Public Infrastructure and Optimal Tax Policies in a Polluted Small Open Economy

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Abstract

In this paper, we construct a general equilibrium trade model of a small open economy where production and consumption entail the creation of pollution emissions. The country’s government can use various domestic taxes, e.g., consumption and consumption pollution taxes, production and production pollution taxes, and trade taxes, e.g., import tariffs. All tax revenues are used to finance a public input which for analytical convenience we call “public infrastructure”. Increase in public infrastructure first, reduces the amount of pollution per unit of consumption or production of private goods. Second, public infrastructure reduces the cost of transporting private goods from their production site to markets and given world prices of goods, it increases the producer prices. Within this framework, we examine the open economy’s optimal tax policies considering the following cases. First, we derive the optimal domestic and trade tax rates when the government chooses endogenously the fraction of tax revenues earmarked for the financing of a given (exogenous) level of the public infrastructure good. Second, assuming that (i) there is only consumption generated pollution, (ii) the level of the public infrastructure good is endogenous, and (iii) all tax revenue is earmarked for financing it, we derive the optimal consumption tax, consumption pollution tax, and tariff, first each tax alone and then any two of these taxes at a time. Finally, assuming that (i) there is only production generated pollution, (ii) the level of the public infrastructure good is endogenous, and (iii) all tax revenue is earmarked for financing it, we derive the optimal production tax, production pollution tax, and tariff, first each tax alone and then any two of these taxes at a time. To facilitate the understanding of the analytical results, we consider various special cases of the general model.

1 An example of such a public infrastructure good, in the context of the present analysis, could be a highway. More or better highways may increase the number of trips, thus more aggregate consumption pollution, but it reduces the time per trip, and thus pollution per unit of trip. On the other hand, more or better highways facilitate, and reduce the cost of, transporting goods from their production site to markets. The reduction in transportation costs raises the producer prices and thus aggregate production and production pollution. But again, each unit of the good produced, now generates less pollution than before.