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New(spaper) Evidence of a Reduction in Suicide Mentions during the 19th-century US Gold Rush

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UNIVERSITÄT DUISBURG ESSEN
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Abstract

I analyze the relationship between state-level economic shocks and suicides using historical US gold discoveries (1840-1860) as a large unexpected economic shock.
Gold discoveries were an unexpected and large economic shock of up to 3.5% of GDP. They provide as good as random variation to the local economy, that I use to estimate the effect of economic changes on suicides. Comprehensive mortality data by state and year does not exist for the US for 1840 to 1860. I thus make use of web scraped data from a newspaper archive and use suicide mentions per 100,000 pages as a proxy for suicides.
Results show that overall gold discoveries are linked with a clear reduction in newspaper suicide mentions. The results indicate that an economic shock changes the suicide rate by one for every $136,659 to $251,145. This is estimate implies a higher cost-effectiveness than previous research but is still seven to fourteen times the size of modern, cost-effective suicide prevention method.

Keywords: *Gold Rush; Economic Shock; Suicide; Newspaper*

JEL classification: *N31; I15; J11*

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I. Introduction

The relationship between the aggregate economic situation and mortality has gotten a lot of attention since Ruhm (2000). Studies using US-data have unanimously estimated that for most causes of mortality improvements in the overall economy lead to lower mortality (Fishback et al., 2007; Ruhm, 2000). The consistent exception to this are suicides. The US Suicide Prevention Resource Center reports the societal costs of suicides to be about $1.4 million per suicide or total costs of all attempted and completed suicides to be $93.5 billion per year (Substance Abuse and Mental Health Services Administration, 2019). Yet, with the exception of Fishback et al. (2007) there are no causal estimates of how economic changes affect suicides.

In this paper I offer a causal estimate of an exogenous change in the economy and test whether it has affected suicides. It is particularly hard to think of an exogenous change in this context as that change needs to affect an entire economy sufficiently to plausibly have a suicide effect, while at the same time it needs to be unexpected such that people cannot adjust their behavior in anticipation of the change. I exploit the US gold rush as an event that plausibly fulfills these criteria. The gold rush was unexpected and peaked very fast at around 3.5% of federal GDP. I use two-way fixed-effect estimation to show that the gold rush reduced suicides, but not to an extent that it would be deemed a cost-effective intervention by modern standards. The estimation is performed on a state-year panel that consists of gold discovery values from 1840-1860 and suicide mentions per 100,000 in regional newspapers as a proxy for suicides (see Kronenberg (2020)).

Using this novel dataset, a concern is that suicide mentions mechanically decline when gold is discovered as articles about the discovery crowd out suicide mentions. I estimate my models with and without controlling for gold mentions and the coefficients from models with gold mentions do not meaningfully vary from the same models without gold mentions. Another concern are spillovers and sensitivity of the estimates to choices about the start and end date of the data. However, previous work by Lindo (2015) argues that states are the best level of aggregation. Ruhm (2000) suggest as a rule of thumb that one should use more than 15 years

to avoid the estimates being sensitive to the start and end date of the data – thus the data I use here fulfills the recommendations formulated by previous work.

Overall, the literature looking at how economic changes affect suicides is mature (Fishback et al., 2007; Gerdtham and Ruhm, 2006; Miller et al., 2009; Ruhm, 2000, 2015, 2016; Stevens et al., 2015).[1] Yet, this study differs from this literature in as far as I look at an economic shock, something that so far has only been done by Fishback et al. (2007) exploiting exogenous variation in the New Deal. This study goes further back in time exploiting gold discoveries and is thus the first study to explore the relationship between economic shocks and suicides pre-1900. Beyond the intrinsic historical value of exploring an unexplored time period in US history,[2] this time period is ideal from an analysis point as virtually no social safety net exists. There is thus some scope to extrapolate the results here to countries currently on the level of economic development the US had mid-19th century. Following Inklaar et al. (2018) in 2016 24 countries in the world had lower real GDP per capita in 2011US$ than the United States in 1850 ($2,825).[3] Even though this might even be an underestimate as the effect likely varies with cultural norms around gold. Bhalotra et al. (2020) has shown that in India neonatal mortality is closely linked with the world gold price.

The results of this study are in line with Fishback et al. (2007) and Ruhm (2000) namely that large positive shocks to the aggregate economy reduce suicides. The dollar values associated with a reduction in suicide mentions ($136,659 to $251,145) are far larger than the ballpark of cost-effective suicide prevention (Knapp et al., 2011).

[1] Bellés-Obrero and Castelló (2018) provide a good overview of the overall literature on economic changes and health.

[2] Arthi et al. (2020) also look at economic changes in the 19th century, but do not consider suicides and focus on the UK. Even though the economic shock they exploit, the civil war, originates in the US.

[3] These countries are Afghanistan, Burundi, Benin, Burkina Faso, Central African Republic, D.R. of the Congo, Comoros, Ethiopia, Guinea, Gambia, Guinea-Bissau, Haiti, Liberia, Madagascar, Mali, Mozambique, Malawi, Niger, Rwanda, Sierra Leone, Togo, Uganda, Yemen and Zimbabwe.

II. Background

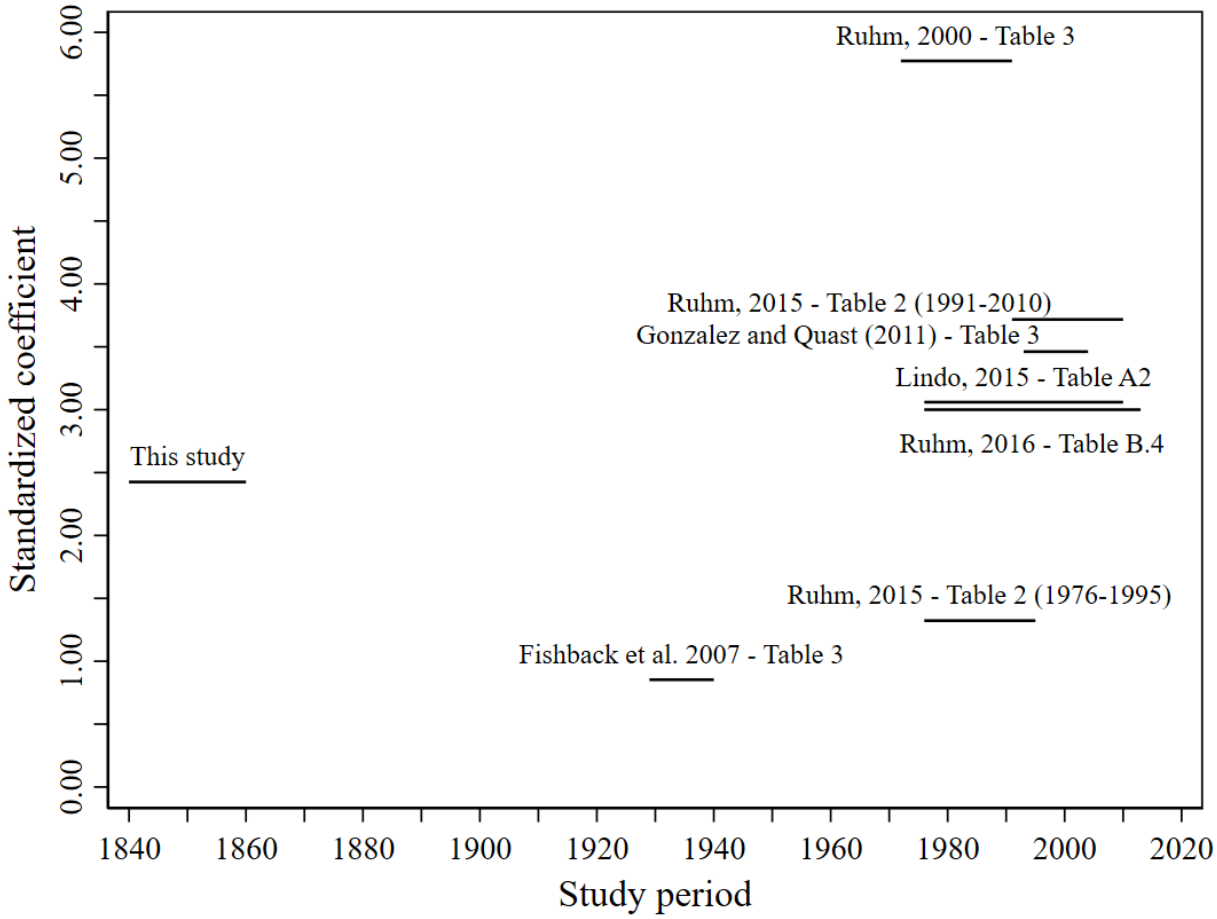
This section briefly describes the context of the study. First, elaborating on the existing knowledge and then on the history on 19th century gold rushes in the US.

II.1. Literature

While, the literature looking at how economic changes affect suicides is mature (Fishback et al., 2007; Gerdtham and Ruhm, 2006; Gonzalez and Quast, 2011; Miller et al., 2009; Ruhm, 2000, 2015, 2016; Stevens et al., 2015) the literature is substantially smaller than the literature looking at economic changes and total mortality (cf. Bellés-Obrero and Castelló (2018)). Additionally, it is a literature that has less consistent results than the literature looking at total mortality. In the figure I abstract from the sign of the coefficients to focus on the magnitude, implicitly assuming that the effect of positive and negative economic changes is symmetric. Fishback et al. (2007) and Lindo (2015) look at positive economic changes resulting in a negative sign. Most other studies look at increases in state unemployment, thus a negative change, resulting in a positive sign.

The figure emphasizes that most of the existing research has focused on study periods that are very close to each other and that often overlap largely. The results by Fishback et al. (2007) and Ruhm (2015) have the lowest magnitude, while Ruhm (2000) has the largest magnitude. The figure also again highlights that suicides, while important and an outlier in this literature are understudied. The review by Bellés-Obrero and Castelló (2018) contains 53 studies and following their Table 1 only 8 consider suicide as an outcome, while key studies in this literature like Ruhm (2000) clearly note the special case of suicides in this literature. There are of course studies looking at mental health outcomes (Bradford and Lastrapes, 2014; Carpenter et al., 2017; Charles and DeCicca, 2008; Currie and Tekin, 2015; McInerney and Mellor, 2012). While mental health care is a key channel, suicidal individuals, at least partially, base their decision on rationally explainable thought processes as suggested by Hamermesh and Soss (1974) and empirical confirmed by Campaniello et al. (2017). This implies that it is useful to look at the whole picture between economic changes and suicides in addition to exploring potential channels.

Figure I: Overview of the existing literature



Note: Inclusion in this graph is based on studies looking at the relationship between state-level economic variation and suicides. Standardized coefficients represented on the y-axis represents coefficients divided by standard errors. The x-axis represents the study period of the depicted studies. Miller et al. (2009) is not included, because no standard errors are reported in the study. For this graph I for convenience assumes that the effect of economic changes on suicides is symmetric for positive and negative economic changes. This assumption allows me to ignore signs and focus on the magnitude of the estimated effects. Therefore, OSD depicts standardized magnitudes as signs are ignored. Fishback et al. (2007) and Lindo (2015) look at positive economic changes resulting in a negative signs. Most other studies look at increases in state UR, thus a negative change, resulting in a positive sign.

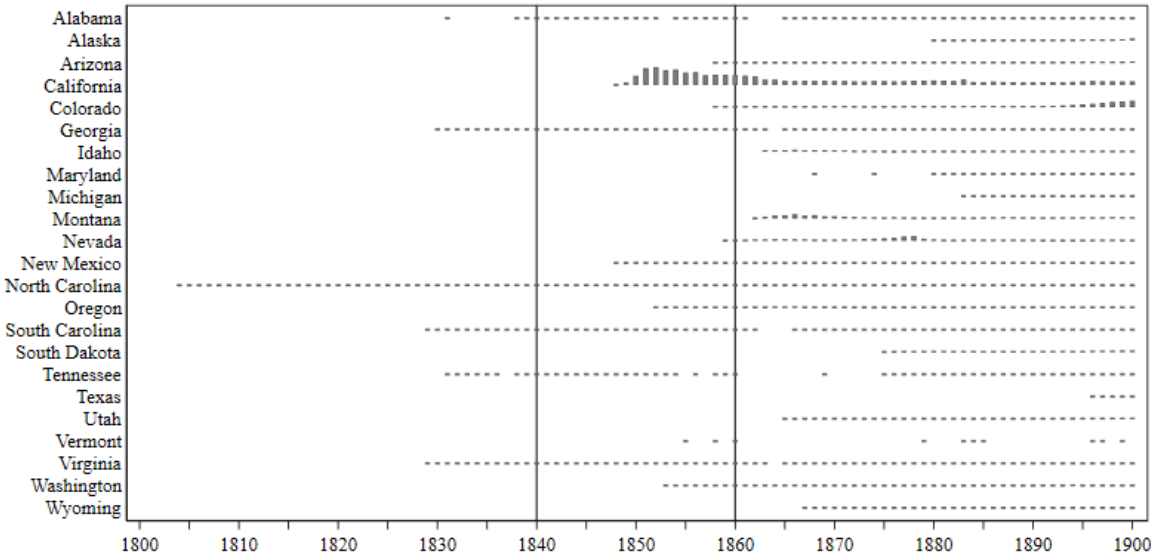
II.2. 19th-century gold rushes

Even though the first recorded gold discovery in the US took place in North Carolina at the beginning of the 19th century. The beginning of the first gold rush is arguably the discovery of gold at Sutter's Mill in January 1848 when James Marshall accidently discovered gold while building a mill (Fetherling and Fetherling, 1997). The discovery at Sutter's Mill started a large gold rush on the west coast of the US.Figure II displays the amount of gold discovered in each state and year in troy ounces[4]. The figure presents gold discoveries for the 24 of the 50

[4] A troy ounce is roughly 31.1 grams.

US states that ever discovered gold. Implying that roughly half of all US states did not discover any gold.

Figure II: Gold discoveries over time and by states



Note: The figure represents the amount of gold discovered in a state and year in troy ounces. A troy ounce is roughly 31 grams. The exact values are available in Craig and Rimstidt (1998), this figure is meant to given an intuitive overview of the variation in gold discoveries. States without gold discoveries are not presented for brevity. The vertical lines represent the start and end of the study period. This graph was produced in Stata 15.1 using the tabplot plugin (Cox, 2016).

Given that more than half of all states did not discover gold and the variation in the discovered amounts of gold between states that did discovered gold (see Figure II), it seems likely that the importance of gold to the state economy varied substantially. Unfortunately, no state-year GDP estimates are available to explore how important gold discoveries were for different states[5]. Figure III shows gold discoveries as a share of federal GDP. The figure shows that gold discoveries as share of US GDP varied from virtually 0% to over 3% in 1852.

[5] The availability of state-year GDP data (or estimates) would allow two-stage least squares estimation.

Figure III: Gold discoveries as percent of GDP

Note: The y-axis indicates how much percent US gold discoveries were as part of GDP for each year between 1840 and 1900. Nominal GDP estimates have been obtained from Global Price and Income History Group's internet site: http://gpih.ucdavis.edu (Last accessed 20.02.2019). Gold data is obtained from Craig and Rimstidt (1998). Ticks on the x-axis indicate five-year intervals.

Gold discoveries in new areas were mostly accidental as in the case of Sutter's Mill. Of course methods improved over time. However, even today with better knowledge with respect to the geology of gold, miners cannot forecast the places and amount of gold findings precisely (Goldfarb et al., 1998). Importantly, historical research shows that on average financial gains from the gold rush were made by those supplying goods and services in those areas and not the miners themselves (Clay and Jones, 2008).

III. Data

III.1. Data sources

State-year data on suicides for the 19th century are very scarce. The only existing data comes from the mortality censuses. For this study period (1840-1860) this implies that data is only available for 1850 and 1860. Furthermore, like all census types, mortality census usually only covers areas once they received statehood. Thus, this would produce insufficient data for any type of empirical analysis. An additional problem is academic work from the time Whipple (1922) raises concerns about the accuracy of the morbidity registration. Modern counterparts confirm this

point, Haines (2001) for example reports that death registration similar to modern standards was only implemented in the 1930s. Moreover, Fernandez (2019) shows that even current CDC suicide statistics are severely affected by differential professional standards for coroners in the US.

Therefore, I use data from a historical newspaper archive. The archive is called the National Digital Newspaper Program (NDNP) and is a collaboration between the National Endowment for the Humanities (NEH) and the Library of Congress (LC). Their joint website "Chronicling America" provides access to digitized historical newspaper pages. NEH-funded institutions (hereafter awardees) from all US states conducted the digitization. Awardees digitized 100,000 pages a year since 2005, with the exception of 2006. The historical years from which newspaper pages are digitized vary by year, but are in the range 1690-1963. Within the grant criteria, which are mainly states and historical time windows, the awardees decided which pages are scanned. Some awardees were funded multiple times, thus from those states more newspaper pages are available.

I search this archive for occurrences of the term "suicide(s)". The result is a dataset of all mentions of suicides within the archive. Given that I have more pages for some states and years than for others, I divide the total number of suicide-mentions by state and year by the total number of newspaper pages per state-year cell and multiply by 100,000. This approach is analogues to cause-specific mortality that is usually reported as deaths per 100,000 individuals for a specific disease/cause (e.g. suicide).

During the 19th century, the US experienced high degrees of external and internal migration. Unfortunately, there is no source of population numbers on state-year level and thus to capture variation in migration patterns by ethnic group the number of newspapers in each state-year cell per language group is coded. The overall distribution of languages over time in the raw data is described in Kronenberg (2020). For each language, a variable is created that gives the number of newspapers for that state and year. For sample size reasons some languages are grouped together the first group is Czech, Polish, Slovenian and Croatian, the second group is Danish, Swedish, Norwegian, Icelandic and Finnish and the third group is Spanish, Italian and French. Cherokee and Hawaiian were not grouped

despite small numbers, because of the lack of similar languages. German is not clustered, because it is the language that appears the most after English and thus enough observations are available without grouping.

Additionally, I code the full-time equivalent post-offices by state and year using data from the United States Postal Service[6]. The variable is analogue to full-time equivalents for workers; thus it takes the value 1 if one post-office was open in a state for the entire year. The additional advantage of this variable is that during the 19th century, many newspapers were distributed via postal services.

A variable that describes how often a state-year combination was sampled is prepared as well. This information is a combination of the information provided in Table 2 and 3 in Kronenberg (2020). For example, the combination Arizona and the year 1881 is coded as four. Newspapers from Arizona were scanned four times and each time 1881 was covered in the award period. 1879 on the other hand was coded as three, because the 2008 award only covers the period 1880-1922.

Data on the amounts of gold discovered by state and year has been obtained from Craig and Rimstidt (1998). This variable is coded as metric tons of gold discoveries on state and year level. The official gold price is fixed at $20.67 during the observation period (National Mining Association, 2012). Therefore, I calculate the dollar value associated with one-unit reduction in suicide mentions. For this calculation, the dollar value of a ton of gold in 2019 is necessary. Given that, an ounce of gold is 31.10 grams at a price of $20.67 the price of a ton of gold 1900 is $664,566.12, which in 2019 is $20,264,753.44. Thus, to know the dollar value associated with a reduction of one in suicide mentions the coefficient is divided by $20,264,753.44. This rough dollar value allows for a comparison of the gold rush versus modern suicide prevention in terms of cost-effectiveness.

III.2. Data inclusion criteria

I restrict the final dataset to the years 1840-1860 for numerous reasons. First, newspaper data before 1840 is scarce, because of a lower number of grants covering the period as well as a lower number of existing newspapers, for more detail on this see Kronenberg (2020). Second, the gold rush starts very rapidly at then peaks

[6] The data can be accessed at https://webpmt.usps.gov/pmt010.cfm (Last accessed April 23, 2019).

around 1852, but there is no clear end (see Figure III). However, the American Civil War (1861 – 1865) likely had large effects on suicides and gold mining I thus pick 1860 as the end date of the analysis.

In terms of geographical restrictions, I have dropped all observations that are not from current states but from current districts or territories – like the District of Columbia, Puerto Rico, Guam, etc. The reason they are dropped is, that NEH grants are only given to current-day states. Thus, it is unknown which state organization scanned those pages and it is therefore impossible to correctly account for the data generating process. Furthermore, the gold data by Craig and Rimstidt (1998) is reported based on current states. Thus, I do not know whether and if how much gold was discovered in areas that are not US states.

The final restriction is that I have only used local newspapers in the newspaper dataset. Local newspapers are defined as those distributed only within one state. This is meant to limit spillovers in suicide reporting.

IV. Econometric approach

I use a specification that has become standard in this literature (see Lindo (2015); Ruhm (2000); Stevens et al. (2015)) to estimate the relationship between the value of gold discoveries and suicide mentions. Using subscript j for state and t for year, the base specification is:

$$S_{jt} = \alpha_t + G_{jt}\gamma + GM_{jt}\delta + F_j + \mathrm{X}_{jt}\beta + \epsilon_{jt} \quad (1)$$

Where S_{jt} is the number of suicide mentions per 100,000 pages in newspapers published and distributed in state j in year t. G is the amount of gold in metric tons in state j in year t. GM are the gold mentions per page, gold mentions are rare and are thus coded per page instead of per 100,000 pages. Controlling for the number of gold mentions directly controls for changes in gold mentions due to gold discoveries. Otherwise, a potential concern is that increasing gold mentions due to gold discoveries crowd out suicide mentions and thus bias G downwards. X is a vector of further variables described above and ϵ the error-term. The year-specific intercept (α_t) holds determinants of suicide mentions constant that vary across all states over time in the same way, such as federal laws, innovations in gold mining

and the general economy. The state fixed-effect (F_j) holds constant state-specific time-invariant factors like state geography or climate, which are fixed within states and do not vary over time.[7] Holding geography fixed is important as some geographical features (e.g. rivers) make gold mining easier.

A concern is that celebrity suicides are widely reported on and are over-counted using the outcome measure. The year-specific intercept should capture part of that, but to further account for that, I estimate the model with an adjusted outcome measure, which only counts one suicide mention per day and newspaper. The downside of this approach is that I might miss a suicide if multiple suicides are reported on the same day and in the same newspaper. However, a further advantage is that this approach accounts for cases in which a newspaper mentioned the same suicide more than once e.g. if an article is printed on more than one page. Overall this problem is likely a small issues as Kronenberg (2020) has shown that there are 1.45 mentions per suicide in this data.

The error-term is clustered at state-level in all cases. Clustering is necessary as errors are likely to be correlated within states, not adjusting for this correlation could lead to misleadingly small standard errors. The fixed-effect approach taken here might already reduce the concern of within state correlation of the error-term. However, it is unlikely that it completely addresses the problem. I follow the suggestions in Cameron and Miller (2015) and implement the model using the within estimator and not the least squares dummy variable estimator. The estimator is implemented with the xtreg command in Stata 15.1 with the vce(robust) option (Cameron and Miller (2015), p. 331).

The model estimated here is commonly called a Two-Way Fixed-Effects (TWFE) model. TWFE models have extensively been used to evaluate policies that are introduced in e.g. US states over time (see for example Stevenson and Wolfers (2006)). However, recent work has pointed to some issues with TWFE models (de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2018; Sun and Abraham, 2020). Yet, these papers only address TWFE models with a binary

[7] State geography and climate are likely changing within state. However, processes such as global warming are slow and take hundreds of years or longer, while "only" a two decades are observed here. Thus, from the perspective taking in the model they do not vary within state.

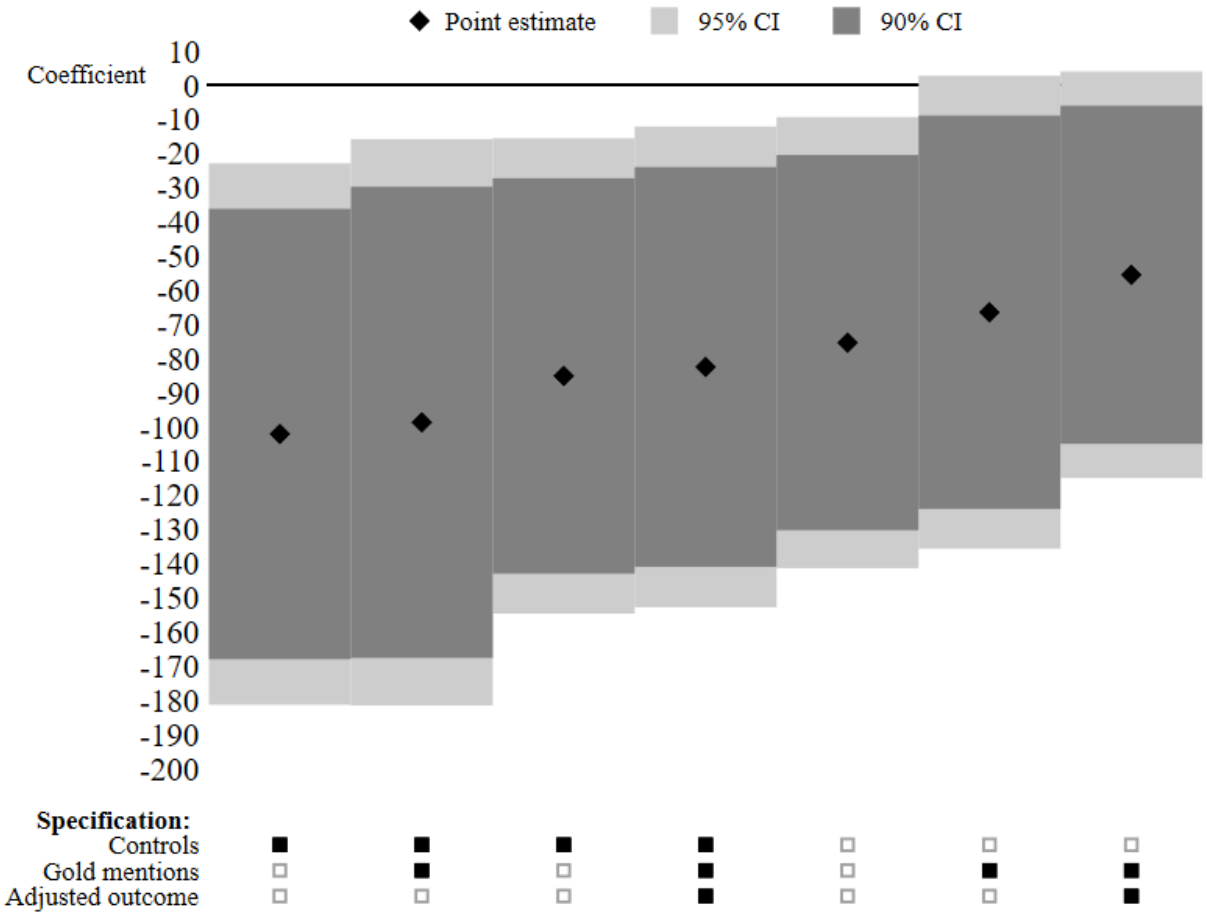
variable (usually policies switching on over time) and not the case of a continuous variable like gold discoveries. One solution to many of the issues raised is an event-study design. Unfortunately, an event study approach is not possible as the first gold discovery per state varies substantially (see Figure II).

V. Results

The main specification has a large coefficient with -98, but also a fairly wide 90% confidence interval ranging from -11 to -187. This lack of precision is unsurprising given the sample size of 480 observations.

Figure IV illustrates that the effect of gold discoveries on suicide mentions is negative, large and significant at the 10% level independently of several variations of the main specification. The variations to the main specification, as presented in equation (1), are switching GM_{jt} as well as X_{jt} on and off as well as changing taking S_{jt} as suicide mentions per 100,000 pages and as the adjusted measure. The adjusted measure only counts at most one mention per newspaper and day and then aggregates to mentions per 100,000 pages. The second specification is the main specification and equals equation (1). Thus varying the controls, adding gold mentions to the model or adjusting the outcome in most cases mildly reduces the magnitude of the association of the main specification. Yet, only in the case of ignoring the controls and adding gold mentions as well as in the case of combining gold mentions with the adjusted outcome measure does the association become imprecise with respect to the 95% but not the 90% confidence interval.

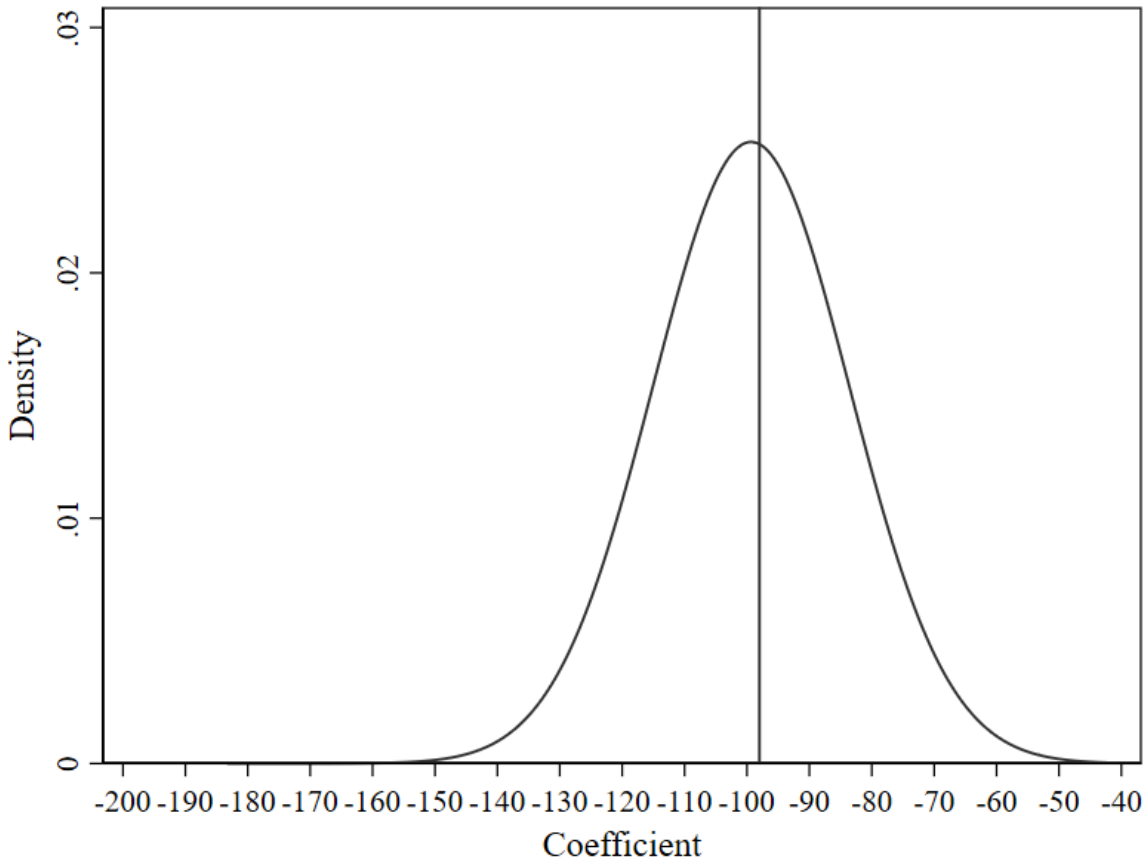
Figure IV: Specification curve



Note: The graph shows the results of equation (1) switching GM_{jt} as well as X_{jt} on and off as well as taking varying the outcome between suicide mentions per 100,000 page (default) and the adjusted outcome, which only counts one mention per day and newspaper before aggregating to mentions per 100,000 pages. The sample is based on state-year observations from 1840-1860 totaling 480 observations. In all regressions, the error is clustered on state level.
The graph is based on code provided by Hans H. Sievertsen at https://github.com/hhsievertsen/speccurve. Specification curves generally were originated by Uri Simonsohn see Simonsohn et al. (2020).

Given the small sample size a concern is that outliers could drive the results. So, I run the main specification a 1,000 times each time leaving out a random 10% of the sample. The result is Figure V, which shows that the coefficient of the main specification (-98 represented by the solid vertical line) is very close to the center of the distribution (-99) of the coefficients from the 1,000 re-estimations. Furthermore, the right tail of the distribution ends below -40, thus there is no instance in which the sign of the coefficient changes. The graph thus further emphasizes that gold discoveries had a negative effect on suicide mentions and that the results are not driven by a small number of extreme outliers.

Figure V: Do outliers drive the result?

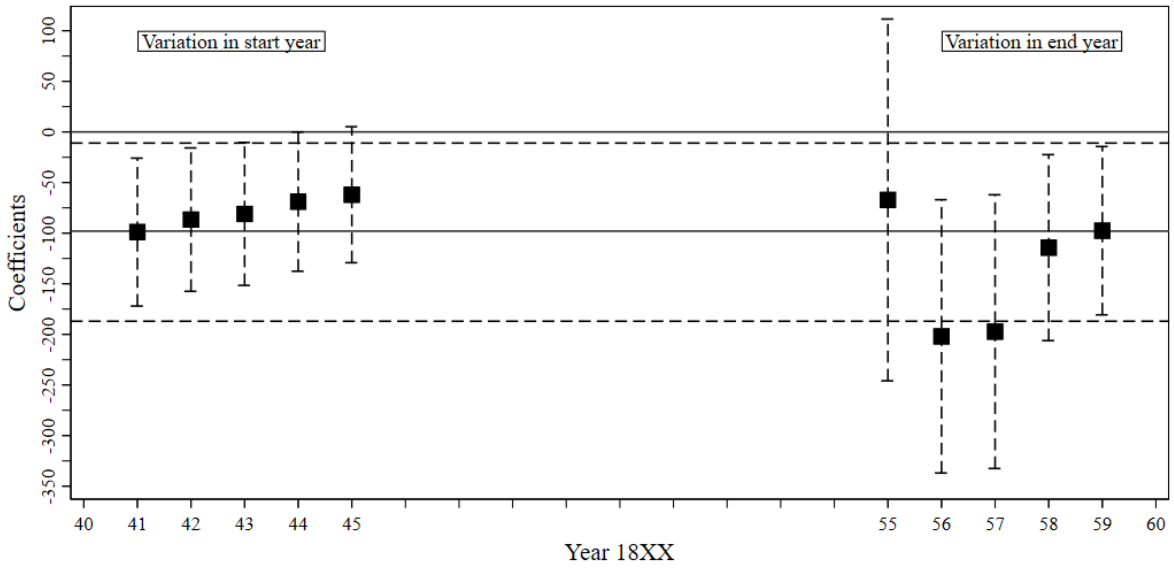


Note: The distribution is the result of 1,000 re-estimations of the main model with each re-estimation dropping a random 10% of the sample. Thus, these 1,000 estimations are conducted on 432 instead of 480 observations. The vertical line represents the coefficient of the full sample. The median of the distribution is -99, the coefficient for the full sample is -98.

Figure VI shows that the results are also qualitatively unaffected by varying the sample window. This is important as the literature has suggested that estimates of the relationship between the economy and health might be sensitive to the start and end date of the analysis. Ruhm (2000) suggests that researchers should use more than 15 years to avoid the estimates being sensitive to the start and end date of the data – thus the 20 years of data I use here fulfills this recommendations. Yet, I re-estimate the model by varying the start and end years until I reach the recommended minimum 15 years. Thus,

Figure VI shows the main model re-estimated with start years 1841-1845, keeping the end year fixed at 1860 as well as varying the end year from 1855-1859 keeping the start year fixed at 1840. The solid, horizontal line at -98 is the coefficient and the dashed, horizontal lines are the 90% confidence interval of the main specification using the full sample. Varying the start year slightly nudges the coefficient towards zero as more years are dropped from the estimation. The coefficient for the 1845-1860 sample even turns insignificant. For the variation in the end year the coefficient for 1840-1855 is insignificant, which is unsurprising given that this is based on the model with the smallest sample, same as for 1845-1860 coefficient. Yet, the coefficients for 1840-1856 and 1840-1857 are substantially larger than the coefficient from the main estimation. This is potentially explained by the sample window ending at the peak of the gold rush. The coefficients for 1840-1858 and 1840-1859 already closely resemble the main specification.

Figure VI: Are the results sensitive to varying start and end year of the sample?



Note: The five coefficients on the left present re-estimations of the main model by starting the sample at the indicated years (1841-1845), but keeping the end year fixed at 1860. The five coefficients on the right present re-estimations of the main model by ending the sample at the indicated years (1855-1859), but keeping the start year fixed at 1840. The solid, horizontal line and the dashed, horizontal lines respectively indicate the coefficients and the 90% confidence interval of the main specification.

In terms of cost-effectiveness the results indicate the gold discoveries are ineffective compared to targeted suicide prevention measures (Knapp et al., 2011).

This should reassure policy makers that they have effective tools available to counter any negative suicide effects of economic downturns.

The calculations is based on taking the 2019 US Dollar value of a metric ton of gold from section III.1 ($20,264,753.44) and the coefficients presented in Figure IV the Dollar value per suicide mention averted ranges from $198,156 to $364,161. Kronenberg (2020) has shown that the data contains 1.45 suicide mentions per suicide, thus the range for averted suicides is $136,659 to $251,145. This is substantially lower than the $1,935,784 estimated by Fishback et al. (2007). Knapp et al. (2011) summarize the costs of effective suicide prevention measures as ranging from £15,726 ($20,056) after one year to £29,235 ($37,283) after ten years. If the effect of economic shocks is symmetric this implies that the costs of preventing suicides due to an economic downturn are only a fraction of the economic downturn itself and a lot cheaper than the societal costs of $1.4 million that are associated with every suicide (Substance Abuse and Mental Health Services Administration, 2019). Policy makers can thus disregard any suicide side effects of economic changes or planned economic policies if they address them via more cost-effective health policy.

VI. Discussion

I examine how gold discoveries from 1840-1860 affect suicide mentions in local newspapers in the US. US gold discoveries were large with being about 3.5% of US GDP at the beginning of the 1850s. Given that the value of gold is known, I am able to quantify the economic shock in US dollar and to estimate the size an economic shock that is required to affect the suicide rate by one. Additionally, this is the second study, after Arthi et al. (2020), considering the effect of an economic change on cause-specific mortality for the 19th century. This context is important, because it is one with virtually no social safety net and high baseline suicide rates. It thus helps us to gain more insights into how economic shocks affect suicides.

The results show that gold discoveries are associated with large reductions in suicide mentions with the discovery of one metric ton reducing suicide mentions by 98. However, even these large reductions imply that an economic shock needs

to be $136,659 to $251,145 to change the suicide rate by one, while previous research has shown that suicide prevention can reduce the suicide rate by one for $20,056.

Yet, while the novel data allows me to generate novel insights, it comes at the cost of only allowing analysis on the aggregate level. This is important, because migration of gold miners, unobservable in this data, could change the pool of individuals available in gold discovering states versus states without gold discoveries and thereby bias the results.

Historical analysis shows that in the case of California, the main characteristics of migrants are males, low age, low literacy and short distance to California prior to the first gold discovery (Clay and Jones, 2008). Thus, gold rush states are faced with an inflow of a group that has higher suicide rates than other demographic groups (Canetto and Sakinofsky, 1998; Standish, 2020). Thus, migration should increase the suicide rate in gold rush states. Indeed, the suicide mentions per 100,000 pages in state-year cells with gold discoveries is substantially higher than in those without gold discoveries (4,479 vs 2,923). Thus, migration likely makes it harder to detect any suicide reducing effect of the gold rush.

Yet, Arthi et al. (2020) observe a negative economic shock to cotton producing regions in Lancashire and by exploiting a full census the day before the economic shock they are able to account for migration in their analysis. They find that once they account for migration the negative economic shock worsened overall mortality, while if they had ignored migration their estimates would have shown improved mortality. However, Arthi et al. (2020) do not consider suicides and they argue that mortality increased in Lancashire among the elderly and that in the migration receiving areas mortality increased due to the spread of contagious disease. Both channels seem unlikely to relate to suicides.

An important caveat is that given xenophobia and racism it is likely that most suicides in the data likely refer to white Europeans. For example, sinophobia was very prominent during the gold rush with several laws being passed taxing miners for mining, but only Chinese miners (see Foreign Miners' Tax Act of 1850 and the Foreign Miners' License Tax Act of 1852 in California).

The results thus imply economic changes that cause/prevent suicides are less effective than healthcare interventions. Policy makers should thus consider disregarding suicide side effects of economic changes, as long as they invest suicide prevention.

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