry in Chicago only *after* the 1871 Fire. In a study on the 1906 disaster in San Francisco, Douty (1977) looks at various aspects of the city's redevelopment and reconstruction.

[5] A similar "weeding-out" of less-productive firms occurred in the wake of Hurricane Katrina (Basker and Miranda, 2018).

(1986) studies such patterns among several trades using three historical urban fires—in Baltimore, Boston, and Chicago—it is not clear whether the results would hold in a larger sample of industries. Additionally, previous systematic studies of shocks in particular cities have focused on their impacts on land use, land values, or labor markets, leaving much to learn about their effects on business location patterns. This paper aims to fill these gaps.

Firm location patterns in old cities are driven by several factors. The high costs of moving goods relative to moving people explains much business clustering in old cities (Moses and Williamson, 1967). Other reasons for firm agglomeration include the benefits of labor pooling and the sharing of ideas.[6] Firms may be attracted to particular neighborhoods for such fundamental reasons as proximity to customers or transport networks, or simply due to historical accident. Measuring these forms of agglomeration is an important task in explaining its historical patterns within and across cities and regions. Several different indexes suggest strong tendencies for industries—particularly in manufacturing—to agglomerate at the regional level in the U.S. (Ellison and Glaeser, 1997), U.K. (Duranton and Overman, 2002), and Japan (Mori et al., 2005). For the U.S., Ellison and Glaeser (1997) find evidence that extreme cases of agglomeration are likely due to natural advantages, although they assert that there is much concentration left to explain. Long-run trends in U.S. manufacturing show evidence of a general decline in specialization and localization between 1860 and 1987, which is largely due to changes in resource use and scale economies (Kim, 1995). Industrial concentration was stable for industries from 1972 to 1992 overall, with only a small role for historical accidents in explaining concentration among some industries (Dumais et al., 2002). Overall, these studies suggest that agglomeration patterns tend to resist change in the short run, at least at the regional level. But can the same be said of industry agglomeration *within* a city? Many characteristics and amenities of a region—such as climate—are

[6] Within cities, these benefits tend to weaken with distance to the central business district as opportunities for clustering decline, thus encouraging firms to locate near the city's center (Mills and Hamilton, 1994, p. 118).

common across an entire city, and so the stability seen in regional patterns may not exist for firms and industries within a city. As suggested by Davis and Weinstein (2002, p. 1285), the level of aggregation may matter in the study of agglomeration patterns.

The central question in this paper is whether the impact of the 1906 disaster on agglomeration in San Francisco was permanent or temporary. First, clustering within industries is measured using an index developed by Ripley (1977), which is then used to test whether the geographic concentration of industry-firms was permanently perturbed by the shock. Second, the share industry-firms located in each neighborhood is used as a proxy for business activity. The question, then, is whether neighborhoods recovered their industry shares or were instead permanently changed in the wake of the disaster. Evidence presented here suggests that, while the disaster indeed had an impact on industry clustering in San Francisco, the effect had dissipated by 1915. Thus, the benefits of locating nearby similar firms support a single equilibrium outcome in industry clustering. Neighborhoods, on the other hand, were more permanently changed by the disaster: both quantitative and qualitative evidence suggests that not all neighborhoods regained their industry shares after 1906. Together, these outcomes suggest that firms' neighborhood locations are more sensitive to large, temporary shocks than are their clustering patterns.

2 Historical Background

San Francisco was thriving at the beginning of the twentieth century, which was a time of heavy industrialization in the U.S. Between 1890 and 1900, the city's population grew 15 percent (Issel and Cherny, 1986, p. 24, Table 1). The city's manufacturing sector swelled from 1,748 establishments in 1899 and 2,251 in 1904, with corresponding increases in employees, capital, and output (Douty, 1977, p. 366, Table 29). All the while, as in other growing cities in the early 1900s, San Francisco was expanding outward and building upward.

A large earthquake struck the city in April 1906. Water lines busted and gas lines ruptured, causing small fires to erupt into a large blaze that quickly overtook several neighborhoods in the city. City streets often served as useful firebreaks to squelch the flames, thus leading otherwise similar areas to be differentially treated by the disaster. Citizens and firefighters also created firebreaks by blowing up buildings in the path of the fire. Overall, the fire caused the bulk of the disaster's damage. In total, 28,188 buildings were consumed by flames across 4.7 square miles of land (Tobriner, 2006, p. 147). Figure 1 shows the geographic reach of the fire, which is represented by the darkest area on the map. While the buildings in non-burned areas were damaged in the earthquake, they were often left in reparable shape. Estimates of the fire's destruction itself range from 80 to 95 percent of the total damage inflicted by the disaster (Tobriner, 2006). This destruction led to a drastic decline in the supply of buildings in the city, thus forcing businesses to shutter or relocate to outlying neighborhoods or even other cities. Oakland, for instance, welcomed burned-out businesses, many of which moved across the bay permanently (Davies, 2012, p. 135).

Despite the severity of the disaster, San Francisco's population grew by 21 percent between 1900 and 1910 (Issel and Cherny, 1986, p. 24, Table 1). Manufacturing had largely recovered its employees and output by 1914. In 1909, the city had 1,796 manufacturing establishments, a 20-percent decline from 1904. However, by 1914, the number of manufacturing establishments had rebounded to a total of 2,334.[7] The manufacturing sector remained a vital part of the city's economy even after 1906.

Reconstruction was rapid. City-wide building permit issues returned to their pre-disaster level by 1914 (SFMR, 1904–1916). Roughly 28,500 buildings were constructed between 1906 and 1914, essentially replacing those lost in the fire (Siodla, 2015, p. 51, Table 2). Capital was widely available in reconstruction and most of the loss was insured (Tobriner, 2006, p. 192). The inflow of capital to San Francisco was immense, as insurance payouts from

[7] These data are from (Douty, 1977, p. 366, Table 29), which is based on the U.S. Census of Manufacturing.

overseas contributed to a monetary expansion in the U.S. (Odell and Weidenmier, 2004). To achieve good public favor, many insurance companies even paid settlements in excess of their obligations (Tobriner, 2006, p. 193). While housing construction was an important piece of the rebuilding puzzle, the path of reconstruction was largely initiated, and driven, by business owners. The city supported these efforts in order to quickly re-establish a significant part of the tax base and get the local economy running again. In this way, businesses were instrumental in the city's redevelopment. Overall, many observers believed the city to have been completely rebuilt by the time of the Panama-Pacific International Exposition in 1915. The exposition was seen as the perfect opportunity to show the world that San Francisco was back (Fradkin, 2005).

With all the new construction came pressure to follow existing building codes—which were scant—and implement new ones. However, whether existing or new, regulations were often ignored in the rush to rebuild. In the months following the disaster, commercial construction projects were allowed to commence without city permits (Davies, 2012, p. 112). Even the most significant changes to the city's codes—a moderate expansion of the fire limits (where buildings were required to be largely non-combustible), a new fireproof roof area, and the legal permissibility of concrete in buildings—were not strictly enforced (Tobriner, 2006). The city's first zoning code was not implemented until 1921, and its powers were first vested in the Board of Supervisors—rather than the City Planning Commission—until 1928. Such a setup helped create a lax regulatory environment. According to Weiss (1988, p. 317),"In the freewheeling 1920s, the San Francisco Board of Supervisors...would frequently grant almost any zoning change requested by any property owner, so long as it was accompanied by appropriate private compensation." At this time in San Francisco's history, real estate developers were largely free to determine the geographic patterns of economic activity.

3 Data and Preliminary Analysis

3.1 Business Location Data

The primary data sources for this study are historical business directories. Produced annually, these directories list business names and street addresses by industry, or trade. Figure 2 is a sample page from the 1915 directory, which shows listings for cigar manufacturers and other trades. Each entry consists of a business name—or the name of a sole proprietor—and the establishment's street address.

Business addresses were gathered for over 100 randomly chosen trades from the 1900, 1905, 1906, 1915, and 1930 directories (Crocker Langley, 1900, 1905, 1906, 1915; R.L. Polk, 1930).[8] To maintain a consistent sample across time, trades not present in all five years were excluded, leaving 71 total industries for the entire period of study. Directories were generally published in May of each year, expect for the 1906 directory, which was published in December of that year. The 1906 directory thus gives business locations only months after the disaster. Addresses collected from the directories were linked to their geographic coordinates using a historical GIS geocoder—produced specifically for this project—based on information from Sanborn maps for the years 1900, 1905, 1914, and 1931 (Sanborn Map Company, 1899–1914, 1905, 1928–1931). These maps are highly detailed representations of urban land use that helped out-of-town fire insurers craft local policies. The maps also provide address ranges for each city block and street; I exploit this feature to match businesses to their geographic coordinates in each year. Since street names and addresses ranges change over time—and these changes are reflected in the Sanborn maps—the locations determined in this study are more historically accurate than they would be using a modern geocoder, which relies on modern addresses to identify locations. Addresses were also linked to seven

[8]The city directory for 1905 presents a slight problem, as some portions of the digitized pages were unreadable. This problem arose rarely, but in the cases when it was impossible to determine the address for a particular business, that business was deleted from the sample.

historical neighborhoods, the boundaries of which are noted in Issel and Cherny (1986) and depicted in Figure 3.[9] Each firm's geographic coordinates and neighborhood locations are used to calculate the study's agglomeration measures.

It is helpful in the analysis to categorize industries by sector. I use the Standard Industrial Classification (SIC) system—developed in 1937—to classify industries into five major sectors: FIRE (fire, insurance, and real estate), manufacturing, retail trade, (general) services, and wholesale trade. I focus largely on manufacturing due to the strong evidence of agglomeration benefits among firms in this sector. Of the 71 industries present in the data, 35 are in manufacturing while the remainder are distributed across other sectors. Appendix Table A1 reports the sectors and industries/trades included in the sample.

Another important facet of the study includes identifying which businesses and industries were impacted by the disaster. Since the fire was the most damaging aspect of the disaster—as opposed to earthquake damage—I focus on burned city blocks to determine which firms were impacted. Being burned by the fire was an exogenous determinant of firm locations in the aftermath of the disaster. Figure 1 shows the map used to determine which blocks were burned and which went unscathed, and hence which businesses were burned out by the blaze and which were not. In most cases, entire blocks were burned by the fire. In the few cases in which a block was only partially burned, I consider it burned—and all businesses located there—if more than half of its land area succumbed to flames.

Lastly, this study's spatial area of focus includes the core of the city and immediately surrounding neighborhoods. The following neighborhoods are collectively considered to be 'Suburbs': Outer Mission, Richmond, and Sunset (see Figure 3). The establishments located in these areas between 1900 and 1930 were classified as being in a conglomerate suburban neighborhood. While the suburbs grew in importance over this time, the vast majority of

[9] Davies (2012) uses these neighborhoods in her study of relief and recovery in San Francisco following the fire.

economic activity took place in the city's central neighborhoods.

Table 1 shows the distribution of firms in the sample by sector and year. Thousands of establishments make up the sample with a range between 2,878 firms in 1906 and 4,774 firms in 1905. Between 1900 and 1905, the number of firms in the sample's 71 trades grew by 12 percent. By December 1906, many had closed in the wake of the fire or were otherwise unaccounted for.[10] Nevertheless, the number of firms in these industries had largely rebounded by 1915. In relative terms, just after the disaster in 1906, the number of FIRE and general-service firms increased and the number of manufacturing and retail establishments decreased among the sample industries. The growth in the number of financial firms after the earthquake and fire in San Francisco was seemingly permanent.

3.2 Measurement and Preliminary Analysis

This study considers two ways to measure agglomeration and the spatial distribution of business activity in early twentieth-century San Francisco. The first is focused on the geographic concentration of businesses in an industry, or how clustered are an industry's firms. This measure of agglomeration is henceforth called industry 'clustering.' Another way to consider agglomeration is to focus on the location of industry-firms across neighborhoods. Some neighborhoods, for instance, may have many manufacturing firms, while others may possess large retail shopping districts. A neighborhood tends to take on a resilient character and thus acts as an informative level of spatial analysis. Here, agglomeration is measured as the proportion of firms from a particular industry in seven neighborhoods across the city—i.e., neighborhood-industry shares. I refer to this measure of agglomeration as industry 'location.'

[10]While firm closures and exits were highly likely in the wake of the disaster, one cannot dismiss the possibility that many were simply unaccounted for.

3.2.1 Industry Clustering

This study first analyzes industry clustering, which is measured using a function developed by Ripley (1977) and described in detail in the appendix.[11] The function, which I call the L-index, captures the degree of clustering among industry-firms by identifying the number of same-industry establishments within a certain radius (in feet) of each establishment, and calculating a measure that compares this number to the expectation under perfect spatial dispersion. Larger values of the L-index reflect greater degrees of clustering, while smaller values reflect more disperion. An index value was calculated each sample year—1900, 1905, 1906, 1915, and 1930—for the 71 industries in the study.

A summary of the clustering data is given in Table 2, which compares values of the L-index across sectors and years. First notice the differences in agglomeration across industries. Firms in the FIRE and wholesale sectors were the most agglomerated in these three decades. Often locating nearby their customers, businesses in the retail sector were the least agglomerated. All sectors exhibited stable agglomeration patterns between 1900 and 1905. The disaster disrupted this stability by causing firms to become more dispersed: across all industries, in 1906, average levels of the L-index were about half those in 1905. However, by 1915, agglomeration returns to levels near those experienced in 1905. With a few exceptions, levels of clustering achieved by 1915 were relatively stable up to 1930.

3.2.2 Industry Location

The analysis of industry locations uses of a sample of 497 neighborhood-industry pairs, each of which reflects the share of an industry firm's in a given neighborhood. The greater an industry's presence in an area of the city relative to other areas, the greater the neighborhood-industry share. Since it is highly correlated with employment and output, this share is a

[11] This function was also used by Hornbeck and Keniston (2017) to measure industry agglomeration in Boston in the years surrounding the 1872 fire.

proxy for an industry's economic activity in a particular neighborhood.

Table 3 shows mean industry shares by neighborhood and year. Industry locations were fairly stable leading up to the fire, but the disaster in 1906 had a substantial impact on firm presence in nearly all neighborhoods. Downtown and Western Addition were particularly affected, whereby Downtown's share of activity decreased and Western Addition's share of activity increased. On average, these neighborhoods had not completely recovered their pre-disaster business activity by 1915, thus suggesting a lasting impact of the earthquake and fire. The fire also encouraged a permanent exodus of firms to the suburbs, which grew over this time period. Overall, there is variation across neighborhoods in the degree of recovery from the disaster; it forced some firms and industries to relocate to different areas of the city and reinforced the old locations of others.

4 The Disaster and Agglomeration

4.1 Industry Clustering Results

The preliminary analysis suggests a large impact of the fire in 1906 on firm clustering and a general recovery by 1915. This section identifies the disaster's impact and its persistence following the methodology developed by Davis and Weinstein (2002), which has been subsequently used in other studies (Brakman et al., 2004; Davis and Weinstein, 2008).[12] The objective is to test whether San Francisco's industry clustering patterns were disturbed by the 1906 disaster, and if so, whether the impact was permanent. Let L represent the L-index value described in Section 3.2.1, so that the following equation represents agglomeration for industry i at time t:

$$L_{it} = \Omega_i + \varepsilon_{it}, \tag{1}$$

[12]The methodology is articulated well by Brakman et al. (2009). Much of this section is based on their presentation.

where Ω_i is an initial L-index value for industry i and ε_{it} represents industry-specific shocks. The persistence of a shock in period t can then be modeled as

$$\varepsilon_{i;t+1} = \rho\varepsilon_{it} + \nu_{i;t+1}, \tag{2}$$

where ν_{it} is independently and identically distributed (i.i.d.). It is assumed that $0 \leq \rho \leq 1$.

First-differencing (1) and using (2) yields the following equation:

$$L_{i;t+1} - L_{it} = (\rho - 1)\nu_{it} + [\nu_{i;t+1} + \rho(1-\rho)\varepsilon_{i;t-1}]. \tag{3}$$

The term in brackets is the error term, and is uncorrelated with the shock in period t. A shock is permanent if $\rho = 1$, while it dissipates over time with varying degrees of persistence if $0 < \rho < 1$. If $\rho = 0$ the shock has no persistence at all in the period between t and $t+1$.

The key to estimating the value of ρ is identifying the shock, ν_{it}. In the present case, one proxy is the change in the level of clustering between 1905 and 1906, years which represent time periods in the data that are directly before and after the disaster. Business location decisions and patterns within this narrow time period were impacted greatly by the shock. Using (3), the following equation can then be estimated:

$$L_{i;1906+t} - L_{i;1906} = \alpha(L_{i;1906} - L_{i;1905}) + \beta_0 + \lambda_s + \mu_i, \tag{4}$$

where $\alpha \equiv \rho - 1$ and μ_i is an error term. Also included are sector dummies (λ_s), which capture characteristics specific to sectors that may influence clustering dynamics. Equation (4) tests whether clustering follows a random walk with drift. Drift is represented by β_0, which captures long-run trends in agglomeration in San Francisco that may be due to a variety of changes during this time period. In this setup, the disaster shifted clustering patterns to a new equilibrium if $\alpha = 0$ ($\rho = 1$). If $\alpha = -1$ ($\rho = 0$), then the shock had no effect at all over the period in question. If $-1 < \alpha < 0$, then the disaster had a mean-reverting effect on clustering paths in San Francisco. A mean-reverting effect can also be interpreted as a partial recovery to pre-disaster patterns, or recovery for certain industries and not others.

The shock itself is measured with error since it contains information about past changes and is thus correlated with the error term in equation (3). In order to identify the innovation ν_{it}, it is necessary to use a valid instrument for the shock in 1906. The principal variable that reflects the disaster's destruction is the proportion of an industry's firms burned by the fire. Industries that suffered more in the disaster—as reflected by relatively more burned-out firms—potentially experienced more substantial changes in location patterns soon after. Specifically, badly burned industries likely became more dispersed in the wake of the disaster as they relocated to other areas.

Finally, it is necessary to choose a proper length for the recovery period. In the case of San Francisco, the city declared itself to be rebuilt by the time of the Pan-Pacific International Exposition in 1915. Indeed, hosting the exposition created a push to prepare the city for global business and make it appear as though no disaster had occurred (Davies, 2012, p. 138). The period between 1906 and 1915 thus serves as the primary recovery period, in which case $t = 9$ years in equation (4). Analysis is also conducted for a time horizon out to 1930, in which case $t = 24$ years. However, the results for this longer recovery period are more susceptible to the influence of confounding factors, including the introduction of zoning in 1921 (however effective it was) and the general decentralization of the city's industry and residents during the 1920s. Nevertheless, these horizons of recovery are similar to those used in previous studies of shocks to urban systems.[13]

Figure 4 helps motivate the analysis. The scatter plot shows the changes in the L-index between 1906 and 1915 against the changes between 1905 and 1906. The data suggest

[13]See, for example, Davis and Weinstein (2002), Brakman et al. (2004), and Davis and Weinstein (2008).

significant variation in both the impact of the fire and the clustering response over the following nine years. The disaster clearly dispersed firms in most industries. Furthermore, industries that became more dispersed in the wake of the disaster became more concentrated in the years leading up to 1915.

Table 4 reports the first-stage regression results where the change in the L-index between 1905 and 1906 is regressed on the instrument. Column (1) shows the results for the basic specification, while column (2) shows the results when accounting for pre-disaster changes in clustering. In each case, the instrument is highly correlated with the dependent variable. Specifically, a higher proportion of burned firms in an industry was associated with greater initial dispersion. In other words, the more impacted was an industry by the fire, the less geographically concentrated it became in the wake of the disaster. Overall, the coefficients are jointly significant in each regression with values for the F-statistic near ten.

Table 5 reports the results of estimating equation (4) using the instrument in a two-stage least-squares (TSLS) framework. The coefficient of interest is for the change in localization between 1905 and 1906, which corresponds to $\alpha \equiv \rho - 1$. First consider the results for the 9-year recovery horizon ($t = 9$), shown in columns (1) and (2). Whether accounting for pre-disaster changes in the L-index or not, the point estimate for α is roughly –1, which means that $\rho = 0$. Thus, one can reject the hypothesis of a persistent impact of the disaster on industry clustering patterns, at least by 1915.[14]

Columns (3) and (4) show the results for the 24-year horizon ($t = 24$). As mentioned before, the results should be considered carefully in this case since a longer period introduces more confounding factors. The results are similar nonetheless to those for the 9-year horizon, if slightly smaller in magnitude. Furthermore, the coefficients are not significantly different

[14]Using an alternative index of localization developed by Mori et al. (2005)—based on the distribution of firms across city blocks—gives very similar results, namely complete recovery of industry localization by 1915. This index, however, is best utilized for regional data as it does not account for the spatial proximity of establishments.

from −1. While the time horizon may be so long in the 24-year case that it captures other factors that influenced business location patterns after 1915, the general conclusions reached in the 9-year case remain.

The results for clustering suggest that most firms accrue immense benefits from locating nearby other firms in the same industry. This may be especially so in old compact cities, and thus a large, temporary shock would not be expected to alter existing patterns of agglomeration. Even retail establishments in San Francisco benefited from agglomeration during this time, having formed shopping districts that became possible through the expansion of the streetcar system. Increasingly, these businesses could be located farther from their customers and yet still benefit from inter-store externalities. New retail districts—previously located downtown—had emerged within a few short years after the fire. One example is the emergence of retail on Market Street, the central thoroughfare in San Francisco. Upon visiting the city in 1909, one writer observed,"Market street [sic], which, previous to 1906, was strictly a wholesale thoroughfare...is now lined with retail stores..." (Grant, 1909, p. 370). Thus, while the disaster left no permanent mark on industry clustering patterns, it may have altered the distribution of industry-firms across neighborhoods. The next section explores this hypothesis.

4.2 Industry Location Results

While impacted by the fire, patterns of industry clustering had recovered by 1915. But did neighborhoods in San Francisco recover their previous levels of business activity after 1906? Following the previous methodology, let S be the share of businesses in industry i located in neighborhood n in the following equation:

$$S_{in;1906+t} - S_{in;1906} = \alpha(S_{in;1906} - S_{in;1905}) + \beta_0 + \lambda_s + \mu_{in}, \tag{5}$$

where $\alpha \equiv \rho - 1$ and the drift parameter is β_0, which captures long-run trends in neighborhood-industry shares. Also included are sector dummies (λ_s), which capture characteristics specific to sectors that may influence neighborhood location dynamics. In this setup, neighborhoods reached a new equilibrium outcome in industry activity if $\alpha = 0$ ($\rho = 1$). If $\alpha = -1$ ($\rho = 0$), then the shock had no effect at all and neighborhoods completely recovered their industry shares. If $-1 < \alpha < 0$, then the disaster's impact on business activity across neighborhoods was mean-reverting, potentially with some neighborhoods returning to previous outcomes and others not.

As an instrument, I use the proportion of firms within a neighborhood-industry burned in the fire. As before, equation (5) is estimated for 9- and 24-year recovery periods. Not all industries have firms in each of the seven neighborhoods in any given year, and so neighborhood-industry shares sometimes equal zero. As a robustness check, I also limit the sample to observations with nonzero share values in each of the years under consideration.

To motivate the analysis, Figure 5 shows the relationship between the impact of the fire on neighborhood-industry locations and subsequent changes over the next nine years. As the negative relationship in the diagram depicts, any impact of the disaster was generally undone in the ensuing years. However, the figure also shows variation in the extent to which the fire impacted firm and industry locations and subsequent post-disaster responses. Overall, while the raw data show that the general outcome was one of recovery, many altered neighborhoods had not completely bounced back to their pre-disaster industry shares by 1915.

Table 6 depicts the results of the first-stage regressions. Column (1) shows the basic specification, where the instrument is highly correlated with neighborhood-industry changes between 1905 and 1906. Industries in neighborhoods that were more affected by the fire witnessed less growth in those areas right afterwards. In other words, more burned-out firms led to less relative business activity in a neighborhood between 1905 and 1906. This relationship holds in the specification shown in column (2), which accounts for pre-disaster neighborhood-industry changes. In both cases shown in columns (1) and (2), the F-statistics are large and the instrument is statistically significant.

Table 7 shows the main results using a TSLS framework. The results in column (1), for which the recovery period is nine years, show that neighborhoods had partially recovered their industry shares by 1915. Similar results are obtained in column (2), where the specification accounts for pre-disaster changes. The results in columns (1) and (2) suggest that α is roughly –0.7, with similar estimates for the 1906–1930 period (see columns (4) and (5)). Estimating (5) using only nonzero share observations yields an α of –0.6 for both time periods, as shown in columns (3) and (6). All of these coefficient values are significantly different from –1. Thus, neighborhoods mostly recovered their pre-disaster industry activity, although the recovery is not complete. This outcome implies that some neighborhoods and industries experienced a more permanent impact of the fire than others. The next section turns to qualitative evidence of neighborhood change in San Francisco as a result of the 1906 disaster.

5 The Disaster and Neighborhood Change

The 1906 disaster in San Francisco left a permanent mark on the city. Near the fire's boundary, housing became denser (Siodla, 2015) and land generally switched from residential use to nonresidential use (Siodla, 2017). These changes are still visible in many areas of the city today. As shown in this study, although the patterns of industry clustering largely recovered after 1906, the makeup of neighborhood businesses often permanently changed. Underlying forces at work before the fire may have helped drive such changes. According to (Issel and Cherny, 1986, p. 78), "During the third of a century following the destruction of 1906...patterns of residence, work, ethnicity, and family not only continued but also in some instances intensified." Thus, the disaster may simply have accelerated the city's transformation.

Firms in some industries were fairly transient before 1906. One observer speculated in 1898 that, while some sectors had well-established locations, others did not owing to San Francisco's relatively young age: "Everything has gone to Market street, except financial business, which still centers, and will remain [downtown]...Until a city has attained a population of 300,000 people no one can tell where permanent business centres will be" (San Francisco Real Estate Circular, May 1898).[15] Another reporter in 1898 commented on the general movement of wholesale business to South of Market, "wholesale business is tending more strongly over there...The number of these buildings will increase, and tenants more and more desire to be on the other side of Market" (San Francisco Real Estate Circular, July 1898). Just before the fire in 1904, the *San Francisco Real Estate Circular* suggested that, "The purchaser who buys outer Market Street or Mission Street or lower Van Ness Avenue at present prices must in time make large profits. It is only a question of time when business must arrive there" (San Francisco Real Estate Circular, December 1904). In the years before the fire, forces were at work to reorganize the spatial distribution of business establishments in the city.

These observations suggest an uprooting of San Francisco's business locations in the years surrounding the fire. The disaster seemed to accelerate a movement of economic activity to the suburbs, a wave that had begun in the years before 1906 (Harris, 1988). Overall, industrial development and residential suburbanization worked in tandem to drive the outward expansion of the city (Walker, 2001). A reporter noted weeks after the fire, "The movement of wholesale houses to the railroad tracks and vicinity will no doubt be permanent. This process had been going on very slowly and without attracting much notice, for some years" (San Francisco Real Estate Circular, June 1906). A process of disaster relocation seemed to strengthen forces at work even before 1906. According to Davies (2012, p. 132), "disaster suburbanization sowed the seeds for neighborhood growth south and west of downtown San

[15]See Figure 3 for a map of San Francisco's neighborhoods and prominent streets.

Francisco. Later post-disaster developments...reaffirmed these neighborhood social boundaries." After 1906, Downtown became a center of finance, leaving less space for residents and manufacturing firms (Davies, 2012, p. 122). Neighborhoods on the outskirts of the city grew in population after 1906, and central areas continued to have a strong presence of firms from particular industries and sectors, such as FIRE services. These post-disaster developments were not necessarily surprising to city observers.

Even so, some changes were unexpected. After earth and ashes had settled, retail business moved to large streets in Western Addition (San Francisco Real Estate Circular, September 1910). It was a movement viewed as temporary in the months after the disaster (San Francisco Call, 7 May 1906). The *San Francisco Real Estate Circular* speculated two months after the fire, "The movement of retailers to Van Ness avenue and Fillmore street [sic] is...in our opinion, a natural movement demanded and made necessary by the conditions succeeding the fire. That it will be temporary in nature we do not doubt" (June 1906). The newspaper went on to state that many retailers would return to their old locations once buildings were reconstructed. But that is not what happened. In the Western Addition neighborhood, Polk and Van Ness became vibrant commercial thoroughfares in the new city (Issel and Cherny, 1986, p. 66). Market Street was also transformed in unexpected ways. Contrary to the 1898 speculation that financial firms would not ever leave downtown for Market Street, this movement is exactly what happened when the fire cleared out old buildings and thus "provided an opportunity for banks to secure better locations by purchasing new sites on San Francisco's great artery" (San Francisco Real Estate Circular, September 1910). The disaster often changed the city's neighborhoods and streets in surprising and meaningful ways.

Whether the neighborhood transformations after 1906 were unexpected or anticipated, marginal or significant, the disaster was a potent force behind the relocation of San Francisco's business establishments. Even so, some firms and trades regained their previous locations even after temporary moves. For all the speculation that movement of wholesale firms to the railroad tracks in the South of Market neighborhood would be permanent, many such merchants returned to their old locations within several years of the fire (Grant, 1909). Many of the retail firms that were located Downtown before the fire had largely returned by 1909, even though large shopping districts had formed on the ashes of once quieter streets (San Francisco Real Estate Circular, December 1909). For some industries and sectors, the disaster accelerated forces already at work in transforming San Francisco's spatial distribution of economic activity. For others, it ultimately caused the changes. The earthquake and fire in 1906 had a lasting and substantial impact on the city: many neighborhoods gained establishments from particular industries or otherwise lost them. Big shocks in cities thus have the potential not only to release pent-up pressure and accelerate previous trends, but also to change the ways in which they are organized in significant and unanticipated ways.

6 Conclusion

The 1906 disaster in San Francisco was a large, temporary shock to the city. Business as usual was disrupted, with relocation a near certainty for those establishments burned out by the fire. This paper shows that the fire had a permanent impact on industry locations across neighborhoods. Yet industries recovered their clustering patterns in the years following the disaster. Thus, while the disaster changed some neighborhoods through the relocation of thousands of businesses, it did not change how closely these firms located nearby one another. Industry clustering was resilient in the face of the shock; the distribution of industry locations across neighborhoods was susceptible to change.

The results suggest that, when studying the impact of large, temporary shocks on economic activity, it is important to consider the level of aggregation. Indeed, Davis and Weinstein (2008) find that Japanese cities had largely recovered their industries after the bombings of World War II, an outcome that is less true of San Francisco's neighborhoods following the 1906 disaster. As the discussion of the qualitative evidence further implies, analysis is highly nuanced at the levels in which firms closely interact with residents and their surrounding neighborhoods.

Appendix

A.1 Clustering Index

The clustering index used in the study is Ripley's L-function (Ripley, 1977), as used and described in Hornbeck and Keniston (2017). This index provides a normalized measure of same-industry businesses within a radius r of each establishment, relative to the number of establishments that would be expected under perfect spatial dispersion. The reference area is the entire city of San Francisco. For industry i with N_i establishments in the city, which has square footage A, let λ_i be the sample estimate of the density of same-industry establishments per square foot: $\lambda_i = N_i/A$. The value of L_i for radius r (in feet) is then:

$$L_i(r) = \sqrt{\lambda_i^{-1} \sum_{k=1}^{N_i} \sum_{j=1; j \neq k}^{N_i} I[d(k,j) < r]/\pi N_i} - r, \quad (6)$$

where $I[d(k,j) < r]$ is an indicator function equal to one if the pairwise distance between firms k and j is within r. Values of $L_i > 0$ reflect greater clustering (i.e., agglomeration) among same-industry firms. A value of $L_i = -r$ reflects complete spatial dispersion, in which case $I[d(k,j) < r] = 0$ and there are no establishments in industry i within distance r of other same-industry establishments.

A.2. Sample Sectors and Industries

Table A1 provides the list of industries in the sample and their respective sectors.

Table A1: Sample Sectors and Industries

Sector	Industry
FIRE	Accident insurance; Banks; Fire insurance; Life insurance; Marine insurance; Real estate
Manufacturing	Belting manufacturers; Boiler makers; Book printers; Bookbinders; Brass foundries; Cabinet makers; Canneries; Cap manufacturers; Cigar manufacturers; Confectioners; Flour mills; Furniture manufacturers; Glove manufacturers; Hat manufacturers; Iron foundries; Jewelry manufacturers; Machinists; Marble works; Paint manufacturers; Paper manufacturers; Pickle manufacturers; Planing mills; Rubber manufacturers; Sausage makers; Shipbuilders; Shirt manufacturers; Soap makers; Stationery; Steam and hydraulic packing; Sugar re ners; Tank manufacturers; Tool manufacturers; Watch case makers; Wire cloth, netting, and rope manufacturers; Woolen mills
Retail	Booksellers; Boots and shoes; Cigars and tobacco; Dry goods; Hardware; Jewelers; Men's furnishing goods; Stationers; Variety stores
Services	Blacksmiths; Civil engineers; Coppersmiths; Drayage; Electrical engineers; Horseshoers; Mechanical engineers; Mining engineers; Painters; Silversmiths; Upholsterers
Wholesale	Boots and shoes; Cigars and tobacco; Dry goods; Engineer supplies; Hardware; Jewelry; Junk dealers; Machinist supplies; Stationery; Tobacco leaf

Notes: FIRE refers to nance, insurance, and real estate.

A.3. Industry Clustering Results at Different Radii

Table A2 shows the results of estimating equation (4) using a radius of 100 feet and 500 feet in the L-index. In the context of the entire area of the city of San Francisco, these radii are relatively short and thus show smaller levels of clustering among firms. The results are largely consistent with those for a radius of 1,000 feet, which is the value used in the paper. Results are shown for the principal recovery period, 1906–1915, using the basic specifications—i.e., not accounting for pre-fire changes in the L-index. Similar estimates are obtained when including the 1900–1905 change in the L-index as an independent variable.

Table A2: TSLS Estimates of Impact of Fire on Industry Clustering

Independent variable	First stage: Dependent variable = *L*-index, 1905{1906 (1)	(2)	Second stage: Dependent variable = *L*-index, 1906{1915 (3)	(4)
Proportion of rms burned	-5201.38	-11692.49		
	(2172.86)	(3061.10)		
L-index, 1905{1906			-1.515	-0.978
			(0.463)	(0.166)
Constant	3437.97	7140.72	-809.25	-1075.43
	(1847.13)	(2724.96)	(563.90)	(655.25)
p-value, H_0: = 1			0.266	0.894
L-index radius	r = 100	r = 500	r = 100	r = 500
No. of observations	71	71	71	71

Notes: The *L*-index measures the level of clustering among rms as described in the text. The value r refers to the radius used in the calculation of the index (in feet). Each regression includes sector dummies. Robust standard errors are in parentheses.

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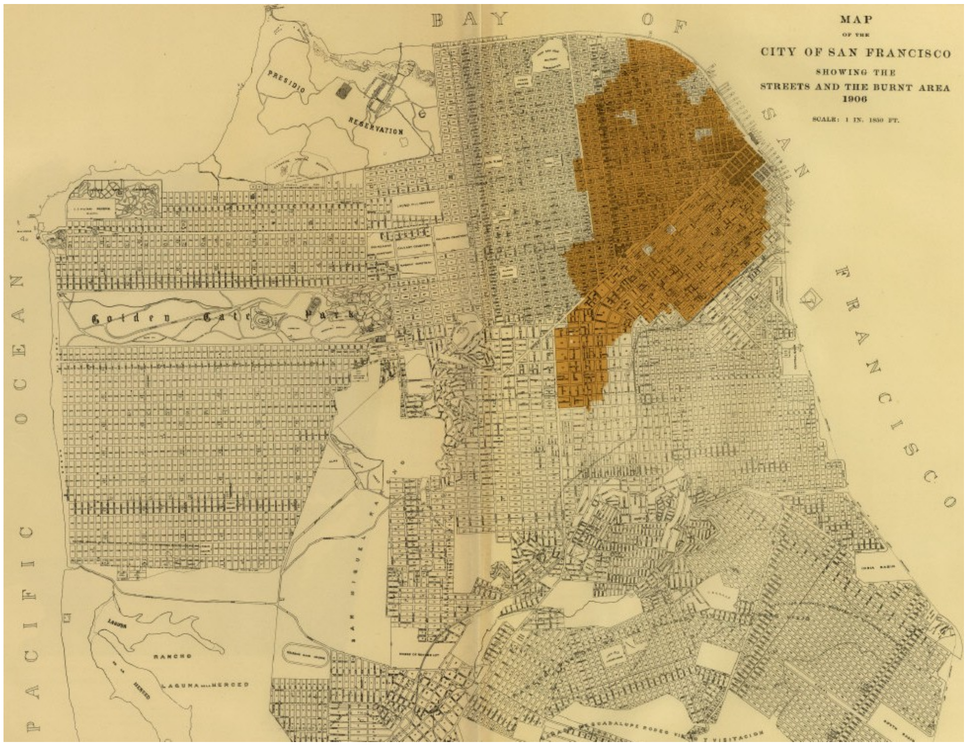
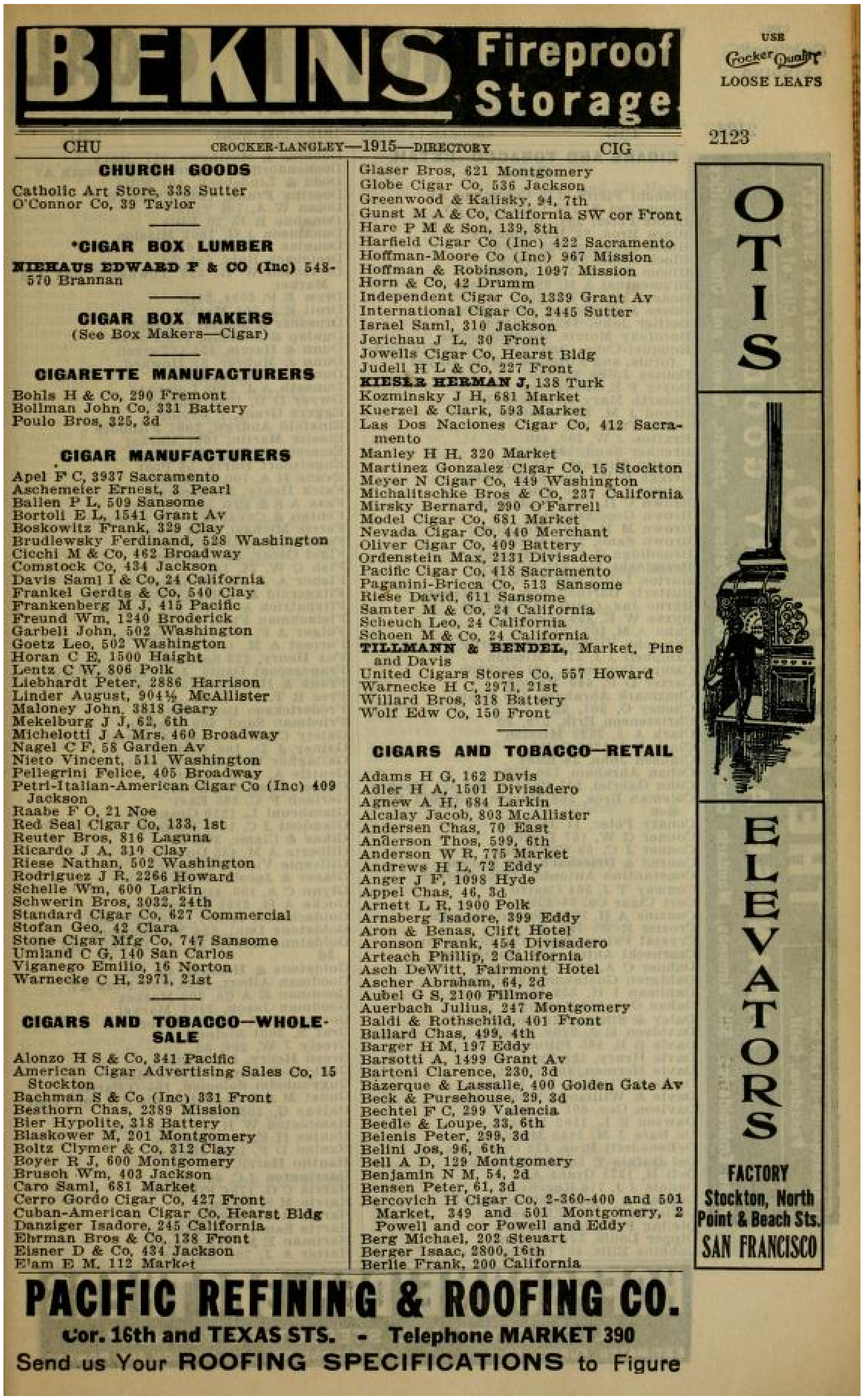


Figure 1: Geographic Extent of the 1906 Fire in San Francisco

Source: SEIC (1908).



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Boyer R J, 600 Montgomery
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Nevada Cigar Co, 440 Merchant
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Ordenstein Max, 2131 Divisadero
Pacific Cigar Co, 418 Sacramento
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Aronson Frank, 454 Divisadero
Arteach Phillip, 2 California
Asch DeWitt, Fairmont Hotel
Ascher Abraham, 64, 2d
Aubel G S, 2100 Fillmore
Auerbach Julius, 247 Montgomery
Baldi & Rothschild, 401 Front
Ballard Chas, 499, 4th
Barger H M, 197 Eddy
Barsotti A, 1499 Grant Av
Bartoni Clarence, 230, 3d
Bazerque & Lassalle, 400 Golden Gate Av
Beck & Pursehouse, 29, 3d
Bechtel F C, 299 Valencia
Beedle & Loupe, 33, 6th
Belenis Peter, 299, 3d
Belini Jos, 96, 6th
Bell A D, 129 Montgomery
Benjamin N M, 54, 2d
Bensen Peter, 61, 3d
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Figure 2: Sample Page from the 1915 San Francisco Business Directory

Source: Crocker Langley (1915).

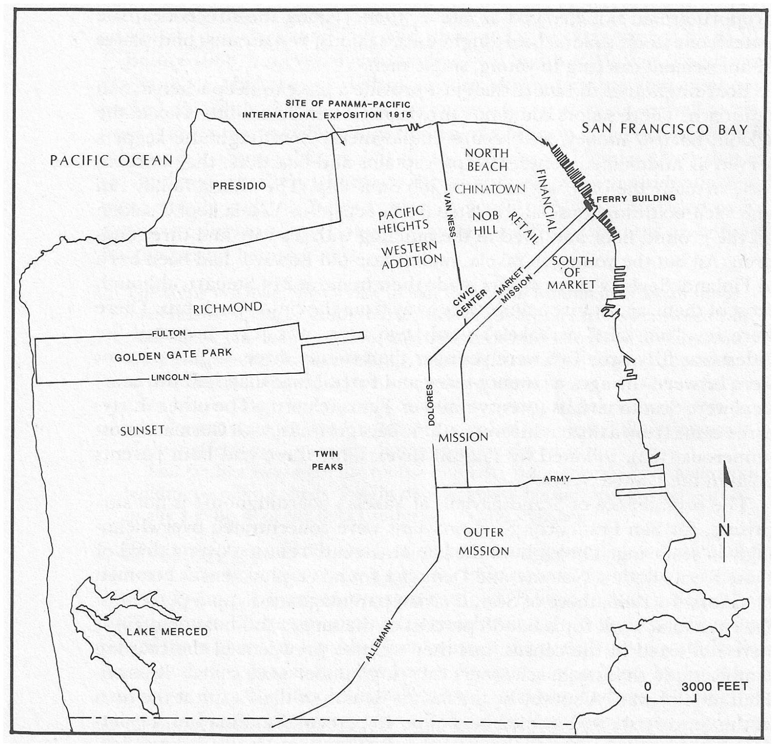

Figure 3: San Francisco Neighborhoods and Streets in the Early Twentieth Century

Source: Issel and Cherny (1986, p. 59).

Figure 4: Relationship Between Pre-Fire and Post-Fire Industry Clustering

Notes: Each dot represents an industry. The *L*-index measures the degree of clustering whereby larger numbers refer to higher levels of agglomeration among firms. The year 1906 represents a time period several months after the disaster.
Source: See text.

Figure 5: Relationship Between Pre-Fire and Post-Fire Industry Locations

Notes: Each dot represents a neighborhood-industry pair. A neighborhood-industry share is the proportion of firms within an industry located in a particular neighborhood. The year 1906 represents a time period several months after the disaster.
Source: See text.

Table 1: Number of Firms in Sample, by Sector and Year

Sector	Year 1900	1905	1906	1915	1930
FIRE (n = 6)	538 [0.13]	748 [0.16]	671 [0.23]	1030 [0.23]	1033 [0.25]
Manufacturing (n = 35)	964 [0.23]	1027 [0.22]	587 [0.20]	926 [0.21]	1011 [0.24]
Retail trade (n = 9)	1744 [0.41]	1973 [0.41]	947 [0.33]	1467 [0.33]	1523 [0.36]
Services (n = 11)	794 [0.19]	797 [0.17]	537 [0.19]	803 [0.18]	476 [0.11]
Wholesale trade (n = 10)	208 [0.05]	229 [0.05]	136 [0.05]	185 [0.04]	155 [0.04]
Total (n = 71)	4248 [1.00]	4774 [1.00]	2878 [1.00]	4411 [1.00]	4198 [1.00]

Notes: FIRE refers to nance, insurance, and real estate. The number of industries in each sector is given by n. The year 1906 represents a time period several months after the disaster. Proportions of total rms are in brackets.

Table 2: Summary Data for Clustering Index, by Sector and Year

Sector	Year 1900	1905	1906	1915	1930
FIRE (n = 6)	12701.51	11878.60	7258.87	13686.85	13536.18
	(4146.87)	(4858.09)	(3330.37)	(4339.26)	(4320.26)
Manufacturing (n = 35)	8810.10	8079.42	3732.85	7335.09	5816.33
	(4074.21)	(3493.91)	(3486.93)	(4048.98)	(3895.22)
Retail trade (n = 9)	3748.69	3417.67	3121.71	2955.30	3523.27
	(1725.16)	(1678.67)	(1409.40)	(1853.49)	(1669.37)
Services (n = 11)	6657.97	6836.58	3159.20	6171.01	7252.31
	(4194.54)	(4662.33)	(2479.95)	(4267.92)	(5000.89)
Wholesale trade (n = 10)	12419.42	11182.49	5162.13	9804.50	9462.10
	(3510.07)	(2840.80)	(2980.21)	(4272.33)	(5074.42)
Total (n = 71)	8672.29	8054.05	4065.78	7484.13	6914.01
	(4570.53)	(4210.58)	(3207.84)	(4651.39)	(4763.37)

Notes: FIRE refers to nance, insurance, and real estate. Clustering is measured using the L-index described in the text, where larger numbers refer to higher levels of agglomeration among rms. The number of industries in each sector is given by n. The year 1906 represents a time period several months after the disaster. Standard deviations are in parentheses.

Table 3: Summary of Neighborhood-Industry Shares, by Neighborhood and Year

	Year				
Neighborhood	1900	1905	1906	1915	1930
Downtown	0.50	0.45	0.18	0.38	0.37
	(0.31)	(0.30)	(0.21)	(0.30)	(0.32)
Mission District	0.05	0.06	0.11	0.08	0.06
	(0.06)	(0.08)	(0.13)	(0.09)	(0.08)
Nob Hill/Pacific Heights	0.01	0.01	0.03	0.02	0.02
	(0.02)	(0.03)	(0.05)	(0.04)	(0.04)
North Beach/Chinatown	0.03	0.03	0.02	0.03	0.05
	(0.04)	(0.04)	(0.06)	(0.05)	(0.10)
South of Market	0.38	0.41	0.33	0.39	0.39
	(0.28)	(0.28)	(0.32)	(0.28)	(0.30)
Suburbs	0.02	0.02	0.07	0.06	0.08
	(0.05)	(0.05)	(0.10)	(0.11)	(0.11)
Western Addition	0.02	0.02	0.20	0.04	0.04
	(0.04)	(0.05)	(0.21)	(0.07)	(0.06)

Notes: A neighborhood-industry share is the proportion of firms within an industry located in a particular neighborhood. The sample consists of 497 neighborhood-industry observations. The year 1906 represents a time period several months after the disaster. Standard deviations are in parentheses. See Figure 3 for a map that depicts San Francisco's neighborhoods.

Table 4: First-Stage Clustering Regressions (Dependent Variable = Δ L-index, 1905–1906)

Independent variable	(1)	(2)
Proportion of firms burned	-11903.37	-12321.30
	(3557.33)	(3541.15)
L-index, 1900–1905		-0.349
		(0.253)
Constant	6338.96	6511.17
	(3175.86)	(3074.77)
R^2	0.306	0.329
F-statistic	10.46	8.64
No. of observations	71	71

Notes: The L-index measures the level of clustering among firms as described in the text. Each regression includes sector dummies. Robust standard errors are in parentheses.

Table 5: TSLS Estimates of Impact of Fire on Industry Clustering

Independent variable	Dependent variable = *L*-index, 1906{1915 (1)	(2)	Dependent variable = *L*-index, 1906{1930 (3)	(4)
L-index, 1905{1906	-1.109	-1.029	-0.707	-0.663
	(0.223)	(0.176)	(0.337)	(0.322)
L-index, 1900{1905		-0.796		-0.440
		(0.210)		(0.326)
Constant	-1218.27	-1451.48	-990.89	-1119.87
	(1045.93)	(963.09)	(1814.47)	(1847.87)
p-value, H_0: = 1	0.624	0.870	0.385	0.295
No. of observations	71	71	71	71

Notes: The *L*-index measures the level of clustering among rms as described in the text. Each regression includes sector dummies. Robust standard errors are in parentheses.

Table 6: First-Stage Industry Location Regressions (Dependent Variable = Δ neighborhood-industry share, 1905–1906)

Independent variable	(1)	(2)
Proportion of rms burned	-0.200	-0.201
	(0.022)	(0.022)
share, 1900-1905		-0.041
		(0.135)
Constant	0.068	0.068
	(0.011)	(0.011)
R^2	0.195	0.195
F-statistic	17.90	14.92
No. of observations	497	497

Notes: A neighborhood-industry share is the proportion of rms within an industry located in a particular neighborhood. Each regression includes sector dummies. Robust standard errors are in parentheses.

Table 7: TSLS Estimates of Impact of Fire on Industry Locations

Independent variable	Dependent variable = neighborhood-industry share, 1906{1915 (1)	(2)	(3)	Dependent variable = neighborhood-industry share, 1906{1930 (4)	(5)	(6)
share, 1905{1906	-0.725	-0.723	-0.633	-0.674	-0.676	-0.578
	(0.055)	(0.055)	(0.073)	(0.072)	(0.072)	(0.093)
share, 1900{1905		-0.103			0.101	
		(0.129)			(0.137)	
Constant	0.002	0.002	0.008	0.003	0.003	-0.008
	(0.006)	(0.006)	(0.017)	(0.008)	(0.008)	(0.018)
p-value, H_0: = 1	0.000	0.000	0.000	0.000	0.000	0.000
Sample	Full	Full	Share > 0	Full	Full	Share > 0
No. of observations	497	497	206	497	497	185

Notes: A neighborhood-industry share is the proportion of rms within an industry located in a particular neighborhood. Each regression includes sector dummies. Samples limited to nonzero share observations are used to obtain the results shown in columns (3) and (6). Robust standard errors are in parentheses.