Problem Set 1 – Labor supply

**Question 1.** There’s a tiny island where 10 people live. We visit the island and observe that 7 people are working for the only company in the island, while 1 person is applying for a job at the firm but has not been hired yet, and 2 are sick and cannot work. The people who are working make 12 euros an hour, and they work 40 hours a week. The company provides no benefits, and there is no other way of making money in the island.

a) Calculate the labor force participation rate and the unemployment rate in the island.

b) Calculate the monthly earnings of the individual worker. What’s her total (monthly) income?

We come back to the island after 2 years and first of all notice that the population has increased by a recent birth of twins. We also find out that now 8 people are working and 2 applying for a job at the company, and that the workers are now making 13 euros an hour. We go to the local market and notice that prices are 10% higher than 2 years ago.

c) Describe the change in the labor force participation rate and in the unemployment rate from the first visit to the second.

d) Calculate real wages for the workers, at the prices of the year when we first visited the island. Did real wages increase or decrease? By how much?

**Question 2.** Ben has a utility function given by $U(C,L) = C^{\alpha}L^{1-\alpha}$ where $C$ is consumption and $L$ is hours of leisure per day. Ben needs to sleep 8 hours a day and divides the remaining 16 hours between leisure and market work. The wage rate is $w$, the price of consumption is $p$, and non-earned income is $V$.

a) Write down Ben’s maximization problem and the resulting first order conditions.

b) How many hours does Ben work per day depending on $\alpha$, $w$, $p$, and $V$?

c) How many hours does he work per day if $w=10$, $p=2$, $V=15$, and $\alpha=1/3$? How much does he consume?

d) One day, Ben inherits a small fortune, which increases $V$ to 155. Analyze whether this has an effect on the number of hours Ben works and his consumption.

e) What is Ben’s reservation wage in this case?
**Question 3.** In France, women raising their children on their own are eligible for the *Allocation de Parent Isolé* (API, or single parent benefit), as long as the youngest child is under 3 years of age. In 1998, a single mother with 2 children (one of them under 3) was eligible for 900 euros a month from the government if she had no other income. The benefit actually received equalled the difference between the 900 euros guarantee and her income from other sources.

a) Assuming the only sources of income in the household are benefits and earnings, draw the budget constraint for a single mother with 2 children, one of them younger than 3. Draw the indifference curve for a woman who would choose not to work under these conditions, and the indifference curve for another woman who would choose to work. (Use a month as the reference period. Assume there are 25 workdays per month and 16 hours a day available for either work or leisure. Assume also that the woman can find a job at the minimum wage, which is 8 euros an hour.)

b) How many hours does the woman need to work a month in order for her income to be higher than 900 euros a month? How many hours would she need to work per day?

c) Explain the incentives created by this program (talk about the income and substitution effects). Does it make single mothers more, or less likely to participate in the labor market? Are all types of single mothers affected by the program?

**Question 4.** The API was reformed in 1999 in order to modify the incentives to work. After the reform, a woman on API who started working could keep the full API guarantee during the first 6 months. After that, and during the following 9 months, 50% of the woman’s earnings had to be subtracted from the API guarantee. After that period, 100% of earnings had to be subtracted, just like before the reform.

a) Draw the budget set under the new rules for a woman on API who is considering whether to start working. (Assume the API guarantee is still 900 euros. Note that there is one budget constraint for the first 6 months, a different one for the following 9 months, and a third one after those initial 15 months.)

b) Explain how the reform alters the incentives to work for single mothers with young children (argue relative to the initial design of the program as described in question 3 and use the concepts of income and substitution effects). After 1999, should we expect more single mothers to work or fewer?

**Question 5.** In the debate on ecological taxes, proponents argue that taxes on the consumption of ecologically harmful products (gasoline, electricity, etc.) should be increased and that the revenue generated by this move should be used to reduce the rate of social security contributions (here: reduce a constant tax rate $t$).

a) Assuming that the increase in the price level $p$ is the same for everyone, what are the incentive effects of such a reform for individuals who are not working in the context of the static labor supply model.

b) Analyze the incentive effects for individuals who are working.

c) What are the total labor supply effects of such a reform? Are there distributional effects as well?
**Question 6.** (Borjas, 3rd edition, Problem 2.14) In 1999, 4,860 TANF (Temporary Assistance to Needy Families) recipients were asked how many hours they worked in the previous week. In 2000, 4,392 of these recipients were again subject to the same TANF rules and were again asked their hours of work during the previous week. The remaining 468 individuals were randomly assigned to a "Negative Income Tax" (NIT) experiment which gave out financial incentives for welfare recipients to work and were subject to its rules, Like the other group, they were asked about their hours of work during the previous week. The data from the experiment are contained in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Total number of recipients</th>
<th>Number of recipients who worked at some time during the survey week</th>
<th>Total hours worked by all recipients during the survey week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1999</td>
<td>2000</td>
</tr>
<tr>
<td>TANF</td>
<td>4,392</td>
<td>1,217</td>
<td>1,568</td>
</tr>
<tr>
<td>NIT</td>
<td>468</td>
<td>131</td>
<td>213</td>
</tr>
<tr>
<td>Total</td>
<td>4,860</td>
<td>1,348</td>
<td>1,781</td>
</tr>
</tbody>
</table>

a) What effect did the NIT experiment have on the employment rate of public assistance recipients? Develop a standard difference-in-differences table to support your answer.

b) What effect did the NIT experiment have on the weekly hours worked of public assistance recipients who worked positive hours during the survey week? Develop a standard difference-in-differences table to support your answer.