14.41 Problem Set 4 Solutions
Fall 2005

1. a) i) This proposal would increase health care coverage, since most states don’t cover children above 200% of the poverty line. There would be some crowd-out of private insurance. Current evidence suggests that around 20-50% of new Medicaid coverage results from crowd-out. It is likely that crowd-out will be higher for children of wealthier families. Some of you also mentioned that parents may cancel their private family insurance in favor of the children’s Medicaid program. In this case, Medicaid would cause more parents to be uninsured (a consequence of crowd-out).

ii) Medical utilization would certainly go up for those taking up the program. Since Medicaid is so generous, those who switch from private insurance will most likely increase utilization in addition to those who were previously uninsured.

iii) There are a number of studies which showed that providing health insurance to the previously uninsured can improve health outcomes. For example, the Currie and Gruber study showed that expansions of Medicaid for pregnant women reduced infant mortality went down by 8.5%. Hanratty found that national health insurance in Canada induced a 4% decline in infant mortality. For those previously on private insurance, health probably wouldn’t increase by much, since those children were previously on the flat part of the health effectiveness curve already. The book didn’t list any studies relating specifically to children, but those mentioned are suggestive.

b) i) This proposal would also increase health care coverage, since non-pregnant women are not currently covered by Medicaid. In addition, crowd-out would be less than in (a) because these women are poorer and less likely to be on private health insurance.

ii) Similar to (a) ii)

iii) Similar to (a) iii)

c) i) This proposal will most likely increase the number of insured. Those previously uninsured will most likely take up the program. People previously on Medicaid might switch to private insurance because coverage is considerably lower in this new program. Crowd-out will likely be minimal because of the program’s lower benefits and poorer target population.

ii) Medical utilization would most likely decrease for those who were previously on Medicaid, whether they take-up the catastrophic coverage or not. It will probably not increase much for the previously uninsured, since those who cannot pay usually use health services for catastrophic events anyways. Quality of care will most likely increase, however, if the coverage provides more options than what the poor would have chosen before.

iii) The program could be designed so that recipients would be covered for events on the steep part of the health effectiveness curve. It might, however, lead to under-use of care and poor health outcomes if the coverage isn’t comprehensive enough.

2. a) There are several possible reasons including but not limited to:
   - Competition between MCO plans should reduce costs.
- Some politicians will hope that MCOs may make Medicaid a less attractive option, leading to less crowd-out and better cost-effectiveness for the program.
- Some politicians will hope that MCOs may make Medicaid a more attractive option, by increasing efficiency and access relative to the current system, which relies heavily on public clinics and emergency rooms.
- MCOs (rather than states) bear the risk of the Medicaid recipient's health care costs.
- Capitation, rather than the current retrospective reimbursement system, means that MCOs have an incentive to encourage preventative care and cost-efficient utilization of medical care.

b) MCOs may make Medicaid less attractive, so people who are eligible for private health insurance would be less likely to take up Medicaid. Even among those who aren't eligible for private insurance, some people may be discouraged from taking up Medicaid because the MCO may involve more rules and restrictions about medical care. This effect might be particularly pronounced among healthy individuals, who decide not to go to enroll due to the hassle costs of dealing with the MCO.

However, some eligibles may be more likely to take up if they perceive that they'll have better access to care than under the old program, which relies heavily on public clinics and emergency rooms. There may also be reduced stigma.

c) It may decrease access to care because MCOs can restrict access (i.e. the MCO can require that patients obtain a referral before they can see a specialist). Moreover, MCOs have the financial incentive to minimize the amount of care that an enrollee receives, since they don't get any extra money from the state when they provide more care. On the other hand, enrollees may have increased access to care, since their MCO doctors are guaranteed to accept them, whereas previously there was a good chance that any doctor they chose would not accept Medicaid recipients.
3a) There are two possible “diff-in-diff” experiments that you could consider. The first assumes that married mothers in Boston (who aren’t subject to the welfare reform) are a valid control group for single mothers in Boston. The second assumes that single mothers in Springfield are a valid control from for single mothers in Boston.

The first method yields a diff-in-diff estimate of the causal impact of the welfare change of 45: (single mothers after – single mothers before) – (married mothers after – married mothers before)=(210-175)-(290-300)=45. One way to think about this is, assuming married mothers are a valid control group, that *in the absence of reform*, single mothers’ earnings would have fallen by 10; since single mothers’ earnings actually increased by 35, their earnings increased by 45 over what they would have increased in the absence of reform. For this estimate to be an actual causal estimate, our regular diff-in-diff assumptions must hold: in the absence of welfare reform, earnings would have changed by the same amount for single mothers and married mothers. Another acceptable way of saying this is that the time bias for married and single mothers was the same over the period. This could be violated in two ways: 1) the trend in earnings for single and married mothers is not parallel over the period (so that in the absence of reform, earnings would have increased by more for single mothers anyhow) or 2) something else occurred simultaneously with the welfare reform that induced earnings for single mothers to increase. There are many ways in which this may be violated. Here are two examples:

- firms may gradually become more accommodating for single mothers, by providing subsidized child care or allowing flexible hours. If so, then earnings for single mothers may naturally have increased by more at an annual basis than earnings for married mothers.
- Welfare reform may be implemented as part of a larger legislative package that also works to induce additional labor supply from single mothers (i.e. free child care, tax credits contingent on labor supply) such that these are actually driving the increase in single mothers’ labor supply, rather than the strict welfare requirements.

The second method yields an estimated causal effect of 30: (Boston single mothers after – Boston single mothers before) – (Springfield single mothers after – Springfield single mothers before)=(210-175)-(125-120)=30. One way to think about what this estimate is implying is that *in the absence of reform*, the earnings of single mothers in Boston would have changed by the same amount as earnings did for single mothers in Springfield (5); hence, 5 of the 35 increase for Boston single mothers’ is due to time trends in the earnings of all single mothers. The remainder (30) must be attributable to welfare reform. Again, the assumption here is that in the absence of reform, the earnings for single mothers in Boston would have increased by the same amount as single mothers in Springfield between 1994 and 1996. One way in which this is violated:

- the towns experienced differences in economic growth between 1994 and 1996. For instance, if general economic growth is stronger in Boston than Springfield, then a portion of the earnings differential is due economic growth rather than welfare reform. If this differential in growth rates is gradual and on-going over the entirety of the early 1990s, then pre-trends are different and we would suspect that our diff-in-diff estimate is invalid. If the differential
growth began in 1994, then an examination of pre-trends wouldn’t reveal this violation, but the estimate would still be invalid because economic growth, rather than welfare reform, caused the earnings differential.

3b) This is highly subjective, and depends on whether you think married mothers in Boston, or single mothers in Springfield, are a valid comparison group. As long as you provided some justification, either answer is acceptable. (Personally, I would prefer using married mothers within Boston, as I suspect that bias from differential growth across cities would be greater than any differences in earnings growth between single and married mothers). In practice, one would know more about the labor market environment in both cities than the information that we’ve provided, and use this to justify the choice of control. Or, one could examine pre-trends and other summary statistics between the controls and the treatment, and choose the control for which the DD assumptions most closely hold.

c) You could set up the estimator in many different (but equivalent) ways. For example:

- \[ (\text{Boston single mothers after} - \text{Boston single mothers before}) - (\text{Boston married mothers after} - \text{Boston married mothers before}) - (\text{Springfield single mothers after} - \text{Springfield single mothers before}) - (\text{Springfield married mothers after} - \text{Springfield married mothers before}) \]

- \[ (\text{Boston single mothers after} - \text{Boston single mothers before}) - (\text{Springfield single mothers after} - \text{Springfield single mothers before}) - (\text{Boston married mothers after} - \text{Boston married mothers before}) - (\text{Springfield married mothers after} - \text{Springfield married mothers before}) \]

Either of which yields the DDD estimate of the causal effects of welfare reform of 50. Note this is NOT the same as subtracting your two DD estimators from each other!!!

d) The reason that we would want to use DDD instead of DD is because even if bias exists in the DD estimates (that is, the change in earnings between treatment and control would have been different even in the absence of welfare reform), the DDD can potentially correct for this. Consider our first DD estimate. This estimate is invalid if the amount by which earnings grows for married Boston mothers is different than that for single Boston mothers due to some non-welfare related factors. Suppose, however, you think that in the absence of welfare reform, the difference between earnings growth for single and married mothers in Boston is the same as that for single and married mothers in Springfield. In other words, the DD assumption is violated between single and married mothers in Boston, but is violated in the exact same way for Springfield mothers – that is, the time bias between single and married mothers in Boston is the same as the time bias for single and married mothers in Springfield. If this is true, then you can use DDD to correct the bias from a DD estimate. The pictures at the end of these solutions may help clarify this even further.
So, for the DDD estimate to be valid, the difference in earnings changes between single and married mothers must have been the same in Boston as in Springfield in absence of the reform. Or, alternatively, the difference in earnings changes between single women in Boston and Springfield must be the same as for married women in Boston and Springfield in the absence of welfare reform.

e) This is violated if something occurs (other than welfare reform) which differentially affects the earnings of one of four of these groups: single Boston mothers, married Boston mothers, single Springfield mothers, married Springfield mothers. If this is true, then the time bias between married and single mothers in Boston would be different from than in Springfield, and so you couldn’t use an estimate of the time bias in Springfield to correct for the time bias in Boston. Suppose, for example, that Boston – but not Springfield – begins providing free child care to single mothers in addition to welfare reform. Now, the change in earnings between single and married mothers in Springfield is not a valid control for the wage change between single and married mothers in Boston – because part of the difference in wage changes for Boston mothers is due to child care, rather than welfare reform, and this factor does not influence the difference between earnings changes for single and married mothers in Springfield.

f) All of the estimates suggest that welfare reform has a positive affect on the labor earnings of Boston single mothers.
Suppose you have data on single and married mothers in Boston.

The DD estimate is:

\[(S_{q6} - S_{q4}) - (M_{q6} - M_{q4})\]

- \(M_{q6} - M_{q4}\) is the "time bias" - the amount by which the earnings for single mothers would have increased without the welfare change.
- For this to be the true time bias, and thus for our DD to be a true causal estimate of the welfare effect, married women must be a proper control group for single women - i.e., in the absence of welfare reform, earnings for single women would have changed by the same amount as for married women.
- Because this is true pre-1996 (note the parallel trends), as long as nothing else occurred in 1996 to increase single women earnings, this DD estimate is valid.
what if the data looked like this?

Now there is a positive DD estimate, bc the change in earnings for single women btw 1994 and 1996 is greater than that for married women, but this is not due to welfare reform - so the DD estimate is not causal! Instead, the annual change in earnings for single women was greater than for married women, and that is all that the DD estimate picks up. Without looking at pre-trends, you might be tempted to attribute a positive effect to welfare reform, when in actuality there was none!
what if instead:

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{chart.png}
\caption{Comparison of earnings for married and single women from 1994 to 1996.}
\end{figure}

Now, there is a welfare effect (apparently) since single earnings jumps in 1996. But a simple DD estimate couldn't capture this, because the "time bias" (change in earnings by 1994 and 1996) appears to be different for single and married women (because pre-trends are not parallel). That is, you couldn't use the trends in married women earnings to subtract out the time bias for single women.
However suppose you have a similar picture (data) for Springfield.

Now, it appears that the difference in time trends between married and single women in Springfield is the same as in Boston! Calculating the difference in time trends in Springfield, and subtracting this from the DD estimate in Boston, will give an estimate of the causal effects of welfare reform. This is the DDD estimator. It tries to correct for the fact that the DD assumption doesn't hold in Boston (i.e., non-equal time trends/bias for married vs. single mothers) by using the fact that the DD assumption also doesn't hold in a control group (Springfield) but that it doesn't hold in the exact same way as in Boston (i.e., the difference in time trends is equivalent).
So in Boston, a DD with married + single mothers gives:

\[ DD^B = (S_{96}^B - S_{94}^B) - (M_{96}^B - M_{94}^B) = \text{welfare effect + time effect (single)} - \text{time effect (married)} \]

In Springfield:

\[ DD^S = (S_{96}^S - S_{94}^S) - (M_{96}^S - M_{94}^S) = \text{time effect (single)} - \text{time effect (married)} \]

Subtracting the two...

\[ DD^B - DD^S = \text{welfare effect} \]

- So this is a case where the DD would correct the problems with the DD and yield a causal estimate.

- It requires that, in the absence of welfare reform, the difference in time effects bew single + married women in Boston would've been equal to that in Springfield.

This is violated if the difference in pre-shocks bew single + married mothers is not the same in Boston and Springfield or if a shock occurs bew 1994 and 1996 that only affects:

- Single Boston Moms
- Married Boston Moms
- Single Springfield Moms
- Married Springfield Moms
4a) \[ L = \text{leisure! (utility is generally defined only over leisure)} \]

\[ C = 6x\text{hrs worked} = 6(100 - L) = 960 - 6L \]

\[ U = 3\log C + 5\log L = 3\log(960 - 6L) + 5\log L \]

\[
\frac{dU}{dL} = 0 \Rightarrow \frac{-18}{960 - 6L} + \frac{5}{L} = 0 \Rightarrow -18L + 4800 - 30L = 0
\]

\[ 4800 = 48L \]

\[ 100 = L \]

So leisure = 100

hrs worked = 60

C = 6x60 = 360

b,c) LS effects depend on individual's previous choice of labor (i.e. whether they'll face the new budget constraint caused by the welfare program or not). If they're working a lot, there's likely no effect. If they're working a little, there might be a LS effect (probably negative).

new BC meets old

where \( C^{\text{new}} = C^{\text{old}} \) at same \( L \)

\[ C^{\text{new}} = 120 + 6x, 8(160 - L) \]

\[ C^{\text{old}} = 6x(160 - L) \]

\[ C^{\text{new}} = C^{\text{old}} \Rightarrow 120 = 6x, 2(160 - L) \]

\[ 120 = 192 - 1.2L \]

\[ 60 = L \]
4bii)

Assuming that the mother is on the lower (new) portion of the budget constraint, then
\[ C = [G - W*(160-L) \times (BRR)] + W*(160-L) = 120 + 0.8 \times 6 \times (160-L) = 888 - 4.8L \]

\[ U = 3 \log(888 - 4.8L) + 5 \log L \Rightarrow \frac{dU}{dL} = 0 \Rightarrow \frac{-14.4}{888 - 4.8L} + \frac{5}{L} = 0 \Rightarrow 38.4L = 4440 \]

\[ L = 115.625, \quad C = 333 \]

Labor income = \(6 \times (160 - 115.625) = 226.25\), total income = 120

The woman MUST be better off (you don’t even need to do a utility calculation for this), because for any amount of work, she has at least as much income as before the program, so her utility is at least as great as before (if she did not change her work behavior) or greater than before (if she did change her behavior).

c) Now, we’d expect labor supply to fall relative to the program in b. This is because the benefit amount has increased (at any amount of work, she’ll have more total income than in b – i.e. a negative income effect) and the benefit reduction rate has also increased, such that returns to an additional hour of work are less than before (negative substitution effect). Graphically (dotted line is BC from b, solid line is BC from c):

![Graph showing labor supply change](image)

ciii) The budget constraint is now: \(300 + 3 \times (160-L) = 780 - 3L\)
$U = 3\log(780 - 3L) + 5\log L \Rightarrow \frac{dU}{dL} = 0 \Rightarrow \frac{-9}{780 - 3L} + \frac{5}{L} = 0 \Rightarrow 24L = 3900$

$L = 162.5$

However, the maximum amount of leisure a mother can take is 160, so the actual $L=160$, and the mother doesn’t work at all. She receives 300 in welfare benefits, and has no labor income. Again, she must be better off than in b, because for any amount of work, she has more income than before.
d) The following pictures represent the reforms:

1) All proposals should induce some unemployed women to enter the LF. ① quite clearly makes it more painful to remain unemployed. ② increases the returns to work (essentially an increase in the effective wage). Normally, this would have opposing in and sub effects, but since the woman isn't working, there is no income effect associated with the rise in the effective wage. Graphically, some women will have LCs that hit the corner of the BC in the baseline, but are tangent to the BC with positive rays in ②. ③ is a mix of ① and ②, so LS also increases for some women.
ii) 1) represents a negative income shock, should encourage LS. 2) only represents a change in the effective wage. Hence, there are opposing Inc + Sub effects: income - for a given L, wage and income are higher, so use some wealth to purchase leisure and reduce hours. Sub returns to work ↑, so increase hours. Since these effects are opposing, effects are ambiguous, 3) is also ambiguous since 2) is ambiguous (although technically it depends on the magnitude of the change in G1 and B&R).

(iii) Proposal 2) (be its "breakeven level" - where the new BC meets the old BC - is furthest to the left), anything reasonable here will do; depends how much you care about encouraging LS of the unemployed vs those who work little vs discouraging LS for those who work a fair bit.
5. a) i) Tom’s taxes:

\[
\begin{align*}
&54,000 \quad \text{Gross Income} \\
-12,000 \quad \text{Exemptions} \\
\hline
=42,000 \quad \text{Taxable income}
\end{align*}
\]

Tom has to pay $2000 for the first 20,000 of his income, then 25% * 22,000 = 5,500 for the remainder of his income, for a total of $7500 for $54,000, which is 13.9% average tax rate. The marginal tax rate equals the tax on his last dollar of income, or 25%.

Many of you computed the average tax rate over taxable income and not gross income. The text used this computation, so I didn’t take off for it, but you should use gross income in the denominator.

ii) Tatiana’s Taxes:

\[
\begin{align*}
&74,000 \quad \text{Gross Income} \\
-16,000 \quad \text{Exemptions} \\
\hline
=58,000 \quad \text{Taxable income}
\end{align*}
\]

Tatiana has to pay $2000 for the first 20,000 of her income, then 7500 for the next $30,000, then 40% * 8,000 = 3200 for the remainder of her income. Total taxes = $12,700 for $74,000 of income, which is a 17.2% average tax rate. The marginal tax rate equals the tax on his last dollar of income, or 40%.

iii) Family taxes:

\[
\begin{align*}
&128,000 \quad \text{Gross Income} \\
-28,000 \quad \text{Exemptions} \\
\hline
=100,000 \quad \text{taxable Income}
\end{align*}
\]

Now, they have to pay

\[
\begin{align*}
&2,000 \quad \text{for the first 20,000 of taxable income} \\
&7,500 \quad \text{for the next 30,000} \\
&20,000 \quad \text{For the remaining $50,000} \\
\hline
=29,500 \quad \text{Total taxes.}
\end{align*}
\]

This is considerably larger than the $20,200 total taxes that they would pay if they weren’t married. Thus, they have no financial incentive to marry.

b) i) The new tax system is more regressive, since at higher incomes people pay less in taxes, while at lower incomes they pay more.
Under the new tax system, Tom’s family pays 30% on $42,000 taxable income, or $12,600. Tatiana’s family pays 30% on $58,000 taxable income, or $17,400. Both types are worse off, and tax revenues go up.

ii) There is no longer a disincentive to marry, since the total tax liability is just the sum of individual tax liabilities, or $30,000.

iii) 1) Knowing the elasticity of pre-tax income with respect to the marginal tax rate allows you to estimate the change in income that changes in tax rates will induce.

2) Tom’s tax rate increases from 25% to 30%, which is a 20% increase. This means that Tom’s income will go down by 4% to $51,840. Tatiana’s tax rate decreases from 40% to 30%, a 25% decrease. This means that Tatiana’s income will go up by 5% to $77,700. Tax revenues will be more than we calculated in i), so they will certainly be more than what was found in part (a).