International trade : Comparative advantages and optimal trade policy (10 points)

1. Explain why the position of a good on the $[0,1]$ interval can be interpreted as an indicator of the domestic country's comparative advantage in producing good z. (1 point)
For each good z, the relative cost of production in the domestic, relative to the foreign country, is strictly

proportional to $a(z)$: $p(z) = wa(z)$. Whatever z and z', the relative price of good z in terms of good z', in the domestic relative to the foreign country is $p(z)/p(z') = a(z)/a(z')$ which is strictly lower than one if $z > z'$. The higher the position of z on the $[0,1]$ interval, the larger the domestic country's comparative advantage in producing good z, in relative terms with respect to all goods located below z on the $[0,1]$ line. In this sense, the position z is related to the country's comparative advantage in producing the good.

2. Show that, in the free trade equilibrium of this model, there is a threshold good $\tilde{z}$ such that all goods $z \in [0, \tilde{z}]$ are produced and exported by the foreign country while all goods $z \in [\tilde{z}, 1]$ are produced and exported by the domestic country. Discuss how $\tilde{z}$ is affected by changes in the equilibrium relative wage $w/w^* = w$. Draw the relationship in the plan $(\tilde{z}, w)$ and comment. (2 points)

Under free trade, the domestic country produces and exports z if and only if $p(z) \leq p^*(z) \Leftrightarrow wa(z) \leq 1$. The country instead imports goods such that $p(z) \geq p^*(z) \Leftrightarrow wa(z) \geq 1$. There is thus a threshold good $\tilde{z}$ defined by $wa(\tilde{z}) = 1$ such that for $z \in [0, \tilde{z}]$, the good is exported by the domestic country while goods in $z \in [\tilde{z}, 1]$ are imported from abroad. For a given relative wage w, $\tilde{z}$ thus determines the range of goods for which the domestic country has a comparative advantage.

By definition, $\tilde{z} = a^{-1}\left(\frac{1}{w}\right)$ which is decreasing in the $(\tilde{z}, w)$ plan. An increase in the equilibrium wage w increases all relative prices in the domestic country. As a consequence, some goods that used to be in the range of comparative advantages of the domestic country start being produced at lower price in the foreign country, i.e. $\tilde{z}$ decreases.

3. Write the trade balance equation under free trade (or equivalently the equilibrium in the domestic labor market) and show how this determines a second relationship between the equilibrium wage w and the threshold good $\tilde{z}$. Comment (2 points)

The trade balance equation implies that the value of the domestic country's exports is equal to the value of its imports :

$$\int_0^{\tilde{z}} b(z) Y^* dz = \int_{\tilde{z}}^1 b(z) Y dz$$
$$\Leftrightarrow \quad L^* \beta(\tilde{z}) = wL(1 - \beta(\tilde{z}))$$
$$\Leftrightarrow \quad w = \frac{L^*}{L} \frac{\beta(\tilde{z})}{1 - \beta(\tilde{z})}$$

Equivalently the domestic labor market equilibrium :

$$L = \int_0^{\tilde{z}} a(z)y(z)dz$$

$$with \quad y(z) = c(z) + c^*(z)$$

$$and \quad c(z) = b(z)\frac{Y}{p(z)}, \quad c^*(z) = b(z)\frac{Y^*}{p(z)}$$

$$\Leftrightarrow \quad L = \int_0^{\tilde{z}} \frac{b(z)}{w}(wL + L^*)dz$$

$$\Leftrightarrow \quad w = \frac{L^*}{L}\frac{\beta(\tilde{z})}{1 - \beta(\tilde{z})}$$

The market equilibrium equation implies a second relationship between $\tilde{z}$ and w, which is increasing in the $(\tilde{z}, w)$ plan. Intuitively, an increase in the range of commodities hypothetically produced at home at constant relative wages ($\uparrow \tilde{z}$ given w) lowers the domestic country's imports and raises its exports. The resulting trade imbalance would have to be corrected by an increase in the domestic country's relative wage that would raise its import demand and reduce its export competitiveness, and thus restore balance.

4. Explain why, in a free trade equilibrium, an increase in the relative size of the domestic country (an increase in L holding L^* constant) reduces the equilibrium relative wage and increases the share of goods that the country specializes in. [Trick : Use the trade balance equation and discuss the impact of L raising on the equilibrium of labor markets] (1 point)

Starting from the free trade equilibrium, an increase in the domestic country's relative size ($\uparrow L/L^*$) increases the demand for imports, at given wage. The relative wage needs to adjust to restore trade balance. In particular, the additional demand for imports leads to an excess supply of labor at home and an excess demand of labor abroad. Equilibrium in labor markets is restored through a decrease in the relative wage w ($\downarrow w$). All domestic producers thus gain competitiveness with respect to their foreign counterparts. In equilibrium, the range of comparative advantages of the domestic country increases (*uparrow $\tilde{z}$*).

5. Suppose now that the home country imposes an homogenous ad-valorem tariffs τ on all imported goods. Show that there is now a range of products that are no longer traded in equilibrium. Discuss the consequences of such trade policy on the equilibrium wage. What is the likely impact on consumers' surplus ? (3 points)

At given relative wage, the ad-valorem tariff on imports increases the domestic price of foreign goods in the range $z \in [\tilde{z}, 1]$. In particular, some of the goods that used to be imported from abroad (ie such that $a(z)w > 1$) start being produced more competitively at home ($a(z)w < 1 + \tau$). This happens in the range $z \in \left[a^{-1}\left(\frac{1}{w}\right), a^{-1}\left(\frac{1+\tau}{w}\right)\right]$. Those goods are no longer traded in the short run equilibrium (ie at given relative wage) since the domestic production cost is still too high for those goods to be exported abroad.

The new labor market equilibrium condition writes :

$$L = \int_0^{\tilde{z}} \frac{b(z)}{w}(wL + L^*)dz + \int_{\tilde{z}}^{\tilde{\tilde{z}}} \frac{b(z)}{w}wLdz$$

where $[0, \tilde{z}]$ is the range of goods that are produced and exported by the domestic country while goods in $[\tilde{z}, \tilde{\tilde{z}}]$ are produced but not exported. Using the same reasoning as before, this equation simplifies into :

$$w = \frac{L^*}{L}\frac{\beta(\tilde{z})}{1 - \beta(\tilde{\tilde{z}})}$$

2

where, $\tilde{\tilde{z}}$ and $\tilde{z}$ are related by the following equation :

$$a(\tilde{\tilde{z}}) = (1 + \tau)a(\tilde{z})$$

With respect to the free trade case, introducing an ad-valorem tax has an impact on the equilibrium wage and the distribution of comparative advantages. Namely, with respect to the free trade case, the equilibrium wage is higher ($\uparrow w$) and the threshold good above which the foreign country does not import domestic goods reduces ($\downarrow \tilde{z}$). This is because the additional demand of domestic labor induced by goods in $[\tilde{z}, \tilde{\tilde{z}}]$ being now bought to domestic firms creates an excess demand of labor in the domestic country and an excess supply abroad. As a consequence, the domestic relative wage increases which inflates marginal costs and make some goods no longer profitable to import from the domestic economy.

By inflating the price of goods that are imported from abroad, the trade policy has a negative impact on the consumers' surplus. In general equilibrium, aggregate welfare is reduced because the allocation of world labor is no longer optimal : the domestic country produces goods that would be imported at lower price in equilibrium.

6. Suppose now that the domestic country optimally chooses a vector of good-specific tariffs $\{\tau(z)\}$ where $\tau(z) > 0$ represents a tax and $\tau(z) < 0$ a subsidy. Explain what could be the factors influencing the choice of $\tau(z)$, using insights of the different models studied during the course (arguments can go outside of the framework of trade under perfect competition). (1 point)

The government should choose to distort prices in those sectors in which it has a sufficient market power for the trade policy to improve its terms of trade. This should be the case in those sectors in which its comparative advantage is the strongest (for low values of z) since the demand of imports is less sensitive to prices in those sectors.

If the government is sensitive to the demand for protection of some special interest groups, we shall also observe some high tariffs in those sectors that are represented by strong enough lobbies (those with the highest rents), especially if those sectors have a lot to loose from foreign competition.