

初探台灣飲料市場需求體系

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November 14, 2024

Abstract

This paper investigates the long-term effects of job displacement on earnings and mental health using administrative health claims data from Taiwan. Focusing on job loss resulting from mass layoffs, our estimates suggest a displaced worker experienced a 40% decline in employment rates and a 67% earning loss in the year following a layoff. Even after ten years, employment and earnings do not fully recover. Displaced workers also experience a deterioration in mental health, particularly related to stress, with a 16% increase in outpatient visits for mental health issues and a 57% increase in medical costs for mental illness. The negative impact on mental health is more pronounced among workers with lower earnings, men, and older individuals.

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1 前言

1.1 研究背景

新型冠狀病毒 (COVID-19) 自 2019 年出現, 累計至 2023 年 1 月全球已約 6.7 億人確診, 造成 682 萬人死亡, 堪稱是本世紀最嚴重的傳染疾病。為避免疫情擴散, 許多國家採取管制措施, 諸如禁止邊境進出、限制民衆外出、餐廳禁止內用及取消大型活動等, 這些措施嚴重衝擊國內外經濟, 以美國為例, 2020 年第二季國內生產毛額 (GDP) 較 2019 年同季萎縮 9%, 失業率飆升至 14.8%。

1.2 研究目的

台灣在 2020 年 1 月 21 日發現首起本土確診病例, 且在 2 月 15 日出現首起死亡案例。雖然後續的防疫政策奏效, 疫情相較其他國家輕微, 但民衆因疫情肆虐恐慌減少正常活動, 再加上邊境管制,¹ 使國內經濟活力受到相當大的影響, 2020 年第 2 季經濟成長率僅 0.63%, 其中又以批發及零售業、餐飲業、運輸及倉儲業首當其衝。²

It is widely recognized that worker displacement can result in long-term earnings losses (???). Moreover, research has demonstrated that it is associated with heightened risk for health issues and increased mortality rates (??????). Despite significant research on the topic, the relationship between job loss and mental health remains somewhat ambiguous and poses challenges. On one hand, job loss can result in financial difficulties, loss of status, and social disconnection (??), which can contribute to feelings of anxiety and depression. On the other hand, job loss may alleviate some of the mental health problems that comes with working. Although numerous studies have explored the impact of job loss on mental health, there is no consensus on the extent of its effects (?), and some studies have even found no significant impact (??).

¹中央流行疫情指揮中心宣布從 3 月 19 日零時起, 非台灣籍人士一律限制入境。

²依行政院主計總處公布之 2020 年第 2 季國內生產毛額連鎖實質成長率 (與去年同期相較), 服務業整體為 -1.33%, 其中以運輸及倉儲業的 -26.19%, 其他 (含餐飲業) -4.04%, 與批發及零售業的 0.17% 表現最差。

2 文獻回顧

3 資料與敘述統計

3.1 資料

Our study employs administrative data acquired from Taiwan's Health and Welfare Data Science Center (HWDC) to carry out the empirical analysis. We specifically make use of four distinct data sources from the HWDC: (1) National Health Insurance (NHI) enrollment records; (2) NHI claim files for outpatient care; (3) NHI claim files for inpatient care. To connect individuals across these data sources, we utilize their scrambled national identification numbers.

3.2 敘述統計

Our sample comprises individuals aged 20-65 who were employed in a firm with at least 5 employees in the baseline year. We define displaced workers, our treatment group, as those who were employed for a minimum of five years prior to losing their jobs and underwent a mass layoff in a given year between 2005 and 2007. A mass layoff is characterized by a firm reducing its employment by over 90% compared to the previous year. We track these workers for 16 years, including five years before and ten years after job loss. The control group consisted of non-displaced workers who had continuous employment during the sample period and worked in stable firms, which had no more than a 30% employment decrease in December year-on-year.³ Since many workers satisfy this criterion, we randomly select 10% of them to serve as the control group. Our final sample is resulting in 9,700 workers from the treatment group and 332,720 from the control group.

Our empirical strategy to identify the dynamic effects of displacement on earnings and

³Note that they are not necessary to stay in the same firm.

mental health involves estimating the following regression:

$$Y_{it} = \sum_{k=-5}^{10} \delta_k \cdot Disp_i \times \mathbf{I}[t = c + k] + \sum_{k=-5}^{10} \gamma_k \cdot \mathbf{I}[t = c + k] + \alpha_i + \pi_t + X_{it}\beta + \varepsilon_{it}. \quad (1)$$

Y_{it} is the outcome of interest for worker i in year t : 1) Employment (a dummy indicating working for at least one month per year or not); 2) Annual earnings; 3) Cumulative number of visits for mental illness; 4) Cumulative medical expenses of mental illness (including both outpatient and inpatient care). $Disp_i$ indicates whether worker i is a displaced worker. $\mathbf{I}(t = c + k)$ is a dummy variable indicating k years after (pseudo) mass layoff year, c , where k does not include -2 since we consider two years prior to a job loss as the reference year.⁴ γ_k represents the evolution of outcomes among non-displaced workers. δ_k is the coefficient of interest, which measures the change in outcomes among displaced workers with respect to the reference year ($k = -2$), relative to the change of non-displaced workers. We additionally control individual fixed effects (α_i) and calendar year fixed effects (π_t). X_{it} are other controls, mainly quartic function of worker's age and county/municipality level unemployment rate.

⁴For the comparison group, the pseudo mass layoff year is the year we use to confirm the firm did *not* go through a mass layoff and remain no more than 30% reduction in the firm size.)

4 研究設計

本文分別採用 AIDS (Almost Ideal Demand System) 和 LA/AIDS (Linear Approximate AIDS) 兩種需求系統模型進行分析。兩種方法皆用於分析多個商品的需求及其需求彈性，主要差別在於價格指數的處理方式，。以下兩節將分別敘述 AIDS 及 LA/AIDS 的模型架構。

4.1 使用 AIDS 模型分析

$$w_i = \alpha_i + \sum_{j=1}^5 \gamma_{ij} \ln(P_j) + \beta_i \ln\left(\frac{X}{P}\right),$$

- $w_i = \frac{P_i Q_i}{X}$: expenditure share of the i -th beverage category
 - P_i is the price of the i -th beverage
 - Q_i is the quantity of the i -th beverage
 - X is the total expenditure on all beverages, which may vary with monthly income
- $\ln(P_j)$: The natural logarithm of the price of the j -th beverage
- P : Price index, typically approximated by the Stone price index:

$$\ln(P) = \sum_{j=1}^5 w_j \ln(P_j),$$

where w_j is the expenditure share of the j -th beverage

- $\alpha_i, \gamma_{ij}, \beta_i$: Parameters to be estimated for each beverage category

4.2 使用 LAAIDS 模型分析

5 研究結果

Figure ?? presents our estimated dynamic effects of displacement

5.1 使用 AIDS 模型分析

Figures 1a and 1b show that the employment and annual earnings decline sharply in the year following displacement and recover limitedly ten years after displacement. Specifically, we note approximately a 30% decrease in the probability of employment and a 40% reduction in the annual earnings, ten years after the year of displacement. Consistent with graphical evidence on labor market outcomes, Figure ?? suggests that compared to the control group, displaced workers had higher utilization of medical services due to mental illness. Importantly, prior to layoff, these outcomes of the displaced workers align closely with those of the non-displaced counterparts, suggesting that their post-displacement differences are not driven by differential pre-trends between treatment and control groups.

5.2 使用 LAIDS 模型分析

Figure ?? presents our estimated dynamic effects of displacement on earnings and employment from model (1). Before the reference year (two years before displacement), earnings for workers who will be displaced and non-displaced workers follow a similar trend. In the year prior to displacement, there was a significant decline in earnings by roughly 2,000 NTD, economically small compared to previous years.⁵ Annual earnings for displaced workers drop by around 270,000 NTD in the year of displacement and 340,000 NTD in the year following displacement (about 67%). While there is a small recovery in annual earnings two years after displacement, a substantial long-term effect is still visible ten years after a mass layoff. Similarly, Figure ?? (a) shows the probability of employment mirrors the earnings trend, with a sharp initial decline (about 40%) in the year after displacement and a partial recov-

⁵? and ? also found a significant earning loss prior to displacement using data from the U.S. and Germany.

ery thereafter. After ten years, the employment probability remains nearly 30% lower than before the displacement.

5.3

We discuss a number of robustness checks for our main findings in Online Appendix ??, including different matching techniques, different estimation methods, and different choices of samples. In general, our main results are robust to these changes. Moreover, we conduct a set of subgroup analyses and discuss these results in the Online Appendix ??. To sum up, our analysis suggests that the negative effect of job displacement on mental health appears to be more pronounced among lower-income workers, men, and older individuals.

6 結論

地區的限制性 Using Taiwan’s administrative data, we examined the effects of job displacement on employment, earnings, and mental health. Due to the mandatory and generous nature of Taiwan’s NHI, our study are less likely to suffer from sample attrition and to be confounded with changes in health insurance enrollment. On the other hand, the comprehensive NHI data allows us to explore the impact of displacement on both outpatient and inpatient healthcare use.

Tables

Table 1: Summary Statistics

Variable	Before Matching			After Matching	
	Treatment	Comparison	Difference	Comparison	Difference
Individual Characteristics					
Female	0.564 (0.496)	0.460 (0.498)	0.104*** [0.005]	0.565 (0.496)	0.000 [0.005]
Age at displacement	42.526 (9.092)	39.775 (7.556)	2.750*** [0.078]	42.512 (9.093)	0.014 [0.094]
Live in urban area	0.790 (0.407)	0.737 (0.440)	0.053*** [0.005]	0.790 (0.408)	0.000 [0.004]
Work in urban area	0.849 (0.358)	0.804 (0.397)	0.045*** [0.004]	0.849 (0.358)	0.000 [0.004]
Firm Characteristics					
Number of employees	375.977 (1,323.548)	1,494.984 (3,852.285)	-1,119.007*** [39.181]	411.861 (1,515.931)	-35.884** [15.562]
Female Share	0.491 (0.212)	0.436 (0.224)	0.055*** [0.002]	0.492 (0.212)	0.000 [0.002]
Average monthly wage (\$1,000)	34.392 (13.011)	36.745 (13.518)	-2.353*** [0.005]	34.432 (13.027)	-0.040*** [0.005]
Average age	37.530 (5.364)	36.971 (5.042)	0.559*** [0.052]	37.519 (5.365)	0.010 [0.055]
Outcomes Variables in the Second Year Prior to the Displacement					
Real annual earnings (\$1,000)	509.170 (262.076)	541.102 (257.066)	-31.932*** [2.649]	509.638 (262.303)	-0.468 [2.702]
Cul. # of mental illness outpatient visits	0.554 (3.824)	0.450 (3.543)	0.104*** [0.037]	0.551 (3.943)	0.004 [0.041]
Cul. medical expenses of mental illness (\$1,000)	0.807 (11.344)	0.585 (9.831)	0.221** [0.102]	0.708 (10.829)	0.098 [0.112]
Number of observations	9,700	332,720		332,720	

Notes: Standard deviations in parentheses, and standard errors in brackets. The treatment group comprises workers who underwent a mass layoff (firm reducing its employment by over 90%), and the comparison group comprises workers who were employed at a stable firm (no more than a 30% employment decrease) and had continuous employment during the sample period. All dollars are adjusted with CPI and displayed in 2016 NT\$ (1 NT\$ = 0.033 US\$). The cumulative number of outpatient visits and cumulative medical expenses of mental illness are accumulated from the fifth to second years prior to the (pseudo) displacement. The statistics in the *After Matching* columns are weighted by entropy balancing (EB). The variables included in the matching process are all variables in the *Individual Characteristics* and *Firm Characteristics* panel.

*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

Table 2: Long-term Impact of Job Displacement on Employment and Earnings

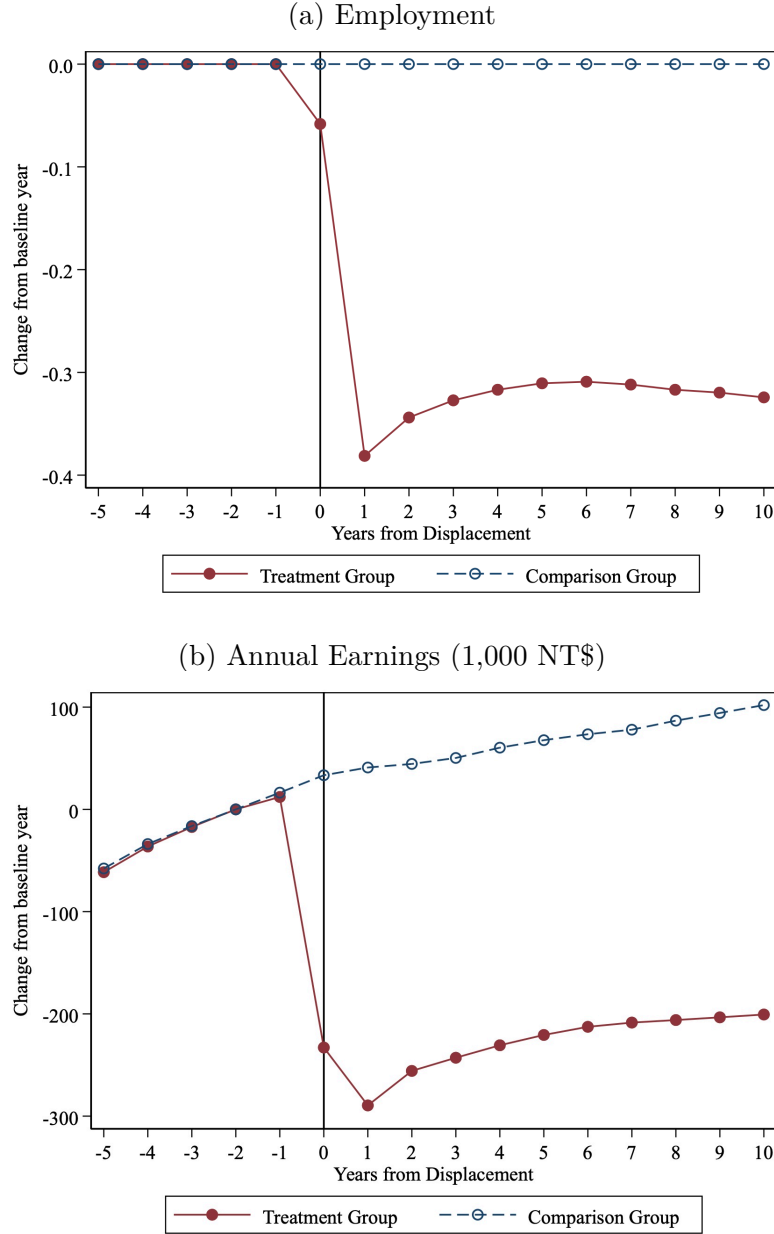
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Employment							
$Disp_i \times \mathbf{I}[t = c + 10]$	-0.324*** (0.005)	-0.326*** (0.005)	-0.326*** (0.005)	-0.326*** (0.005)	-0.326*** (0.005)	-0.326*** (0.005)	-0.326*** (0.005)
Control Baseline Mean				1.000			
Panel B: Annual Earnings (1,000 NT\$)							
$Disp_i \times \mathbf{I}[t = c + 10]$	-302.582*** (3.828)	-305.924*** (3.950)	-305.922*** (3.950)	-305.438*** (3.949)	-305.417*** (3.951)	-305.953*** (4.081)	-305.988*** (4.083)
Control Baseline Mean				509.637			
Observations				5,478,720			
Basic DID	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effect		✓	✓	✓	✓	✓	✓
Age			✓	✓	✓	✓	✓
Individual Control				✓	✓		
Firm Control					✓		
Individual Fixed Effect						✓	✓
Unemployment Rate							✓

Notes: This table displays the estimated coefficients of δ_{10} from equation (1). The coefficient stands for the impact of a mass layoff in the tenth year after the displacement year (c). Standard errors clustered at the individual level are reported in parentheses. All regressions are weighted with EB weights. The control baseline mean is the EB-weighted mean for the comparison group in the baseline year ($t = -2$). Column (1) includes a dummy variable indicating whether an individual belongs to the treatment group (displaced worker) and the event time fixed effect. Column (2) further includes the calendar year fixed effect. Column (3) further includes the quadratic function of age. Column (4) further includes gender, birth month, wage, and county/municipality of residence in the pre-treatment period. Column (5) further includes firm characteristics (location, number of employees, average monthly wage, average age, proportion of females) in the pre-treatment period. Column (6) further includes individual fixed effects. Column (7) further includes county/municipality level unemployment rate.

*** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

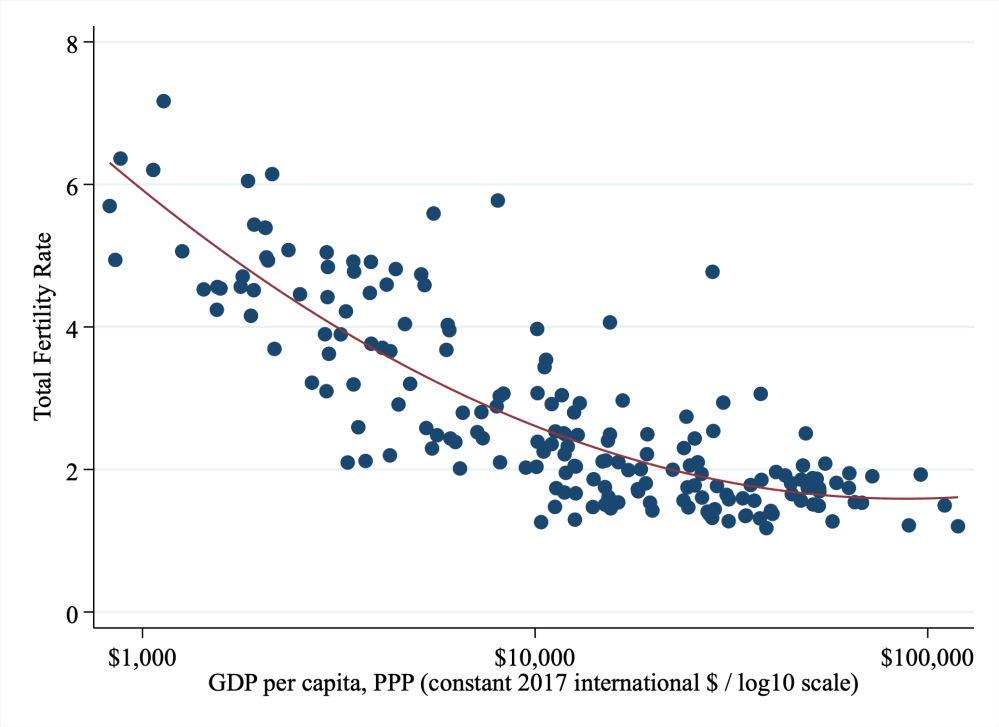
Figures

Figure 1: Trend in Employment and Annual Earnings



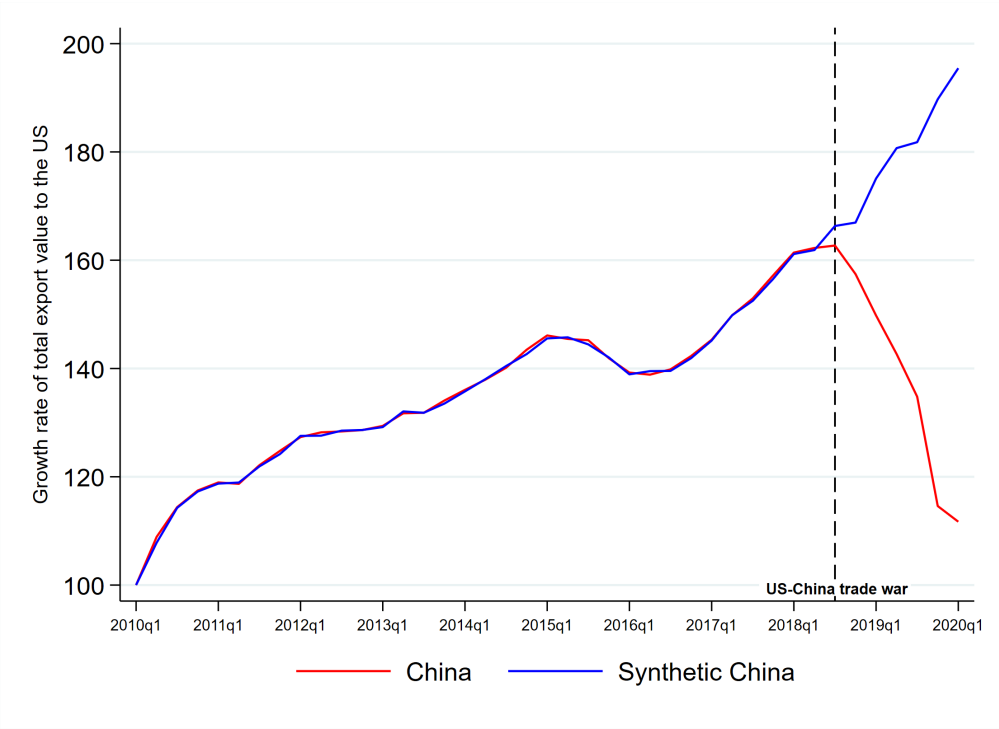
Notes: These figures illustrate the change (from the baseline year) in (a) the proportion of employment (employed at least one month) and (b) annual earnings (NT\$1,000) for the treatment group (i.e., displaced workers) and the comparison group (i.e., non-displaced workers) from five years before to ten years after the (pseudo) displacement year. The vertical axis displays the outcomes at event time t relative to the baseline year ($t = -2$). The horizontal axis refers to the number of years from the (pseudo) displacement year.

Figure 2: The Relationship Between GDP Per Capita and the Total Fertility Rate



Notes: Each symbol stands for one country. The total fertility rate is defined as the number of children per 1,000 women. The data year is 2020. Data source: Our World in Data (??).

Figure 3: The Relationship Between GDP Per Capita and the Total Fertility Rate



Notes: Each symbol stands for one country. The total fertility rate is defined as the number of children per 1,000 women. The data year is 2020. Data source: Our World in Data (??).