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Assessment of the Economic Impacts of Heat Waves: A Case Study of Nanjing, China

Yang Xia1, Yuan Li1,2,*, Dabo Guan1, David Mendoza Tinoco1, Jiangjiang Xia3, Zhongwei Yan3, Jun Yang4, Qiyong Liu4, Hong Huo5,*

1 Water Security Research Centre, School of International Development, University of East Anglia, Norwich NR4 7TJ, UK
2 State Key Joint Laboratory of Environmental Simulation and Pollution Control, School of Environment, Tsinghua University, Beijing 100084, China
3 Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China
4 Chinese Centre for Disease Control and Prevention, Beijing, China
5 Institute of Energy, Environment and Economy, Tsinghua University, Beijing 100084, China

* Correspondence email: y.li4@uea.ac.uk and hhuo@mail.tsinghua.edu.cn

Abstract
The southeast region of China is frequently affected by summer heat waves. Nanjing, a metropolitan city in Jiangsu Province, China, experienced an extreme 14-day heat wave in 2013. Extreme heat can not only induce health outcomes in terms of excess mortality and morbidity (hospital admissions) but can also cause productivity losses for self-paced indoor workers and capacity losses for outdoor workers due to occupational safety requirements. All of these effects can be translated into productive working time losses, thus creating a need to investigate the macroeconomic implications of heat waves on production supply chains. Indeed, industrial interdependencies are important for capturing the cascading effects of initial changes in factor inputs in a single sector on the remaining sectors and the economy. To consider these effects, this paper develops an interdisciplinary approach by combining meteorological, epidemiological and economic analyses to investigate the macroeconomic impacts of heat waves on the economy of Nanjing in 2013. By adopting a supply-driven input-output (IO) model, labour is perceived to be a key factor input, and any heat effect on human beings can be viewed as a degradation of productive time and human capital. Using this interdisciplinary tool, our study shows a total economic loss of 27.49 billion Yuan for Nanjing in 2013 due to the heat wave, which is equivalent to 3.43% of the city’s gross value of production in 2013. The manufacturing sector sustained 63.1% of the total economic loss at 17.34 billion Yuan. Indeed, based on the ability of the IO model to capture indirect economic loss, our results further suggest that although the productive time losses in the manufacturing and service sectors have lower magnitudes than those in the agricultural and mining sectors, they can entail substantial indirect losses because of industrial interdependencies. This important conclusion highlights the importance of incorporating industrial interdependencies and indirect economic assessments in disaster risk studies.

Keywords: Heat Wave, Health, Productivity, Capacity, Macroeconomic, Input-output Analysis, Indirect Loss, Nanjing, China
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