

# Does adaptive capacity reduce funding costs of municipalities that are exposed to climate change risk?

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## 1. Motivations underlying the research

Its scale and complex interactions make climate change a potential source of systemic risk in the financial system. The potential impact of this risk is higher when asset prices do not reflect climate change risks. Acute or chronic climate hazards could abruptly inform investors on the true economic condition of the asset and might lead to a sudden repricing. This sudden repricing may then turn into significant losses in a leveraged financial system.

In a world with perfect information on climate risks and assets' exposure to those risks, asset prices would reflect climate change risks. However, climate change risks are driven by uncertainty on the precise timing and magnitude of climate hazards and market participants have limited information on the exposure of financial assets to climate hazards. This has attracted the interest of academics who empirically analyse the pricing of climate change risks. Evidence exists for climate risks being priced in the stock, real estate, and (municipal) bond markets, although some disagreement about the results exists. Most of the studies focus on physical exposure as the single determinant of physical risk from climate change. However, substantial physical exposure to climate risk might lead to little physical risk if a socioeconomic system has a high adaptive capacity. The adaptive capacity of a socioeconomic system represents its resources available for adaptation, as well as its ability to use these resources effectively. To the best of our knowledge, previous studies have not recognized adaptive capacity as a determinant of physical risk. Additional research is needed to understand whether market participants are aware of the mitigating influence of adaptive capacity on physical risk. Hence our research question: is adaptive capacity recognized as a determinant of physical risk in financial markets? More specifically, we focus our research on the question whether adaptive capacity is priced in the municipal bond market. Previous studies have found evidence for physical risk being priced in municipal bond markets.

## 2. A short account of the research performed

We follow a previous study that found that climate risk was priced in municipal bonds issued by American counties that face risk from rising sea levels. Given this, we examine whether adaptive capacity is priced in the bonds of these municipalities as well. We expect the funding costs of municipalities with higher adaptive capacity to be lower than the funding costs of municipalities with lower adaptive capacity. Therefore, this study is a first attempt to examine whether adaptive capacity is priced. We study a sample of only American cities known to face risk from rising sea levels. Though we cannot form any general conclusions from this sample, we can at least observe whether a higher adaptive capacity would reduce funding costs for those cities at risk.

We analysed a sample of more than 9,000 municipal bonds issued by the counties wherein lie the 22 American coastal cities that are physically exposed to climate risk between 2015 and 2020. For the bonds we obtained our dependent variable issuance cost, and its components yield at issuance and gross spread. We use various bond related independent control variables such as amount issued, time to maturity, and credit risk. More crucial, we use readiness scores from the Urban Adaptation Assessment database of the University of Notre Dame as a proxy for adaptive capacity. The readiness score is not referred to as adaptive capacity in the Urban Adaptation Assessment database. Instead, it is a readiness score, which is defined as "the capacity of an urban society to mobilize adaptation investments from

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private sectors, and to target investments more effectively”. This aligns with our definition of adaptive capacity. Readiness is a score between 0 and 1. In our sample, Oakland is the city with the highest readiness score (0.799) and Los Angeles with the lowest (0.219).

### **3. Main conclusions and policy implications of the work**

We do find a significant negative relation between municipal bond issuance costs and adaptive capacity, supporting the view that adaptive capacity is indeed recognized as an offsetting determinant of physical risk faced from climate change. Furthermore, the influence of adaptive capacity is stronger for bonds with more time to maturity. We explain this by investors being more uncertain about whether observed adaptive capacity is effective in the long run and that demand for longer term bonds is lower for that reason. We conclude that adaptive capacity seems to be priced in addition to climate risk.

We acknowledge some shortcomings in our study, among which are not using a measure for adaptive capacity that was designed for climate risk and our focus on U.S. cities only. However, we do conclude from our results that cities having policies to improve adaptive capacity are likely to be rewarded by lower funding costs. This should stimulate policy makers to focus (more) on climate change adaptation such as to facilitate the adaptation of firms and people, adapt land use and protect critical public assets and services, and help firms and people cope with and recover from disasters and shocks. Policies to improve the adaptive capacity of a municipality increases the financial sustainability of that municipality as funding costs (yields) decline and the willingness to invest increases as spreads (search costs) decrease.