

Problem Set 1

EE468 Integrated Public Economics, Development and Political Economics

Due in class on March 21. All questions count equally toward 10% of your grade. You are encouraged to work together. But make sure to submit your individual work.

1. Poverty traps and welfare dynamics

In class, we learned about the concept of household's intertemporal problem and its dynamic equilibrium. In particular, let's consider a setting where household maximises expected lifetime utility by choosing series of consumption $c_i = \{c_{i1}, \dots, c_{ik}, \dots\}$ and accumulated asset $A_i = \{A_{i1}, \dots, A_{ik}, \dots\}$ by solving

$$\max_{c_i, A_i} E_0 \sum_{t=0}^{\infty} \delta^t U(c_{it})$$

$$\text{subject to } c_{it} + s_{it} = f(A_{it}) - (1 + r)b_{it-1}$$

$$A_{it+1} = (1 - \tau)A_{it} + (1 + r)s_{it} + b_{it}$$

where household can derive income each period from its production $f(A_{it})$. And after netting out repayment of its last period debt b_{it-1} at an interest rate r , household can then choose to consume c_{it} and save s_{it} . The next period asset is then determined from the current period asset depreciated at an annual rate τ , return on current saving and additional borrowing, of which they need to pay back using the following period income. There is no borrowing constraint and so $b_{it} \geq 0$ in any period t .

- 1.1 Consider a setting where there exist a set of immutable and intrinsic household/location characteristics X_i that could impede household's productivity relative to a typical condition, i.e., $f'(A_{it}|X_i) < f'(A_{it})$ for all A_{it} . With the same rate of intertemporal return to household asset, show and explain graphically, how might the presence of X_i could result in a "single equilibrium" or "convergent club" poverty trap.
- 1.2 Give two examples of X_i that could lead different households (with different level of X_i) to different long-run levels of well-being, at least one of which is associated with poverty trap.
- 1.3 Now consider another setting, where household's production function exhibits locally increasing return to scale. In specific, suppose there are two available production technologies: the high and low return. And there is a fixed cost E in adopting high-return technology such that

$$f(A_{it}) = \max\{f^l(A_{it}), f^h(A_{it})\} = \begin{cases} f^l(A_{it}) = \alpha_l A_{it}^{\gamma_l} & \text{if } A_{it} < A_s \\ f^h(A_{it}) = \alpha_h A_{it}^{\gamma_h} - E & \text{if } A_{it} \geq A_s \end{cases}$$

where $f^l(A_{it}), f^h(A_{it})$ are concave and $f^l(A_{it}) > f^h(A_{it})$ if $A_{it} < A_s$.

Draw this locally increasing return production function. At what point would this

exhibit locally increasing return? What production technology would household adopt at different levels of asset? Give two examples of settings that might exhibit this locally increasing return production.

- 1.4 With the same rate of intertemporal return to household asset, show and explain graphically, how this locally increasing return production function could (could not) lead to a threshold-based multiple equilibrium poverty trap with complete financial market (when households are free to borrow necessary assets). Would locally increasing return production lead to poverty trap with complete financial market? Explain.
- 1.5 Let's now consider the reality when financial markets tend to be missing in most of the low-income world. Households thus are not able to borrow for consumption or saving. If they would like to accumulate necessary asset to meet the minimum necessary level, autarchic saving is the only way. In other word, household's problem above is likely constrained by a borrowing constraint: $b_{it} = 0$ in any period t . Show and explain graphically how a combination of locally increasing return production and missing financial markets could lead to threshold-based multiple equilibria poverty trap.
- 1.6 Continue from 1.5, give one example of a setting or a factor that could lead different households to have different s-shape asset accumulation path and so different levels of critical asset thresholds. Show and explain your example graphically using the graphics you just draw for 1.5.
- 1.7 Use the multiple equilibria graphics you just draw to show and explain how might the followings could result in heterogeneous impacts across households with different asset endowments. For simplicity, you may compare the impacts on two types of households: (i) those endowed with assets smaller than the critical threshold and (ii) those with assets slightly above the threshold.
 - a) Household's welfare dynamics given their initial asset endowment and the potential roles of cargo net programs.
 - b) Impacts of asset shocks and the role of social safety net programs.
 - c) Asset smoothing behaviour
- 1.8 Explain how you might test an existence of poverty trap empirically. What might be the key challenges?

2. Nutrition and labour productivity

From the model of Dasgupta and Ray that we learned in class

- 2.1 Explain graphically the income-work capacity relationship and derive labour supply and equilibrium employment level in the market. When might involuntary unemployment exist? Explain why the vicious circle of poverty might be completed through nutrition-productivity relationship in the setting with relatively small labour demand in the market.
- 2.2 Explain graphically the results of non-labour income on household's efficiency

wage and reservation wage. Draw efficiency and reservation wage schedules for households ranked by their non-labour income (asset holdings), the associated labour supply and market equilibrium. Highlight and explain the differences between involuntary and voluntary unemployment.

- 2.3 Explain why low non-labour income could lead to low labour market opportunity, i.e., households with smaller assets tend to be cursed by high probability of becoming involuntarily unemployed. Give one example of policy intervention that can address involuntary unemployment and explain graphically how this could work.
- 2.4 Let's extend Dasgupta and Ray model to a dynamic setting. Explain how might nutrition-based multiple equilibria poverty trap could arise. What condition (s) might we look for empirically in order to test the existence of poverty trap empirically?

Now, if you are given a full 5 year repeated cross-sectional household survey data consisting of detailed 1-week food items consumed, total consumption expenditure, total income and other demographic and geographical characteristics

- 2.5 How might you proceed to explore the elasticity of nutritional intake with respect to income? Write down your preferred choice of regression model, dependent and independent variables. What challenges do you expect to face?
- 2.6 How might you proceed to explore the elasticity of income with respect to nutritional intake? Again, write down your preferred choice of regression model, dependent and independent variables. What might be the key challenges here?
- 2.7 What would you expect to get if you run the following two questions:

$$income_i = \alpha + \beta edu_i + \varepsilon_i$$

$$nutrition_i = \gamma + \delta edu_i + \epsilon_i$$

and how might these results imply about your estimation in 2.6?