Moody's Analytics

ANALYSIS
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Climate Change Scenarios and MESG Climate Risk Scores

Moody's Analytics Physical Risk economic scenarios—including scenarios for the four Representative Concentration Pathways by the Intergovernmental Panel on Climate Change, and the Hong Kong Monetary Authority physical scenario based off of the RCP temperature pathways—are available for all countries in the Global Macroeconomic Model. We constructed these scenarios by adjusting the reference scenario GDP paths for the impact of chronic physical risk implied by the corresponding climate pathway over the full forecast horizon, through 2100.

Moody's ESG sovereign climate risk scores measure country-level physical risk exposure from floods, heat stress, hurricanes and typhoons, sea-level rise, water stress, and wildfires on population, GDP purchasing power parity, and agricultural area. This paper illustrates how sovereign climate risk scores can be incorporated into Physical Risk economic scenarios as an enhancement.

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BY CHRIS LAFAKIS, JANET LEE AND PETR ZEMCIK

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We first introduce the MESG sovereign climate risk scores and discuss our current methodology of creating the Physical Risk economic scenario. We then present our correlation study and regression results by linking the sovereign climates scores to the physical risk damage estimates. This allows us to integrate the MESG sovereign climate risk scores into the Physical Risk economic scenarios. In the conclusion, we summarize our findings and discuss the benefits of incorporating sovereign climate risk scores into economic scenarios. These scores enable us to conduct Physical Risk economic scenarios without relying solely on chronic physical risk estimates.

Moody's ESG sovereign climate risk scores[1]

Methodology

Moody's ESG sovereign climate risk scores measure sovereign physical climate risk exposure from six climate hazards based on population, GDP purchasing power parity, and agricultural area.

These scores are generated by first identifying populated areas of a country that have high exposure to each climate hazard and then identifying the total and relative portion of population, GDP purchasing power parity, and agricultural area in these highly exposed areas.

1 "Measuring What Matters: A New Approach to Assessing Sovereign Climate Risk," J. Naviaux et al., Moody's Analytics, December 2020. Moody's ESG / Insights & Analysis / Measuring What Matters: A New Approach to Assessing Sovereign Climate Risk

We identify areas as high risk from each hazard if they meet the following criteria:

Floods: Exposed to at least 0.2 meter of flooding during a 1-in-100-year pluvial or fluvial flood event.

Heat stress: Exposed to relatively high fluctuations in temperature extremes compared with the global average.

Hurricanes and typhoons: Situated in the regular path of cyclones.

Sea-level rise: Exposed to at least some shoreline flooding during a 1-in-100-year coastal flood event.

Water stress: Currently experiences high water stress or water supplies are diminishing, and/or competition is expected to increase.

Wildfires: Has a high wildfire potential with sizable increases in future wildfire potential severity and high-risk days.

Three scores are available at the aggregate level:

Percent score: Aggregate total percentile score across all climate hazards based on the percent of population, GDP purchasing power parity, and agricultural area exposed.

Absolute score: Absolute aggregate total percentile score across all climate hazards based on the absolute sum measures of population, GDP purchasing power parity, and agricultural area exposed.

Final score: Total aggregate percentile score across all climate hazards based on both the percent and absolute scores.

As shown in Charts 1 and 2, incorporating both the absolute and percent exposure into the final score can have large impacts on the rankings, compared with the score using only the percent exposure. Countries with large populations and wealthy economies see their scores go up significantly when factoring in the total exposure. Take the U.S. as an example. Its risk score based on percent exposure is 49.2, but its final score is 98.4, driven by its high absolute exposure to climate risks in terms of population, GDP and agricultural area. That is because the U.S.'s percent score is normalized for the size of its economy, whereas its absolute score is not. In contrast, Belize, which faces very high risk from several climate hazards, has a high percent score of 94.7, but due to its small population, GDP and agricultural area, its final score is only 46.5, moving it to the lower half of the risk distribution. For countries such as Denmark and the Philippines, the two scores are very similar and factoring in the absolute exposure does not have a material impact on their climate risk rankings. Denmark has a percent score of 16 and a final score of 16.6, while the Philippines has a percent score of 97.3 and a final score of 99.5. The key reason for this variation is the difference in the population of these two countries. Denmark's small population and the Philippines' large population allow these two countries to maintain their final risk scores at the low and high end of the rankings, respectively.

Choosing between the final score and the percent score will depend on the use case. For instance, if the goal is to get a sense of the raw amounts of social and economic capital within a sovereign that should be safe-

guarded against climate hazards, then the final score or the absolute score is the better choice since they factor in the total exposure. However, if the goal is to get a sense of the sovereign's potential ability to absorb and recover from climate shocks and stresses, the percent score is the better option, since it measures the relative exposure.

In this paper, we are interested in linking country damage functions to the MESG sovereign climate risk score. In the climate literature, damage functions estimate the relationships between climate variables and economic variables to translate the effects of physical climate risk to the economy. Since damage functions are usually measured in relative terms such as percentage of GDP, productivity or income, we believe it is more appropriate to use the MESG percent score. Our analysis presents results using both the percent score and final score, and we find that empirically, the percent score also yields slightly better outcomes.

Current methodology of constructing the Physical Risk economic scenario[2]

Moody's Analytics focuses on the following five channels through which climate change affects the economy in creating the Physical Risk scenario:

- Sea-level rise
- Human health effects
- Heat effect on labor productivity
- Agricultural productivity
- Tourism

To quantify the economic effects from these channels, we rely on the damage function estimates by Roson and Sartori (2016),[3] who employ a series of meta-analyses to establish a connection between climate change and economic outcomes. Incorporating interdisciplinary information, these estimates link temperature fluctuations to each impact channel for all major countries. This approach suits regulatory guidance well since projected temperature paths are often a key input in predicting climate change. As an example, Table 1 displays Roson and Sartori's estimated heat impacts on labor productivity by sector and country for various degree increases.

To translate temperature pathways into macroeconomic scenarios, we first create a quarterly RCP 8.5 temperature path to match the Moody's Analytics Global Model's frequency. We then overlay key economic levers in the model that shape economic scenarios to reflect the damages implied by warmer temperature (see Chart 3). Specifically, we rely on three top-line variables. First, sea-level rise affects consumption. Second, tourism changes net exports. Both directly flow into real GDP. Finally, agricultural impacts, heat stress, and

2 Moody's Analytics has used this methodology to produce the Physical Risk scenarios for Network for Greening the Financial System, HKMA, and the Bank of England's Climate Biennial Exploratory Scenario. For more details, see "Climate Risk Macroeconomic Forecasting," J. Licari et al., Moody's Analytics, January 2021; "Macroeconomic Expansion of the HKMA Climate Change Stress Test," M. DiNatale et al., Moody's Analytics, June 2021; and "Macroeconomic Expansion of the Bank of England Climate Biennial Exploratory Scenario," M. Brisson et al., Moody's Analytics, July 2021. https://www.economy.com/products/alternative-scenarios/scenarios-climate-change and https://www.economy.com/databuffet/preview/reference

3 Roberto Roson and Martina Sartori, "Estimation of Climate Change Damage Functions for 140 Regions in the GTAP9 Database," World Bank Group Policy Research Working Paper 7728, June 2016.

other human health effects all have productivity effects that flow into industry contributions to overall GDP and disposable income. Once these central variables are in place, they then cascade through the rest of the Global Model to influence broad outcomes ranging from unemployment to housing prices.

The time series of overlays are weighted averages of the impact channels per degree of warming, with the weights being the global mean temperature increases in the scenarios, assuming a linear impact. For example, if a temperature increase is 1.4°C in a given quarter of a scenario, we added 60% of the impact estimate for a 1°C change and 40% of the 2°C estimate to determine the change in the impact channel relative to the baseline in that quarter. In calculating the productivity impact caused by heat stress and changes in agricultural productivity, because these are largely sector-specific shocks, we need an additional step to account for the industrial composition of a country. For agricultural productivity, once we have a time series of calculated deviations from the baseline, we then multiply those by the agricultural share of each economy. Once a time series of impacts has been calculated for each sector—agriculture, manufacturing and services—we then multiply that series by the size of that sector relative to the size of the overall economy. After calculating a time series for the three channels through which climate change affects productivity and adjusting them to account for their relevant industrial share, these impact channels are aggregated into a single time series overlay for real potential productivity.

Enhancing the current approach with the MESG sovereign climate risk scores

Moody's Analytics quantifies physical risk by leveraging country-specific damage functions as presented by Roson and Sartori. If these functions can be reasonably predicted by the MESG sovereign climate risk scores, the current approach can be enhanced by replacing the country-specific damage functions with a set of damage functions estimated based on the MESG sovereign climate risk scores.

The main benefit of integrating the MESG sovereign climate risk scores into the climate economic scenario is the ability to consider alternative scenarios by adjusting our assumptions of sovereign climate risk. Sovereign physical risk may not be static over time, and the current interpolation method allows for only temperature change but not change in sovereign climate risk. The MESG sovereign climate risk scores provide a mechanism to alter sovereign climate risk exposures in the climate scenarios. For instance, given a temperature pathway, we can now conduct sensitivity analysis to test what happens if sovereign climate risk is significantly above or below its current level by altering its sovereign climate risk score in the model. Moreover, when scenario-conditioned sovereign climate risk scores become available in the future, we can easily incorporate them into the climate economic scenarios as part of the climate stress-testing exercise.

Correlation study

The MESG sovereign climate risk score provides a measure of the degree of socioeconomic exposure to a high degree of projected physical climate risk. It is based on the mapping of the co-occurrence of hazards and exposures, explicitly factoring in the spatial heterogeneity of both climate hazards and people and economic activities across a country. Therefore, we expect the MESG sovereign climate risk score to correlate well with the damage estimates in Roson and Sartori. Out of Roson and Sartori's five impact channels, sea-level rise and the heat effect on labor productivity correspond directly to the sea-level rise and heat stress climate hazard that underpin the MESG climate risk score. For the human health effects impact channel, Roson and Sartori considered some vector-borne diseases (malaria, dengue, schistosomiasis), heat- and cold-related diseases, and diarrhea, which correspond to the heat stress and water stress climate hazard in

the MESG climate risk score. For the agricultural productivity impact channel, the MESG climate risk score assesses exposure of agricultural areas to all six climate hazards, capturing the critical risks to agricultural productivity. Finally, for the tourism channel, all six climate hazards that underpin the MESG climate risk score can influence tourism attractiveness.

To investigate whether MESG sovereign physical risk scores may be useful in predicting economic damages, we first computed the correlations between the Roson and Sartori impact estimates and MESG sovereign climate risk scores by impact channel and temperature fluctuation. Table 2 summarizes the results. Except for the sea-level rise channel, we found negative correlations between -0.3 to -0.7 for all impact channels and most temperature fluctuations. This is consistent with the intuition that countries with higher climate risk scores face greater physical climate risks and experience larger economic damages. The correlations are also stronger for the normalized percent scores than the final scores. For the sea-level rise channel, since the Roson and Sartori damage estimates are near zero for most countries, it is not surprising that the correlations are very low.

Regression study

Next, we sought to represent the Roson and Sartori impact estimates as a function of the country climate risk score and temperature fluctuation for each impact channel c:

$$Country\ Damages_{it}^{c} = F^{c}(\text{CountryScore}_{i}, \text{TempChange}_{t})$$

For the health impact channel, since the Roson and Sartori impact estimates are available only for +10C, we estimated the following linear regression without using temperature change as an explanatory variable:

$$Country\ Damages_{it}^{health} = \alpha + \beta * \text{CountryScore}_{i} + \kappa * (\text{CountryScore}_{i} * \text{Georegion}) + e_{it}$$

For all other impact channels, we estimated the following linear regression for each impact channel c:

$$Country\ Damages_{it}^{c} = \alpha + \beta * \text{CountryScore}_{i} + \gamma * \text{TempChange}_{t} + \theta * (\text{CountryScore}_{i} * \text{TempChange}_{t}) + \lambda * (\text{TempChange}_{t} * \text{Georegion}_{i}) + \kappa * (\text{CountryScore}_{i} * \text{Georegion}) + e_{it}$$

According to Roson and Sartori, there will be winners and losers as the climate changes. Charts 4 and 5 illustrate this phenomenon for a selected number of countries in the agricultural impact channel. As temperature rises, agricultural productivity increases in Sweden, the U.K. and Russia but declines in Cambodia (not shown), Australia, Hong Kong and Japan. The impact estimates are positive and upward-sloping with temperature change for countries that benefit, but they are negative and downward-sloping for countries that lose. Moreover, winners and losers do not always align with the climate risk score. For example, Cambodia has a final climate risk score of 34.2, but it loses big in the agricultural channel with climate change, while Russia has a final risk score of 62.6, but it is expected to gain.

Therefore, we needed a richer model beyond a basic linear model with only country risk score and temperature to capture the bifurcation of impact estimates. We introduced a georegion dummy variable into the regression because the economic effects of climate change can vary significantly across regions. The georegion dummy and interaction terms into the models allow the impact estimates to vary nonlinearly in a dimension other than country risk score and temperature. Additionally, adding the georegion dummy improves model fit significantly and ensures that the signs of the coefficient on the temperature change variable and country score variable align with our intuition. The georegions are East Asia and Pacific, Eastern

Europe and Central Asia, the EU, the rest of Europe, Latin America and the Caribbean, the Middle East and North Africa, North America, and South Asia.

Tables 3 through 7 summarize the regression results for each impact channel using either the final score or the percent score as the country climate risk score. In general, using the percent score leads to better in-sample fits with a higher adjusted R-squared. This makes sense because the percent scores are normalized for the size of the economy, as are the Roson and Sartori impact estimates. After taking the interaction terms into consideration, the effects of the country climate risk score are mostly negative, regardless of which score we used as the country climate risk score. The poor in-sample fits of the sea-level rise impact channel regression are consistent with the low correlations we discussed earlier. This is likely due to the large number of zeros in the sea-level rise impact estimates from the Roson and Sartori study.

Next, to compute the GDP and productivity overlays for the RCP 8.5 temperature pathway, we aggregated up the regression predictions for each impact channel except the sea-level rise channel because the model fits are poor.

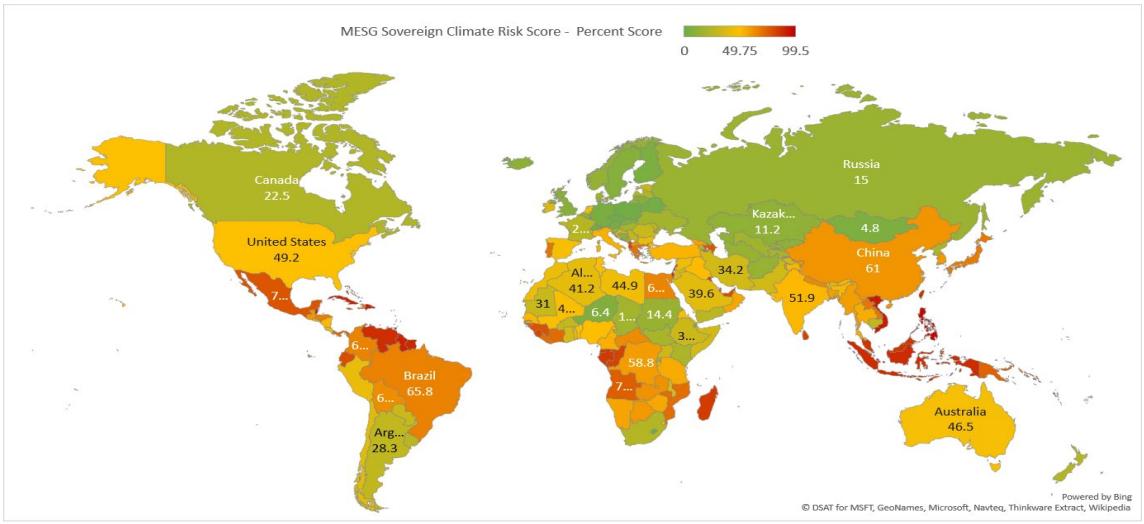
Charts 6 through 13 show the comparison between the regression-based aggregate overlay estimates and the interpolation-based aggregate overlay estimates (current methodology) for the U.K. and Hong Kong. For the tourism channel, the regression approach captures the bifurcation of impact on GDP: The predicted impact on U.K. GDP is positive and increases as the temperature rises, while the impact on Hong Kong GDP is negative and decreases as the temperature rises. For the productivity channel, the regression approach can also capture the negative and decreasing impact on productivity for both the U.K. and Hong Kong. Moreover, which score to use as the country climate risk may not matter much because the regression predictions are very similar.

Conclusion

We have provided empirical evidence to show that the Roson and Sartori country-specific climate damage estimates are negatively correlated with Moody's ESG sovereign climate risk scores, and they can be estimated as functions of the sovereign climate risk scores and temperature changes. Replacing our current interpolation method with the estimated functions will allow us to incorporate MESG sovereign climate risk scores directly into Moody's Analytics Physical Risk economic scenarios.

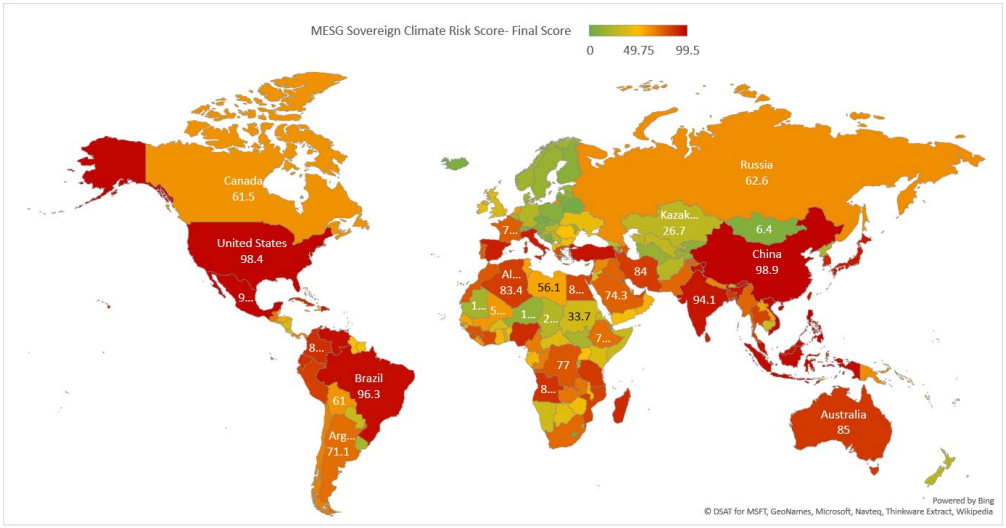
The benefits of integrating sovereign climate risk scores into economic scenarios are twofold. First, sovereign physical risk exposure may not be static over time. Our current interpolation method can account for only temperature change. The sovereign climate risk scores provide a way for us to account for change in sovereign climate risk exposure as well. Second, when scenario-conditioned sovereign climate risk scores become available in the future, we will be able to easily incorporate them into economic scenarios to further enhance our climate stress-test framework. In future work, we intend to expand our analysis to investigate how to incorporate MESG subnational climate risk scores into economic scenarios to account for subnational climate risk exposure.

Chart 1: Climate Risk Score–Percent



Source: Moody's Analytics

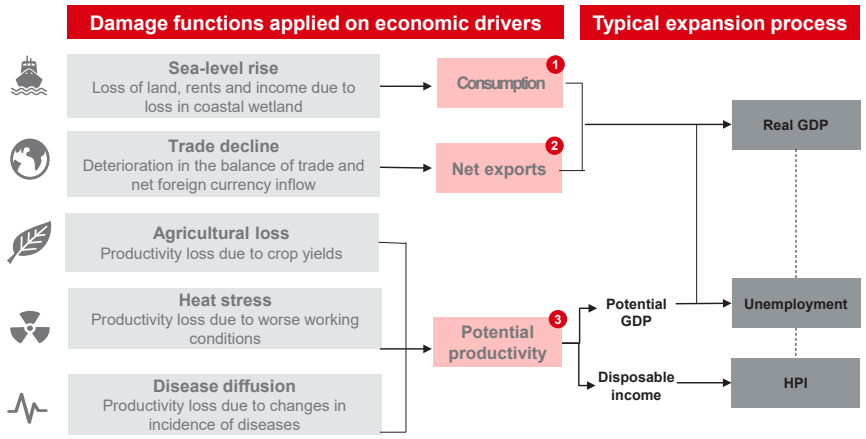
Chart 2: Climate Risk Score–Final



Source: Moody's Analytics

Chart 3: Physical Risk Impact Channels

Roson-Sartori damage function



Three economic drivers are affected:

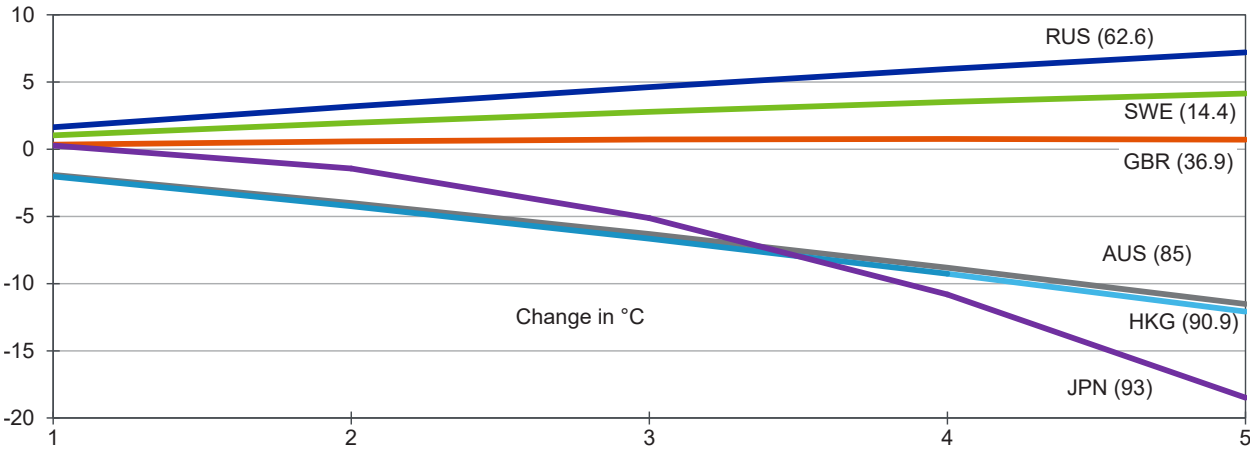
- **Consumption:** Sea-level rise causes a loss in productive lands on the coast and related rent income, which translates into loss of income and consumption.
- **Net exports:** High temperature increases reduce tourism business and export services.
- **Potential productivity:** Labor productivity is affected by heat stress and diffusion of vector-borne diseases; lower crop yields may result.

Consumption and net exports are GDP components having direct effects on output. Productivity affects disposable income and potential GDP.

Source: Moody's Analytics

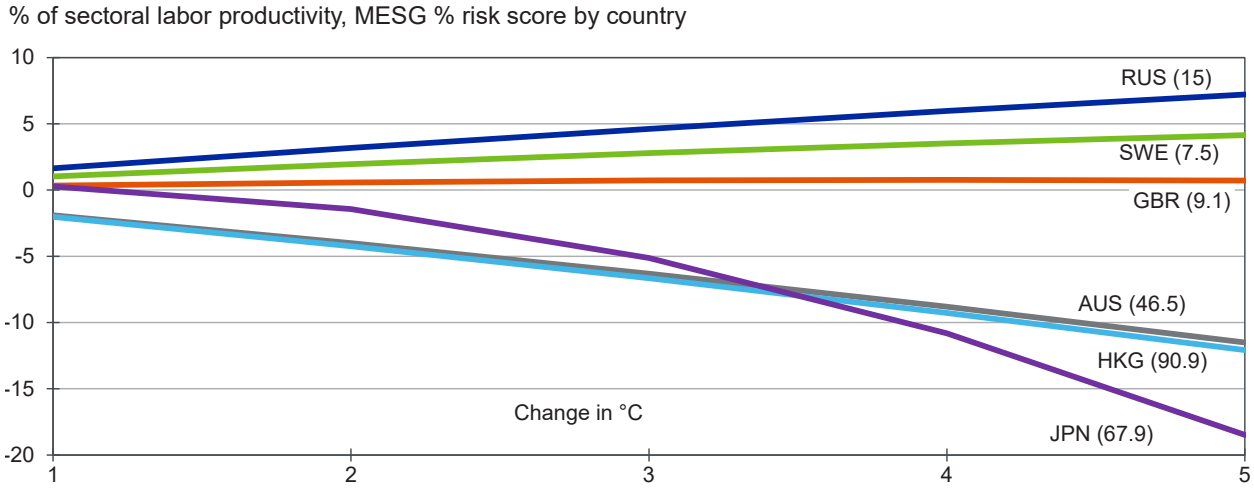
Chart 4: Agriculture, Final Score

% of sectoral labor productivity, MESG final risk score by country



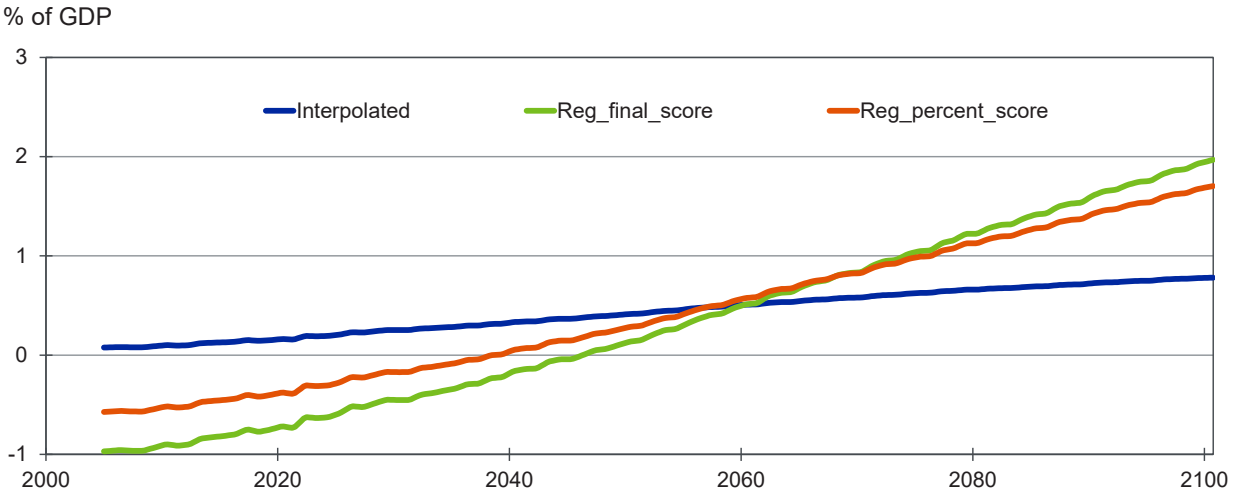
Sources: Roson and Sartori (2016), Moody's Analytics

Chart 5: Agriculture, Climate Percent Score



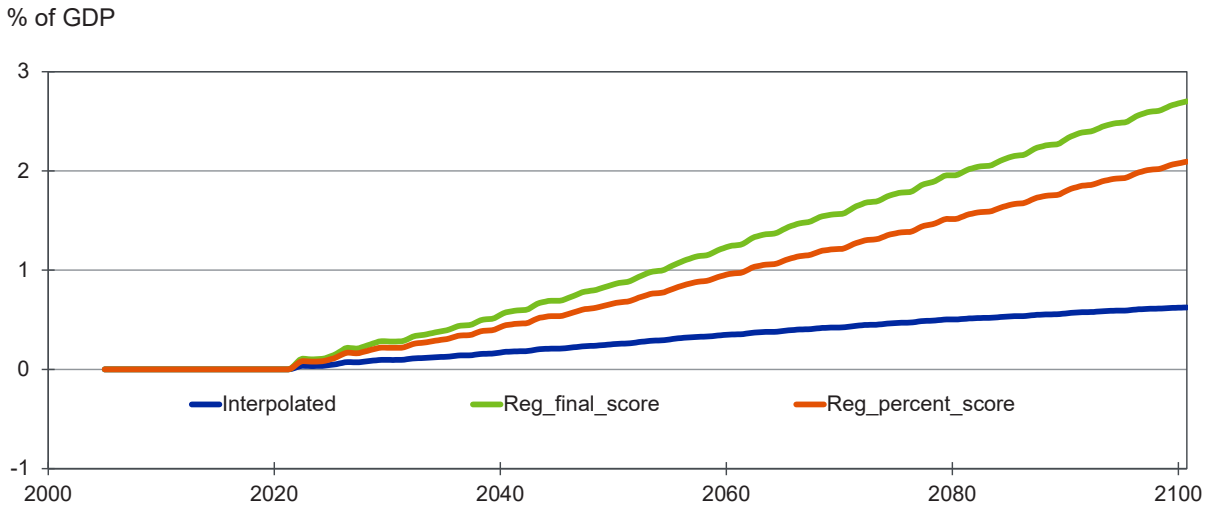
Sources: Roson and Sartori (2016), Moody's Analytics

Chart 6: U.K. GDP Overlay Pre-Lineup



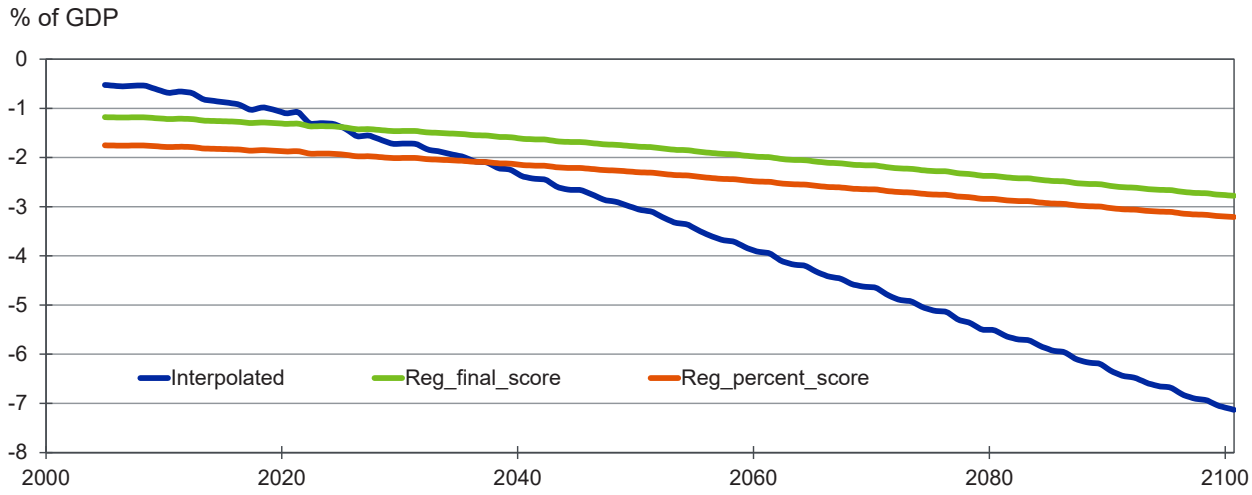
Source: Moody's Analytics

Chart 7: U.K. GDP Overlay Post-Lineup



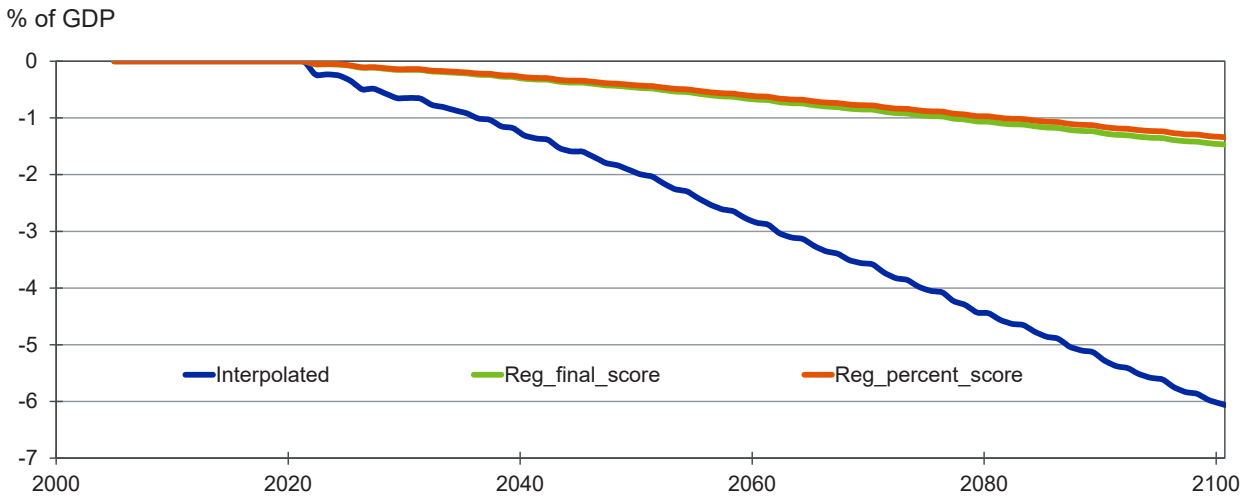
Source: Moody's Analytics

Chart 8: HK GDP Overlay Pre-Lineup



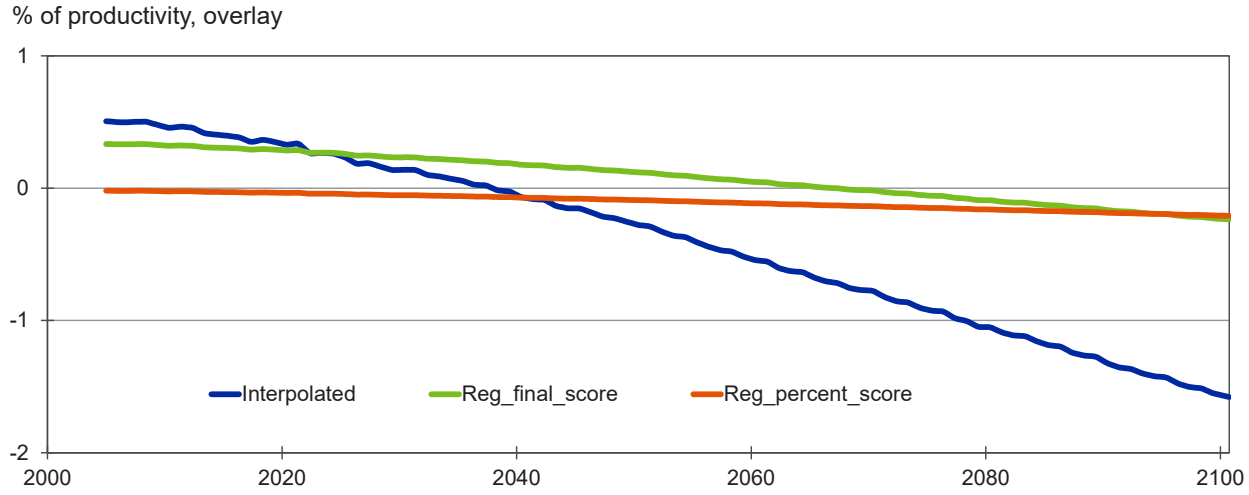
Source: Moody's Analytics

Chart 9: HK GDP Overlay Post-Lineup



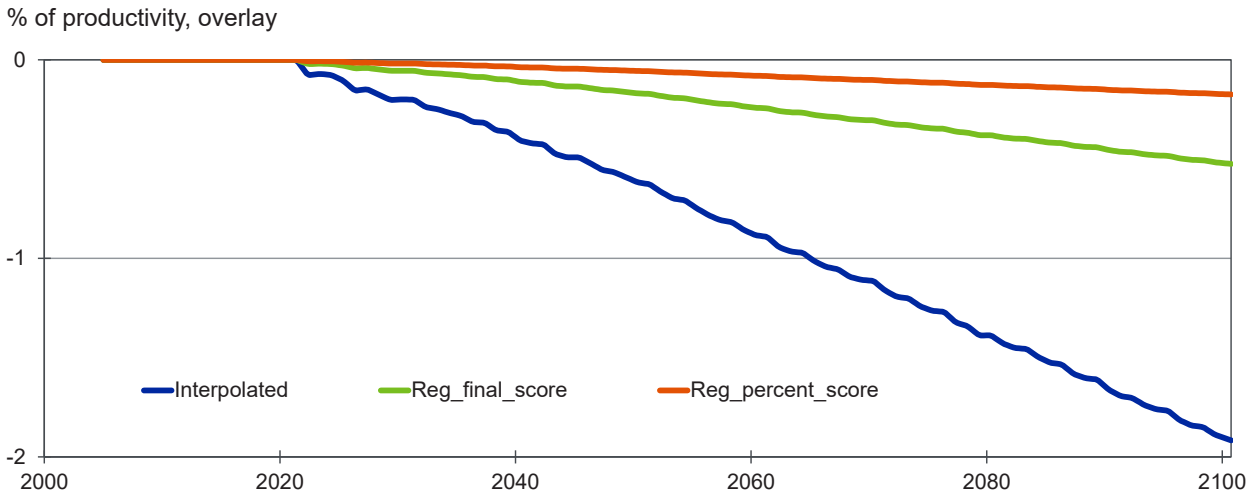
Source: Moody's Analytics

Chart 10: U.K. Productivity, Pre-Lineup



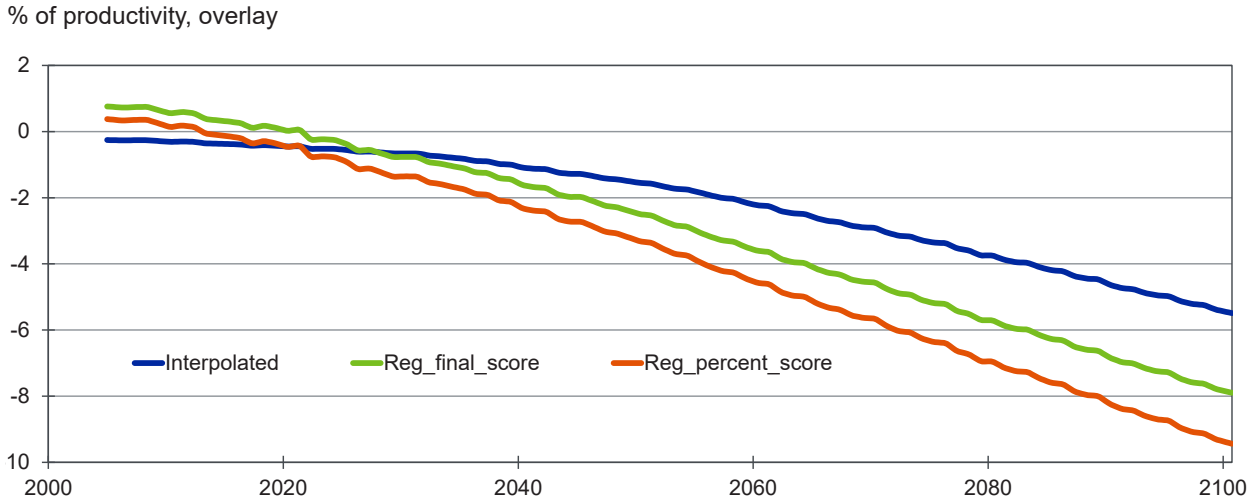
Source: Moody's Analytics

Chart 11: U.K. Productivity, Post-Lineup



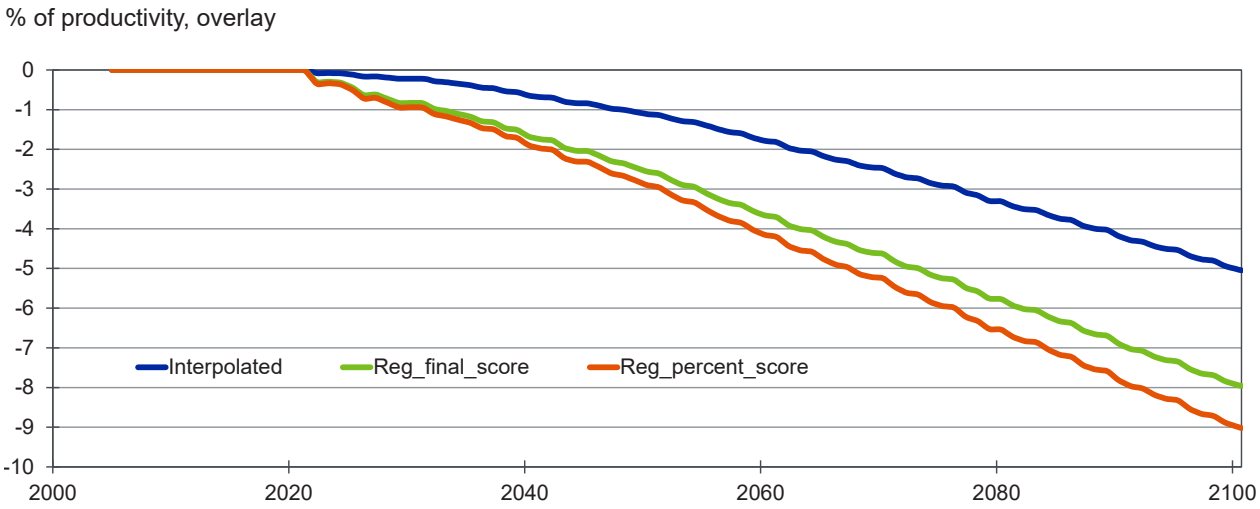
Source: Moody's Analytics

Chart 12: HK Productivity, Pre-Lineup



Source: Moody's Analytics

Chart 13: HK Productivity, Post-Lineup



Source: Moody's Analytics

Table 1: Heat Impacts on Labor Productivity

(By sector, percentage change)

Country		Agriculture					Manufacturing					Services				
number	Code	+1°C	+2°C	+3°C	+4°C	+5°C	+1°C	+2°C	+3°C	+4°C	+5°C	+1°C	+2°C	+3°C	+4°C	+5°C
1	AUS	0.00%	0.00%	-1.09%	-2.86%	-5.55%	0.00%	0.00%	0.00%	-0.02%	-0.87%	0.00%	0.00%	0.00%	0.00%	0.00%
4	CHN	-1.37%	-3.01%	-5.13%	-7.31%	-9.90%	0.00%	-0.51%	-1.46%	-2.69%	-4.17%	0.00%	0.00%	-0.06%	-0.58%	-1.33%
5	HKG	-3.76%	-7.69%	-12.36%	-17.44%	-23.14%	-1.95%	-3.99%	-6.52%	-9.13%	-12.25%	-0.39%	-1.44%	-2.96%	-4.65%	-6.63%
17	SGP	-10.87%	-22.03%	-33.49%	-45.25%	-57.34%	-5.96%	-12.09%	-18.37%	-24.82%	-31.46%	-0.60%	-4.21%	-8.73%	-13.38%	-18.16%
28	USA	0.00%	0.00%	-0.59%	-1.91%	-3.66%	0.00%	0.00%	0.00%	0.00%	-0.51%	0.00%	0.00%	0.00%	0.00%	0.00%
78	GBR	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Sources: Table A6, Roson and Sartori (2016); Moody's Analytics

Table 2: Correlations of Roson and Sartori Estimates and MESG Sovereign Climate Risk Scores

Agricultural impact channel	+1°C	+2°C	+3°C	+4°C	+5°C
Final score	-0.46	-0.5	-0.52	-0.53	-0.54
Percent score	-0.60	-0.63	-0.65	-0.66	-0.65

Heat impact channel	Agriculture sector					Manufacturing sector					Service sector				
	+1°C	+2°C	+3°C	+4°C	+5°C	+1°C	+2°C	+3°C	+4°C	+5°C	+1°C	+2°C	+3°C	+4°C	+5°C
-1	-0.31	-0.33	-0.35	-0.37	-0.38	-0.26	-0.28	-0.30	-0.33	-0.34	-0.20	-0.24	-0.26	-0.28	-0.31
-1	-0.51	-0.54	-0.55	-0.57	-0.58	-0.45	-0.47	-0.50	-0.53	-0.55	-0.24	-0.36	-0.42	-0.46	-0.50

Sea-level rise impact channel	2050					2100				
	+1°C	+2°C	+3°C	+4°C	+5°C	+1°C	+2°C	+3°C	+4°C	+5°C
-1	-0.09	-0.09	-0.10	-0.10	-0.10	-0.09	-0.10	-0.10	-0.10	-0.10
-1	-0.18	-0.19	-0.19	-0.20	-0.20	-0.18	-0.19	-0.19	-0.20	-0.20

Tourism impact channel	+1°C	+2°C	+3°C	+4°C	+5°C
-1	0.03	-0.05	-0.18	-0.36	-0.47
-1	-0.28	-0.34	-0.44	-0.53	-0.47

Health impact channel	+1°C
-1	-0.30
-1	-0.31

Source: Moody's Analytics

Table 3: Regression Results–Health Impact Channel

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.1370	0.0289	-4.74	0.00
Final score	-0.0076	0.0007	-11.48	0.00
Final score:georegionEast Asia and Pacific	0.0065	0.0007	9.85	0.00
Final score:georegionEastern Europe and Central Asia	0.0079	0.0010	7.76	0.00
Final score:georegionEurope	0.0113	0.0035	3.22	0.00
Final score:georegionEuropean Union	0.0093	0.0008	11.54	0.00
Final score:georegionLatin America and the Caribbean	0.0073	0.0007	10.95	0.00
Final score:georegionMiddle East and North Africa	0.0025	0.0007	3.31	0.00
Final score:georegionNorth America	0.0081	0.0013	6.19	0.00
Final score:georegionSouth Asia	0.0031	0.0009	3.35	0.00

R-squared	0.7135
Adjusted R-squared	0.6896
Residual standard error	0.1412
Degree of freedom	108
F-Statistic	29.88
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.1481	0.0271	-5.46	0.00
Percent score	-0.0087	0.0007	-11.86	0.00
Percent score:georegionEast Asia and Pacific	0.0077	0.0007	10.52	0.00
Percent score:georegionEastern Europe and Central Asia	0.0096	0.0011	8.75	0.00
Percent score:georegionEurope	0.0197	0.0087	2.26	0.03
Percent score:georegionEuropean Union	0.0115	0.0010	11.52	0.00
Percent score:georegionLatin America and the Caribbean	0.0087	0.0007	11.97	0.00
Percent score:georegionMiddle East and North Africa	0.0029	0.0008	3.50	0.00
Percent score:georegionNorth America	0.0099	0.0025	3.91	0.00
Percent score:georegionSouth Asia	0.0022	0.0011	1.92	0.06

R-squared	0.7440
Adjusted R-squared	0.7227
Residual standard error	0.1334
Degree of freedom	108
F-Statistic	34.88
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 4: Regression Results–Agricultural Crop Yield Impact Channel

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	0.7014	0.5918	1.19	0.24
Final score	0.0222	0.0125	1.78	0.08
temp	-2.9445	0.2343	-12.57	0.00
Final score:temp	-0.0151	0.0031	-4.89	0.00
Final score:georegionEast Asia and Pacific	-0.0152	0.0111	-1.37	0.17
Final score:georegionEastern Europe and Central Asia	-0.0438	0.0147	-2.98	0.00
Final score:georegionEurope	-0.0187	0.0495	-0.38	0.71
Final score:georegionEuropean Union	-0.0278	0.0117	-2.38	0.02
Final score:georegionLatin America and the Caribbean	-0.0075	0.0114	-0.66	0.51
Final score:georegionMiddle East and North Africa	-0.0145	0.0139	-1.05	0.30
Final score:georegionNorth America	-0.0383	0.0246	-1.56	0.12
Final score:georegionSouth Asia	-0.0212	0.0178	-1.19	0.23
temp:georegionEast Asia and Pacific	1.2506	0.2334	5.36	0.00
temp:georegionEastern Europe and Central Asia	3.3113	0.2424	13.66	0.00
temp:georegionEurope	3.5412	0.3879	9.13	0.00
temp:georegionEuropean Union	2.9419	0.1934	15.21	0.00
temp:georegionLatin America and the Caribbean	0.5821	0.2251	2.59	0.01
temp:georegionMiddle East and North Africa	1.3754	0.2888	4.76	0.00
temp:georegionNorth America	5.1250	0.5942	8.62	0.00
temp:georegionSouth Asia	1.6680	0.4223	3.95	0.00

R-squared	0.7896
Adjusted R-squared	0.7826
Residual standard error	2.825
Degree of freedom	570
F-Statistic	112.6
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	0.8151	0.5260	1.55	0.12
Percent score	0.0366	0.0132	2.78	0.01
temp	-2.9305	0.2072	-14.14	0.00
Percent score:temp	-0.0217	0.0032	-6.85	0.00
Percent score:georegionEast Asia and Pacific	-0.0412	0.0118	-3.50	0.00
Percent score:georegionEastern Europe and Central Asia	-0.0604	0.0149	-4.06	0.00
Percent score:georegionEurope	0.0725	0.1215	0.60	0.55
Percent score:georegionEuropean Union	-0.0602	0.0136	-4.43	0.00
Percent score:georegionLatin America and the Caribbean	-0.0298	0.0119	-2.50	0.01
Percent score:georegionMiddle East and North Africa	-0.0233	0.0137	-1.70	0.09
Percent score:georegionNorth America	-0.0762	0.0414	-1.84	0.07
Percent score:georegionSouth Asia	-0.0149	0.0199	-0.75	0.45
temp:georegionEast Asia and Pacific	1.7263	0.2129	8.11	0.00
temp:georegionEastern Europe and Central Asia	3.3865	0.2143	15.81	0.00
temp:georegionEurope	3.1424	0.3651	8.61	0.00
temp:georegionEuropean Union	3.0656	0.1760	17.42	0.00
temp:georegionLatin America and the Caribbean	1.0116	0.2072	4.88	0.00
temp:georegionMiddle East and North Africa	1.5057	0.2447	6.15	0.00
temp:georegionNorth America	4.6894	0.4873	9.62	0.00
temp:georegionSouth Asia	1.3289	0.3505	3.79	0.00

R-squared	0.8229
Adjusted R-squared	0.8170
Residual standard error	2.592
Degree of freedom	570
F-Statistic	139.4
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 5: Regression Results–Tourism Impact Channel

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-2.7094	0.4518	-6.00	0.00
Final score	-0.0066	0.0095	-0.69	0.49
temp	0.9531	0.1789	5.33	0.00
Final score:temp	-0.0072	0.0024	-3.06	0.00
Final score:georegionEast Asia and Pacific	0.0247	0.0085	2.91	0.00
Final score:georegionEastern Europe and Central Asia	0.0210	0.0112	1.87	0.06
Final score:georegionEurope	0.0476	0.0378	1.26	0.21
Final score:georegionEuropean Union	0.0227	0.0089	2.55	0.01
Final score:georegionLatin America and the Caribbean	0.0344	0.0087	3.95	0.00
Final score:georegionMiddle East and North Africa	0.0419	0.0106	3.96	0.00
Final score:georegionNorth America	0.0324	0.0188	1.73	0.08
Final score:georegionSouth Asia	0.0289	0.0136	2.13	0.03
temp:georegionEast Asia and Pacific	-0.7173	0.1782	-4.03	0.00
temp:georegionEastern Europe and Central Asia	0.1559	0.1851	0.84	0.40
temp:georegionEurope	0.0796	0.2962	0.27	0.79
temp:georegionEuropean Union	0.0930	0.1477	0.63	0.53
temp:georegionLatin America and the Caribbean	-0.7341	0.1718	-4.27	0.00
temp:georegionMiddle East and North Africa	-0.8922	0.2205	-4.05	0.00
temp:georegionNorth America	-0.0135	0.4537	-0.03	0.98
temp:georegionSouth Asia	-0.2730	0.3224	-0.85	0.40

R-squared	0.2864
Adjusted R-squared	0.2626
Residual standard error	2.157
Degree of freedom	570
F-Statistic	12.04
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-1.3895	0.4313	-3.22	0.00
Percent score	-0.0313	0.0108	-2.90	0.00
temp	0.7540	0.1699	4.44	0.00
Percent score:temp	-0.0055	0.0026	-2.11	0.04
Percent score:georegionEast Asia and Pacific	0.0286	0.0096	2.96	0.00
Percent score:georegionEastern Europe and Central Asia	0.0236	0.0122	1.93	0.05
Percent score:georegionEurope	0.1018	0.0996	1.02	0.31
Percent score:georegionEuropean Union	0.0240	0.0112	2.15	0.03
Percent score:georegionLatin America and the Caribbean	0.0234	0.0098	2.40	0.02
Percent score:georegionMiddle East and North Africa	0.0453	0.0112	4.04	0.00
Percent score:georegionNorth America	0.0458	0.0340	1.35	0.18
Percent score:georegionSouth Asia	0.0365	0.0163	2.24	0.03
temp:georegionEast Asia and Pacific	-0.6377	0.1746	-3.65	0.00
temp:georegionEastern Europe and Central Asia	0.1262	0.1757	0.72	0.47
temp:georegionEurope	-0.1095	0.2994	-0.37	0.71
temp:georegionEuropean Union	0.0282	0.1443	0.20	0.85
temp:georegionLatin America and the Caribbean	-0.4068	0.1699	-2.39	0.02
temp:georegionMiddle East and North Africa	-0.7782	0.2006	-3.88	0.00
temp:georegionNorth America	-0.1303	0.3996	-0.33	0.74
temp:georegionSouth Asia	-0.2881	0.2874	-1.00	0.32

R-squared	0.3070
Adjusted R-squared	0.2839
Residual standard error	2.125
Degree of freedom	570
F-Statistic	13.29
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 6: Regression Results–Heat Stress Impact Channel

Agriculture sector

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	0.1450	1.8813	0.08	0.94
Final score	0.0239	0.0397	0.60	0.55
temp	-4.1917	0.7448	-5.63	0.00
Final score:temp	-0.0139	0.0098	-1.42	0.16
Final score:georegionEast Asia and Pacific	-0.0277	0.0354	-0.78	0.43
Final score:georegionEastern Europe and Central Asia	0.0020	0.0468	0.04	0.97
Final score:georegionEurope	0.0013	0.1575	0.01	0.99
Final score:georegionEuropean Union	0.0092	0.0372	0.25	0.80
Final score:georegionLatin America and the Caribbean	0.0440	0.0362	1.22	0.22
Final score:georegionMiddle East and North Africa	0.0020	0.0441	0.05	0.96
Final score:georegionNorth America	-0.0160	0.0782	-0.21	0.84
Final score:georegionSouth Asia	-0.0491	0.0566	-0.87	0.39
temp:georegionEast Asia and Pacific	-0.6517	0.7421	-0.88	0.38
temp:georegionEastern Europe and Central Asia	4.2400	0.7706	5.50	0.00
temp:georegionEurope	4.2957	1.2332	3.48	0.00
temp:georegionEuropean Union	4.1404	0.6148	6.73	0.00
temp:georegionLatin America and the Caribbean	-1.0509	0.7154	-1.47	0.14
temp:georegionMiddle East and North Africa	1.4363	0.9182	1.56	0.12
temp:georegionNorth America	4.8365	1.8891	2.56	0.01
temp:georegionSouth Asia	0.3526	1.3425	0.26	0.79

R-squared	0.5250
Adjusted R-squared	0.5092
Residual standard error	8.98
Degree of freedom	570
F-Statistic	33.16
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-1.1852	1.6957	-0.70	0.48
Percent score	0.0739	0.0424	1.74	0.08
temp	-2.1567	0.6681	-3.23	0.00
Percent score:temp	-0.0632	0.0102	-6.21	0.00
Percent score:georegionEast Asia and Pacific	-0.0806	0.0379	-2.13	0.03
Percent score:georegionEastern Europe and Central Asia	0.0705	0.0480	1.47	0.14
Percent score:georegionEurope	0.1004	0.3918	0.26	0.80
Percent score:georegionEuropean Union	0.0763	0.0439	1.74	0.08
Percent score:georegionLatin America and the Caribbean	-0.0334	0.0384	-0.87	0.39
Percent score:georegionMiddle East and North Africa	-0.0202	0.0441	-0.46	0.65
Percent score:georegionNorth America	0.0191	0.1336	0.14	0.89
Percent score:georegionSouth Asia	-0.0575	0.0640	-0.90	0.37
temp:georegionEast Asia and Pacific	0.8073	0.6863	1.18	0.24
temp:georegionEastern Europe and Central Asia	3.1199	0.6908	4.52	0.00
temp:georegionEurope	2.6056	1.1770	2.21	0.03
temp:georegionEuropean Union	2.8627	0.5673	5.05	0.00
temp:georegionLatin America and the Caribbean	0.7436	0.6681	1.11	0.27
temp:georegionMiddle East and North Africa	2.2402	0.7888	2.84	0.00
temp:georegionNorth America	3.5852	1.5711	2.28	0.02
temp:georegionSouth Asia	0.3926	1.1300	0.35	0.73

R-squared	0.5887
Adjusted R-squared	0.5750
Residual standard error	8.356
Degree of freedom	570
F-Statistic	42.95
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 6: Regression Results–Heat Stress Impact Channel (Cont.)

Manufacturing sector

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	0.1510	1.0121	0.15	0.88
Final score	0.0191	0.0213	0.90	0.37
temp	-1.8626	0.4007	-4.65	0.00
Final score:temp	-0.0062	0.0053	-1.18	0.24
Final score:georegionEast Asia and Pacific	-0.0172	0.0190	-0.91	0.37
Final score:georegionEastern Europe and Central Asia	-0.0070	0.0252	-0.28	0.78
Final score:georegionEurope	-0.0093	0.0847	-0.11	0.91
Final score:georegionEuropean Union	-0.0041	0.0200	-0.21	0.84
Final score:georegionLatin America and the Caribbean	0.0323	0.0195	1.66	0.10
Final score:georegionMiddle East and North Africa	-0.0063	0.0237	-0.27	0.79
Final score:georegionNorth America	-0.0160	0.0421	-0.38	0.70
Final score:georegionSouth Asia	-0.0214	0.0304	-0.70	0.48
temp:georegionEast Asia and Pacific	-0.7991	0.3992	-2.00	0.05
temp:georegionEastern Europe and Central Asia	1.9245	0.4146	4.64	0.00
temp:georegionEurope	1.8935	0.6634	2.85	0.00
temp:georegionEuropean Union	1.8619	0.3308	5.63	0.00
temp:georegionLatin America and the Caribbean	-0.7170	0.3849	-1.86	0.06
temp:georegionMiddle East and North Africa	0.5418	0.4940	1.10	0.27
temp:georegionNorth America	2.2255	1.0163	2.19	0.03
temp:georegionSouth Asia	-0.2799	0.7223	-0.39	0.70

R-squared	0.4703
Adjusted R-squared	0.4527
Residual standard error	4.831
Degree of freedom	570
F-Statistic	26.64
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.8864	0.9263	-0.96	0.34
Percent score	0.0582	0.0232	2.51	0.01
temp	-0.7477	0.3649	-2.05	0.04
Percent score:temp	-0.0341	0.0056	-6.13	0.00
Percent score:georegionEast Asia and Pacific	-0.0569	0.0207	-2.74	0.01
Percent score:georegionEastern Europe and Central Asia	0.0259	0.0262	0.99	0.32
Percent score:georegionEurope	0.0473	0.2140	0.22	0.83
Percent score:georegionEuropean Union	0.0292	0.0240	1.22	0.22
Percent score:georegionLatin America and the Caribbean	-0.0131	0.0210	-0.62	0.53
Percent score:georegionMiddle East and North Africa	-0.0300	0.0241	-1.24	0.21
Percent score:georegionNorth America	0.0001	0.0730	0.00	1.00
Percent score:georegionSouth Asia	-0.0159	0.0350	-0.46	0.65
temp:georegionEast Asia and Pacific	0.1438	0.3749	0.38	0.70
temp:georegionEastern Europe and Central Asia	1.3630	0.3773	3.61	0.00
temp:georegionEurope	1.0320	0.6429	1.61	0.11
temp:georegionEuropean Union	1.2160	0.3099	3.92	0.00
temp:georegionLatin America and the Caribbean	0.2851	0.3649	0.78	0.43
temp:georegionMiddle East and North Africa	1.1280	0.4309	2.62	0.01
temp:georegionNorth America	1.6200	0.8582	1.89	0.06
temp:georegionSouth Asia	-0.3601	0.6173	-0.58	0.56

R-squared	0.5272
Adjusted R-squared	0.5114
Residual standard error	4.564
Degree of freedom	570
F-Statistic	33.45
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 6: Regression Results–Heat Stress Impact Channel (Cont.)

Service sector

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	0.2548	0.5107	0.50	0.62
Final score	0.0143	0.0108	1.33	0.18
temp	-0.8535	0.2022	-4.22	0.00
Final score:temp	-0.0030	0.0027	-1.13	0.26
Final score:georegionEast Asia and Pacific	0.0000	0.0096	0.00	1.00
Final score:georegionEastern Europe and Central Asia	-0.0095	0.0127	-0.75	0.46
Final score:georegionEurope	-0.0126	0.0428	-0.29	0.77
Final score:georegionEuropean Union	-0.0084	0.0101	-0.83	0.41
Final score:georegionLatin America and the Caribbean	0.0115	0.0098	1.17	0.24
Final score:georegionMiddle East and North Africa	-0.0105	0.0120	-0.88	0.38
Final score:georegionNorth America	-0.0148	0.0212	-0.70	0.49
Final score:georegionSouth Asia	-0.0091	0.0154	-0.59	0.55
temp:georegionEast Asia and Pacific	-0.7565	0.2014	-3.76	0.00
temp:georegionEastern Europe and Central Asia	0.8531	0.2092	4.08	0.00
temp:georegionEurope	0.8357	0.3347	2.50	0.01
temp:georegionEuropean Union	0.8262	0.1669	4.95	0.00
temp:georegionLatin America and the Caribbean	-0.1500	0.1942	-0.77	0.44
temp:georegionMiddle East and North Africa	0.1706	0.2492	0.68	0.49
temp:georegionNorth America	1.0330	0.5128	2.02	0.04
temp:georegionSouth Asia	-0.3081	0.3644	-0.85	0.40

R-squared	0.4348
Adjusted R-squared	0.4160
Residual standard error	2.437
Degree of freedom	570
F-Statistic	23.08
p-Value	< 2.2e-16

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.5951	0.4756	-1.25	0.21
Percent score	0.0427	0.0119	3.59	0.00
temp	-0.2737	0.1874	-1.46	0.14
Percent score:temp	-0.0177	0.0029	-6.19	0.00
Percent score:georegionEast Asia and Pacific	-0.0212	0.0106	-2.00	0.05
Percent score:georegionEastern Europe and Central Asia	0.0023	0.0135	0.17	0.86
Percent score:georegionEurope	0.0183	0.1099	0.17	0.87
Percent score:georegionEuropean Union	0.0042	0.0123	0.34	0.73
Percent score:georegionLatin America and the Caribbean	-0.0091	0.0108	-0.84	0.40
Percent score:georegionMiddle East and North Africa	-0.0308	0.0124	-2.49	0.01
Percent score:georegionNorth America	-0.0103	0.0375	-0.28	0.78
Percent score:georegionSouth Asia	0.0040	0.0180	0.22	0.82
temp:georegionEast Asia and Pacific	-0.2672	0.1925	-1.39	0.17
temp:georegionEastern Europe and Central Asia	0.6251	0.1938	3.23	0.00
temp:georegionEurope	0.4445	0.3302	1.35	0.18
temp:georegionEuropean Union	0.5553	0.1591	3.49	0.00
temp:georegionLatin America and the Caribbean	0.2847	0.1874	1.52	0.13
temp:georegionMiddle East and North Africa	0.5637	0.2213	2.55	0.01
temp:georegionNorth America	0.7539	0.4407	1.71	0.09
temp:georegionSouth Asia	-0.4966	0.3170	-1.57	0.12

R-squared	0.4775
Adjusted R-squared	0.4600
Residual standard error	2.344
Degree of freedom	570
F-Statistic	27.41
p-Value	< 2.2e-16

Source: Moody's Analytics

Table 7: Regression Results–Sea-Level Rise Impact Channel

SLR 2050

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.0097	0.0898	-0.11	0.91
Final score	0.0002	0.0019	0.12	0.90
temp	0.0053	0.0356	0.15	0.88
Final score:temp	-0.0001	0.0005	-0.23	0.82
Final score:georegionEast Asia and Pacific	-0.0005	0.0017	-0.31	0.76
Final score:georegionEastern Europe and Central Asia	0.0001	0.0022	0.02	0.98
Final score:georegionEurope	0.0001	0.0075	0.01	0.99
Final score:georegionEuropean Union	0.0001	0.0018	0.08	0.93
Final score:georegionLatin America and the Caribbean	-0.0001	0.0017	-0.04	0.97
Final score:georegionMiddle East and North Africa	0.0000	0.0021	0.01	1.00
Final score:georegionNorth America	0.0001	0.0037	0.02	0.99
Final score:georegionSouth Asia	-0.0001	0.0027	-0.04	0.97
temp:georegionEast Asia and Pacific	-0.1168	0.0354	-3.30	0.00
temp:georegionEastern Europe and Central Asia	-0.0018	0.0368	-0.05	0.96
temp:georegionEurope	-0.0044	0.0589	-0.07	0.94
temp:georegionEuropean Union	-0.0055	0.0294	-0.19	0.85
temp:georegionLatin America and the Caribbean	-0.0055	0.0342	-0.16	0.87
temp:georegionMiddle East and North Africa	-0.0246	0.0438	-0.56	0.57
temp:georegionNorth America	-0.0031	0.0902	-0.04	0.97
temp:georegionSouth Asia	0.0027	0.0641	0.04	0.97

R-squared	0.1103
Adjusted R-squared	0.0806
Residual standard error	0.4287
Degree of freedom	570
F-Statistic	3.718
p-Value	2.32E-7

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.0458	0.0858	-0.53	0.59
Percent score	0.0019	0.0021	0.88	0.38
temp	0.0388	0.0338	1.15	0.25
Percent score:temp	-0.0011	0.0005	-2.05	0.04
Percent score:georegionEast Asia and Pacific	-0.0037	0.0019	-1.95	0.05
Percent score:georegionEastern Europe and Central Asia	0.0009	0.0024	0.35	0.72
Percent score:georegionEurope	0.0016	0.0198	0.08	0.93
Percent score:georegionEuropean Union	0.0009	0.0022	0.39	0.69
Percent score:georegionLatin America and the Caribbean	-0.0006	0.0019	-0.32	0.75
Percent score:georegionMiddle East and North Africa	-0.0017	0.0022	-0.75	0.46
Percent score:georegionNorth America	0.0005	0.0068	0.07	0.94
Percent score:georegionSouth Asia	-0.0004	0.0032	-0.14	0.89
temp:georegionEast Asia and Pacific	-0.0526	0.0347	-1.52	0.13
temp:georegionEastern Europe and Central Asia	-0.0161	0.0349	-0.46	0.65
temp:georegionEurope	-0.0277	0.0595	-0.47	0.64
temp:georegionEuropean Union	-0.0220	0.0287	-0.77	0.44
temp:georegionLatin America and the Caribbean	0.0095	0.0338	0.28	0.78
temp:georegionMiddle East and North Africa	0.0092	0.0399	0.23	0.82
temp:georegionNorth America	-0.0147	0.0795	-0.19	0.85
temp:georegionSouth Asia	0.0114	0.0572	0.20	0.84

R-squared	0.1354
Adjusted R-squared	0.1066
Residual standard error	0.4227
Degree of freedom	570
F-Statistic	4.697
p-Value	3.58E-10

Source: Moody's Analytics

Table 7: Regression Results–Sea-Level Rise Impact Channel (Cont.)

SLR 2100

Final score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.0193	0.1796	-0.11	0.91
Final score	0.0005	0.0038	0.12	0.90
temp	0.0106	0.0711	0.15	0.88
Final score:temp	-0.0002	0.0009	-0.23	0.82
Final score:georegionEast Asia and Pacific	-0.0010	0.0034	-0.31	0.76
Final score:georegionEastern Europe and Central Asia	0.0001	0.0045	0.02	0.98
Final score:georegionEurope	0.0002	0.0150	0.01	0.99
Final score:georegionEuropean Union	0.0003	0.0036	0.09	0.93
Final score:georegionLatin America and the Caribbean	-0.0001	0.0035	-0.04	0.97
Final score:georegionMiddle East and North Africa	-0.0000	0.0042	-0.01	1.00
Final score:georegionNorth America	0.0001	0.0075	0.01	0.99
Final score:georegionSouth Asia	-0.0002	0.0054	-0.04	0.97
temp:georegionEast Asia and Pacific	-0.2335	0.0708	-3.30	0.00
temp:georegionEastern Europe and Central Asia	-0.0035	0.0736	-0.05	0.96
temp:georegionEurope	-0.0091	0.1177	-0.08	0.94
temp:georegionEuropean Union	-0.0113	0.0587	-0.19	0.85
temp:georegionLatin America and the Caribbean	-0.0112	0.0683	-0.16	0.87
temp:georegionMiddle East and North Africa	-0.0485	0.0876	-0.55	0.58
temp:georegionNorth America	-0.0054	0.1803	-0.03	0.98
temp:georegionSouth Asia	0.0056	0.1281	0.04	0.97

R-squared	0.1103
Adjusted R-squared	0.0807
Residual standard error	0.8571
Degree of freedom	570
F-Statistic	3.719
p-Value	2.29E-7

Percent score

Variable	Coefficient	Std. error	t-Statistic	p-Value
(Intercept)	-0.0914	0.1715	-0.53	0.59
Percent score	0.0038	0.0043	0.88	0.38
temp	0.0776	0.0675	1.15	0.25
Percent score:temp	-0.0021	0.0010	-2.05	0.04
Percent score:georegionEast Asia and Pacific	-0.0075	0.0038	-1.95	0.05
Percent score:georegionEastern Europe and Central Asia	0.0017	0.0049	0.35	0.73
Percent score:georegionEurope	0.0028	0.0396	0.07	0.94
Percent score:georegionEuropean Union	0.0018	0.0044	0.40	0.69
Percent score:georegionLatin America and the Caribbean	-0.0012	0.0039	-0.31	0.75
Percent score:georegionMiddle East and North Africa	-0.0034	0.0045	-0.76	0.45
Percent score:georegionNorth America	0.0010	0.0135	0.07	0.94
Percent score:georegionSouth Asia	-0.0009	0.0065	-0.14	0.89
temp:georegionEast Asia and Pacific	-0.1055	0.0694	-1.52	0.13
temp:georegionEastern Europe and Central Asia	-0.0319	0.0698	-0.46	0.65
temp:georegionEurope	-0.0547	0.1190	-0.46	0.65
temp:georegionEuropean Union	-0.0441	0.0574	-0.77	0.44
temp:georegionLatin America and the Caribbean	0.0187	0.0676	0.28	0.78
temp:georegionMiddle East and North Africa	0.0190	0.0798	0.24	0.81
temp:georegionNorth America	-0.0287	0.1589	-0.18	0.86
temp:georegionSouth Asia	0.0229	0.1143	0.20	0.84

R-squared	0.1355
Adjusted R-squared	0.1066
Residual standard error	0.8449
Degree of freedom	570
F-Statistic	4.701
p-Value	3.49E-10

Source: Moody's Analytics

About the Authors

Chris Lafakis is a director at Moody's Analytics. He is the lead modeler for the Moody's Analytics climate risk initiative and is responsible for climate modeling and scenario creation. He also has expertise in macroeconomics, energy economics, model development and model validation. Based in West Chester PA, he also contributes to Economic View. Mr. Lafakis has been quoted by media outlets, including The Wall Street Journal, CNBC, Bloomberg, and National Public Radio and often speaks at economic conferences and events. Mr. Lafakis received his bachelor's degree in economics from the Georgia Institute of Technology and his master's degree in economics from the University of Alabama.

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