The Fast Track to Global Carbon Taxation*

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Abstract

Ask any economist how to accelerate the green transition, and you will get the same answer – *tax carbon.* This is externality-economics 101. But taxation is only one part of economics' century-old solution to efficiently resolving negative externalities. The other is compensating losers to ensure a Pareto improvement – a win-win. This short paper argues, with reference to our recent research, that achieving a specific Pareto improvement – a uniform win-win that provides the same or nearly the same percentage welfare gain to all humanity, no matter their time or place of birth, would expedite the adoption of a global carbon tax. It would do so by giving all nations an equal incentive to immediately adopt the uniform maximally welfare-improving global carbon tax. This tax would dramatically lower carbon emissions and their associated region-specific damages. We also suggest the means by which such a tax could be administered and enforced. Finally, we point out that another seemingly major carbon policy – permanently embargoing Russian fossil fuels in light of Russia's invasion of Ukraine – produces a very modest impact on emissions and, thus, climate change.

JEL classification: F0, F20, H0, H2, H3, J20

Keywords: climate change, carbon taxes, environmental policy, clean energy, externalities, generational equity, economic efficiency, Pareto optimality, uncertainty, risk

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1 Introduction

Whether it be atmospheric rivers deluging California, a snow-less winter in the Alps, a record heat wave in India, extreme flooding in Pakistan, a massive ice melt in Greenland, exceptionally powerful hurricanes in Florida, receding glaciers in Patagonia, or unprecedented wildfires in Siberia, the climate is rapidly changing, far outpacing humankind's limited efforts to reduce the common cause for these and other natural calamities– carbon emissions. Yes, the Paris Agreement pledges its 194 signatories to cut their emissions radically. However, the 2015 Accord is being honored in the breach. This outcome was foreordained, as the Accord's country-specific emission-reduction pledges have no enforcement mechanism. This has led and continues to lead countries with more to lose than gain to simply pay lip service to their obligations.

Yet, the situation is far from hopeless. There is a clear path to accelerating the green transition. It lies in economics' century-old answer for efficiently dealing with negative externalities: tax bad behavior, but achieve Pareto improvements (winners without losers), namely by having winners compensate losers. In the climate context, any old Pareto improvement will not do to secure global carbon-tax buy-in from the world's 195 countries. What is likely needed is a uniform win-win, that is, a path of carbon taxation coupled with generation- and region-specific compensation (positive or negative) that equalizes consumption-equivalent percentage gains in the lifetime welfare of all newborns and future generations as well as the remaining welfare levels of those currently alive. This UWI – *uniform*-welfare-improving win-win –provides all countries the same positive incentive to immediately enact carbon taxation. This incentive is the uniform gain the carbon tax would provide to each country's current and future cohorts, indeed, the largest possible UWI gain. Taken together, Kotlikoff et al. (2021c) and Kotlikoff et al. (2021a) suggest a maximum UWI gain of 10 percent.

How can today's cohorts benefit from carbon taxes that will raise their energy bills? One way is to receive direct or indirect payment from an international agency, say, for example, the World Bank, overseeing the policy. As detailed below, the World Bank could finance these payments by selling general obligation (redeemable by all) Green Bonds and selling country-specific (redeemable only by specific country citizens) Red Bonds to enforce repayment.

Adopting the optimal UWI solution would represent a momentous global achievement. However, this does not preclude industrialized and rapidly industrializing countries from paying reparations to further assist countries facing the largest climate losses. To be clear, optimal UWI policy limits, but does not eliminate climate change. Future generations will still be significantly affected by global warming, but to a far smaller degree than would otherwise be true.

Our recent research calculates win-win policies in global, regional, deterministic, and stochastic models Kotlikoff et al. (2021a,b,c). This short paper briefly summarizes our work and considers how UWI policy can be sustained. We also stress the efficiency of carbon taxation over picking green-energy winners. To highlight the remarkable capacity of global carbon taxation to curb emissions, we compare the emissions reduction from optimal UWI taxation with that of a counterfactual: eliminating all Russian fossil fuel resources from the global totals. As shown, carbon taxation has a major impact on global emissions, far beyond what would arise under the counterfactual.

2 Getting to Yes

According to Kotlikoff et al. (2021c), optimal UWI carbon policy is potentially extremely powerful, reducing global emissions by two-thirds and by 90 percent within 50 years (cf. Figure 1). In addition, the policy would substantially limit the massive harm facing the most vulnerable regions. For example, the win-win policy reduces year-2100 damage to India's GDP from over 40 percent to roughly 25 percent. Furthermore, a carbon tax will do double duty by reducing climate risk. As modeled in Kotlikoff et al. (2021b), this is climate change's second major negative externality. Unfortunately, it's one that is rarely discussed, even though it is simple to appreciate. Intuitively, if party A puts party B at risk, party A is damaging party A, from the relevant welfare perspective, namely ex-ante expected utility. Kotlikoff et al. (2021b) show that the gains from carbon taxation, as measured by the size of the optimal UWI carbon tax, can be as large as the gains from reducing average carbon damage, were such damage to occur for sure.

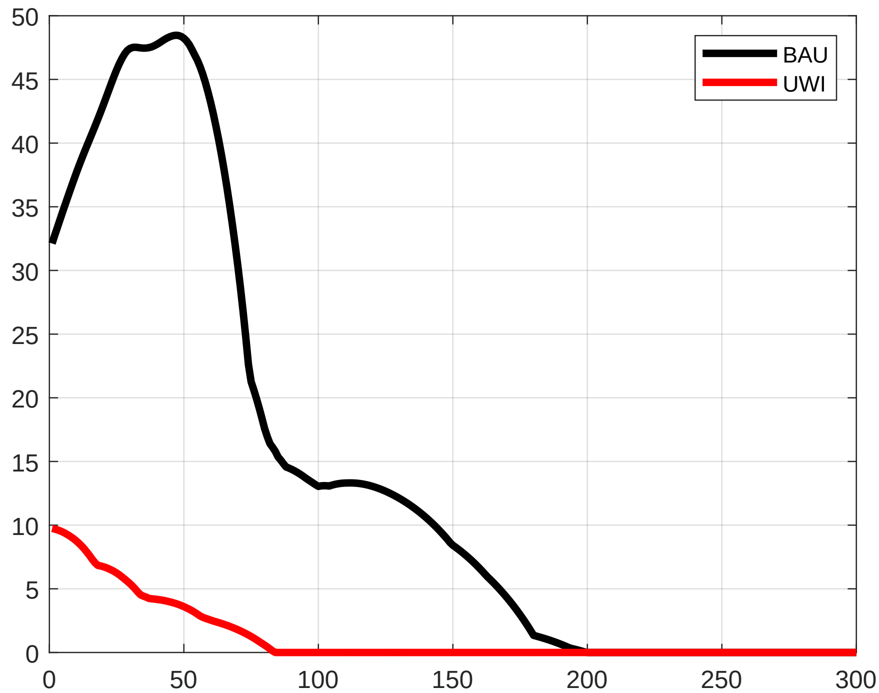

Figure 1: Global CO2 emissions (absent of land emissions, and measured in GtCO2) in our high-damage scenario as a function of years (starting in 2017).

3 Background

Climate economics is now a half-century old. This is thanks to Nobel Laureate William Nordhaus (see, e.g., Nordhaus (1979) and Nordhaus (2017)), who first realized not only its occurrence, but its major economic threat. A host of influential studies, including Acemoglu et al. (2016), Cai and Lontzek (2018), Cai et al. (2013, 2018), Golosov et al. (2014), Hassler and Krusell (2012), Jensen and Traeger (2014), Stern (2007), extended Nordhaus' blueprint for a global carbon tax that would reduce carbon emissions and the associated rise in the planet's temperature.

For all its foresight and originality, the Nordhaus approach sidestepped the clear source of the carbon externality – generational self-interest. Instead, the Nordhaus approach appealed to a social planner. Other economists reframed Nordhaus' model by assuming infinitely-lived, altruistic dynasties, that is, agents who care deeply for their progeny, but not for other dynasties, domestic or foreign. This approach transformed the climate externality into an intragenerational rather than an intergenerational problem, with domestic and foreign dynasties free riding on one another in emitting carbon. The dynasty literature also assumes that all dynasties weigh their future members' welfare based on an identical time preference rate. The resultant optimal carbon-tax policy depends critically on the posited size of this single preference parameter. However, the choice of this parameter is normative, not positive.

With some economists, for example, Stern (2007) and Arrow (2007), arguing for a low time-preference rate, and others, for example, Nordhaus (2008), arguing for a high rate, mainstream climate economics has, unfortunately, devolved into a moralistic debate, with those weighing future generations more heavily (specifying a low time-preference rate) "deriving" a high "optimal" carbon tax and those espousing opposite preferences "deriving" a low "optimal" carbon tax. The debate has rendered the words *carbon taxation* synonymous with *generational conflict* for a simple reason. Generations are not, in the main, intergenerationally altruistic, and when told they should sacrifice for the next generation based on some academic's sense of fairness, their response is a quick *No thank you.*[1]. Yes, the single-agent, infinitely lived model can deliver quick and important insights on issues that do not involve generational trade-offs. However, that is hardly the case for climate change, deficit policy, infrastructure investment, and a host of other issues that pit generations against one another. Moreover, if one includes clan intermarriage, the standard dynastic, altruistic model implies that all clans are altruistically linked (see, e.g., Kotlikoff (1983), Bernheim and Bagwell (1988)), that is, the separate dynasties devolve to one. This, of course, rules out a climate problem since a single, global, altruistically-linked dynasty would already have fixed it. The standard model also ignores the ability of clan members to refuse transfers that are smaller than desired.[2]. Incorporating this option transforms altruistic clan members into partially selfish life-cycle agents.

4 Modeling Matters for Optimal Carbon Policy

The ongoing use of the dynastic model for climate-policy analysis would be of less concern were it to prescribe the same or similar path of carbon taxes as the life-cycle model. This is not the case. Kotlikoff et al. (2021a) present an apples-to-apples comparison of the two models. Their dynasty model is identical to their life-cycle model except for the assumption that agents' utility depends on the utility of their children. The optimal initial value and growth rate of the carbon tax differ dramatically between the two models for all assumed time-preference rates.[3]

[1]The evidence against such behavior appears overwhelming (see, e.g., Boskin and Kotlikoff (1985), Altonji et al. (1992), Abel and Kotlikoff (1994), Hayashi et al. (1996), and Altonji et al. (1997))

[2]Kotlikoff et al. (1990)

[3]Note that there is a set of Negishi et al. (1994) weights that, when applied to the dynasty model's valuation of future generations' utilities, can replicate the UWI life-cycle model outcome. However, this is a theoretical equivalence, not a practical one, since dynastic climate modeling does not solve for and apply such weights.

5 Externality Economics 101

At their heart, externalities constitute missing economic markets. In the climate context, future generations are not present to, for example, pay current generations not to emit carbon or require current generations to pay them for the right to emit carbon. Regardless of who had the property right – the right to emit or the right to prohibit emissions – the market solution, if one were feasible, would entail that emitters face the proper extra cost, at the margin, of emitting carbon. Arthur Pigou clarified, in 1921, how governments could use taxes and subsidies to substitute for missing markets and correct externalities.

When combined, Pareto and Piguo's work prescribes setting the efficient time path for the global carbon tax. However, this has to be done in the context of taxing winners and subsidizing losers. In the climate context, the UWI solution satisfies both Pareto's and Piguo's criteria. Moreover, the UWI carbon policy can be readily administered. An international body, such as the World Bank, could issue a general obligation (repayable to all) *Green Bonds* and use the borrowed funds to make region-specific transfers to generations that stand to lose from the carbon tax. As Kotlikoff et al. (2021c) show, such losers comprise current generations in regions facing future, but not current, climate damage, as well as current and future generations in very cold regions. Canada and Russia are such regions. They would otherwise benefit from global warming.

6 Modeling Selfish Generations

Acknowledging intergenerational and interregional selfishness leads one to look for ways that future generations can compensate current generations and dirtier regions can compensate cleaner regions. (Kotlikoff et al., 2021a,b,c) do this. Each finds the optimal UWI tax and net compensation policy. Kotlikoff et al. (2021a) consider a deterministic, dynamic global, OLG economy. Kotlikoff et al. (2021b) add shocks to productivity, climate damage, and climate change. Finally, Kotlikoff et al. (2021c) ignore shocks but disaggregate the world's 195 countries into 18 separate regions (cf. Table 1 and figure 2), each with its own temperature and damage transitions.

Including regional differences makes UWI compensation policy region- as well as generation-specific. Hence, Kotlikoff et al. (2021c) relate directly to the ongoing debate, raised most recently at COP 27, over cross-country compensation. Such compensation appears the sine qua non for motivating poorer countries to limit their emissions. Unfortunately, the often heated exchange missed the point that compensation is central to achieving a uniform win-win.

7 Current Carbon Policy

The current state of carbon abatement largely comprises ad hoc initiatives. The list ranges from subsidizing the purchase of electric vehicles, underwriting the installation of solar panels, and authorizing the construction of nuclear reactors. This picking of green "winners" is inevitably influenced by political considerations and by politically convenient timetables that ensure that

Stated differently, one needs to posit and solve the life-cycle model's UWI solution to discern the proper Negishi weights to "derive" the UWI solution in the dynastic model.

Table 1: Regions and their Acronyms.

Acronym	Region (Excludes Countries Modeled Independently)
ANZ	Australia and New Zealand
BRA	Brazil
CND	Canada
CHI	China
EEU	Eastern Europe
GBR	The U.K.
IND	India
JSHK	Japan, South Korea, and Hong Kong
MENA	Middle East and North Africa
MEX	Mexico
RUS	Russian Federation
SAF	South Africa
SAP	The South Asian Pacific
SLA	Latin America excluding Mexico and Brazil
SOV	Former Soviet Central Asia
SSA	Sub-Saharan Africa
US	USA
WEU	Western Europe

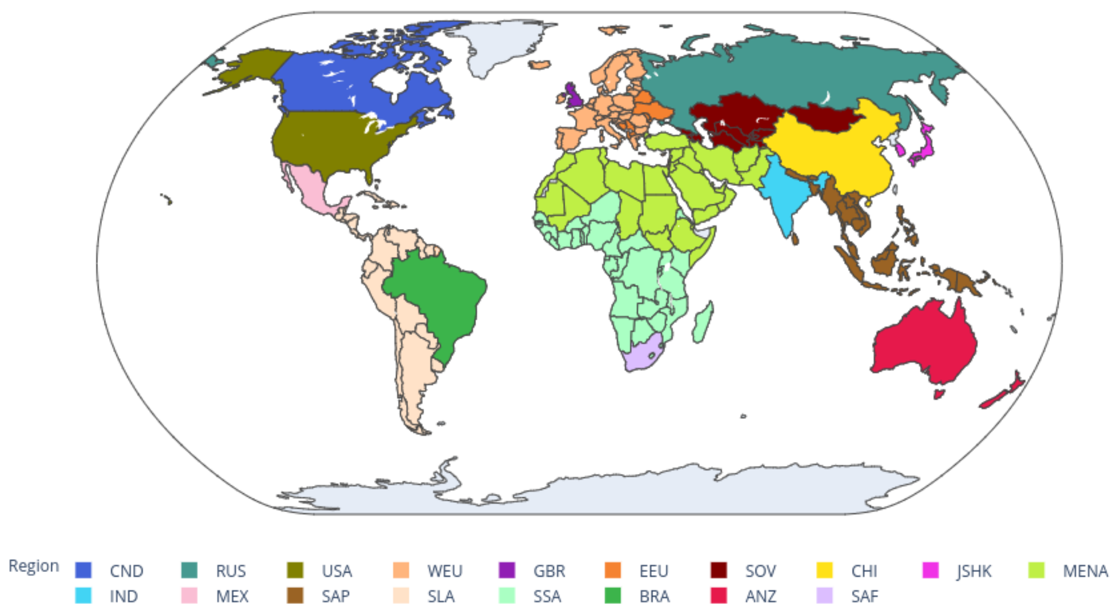

Figure 2: Our global model's 18 regions.

what is done is done too late. Relative to having global green-energy decisions guided by a single price of dirty energy, namely the cost of dirty energy plus the present value of global damages arising from additional carbon emissions (i.e., the social cost of carbon), the current approach both under-provides green energy and delivers an inefficient mix of green energy abatement and climate mitigation. In contrast, carbon taxation lets the market decide the best way to produce energy and lower emissions, taking into account carbon's social cost.

Despite the clear advantage of carbon taxation, only about one quarter of countries tax the use of fossil fuels. The U.S. is not on the list. The reason? U.S. politicians appear reluctant to advocate increasing taxes of any kind. However, the UWI carbon policy involves short-run net tax cuts, not net tax hikes. Specifically, the policy can be explained to the public as combining a tax on emissions with a larger, in terms of revenues, reduction in income, payroll, or other general taxes. The policy can be conveyed as cutting taxes on balance and, thereby, accumulating more government debt (running larger deficits) whose principal and interest payments will be left for carbon-tax beneficiaries (i.e., future generations)to cover. Thus, a new carbon policy paradigm, which emphasizes win-win and short-run net tax cuts, can provide the political support needed in the U.S. and other countries to adopt a carbon tax. UWI policy can be run in a host of different ways. As described below, one would be under the auspices of The World Bank. In this case, the Bank would send money, in the short run, to the U.S. government, which it could disperse to current U.S. citizens to more than compensate them for accepting a carbon tax.

8 Ensuring Compliance with UWI Policy

Servicing the general obligation, Green Bonds, requires levying taxes on those benefiting from the carbon tax. But how does an international agency like the World Bank, which lacks taxation power, ensure compliance? Consider the following mechanism: The World Bank provides a service (e.g., securing the adoption of the global carbon tax) to unborn Party A whose costs it needs Party A to help cover once Party A is born and is old enough to pay. Assume that Party A will be born in the country K and, when she reaches working age, needs to pay X_t annually, where t references year and the annual payments cover A's share of the cost of the UWI policy. Let Party A stand for all country-K citizens who need to pay (make compensation payments) that collectively total X_t in year t. The World Bank would bill country K's government for X_t in year t. In such a way/fashion, the World Bank would never directly interact with country-K citizens. However, then country K would have the incentive to renege. This is true, unless doing so comes at an offsetting cost. To generate a default cost, the World Bank would sell, in year $t-1$, $\$X_t$ country-K-specific, one-year, zero-coupon Red Bonds. The country-K Red Bonds would be sold to country K's citizens at an above-market interest rate. The higher-than-market rate would compensate purchasers of the Red Bonds for accepting the Red Bond's special features.

What are these features? First, country-K-specific Red Bonds could only be redeemed by country-K citizens. Second, servicing by the World Bank of country-K-specific Red Bonds would be contingent on country K paying its $\$X_t$ obligation to the World Bank. Thus, the World Bank gets paid back by the government of K, thereby covering Party A's obligation, and the government of K realizes that reneging on paying X_t will cost other country-K citizens the amount, $\$X_t$.[4]

[4]There is no guarantee that this solution will work. Country K could announce in advance that it will not pay its $\$X_t$ obligations independent of the World Bank's defaulting on country-K Red Bonds. This may preclude their purchase in the first place unless country-K citizens believe its government won't carry through

Would the World Bank break even? Yes. At any point in time, the present value of all country-specific X_t payments would equal the value of outstanding Green Bonds. The World Bank could invest the proceeds of its sale of Red Bonds in, say, U.S. Treasuries, so it would always be able to redeem those bonds. This Red-Bond enforcement mechanism may seem novel, and perhaps it is with respect to enforcing policies of this kind. However, the marketplace routinely relies on the reluctance of nations to default on their own citizens. Take Argentina. On a periodic basis, Argentina is unable to borrow internationally. However, during such periods, it remains able to borrow domestically. The reason for this is that the Argentine government finds it politically far more difficult to default on domestic than on foreign bondholders. There are, nevertheless, exceptions. Russia's default in the late 1990s was a domestic, but not a foreign default.[5]

9 Changing the Framework for Carbon-Tax Analysis

Economists naturally value analytical elegance. Boiling down complex issues into a small number of equations permits an easy and precise understanding of the issue at hand. However, oversimplifying climate change comes at a major cost. Golosov et al. (2014) are an example. By invoking infinitely-lived dynastic agents and making a range of strong assumptions, the authors reduced optimal carbon taxation to one equation – as elegant a "solution" as one would wish.

In contrast, the Kotlikoff et al. (2021c) study, which spares few climate-change-relevant details and solves for a uniform win-win, boils up to over 3 million equations in an equal number of unknowns. Formulating, calibrating, and solving such a model is clearly feasible. Indeed, Kotlikoff et al. (2021c)'s three million-plus-equation model can be solved on a laptop in a few hours.[6] As for its "black box" nature, the model's millions of equations are each satisfied to extremely high precision. Moreover, one can readily test the model by checking that it responds to hypothetical policies, demographic changes, as well as preference and technology parameters in exactly the way common sense suggests and economic theory predicts.

Hence, climate economists can and, in our view, must stop looking for their keys under the street light.[7] Instead, they should model climate change as arising from its actual source – the actions of selfish life-cycle agents who live in very different regions and differ fundamentally

on its threat. But there are other enforcement mechanisms. One is for country K to pay the present value of its future net compensation obligation to the World Bank at the time the carbon tax is enacted. The country could simultaneously issue bonds of an equal amount. Country K's major importers could purchase and hold this debt, which might be British-type consuls. Default on those bonds would likely be meant by retaliatory tariffs. Indeed, the imposition of tariffs could be covenants of the bonds in the event of full or partial default. In short, since countries with positive net present value obligations will gain, on balance, to the same degree as all other nations from the carbon tax, they should be willing to pay for it. If they choose not to make an upfront payment, they could be excluded from the World Bank or otherwise sanctioned. This is, to be clear, a tough public goods problem, but the world is replete with public goods, including the World Bank itself, which have been successfully financed by multiple players with conflicting agendas.

[5]Note that Red Bonds could be issued to enforce compliance with other social behaviors. For example, the World Bank could sell better-than-market-return bonds to citizens of, say, country R that would be repaid only if country R did not invade country U.

[6]Far more complex models can, these days, be solved in seconds if needed by invoking more sophisticated solution algorithms and parallel computation.

[7]Nordhaus, understandably, used the social planner model because of its analytical convenience, not its economic realism.

with regard to technologies, demographics (current and projected), capacities to produce green energy, the potential for climate damage, usage of coal, gas, and oil, etc. These regions face very different climate risks. They can and must be differentially compensated to secure their agreement to tax carbon through time at the optimum global rate.

10 Optimal UWI Policy

As described in Kotlikoff et al. (2021c), optimal UWI policy entails close to a $100 per ton initial carbon tax rising at 1.5 percent annually. As figure 1 makes clear, this global carbon tax makes a huge difference to carbon emissions. And, as described in our paper, global long-term carbon damages are cut roughly in half. The impact on specific types of dirty energy, detailed in figures 3 (Oil), 4 (Gas), and 5 (Coal), is telling.

Coal production, for instance, comes, as shown in figure 5, to an abrupt end in most regions and a quick end in others. As for the uniform welfare gain, it is 4.3 percent, calculated as a compensating consumption differential. Kotlikoff et al. (2021c) also generates the precise lifetime net tax payments owed by each generation in each region. Those with the most to gain, e.g., Indians born in the next century, face the largest net taxes as a share of their lifetime resources. Their negative compensation is very high given the size of the more than offsetting welfare gains they derive from global carbon taxation. However, those generations facing particularly high UWI taxes are located or will, when born, be located in poor regions. Consequently, were the agreed carbon-tax policy to limit taxation on any generation to, say, 10 percent of lifetime resources, the uniform welfare gain to those not receiving special consideration would be little changed. As for those, like future Indians, who would enjoy a lower tax burden, their welfare gains would, of course, be higher than the UWI target. However, placing a limit on UWI carbon policy's tax burden will limit enforcement problems. Additionally, picking a Pareto solution that provides extra help to climate change's worst victims will also likely facilitate its global adoption.

11 Comparing UWI Carbon Taxation and a Permanent Global Embargo on Russian Fossil Fuels

Figure 1, based on the model in Kotlikoff et al. (2021c), shows that the UWI carbon tax would make a big difference to emissions. Figure 6 considers an alternative carbon policy in the context of Russia's invasion of Ukraine. The policy is a complete and permanent embargo of Russian fossil fuels by all regions of the world. Setting aside the enforcement of such an embargo and the ability to maintain it through time, the figure shows that such a policy would make only a very small difference to global emissions. It would remove a significant share of global dirty energy reserves, but the induced higher price of energy would lead to more fossil fuel extraction by other regions. Indeed, there is essentially no change in global emissions over the next 100 years and a moderate reduction thereafter.

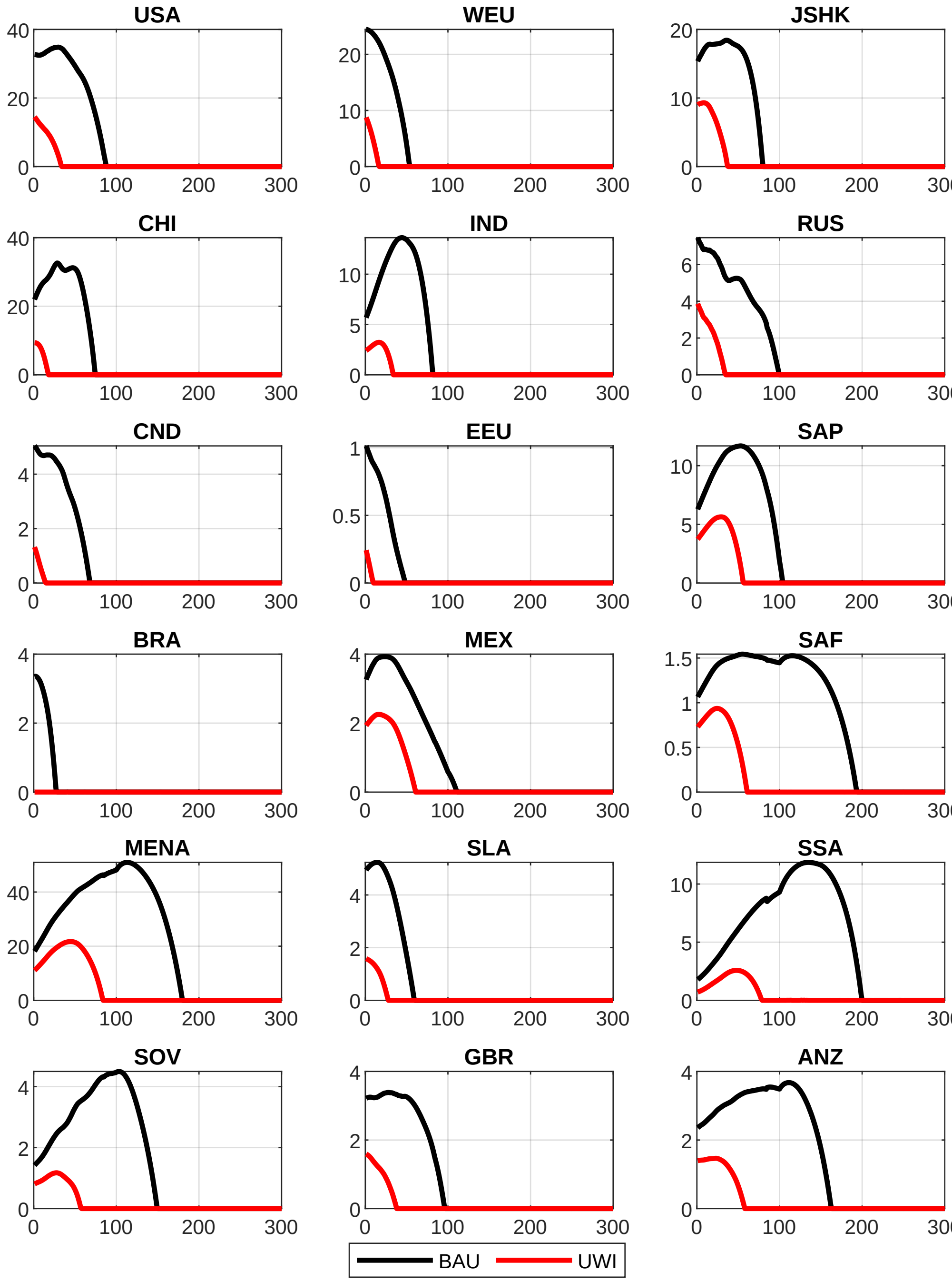

Figure 3: Oil consumption (measured in quad British thermal units).

12 Carbon-Risk Represents a Distinct Negative Externality

Carbon emissions are intergenerational and interregional, not intragenerational (e.g., across dynasty) externalities. Realizing this is of paramount importance. However, so is considering the full scope of the carbon externality. If the externality entails a major, hidden, and generally unperceived cost, carbon taxes, if adopted, will potentially be set far too low. This will render

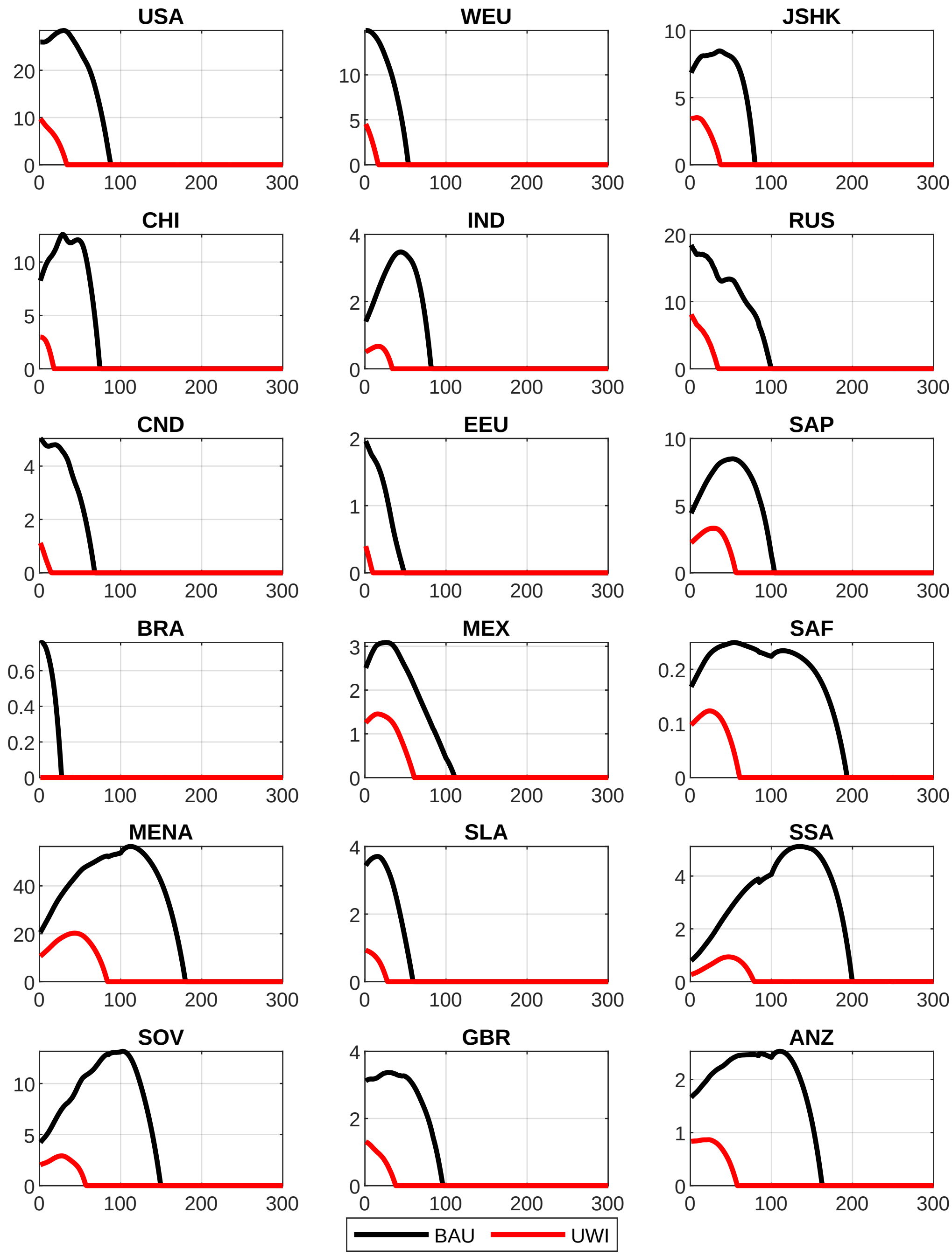

Figure 4: Gas consumption (measured in quad British thermal units).

the green transition slower than appropriate.

The extra hidden negative carbon externality involves risk – the difference between the climate damage that is eventually realized and the damage that is currently predicted. The *climate-risk externality* is distinct from that featured in standard, deterministic climate models. It arises even where carbon emissions cause no economic damage, on average, and entail symmetric shocks. This is the illustrative case we study in Kotlikoff et al. (2021b), which, in turn, is predicated on the original insights of Cai and Lontzek (2018), Cai et al. (2018), and

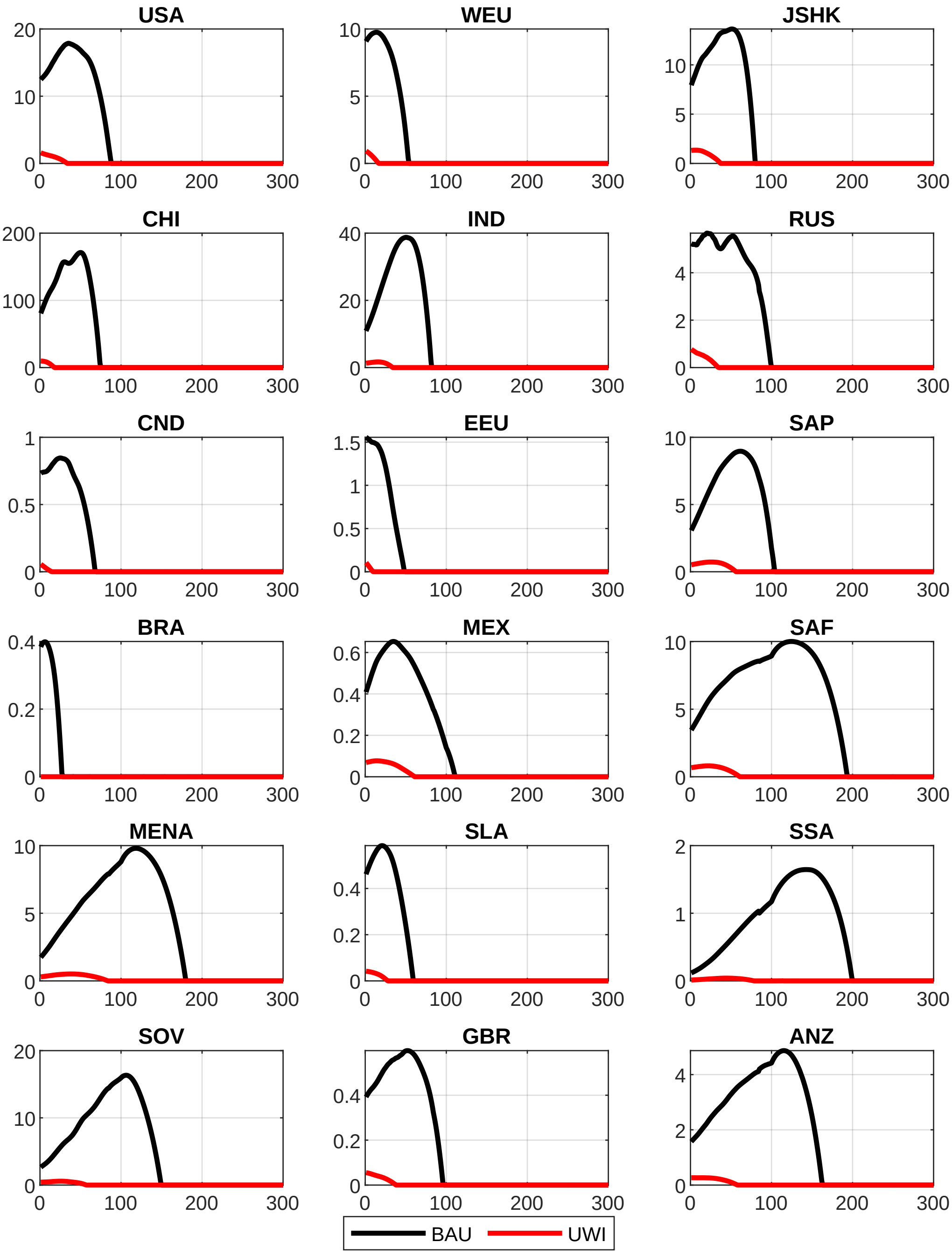

Figure 5: Coal consumption (measured in quad British thermal units).

Cai (2020). As for our study, its economy features uncertainty in the rate of green technological improvement, the extent to which carbon raises the planet's temperature, and the extent of temperature-related damage. Each of these risks is modeled via parameterized distributions with zero means. For example, our model's green-energy technological change can be negative as well as positive. On average, it is zero, with positive and negative shocks symmetrically distributed around zero.

The key takeaway from Kotlikoff et al. (2021b) is that the magnitude of the UWI carbon

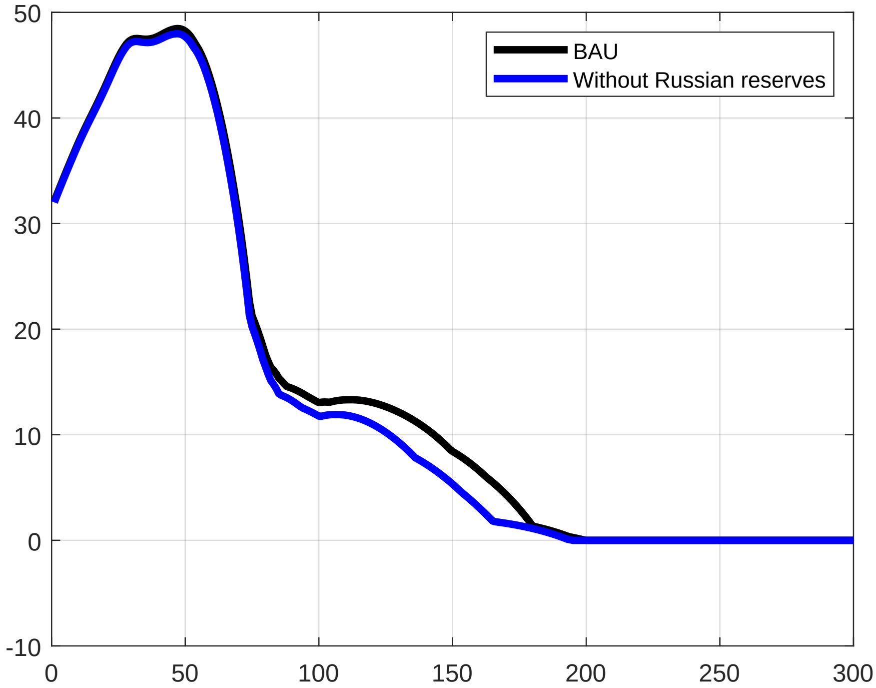

Figure 6: Global CO2 emissions (absent of land emissions, and measured in GtCO2) in the scenario without Russian reserves as a function of years (starting in 2017).

tax needed to handle climate risk appropriately, when there is, on average, zero damage, can be as large as the UWI carbon tax in the absence of risk, but with climate damages that are very high and that are sure to occur. This suggests that the UWI gain from the optimal policy derived in Kotlikoff et al. (2021c) may be twice as large as that reported.

Why do such uncertainties matter if their shocks are zero on average? The answer is risk aversion. Households are far more concerned with downside than with upside outcomes. No one would agree to win or lose half their income on a coin flip. Consequently, when party A puts party B at risk, they are imposing external damage. This damage is not visible, let alone easily measured. In fact, the only means of producing such measurements is via life-cycle models, like ours, that incorporate both risk and the households' aversion to risk.

What does the Kotlikoff et al. (2021b) study add to the path-breaking work of Cai and Lontzek (2018), Cai et al. (2018), and Cai (2020) and the impressive social welfare cost analysis of van der Ploeg et al. (2023) in modeling climate risk? This question is particularly salient given that these studies model climate risk far more precisely. The answer involves their assumption of intergenerally altruistic dynastic agents who will naturally share climate risk across current and future dynasty members. Consequently, this within-family, intertemporal risk sharing will suggest a smaller carbon tax is needed than that prescribed in a life-cycle model.

13 Conclusion

Climate economics must start where the climate problem begins – with selfish life-cycle households living in selfish countries who need to be compensated (bribed) to support global carbon taxation. Such bribes are hard to advocate since they must be paid by future generations who are being victimized by current generations. However, paying these bribes is far better than the alternative – either a no-carbon policy or a half-hearted carbon policy. The benefits to future generations net of paying these bribes will make them and everyone better off. To achieve universal support for global carbon taxation, bribes can be arranged such that every current and living human experiences the same percentage of welfare gain.

That is what theory – a theory that dates back a century — tells us, and that large-scale simulation modeling confirms. Given human heterogeneity, there will, of course, be those who gain somewhat more and those who gain somewhat less from the UWI solution. Additionally, with uncertainty, UWI policy needs to equalize ex-ante expected utility. The policy will not ensure that the climate produces, for example, the average number of hurricanes of average strength taking their typical paths. The change in climate *change* means we are living not just on a planet whose temperature is rising, but whose temperature is changing differently in different regions, producing, from our prospective, random, that is, unpredictable, global climate shocks. These shocks can be irreversible. Thus, if the sea level rises by, say, eight feet, it will take millennia to lower it back down by eight feet. Hence, uncertainty places a limit on UWI policy. We can, for a range of potential shocks, equalize the expected welfare (utility) gains by compensating regions and generations facing particularly high climate uncertainty. However, compensating, for example, island nations for disappearing due to sea level rise places a limit on the UWI policy since the expected benefit to such inhabitants goes far beyond the uniform gain of a global carbon tax and is surely beyond their capacity to reimburse. Hence, the best that may be possible is to base UWI policy on expected climate damage, that is, make the calculations as in Kotlikoff et al. (2021c) rather than as in Kotlikoff et al. (2021b). Other policies can be developed to handle risk. An example is a global climate disaster insurance fund, to which countries pay premiums and receive payment when they experience a localized climate shock.

Our bottom line? Climate change is exceedingly dangerous and urgent. There is only one way to limit its average damage with the hope that doing so will limit the likelihood of its maximum damage. The answer is the immediate adoption of global carbon taxation. However, a global carbon tax has become politically radioactive. This is thanks, in large part, to climate economists who have transformed climate policy into an ethical decision as opposed to the solution to a major, but still standard externality problem.

Where economists can help is in finding policies to which all can agree – policies that account for self-interest and that are designed to elicit support based on self-interest, not presumed goodwill. If, as UWI policy provides, every country, and every citizen of each country benefit to the same degree, there should be close to universal adoption of global UWI carbon policy. Since available UWI policy gains get smaller and smaller the longer the policy's adoption is delayed, everyone everywhere has a strong incentive to adopt the UWI policy immediately. Particular sectors and agents in a given country, for example, coal miners, would need extra compensation from their governments to ensure uniform intra-country welfare gains. And dirty energy-producing countries would surely oppose taxing carbon. Fortunately, the use, not the production of fossil fuels, causes carbon emissions, and fossil-fuel producers are not major users. Moreover, if major players, starting with the US, China, the UK, the EU, and Japan, sign on quickly under the auspices of the World Bank, others will surely do so as well. Their incentive will be to secure the compensation available to current generations that the UWI policy offers.

The promise of a win-win carbon policy is substantial. Relative to business as usual, its adoption, which entails moderately high and rising carbon taxes coupled with significant net side payments, can achieve a five to ten percent welfare gain for everyone, everywhere, through time. This is a large enough benefit for people to strongly urge their politicians to adopt the policy. The available gains reflect the power of carbon taxation, as opposed to piecemeal green initiatives, to quickly and dramatically lower global carbon emissions.

Climate economics is now mired in generational conflict. This need not continue. Climate economists should pay attention to the well-established solution to negative externalities – compensate self-interested actors for being forced to pay, at the margin, the full price of their additional economic damage. The UWI carbon policy provides an opportunity to change the conversation. Older opponents of carbon taxation, who care more about energy prices than the welfare of their progeny, will be enticed to support carbon taxation because they will share in its gains. Climate deniers will be persuaded by the compensation and their realization that their beliefs about climate change, even if correct on average, are exposing their children and grandchildren to substantial risk. In short, it is time for a new, two-word, global carbon-policy mantra – Win-Win.

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