



Thammasat University

Bachelor of Economics

Effects on stock market and government intervention during
Spanish influenza

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EE406: Contemporary Economics Issue

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Overview

The Spanish flu or also known as the 1918 flu pandemic was one of the deadliest pandemics in history. This influenza pandemic is caused by the H1N1 influenza A virus or commonly known as pig flu/swine flu which infected approximately 500 million people (one-third of the world's population at the time). The total number of mortalities is somewhere between 17 million and 50 million. The timeline can be separated into 4 waves between February 1918 to April 1920.

It is believed that the flu began on 4 March 1918 in the US army camp training called Camp Funston, Kansas, USA. The disease spread very fast as there were around 522 people that got infected within a day. As those US soldiers were participating in World War I, they were sent to Europe which caused the disease to become an epidemic. It quickly spread to the other countries' armies such as France, Great Britain, Italy, and Spain. Moreover, after the prisoners were released and sent back to their countries, those people also brought the disease with them too. Consequently, this disease was all over the place such as Russia, North Africa, India, East and Southeast Asia. Thailand also received this pandemic too as Thai soldiers who had just finished their mission in World War entered the country through the Southern part and the disease had spread quickly. Statistically, there were approximately 2.3 million Thai people infected which is more than a quarter of the whole population at that time and caused approximately 80,000 people to die. However, this was just a first wave and the deadliest has yet to come.

In the second half of August 1918, there was a ship that carried the American and French army to Boston, USA which their purpose was just for naval training. However, those armies also brought the disease with them too. In September 1918, the Surgeon General of the Army received an order to check out the army camp. The reason is there were hundreds of young soldiers in the hospital and there were no vacant beds at all. They were in a very serious condition and eventually there were 63 men that died that day. As a result, this pandemic has frightened everybody at that time because they never imagined that an influenza could ever damage people like this before. At that time, there was another war called Russian Civil War, it is believed that the virus spread through Arkhangelsk (a city in the north of Western Russia) by the North Russia Intervention. Then, it went to Iran through a war and then later in India, China, and Japan. The second wave became the deadliest wave, especially in October 1918. The total death toll in the second wave was around 20-50 million compared to 3-5 million in the first wave.

The third wave began in January 1919. The disease reached Australia and it killed approximately 12,000 people after the maritime quarantine was being lifted. Then, it spread quickly through Europe and the United States. The countries that were most affected by this wave were Spain, Serbia, Mexico, and Great Britain which resulted in 100,000 deaths. Even though it was less severe than the second wave, it is still deadlier than the first one.

The fourth and the last wave began in the Spring of 1920. Most of the infected areas were occurred in the places that have low populations such as islands. However, some cities such as New York recorded 6,374 deaths during the last wave. The very last cases were believed to occur during between March to April 1920 where there was some reported case in Japan in March 1920.

Next, the reason that makes the second wave became the deadliest wave. There are many possibilities that could be a main cause of the problem. First reason is there was a lack of

quarantine. At that time, the World War I was still ongoing, and the main focus was at the war. Therefore, the government official did not prioritize the Spanish flu as much as it should be. For instance, one of the British government officials named Arthur Newsholme fully aware of the method to resolve to the Spanish flu situation by having a quarantine. He knows that to quarantine and keep social distancing will be the best method to control the flu. However, he could not do that as it would destroy the war's efficiency. To having a quarantine means some troops or war suppliers need to be kept at their places, in other words, the British will lose some amount of people. Therefore, they need to carry on with war even though they have to face with a risk that will happen from the flu. Moreover, there are not enough doctors and nurses to cure infected as well since many of them were deployed to fight in the war. The second reason is the medical science was not good enough too. At the time Spanish flu was occurred, the microscope still can not see the virus yet, so they were not be able to develop a vaccine. The third reason is there was an engagement of embodied globalization. It is a must for people to move around during the war. Therefore, it is easier for virus to spread from one person to another person.

As a current situation of COVID-19 pandemic, we could learn from the past pandemics in order to be more prepared with the upcoming situation. The Britain officials urge to protect NHS or United Kingdom National Health Service so they could be well-prepared from the increasing of infected people. In the past, the UK was not prepared for the situation since some doctors or nurses were placed on duty. Therefore, there are not enough medical personnel and suppliers and was resulted in many losses. Consequently, UK officials are becoming fully aware of lack of equipment for medical personnel and push for a facilitation. Also, the measure of quarantine is not that strict too. Even though, some public places such as theatres, school, or churches were closed in order to create a social distancing. However, some pub was still opened with limited number of hours. Apart from measures, the medical knowledge was not good as there was false belief that drinking cocoa three times a day can cure the flu. The medical science is gradually improved as well since the Spanish flu pandemic. The first antibiotic was invented in 1928 or 10 years after the pandemic. Also, the vaccine was introduced in 1940s. Many countries were more aware of the dangerous, so they established their public health organization in order to control the further situations.

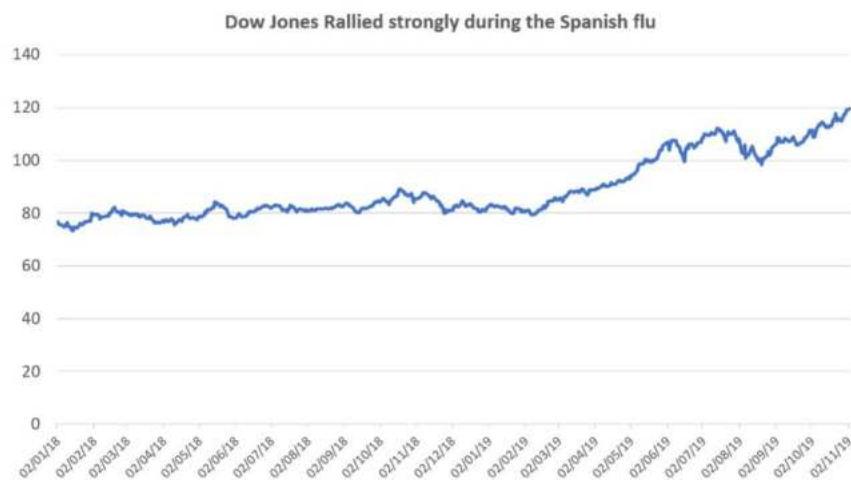
Another interesting point is there was a raised in gender equality since the Spanish flu pandemic. As most of the death people from the Spanish flu were men since they were fought in the war. During the pandemic, there was a decline in businesses around 40 to 70% which is caused by a shortage of employers especially in manufacturing industry. Therefore, this led into women started to replace this role. Previously, women were banned from involving in this kind of industry such as textile industry. As they are getting more involved, they demand more equally wage too and this led into more actively protest for women's' rights. In 1923, US has their first woman governor named Nellie Taylor Ross and women's life standard were improved since then.

Stock Market

In terms of the capital market, we should not forget that during that period not only the Spanish influenza pandemic that can make a negative impact to the stock market but also there is world war occurring during that time. However, to measure the impact of the pandemic on the stock market, during that period, there is not much stock market in the world. Thus, in our research, we will use the one that seems to be the biggest and the longest that even nowadays

has created the most impact to other indexes which is the US capital market: Dow Jones. The reason that we use the Dow Jones Industrial Average as the indicator to measure the impact of the pandemic to the stock market is because in the past it was unlike today's situation. Today, the majority would take NASDAQ that contains lots of technology stock as an indicator since they are the one that lead the stock market during nowadays crisis but during the Spanish influenza there is no technology stock exist, so the most popular index that used are Dow Jones Industrial Average and Dow Jones Transportation Average due to the fact that people do believe the two factors that will affect stock market the most are Transportation and Industrial. Nonetheless, the Dow Jones Transportation Average is no longer famous and no longer used by the majority since they do believe as the time passed the transportation no longer become the essential factor. In addition, DJIA covers 30 large-cap companies

which can be identified as the clear picture of how the economy is going at that period. Therefore, in this research, we will use the movement of Dow Jones Industrial Average as an indicator to measure the impact of Spanish influenza.



Even though there is a pandemic and world war where [Spanish flu of 1917-1918](#) has killed an estimated 20-50 million people and ranks among the worst epidemics of all time, but the impact to the stock market is not that much compared to the situation. Dow Jones Industrial Average (DJIA) never declines for more than 5% than its point before the existence of the pandemic which is March 4, 1918 ; moreover, during the peak of the death and the number of infected people in November 1918. DJIA has reached 11% higher. The reason behind is because usually the stock market is the one that will reach economic and investors do play with the expectation not the reality that exists at that time. Hence, at the peak of the pandemic, investors do expect that the pandemic would be better and the chance of more intense of the pandemic in terms of death and infected population is low. Investors who hold the liquidity asset such as cash start to come back to the capital market and do the speculation and investing. Furthermore, since the stock market is the reflection of the operation result of the listed companies in the market and as mentioned that DJIA mostly depends on large -cap companies which usually they are the big businesses that will get impacted the most whenever the shock occurs to the economy. Consequently, the less decline of the index and the sharply rise during the peak of the pandemic has indicated that the impact of the pandemic to the consumption and the use of money is low due to the fact that although people in 1918 during the spread of this pandemic are told to wear mask but there is no lockdown like nowadays pandemic. Thus, the

velocity of money still does not change much, people still use money and in terms of economics the money multiplier which seems to be the most necessary that makes the expansion of the economy is still the same. To be more clear, in the current situation, with the pandemic such as Covid-19, the lock down has affected the spending of people and the money multiplier and that is the main reason for the recession of our economy right now. "The world's stock markets actually boomed during the Spanish flu, the worst pandemic since the Great Plague. It is the opposite of the panicked selling we are seeing now and government actions to close down the economy," UNSW Business School professor [Peter Swan](#) says.

In addition, one of another factors that is different between the period of Spanish influenza and the current pandemic is the world globalization. Currently, globalisation becomes the essential role that some of the businesses depend on the movement of people such as airline business but in the period of Spanish influenza mostly the businesses revenues depend on the domestic consumption of the people. In other words, the more globalization means the more impact to the stock market whenever shock occurs to the economy. Not only in terms of movement of people, but also movement of the investors sentiment pass through today's technology such as social media. It is inevitable that using social media can create more panic sentiment from the rumour, picture and the news regarding the danger of the pandemic. As a result, when people receive them through the social media they can expect the pandemic situation to be more intense which creates the sell force and the panic sentiment to the stock market. On the contrary, during the period of Spanish influenza, the globalization in terms of technological advancement is still not as much as today, so the panic sentiment that occurs to the capital market is lower and that is why DJIA has never fallen below 5% rate. For instance, comparing Covid-19 to Spanish influenza, the news regarding to the spread of the pandemic from one country to another country take only a few minutes for people to acknowledge since the government can announce pass through the official website or official account of social media, by contrast, to inform people to know that there is the spread of Spanish influenza to their country there need to take a lot of time.

To sum up, there is no much impact to the stock market during the period of Spanish influenza pandemic due to the reason of the low movement of people, the impact in terms of the revenue of the listed companies and the low panic sentiment of investors.

Government Intervention

Introduction

This report will discuss whether the non-pharmaceutical interventions (NPIs) that aimed to reduce the mortality rate during a pandemic significantly cause the negative effects to the economy. Since the latest outbreak which is COVID-19 has just occurred, the questions about the impact of pandemics and the associated public health responses on the real economy have been brought up. Hence, the economic effects from the largest influenza epidemic in U.S. history, the 1918 flu pandemic, will be examined in this report.

There is the variation in the speed and intensity of the NPIs implemented by the U.S. government across many cities during 1918. Compared with COVID-19 situation, the NPIs during the 1918 flu pandemic are less intense than the current one in COVID-19 pandemic. In order to slow down the spread of pandemic, many policies have been implemented such as school, theatre, and church closures, banning in public gatherings, quarantine of suspect people, and restriction in business hours.

The main objective of the NPIs is to flatten the curve. In other words, these policies have been implemented to significantly reduce the mortality and the number of cases. The findings illustrate that NPIs succeed in substantially reducing peak mortality, of about 45%. Other evidence also suggests that cities intervening both aggressively and early have a lot of reduction in cumulative excess mortality of about 20%. Therefore, NPIs achieved their goals in reducing the transmission rate of disease, and infection rates.

Our main focus is on the economic effects in U.S. cities from implementing NPIs. Theoretically, the effects from NPIs can be either positive or negative. By having other things constant, NPIs restrict the economic activities such as decrease the consumption of people, lower the number of employees who risk becoming infected, and reduce the amount of investments due to the uncertainty of the economy. Since NPIs are able to contain the pandemic, they can also alleviate the pandemic-related economic crisis.

Firstly, the short-term impact of NPIs on local economic activities will be studied in this report by constructing a city-level index of business disruptions at a monthly time period. The index indicates that an increase in business disruptions is related to the pandemic itself during the 1918 flu pandemic. Many newspapers during that time report that there was a dramatic decrease in the total outputs and sales in several industries due to the reduction in supply of labour and the falling in demand for outputs. Nonetheless, if we compare the cities that implement strict NPIs with the cities that implement mild NPIs, the result is that the rise in business disruptions during the 1918 flu pandemic was statistically similar across the two categories. Therefore, this report implies that NPIs did not the main cause of the economic disruptions during the pandemic.

Furthermore, this report will discuss the economic effects of NPIs in the medium run period. The evidence we found suggests that the economic activities of cities that intervened earlier and more aggressively perform worse in the period after the pandemic. It can be measured by the local employment, total output, and the size of the local banking sector. Our results show that cities with stricter NPIs face a similar decline in employment and output in the period following the epidemic compared to the cities with milder NPIs. Moreover, the strict NPIs cities experience the increase in economic activities from 1919 onwards. To conclude, our reports indicate that the high level of NPIs may reduce the transmission rate of disease without increasing the economic disruptions.

Measures of non-pharmaceutical interventions

Our methodology is to use variation in the speed and intensity of the announcement of non-pharmaceutical interventions (NPIs) across several U.S. cities in fall 1918. By using variables created by Markel et al. (2007), we decide to measure NPIs in three ways.

Table A1: Non-pharmaceutical interventions (NPI) in 43 cities during Fall 1918 (Markel et al., 2007).

City	State	First Case	Mortality Acc. Date	Response Date	<i>NPI Speed</i> _{c,1918}	<i>NPI Intensity</i> _{c,1918}	<i>Mortality</i> _{c,1917}	<i>Mortality</i> _{c,1918}
Albany	New York	Oct/06/1918	Oct/15/1918	Oct/18/1918	-3	47	187.4	679.1
Baltimore	Maryland	Sep/27/1918	Oct/08/1918	Oct/18/1918	-10	43	251.9	836.5
Birmingham	Alabama	Oct/03/1918	Oct/09/1918	Oct/18/1918	-9	48	334.7	843.6
Boston	Massachusetts	Sep/13/1918	Sep/21/1918	Oct/04/1918	-13	50	228	844.7
Buffalo	New York	Oct/03/1918	Oct/07/1918	Oct/19/1918	-12	49	184	637.5
Cambridge	Massachusetts	Sep/13/1918	Sep/20/1918	Oct/04/1918	-14	49	164.2	676.5
Chicago	Illinois	Sep/26/1918	Oct/07/1918	Oct/05/1918	2	68	201.7	516.6
Cincinnati	Ohio	Oct/03/1918	Oct/13/1918	Oct/15/1918	-2	123	171.3	605.4
Cleveland	Ohio	Sep/29/1918	Oct/16/1918	Oct/14/1918	2	99	198.5	590.9
Columbus	Ohio	Sep/29/1918	Oct/15/1918	Oct/20/1918	-5	147	168.1	451.9
Dayton	Ohio	Sep/29/1918	Oct/14/1918	Oct/09/1918	5	156	157.8	525.2
Denver	Colorado	Sep/26/1918	Oct/06/1918	Oct/15/1918	-9	151	134.4	727.7
Fall River	Massachusetts	Sep/18/1918	Sep/25/1918	Oct/05/1918	-10	60	229.7	799.7
Grand Rapids	Michigan	Oct/02/1918	Oct/11/1918	Oct/28/1918	-17	62	89.6	282.7
Indianapolis	Indiana	Oct/01/1918	Oct/09/1918	Oct/16/1918	-7	82	156.6	459.4
Kansas City	Missouri	Sep/29/1918	Oct/05/1918	Oct/05/1918	0	170	205	718.1
Los Angeles	California	Oct/06/1918	Oct/15/1918	Oct/20/1918	-5	154	93.3	484.5
Louisville	Kentucky	Sep/22/1918	Oct/10/1918	Oct/16/1918	-6	145	209.5	1012.9
Lowell	Massachusetts	Sep/18/1918	Sep/25/1918	Oct/06/1918	-11	59	183.6	696.1
Milwaukee	Wisconsin	Sep/23/1918	Oct/15/1918	Oct/20/1918	-5	132	186.3	474.1
Minneapolis	Minnesota	Sep/30/1918	Oct/15/1918	Oct/21/1918	-6	116	126.3	387.7
Nashville	Tennessee	Sep/30/1918	Oct/15/1918	Oct/16/1918	-1	55	188.6	910.2
New Haven	Connecticut	Sep/23/1918	Oct/02/1918	Oct/24/1918	-22	39	236	768
New Orleans	Louisiana	Sep/19/1918	Oct/10/1918	Oct/17/1918	-7	78	178.5	768.6
New York	New York	Sep/14/1918	Oct/08/1918	Sep/27/1918	11	73	204.5	582.5
Newark	New Jersey	Sep/15/1918	Oct/09/1918	Oct/19/1918	-10	33	184	680.4
Oakland	California	Oct/10/1918	Oct/17/1918	Oct/21/1918	-4	127	96.3	496.9
Omaha	Nebraska	Sep/27/1918	Oct/13/1918	Oct/14/1918	-1	140	207.1	660.8
Philadelphia	Pennsylvania	Sep/05/1918	Oct/04/1918	Oct/12/1918	-8	51	228	932.5
Pittsburgh	Pennsylvania	Sep/13/1918	Oct/06/1918	Oct/13/1918	-7	53	380.4	1243.6
Portland	Oregon	Oct/11/1918	Oct/16/1918	Oct/20/1918	-4	162	72.4	448.2
Providence	Rhode Island	Sep/17/1918	Sep/26/1918	Oct/15/1918	-19	42	221.7	737.4
Richmond	Virginia	Sep/30/1918	Oct/08/1918	Oct/15/1918	-7	60	199.5	661
Rochester	New York	Oct/01/1918	Oct/15/1918	Oct/18/1918	-3	54	151.7	522.7
Saint Paul	Minnesota	Sep/30/1918	Oct/11/1918	Nov/15/1918	-35	28	112	480.6
San Francisco	California	Oct/03/1918	Oct/16/1918	Oct/27/1918	-11	67	126.4	647.7
Seattle	Washington	Oct/03/1918	Oct/10/1918	Oct/15/1918	-5	168	58.9	425.5
Spokane	Washington	Oct/07/1918	Oct/18/1918	Oct/19/1918	-1	164	102.5	487.4
St. Louis	Missouri	Oct/02/1918	Oct/16/1918	Oct/17/1918	-1	143	227	536.5
Syracuse	New York	Sep/21/1918	Sep/27/1918	Oct/16/1918	-19	39	155.2	704.6
Toledo	Ohio	Sep/30/1918	Oct/22/1918	Oct/24/1918	-2	102	152.4	401
Washington	District of Columbia	Sep/20/1918	Oct/02/1918	Oct/12/1918	-10	64	166.8	758
Worcester	Massachusetts	Sep/18/1918	Sep/21/1918	Oct/06/1918	-15	44	192.3	727.1

Firstly, we measure the intensity of NPIs by the cumulative sum of the number of days where three types of NPIs were implemented (school closure, public gathering bans, and quarantine/isolation of suspected cases) in the 1918 flu pandemic, denoted by NPI Intensity.

Secondly, we measure how fast an NPIs were activated by the number of days passed between when the mortality rate exceeded twice the baseline death rate and the first day the city officials announced a local NPI. The day count was multiplied by minus one in order to indicate that higher values imply a faster counter, denoted by NPI Speed.

Thirdly, the variable that equal to one for cities that both NPI Speed and NPI Intensity exceeded their medians, referred as High NPI, was constructed by given that the most efficient interventions tend to be early and aggressive. High NPI is equal to one for 18 cities and zero for 25 cities in the sample of 43 major U.S. NPI cities.

Table A2: Comparison of cities with high and low NPIs.

	<i>Low NPI</i>		<i>High NPI</i>		Difference	
	Mean	Std	Mean	Std	Diff	t-stat
Longitude	-80.94	12.05	-96.07	16.48	-15.13	-3.32
NPI Speed	-11.56	7.06	-1.50	4.40	10.06	5.74
NPI Intensity	56.28	23.42	132.72	30.89	76.44	8.85
Influenza mortality, 1917	194.61	63.48	157.72	53.18	-36.89	-2.07
Influenza mortality, 1918	721.04	181.38	544.78	146.10	-176.25	-3.53
Log city population, 1910	12.33	0.72	12.66	1.00	0.33	1.20
Log city population, 1900	12.07	0.79	12.20	1.14	0.12	0.40
City Density, population 1910 per sqm	9033.44	4694.15	7933.83	4371.95	-1099.61	-0.79
Health expenses in 1917/Population in 1910	0.55	0.26	0.52	0.22	-0.04	-0.50
Manuf. Emp./Population in 1910	0.14	0.07	0.11	0.05	-0.03	-1.51
Log manuf. emp, 1914	1023.90	82.21	1035.75	128.49	11.85	0.34
Agr. empl. share in 1910, state-level	19.67	18.44	27.44	10.47	7.77	1.75

All of the cities in the sample used in Markel et al. (2007) implemented at least one of the three types of NPIs. School closures and public gathering bans were the most common. Nevertheless, there was some variance across cities in the speed and intensity of the NPIs. The duration was four weeks at median, with the longest implementing by ten weeks (Markel et al. (2007)). On the average, high NPI cities activated the first NPI around 1.5 days after the mortality rate exceeded twice its baseline level. On the other hand, low NPI cities responded after twelve days on the average. Likewise, high NPI cities had an average NPI intensity of 133, compared with 56 for the low NPI cities.

Non-pharmaceutical interventions and mortality

Table 1: Non-pharmaceutical interventions, peak mortality, and cumulative mortality.

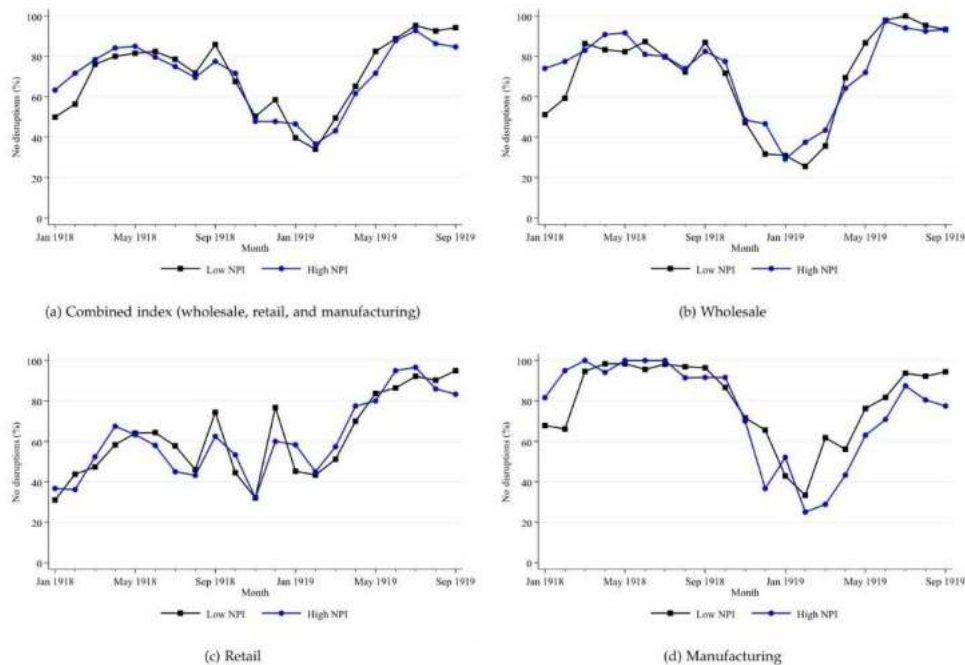
Panel A: Peak Mortality									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>NPI Intensity_c</i>	-0.62 (0.11)			-0.55 (0.16)			-0.45 (0.19)		
<i>NPI Speed_c</i>		-1.00 (0.96)			-0.55 (1.13)			-0.42 (0.87)	
<i>High NPI_c</i>			-56.8 (11.5)			-52.6 (14.6)			-44.2 (17.4)
R ²	.33	.025	.32	.4	.22	.43	.45	.34	.47
Effect size (%)	-55.4	-22.8	-57.6	-49.3	-12.5	-53.3	-40.5	-9.7	-44.8
Panel B: Cumulative Excess Mortality									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>NPI Intensity_c</i>	-1.03 (0.37)			-1.28 (0.46)			-0.62 (0.42)		
<i>NPI Speed_c</i>		-3.20 (2.61)			-2.82 (3.37)			-2.21 (1.82)	
<i>High NPI_c</i>			-140.8 (35.0)			-163.2 (40.5)			-109.3 (42.3)
R ²	.12	.033	.26	.24	.12	.37	.52	.5	.6
Effect size (%)	-18	-14.2	-27.9	-22.4	-12.5	-32.3	-10.9	-9.8	-21.6
N	43	43	43	43	43	43	43	43	43
Baseline Controls				Yes	Yes	Yes	Yes	Yes	Yes
Lagged Mort. Control							Yes	Yes	Yes

First, we examine the relationship between NPIs and mortality by estimating city-level regressions of the form: $Mortc = \alpha + \beta NPIc + Xc \delta + uc$, where $Mortc$ is a city-level measurement of mortality from influenza and pneumonia and $NPIc$ is one of the three NPI methods. Panel A of Table 1 examines the impact of NPIs on weekly peak mortality. Columns (1)-(3) report the regressions with no controls. The estimates are statistically significant for NPI Intensity and High NPI. For NPI Speed, the point estimate is negative but not statistically significant, and the R^2 is dramatically lower. Columns (4)-(6) indicate that the estimates are similar with the inclusion of our baseline controls for city characteristics. Next, columns (7)-(9) show that when we add lagged influenza mortality, the estimates drop slightly, but the estimates on NPI Intensity and High NPI remain statistically significant. Focusing on magnitudes, the estimate in column (9) implies that high NPI cities had a 45% reduction in peak mortality relative to the mean. Therefore, NPIs in the fall of 1918 were successful in flattening the curve.

In Panel B of Table 1, we examine the relationship between NPIs and cumulative excess mortality over the 24-week period from September 8, 1918 to February 22, 1919. Columns (1)-(3) indicate that NPI Intensity and High NPI are involved with statistically significantly lower cumulative excess mortality in a regression with no controls. As in the regressions for peak mortality in Panel A, the estimate on NPI Speed is negative but not statistically significant. Columns (4)-(6) show that the estimates are similar with the inclusion of our baseline controls for city characteristics. However, columns (7)-(9) show that the estimates decrease significantly when we add lagged influenza mortality. Only the estimate on High NPI in column (9) remains significant at the 5% level. This estimate implies a drop in cumulative mortality of 22% relative to the mean, a size is similar to Hatchett et al. (2007) (20% drop) and Bootsma and Ferguson (2007) (10-30% drop).

Non-pharmaceutical interventions and economic disruptions in the short run

Next, we will examine the impact of the epidemic and NPIs on city-level business disruptions during the 1918 flu pandemic. In this report, we focus on a monthly index of business disruptions created from Bradstreet's trade conditions reports.



The above figures illustrate the average of “No disruptions” variable across cities with their NPI Intensity and NPI Speed exceeded the median in the sample of 25 cities for which the index is available. “No disruptions” are referred to a value of 100 and “Disruptions” are referred to a value of 0. The figure (a) plots the combined index for wholesale, retail, and manufacturing, and the remaining figure separately shows the index of each sector.

The main point from the figure is that the epidemic itself was involved with the economic disruptions. Figure (a) indicates that from September 1918 to February 1919, there was a decrease in the combined index. Other figures show that the economic disruptions were spread in each sector.

The second point from the figure is that the decline in activities was similar in high and low NPI cities. In particular, Panel (a) shows that high and low NPI cities see almost equal declines in the combined business disruptions index. For example, from September 1918 to February 1919, high NPI cities had a 41 point decline in the index, while low NPI cities had a 52 point decline. The patterns in Panel (b) for wholesale trade are similar. Retail trade in Panel (c) also shows similar fluctuations in high and low NPI cities. Panel (d) for manufacturing shows that high and low NPI cities saw similar declines in business conditions. The figure indicates that high NPI cities saw a slightly accelerated decline based on the December 1918 value, as well as a little delayed recovery in spring 1919.

To deeply study the patterns in the above figure, the following table presents results from estimating difference-in-differences models of the form:

$$\text{TradeDisruptions}_{ct} = \alpha_c + \tau_t + \beta(\text{NPI}_c \times \text{Post}_t) + (\text{X}_c \times \text{Post}_t) + \text{ect},$$

where $\text{TradeDisruptions}_{ct}$ is one of the four trade disruptions indexes from Bradstreet’s, NPI_c is one of the three NPI measures, and X_c comprises a set of city-level controls.

Table 2: Non-pharmaceutical interventions and short-term economic disruptions in Bradstreet’s Trade Conditions.

Panel A: NPI Intensity Measure				
	Combined: W+R+M	Wholesale Trade	Retail Trade	Manufacturing
	(1)	(2)	(3)	(4)
$\text{NPI Intensity}_c \times \text{Post}_t$	-0.088 (0.065)	-0.12 (0.13)	-0.030 (0.15)	-0.12 (0.12)
R ² (Within)	.0097	.0074	.00036	.012
N	344	343	342	340
Panel B: NPI Speed Measure				
	(1)	(2)	(3)	(4)
$\text{NPI Speed}_c \times \text{Post}_t$	-0.11 (0.45)	-0.64 (0.61)	0.097 (0.94)	0.12 (0.33)
R ² (Within)	.00052	.0069	.00013	.00041
N	344	343	342	340
Panel C: High NPI Measure				
	(1)	(2)	(3)	(4)
$\text{High NPI}_c \times \text{Post}_t$	-3.86 (7.78)	-6.69 (13.4)	7.65 (14.5)	-15.3 (10.2)
R ² (Within)	.0028	.0033	.0035	.028
N	344	343	342	340
No of cities	25	25	25	25
City and Time FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

The estimation period is January 1918 to February 1919, and Postt is a dummy variable that is equal to one from August 1918 onward. Across all three NPI measures, higher NPIs are substantially not associated with significant reductions in the combined index (column 1), the wholesale trade index (column 2), retail trade (column 3), or manufacturing (column 4). Although the estimators are generally negative, they are small and none is statistically significant.

Taken together, monthly data on business disruptions indicates that cities that flattened the curve through NPIs did not have clearly larger disruptions in local economic activities. The pandemic itself did disrupt the economy, but public health interventions did not expand the disruptions.

Medium-Run

From the above analysis of Non-pharmaceutical interventions (NPIs) towards economic disruption, the findings show that cities with stricter NPIs implementation did not encounter different degrees of economic disruption in the short-term. To see its true effect, the analysis on the medium run needed to be undertaken.

From our reference research (Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu), to see the consequence in the medium run, city-level data from the Census of Manufacturers on employment and output (cover all 43 cities) was used. But, there was a drawback since this set of data was only collected every five years until 1919 and every two years from 1919 onwards. To handle this drawback, the researchers proxy for local economic activity using data on total national bank assets per city, since it is available at an annual frequency.

To see this effect, the correlation between NPIs and growth in local manufacturing activity from 1914 and 1919 (which were the period after the pandemic) was observed. And the results show that NPIs had a substantial positive effect on the economy since it was noticed that cities with high NPI intensity had a positive growth in manufacturing employment. One important concern is that cities with stricter NPIs could have been on different growth directions prior to the 1918 Flu. So, the test was conducted to address this concern by correlating NPIs with the growth in manufacturing employment from years 1909-1914 and the test shows that there is no correlation between NPIs and previous growth in manufacturing. These patterns thus provide initial suggestive evidence that NPIs are not associated with weaker economic activity in the aftermath of the 1918 flu. To more conventionally study the medium-term impact of NPIs around the 1918 Flu Pandemic, the research suggested to estimate by regressing a measure of economic activity in city relatives to NPIs measurement (to capture the relative dynamics of cities with stricter NPIs) and others set of control variables that had an interaction with time indicator variables for allowing changes in the relation between outcome variables and controls. Firstly, The estimates without controls indicates that, cities with serious NPIs policy implementation had a greater level of employment from 1919 onward than those with less stricter NPIs, For example, the results for 1919 implies that cities stricter level of NPIs implementation had experienced 18% higher employment growth from 1914 to 1919. However, the estimates without controls also show that cities with stricter NPIs had a higher growth between 1904-1909, indicating a pre-trend before the pandemic. This has raised the concern that the results may be driven by more general city-growth patterns. But the research suggests that this concern is not totally surprising given that most cities with strict NPIs were located

further on the west side. As the structure of the U.S. cities and economies changed quickly around the period of the 20th century, implying that cities like Los Angeles with stricter NPIs also changed considerably between 1904 and 1909

One method to addressing this concern is to control for observable differences across cities with strict and lenient NPIs. The estimates with controls indicate that there are no clear differences between cities with stricter and lenient NPIs in the years prior to the 1918 Influenza. Once controls are included, the estimates after 1918 remain positive but are not always significant. For instance, the point estimate shows that manufacturing employment in High NPI cities is around 5 percent higher in 1919 compared to 1914, but its coefficient is not significant. To confirm the pattern of growth, the pre- and post-period average in manufacturing employment and output are needed to be compared, while city observables are controlled. The estimation from the controlled model suggest that High NPI cities see around 11% higher manufacturing employment and 18% higher output after the pandemic. And the further model using the other two measures of NPIs also suggest the moderate positive effects with the confidence intervals reject a negative effect of NPIs on both measures of economic activity.

Conclusion

This paper investigates the impact of non-pharmaceutical interventions (NPIs) during the 1918 Flu Pandemic on mortality and economic activity. The research found that while NPIs flattened the curve of disease transmission, they were not associated with worse economic performance during or after the 1918 flu. Instead, these findings suggest that the main source of economic disruption was the pandemic itself. The direct effect of NPIs such as theater closures and public gathering bans is contractionary, since these policies necessarily restrict economic activity. However, the pandemic itself can be highly troublesome for the economy. To avoid the spreading of the virus, households cut back on their consumption and labor supply, while businesses sector reduce the level of investment in response to the shortages of labor, decreased demand, and high uncertainty situation. As a result, the counterfactual without NPIs would still be associated with downturn.

Moreover, NPIs may have indirect economic benefits by addressing the root of the economic disruption—the pandemic itself. Mitigating the pandemic can prevent an ultimately worse economic downturn. For example, NPIs may mitigate the decline in output even without remarkably decreasing cumulative infection rate. But, production in the sector important to the economy is less disrupted when illness, death rate and the risk of infection at a given point in time is lower, leading to a smaller overall decline in output. Further, by reducing cumulative infection rates, NPIs may have medium-term economic advantages by directly reducing illness and mortality and by reducing the costs associated with increased mortality.

More specific historical details also gave a picture on why NPIs implementation in 1918 did not worsen the economic downturn during the pandemic and the period onward. NPIs implemented in 1918 were more clement than the measures adopted in some countries during COVID-19. More severe measures such as closures of business likely increase the cost of NPIs. School closures were less costly in 1918, as female labor force participation was just the minority of the whole workforce. Estimates suggest that 1918 Flu was more deadly than COVID-19, especially for prime-age workers, which also suggests more severe economic impacts of the 1918 Flu and greater medium-run benefits of NPIs. The 1918 virus also had a shorter incubation period than COVID-19, which facilitated identifying and isolating suspected cases. As a result,

we stress the limits of external validity of lessons from the 1918 Flu Pandemic. Despite these important differences, ongoing research finds that NPIs implemented in 2020 have reduced disease transmission without leading to substantial further economic disruptions, and countries that implemented NPIs in the earlier stages of the COVID-19 pandemic have better short term economic outcomes. We look forward to future research that disentangles the net impact, direct costs, and indirect benefits of NPIs implemented during COVID-19 in both the short and medium run.

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