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Technical Annex

**Trade Effects of the East African Community: The Model of Verdoorn**

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This document is the technical annex to the full paper “Trade Effects of the East African Community” which is available separately.

To analyse the different trade effects a customs union may have, Verdoorn (1960) considers a standard utility function for a particular commodity category ( $Q$ ), such as shoes:<sup>1</sup>

$$(1) \quad U = f [f_1 (Q_1, Q_2), Q_3],$$

where the branch of the utility function  $f_1$  is homogeneous,  $Q_1$  and  $Q_2$  denote imports of shoes from preferred and non-preferred countries, and  $Q_3$  represents domestically produced shoes. The assumption of homogeneity of the utility function implies that total imports ( $Q_1+Q_2$ ) are substituted equally for domestic production. By using import demand elasticities ( $\xi$ ), we can thus employ import data without having to rely on domestic production data. This particular assumption is not only convenient, but

also rather necessary in the case of Kenya, Tanzania and Uganda, since detailed domestic production data are not available.

Against this background, we can focus on different sorts of imported shoes only. The consumer allocates expenditure to preferred and non-preferred imports subject to his or her budget constraint

$$(2) \quad Y_s = P_1Q_1 + P_2Q_2,$$

where  $Y_s$  refers to the share of total income spent on imported shoes and  $P_i$  stands for the prices of different imports.

Consider now the impact of a tariff ( $t$ ) elimination only on preferred imports  $Q_1$ . If the supply elasticities are infinite, then the price of the beneficiaries' imports  $P_1$  changes by

$$(3) \quad \frac{dp_1}{p_1} = \frac{\Delta t}{1+t}.$$

To measure the degree of substitution of  $Q_1$  and  $Q_2$ , we use the Allen (1962) partial elasticity of substitution ( $\sigma$ ). We can thus express the total expansion of imports from the preferred country's viewpoint as follows:<sup>2</sup>

$$(4) \quad \frac{\delta Q_1}{Q_1} = (\alpha_1 \xi + (1 - \alpha_1) \sigma) \left( \frac{\Delta t}{1+t} \right),$$

where  $\alpha_1$  refers to the share of  $Q_1$  in the total consumption of imported shoes ( $\alpha_1 = Q_1/(Q_1+Q_2)$ ). Accordingly,  $\alpha_2$  measures the share of  $Q_2$  in total imports, and the sum of  $\alpha_1$  and  $\alpha_2$  equals 1.

Equation (4) can be rearranged by substituting  $\alpha_2$  for  $\alpha_1$ :

$$(5) \quad \frac{\delta Q_1}{Q_1} = (\xi + \alpha_2(\sigma - \xi)) \left( \frac{\Delta t}{1+t} \right).$$

Finally, the total trade effect can be separated into trade creation (TC) and trade diversion (TD). Trade creation, that is, the increase in preferred imports due to

replacement of domestically produced goods, can be determined from the recipient country's viewpoint as follows:

$$(6) \quad TC = Q_1 \xi \left( \frac{\Delta t}{1+t} \right).$$

Likewise, trade diversion is defined as the replacement of non-preferred with preferred imports:

$$(7) \quad TD = Q_1 \alpha_2 (\sigma - \xi) \left( \frac{\Delta t}{1+t} \right).$$

## **Endnotes**

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1. In his original paper Verdoorn considered the trade effects of the customs union between Belgium, Luxembourg and the Netherlands in the late 1930s.
2. See Verdoorn (1960) for details. Income effects are neglected, since these would be extremely small.