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# Public economics of hitchhiking species and tourism-based risk to ecosystem services



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### ABSTRACT

This paper is the first to examine the public economics of export-based externalities arising within the provisioning of ecosystem services, with direct application to policies to prevent the spread of hitchhiking invasive species. We find when risk enters through exports, policy makers face a tradeoff between welfare improvements and reducing risk of invasion. Estimates of visitor demand elasticity for ecotourism are low, so price policies are not likely to reduce risk, though they can raise tax revenue. If demand is elastic enough to reduce risk, trade effects can cause loss of income greater than the risk of the invasion. The paper is motivated by the expansion of invasive species' within the United States. We apply our model to the specific example of quagga and zebra mussels invasion into the U.S. Pacific Northwest.

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## 1. Introduction

This paper is the first to examine the public economics of export-based externalities arising within ecosystem services, with direct application to ecotourism and policies to prevent the spread of hitchhiking invasive species. Our approach contrasts the large literature on *import*-based spread of invasive species, which has become the dominant paradigm in research and policy. We show the useful but narrow lessons from this import-risk literature could lead to unintended consequences and be applied to problems they were not meant to address. We consider the welfare effects of correcting an externality on both the import and export sides of trade and show the source of risk matters as much as the risk itself when designing corrective measures for bioeconomic externalities posed by invasive species. We find that, when risk comes from exports, price instruments are not likely to be appropriate tools for reducing risk of invasion.

Olson (2006), Lovell et al. (2006), and Finnoff et al. (2010) review the economics literature on invasive species, including literature on managing trade-based risk. As other authors have pointed out, trade is like any other risky behavior in which humankind partakes. Agents must balance risk of contamination with enhanced opportunities from multiple trade partners. Well informed agents can optimally manage this risk by choosing private or public methods of protection and insurance (Sausgruber, 1990). Work along these lines has focused on externalities introduced through imports, and not addressed the contact with trade partners through exports and trade in domestically provided services. The story in this paper is centered around hitchhiking aquatic invasives, such as zebra and quagga mussels, but the model is applicable to any hitchhiking species and other export-based threats such as domestically owned ships, planes, and automobiles that can become contaminated while visiting other regions and bring unwanted pests home. Following the trade literature (Deardorff, 1985; Melvin, 1989; van Marrewijk et al., 1997; Copeland, 2002; Cullinan, 2005), goods and services consumed by nonresidents are exports, as payments flow from outside the region to local firms and households.<sup>1</sup>

Differentiating between import- and export-related externalities determines the ability of agents to manage the associated risk. Consumption of imports can be taxed in a way that internalizes cost of environmental damages within the regional economy (McAusland and Costello, 2004).<sup>2</sup> Environmental damages cannot be internalized when they come from exports. We show that if taxes reduce risk, they must also lower regional incomes. Taxes affect the terms of trade, and levying a tax causes declines in domestic production, and local income, large enough to offset the welfare gains from correcting the environmental problem. This result is taken for granted when discussing commodity exports, and many exported goods are subsidized. Taxes targeting visitors, however, are common (e.g., hotel taxes, rental cars, out of state fishing licenses, airport fees), consistent with evidence that voters prefer taxing others over themselves regardless of the efficiency of the taxes (Sausgruber and Tyran, 2011). Costello and McAusland (2003) show that tariffs can alter the domestic production mix making a country more or less susceptible to damages, and Tu et al. (2008) show that the resulting effect of tariffs on production mix can influence the probability of invasion by favoring imports more likely to harbor invasive species.

The focus of our paper is on differences between import and export policy perspectives. Our theoretical model purposely follows the previous literature to allow comparability of results and further an ongoing discussion within the literature, though some new features are required for our analysis. Specifically, we follow the public finance literature on environmental regulation and tax interactions. We contribute new second best welfare effects that are necessary for studying trade-based externalities. A large literature exists on potential gains from an environmental tax beyond correcting the externality, known as the 'double dividend' hypothesis. Oates (1995) reviews this literature and

<sup>1</sup> Recent findings of a fish virus (*viral hemorrhagic septicemia*) have restricted interstate transport of live bait in the Great Lakes area. Other examples of externalities from exported services and visitor consumption are automobile exhaust (Peretz et al., 2005), diver impact on coral reefs (Hawkins et al., 2005), and pollution tied to sporting events (Collins et al., 2007). While these externalities are well known, little has been said about the welfare effects of policies to correct these externalities.

<sup>2</sup> In a model with taxes and inspections, they find optimal tariffs are non-negative, and equal to zero if and only if inspection is costless and detection is perfect.

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