ECON 8401 **T. J. KEHOE**
INTERNATIONAL TRADE AND PAYMENTS THEORY **FALL 2013**

PROBLEM SET #5

1. To answer this question you will have to download bilateral trade between two countries, bin the products according to trade in the first period, and see how much each bin grew. Detailed instructions are provided in Least Traded Instructions.pdf at http://www.econ.umn.edu/~tkehoe/classes/8401-13.html. There is also an MS Excel workbook with an example of exports from Canada to Mexico, 1989–2009, CantoMex8909.xls, and an MS Excel workbook with a list of 4 digit SITC, 4DigitSITC2Codes.xls

a) Choose an importer-exporter pair, possibly where the exporter underwent a trade reform with the importer or underwent structural change. Download bilateral trade data for that pair, as reported by importer at the 4-digit SITC Rev. 2 level, including at least 3 years of data before the trade reform/structural change happened (if you are interested in how it affected trade) an ending point at least 10 years later. The best places to download trade data are Comtrade: http://comtrade.un.org/db and WITS (World Integrated Trade Solution): https://wits.worldbank.org/WITS/WITS. The data is the same (and also matches up with the OECD trade data). You can only download 50,000 records at a time for free, but you can download several files and combine them.

b) Sort each code by the value of trade over the first 3 years of your sample, and then place codes into bins according to this sorting, until each bin accounts for exactly 10 percent of trade in the first period (split goods if necessary). Compute the number of goods in each bin, and the fraction of trade that each bin accounts for in the base period. Create a bar graph where each bar is a 10 percent bin in the base period, and the height of the bar corresponds to the fraction of trade accounted for by the bin in your final period. Pick out some of the goods that grew the most or were highly traded in either the beginning or end period. What are they?

2. Consider a small open economy whose government borrows from international bankers. In every period, the value of output is

$$y(z) = Z^{1-z}\bar{y}$$

where $1 > Z > 0$ is a constant and $z = 0$ if the government defaults in that period or has defaulted in the past and $\bar{y}$ is a constant. The government's tax revenue is $\theta y(z)$ where the tax rate $1 > \theta > 0$ is constant. The consumers in the economy consume $c = (1-\theta)y(z)$. The government is benevolent and makes choices to maximize the expected discounted value of

$$u(c, g) = \log c + \gamma \log g$$

where $\gamma > 0$ and $1 > \beta > 0$ is the discount factor. At the beginning of every period, the state of the economy is $s = (B, z_{-1}, \zeta)$ where B is the level of government debt; $z_{-1} = 0$ if the government has defaulted in the past, and $z_{-1} = 1$ if not, and $\zeta \sim U[0,1]$ is the realization of a sunspot variable. The government first offers B' to international bankers. The intentional bankers have the same discount factor β as the government. They are also risk neutral and have deep pockets. These international bankers buy the bonds at a competitive auction that determines a price for B', $q(B', s)$. The government finally chooses to default or not, which determines private consumption c. Government spending g is determined by the government's budget constraint

$$g + zB = \theta y(z) + q(B', s)B'.$$

If the government defaults, setting $z = 0$, then assume that $z_{-1} = 0$ implies $z = 0$ thereafter; that is, the economy suffers from the default penalty $1 - Z$ forever. Furthermore, $z_{-1} = 0$ implies $q(B', s) = 0$; that is, the government is permanently excluded form credit markets.

a) Define a recursive equilibrium.

b) Assume that the bankers expect the government to default if $\zeta > 1 - \pi$ and if such an expectation would be self-fulfilling, where $1 > \pi \geq 0$ is an arbitrary constant. Find a level of debt $\bar{b}$ such that, if $B \leq \bar{b}$, no default occurs in equilibrium, but that, if $B > \bar{b}$, default occurs in equilibrium.

c) Suppose that $B_0 > \bar{b}$, and the government chooses to run down its debt to $B_T \leq \bar{b}$ in T periods. Prove that it cannot be optimal to set $B_T < \bar{b}$. Prove that it is optimal for the government to set g_t constant as long as $B_t > \bar{b}$ and no crisis occurs. Find expressions for g_t and B_t that depend on B_0 and T. Find an expression for the expected discounted value of the utility of running down the debt that starts at B_0 to $\bar{b}$ in T periods. Find the limit of these expressions when $T = \infty$.

d) Using the answers to part c, write down a formula that determines a value of debt $\bar{B}(\pi)$ such that the government would choose to default if $B > \bar{B}(\pi)$ even if international bankers do not expect a default.

e) Using the answers to parts a–d, construct a recursive equilibrium.

f) Use this model to interpret events of the Mexican financial crisis of December 1994 through January 1995.

g) [Optional] Assume that $Z = 0.9$, $\bar{y} = 100$, $\theta = 0.4$, $\gamma = 0.5$, $\beta = 0.95$, and $\pi = 0.05$. Calculate $\bar{b}$. Calculate the expected discounted value of the utility of running down the debt that starts at B_0 to $\bar{b}$ in T periods for $T = 1, 2, 3, 4, 5, 6, 7$. Calculate $\bar{B}(0.05)$. Graph a policy function for government debt $B'(B)$. Graph a policy function for government spending $g(B)$.