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Sufficient statistics for tariff reform when revenue matters☆

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ABSTRACT

What kinds of tariff reform are likely to raise welfare in situations where tariff revenue is important? General conditions for welfare to rise without reducing tariff revenue are opaque. We show that they can be greatly simplified using a small number of sufficient statistics, primarily the generalized mean and variance of tariffs. We present sufficient conditions for a class of linear tariff reform rules that guarantee higher welfare without a loss in revenue. The rules consist of convex combinations of (i) trade-weighted-average-tariff-preserving cuts in dispersion; and (ii) uniform tariff cuts that preserve domestic relative prices among tariff-ridden goods.

1. Introduction

What kinds of tariff reform are likely to raise welfare in situations where tariff revenue is important? The question is an important one: despite steady reductions in average tariffs, tariff revenue is still a significant component of total tax revenue, especially in low-income countries. Baunsgaard and Keen (2010) review the empirical evidence on the revenue effects of trade liberalization in recent decades, and conclude that, while middle-income countries have managed to offset reductions in trade tax revenues by increasing their domestic tax revenues, many low-income countries have not. Even in rich countries, the revenue effects of changes in tariffs can be substantial in absolute if not in relative terms, and can be a factor influencing the decision to liberalize trade. The implications of trade reform for revenue have featured prominently in discussions of the EU's association agreements with countries in the Southern Mediterranean region (see Abed, 1998), and even in official discussions of the case for the U.S. joining NAFTA (see Congressional Budget Office, 1993).[1]

Unfortunately, as we shall see, general conditions for welfare to rise without reducing tariff revenue are opaque, and provide little guidance to practical policy-making. Our main contribution is to show that they can be greatly simplified using a small number of sufficient statistics, primarily the generalized mean and variance of tariffs. Reexpressing the general conditions in terms of these sufficient statistics leads to new operational guidelines for tariff reform that guarantee higher welfare without a loss in revenue. The rules consist of convex combinations of cuts in tariff dispersion that preserve the trade-weighted-average-tariff, on the one hand, and uniform tariff cuts that preserve domestic relative prices among tariff-ridden goods, on the other. These guidelines provide a theoretical foundation for the standard World Bank advice to developing country clients that they should reduce dispersion of tariffs while maintaining average tariffs to preserve revenue. In plausible special cases, the rules require only observable data and a small number of aggregate elasticities.

Our approach builds on the sizeable literature on trade policy reform in open economies, stemming in particular from Hatta (1977). Much of this literature provides guidelines for welfare-improving tariff reform when government revenue is not a concern, which amounts to

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assuming that the government has lump-sum tax/transfer power. This approach has been extended to study the interplay of revenue and efficiency considerations in trade policy reform by a number of authors, including Falvey (1994), Emran and Stiglitz (2005), Hatta and Ogawa (2007), and Raimondos-Møller and Woodland (2015). However, these papers either use relatively special low-dimensional models, or do not provide rules that can be easily implementable. An exception is a branch of the literature which advocates replacing border taxes with domestic consumption taxation. (See for example, Hatzipanayotou et al. (1994), Keen and Ligthart (2002), and Kreickemeier and Raimondos-Møller (2008).) The intuitive argument that the base is broader can be supplemented with optimality considerations. Diamond and Mirrlees (1971) demonstrated that it is inefficient to distort productive efficiency when raising revenue with distortionary taxation. Trade taxes, by subsidizing production, drive a wedge between domestic and international marginal rates of transformation. However, Anderson (1999) shows that gradual reform of this type need not improve welfare when uniform radial reductions are used to lower tariffs. The present paper admits a much broader class of trade reforms when wage taxation is the alternative revenue source and provides more optimistic prospects for tariff reforms which reduce dispersion.

The present paper draws on Anderson and Neary (2007), where the approach using generalized moments of the tariff structure was introduced and applied to devising rules for trade policy reform in the conventional setting of no revenue constraint. That paper derived linear welfare-improving reform rules as implications of reform that reduced either or both of two sufficient statistics, the generalized mean and generalized variance of the tariff structure. Here we extend these methods to the case where lump-sum taxes and transfers are not feasible and so the government faces a binding revenue constraint. All government tax changes become costly at the margin because they involve distortions. The same sufficient statistics prove useful in the case of an active revenue constraint, supplemented by some additional aggregate elasticity terms. In a big step toward applicability with very limited information, Anderson and Neary (2007) also showed that, in a special CES case, the generalized mean and variance reduced to the readily observable trade-weighted version of these statistics. A second contribution of the present paper is to demonstrate that observability of generalized moments obtains with weak separability, nesting not only the CES but most other widely-used preference and technology structures. A group of goods such as clothing under separability can contain pairs that are complements (shirts and trousers) and other pairs that are substitutes (cotton and silk shirts). The separable setting also permits a further realistic extension which replaces the representative agent with heterogeneous agents while maintaining feasible operational rules that yield Pareto improvement.

Section 2 sets up the model and derives the general expressions for tariff reform in the presence of revenue constraints. Though insightful, these do not easily lend themselves to practical implementation. The remainder of the paper shows how they can be operationalized using the tariff moments approach introduced in Anderson and Neary (2007). Section 3 reviews and extends that approach, while Sections 4 and 5 use it to analyze trade reform and to derive the main results of the paper. Section 6 extends the results to the case of many households, while Section 7 concludes.

2. Equilibrium and the effects of tariffs and taxes

2.1. The setting

The tariff reform problem is to advise on directions of change of tariffs from initial values. Full optimization is not feasible by assumption. The setting is a competitive small open economy which raises its revenue with a set of tariffs and with a wage tax. For simplicity we will present the results in terms of a perfectly competitive economy though, as shown in Anderson and Neary (2005), the results also apply to a variety of monopolistically competitive models with fixed entry costs and firm heterogeneity. The wage tax is distortionary because labor supply is variable (due to household choice in an economy where immigration is shut down) and leisure cannot be taxed. Tariffs and the wage tax are initially set sub-optimally. The objective of the reform is to move the taxes gradually toward their optimal (Ramsey) values. This section first describes the economy and then derives general expressions which show how tariff changes affect welfare and tariff revenue. These results are the key building blocks for our results in later sections that are expressed in terms of tariff aggregates.

The representative consumer's net expenditure function is given by $e(\pi, w, u)$. It gives the minimum spending needed to sustain a level of utility or real income u when the representative consumer faces a vector of prices of traded goods subject to tariffs, denoted by π, and a net-of-tax wage rate denoted by w. The domestic prices π differ from world prices π^* by a vector of specific tariffs t. Since the economy is small, the world prices are exogenous, so changes in domestic prices $d\pi$ are equal to changes in tariffs dt throughout. Implicit in the list of arguments of e is the price of a composite export good, which we take as numeraire so its price can be set equal to one. By Shephard's Lemma, e_π gives the vector of final demand for traded goods, while $-e_w$ gives labor supply. As for the supply side of the economy, the maximum value of GDP which can be produced given its technology and facing goods prices π and a gross wage $w+\tau$, where τ is the tax on labor income, is given by the GDP function $g(\pi, w+\tau)$. By Hotelling's Lemma, the vector of supply of traded goods (or where appropriate, minus the demand for traded inputs) is given by g_π while $-g_w$ gives labor demand.

The trade expenditure function for this economy is defined as the excess of domestic expenditure over GDP, with the added constraint that the labor market clears in the background:[2]

$$E(\pi,\tau,u) = \max_w \ [e(\pi,w,u) - g(\pi,w+\tau)]. \tag{1}$$

E gives the net transfer to the private sector needed to support utility u when domestic prices of traded goods are set at π and the wage tax is set at τ. Its derivative with respect to π, E_π, is the vector of excess demand for traded goods, which equals the vector of net imports m; while its derivative with respect to τ, $E_\tau = -g_w$, is equilibrium employment, where the maximization with respect to w ensures that the labor market clears: $e_w = g_w$.

Since e-g is concave in (π, w, τ), E is concave in (π, τ): compensated net import demand functions are downward-sloping, and a higher wage tax reduces employment.

The private-sector budget constraint is:

$$E(\pi,\tau,u) - s = 0. \tag{2}$$

Here, s is the transfer from the government to the private sector. If the government has lump-sum power, s is an active policy instrument. Otherwise, it is an exogenous transfer, which also serves as a useful analytic link between the private-sector and government budget constraints.

The government budget constraint expresses the requirement that a given amount of revenue must be raised net of subsidies. Taxes are collected on tradable goods at rates $t = \pi - \pi^*$ and on labor at the rate τ. The government budget constraint is therefore given by:[3]

$$R(\pi,\tau,u,s) \equiv t'E_\pi + \tau E_\tau - s \geq R^0. \tag{3}$$

Here, R^0 represents the government's revenue requirement, to fund public goods, repay foreign loans, or finance some other goal which does not directly affect private-sector decisions. Extending the model to

[2] See Anderson and Neary (2007) for a discussion of the trade expenditure function when labor supply is fixed, and for further references.

[3] All vectors are column vectors and a prime denotes a transpose.

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