# A note on Elasticities

**Generally**

The labour supply elasticity is the percent increase in labour supply that accompanies a 1 percent increase in the after-tax wage rate cf. Keane 2011 pp. 963.

The more elastic is labour supply to after-tax wages, the lower is the optimal tax rate.

**Income effect: the effect of an increase in nonlabour income on labour income (given an extra dollar of nonlabour income, how much does a worker reduce his/her earnings)**

**Marshallian (labour supply) Elasticity**

**Theory**

Marshallian is known as the "uncompensated" or "total elasticity".

The Marshallian elasticity can be decomposed into separate income and substitution effect. It can also be decomposed into "Hicks" labour supply elasticity and a term that is the income effect.

**How to spot it?**

We only change wages

* No compensation
* No change in nonlabour income

**Why is it relevant? - predicting effects of permanent tax changes**

**How is it simulated?**

Can be simulated as an unanticipated permanent increase in wage.

**How to implement?**

Increase the wage - and only the wage - for all periods.

**Hicks Elasticity**

**Theory**

Keeping utility constant such that we are compensated by holding utility same but changing wage.

Hicks Compensated elasticity because we adjust nonlabour income to keep utility the same

**How to spot it?**

Keeping utility constant such that we are compensated by holding utility same but changing wage.

Hicks Compensated elasticity because we adjust nonlabour income to keep utility the same

**Why is it relevant? - predicting effects of permanent tax changes**

Hicks is important because we need to run a balanced budget.

**How is it simulated?**

Unanticipated permanent compensated increase in wage.

**How to implement?**

Backout the Hicksian elasticity using Slutsky as it is cumbersome to hold the maximised lifetime value function fixed.

**Frisch Elasticity**

**Theory**

Willing to change labour supply across periods (similar to consumption smoothing) as relative wage changes.

* Shifting labour supply toward periods of high wages to reap the benefit of a tax reform

Frisch elasticity is sort of compensated because it makes sure we are not changing intertemporal value of wealth.

**How to spot?**

To classify if we should use Frisch it does not matter if transitory nor anticipated only thing is that we need to have invariance of lifetime wealth

**Why relevant? - predicting effects of transitory tax changes**

The reason we estimate Frisch is because it is only one parameter (no need to model wage process):

Can we estimate Frisch then we have an upper bound of labour supply elasticity (given inequality ordering) for Hicks and Marshallian.

* It allows us to bound policy-relevant elasticities: tax rate, efficiency loss of labour income taxation etc.

**How is it simulated?**

Anticipated transitory increase in wage (income and thus wealth effect small)

* Hence tax cut or tax increase is rescinded in next period

People foresee a blip in future wages then marginal utility of wealth is not going to change much because it is going to be smooth out over life cycle.

* Transitory part means low income effect
* Anticipated means very low wealth effect

**How to implement?**

Due to perfect foresight we need to make it anticipated by shocking the very first period and only the very first period.

**Elasticities | When NO Human Capital**

When we have no human capital the elasticities are basically the same in static and dynamic case. And they are only a function of parameters (i.e., they do not vary with age).

Regarding order, we have

The order of magnitude of elasticities is due to diminishing marginal utility of consumption ().

* Ignoring income effect gives a larger response (the reason why Hicks is larger than Marshallian)
* the Hicks and Marshallian approach each other as there is no income effect

**Order of Elasticity | Including Human Capital**

The ordering might not hold due to downward bias in Frisch elasticity.

**The implication of the disconnect between OCT and Wage on responsiveness of young workers to a *transitory* tax-change?**

Transitory tax change will only change a fraction of OTC and hence Frisch in dynamic model with HC is lower than in model without HC.

* Earlier model (no HC) you would reap benefit of 1 period with higher wage
* OTC is large for young people, hence elasticities are lower for young people

**The implication of the disconnect between OCT and Wage on responsiveness of young workers to a permanent tax-change?**

A permanent tax-change now increases the return to human capital. Hence, Marshallian elasticity can be higher compared to case without HC.

*Note C\* and E\_t are not what you think see slide 15 in lecture 4.*

Larger pure effect from substitution, because larger effect on OCT than in the transitory case.

Income effect < 0, hence Marshall < Hicks

* Because only positive if then may be negative for some ages

+ that probability of death changes frisch elasticity!

**Simulated Elasticities**

**Short run - current period response**

W c colcwtde 
ho 

**Long run (regime shift) - average effect from a permanent increase throughout life**

o c calcul&te cffc& 
e MenN 

1. 
2. 
3. 
4. 
Solve optimal labor supply, N) 
Simulate baseline labor supply for w + hi(w, N) 
Simulate alternative with 1% higher wage —+ hi(w(l + 0.01), N) 
Calculate average pct change, 
+ 0.01), N) — hi(w, N) 
x 100 
hi(w, N) 