Global Pricing of Carbon Transition Risk

by

Patrick Bolton and Marcin Kacperczyk

Public opinion, governments, business leaders, and institutional investors all over the world are awakening to the urgency of combatting climate change. This growing concern about climate change could precipitate a faster and perhaps more disorderly transition away from fossil fuels to renewable energy. This, in turn, means greater carbon-transition risk for companies, especially those that rely more on fossil fuel production or consumption.

In our study we take a (forward-looking) global financial-market perspective to evaluate the economic importance investors attach to this transition risk, by looking at stock returns for more than 14,000 publicly listed companies in 77 countries with different degrees of exposure to this risk. From an individual firm's perspective, transition risk captures the uncertain rate of adjustment towards carbon neutrality. From an investor's perspective, the risk also embodies the evolving beliefs about the transition to a greener economy. In terms of its determinants, transition risk is a result of a wide range of shocks, including changes in climate policy, reputational impacts, shifts in market preferences and norms, and technological innovation.

Two leading hypotheses suggest themselves to the global pricing of transition risk. One possibility is that financial markets are globally integrated, so that the same climate change risk in Bangladesh or in New York is priced the same way. The other is that there is substantial segmentation in financial markets, so that the pricing of carbon risk in each country also reflects local conditions.

Investors in companies that supply fossil fuel energy, and in companies that rely on this energy for their operations, are increasingly exposed to risk with respect to policies seeking to curb carbon emissions and to technological risk from alternative, increasingly affordable, renewable energy. Using firm-level carbon emission and financial data we quantify the carbon premium, that is, the return that compensates investors for taking on this carbon-transition risk.

If carbon-transition risk is overlooked one would expect to see no significant correlation between stock returns and CO_2 emissions (once one controls for all other known risk factors and firm characteristics). Yet, we find that carbon emissions do affect stock returns in most geographic areas

of the world. The premium is economically sizable with respect to direct emissions (scope 1), indirect emissions from consumption of purchased electricity, heat, or steam (scope 2), and other indirect emissions from the production of purchased materials, product use, waste disposal, outsourced activities, etc. (scope 3). Interestingly, what matters is both the total level of CO_2 emissions produced by companies as well as their year-by-year changes in emissions. The former measure can be understood as a long-term risk projection, given that emissions are highly persistent, while the latter is a short-term projection of the risk.

We explore which factors carbon premia are associated with across countries, industries, and firms, and discover a number of interesting patterns in the data. The first surprising result is that the level of economic development does not explain cross-country variations in the carbon premium. However, several other country characteristics matter. Both "voice" (how democratic political institutions are) and "rule of law" significantly affect the carbon premium associated with changes in emissions. More democratic countries with stronger rule of law tend to have lower carbon premia, other things equal. One possible interpretation of this result is that in these countries pressure from green public opinion has already resulted in significant tightening of regulations of carbon emissions, so that the transition risk going forward is lower. In support of this interpretation, we also find that the carbon premium is lower in countries with a higher share of renewable energy, and higher in countries with larger oil, gas, and coal extracting sectors. We further find that firms located in countries with tighter domestic (but not international) climate policies exhibit a higher long-term return premium. Surprisingly, firms in countries that have been exposed to greater damages from climate disasters (floods, wildfires, droughts, etc.) do not show a markedly different carbon premium associated with the level of direct emissions.

Given that climate change has become a salient issue for investors only recently we also explore how the carbon premium around the world has changed in recent years. We do this by comparing the estimated premia for the two years leading up to the Paris Agreement and following the agreement. A number of striking results emerge from this analysis. First, when we pool all countries together, we find that there was no significant premium before the Paris Agreement, but a highly significant and large premium in the years following the agreement. This general result is consistent with the view that investors have only recently become aware of the urgency of climate change. When we break down the change in the carbon premium around the Paris Agreement by continent, we find

that the premium is insignificant in North America before and after Paris, has declined in Europe, but, astonishingly, has sharply risen in Asia. In effect, Asia is entirely responsible for the rise in the global carbon premium around the Paris Agreement.

Overall, our analysis paints a nuanced picture of the pricing of carbon transition risk around the world. The pricing is uneven across countries but widespread in North America, Asia, and Europe. The pricing is also rising, with a significant increase post Paris Agreement.

Our study is relevant for the debates around carbon taxation. Carbon taxes have been touted as the policy solution for mitigating climate change. Yet, in practice (global) carbon taxation has met significant political opposition. In light of this reality, our study suggests an alternative (complementary) approach via financial markets. The increasing cost of equity for companies with higher emissions can be viewed as another form of carbon pricing by investors seeking compensation for carbon-transition risk.