Economics of COVID-19: Exploring key issues of impact on the economy

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The economic impact of SARS: How does the reality match the predictions?

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Abstract

Objectives: To perform a retrospective analysis of the macro-economic impact of the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak.

Methods: As several years have now passed, it is possible to interrogate national statistics that have become available since the outbreak to provide a more accurate estimate of the actual macro-economic impact of SARS. National statistics were examined for anomalies that corresponded to the timing of the SARS outbreak and, where possible, the size of any gain or loss found estimated.

Results: Estimates and models produced at the time of the outbreak suggested that SARS could have a catastrophic effect on the global economy. Our analysis suggests that the scale of the SARS impact on affected economies was far smaller than suggested by contemporary media reports and model estimates.

Conclusions: This exercise holds important lessons for estimating the economic impact of future outbreaks – such as pandemic influenza – and measures to control or prevent them. We suggest that further work is needed to develop a more comprehensive macro-economic model able to more accurately estimate the relative cost and effect of a global response to outbreaks of international concern. The implications of our findings are discussed in the light of a prospective influenza pandemic.

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The economic impact of severe acute respiratory syndrome in Beijing, China

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Summary

OBJECTIVE To document the impact of the severe acute respiratory syndrome (SARS) outbreak in Beijing on indicators of social and economic activity.

METHODS Associations between time series of daily and monthly SARS cases and deaths and volume of public transport, airplane and cargo transport, tourism, household consumption patterns and gross domestic product growth in Beijing were investigated using the cross-correlation function.

RESULTS Significant correlation coefficients were found for all indicators except wholesale accounts and expenditures on necessities, with the most significant correlations occurring with a delay of 1 day to 1 month.

CONCLUSIONS Especially leisure activities, local and international transport and tourism were affected by SARS particularly in May. Much of this contraction was merely postponed; but irrecoverable losses to the tourist sector alone were estimated at about US$ 14 bn, or 300 times the cost of treatment for SARS cases in Beijing.

Keywords severe acute respiratory syndrome, economic impact, leisure industry, postponed consumption, losses, People’s Republic of China

Introduction

Severe acute respiratory syndrome (SARS) emerged in late 2002 in the Guangdong province of the People’s Republic of China. The causative pathogen was identified as the...
HEALTH ECONOMICS LETTERS

PARTIALLY WRONG? PARTIAL EQUILIBRIUM AND THE ECONOMIC ANALYSIS OF PUBLIC HEALTH EMERGENCIES OF INTERNATIONAL CONCERN

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SUMMARY

We argue that traditional health economic analysis is ill-equipped to estimate the cost effectiveness and cost benefit of interventions that aim at controlling and/or preventing public health emergencies of international concern (such as pandemic influenza or severe acute respiratory syndrome). The implicit assumption of partial equilibrium within both the health sector itself and – if a wider perspective is adopted – the economy as a whole would be violated by such emergencies. We propose an alternative, with the specific aim of accounting for the behavioural changes and capacity problems that are expected to occur when such an outbreak strikes. Copyright © 2008 John Wiley & Sons, Ltd.
• Economy complex and globally interconnected
• Epidemiologically, isolation has major positive externalities
• Economically, isolation has major negative externalities
• Reduced demand and reduced supply, at pace, differentially across counties and sectors, creates reinforcing feedback loop of overall contraction and ultimately major loss of economic surplus
What form of ‘macro-economic technique’?

• Number of macro-economic approaches around (eg. Growth models, COMPACT...), but:
  • Relevance – too broad (eg no sectoral disaggregation)
  • Feasibility – some difficult to parametarise intervention effects (eg BoEQM)
  • Sensitivity – some offer/require large impacts only
  • Flexibility – some very context-specific (countries, time)
• CGE addresses these as micro-based whole-economy model
The importance of health co-benefits in macroeconomic assessments of UK Greenhouse Gas emission reduction strategies

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Chronic Diseases: Chronic Diseases and Development 2

Health, agricultural, and economic effects of adoption of healthy diet recommendations

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The welfare implications of public healthcare financing: a macro–micro simulation analysis of Uganda

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Assessing the macroeconomic impact of a healthcare problem: The application of computable general equilibrium analysis to antimicrobial resistance

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www.sciencedirect.com/journal/jheconomics


THE ECONOMIC IMPACT OF H1N1 ON MEXICO’S TOURIST AND PORK SECTORS

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SUMMARY

By examining tourist arrivals and pork output and trade statistics, this analysis estimates the economic impact to the Mexican tourism and pork sectors because of the H1N1 influenza pandemic. It also assesses the role of the international response in the context of this economic impact.

For tourism, using almost a million overseas visitors translated into losses of around $US2.3bn, which extended over a four-month period, mostly because of the scare factors of European travel bans. For the pork industry, seasonal decreases in output varied in most of the country and related to H1N1 incidence (r2=0.614, r2=1.3). By the end of 2009, Mexico had a pork trade deficit of $US273m. The losses derived from this pandemic were clearly influenced by the risk perception, perceived in travel latency and trade月末.
What is ‘CGE’ modelling?

- CGE is general equilibrium model solved (forced) to find prices at which quantity supplied equals quantity demanded across all markets (sectors)
- Describes economy using representative agents: consumers, producers, and government
  - Consumers allocate time to employment/leisure and income to consumption/saving to max utility
  - Producers combine labour/capital inputs to max profit
  - Government collects tax revenue to finance expenditure & redistribute as benefits
- Export and import function in single country model, or linked country trading in multi-country models
**Initial Equilibrium State of Economy**
- Supply = Demand
- Income = Expenditure
- Profits maximised
- Ideal consumption patterns

**Shocked State of Economy**
- Less Supply
- Smaller profits
- Changed consumption patterns
- Find a new equilibrium solution!

**Economic Indicators**
- Initial GDP
- Initial sector outputs
- Etc.

**Economic Indicators**
- Post-shock GDP
- Post-shock sector outputs
- Etc.

Before/after difference = economic impact
Microconsistent benchmark data set for single year (SAM)

Exogenous elasticities  <->  Calibration (model spec.)

Calculation of benchmark equil.  <->  Replication check

Policy evaluation - pairwise comparison between counterfactual & benchmark equil.
Strengths and weaknesses of CGE

• Strengths:
  • Wide range of indicators – GDP, tax receipts, inflation, exchange rates, employment…
  • Sectoral (and agent) disaggregation and analyses (distributional impacts)
  • Temporal (adjustment) affects (dynamic models)
  • Individual country, linked country or regional/ global analyses (‘trade’ models)

• Weaknesses:
  • Quality of model dependent on quality of data
  • Parameterization of shocks/effects can be difficult (esp behavioural)
  • Realism of (neo-classical) theory (eg markets clear)
  • Health effects = monetary terms (‘human capital’, not ‘intangible’ value of health…)
The economy-wide impact of pandemic influenza: a computable general equilibrium modelling experiment

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ABSTRACT
Objective To estimate the potential economic impact of pandemic influenza, associated behaviours and responses, school closures, and vaccination on the United Kingdom.
Design A computable general equilibrium model of the UK economy was specified for various combinations of mortality and mobility from pandemic influenza, averted illness, school closures, and prophylactic absenteeism using publicly available data.
Setting The 2004 UK economy (to most up to date available with reliable economic data).
Main outcome measures The economic impact of various scenarios with different pandemic severity, vaccination, school closure, and prophylactic absenteeism specified in terms of gross domestic product, output from different economic sectors, and equivalent variation.
Results The costs related to illness alone ranged between 6.1% and 42.0% of gross domestic product (£58.6bn to £66.9bn) for low-scenario scenarios, 3.3% and 4.3% (£53.5bn to £72.3bn) for high-scenario scenarios, and 622% for an extreme scenario. School closure increases the economic impact, particularly for mild pandemics. If widespread travel behaviour change takes place and there is a large spread of prophylactic absenteeism from work, the economic impact would be notably increased with few health benefits. Vaccination with a pre-pandemic vaccine would save 0.1% to 2.3% of gross domestic product (£2.2bn to £36.8bn), a single dose of a matched vaccine (2000), H1N1 subtype of the influenza A virus (2009), and sporadic outbreaks of H3N2 influenza subtype.5 In addition to direct health impacts, a series of outcomes should be considered about the economic impact, especially at a time of global recession.6 Preparedness planning for a pandemic must revalue two key policy strands—maintaining "business as usual" to minimise the economic impact of a pandemic, and encouraging "social distancing" to minimise the health-related impact of a pandemic—both using resources such as antiviral and vaccination.
This paper addresses the tension inherent in these two policy strands. It provides evidence of the economic-wide impact of each approach, as well as the impact that vaccine development may have in reconciling these two objectives of minimising both the health and economic effects of a pandemic. A key contribution in this analysis is the role of public perception and confidence, expressed by "socially responsible behaviour", where healthy people avoid social contact, including going to work. This response is likely to emerge at a higher cost of fatalities and to be moderated by the availability of effective vaccines (the current strain of H1N1 influenza seems to be highly infectious but not very deadly), and this may explain in limited economic impact.

Estimating the economic impact of pandemic influenza: An application of the computable general equilibrium model to the UK

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ABSTRACT
There is concern regarding the impact that a global infectious disease pandemic might have, especially the economic impact in the current financial climate. However, preparedness planning concentrates more upon population health and maintaining a functioning health sector than on the wider economic impact. We developed a single country Computable General Equilibrium model to estimate the economic impact of pandemic influenza (PI) and associated policies. While the context for this development was the United Kingdom, there are lessons to be drawn for application of this methodology as well as for other countries.
Please scenarios were constructed from an epidemiological model which estimated case fatality rates (mild, moderate and severe) of 0.0%, 0.8%, and 3.3%, and, respectively for the three pandemic scenarios for which the impact of PI itself is smaller than those that mitigate policies; combining school closure with prophylactic absenteeism yields percentage cost effect of 4.1% (1.4% to 6.8%) and 1.6% (1.4% to 3.2%) respectively for the three scenarios. Sensitivity analysis shows little variability with changes in disease parameters but notable changes with variations in school closure and prophylactic absenteeism. The most severe sensitivity scenario results in a 2.9% (£37.4bn), 2.2% (£41.8bn) and 1.7% (£47.3bn) loss to GDP respectively for the three scenarios.
What do we model?

• Disease impact
  • Morbidity – temporary reduction in labour force
  • Mortality – permanent reduction in labour force

• Behavioural change
  • Avoidance behaviours, consumption patterns etc

• Interventions
  • Anti-virals, vaccination, school closure
GDP Impacts for UK

2007-9 Recession = 2.3% UK
4.5% globally
The impact of Covid-19 and associated behaviour and policies on the UK economy: a computable general equilibrium model

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Model impact of 3 scenarios

Scenario 1: direct health costs and effects
• Health-related reductions in labour supply due to the disease and the associated health costs
  • CAR = 48% (82% mild 7 days illness, 15% severe – 10 days hospital, 3% critical 15 days hospital) and CFR = 1.6%

Scenario 2: Preventative actions and economic effects
• Scenario 1 plus effects from preventative actions taken to avoid infection by individual/organisation
  • 79% reduction in trade, travel/tourism and food/beverage sectors for 12 weeks

Scenario 3: National Policy Responses
• Scenario 2 plus national policy on school closure, reduced travel, cancelled events, working from home etc
  • All schools and 50% businesses close for 12 weeks

All feed in to epi/demographic model that reshapes ‘the curve’
Timing and width of peak uncertain due to:
- Stochasticity in early dynamics
- Heterogeneities in contact patterns
- Spatial variation
- Uncertainty in key epidemiological parameters

Epidemic growth, doubling time 4-7 days

Social distancing flattens curve

Risk of resurgence following lifting of interventions
Headline UK Results

• Scenario 1 (no action):
  • 30 million symptomatic cases, 6.5 million hospitalisations, 1.1 million ICU admissions and > 500,000 deaths
  • Economic impact £14.1bn = 0.62% of GDP, mostly from impact on labour supply

• Scenario 2 (health plus mitigating actions)
  • £51.9bn = 2.27% of GDP mostly due to reduced trade (ie economy slows). Hospitality worst hit at £27.6bn.

• Scenario 3 (health plus ‘lockdown’)
  • £244bn (10.68% of GDP) (cf last recession 2.3% UK)
  • Health-related economic impacts fall to £12.5 (0.55%)
  • 174,000 lives might be saved.
  • Equates to ~£1.2m per life saved
Conclusion

• Consistent with previous work:
  • Increasing scale of impact:
    • Disease with no social or policy response (‘regular’ flu)
    • Disease with social response (the low end of PI)
    • Disease with policy response (current)
  • Reduced CFR does not impact health costs but does change social/policy response and hence wider economic impacts
Conclusion

- Recommendations of mitigating economic policies have been taken on board:
  - Support liquidity – delay mortgage repayments, guarantee (or replacement – 80% in UK), cash loans/grants...
  - Tax rebates, cuts, holidays, etc
  - Cut interest rates and/or QE programs
  - Keynesian pump priming (beginning with health care)

*Figure 2: Flattening the Recession Curve*

Source: Gourinchas: "Flattening the Pandemic and Recession Curves", 13 March 2020
What next?

• Model now outdated
  • Most assumptions, policies and recommendations have now been enacted
  • Static single year model was fine for ‘short, sharp shock’ but not current situation

• Updating analysis at the moment (so no results to share)...
  • Dynamic multi-year model
  • Updated with current context as the ‘base-line’ scenario

• Assumptions on ‘longer-term’ key – bounceback, recession, structural change etc (unkown unkown!
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Restaurant Receipts HK$Mn

Retail sales HK$Mn

Hong Kong Hotels yoy % change

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Some thoughts for discussion...

• Experiences from other countries, and what analyses have been or are being done?

• Value of models versus empirical observation given fast moving pace of change (and the question of counterfactuals)?

• At what point are we in to the medium or long term – and what are the scenarios for that – recession, structural shifts, bounce-back?
  
  • Impact on health of policies (mental and physical impacts of social distancing, self-isolation and recession) compared to disease – where is the equilibrium?
Thank You

Obrigado!

شكراً

Hvala

Ευχαριστώ

Díky

謝謝您

תודה

Grazie

Köszönettel

Merci

बधाई

Bedankt