Globalization, Financial Markets and Climate Change[1]

Barry Eichengreen
University of California, Berkeley

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Globalization's critics, many of whom are on the left, do not typically regard financial markets as their friend. The pressure of the quarterly profit-and-loss statement and the footloose nature of finance are seen as limiting the space available for creating a more civilized version of market capitalism. The need for positive financial results to support share prices and satisfy financial-market participants constrains the growth of wages and benefits. The mobility of financial capital limits the ability of governments to tax capital income. To avoid provoking capital flight, policy makers are forced to check their industrial-policy ambitions at the door and proclaim their allegiance to the Washington Consensus. There may be an element of caricature to this depiction, but it is still true that many of the more thoughtful and economically well-informed skeptics of globalization direct much of their criticism at the operation of financial markets.[2]

An important exception to this rule arises when we come to climate change, another issue of concern on the left. Here the advantages of financial markets are compelling. Financial markets offer instruments with which to insure against extreme outcomes like flood or drought that may result from climate change. They allow insurers to offer protection against hurricane and cyclone risk. They enable governments to buy protection from such contingencies through sovereign insurance. A market in tradable permits is also a way of limiting carbon emissions at

[1] Speech to the Bank Indonesia Annual Conference, Bali, 2 August 2008. I am grateful to Glenn Yago for comments on an earlier draft. The Coleman Fung Research Center of the University of California, Berkeley provided financial support, which is acknowledged with thanks.
[2] See for example Joseph Stiglitz, *Globalization and its Discontent* (New York, Norton 2002), Dani Rodrik, *One Economics, Many Recipes* (Princeton, Princeton University Press, 2007).

least cost to productivity and living standards. To be sure, there may be other ways of managing and limiting emissions with lower start-up costs, such as a carbon tax, although those alternatives may have disadvantages as well, and they may not be as feasible politically.

As in many things economic, the devil is in the details. The issue is how to provide farmers, homeowners, insurers and others, especially in poor countries, with financial instruments for protecting against the risk of climate change at an acceptable price. It is how to limit the moral hazard created by insurance so that we do not encourage home building in food plains and agricultural production in drought zones. It is how to design a market in tradable emissions permits that enhances economic efficiency and productivity rather than reducing them.

The classic case for insurance arises when the pool is large and risks are independent. It is then straightforward for the insurer to calculate expected losses, set premiums as a mark-up over that figure, and keep an appropriate amount of capital as a buffer. This is how the market for crop insurance is said to work in the United States. Farmers supply information on their crop yields. Those with a track record (in the form of certified historical yield records) are then able to insure against weather risk.[3]

Unfortunately, the classic preconditions for the provision of insurance may prevail in a variety of real-world setting. Insurers may lack the data needed to estimate the distribution of losses from the aggregate risk pool. The information needed to estimate the distribution of losses will be especially difficult to assemble when the risks are changing, as in the case of climate *change*, and when there is uncertainty about how they are changing. Remote areas may lack historical field data on which to base computer modeling.[4] In countries like Indonesia, where

[3] In the case of some crops and counties, payoffs are indexed to county yields rather than the individual farmer's yield to address moral hazard problems.

[4] Thus, a recent article by describes the controversy over the computerized models used by large reinsurers like Swiss Re and Munich Re to assess the probability of destructive hurricanes in the immediate future; these models

there are a large number of smallholders, writing policies and settling claims can be costly. Information on yields may be hard to secure. Moral hazard, where yields decline because the farmer withholds effort or diverts it to another activity, may prevent insurers from offering yield-based insurance.[5]

All this may make insurance prohibitively expensive and even impossible to obtain. At a minimum it creates challenges for the effective provision of insurance against climate-change risks in poor countries. It is worth observing that even in the United States, with its relatively sophisticated financial markets, well-developed insurance industry and rich information environment, the existence of a relatively well functioning market in crop insurance in the United States in fact reflects a long history of government subsidization. The private market has long provided hail insurance, since losses from hailstorms are localized and easily identified. Crop-hail insurance also provides protection against fire, for the same reasons. In contrast, multi-peril insurance has been heavily subsidized by the federal government through a series of programs, reflecting the fact that farmers' losses tend to be correlated with one another and more difficult to identify. Thus, the government has provided reinsurance to private insurers, sharing a portion of their risks, and subsidized the market in a number of other ways.[6]

Some of these problems can be solved, at least in part, by substituting index insurance for crop insurance. Payoffs can be calibrated to weather outcomes that are easily measured and not subject to manipulation. The problem with index insurance is basis risk, namely that the

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assume a link between global warming (sea temperature in particular) and the intensity and frequency of hurricanes, despite the fact that there is disagreement among scientists over the magnitude and even direction of the effect. M.P. McQueen, "Hurricane Watch: Insurers Criticized for New Rate Models," *Wall Street Journal* (1 July 2008), www.wsj.com.

[5] Similarly, when farmers are encouraged to plant on a flood plain and homeowners are encouraged to build on the outer banks of South Carolina by the availability of insurance, the distribution of risks may change in inefficient ways.

[6] Reflecting the additional complications of administering multi-peril insurance, such policies typically involve a deductable, in contrast to crop-hail policies, which pay off on the first dollar of losses.

correlation between the event triggering the payout and the incidence of losses by the insured is inefficiently low. If the weather event has a low correlation with yields, or if there is a lot of variation of yields hiding within the area average, then the individual farmer ends up paying a substantial premium for financial assistance at the wrong times. Here, however, technology is our friend. Satellite imaging can be used to measure yields and other index triggers separately for a large number of small areas.[7] Agricultural science can be used to tailor index contracts to the circumstances of the individual crop.

This leaves the problem that the impact of weather outcomes is not independent across the members of the pool, which can create an expensive proposition for the insurer. When everyone in Aceh is hit by a tsunami at the same time, capital costs to the insurer may be very large.[8] To put it another way, when individual risks are highly correlated, we have the case of catastrophes. Catastrophes are, by definition, low-frequency, high-severity events. This means that there is not much data for use in forecasting losses. This uncertainty and the high variance of losses imply the need for a large capital buffer, which in turn raises costs. This means that premiums can be a multiple of expected losses.[9]

I can testify to this from first-hand knowledge. Among the economics faculty at UC Berkeley, there is an ongoing debate over whether earthquake insurance on one's home is worth the cost. The UC Berkeley campus and therefore the homes of many of its faculty sit astride the

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[7] Swiss Re offered drought insurance to the villagers involved in Jeff Sachs' Millennium Villages project, using satellite imagery to measure total vegetation as a proxy for crop yields. For areas planted with grains and other crops not suited for pure satellite coverage, satellite based vegetation indices were combined with local water metering to create a combined climate impact index. See Dan Ozizmir, "Presentation to Milken Institute Annual Conference," www.milkeninstitute.org (April 2008).

[8] The same is true in other contexts, such as drought risk. Thus, Mapfumo in a study of the feasibility of weather-index-based crop insurance in South Africa shows that drought risk is highly correlated across African provinces, creating difficulties for such an insurance scheme. Shadrick Mapfumo, "Weather Index Insurance: The Case for South Africa," unpublished manuscript, Microinsurance Holdings LLC (2007).

[9] The tsunami hitting Aceh (and the high-magnitude earthquakes that hit Turkey and El Salvador) also illustrate another point, that these risks are much less completely insured against in emerging markets than in, say, the United States. Typically insurance returns only 2 per cent of the cost of disasters in emerging markets, compared to 50 per cent in the United States. Hence market solutions that close this gap would be of considerable value.

Hayward Fault. Nonetheless, a number of my colleagues choose not to buy earthquake insurance, owing to its expense. This is in contrast to fire insurance—which is more economical since risks are less correlated across policy holders and aggregate losses are easier to predict—and which everyone has.

The obvious way of addressing the correlation problem is through reinsurance. My insurer, rather than holding the earthquake risk of all members of the UC Berkeley faculty, buys a policy from a reinsurance company that pays out when the claims paid by my company reach a certain level. The reinsurance company acquires a portfolio of such policies on which the risks are independent or at least imperfectly correlated. This brings us back to the theme of globalization; clearly the scope for this kind of reinsurance is enhanced by the globalization of the market, which permits geographical diversification and scale.[10]

The existence of reinsurance makes my earthquake insurance less expensive. Unfortunately, it doesn't appear to make it that much less expensive. (Hence the debate among my colleagues.) This may reflect the limits to diversification. The San Andreas Fault runs through both Northern and Southern California. The same earthquake can generate tidal waves all around the Indian Ocean. To return to our other theme, it is not the case that climate-change-induced events in different parts of the world are independent; after all, they are all being triggered by the same underlying factor, climate change.

In addition, reinsurance markets are thin because the capital buffers needed by a well-diversified reinsurance company are large; the market is therefore dominated by a few players. Even where competition is intense, substantial capital costs mean that premiums are high. The

[10] Thus, Mapfumo, in the study referenced above, suggests reinsurance as a solution to the problem of co-variant risk in South Africa, since drought risk is not highly correlated between South Africa and other African countries. Another approach for obtaining this kind of diversification is catastrophe risk swaps, when two firms with exposure to different types of catastrophic risk swap some of the relevant exposures. This may require more local knowledge about conditions in a far-off place than is possessed by the typical small insurer—which is why there is a market for reinsurers.

originating insurance company or other insured also faces fluctuations in the costs, since protection is typically for one year, after which rates must be renegotiated, and rates tend to rise sharply in the wake of large earthquakes etc. (and fall in their absence). The insured also faces credit risk in the event that the reinsurer defaults on its contractual obligation – a real possibility in the face of catastrophic events, especially when underlying (climatic) conditions are changing in uncertain ways.

Cat bonds are the alternative to reinsurance for entities in a position to issue them.[11] The receipts from selling the bonds are invested in high-quality securities, returns on which, together with other resources, are used to pay the interest on the bonds. In the event of the catastrophe in question, the bond is triggered – the bondholder loses interest and principal.[12] Insurance companies offering coverage to individual homeowners and farmers may issue Cat bonds. Or governments and their reinsurers seeking insurance against catastrophic risk may do so.

Cat bonds allow the risk of catastrophic events resulting from climate change to be shared more widely among investors. The damage from hurricanes may, in some years, amount to a large fraction of insurance company capital, but it is a small fraction of bond market capitalization, much less total financial wealth. The fact that floods and hurricanes have a low correlation with stock market returns make them attractive for investors seeking high-return instruments that are not correlated with existing portfolios. And the fact that the revenues from bond sales are collected up front frees the insured from the credit risk associated with

[11] While the fixed costs are high, this option is not limited to governments or financial firms. The first Cat bond by a nonfinancial firm was by Oriental Land Company to insure against earthquake risks to Tokyo Disneyland. FIFA (the international football association) opted to issue Cat bonds to insure itself against the risk that the World Cup final would be cancelled due to rain.

[12] Some Cat bonds include principal protected tranches, which guarantee the return of principal. In their case the triggering event affects payment of interest and the timing of the repayment of principal (which might be stretched out from, say, 3 to 10 years).

reinsurance.[13] Delays in payoffs may be less than in the case of indemnified insurance policies, since Cat bonds are triggered by an observable index (the Richter Scale or a measure of rainfall), obviating the need for an extended adjustment process. Fluctuations in costs are smoothed since most Cat bonds have multi-year tenors.

The problems with Cat bonds are basis risk and cost. From the standpoint of the insured, there is more basis risk (compensation is not tightly linked to actual losses) with an index-triggered Cat bond than indemnity-based reinsurance.[14] Underwriting and marketing costs are also considerable. One estimate puts the cost of issuing Cat bonds at 20 per cent above the cost of similar insurance contracts.[15] There is the danger that the reinsurance company may retain its best risks while securitizing and selling off the questionable ones.[16] In turn this may require additional expenditure on modeling and rating in addition to normal underwriting and legal fees in order to reassure investors. This explains why the costs of the underwriter, the rating agency, the modeling agency (which provides estimates of the distribution of risks) and legal council can approach $5 million.[17] Even then only hedge funds (specifically dedicated Cat risk hedge funds) may be willing to bear the additional risk in return for an extra premium, which can in turn cost the issuing government a spread over Libor in addition to fees.[18] Floods, droughts and hurricanes that cause the bond to expire may not be uncorrelated with the stock market, which will make them less attractive to hold. Note however that this last condition – the absence of a

[13] At the same time, the revenues from bond sales are supposed to be invested in safe and liquid assets that may turn out not to be so safe and liquid in the event of a credit market event like that which occurred in the summer of 2007. Credit risk may not be absent, in other words.
[14] Although in fact the majority of Cat bonds issued in 2007 had an indemnity trigger.
[15] Glenn Yago and Patricia Reiter, "Financial Innovations for Catastrophic Risk: Cat Bonds and Beyond," Santa Monica: Milken Institute (April 2008), p.24.
[16] In a manner reminiscent of the subprime crisis.
[17] See Jo Anne Linnerouth-Bayer, "Data Challenges for Insuring Catastrophic Risks," unpublished manuscript, IIASA (2006).
[18] One way of creating a large investor base, it has been thought, is by pooling and then slicing and dicing Cat bonds into tranches, creating collateralized debt obligations. (The first CDO structure including Cat bonds was launched in May 2007.) Given what we have learned about CDOs subsequently, there may be less scope for this than previously supposed.

correlation with the stock market – is most likely to be met when the bonds are marketed internationally, which is again an argument for financial globalization.

Neither reinsurance nor Cat bonds are a perfect solution given the current structure of the markets. It is interesting therefore to note that different countries have responded in different ways. Mexico issued a Cat bond to insure against earthquake risk, while Asian countries, according to the *Financial Times*, are opting for reinsurance.[19] In the Mexican case the yield to investors is 9 per cent; this was regarded as tight pricing, favorable to the issuer, compared to previous earthquake-based bonds.[20] The revenues from the sales to bondholders are invested at 5 per cent, so the government's additional premium is 4 per cent. (The yield is that high because the bond is rated BB/BB- by the rating agencies, as the equivalent of a corporate bond with a default probability of 1 per cent, since the probability of the triggering event, an earthquake registering 8.0 on the Richter Scale, is estimated at 1 per cent.[21]) Swiss Re acted as the underwriter and purchaser of last resort. $160 million of bonds were sold successfully in the private placement market.

Mexico also sought comparable insurance against hurricanes but could not obtain it at an acceptable price.[22] A potential explanation is that for climate-related events like hurricanes, as opposed to earthquakes, the risks may be changing in unpredictable ways, which makes it more

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[19] The article referred to four Asian countries without specifying which ones. Nor did it explain why Swiss Re was simultaneously negotiating with four countries. A logical answer is that Cat bonds may be more attractive when they combine several uncorrelated hazards (an earthquake in China, a cyclone in Indonesia), since geographical diversification reduces the risk that the bondholders will lose the entire principal. SCOR, a French reinsurer, has issued a multi-peril bond covering Japanese earthquakes, U.S. earthquakes and European windstorms. Assurances Generales de France has issued a Cat bond covering earthquakes in Monaco and windstorms in France/Corsica. The World Bank is working on a number of bonds along these lines that would combine perils facing different developing countries.

[20] This may be because the Cat bond market is maturing or because investors found especially attractive the diversification offered by a Mexican bond; either way this bodes well for other developing countries.

[21] The trigger is 7.5 per cent on the Richter Scale if the quake strikes Mexico City.

[22] Which are a serious problem for the Yucatan. This difficulty is described in Bloomberg, "Mexico Sells $160 Mln. Bond to Insure Against Quakes," www.bloomberg.org (12 May 2006).

difficult to assign a rating to such bonds.[23]

This may be why Asian governments approached Swiss Re for reinsurance rather than for help in underwriting Cat bonds.[24] *The Financial Times* (May 26, 2008) reported that the governments of four Asian countries were in negotiations with Swiss Re for as much as $500 million of reinsurance cover.[25] Or it could be that, given the size of the transaction, Swiss Re will underwrite bonds to pass along some of the exposure not to other insurance companies but to individual investors. It would be interesting to hear more about this from the officials present.[26]

A fundamental qualm about all these insurance instruments is that they may reduce the urgency attached by governments and others to mitigating climate change. Why invest in abatement, in other words, if it is instead possible to build stronger levies and buy insurance protection? The reality, of course, is that an efficient response would involve action on both of these margins: insuring against the adverse effects of climate change but also limiting those effects by reducing emissions. But the more available efficient insurance instruments become, the more important it is to develop an efficient mechanism for reducing emissions so as to encourage agents to do both.

The question of how to use financial markets as a mechanism for achieving a reduction in carbon emissions boils down to the relative merits of a cap-and-trade system, in which permits are traded on a market like any asset, versus a carbon tax, which does not entail a role for financial market-like arrangements. In the textbook world of complete information and no

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[23] Thus, the aforementioned article by McQueen notes the existence of considerable uncertainty about how variables like air pressure and wind velocity are being affected by climate change.
[24] Aside from Taiwan, which issued a Cat bond to insure against earthquake risk in 2003.
[25] Consistent with this interpretation is that fact that reinsurance companies like Swiss Re are in fact the main issuers of Cat bonds.
[26] Since it could be that the transaction is too costly to be completed; revealingly, there does not appear to have been more news about it since negotiations between Swiss Re and the four Asian governments showed up on the front page of the *Financial Times* in May.

politics, the implications for resource allocation of the two schemes are, of course, identical. A carbon tax with revenues rebated in lump-sum fashion is exactly equivalent to a cap and trade scheme.[27] Thus, one must relax the assumptions of full information and no politics to choose between them. For an economist, the case for taxing carbon is simplicity and transparency.[28] Firms pay according to their emissions, everyone sees what they pay, and everyone therefore sees what the policy adds to the cost of their products. For politicians, it is precisely its opacity that makes the alternative cap-and-trade system attractive. Politicians have a natural aversion to the word tax, which they can claim they are avoiding through cap and trade. A more polite way of putting the point is that a cap-and-trade scheme which relies on the equivalent of financial markets is more likely to be politically feasible.[29]

The problem becomes more complex when we acknowledge uncertainty about abatement costs. Here whether a carbon tax or cap-and-trade system is better depends on whether the marginal benefits of emissions reduction are relatively flat or the marginal costs are relatively flat.[30] If the benefit schedule is relatively flat, then price instruments (taxes) are

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[27] Equivalently, a carbon tax is exactly equivalent to a cap and trade system in which the initial allocation of permits is auctioned.

[28] As in N. Gregory Mankiw, "One Answer to Global Warming: A New Tax," *New York Times* (16 September 2007), www.newyorktimes.com.

[29] In addition, with a carbon tax the question of whether to compensate the impacted firms and consumers with the equivalent of lump-sum subsidies is a separate issue. Under a cap-and-trade system, the costs of reducing emissions and the question of compensation are linked because the distribution of permits is the first stage of implementation. This raises the prospect, and indeed the danger, that the largest allocations of permits and therefore the most generous subsidies will go to precisely those industries that are the most serious polluters, which will scream the loudest and tend to be well connected politically. Thus, the German government, in conjunction with the establishment of the EU carbon market, handed out free credits to the country's coal-fired electric power plants. This is not obviously desirable on either efficiency or equity grounds. See David Victor and Danny Cullenward, "Making Carbon Markets Work," *Scientific American*, www.sciam.com (24 September 2007) and Robert J. Shapiro, "Addressing the Risks of Climate Change: The Environmental Effectiveness and Economic Efficiency of Emissions Caps and Tradeable Permits, Compared to Carbon Taxes," www.theamericanconsumer.org (February 2007).

[30] Discussion here follows the analysis of the circumstances under which it is better to operate on prices than quantities in Martin Weitzman, "Prices versus Quantities," *Review of Economic Studies* 41 (1974), pp.477-491. Applications to emissions abatement include William A. Pizer, "Prices vs. Quantities Revisited: The Case of Climate Change," Discussion Paper 98-02, Washington, D.C.: Resources for the Future (October 1997) and Lawrence Goulder and Ian W.H. Perry, "Instrument Choice in Environmental Policy," Discussion Paper 08-07, Washington, D.C.: Resources for the Future (April 2008).

preferred. In contrast, if the cost schedule is relatively flat, then quantity instruments are preferred. Intuitively, if the benefits are relatively flat, then the optimal price of emitting remains more or less the same after the uncertainty is resolved, so setting the price ex ante is relatively efficient. In contrast, when the benefits are relatively steep, the optimal quantity is more or less the same over a range of outcomes (after the uncertainty is resolved), which makes it preferable to set the quantity ex ante by imposing a cap.[31]

Environmental economists tend to believe in marginal benefit curves that are flat relative to marginal costs. Emissions reductions are likely to become more difficult as they proceed (the cost schedule is likely to be steep). In contrast, the benefits of emission reduction are likely to be relatively insensitive to the level of emissions in a given year because damages due to greenhouse gasses depend on their stock in the atmosphere rather than current emissions and because those greenhouse gases remain in the atmosphere for a long time. As a result, standard analyses have favored price-based intervention (a carbon tax).[32] More recently we have seen models with dramatic nonlinearities, where adding a little more greenhouse gas to the atmosphere can lead to catastrophic climate change. In this range, the benefits of a hard cap to prevent that tipping point from being reached may be compelling.[33]

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[31] More prosaically, if costs are if marginal benefits are relatively constant (the social cost of a metric ton of CO_2 emissions is $20, and that cost doesn't change much whether emissions are high or low), but the costs of abatement, whatever they are, rise sharply with levels of emissions reduction, then operating on prices (levying a tax) is preferable. If the social cost of a ton of CO_2 emissions is $20, then a tax of $20 a ton will internalize the externality – end of story. Producers can then decide the amount of abatement, and they will reduce emissions right to the point where the cost of the marginal reduction rises to $20. By implication, the marginal benefit of emissions reduction ($20) will equal the marginal cost ($20). Not so with a cap-and-trade system. If the cap is too strict there will be a big increase in abatement costs (precipitating a recession) that vastly exceed the additional abatement benefits. The opposite case is one where marginal benefits decline sharply with levels of abatement (lots of CO_2 means lots of global warming, but a bit of CO_2 has no discernible effect) but the costs, whatever they may be, do not change as abatement proceeds. Here a cap tends to be preferred, since an error in the amount of emissions abatement can be quite costly (if the tax is set at too low a level to achieve the desired level of emissions reduction, the polar icecaps melt).

[32] See Pizer, op cit.

[33] In fact, views of this question – how close we are to a tipping point where a slight further increase in temperature due to CO_2 emissions has catastrophic consequences – probably explain why environmentalists of apocalyptic

The question becomes still more complicated when we acknowledge that climate change is global and intervention must be coordinated internationally. An efficient carbon tax should be set at the same level in all countries, since the cost to global society of a metric ton of CO_2 emissions is the same wherever it is produced. If the tax is imposed globally, there will be little impact on the relative competitiveness of industry X in countries A and B. (There will be an impact only insofar as technology varies across countries. Of course, countries that specialize in relatively carbon-intensive industries will be disproportionately impacted.) There may be an incentive to chisel on the agreement, but the level of carbon taxes in other countries is easy to monitor. We have considerable experience with conventions designed to harmonize the level of taxation internationally.

A global cap-and-trade system in which countries receive permits in proportion to their current emissions would be exactly equivalent to a uniform global carbon tax, following the same logic that is applicable at the country level. But establishing an efficiently functioning trading platform would have higher start-up costs. Europe's experience suggests that getting it right can be expensive.[34] Monitoring compliance with permit issuance guidelines might also be more difficult than in the case of a tax. Permit sales are supposed to be accompanied by reductions in pollution; could one be confident that this was the case everywhere? One might ask the same about whether taxes on the books were actually levied, but here taxes, to repeat, have the advantage of transparency.

Moreover, China, India and Indonesia would be unlikely to agree to allocate permits in proportion to the current level of emissions; they would presumably insist that permits be

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outlook favor hard caps and look with suspicion on taxes. It appears that the parties to the debate, to the extent that this is an accurate characterization of their views, have the intuition right.

[34] See A. Denny Ellerman and Paul Joskow, *The European Union's Emissions Trading System in Perspective*, Arlington, Virginia: Pew Center for Global Climate Change (May 2008).

distributed according to population. The U.S., with its higher living standards, would then buy permits from China. Would American voters embrace a global cap-and-trade system in which they had to pay higher energy prices and also transfer income to China? Of course, the advocates of cap and trade would respond that China is equally unlikely to be willing to levy the same carbon taxes as the United States, or the U.S. to burden its industries with higher carbon taxes than China. Neither approach – neither that relying on taxes nor that relying on the trading of permits in financial markets – offers a simple solution to this conflict.

That said, climate change is a clear case where financial markets and instruments can be part of the solution, not part of the problem. They offer coping strategies for firms, farmers and governments struggling with the consequences, although those markets and instruments do not always work smoothly. The same can be said of strategies for reducing emissions. There are financial-market-like approaches, variants of cap-and-trade offering cheaper ways than mandates of limiting emissions. These too have their problems, which is why there is a spirited debate between the advocates of carbon taxation and cap and trade. Of course, both approaches require political will. And for that particular problem, financial markets offer no solution.