(1) [10 points] Leontief's paradox refers to the "failure" of the Heckscher-Ohlin to explain U.S. pattern of trade. Leontief showed that the factor content of U.S. export was labor intensive whereas the H-O Theorem predicts that it should be capital intensive under the assumption the that U.S. is labor capital.

For several explanations attempting to reconcile Leontief's finding with the H-O Theorem see our lecture notes. The "most" important explanation was given by labor economists which suggest that human capital should be counted as capital rather than as labor.

(2a) [5 points] Figure 1 illustrates how the capital market reacts to the reduction in the world price of cars, p_C.

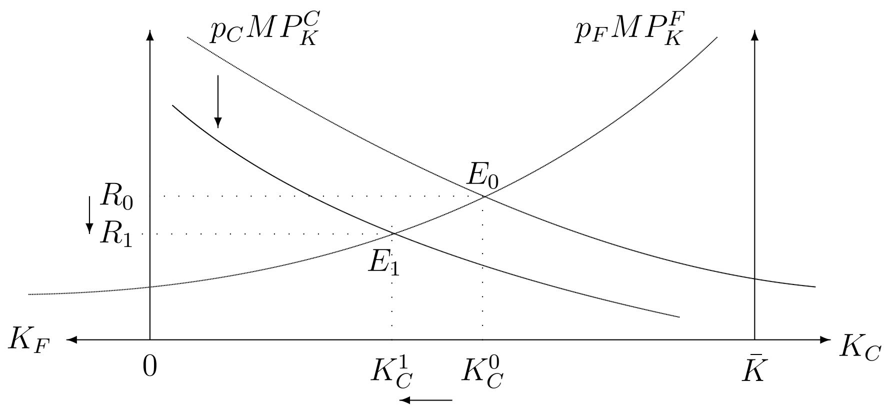

Figure 1: Problem 2a: The market for capital.

$$p_C \downarrow \Longrightarrow VMP_K^C \downarrow \Longrightarrow K_C \downarrow \text{ and } K_F \uparrow .$$

Using words, as a result of the reduction in the price of cars, the car industry contracts by renting less capital whereas the financial sector expands by renting more capital.

(2b) [5 points] Figure 1 demonstrates that the nominal rent declines, $R \downarrow$. Hence, R/p_F also declines (since p_F does not change).

Since p_C declines by 10% but R declines by less than 10%, R/p_C increases. Hence, we can't tell what happens to the real price of capital in terms of cars both consumption goods. Therefore we cannot conclude whether capital owners are better or worse off under free trade.

(2c) [5 points] Car specific labor is hired according to $p_C MP_L^C = w_C$, or $MP_L^C = w_C/p_C$. Therefore,

$$K_C \downarrow \Longrightarrow MP_L^C \downarrow \Longrightarrow \frac{w_C}{p_C} \downarrow .$$

Since $w_C = p_C \downarrow \cdot MP_L^C \downarrow$ the nominal wage rate w_C also declines. Therefore w_C/p_F also declines (because p_F does not change).

Therefore, car-specific labor experiences a reduction in their nominal and real wage and would therefore lobby against free trade.

(2d) [5 points] Labor in the financial sector is hired according to $p_F MP_L^F = w_F$, or $MP_L^F = w_F/p_F$. Therefore,

$$K_F \uparrow \Longrightarrow MP_L^F \uparrow \Longrightarrow \frac{w_F}{p_F} \uparrow \Longrightarrow w_F \uparrow$$

because p_F does not change. Also because $w_F \uparrow$ and $p_C \downarrow$, $w_F/p_C \uparrow$. Therefore, labor in the financial sector experiences an increase in the nominal and real wages and would therefore lobby for free trade.

(3a) [3 points]

$$\frac{p_1}{p_2} = \frac{MU_1}{MU_2} = \frac{\frac{1}{2}(q_1)^{-1/2}}{\frac{1}{2}(q_2)^{-1/2}} \Longrightarrow q_1 = (p_1)^{-2}(p_2)^2 q_2 \Longrightarrow e_1 = \cdots = e_n = -2.$$

Brand i producing firm sets its monopoly price p_i to satisfy

$$p_i \left[1 + \frac{1}{-2}\right] = \frac{p_i}{2} = c = 2 \Longrightarrow p_i = \$4.$$

(3b) [3 points] Zero profit (resulting from free entry) implies that revenue equals total cost. Hence,

$$p_i q_i = F + c q_i \Longrightarrow 4q_i = 120 + 2q_i \Longrightarrow q_i = 60.$$

That is, each brand producing firm produces 60 units under autarky.

(3c) [3 points] The resource constraint implies that

$$n(F + cq_i) = L \Longrightarrow n(120 + 2 \cdot 60) = 2400 \Longrightarrow n = 10.$$

That is, under autarky there are 10 brand producing firms (10 brands).

(3d) [3 points] Under autarky 10 brands are produced and consumed, each at a level of $q_i = 60$ units. Therefore, the utility level under autarky is

$$U^{aut} = 10\sqrt{60} \approx 77.46.$$

(3e) [3 points] Under free trade, since each country produces 10 brands, consumers buy 30 brands. The production of each brand $q_i = 60$ is sold in 3 countries, so consumers in each country consume $q_i/3 = 60/3 = 20$ units of each brand. Hence, a country's free trade utility level is

$$U^{ft} = (10 + 10 + 10)\sqrt{\frac{60}{3}} \approx 134.16 > U^{aut}.$$

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(4a) [10 points] We have to distinguish between two cases: $p_W + t = 30 + t < 80$ (no domestic production) and $p_W + t = 30 + t \geq 80$ (domestic production). That is, $t < 50$ and $t \geq 50$.

If $t < 50$ there is no local production, so the entire demand is satisfied by imports, $I = y^d = 120 - 30 - t$. The government solves

$$\max_t G = t \cdot I = t(90 - t) \quad \Longrightarrow \quad t_G = 45 \quad \Longrightarrow \quad G = 45(90 - 45) = 45^2 = 2025.$$

If $t \geq 50$ there is local production. In equilibrium, quantity demanded equals domestic supply plus imports. Formally,

$$y^d = 120 - 30 - t = 30 + t - 80 + I = y^s + I \quad \Longrightarrow \quad I = 20 - 2t.$$

The government chooses t to maximize $G = t \cdot I = 20t - 2t^2$, yielding $t_G = 5 < 50$, a contradiction.

Hence, $t_G = 45$ is the revenue-maximizing tariff.

(4b) [10 points] Demand equals supply implies ($y^d = I + y^s$) implies $120 - p_Y = 20 + p_Y - 80$. Therefore, the domestic price under an import quota of $\bar{I} = 20$ is $p = 90$. In order to implement this policy the government should set a per-unit import license fee of $\phi = p_Y - p_W = 90 - 30 = 60$. Thus, total government revenue from selling 20 import licenses is $G = \phi \cdot 20 = 1200$.

(4c) [10 points] Under the subsidy, $p_W = 30 = 80 - y^s - s = 10 - y^s$, hence $y^s = 20$ units and $G = -s \cdot y^s = -70 \cdot 20 = -1400$ which constitutes government deficit.

Under $p_W = 30$, consumer demand $y^d = 120 - 30 = 90$ units. Therefore, the amount imported is $I = y^d - y^s = 90 - 20 = 70$ units.

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(5) [10 points] The value of imported inputs for each domestically produced car is $\$2 \cdot 1000 = \$2000$ (steel), $\$1 \cdot 1000 = \$1000$ (plastic), and $\$5 \cdot 100 = \$500$ (rubber). Therefore,

$$\theta_S = \frac{2000}{20,000} = \frac{1}{10}, \quad \theta_P = \frac{1000}{20,000} = \frac{1}{20}, \quad \text{and} \quad \theta_R = \frac{500}{20,000} = \frac{1}{40}.$$

Therefore,

$$\text{ERP}_C \stackrel{\text{def}}{=} \frac{t_c - t_S\theta_S - t_P\theta_P - t_R\theta_R}{1 - \theta_S - \theta_P - \theta_R} = \frac{50 - \frac{40}{10} - \frac{40}{20} - \frac{40}{40}}{1 - \frac{1}{10} - \frac{1}{20} - \frac{1}{40}} = \frac{1720}{33} \approx 52.12\%$$

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(5) [15 points] Because labor is internationally mobile, good Y will be produced in country A only, and good X in country C only. The world PPF (not drawn) is characterized by the equation $y^W = 600 - 2x^W$. Utility is maximized when $y^W = x^W$ (goods are perfect complements). Hence, aggregate world production and consumption levels are $y^W = x^W = 200$ units.

To produce $y^W = 200$ units country A needs 200 units of labor. Hence, 100 workers will immigrate from Country B to country A. To produce $x^W = 200$ units country C needs 400 units of labor. Hence, 100 workers will immigrate from Country B to country C.

THE END

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