

# Labor Supply: Second Lecture

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LABOR ECONOMICS (ECON 385)

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# Corner solutions

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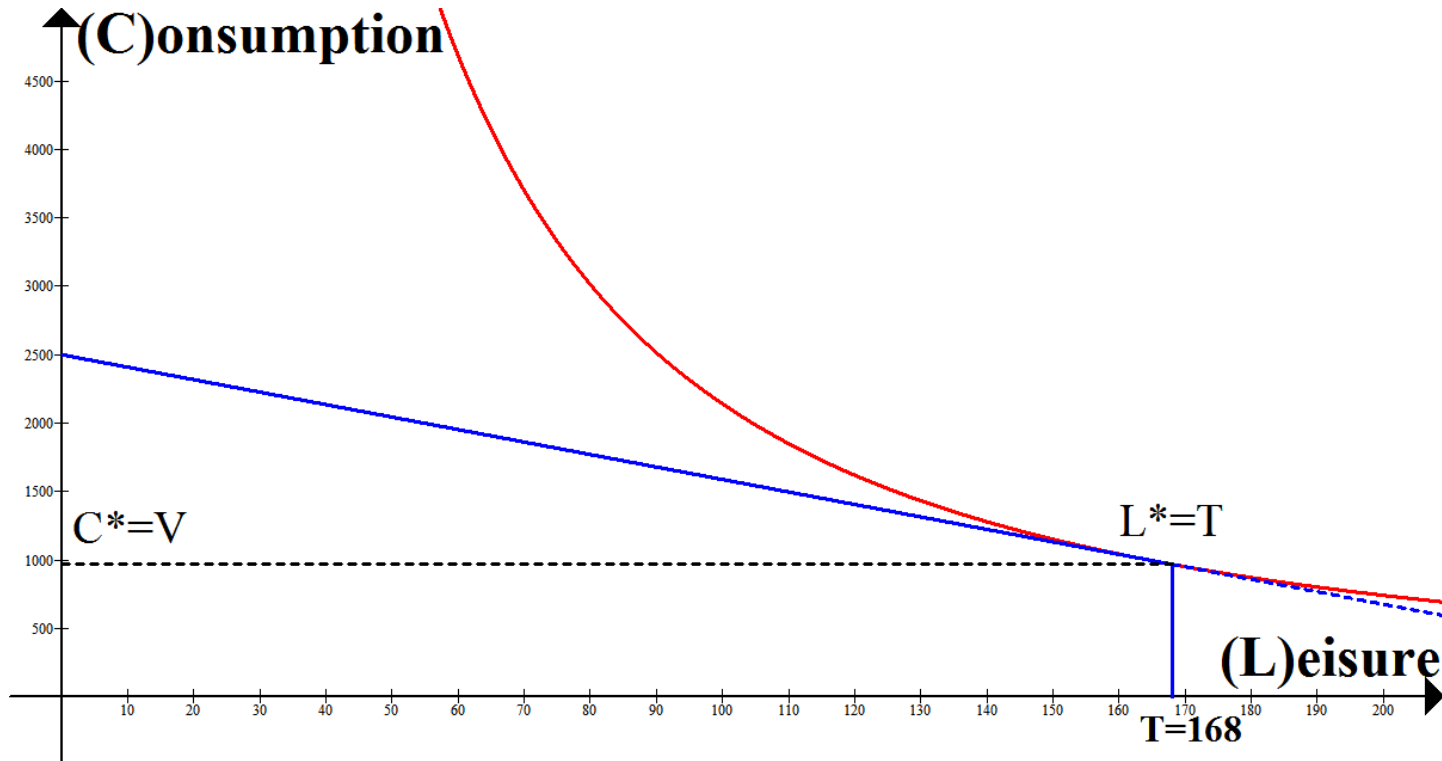
Recall that the agent has a finite number of hours to allocate between leisure and working ( $T$ ). But there isn't anything mathematical that says the tangency point has to occur in the range,  $L^* \in [0, T]$ .

What if the tangency point occurred to the right of  $T$ ?

This would seem to imply the person supplies negative (!) hours of labor, since  $L^* > T$ .

- Of course this is impossible, and the minimum that he can feasibly supply is zero. If  $L^* > T$ , he supplies zero labor and  $L^* = T$ . This is called a corner solution to the utility maximization problem.
  - Solutions in which the agent supplies positive hours are then, by contrast, interior solutions.
- Corner solutions (non-participation) occur when the non-labor income is sufficiently high or wage sufficiently low that it makes working “not worth it” for the agent.

# Corner solutions (continued)



- If the tangency would occur to the right of this point, this combination at the “corner” of the budget constraint is the one the agent would choose.

# The reservation wage

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The smallest wage that will induce them to supply positive hours is called the reservation wage ( $\tilde{w}$ )—the level below which they will not accept employment.

- It can be shown by the vertical intercept on the individual's labor supply graph. This feature, the general upward-sloping shape, and the back-bending region at the top comprise the main features of an individual labor supply curve.

# Labor supply elasticity

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Market labor supply is the aggregate of individual labor supplies. It has the same broad features as individual curves, and its elasticity can be specified similar to labor demand.

$$\text{Labor Supply Elasticity} \equiv \sigma = \frac{\% \Delta \text{Hours}}{\% \Delta \text{Wage}}$$

- A thorough yet accessible treatment of theoretical labor supply modeling, as well as the empirical challenges in estimating supply elasticities is found in Keane's (2011) recent paper.\*

\*Keane, Michael P. 2011. "Labor Supply and Taxes: A Survey." Journal of Economic Literature, Vol. 49, No. 4: 961-1075.

# Measuring labor force participation

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How many individuals participate in the labor force? The official U.S. [procedure](#) for measuring the labor force and unemployment may be found at the Bureau of Labor Statistics. There are also [alternative measures](#) of labor utilization, based on the same data: the Current Population Survey (CPS).

- “. . . the Government conducts a monthly sample survey called the Current Population Survey (CPS) to measure the extent of unemployment in the country. The CPS has been conducted in the United States every month since 1940 . . . There are about 60,000 households in the sample for this survey . . . selected so as to be representative of the entire population of the United States.”
- “. . . People with jobs are employed. People who are jobless, looking for jobs, and available for work are unemployed. People who are neither employed nor unemployed are not in the labor force.”
- “The sum of the employed and the unemployed constitutes the civilian labor force.”\*

\*“How the Government Measures Unemployment.” U.S. Bureau of Labor Statistics. 2009. Accessed from: [http://bls.gov/cps/cps\\_htgm.pdf](http://bls.gov/cps/cps_htgm.pdf) on 5 September 2013.

# Counting the hidden unemployed

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Many of the alternative measures were created to measure the hidden unemployed. This category contains workers that are:

- discouraged: no longer actively seeking work because they have ceased expecting to find it.) or
- marginally attached: persons not in the labor force who want and are available for work, and who have looked for a job sometime in the prior 12 months (or since the end of their last job if they held one within the past 12 months), but were not counted as unemployed because they had not searched for work in the 4 weeks preceding the survey. Discouraged workers are a subset of the marginally attached.

BLS official definition from: <http://www.bls.gov/bls/glossary.htm>.

# The hidden unemployed (continued)

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- The broadest measure even includes people who are technically employed but underemployed: those who are working part time jobs but want to work full time jobs.
- Broader measures tend to get more attention during recessions. See for more,  
<http://economix.blogs.nytimes.com/2012/09/07/not-looking-but-still-wanting-to-work/>  
<http://macroblog.typepad.com/macroblog/2012/05/labor-force-nonparticipants-so-what-are-they-doing.html>  
<http://ftalphaville.ft.com/blog/2012/02/01/860841/us-unemployment-progress/>  
<http://www.nextnewdeal.net/rortybomb/getting-our-arms-around-labor-force-participation-two-fed-studies>



# Measures of labor underutilization

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Table 2. Alternative measures of labor underutilization<sup>4</sup>

(2008 annual averages)

## Measure

- U-1 Persons unemployed 15 weeks or longer, as a percent of the civilian labor force
- U-2 Job losers and persons who completed temporary jobs, as a percent of the civilian labor force
- U-3 Total unemployed, as a percent of the civilian labor force (official unemployment rate)
- U-4 Total unemployed plus discouraged workers, as a percent of the civilian labor force plus discouraged workers
- U-5 Total unemployed, plus discouraged workers, plus all other marginally attached workers, as a percent of the civilian labor force plus all marginally attached workers
- U-6 Total unemployed, plus discouraged workers, plus all marginally attached workers, plus total employed part time for economic reasons, as a percent of the civilian labor force plus all marginally attached workers

# Recent trends in unemployment

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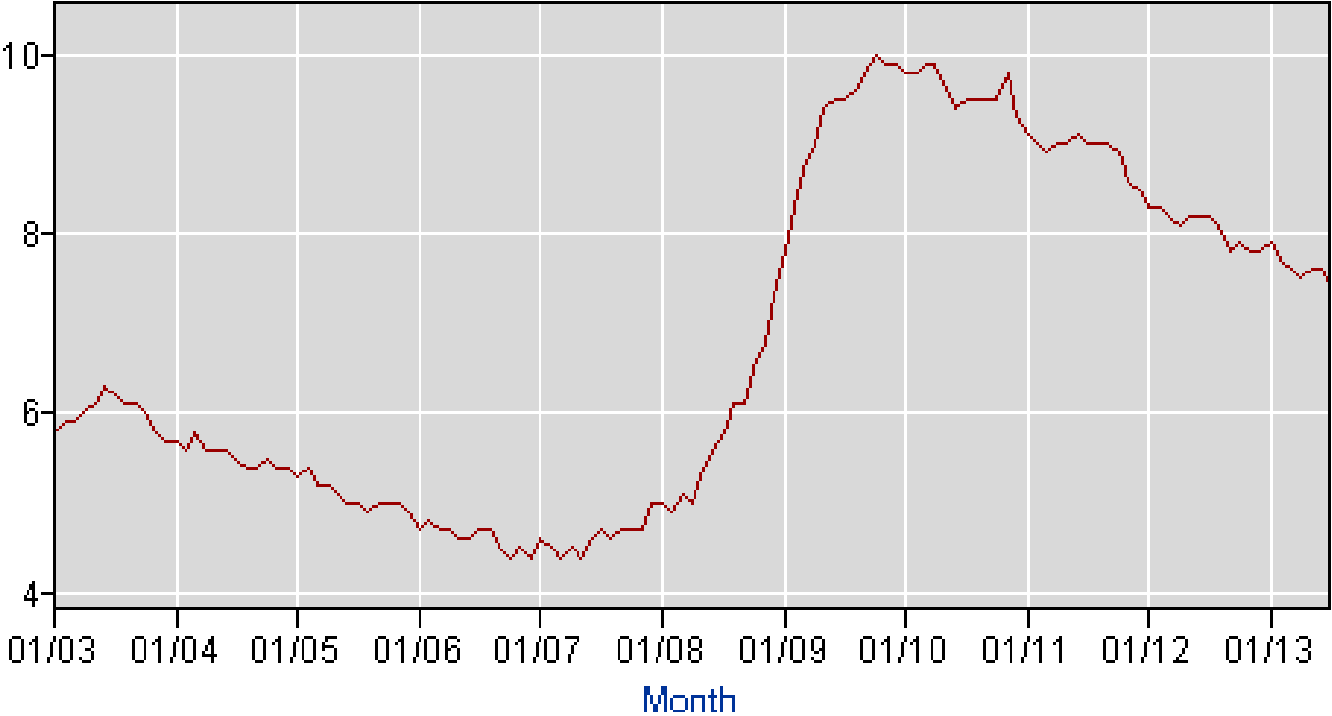
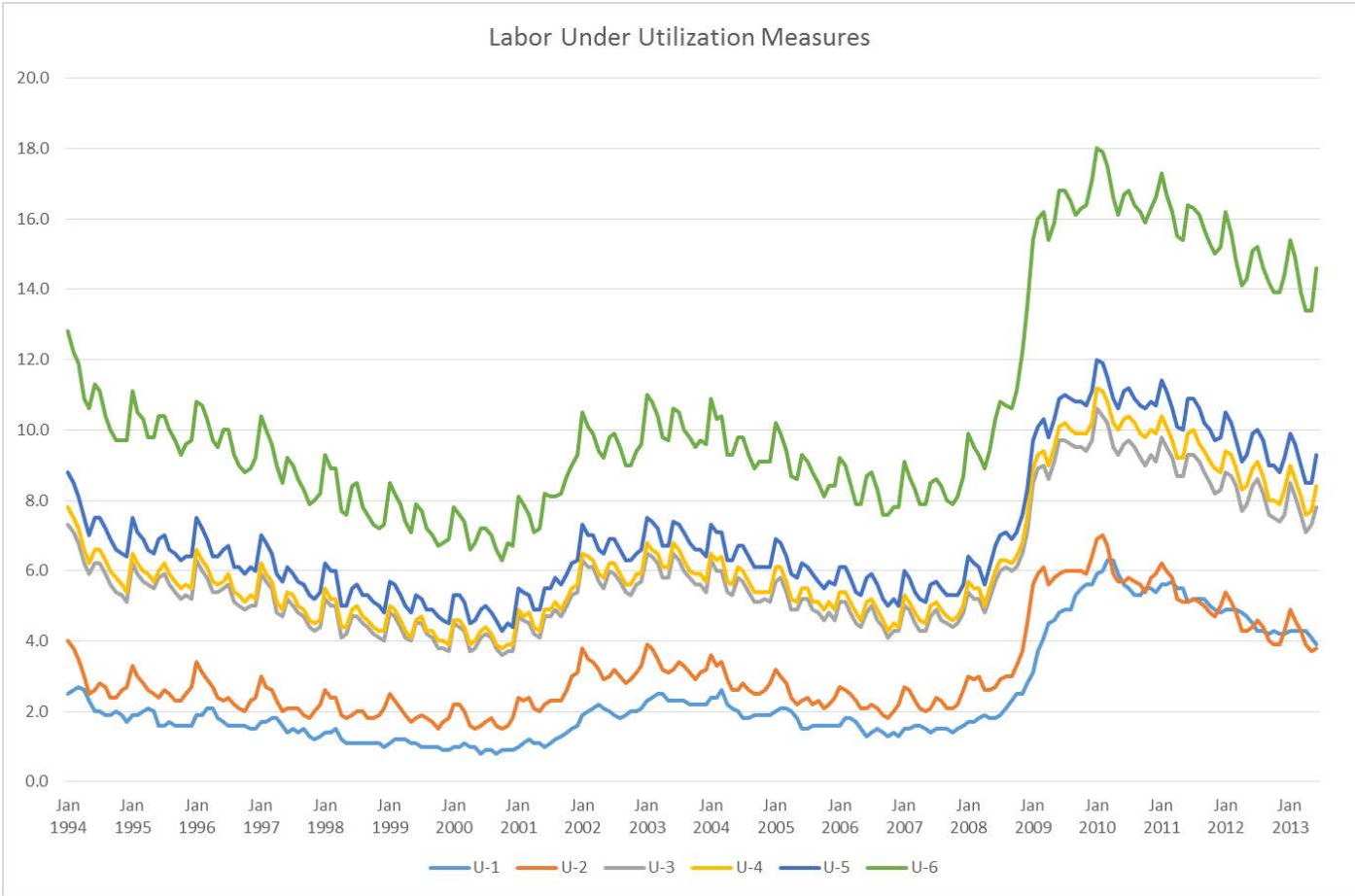


Figure 1: Unemployment Rate. Source: BLS.gov.

# Recent trends in labor underutilization



# Recent trends in labor force participation

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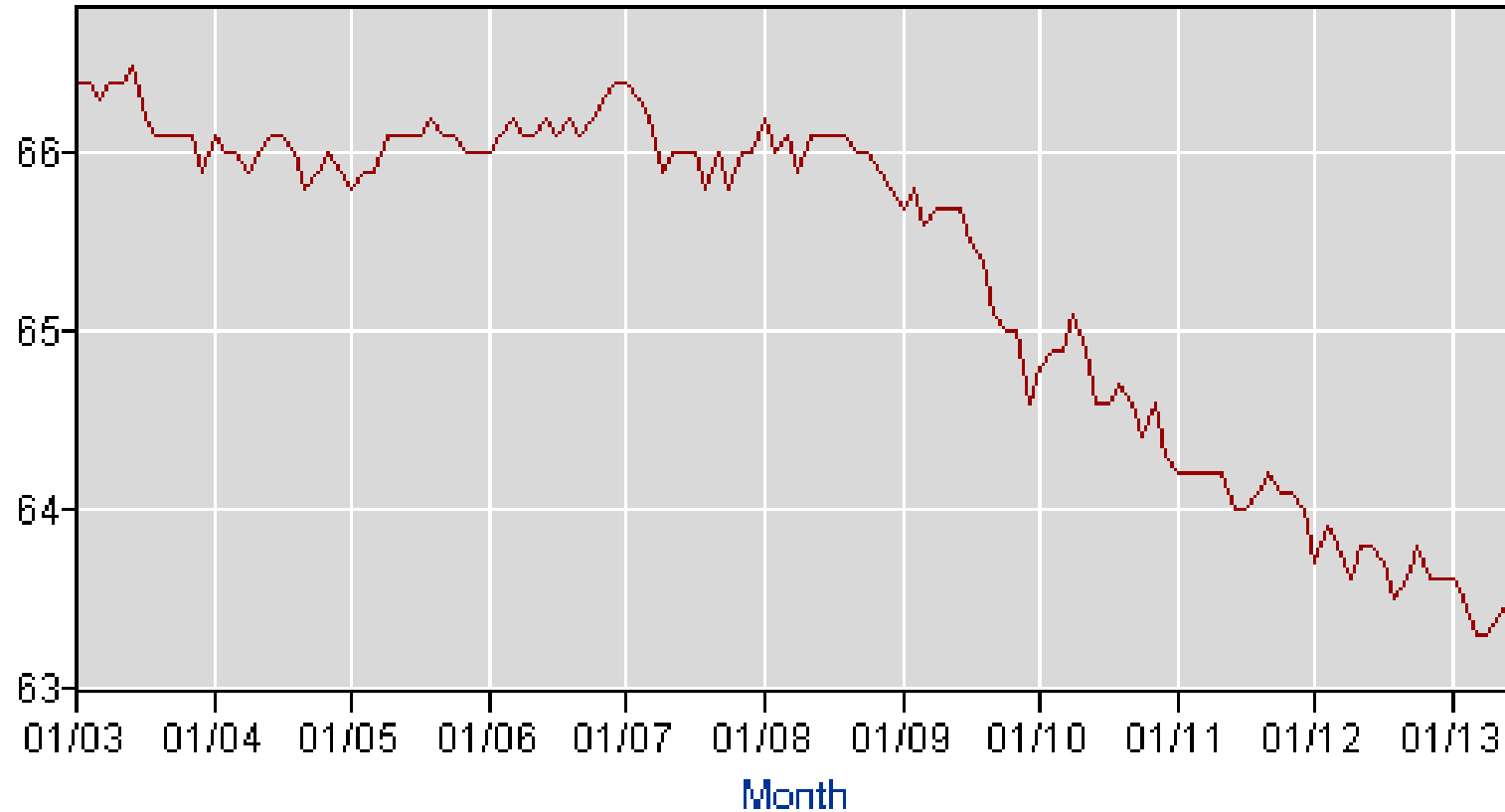


Figure 2: Civilian Labor Force Participation Rate. Source BLS.gov.

# Labor utilization: the employment-population (EP) ratio

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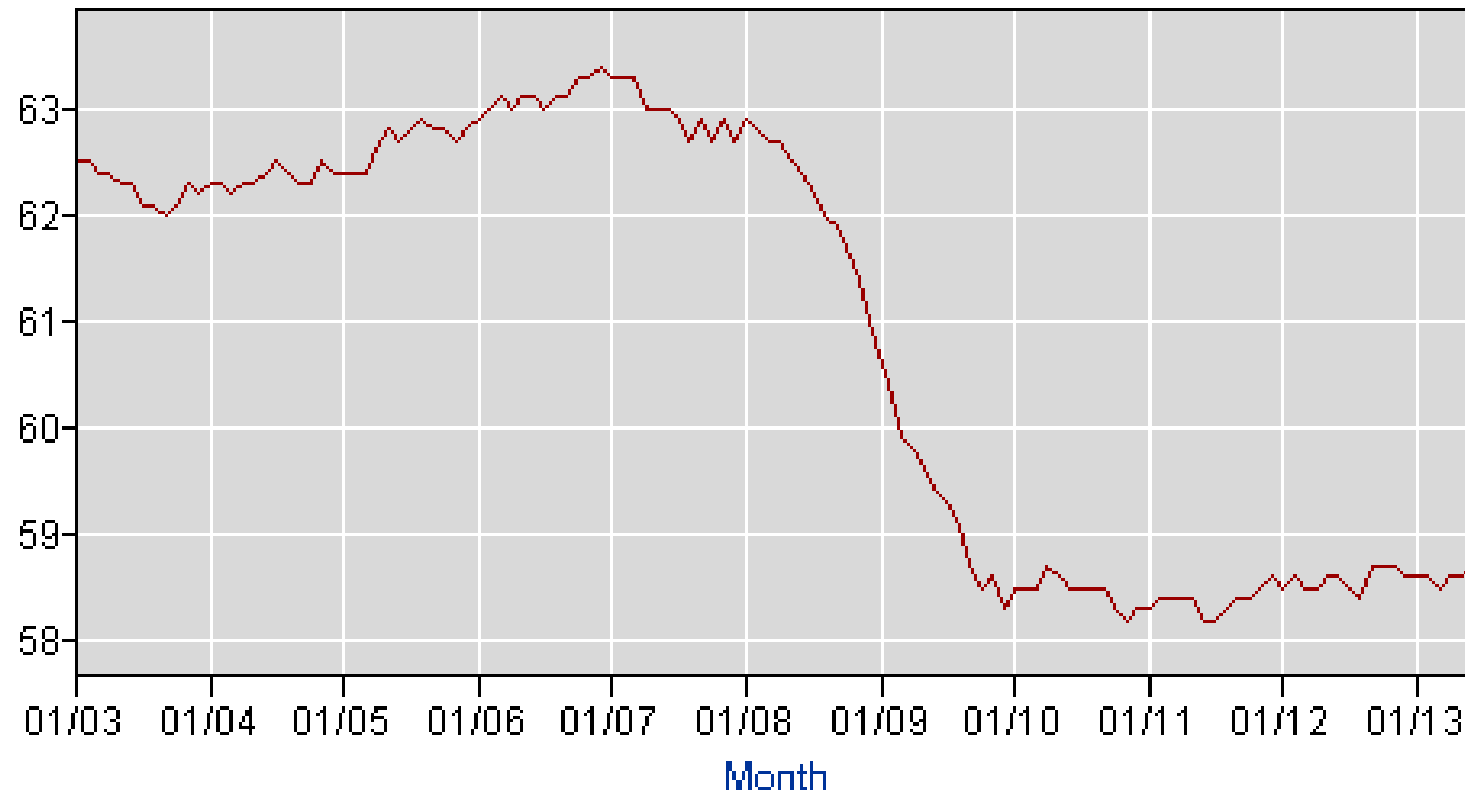


Figure 3: Employment-Population Ratio. Source: BLS.gov.

# Optional Material: Estimating Labor Supply Elasticity

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Estimating market labor supply elasticity from data involves a variation of the following regression. Observe hours ( $h$ ), wage per hour ( $w$ ), non-labor income ( $V$ ) for a homogeneous (with respect to factors influencing demand for individual labor, like education and experience) sample of workers. The model

$$\ln h_i = \alpha + \beta \ln w_i + \gamma \ln V_i + \varepsilon_i$$

may be used with a least squares procedure to estimate the parameter,  $\beta$ , indicating the supply elasticity.

$$\frac{\partial \ln h_i}{\partial \ln w_i} = \beta$$

Using the chain rule of calculus,

$$\beta = \frac{\partial \ln h_i}{\partial \ln w_i} = \frac{\partial \ln h_i}{\partial h_i} \frac{\partial h_i}{\partial w_i} \frac{\partial w_i}{\partial \ln w_i} = \frac{\partial h_i}{\partial w_i} \frac{w_i}{h_i} = \frac{\% \Delta h}{\% \Delta w} = \sigma \text{ (supply elasticity).}$$

# Estimating labor supply elasticity (continued)

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If  $\beta > 0$ , the elasticity is positive. If  $\beta < 0$ , it is negative (the back-bending part of the curve). And if  $|\beta| < 1$ , labor supply is “inelastic”.

This also enables a test of whether leisure is an inferior good. If so an increase in non-labor income should lead to less leisure and more labor supply. Consequently,

$$\gamma = \frac{\% \Delta h}{\% \Delta V} > 0$$

if leisure is an inferior good.  $\gamma$  should be  $< 0$  if leisure is a normal good.

# Estimating elasticity (potential problems)

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A comprehensive treatment of estimation issues is in Blundell and MaCurdy (1999).\* Among them, consider:

- Measurement error in hours. Particularly for salaried workers who do not monitor their own hours and often report 40 hours to represent a full-time week.
- Measurement error transmitted to hourly wage by imputing it for salaried workers based on reported hours. Underreported hours means overestimated wages. So the dependent and independent variables are both systematically mis-measured, and this introduces a spurious negative correlation between wage and hours.
  - Correcting for this tends to increase estimates of the elasticity, reducing the exaggerated role of the income effect.
  - The average wage imputed in this fashion is very different from the marginal wage—which is the relevant concept in the theoretical model.

\*“Labor Supply: A Review of Alternative Approaches.” in Handbook of Labor Economics, vol. 3A, eds. Ashenfelter and Card: pp. 1559-1695.



# Estimating elasticity (potential problems)

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- Neither wages nor hours is observed for non-workers. Interpreting the estimates as “elasticities conditional on participation” does not resolve the problem, either, because workers are not a representative sample of all individuals.
- Non-Labor income is related to past labor supply and wages; specifically it reflects savings from prior periods. So estimates of  $\gamma$  will reflect the true income elasticity plus a (positive) bias:

$$\hat{\gamma}(\text{estimated}) = \gamma + \frac{\partial h(\text{current})}{\partial h(\text{past})} \frac{\partial h(\text{past})}{\partial V};$$

gamma will be overestimated by this bias. The bias overemphasizes the income elasticity and makes leisure appear more like an inferior good than it really is.

# Labor supply elasticity estimates

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Some estimates of these parameters do a better job of avoiding the pitfalls, and their values suggest a supply elasticity for men around (-0.1).

- Negative, suggesting that men are on the backward-bending part of their supply curves.
- Inelastic, consistent with the observation that most men work full time (as much as is feasible) and cannot respond with much more labor to a wage increase.
  - Could plausibly say that male labor supply is close to perfectly inelastic ( $\sigma \approx 0$ ).
- Elasticities could vary considerably among younger and older workers. Results reported here consider all adult men, averaging across groups.

# Labor supply elasticity estimates (continued)

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22 studies surveyed by Keane come up with an average (Hicksian) elasticity of 0.31 (Keane (2011), p. 1043). This latter group includes further considerations like intertemporal choice of hours, human capital accumulation and progressive income taxation—which make the positive male labor supply elasticity more plausible.

- Many of these considerations are too complex for this class, but Keane's paper does an excellent job of explaining how researchers have confronted them.
- Keane also finds that many of the smaller (closer to zero) estimates were more susceptible to downward bias from using imputed wages than the large estimates—which more often used directly observed wages.
  - This suggests male labor supply is closer to 0.43.
- Keane's and a co-author's (2004) paper that rigorously treats human capital accumulation suggests that even 0.43 is a low estimate—and that 1.32 (the elastic range) is more appropriate.
  - Imai, Susumu and Michael P. Keane. 2004. "Intertemporal Labor Supply and Human Capital Accumulation." International Economic Review, Vol. 45, No. 2: 601-641.
  - This follows from the assessment that wages are not exogenous, but are instead the product of previous period labor market experience. Intuition is that a lower wage induces young workers to accumulate less experience, have lower future wages and to supply less labor in the future—a large response, taking all time periods collectively.

# Male labor supply elasticity estimates

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I share Keane's (2011) conclusion that: “. . . note that no existing paper deals with all of the issues I discussed . . . For instance, no paper has allowed for saving, progressive taxation, human capital, and participation decisions simultaneously. This would obviously be a difficult undertaking.” Even though labor supply elasticity has been studied more than most topics, it involves supremely challenging empirical issues that have not yet been completely resolved.

- (Keane, p. 1045).

# Female labor supply elasticity estimates

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Female labor supply estimates, in contrast, tend to be positive—in the inelastic range and around 0.2.

- Most of this represents the participation decision. Unlike men, women historically have not participated unanimously in the labor force. Estimates seem to imply that female hours are more responsive to wage, but really female labor supply is as inelastic as males' is.
- For married women, participation is also responsive to the husband's wage. Estimates on the order of (-0.5) for participation (10% increase in husband's wage decreases participation probability by 5%) and (-0.17) for hours (conditional on participation).

Keane's paper concludes that estimates of female labor supply that account for participation decisions and life cycle considerations like fertility and marriage are comfortably within the elastic range and over 2.