Research Experience Sharing in Agricultural and Environmental Economics

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Biography

➢ **Current Position**
 -- Professor, Dept. Agricultural Economics, NTU
➢ **Education**
 -- Ph.D, Applied Economics and Management, Cornell University
 -- Master, Agricultural Economics, National Taiwan University
 -- Bachelor, Agricultural Economics, National Taiwan University
➢ **Personal Website**:
 http://homepage.ntu.edu.tw/~hunghaochang/

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Academic Activities

➢2021-   Co-Editor, *Food Policy*
➢2022-   Advisory Editorial Board, *Journal of Agribusiness Marketing*
➢2015-   Associate Editor, *Agricultural Economics*
➢2017-   Associate Editor, *Journal of Agribusiness in Developing and Emerging Economies (JADEE)*
➢2019-2020   Managing Editor, *Agricultural and Resource Economics Review*
➢2017-2019   Editor, *Agricultural and Resource Economics Review*
➢2012-2015   Editorial Board, *Applied Economic Perspectives and Policy*

Topics of Today's Presentation

➢ What are the hot research topics?

➢ What are the hot research approaches?

➢ How to conduct your research ?

➢ Popular journals in agricultural and environmental economics

➢My recent research paper

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Hot Topics in Recent Years

➢ SDG (Sustainable Development Goals)

➢Circular Economy

➢ ESG (Environment, Social, and Governance）

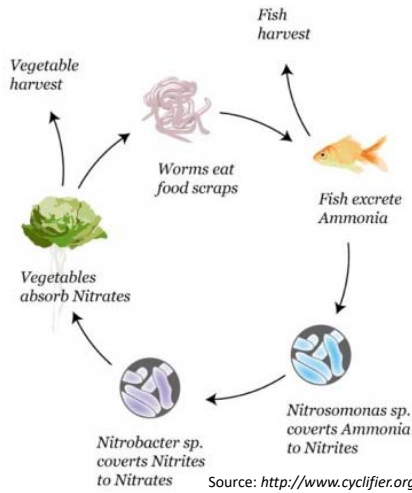➢Carbon Neutrality / Net Zero

➢ COVID-19

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Circular Economy

➢ A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible

➢ The life cycle of products is extended
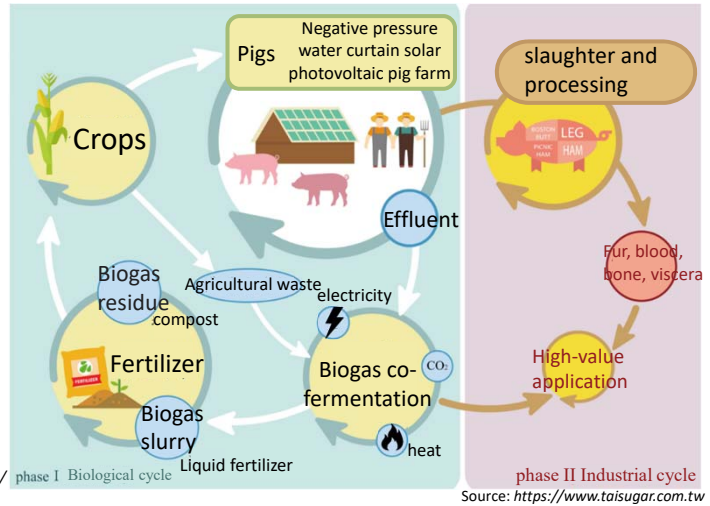
➢ Reducing waste to a minimum level

Source: News European Parliament

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Development of Circular Economy in Taiwan

Fish harvest

Vegetable harvest

Worms eat food scraps

Fish excrete Ammonia

Vegetables absorb Nitrates

Nitrosomonas sp. coverts Ammonia to Nitrites

Nitrobacter sp. coverts Nitrites to Nitrates

Source: http://www.cyclifier.org/

Aquaponics Cycle

Pigs — Negative pressure water curtain solar photovoltaic pig farm

Crops

slaughter and processing

Effluent

Fur, blood, bone, viscera

Biogas residue

Agricultural waste   electricity

compost

Fertilizer

Biogas co-fermentation CO_2

High-value application

Biogas slurry

heat

Liquid fertilizer

phase I Biological cycle

phase II Industrial cycle

Source: https://www.taisugar.com.tw

Piggery Circular Economy System

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ESG (Environment, Social, and Governance)

➢ First proposed by the UN in 2004
➢ ESG ➡ long-term financial performance
         ➡ company operation
E：safeguards the environment
S：manages relationships with employees, suppliers, customers, and the communities
G：deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights.

Social

Governance

Environ-ment

ESG investment

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ESG in Taiwan

➢ More than 700 manufacturers in the supply chain to fully promote green manufacturing
➢ The first semiconductor factory in the world that requires advanced process equipment to introduce energy-saving measures

➢ Requires all suppliers to sign a "Sustainable Clause Commitment"
➢ Spend 1.4 billion to buy an island in Malaysia, plant trees on the island, protect coral reefs, etc ➡ "zero-carbon island"

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ESG in Taiwan

➢ The first company to use ISO14064-1 for greenhouse gas inspection for all of the branches and franchises.
➢ Use the air-conditioning with the first-class energy-saving label
➢ Replacing T5 fluorescent tube lighting with LED lights
➢ Using environmentally friendly refrigerants and enhancing the performance of freezer refrigerator compressors

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SDG (Sustainable Development Goals)

- First proposed by the UN in 2015

- Global action plans for the next 15 years (2016-2030)

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My research related to SDGs

➢ **3: GOOD HEALTH AND WELL-BEING**
Health Care Expenditure and Farm Income Loss: Evidence from Natural Disasters

➢ **7: AFFORDABLE AND CLEAN ENERGY**
Solar Power Promotion Plans, Energy Market Liberalization and Farmland Prices – Empirical Evidence from Taiwan

➢ **15: LIFE ON LAND**
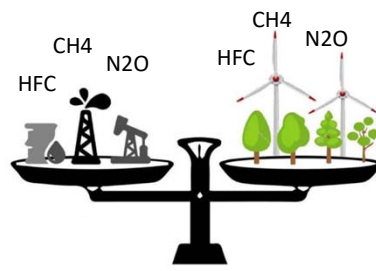Afforestation Programs and the Distribution of Forest Farm Income

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Carbon Neutrality / Net Zero

Carbon neutrality

Net zero

Carbon negative

CO2   CO2

CH4   CH4
CH4   N2O   N2O
HFC   HFC

Emitting carbon

less than

Absorbing carbon
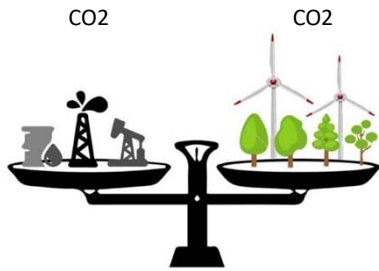
Emitting = Absorbing
carbon   carbon

Greenhouse gas = Greenhouse gas
produced   removed

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Carbon Neutrality / Net Zero

Source of emission

direct emission source

indirect emission source

active emission source

1. inventory

5. perform reduction

2. search

Solution strategy

4. find room for reduction

3. declare

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Research on Net Zero in Taiwan

Net zero

01 Innovative model of carbon budget for low carbon cropping system

02 Forest innovation negative carbon technology and management

03 Innovative net zero carbon emission technology and management in livestock industry

04 Smart carbon balance monitoring and zero-carbon optimization management

05 Evaluating economic, environmental and social effects of net zero carbon emission and circular economy

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Call for COVID-19 Papers

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How popular of these topics in research?

Circular economy 2,200,000

ESG 389,000

SDG 271,000

Carbon neutrality 3,400,000

Net zero 5,550,000

COVID-19 412,000

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One of my recent papers on COVID-19

COVID-19 and the demand for online food shopping services: Empirical Evidence from Taiwan

HH Chang, CD Meyerhoefer - American Journal of Agricultural ..., 2021 - Wiley Online Library

We investigate how the coronavirus pandemic affected the demand for online food shopping services using data from the largest agri-food e-commerce platform in Taiwan. We find that …

☆ 儲存 ⁣⁣ 引用 被引用 221 次 相關文章 全部共 18 個版本 ≫

WILEY

Top Cited Article 2020-2021

Congratulations to:
Hung-Hao Chang

whose paper has been recognized as a **top cited** paper in:

AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS

COVID-19 and the Demand for Online Food Shopping Services: Empirical Evidence from Taiwan

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My two-cents comments

➢ Understand the insights and contexts of these topics

➢Accommodate your own strength with these topics

➢Do not just simply follow the paths of existing studies – innovation matters !

➢There are still much room for empirical work

➢Multi- disciplinary cooperation

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Hot Research Approaches

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Casual Inference

Social science (Economics) is experiencing two methodological "revolutions" over the past few decades.

➢*"Credibility"* The goal of empirical research is to understand causality, but not correlation (require more policy insights)

➢*"Big Data"* Increasing ability to produce, collect, store, and analyze vast amounts of data transforms our understanding of human behaviors (require multi-disciplinary approach).

Recognition of the Importance of Causal Inference

Why is causality so important?
Correlation versus. Causality

Income

B2

B1

A2

A1

Before
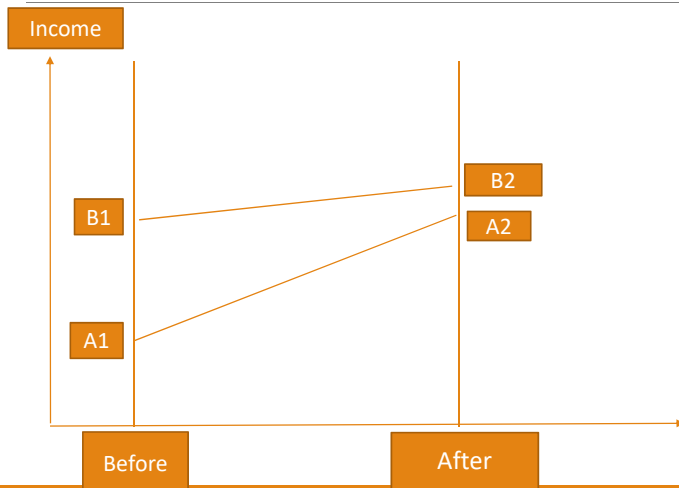
After

➢Group A (policy recipients), Group B (non-recipients).
➢If comparing 1 year data, recipients have lower income. Does policy lower farm income?
➢If comparing two years data, recipients' income increased after the policy!

Rising Importance of Casual Inference

➢Causal inference is the study of **unobservable counterfactuals**.

➢Causal inferences help us infer the values of **these unobserved counterfactual outcomes** from **observed data** by **imposing specific assumptions**.

➢Some methods of causal inference: Randomized Experiment, Regression and Matching, Instrumental variables, Differences-in-Differences (DID), Regression discontinuity…

Causal Inference

Social science (Economics) theories are almost always causal in their nature
◦ X causes Y
◦ An increase in price of apples causes consumer's demand for apples to decrease
◦ Raising minimum wage would reduce employment opportunity of low-skilled workers

Two key features of causality:
◦ Causes are asymmetrical
  ◦ In general, if X causes Y, Y does not cause X
◦ Causes are effective
  ◦ A cause must be distinguished from an accidental correlation

Fast rising research attention on causality

Janet Currie, Henrik Kleven, and Esmée Zwiers (2020), " Technology and Big Data Are Changing Economics: Mining Text to Track Methods " *AER P&P*
◦ Use contextual analysis to explore the trend of research of NBER working paper & top-5 journals.
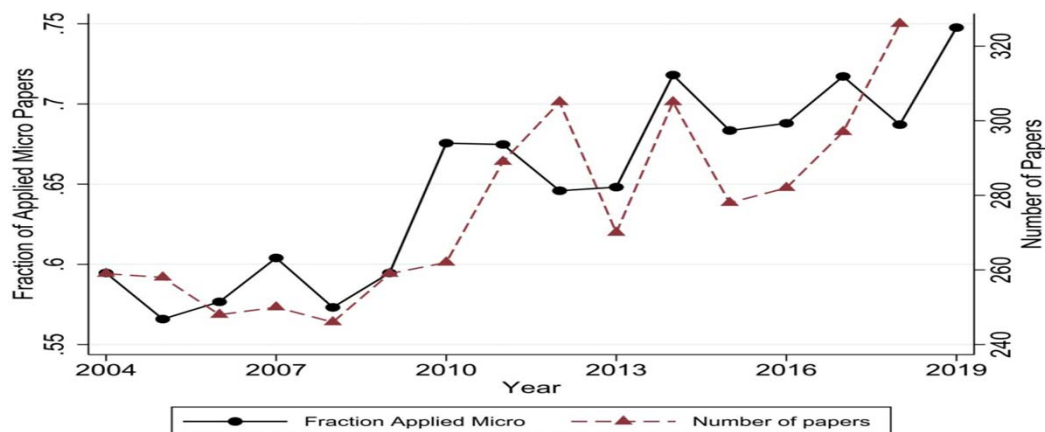
Sharing of My Research Experience

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How to select a research topic?

➢ **Something we don't know that much so far**

-- e.g., a new policy scheme; new application to a country/area; emerging hot issues

➢**Something we have known, but are interested in knowing more**

-- e.g., advanced method with new results; longstanding topics with updated results (deeper analysis is required)

➢**Something we can provide solid/better evidence**

-- e.g., quantitative analysis

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Research topics Selection

My simple rule：Wine vs. Bottle

➢ Material (wine) vs. Topic (bottle)

- Old bottle with new wine

- New bottle with old wine

- New bottle with new wine

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➢Impacts of Disaster Payments on Farmland Values

➢Impacts of Disaster Payments on Farmland Values: An Application of the Matching Frontier Model

➢Impacts of Disaster Payments on Farmland Values: Empirical Evidence of Fruit Farms in Taipei City

What do you expect to see behind each title?

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Contribution

➢To me, all of these three papers are publishable. All of them are worthy to read. However, it will depend on how you highlight/find your contribution !

➢Contribution

-- closely connects to literature review

-- make it a general or broad idea (concept)

-- be humble/honest on your contribution

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Structure of a reasonable empirical paper

➢Introduction

➢Background information

➢Theory/working hypotheses

➢Method and materials

➢Results and Discussion

➢Conclusion and Policy Implication

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Introduction

➢What issues are you addressing ?

➢Elaborate the importance of the issue/topic

➢How do you answer these research questions?

➢What do you find in this paper?

➢Major findings and contributions

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Literature Review

➢Of course, this section has to review relevant articles or work (type of writing styles).

➢What kinds of articles should I include?

➢Have I reviewed enough materials?

➢Make sure to summarize the findings of the previous studies

➢Select papers in good quality journals

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Results and Discussions

➢This part is almost the heart of the paper.

➢Make sure to present the results precisely.

➢Show the validation of the results (placebo test, robustness check).

➢Discussions should be highly connected with your results (again, be humble and professional !).

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Components of Good Empirical Paper

➢An attractive topic

➢Clear writing and presentation

➢ Free of errors or mistakes

➢ Solid empirical analysis

➢Deep analysis or elaboration of the results

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Writing your paper

Be humble

➢How details should we provide ?

➢How many tables should I present?

➢Should I show the drawback of my study?

Where to Submit My Paper ?

Game on only after you finished your draft !

➢Which journal should I submit?

➢Is this version ready to go?

➢How to handle reviewers' comments?

Where to Submit?

➢Mainstream journals in each field

-- **Economics**: American Economic Review (AER); QJE; J Political Econ.

-- **Agricultural Economics**: American Journal of Agricultural Economics (AJAE); European Review of Agricultural Economics (ERAE).

-- **Environmental Economics**: JEEM, JAREA, Land Economics.

-- **Development Economics**: Journal of Development Economics (JDE).

-- **Food and Consumption Economics**: Food Policy

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Agricultural Economics Journals

➢AJAE & ERAE：First tier journals, **require new wine in new bottle**

Agricultural Economics (AE); Journal of Agricultural Economics;
AEPP; AJARE; JARE
  -- Regional/country journals. Focus more on regional topics.
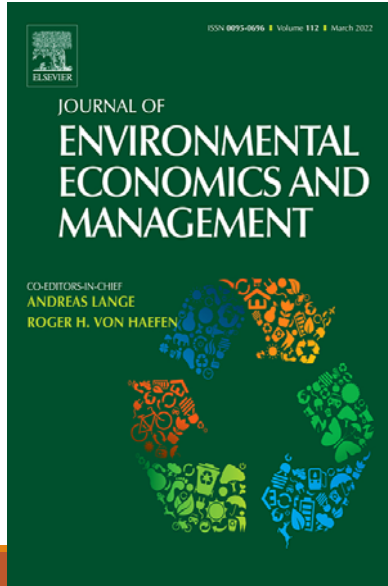

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Economic Development Journals

ISSN: 0304-3878 ISSN: 0305-750X

Environmental Economics Journals

Different Level Journal Publish Different Papers

New Wine in New Bottle	New(Old) Wine in Old(New) Bottle

New Wine in New Bottle

Estimating *Ex Ante* Cost Functions for Stochastic Technologies

Robert G Chambers; Teresa Serra

American Journal of Agricultural Economics, aay068, https://doi.org/10.1093/ajae/aay068
Published: 11 October 2018   **Section:** Article

Abstract ▾   View article

Nutrient Production and Micronutrient Gaps: Evidence from an Agriculture–Nutrition Randomized Control Trial
Andrew Dillon; Joanne Arsenault; Deanna Olney

American Journal of Agricultural Economics, aay067, https://doi.org/10.1093/ajae/aay067
Published: 10 October 2018   **Section:** Article

Abstract ▾   View article

Comment on "Estimating the Productivity Impacts of Technology Adoption in the Presence of Misclassification"
Karen Macours

American Journal of Agricultural Economics, aay078, https://doi.org/10.1093/ajae/aay078
Published: 4 October 2018   **Section:** Comment

Extract ▾   View article

Experimental Evidence on Policy Approaches That Link Agricultural Subsidies to Water Quality Outcomes
Leah H Palm-Forster; Jordan F Suter; Kent D Messer

New(Old) Wine in Old(New) Bottle

🔓 Full Access

When knowledgable neighbors also share seedlings: diffusion of banana cultivation in tanzania

Anna Folke Larsen

First Published: 10 October 2018

Abstract | PDF | Request permissions | Find It@NTU

Original Articles

🔓 Full Access

Cross country maize market linkages in Africa: integration and price transmission across local and global markets

Guillaume Pierre, Jonathan Kaminski

First Published: 09 October 2018

Abstract | PDF | Request permissions | Find It@NTU

Original Articles

🔓 Full Access

Modeling producer responses with dynamic programming: a case for adaptive crop management

David Boussios, Paul V. Preckel, Yigezu A. Yigezu, Prakash N. Dixit, Samia Akroush,

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Is This Version Ready to Go?

➢There is no perfect answer depending on your experience

➢Check recent papers published in that journal

➢Peer Opinion (**value of your senior co-authors**)

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Decision of your submissions

➢ Desk rejection

➢ Under review

➢ Major Revision; Minor Revision

New one: Expedited Submission
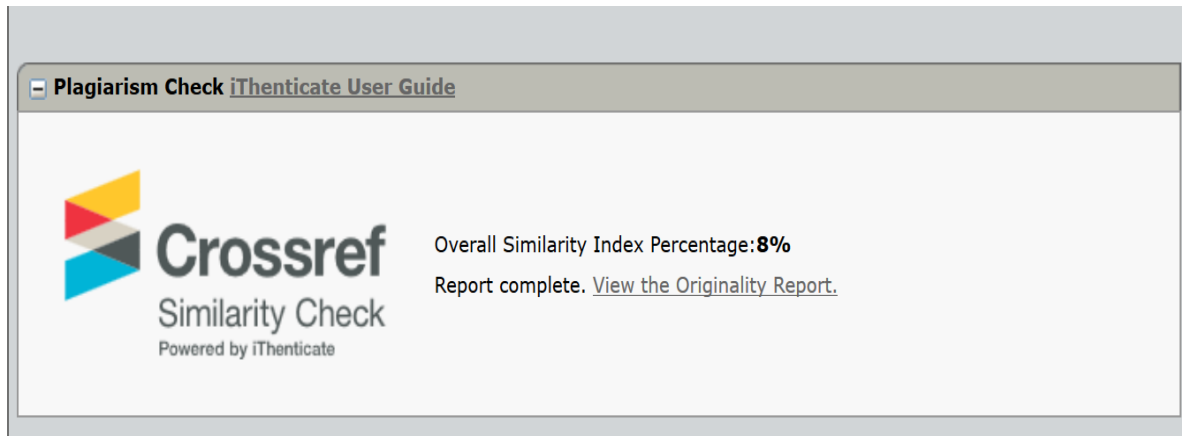
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How to Handle Reviewers' Comments?

➢ Basic Idea: Treat review comments seriously

➢ Read twice & think about these comments carefully

➢ Check deadline of the revision

➢ Read the handling editor's overall comments carefully.

➢ How to treat rejected manuscripts?

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Plagiarism

Plagiarism Check iThenticate User Guide

Crossref
Similarity Check
Powered by iThenticate

Overall Similarity Index Percentage:**8%**
Report complete. View the Originality Report.

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Conferences

➢Should I attend conferences to present my paper?

➢What is the "purpose" of doing this ?

➢Attitude to present a paper

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My overall comments on paper writing

➢Read good quality papers

➢Focus on limited topics of your research

➢Be patient of your research work

➢Connect your expertise with new or hot topics

➢For policy studies, get yourself familiar with policy context

➢Find an appropriate method and data

➢To present your paper before submitting it to journals

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COVID-19 Prevention and Air Pollution in the Absence of a Lockdown

HUNG-HAO CHANG, NATIONAL TAIWAN UNIVERSITY

CHAD D. MEYERHOEFER, LEHIGH UNIVERSITY

FENG-AN YANG, NATIONAL TAIWAN UNIVERSITY

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Sharing Points

➢How do I motivate this paper?

➢What are research questions I addressed?

➢How do I answer these questions?

➢What do I find ?

➢What are the contributions of this study?

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Covid-19 and Air Quality

➢To reduce the spread of COVID-19, many cities and countries implemented restrictions on business operations and the mobility of residents.

➢The closure of restaurants, retail establishments, and non-essential businesses likewise limited movement and reduced economic output.

➢**Did these restrictions affect air quality?**

➢Media outlets and newspapers have reported an improvement in air quality due to COVID-19 in many cities or countries.

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What happened in India and China?

3/11/2020 5:30AM

What China's Pollution Tells Us About Coronavirus and the Economy

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What happened in Europe and the U.S.?

Europe breathes fresher air under lockdown as coronavirus measures ease pollution ⬭ COMMENTS

By **Julie Gaubert** with **AFP** • last updated: 31/03/2020

PUBLIC HEALTH , RESEARCH

Research Brief: Air pollution in the U.S. declines during the COVID-19 pandemic

Air pollution falls by unprecedented levels in major global cities during coronavirus lockdowns

By **Helen Regan**, CNN
Updated 0405 GMT (1205 HKT) April 23, 2020

SHARE THIS ARTICLE Atmospheric pollution from industrial activity has fallen across Europe as countries shutdown their economies to fight the coronavirus pandemic.
Images from the Copernicus programme's Sentinel-5P satellite clearly show a drop nitrogen dioxide concentration in France, Italy and Spain throughout March.

Prevention strategies for COVID-19

In China, the U.S. and Europe:

-- restricted social lockdown; restaurants and food services were closed.

-- people sheltered at home; remote work.

In Taiwan:

-- promote social distancing within the country.

-- border control; quarantine from international arrivals.

-- use of facemasks in public.

No strict restriction on mobility within Taiwan!

Question?

Will We Find A Different Result for Taiwan? Why?

Let's do it!

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Literature Review

Fast-growing literature on the impact of COVID-19 on air pollution. Some studies focus on individual cities with air pollution monitoring stations, while others use satellite imagery over countries.

Consensus findings:

-- 5 major air pollutants CO, SO_2, NO_2, O_3, $PM_{2.5}$

-- strict lockdowns in China reduced the level of major air pollutants.

-- O_3 increased due to reductions in NO_2

-- In EU, a reduction in NO_2 and PM.

-- In the U.S., the evidence is mixed.

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Our Research Objectives

➢Identify the causal effect of COVID-19 on air pollution in Taiwan, <u>the country without a social lockdown.</u>

➢Investigate the mechanism behind the findings.

➢Link COVID-19 study to air quality and transportation analysis.

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Analytical Framework

| COVID-19 | | Air Pollution |

Transportation of Commuters (Metro, Car)
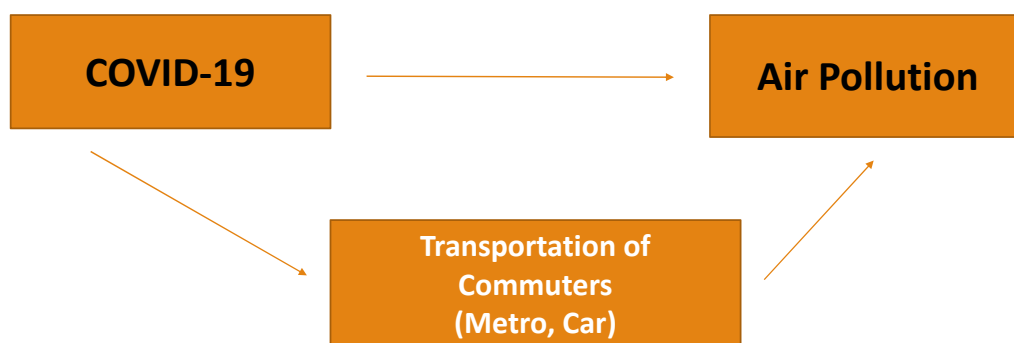
A natural experiment to link changes in air pollution and the use of transportation

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Difference-in-Differences (DiD) Model

Jan. 1	Year 2020		Year 2017-2019

Before COVID-19 Period

Jan. 22

After COVID-19 Period

Mar. 31

Treatment Group	**Control Group**
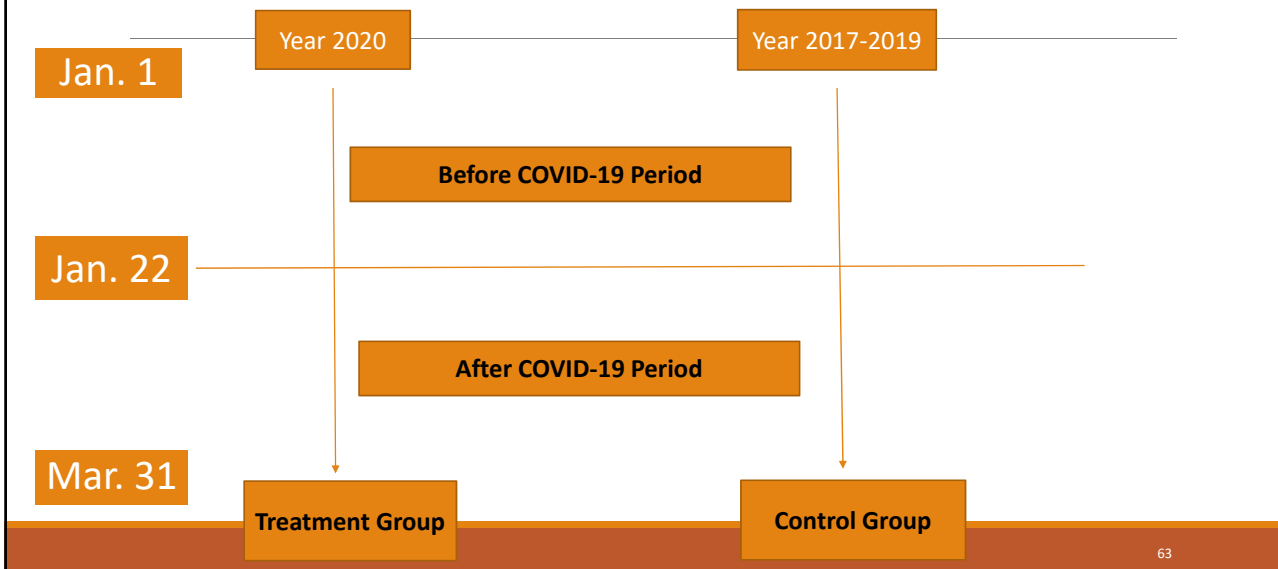
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Econometric Model

We estimate the generalized version of the DiD model using a panel data. The outcome variable is specified as:

$$log(y_{ijt}) = \alpha_1 + \gamma_1 \cdot COVID_{jt} + \beta_1{}'X_{ijt} + \upsilon_j + t_m + t_y + \varepsilon_{ijt}$$

y_{ijt}: outcome variable for station i in city j during time t; time is day.

$COVID_{jt}$ measures COVID-19 cases (0/1 and cont.) in city j at time t.

X_{ijt} explanatory variables associated with the outcome variable.

υ_j, t_m, and t_y are fixed effects for city, month and year.

ε_{ijt} is a random error term.

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Data

➢We compiled data from several administrative sources.

➢From January 1, 2020 to March 31 in 2020, 2019, 2018 and 2017.

➢The cases of COVID-19

➢Air quality

➢Car / Motorcycle traffic data (personal vehicle)

➢Metro use (public transportation)

➢U-bike use (public transportation)

➢Socio-demographic variables (district-level)

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COVID-19 data

➢The number of the confirmed cases of COVID-19 in Taipei and New Taipei City during each day.

➢Variables for COVID-19:

-- Extensive margin: the period when confirmed COVID-19 cases existed in the two cities (0/1).

-- Intensive margin: continuous measure of the cumulative number of the confirmed cases in each day in each of the two cities (continuous measure of COVID-19).

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Time trend of COVID-19 cases
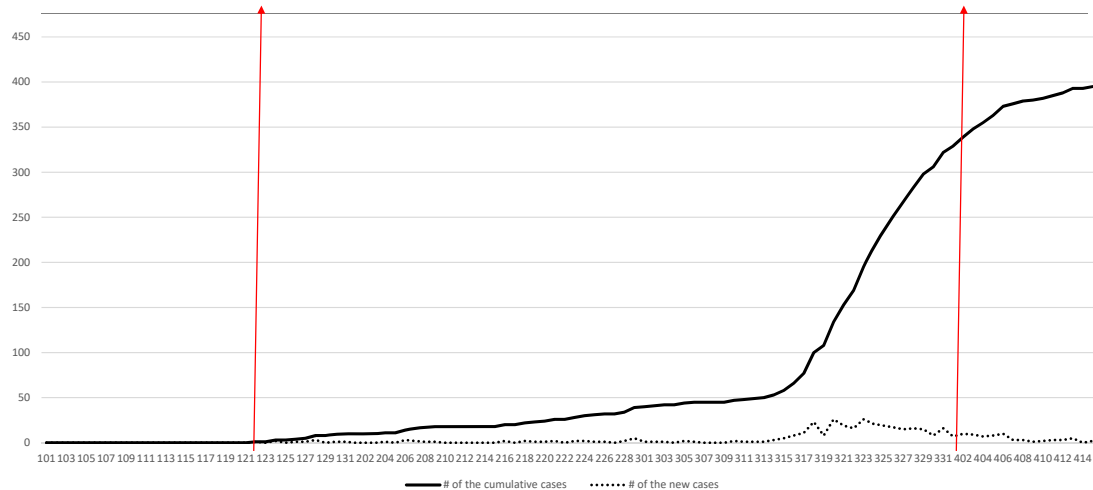
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Air quality data

➢Measures of air quality from 19 monitoring stations from EPA.

➢Select $PM_{2.5}$, NO_2, SO_2, CO, and O_3

➢Merge COVID-19 variables into this dataset by city and date.

➢5,741 station-day specific observations.

➢Outcome variables: the average concentration over 24 hours for each pollutant.

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| Two stations close to China | 19 stations in the two cities |

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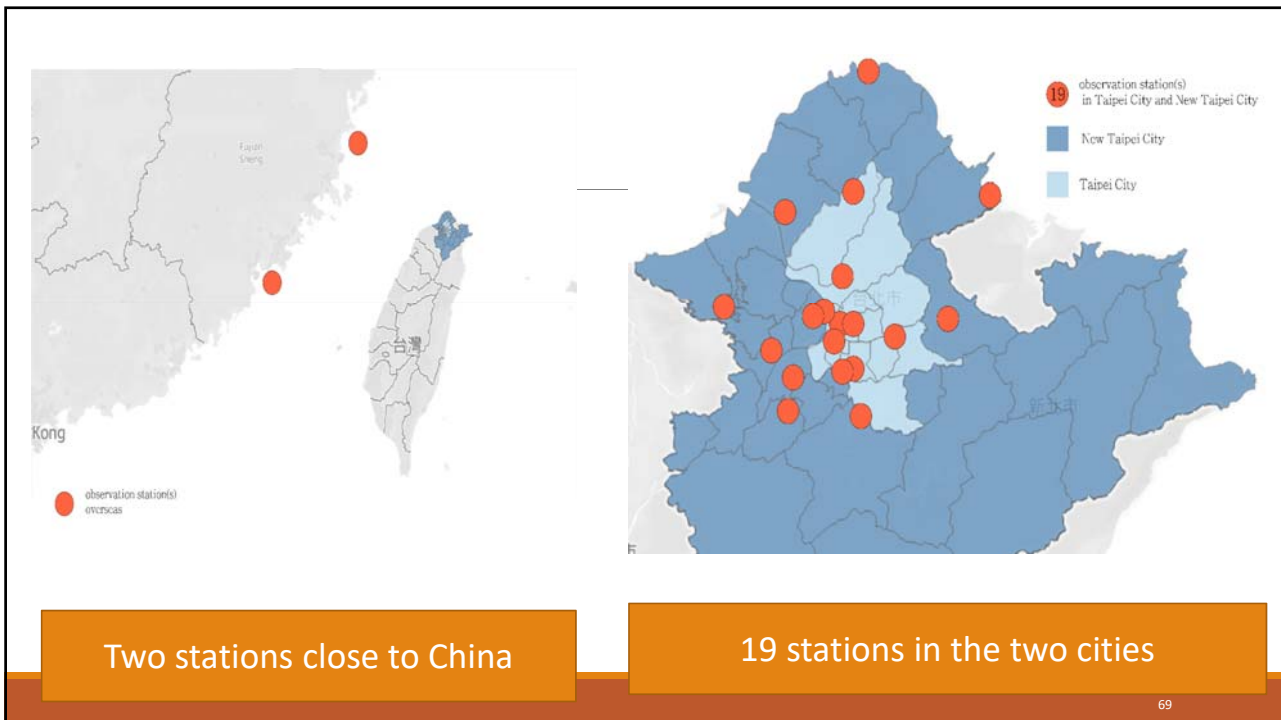
Metro Use Data

➢108 station of the Taipei metro system (cover the two cities).

➢Data on the number of ridership who departed and exited the station every day during our treatment and control periods.

➢In total, 38,880 station-day specific observations.

➢Outcome variable: Number of ridership per day per station (in log).

➢Control variables: characteristics of the metro stations; indicator for weekday.

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Car traffic data

➢35 traffic monitoring stations along the main bridges that connect Taipei and New Taipei City.

➢Capture commuting patterns by cars and motorcycles.

➢The number of cars during every 4 hours of the treatment and control periods.

➢77,242 station-4-hour-period specific observations.

➢Outcome variable: small-sized car (<3500 kg and <10 seats); large-sized car (truck, bus etc.) ; motorcycle

➢Other variables: a series of 4-hour dummies, type of station; weekday, inbound visitors, gasoline price.

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U-bike Data

➢Draw from the Taipei and New Taipei City Government.

➢We selected 966 U-bike stations in the two cities (exclude stations newly opened in 2020).

➢Final sample includes 222,639 station-day specific observation.

➢Outcome variable: the number of departure & exist of each station in each day (in log).

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Other variables

➤In all models, 2 variables on district-level characteristics:

-- geographic area of each district

-- monthly population density.

➤Number of inbound visitors in each day.

➤Wind speed; gasoline price.

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Empirical Results

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Main results of the air quality

Dependent variable (in log)	Key variable: If COVID19 period			Key variable: Cumulative COVID19 confirmed cases			
	Coef.	S.E	Adj. R2	Coef.	S.E	Adj. R2	N*T
CO	0.0367***	0.0089	0.5840	0.0098***	0.0022	0.5841	5,741
O3	0.0726***	0.0088	0.4704	0.0234***	0.0022	0.4717	5,741
SO2	0.0566*	0.0306	0.3270	0.0049	0.0078	0.3267	5,741
NO2	-0.0180	0.0138	0.5969	-0.0070	0.0047	0.5970	5,741
PM25	0.0277*	0.0152	0.4478	0.0063*	0.0035	0.4478	5,741

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Weekend vs. Weekday

Dependent variable (in log)	Key variable: If COVID19 period			Key variable: Cumulative COVID19 confirmed cases			
	Coef.	S.E	Adj. R2	Coef.	S.E	Adj. R2	N*T
Panel A. Working Days							
CO	0.066***	0.009	0.597	0.009***	0.002	0.597	3,705
O3	0.074***	0.011	0.501	0.023***	0.002	0.503	3,705
SO2	0.089**	0.036	0.328	0.003*	0.001	0.327	3,705
NO2	0.015	0.020	0.588	0.005	0.004	0.588	3,705
PM25	0.011**	0.004	0.431	0.004*	0.002	0.431	3,705
Panel B. Non-working days							
CO	0.009	0.022	0.573	0.002	0.007	0.574	2,036
O3	0.055	0.014	0.436	0.020	0.035	0.436	2,036
SO2	0.014	0.052	0.319	0.016	0.012	0.319	2,036
NO2	-0.030*	0.015	0.602	-0.004*	0.002	0.602	2,036
PM25	-0.049	0.030	0.478	-0.009	0.006	0.478	2,036

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Robustness Checks

Falsification & Sensitivity Test

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Dependent variable (in log)	Key variable: If COVID19 period			Key variable: Cumulative COVID19 confirmed cases		
	Coef.	S.E	Adjusted R2	Coef.	S.E	Adjusted R2
Panel A. Hypothetical event occurred in 2019.						
CO	-0.026	0.030	0.577	-0.003	0.002	0.582
O3	0.073	0.060	0.445	0.001	0.001	0.444
SO2	-0.015	0.054	0.325	-0.002	0.002	0.326
NO2	0.000	0.029	0.599	-0.004	0.001	0.602
PM25	0.050	0.070	0.444	-0.001	0.002	0.445
Panel B. Hypothetical event occurred in 2018.						
CO	0.001	0.001	0.578	-0.005	0.046	0.577
O3	-0.001	0.001	0.443	-0.003	0.043	0.443
SO2	0.001	0.001	0.325	-0.096	0.058	0.326
NO2	0.000	0.001	0.599	0.025	0.066	0.599
PM25	0.002	0.002	0.445	-0.085	0.085	0.445
Panel C. Hypothetical event occurred in 2017						
CO	0.026	0.039	0.577	0.001	0.001	0.577
O3	-0.054	0.066	0.444	0.002	0.001	0.446
SO2	0.071	0.058	0.326	0.000	0.002	0.325
NO2	-0.025	0.056	0.599	0.000	0.001	0.599
PM25	0.050	0.076	0.444	0.001	0.002	0.444

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Key variable	If COVID19 period			Cumulative COVID19 confirmed cases		
	Panel A. baseline model (include city, year and month fixed effect)					
Dependent variable (in log)	Coef.	S.E	Adjusted R2	Coef.	S.E	Adjusted R2
CO	0.037***	0.009	0.584	0.010***	0.002	0.584
O3	0.073***	0.009	0.470	0.023***	0.002	0.472
SO2	0.057*	0.031	0.327	0.005	0.008	0.327
NO2	-0.018	0.014	0.597	-0.007	0.005	0.597
PM25	0.028*	0.015	0.448	0.006*	0.004	0.448
	Panel B. Include month and year-city specific fixed effect					
CO	0.038***	0.009	0.585	0.010***	0.002	0.585
O3	0.071***	0.009	0.472	0.023***	0.002	0.473
SO2	0.055*	0.031	0.327	0.004	0.008	0.327
NO2	-0.014	0.017	0.600	-0.006	0.005	0.600
PM25	0.028*	0.015	0.452	0.006*	0.003	0.452
	Panel C. Use year and month-city specific fixed effect					
CO	0.036***	0.009	0.584	0.010***	0.002	0.584
O3	0.073***	0.009	0.471	0.023***	0.002	0.472
SO2	0.056*	0.031	0.327	0.005	0.008	0.327
NO2	-0.019	0.013	0.597	-0.007	0.005	0.597
PM25	0.027*	0.015	0.448	0.006*	0.003	0.448

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Testing Common Trend Assumption

	Ho: all previous periods are equal	
	t value	p-value
CO	0.34	0.73
O3	1.03	0.30
SO2	1.20	0.23
NO2	1.19	0.23
PM25	0.58	0.56

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Results on the Mode of Transportation

Results of the metro use

Variable	All sample			
	Coef.	S.E	Coef.	S.E
D_COVID	-0.187***	0.044		
Case_COVID			-0.002***	0.001
Other variables	Yes		Yes	
Adjusted R2	0.355		0.354	
N*T	38,880		38,880	
	Panel A. Working days			
D_COVID	-0.121***	0.016		
Case_COVID			-0.002***	0.000
Other variables	Yes		Yes	
Adjusted R2	0.338		0.337	
N*T	25,272		25,272	
	Panel B. Non-working days			
D_COVID	-0.252***	0.066		
Case_COVID			-0.004***	0.001
Other variables	Yes		Yes	
Adjusted R2	0.328		0.333	
N*T	13,608		13,608	

Results of the small-car traffic

Variable	All sample				Non-working days			
	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E
D_COVID	0.243	0.299			-0.504***	0.154		
Magnitude	8.03%				-18.77%			
Case_COVID			0.007	0.008			-0.019***	0.005
Magnitude			0.22%				-0.71%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.040		0.040		0.053		0.053	
N	77,242		77,242		26,288		26,288	
	Traffic hours in working days				Non traffic hours in working days			
D_COVID	0.586**	0.238			0.345**	0.148		
Magnitude	15.93%				11.65%			
Case_COVID			0.016*	0.004			0.008*	0.005
Magnitude			0.45%				0.27%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.057		0.057		0.013		0.013	
N	16,956		16,956		33,995		33,995	

Results of the Large-car traffic

Variable	All sample				Non-working days			
	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E
D_COVID	0.013	0.476			-0.024	0.016		
Magnitude	2.11%				-4.92%			
Case_COVID			0.000	0.003			0.000	0.006
Magnitude			0.07%				-0.10%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.004		0.003		0.005		0.005	
N	77,242		77,242		26,288		26,288	
	Traffic hours in working days				Non traffic hours in working days			
D_COVID	0.027*	0.014			0.019	0.011		
Magnitude	3.39%				2.82%			
Case_COVID			0.001*	0.000			0.000	0.005
Magnitude			0.08%				0.06%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.003		0.003		0.004		0.003	
N	16,956		16,956		33,995		33,995	

Results on Motorcycle Use

Variable	All sample				Non-working days			
	Coef.	S.E	Coef.	S.E	Coef.	S.E	Coef.	S.E
D_COVID	0.193**	0.086			-0.083*	0.043		
Magnitude	17.46%				-9.80%			
Case_COVID			0.001**	0.000			-0.003*	0.001
Magnitude			0.10%				-0.31%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.010		0.010		0.012		0.012	
N	77,242		77,242		26,288		26,288	
	Traffic hours in working days				Non traffic hours in working days			
D_COVID	0.241**	0.109			0.171*	0.148		
Magnitude	24.39%				12.49%			
Case_COVID			0.002*	0.021			0.002*	0.001
Magnitude			0.22%				0.13%	
Other variables	Yes		Yes		Yes		Yes	
R2	0.013		0.013		0.012		0.011	
N	16,956		16,956		33,995		33,995	

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Results on U-bike Use

Variable	All sample			
	Coef.	S.E	Coef.	S.E
D_COVID	-0.119***	0.016		
Case_COVID			-0.002***	0.000
Other variables	Yes		Yes	
Adjusted R2	0.810		0.810	
N*T	222,639		222,639	
	Working days			
D_COVID	-0.015**	0.006		
Case_COVID			-0.001**	0.000
Other variables	Yes		Yes	
Adjusted R2	0.822		0.337	
N*T	144,757		144,757	
	Non-working days			
D_COVID	-0.239***	0.070		
Case_COVID			-0.006***	0.000
Other variables	Yes		Yes	
Adjusted R2	0.790		0.790	
N*T	77,882		77,882	

Conclusion

➤ We find CO, SO_2, and $PM_{2.5}$ increased during the COVID-19 period.

➤ Findings in Taiwan are opposite to the experience of China, the U.S. and Europe

➤ Our findings are likely due to a shift in preferences for mode of transport away from public transportation (metro/U-bike) and towards personal automobiles.

➤ The change in mode of transport was a strategy used by individuals to reduce their chances of contracting COVID-19, especially during working days.

➤ No Win-Win strategy of prevention: *Economy* vs. *Health risk* vs. *Air quality (death)*.

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Are We On the Right Track?

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【編輯長專欄】疫情肆虐銷量卻逆勢成長的摩托車

2020-5-1 「Webike news」編輯長 Kenny佐川

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Contribution to Previous Literature

➢Provide the first case study of a county without a strict lockdown.

➢Use real-time observed data (administrative record).

➢Identify the causal effect of COVID-19 on air quality and the mode of transportation.

➢Different prevention policies lead to different findings. We find opposite evidence to prior studies.

➢Examine mechanisms behind the effect of COVID-19 on air quality.

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More About This Project !

COVID-19 Prevention and Air Pollution in the Absence of a Lockdown

Hung-Hao Chang, Chad Meyerhoefer, Feng-An Yang

NBER Working Paper No. 27604
Issued in July 2020
NBER Program(s): Environment and Energy Economics, Health Economics

Recent studies demonstrate that air quality improved during the coronavirus pandemic due to the imposition of social lockdowns. We investigate the impact of COVID-19 on air pollution in the two largest cities in Taiwan, which were not subject to economic or mobility restrictions. Using a generalized difference-in-differences approach and real-time data on air quality and transportation, we estimate that levels of sulfur dioxide, nitrogen dioxide and particulate matter increased 5 - 12 percent relative to 2017 - 2019. We demonstrate that this counterintuitive finding is likely due to a shift in preferences for mode of transport away from public transportation and towards personal automobiles. Similar COVID-19 prevention behaviors in regions or countries emerging from lockdowns could likewise result in an increase in air pollution.

Journal of Environmental Management
ELSEVIER
Volume 298, 15 November 2021, 113522

COVID-19 prevention, air pollution and transportation patterns in the absence of a lockdown

Hung-Hao Chang [a], Chad D. Meyerhoefer [b], Feng-An Yang [a]

My other covid-19 papers

American Journal of Agricultural Economics
AAEA

COVID-19 Agriculture, Food, Environment, and Development Article | Free Access

COVID-19 and the Demand for Online Food Shopping Services: Empirical Evidence from Taiwan

Hung-Hao Chang, Chad D. Meyerhoefer

Journal of Transport Geography

JAE Journal of Agricultural Economics

ORIGINAL ARTICLE | Free Access

The economic impact of the COVID-19 pandemic on the Taiwanese food industry: Empirical evidence using business transaction data

Feng-An Yang, Hung-Hao Chang, Jiun-Hao Wang

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The End

Thank You

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