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Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world

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HIGHLIGHTS

- We analyze public revenue generated from global carbon tax and cap-and-trade systems.
- 70% of cap-and-trade revenues ($4.60 billion) are earmarked for "green spending".
- 72% of carbon tax revenues ($15.6 billion) are refunded or used in general funds.
- Revenues per capita vary widely and are a useful qualitative explanatory variable.

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ABSTRACT

We investigate the current use of public revenues which are generated through both carbon taxes and cap-and-trade systems. More than $28.3 billion in government "carbon revenues" are currently collected each year in 40 countries and another 16 states or provinces around the world. Of those revenues, 27% ($7.8 billion) are used to subsidize "green" spending in energy efficiency or renewable energy; 26% ($7.4 billion) go toward state general funds; and 36% ($10.1 billion) are returned to corporate or individual taxpayers through paired tax cuts or direct rebates. Cap-and-trade systems ($6.57 billion in total public revenue) earmark a larger share of revenues for "green" spending (70%), while carbon tax systems ($21.7 billion) more commonly refund revenues or otherwise direct them towards government general funds (72% of revenues). Drawing from an empirical dataset, we also identify various trends in systems' use of "carbon revenues" in terms of the total revenues collected annually per capita in each jurisdiction and offer commensurate qualitative observations on carbon policy design choices.

1. Introduction

For economists, political scientists, and policy analysts who wish to put a price on carbon, the question of optimal carbon pricing mechanisms has long been hotly debated. Some economists have argued for a direct carbon tax (Metcalf and Weisbach, 2009; Nordhaus, 2007) and others have advocated cap-and-trade (Keohane, 2009; Stavins, 2007), while a third group has argued that the two policies are functionally equivalent (i.e. that a given cap-and-trade system can be designed to essentially mimic a carbon tax, and vice versa; Aldy et al., 2010; de Mooij et al., 2012). Policy design elements have been explored in depth conceptually or through modeling exercises.

Carbon pricing is widely implemented across the globe today. Furthermore, jurisdictions enacting carbon prices have often done so for varied political and policy reasons which are not limited to carbon pricing's academic purpose of increasing the marginal cost of greenhouse gas emissions to avoid anthropogenic climate change (Harrison, 2013; Schatzki and Stavins, 2013). The emergence of a global carbon pricing dataset leads to new opportunities for comparative empirical analysis of policy dynamics and design choices as they exist in the real world in order to better inform conceptual understanding of these policies (Tables 1 and 2).

In particular, given growing interest in the United States in the potential for carbon pricing revenue-neutrality to improve the political prospects of broad-based climate policy in that country (Parry et al., 2015; Shultz and Becker, 2013; Taylor, 2015), we have chosen to investigate the use of public revenues which are generated through both carbon taxes and cap-and-trade systems. Our examination of carbon-pricing revenues in all of the major worldwide jurisdictions in which it is practiced suggests that the

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usage of such revenues helps to illuminate the framing of the policy.[1]

Reviewing government literature, we estimate that more than $28.3 billion in government "carbon revenues" are currently collected each year in 40 countries and another 16 states or provinces around the world. Of those revenues, 27% ($7.8 billion) are used to subsidize "green" spending in energy efficiency or renewable energy,[2] while 26% ($7.4 billion) go toward state general funds. Notably, 36% ($10.1 billion) of today's carbon revenues–the largest share overall–are returned to corporate or individual taxpayers through paired tax cuts or direct rebates.

Our observations of carbon pricing in the real world suggest that while the form of a carbon pricing system may be theoretically interchangeable in terms of incentivizing emission reductions, system form does seem to matter in terms of how revenues are used. Namely, cap-and-trade systems earmark a larger share of global revenues for additional "green" spending, while carbon tax systems more commonly refund revenues or otherwise direct them towards government general funds.

2. Methodology

We estimated 2013 revenue collections and expenditures from each global carbon pricing system operating at the state/provincial level or above using government documents and secondary literature, as described in the individual country descriptions contained in Appendices A and B. Expenditures were categorized into three themes[3]:

(1) *Green spending*, which includes any form of government spending on or subsidy toward (primarily) energy efficiency and renewable energy research, development, and deployment, as well as other efforts intended to reduce greenhouse gas emissions related to agriculture and forestry, landfill management, alternative vehicles, and mass transit or transit-oriented development, as well as measures to adapt to climate change. This category does not include all "green spending" undertaken by a government with a carbon pricing system, only that additional spending tied to carbon revenues.
(2) *General funds*, where governments describe carbon revenues as independent of any other public spending obligations, expressly contributing to general funds, or where the use of carbon revenues is not otherwise specified and does not appear to be linked to particular spending programs.
(3) *Revenue recycling*, where carbon revenues are directly returned to some broad portion of the population through individual or business tax rate cuts, tax eliminations, or rebates in order to offset, in aggregate, the negative macroeconomic impacts of higher energy costs under a carbon price. To meet the definition, revenue recycling should be carried out independent of an individual's, corporation's, or sector's cost of emitting carbon dioxide. We therefore do not include free allocation of emission permits (for cap-and-trade systems) as a form of revenue recycling, nor do we count the use of revenues for targeted industry assistance (for trade-exposed or energy-intensive firms).[4]

We then compare each carbon pricing system's revenue uses to other system attributes, with a focus on system "revenue per capita" as a differentiating comparator. Revenue per capita is a useful simplified indicator to understand the fiscal impact of a carbon-pricing system in the aggregate; the incidence of policy costs may actually be more narrow depending on system design, but revenue per capita gives a sense for the policy's overall burden. It is also relatively direct compared to more commonly-used carbon policy indicators such as price per ton of emissions, total emission coverage, or reduction targets. The actual effects of any of those measures are not consistent across implementation environments, as they are filtered through numerous other economic and design variables before being felt.[5]

3. Results

3.1. Carbon cap-and-trade revenues

Carbon cap-and-trade systems raised about $6.57 billion globally in government revenues in 2013 through the sale of emission permits created by public entities.[6] State-run carbon permit auction and sales revenues alone therefore make cap and trade systems a significant policy tool for revenue generation—23% of overall global carbon revenues, and growing (despite the poor salience of these revenues[7] among the general populace). Of carbon cap and trade revenues, 70% are currently spent on "green" subsidies such as support for energy efficiency or renewables, while only 9% are directly returned to taxpayers or individual consumers.

Unlike carbon taxes, which have a longer global track record owing to their continued use in Scandinavian countries since the early 1990s, carbon cap-and-trade systems have only been producing measurable revenues for the last six or seven years. In some cases, such as the

[1] Policy discussions of global policies to price the emission of greenhouse gases such as carbon dioxide, whether through direct taxes or indirect cap-and-trade mechanisms, often focus on the desired *effect* of the new price–reduced emissions by marginally increasing the cost of carbon-intensive energy consumption–rather than the potentially substantial government *revenues* generated alongside. This stands in contrast to Barthold's (1994) observation that environmental excise taxes (such as gas taxes or chemical fees) were historically used primarily as revenue devices rather than incentives to change behavior. In this way, carbon taxes are perhaps more similar to dual-purpose "fiscal-behavioral" sin taxes on alcohol and tobacco products (with the "sin" in this case being carbon emissions).

[2] This represented about 6.4% of 2013 global public subsidies toward renewable energy ($121 billion, according to the International Energy Agency). Measurements of government spending on energy efficiency are both less precise and subject to broad definitional variation; they can conservatively said to be on the order of renewable subsidies, which would put carbon revenue spending at about 3% of the combined global total government "green spending" (IEA, 2013, 2014a, 2014b).

[3] Total spending may not add up to 100% as not all spending is necessarily captured by these three categories and on account of yearly discrepancies in carbon revenue inflows versus expenditures (or, otherwise, formal fund designations). Currencies are converted to nominal U. S. dollars at then-market exchange rates.

[4] The reason is that both free allocation and industry assistance are tied to specific emitter characteristics and more akin, respectively, to selectively lowering the original carbon price (where the government never sees the revenues) or buying off political opposition to the carbon pricing policy (Markussen and Svendsen, 2005). It is arguable that such interventions could in fact be regarded as a form of arms-length "spending" by governments for which it would be politically untenable to actually first take possession of these lost revenues; the implications of such arrangements are left to further study.

[5] Far more precise economic effects of carbon pricing policies are generally estimated through complex economy-specific modeling exercises. See for example, computable general equilibrium (CGE)-based efforts by Meng et al. (2013) for the Australian carbon tax, and comments therein regarding public skepticism of similarly advanced modeling undertaken by the Australian Treasury.

[6] This figure is for direct cash receipts does not include the implicit value of carbon permits granted by the state to emitters through grandfathering or other free allocation; it also does not include the value of emission permits generated through offsets or other peer-to-peer trading.

[7] For example, a recent survey of California residents found that 87% of respondents had heard "nothing" or just "a little" about the state's cap-and-trade program, which began generating government revenues later that year, and that 65% had "very little" or "no" confidence in the state's government to use that money wisely (Baldassare et al., 2012).