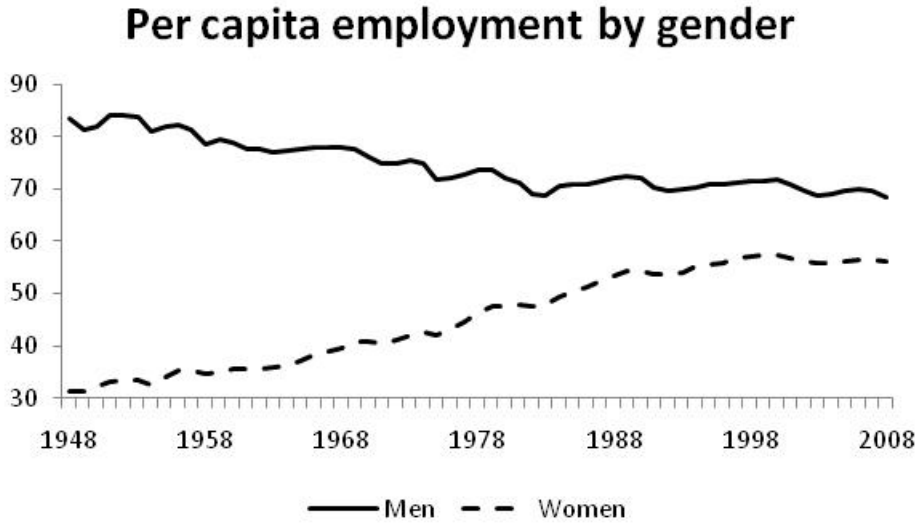
Trends in Employment and Evidence based on the Static Model

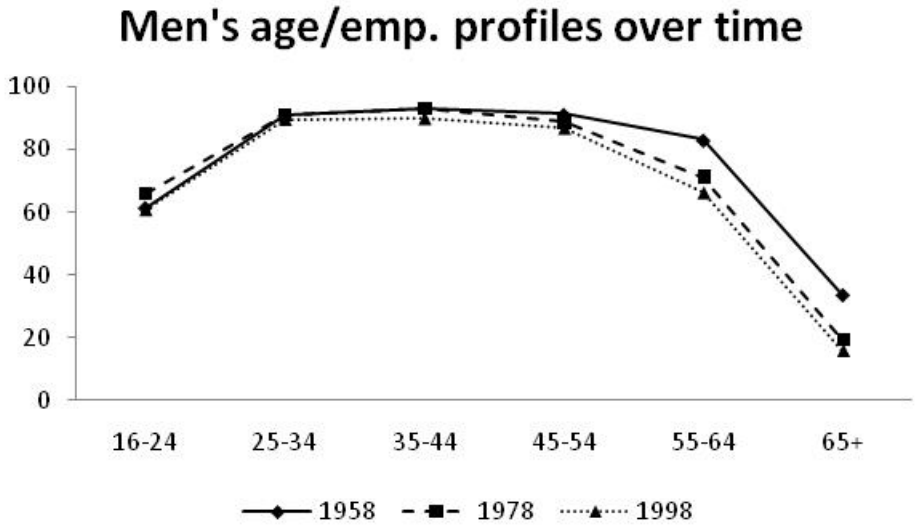
A. Trends

1. Trends in men's and women's per capita employment



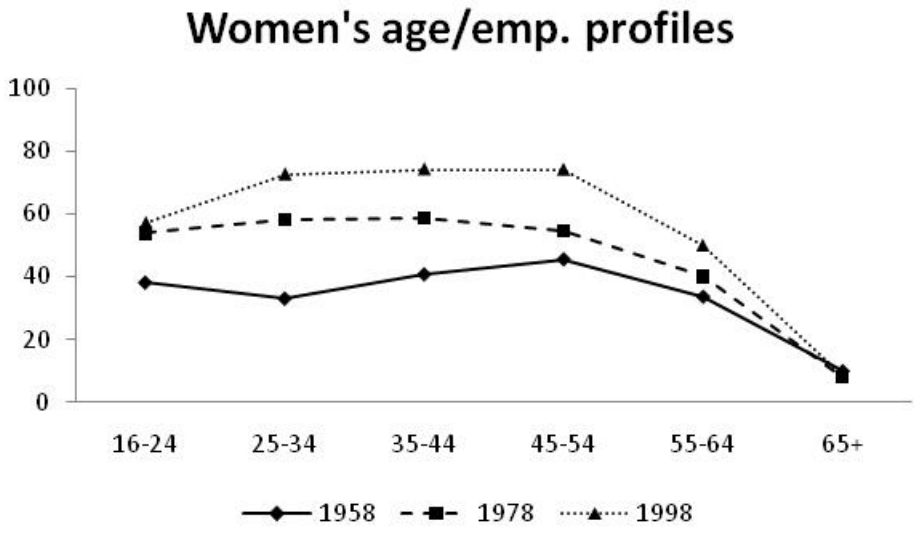
2. Age-specific trends for men

Year	All	16-24	25-34	35-44	45-54	55-64	65+
1948	83.5	69.7	93.2	95.6	93.4	86.7	45.2
1958	78.5	61.5	90.8	92.9	91.2	83.0	33.7
1968	77.8	63.0	95.1	95.6	93.4	82.7	26.5
1978	73.8	66.1	91.1	93.0	88.8	71.3	19.5
1988	72.0	64.1	89.3	90.9	87.8	64.7	16.1
1998	71.6	60.8	89.5	89.8	86.7	66.2	15.9
2008	68.5	52.3	85.9	88.0	84.2	67.7	20.5



3. Age-specific trends for women

Year	All	16-24	25-34	35-44	45-54	55-64	65+
1948	31.3	41.2	31.8	35.8	34.0	23.5	8.9
1958	34.5	38.1	33.0	40.7	45.5	33.6	9.9
1968	39.6	43.8	40.6	47.2	51.1	41.5	9.3
1978	46.4	53.8	58.1	58.6	54.7	40.0	8.0
1988	53.4	57.6	68.6	72.1	66.6	42.3	7.7
1998	57.1	57.2	72.6	74.2	74.1	50.0	8.3
2008	56.2	50.2	71.0	72.7	73.1	57.0	12.7



B. General Econometric Issues

1. Functional form of the labor supply function
   a. How do we choose the appropriate functional form?
   b. Theory simply states that labor supply is a general function of wages and non-labor income.
   c. One approach is to start with a known direct utility function (structural approach)
      1) For instance, we could use a Stone-Geary specification and let

         $$U(C, L) = \alpha \ln (C - \gamma_C) + (1-\alpha) \ln (L - \gamma_L)$$

         then the labor supply function will be

         $$H^* = \alpha (K - \gamma_L) - (1-\alpha) (N - \gamma_C) / W$$

      2) approach is theoretically consistent; can see how particular theoretical elements affect labor supply
      3) requires a strong assumption regarding preferences
   d. An alternative is to choose an approximate representation (e.g., linear function) for the labor

supply function

1) easier and more flexible way to start
2) still implicitly imposes restrictions on preferences; for instance, a linear equation

$$H^* = \alpha + \beta W + \delta N$$

leads to a direct utility specification

$$U(C,L) = \frac{\delta(K-L)-\beta}{\delta}\exp\left[\frac{\delta(\alpha+\delta C)-\beta}{\delta(K-L)-\beta}\right]$$

3) while this example is theoretically consistent, other labor supply functions may not be unless they satisfy the integrability conditions

2. Sources of heterogeneity
   a. How do we account for the differences (heterogeneity) in labor supply across people?
   b. There will be some observed heterogeneity in wages and non-labor incomes; that is, variation in the budget constraints that people face
   c. Beyond this, there may also be variation across people in their preferences
      1) the sources of variation may depend on observed or unobserved variables
      2) we could specify one or more of the preference parameters as a function of observed and unobserved variables
         – in the Stone-Geary specification, we could let

$$\alpha(K - \gamma_L) = X'\beta + \varepsilon$$

- need to be mindful possible restrictions (e.g., the above term would need to be positive)
- represents a strong assumption

3) difficult to assign heterogeneity specifically to preferences if you start with an approximate representation
   - in this case, we usually just let the terms enter linearly
   - interpretation is more difficult

d. measurement error in the labor supply outcome is another possible source of heterogeneity
   1) could arise because people answer questions about average hours worked
   2) could also reflect genuine recall errors
   3) recall that measurement error in the explanatory variables will lead to other econometric problems (not a great way to motivate your specification)

3. How will the economic variables be measured?
   a. Labor supply variables
      1) Will the study focus on the discrete employment decision or the continuous labor supply decision?
      2) For either outcome, what is the appropriate dimension of time
         - for an experiment, a few hours or a day might be appropriate
         - some analyses consider weekly data (such data

are relatively easy to obtain; however, people may have limited scope to vary their hours)

- monthly or annual data allow more variation but also increase the chances of mismeasurement or recall errors; problems also arise if people switch jobs

b. Wages

1) Are data on hourly wages available?
   - some people are only paid monthly or annually
   - some people are paid on a commission or piece-rate basis
2) There are obvious problems associated with using earnings data from longer periods such as weeks or years if we want to examine the effects of wages on labor supply (earnings conflate wage and labor supply outcomes)
3) May introduce bias (spurious negative correlation) if we divide earnings by hours
   - consider equation

$$H^* = \alpha + \beta(E/H) + \delta N$$

   - if earnings, $E = WH$, the hours terms in the numerator and denominator cancel leaving W
   - if $E \neq WH$, some portion of hours will remain in the denominator leading to a negative correlation with the dependent hours variable
4) Are wages the same over the entire range of hours? (is the budget constrain linear?)
   - over-time

- moonlighting or multiple jobs over time
- taxes

c. Nonlabor income
   1) May observe only a fraction of non-labor income
      - may not observe certain types of retirement savings
      - may not observe imputed returns from housing
   2) Nonlabor income may depend on work effort
      - direct relationships for sources such as unemployment insurance and welfare benefits
      - may reflect previous work effort
   3) Nonlabor income may be endogenous for other reasons
      - could reflect earnings of other family members
      - could depend on other behavior (e.g., strategic bequests)

4. Selectivity issues
   a. Should we examine both workers and non-workers?
      1) If non-workers are included, we face problems with censoring
      2) If non-workers are excluded, we face problems with truncation and selectivity
   b. How should we account for selectivity?
      1) Do we use a standard ML tobit approach?
      2) Do we use Heckman's two-stage (generalized tobit) approach?

3) Do we use a less restrictive specification like symmetrically-censored least squares

c. How do we impute wages for non-workers?
   1) Do we use model-based imputations?
   2) Do we use hot-deck imputations?
   3) Do we use multiple imputation methods?
   4) How do we account for the errors in imputations?

C. Summary of Empirical Evidence

1. Killingsworth (1983) – distinguished between two "generations" of research
   a. first generation studies relied mostly on OLS; recognized selection issues but did not use formal methods to address them
   b. second generation studies were much more concerned with selectivity and other econometric issues, such as discontinuous labor supply schedules and nonlinear budget constraints; used formal techniques to address these issues

2. Empirical findings of first generation studies (results summarized in Tables 3.1-3.5 of Killingsworth 1983)
   a. uncompensated wage elasticities
      1) men: generally fell between 0.00 and -0.40, though positive elasticities appeared in some studies
      2) women: selectivity concerns led to fewer studies; wider range of estimates [0.20 to 0.90]

b. income elasticities
    1) men: generally in the range 0.00 to -0.16, though some stronger results were reported
    2) women: generally in the range -0.10 to -0.20
c. one general conclusion was that women's labor supply was more sensitive to wage and non-labor income changes than men's

3. Income maintenance experiments
    a. Description of experiments
        1) different social experiments run in the late 1960s and 1970s in New Jersey & Pennsylvania, rural North Carolina, Iowa, Gary, Seattle and Denver
        2) designed to examine a "negative income tax"
        3) changed effective wages and non-labor incomes for some randomly chosen, low-income families (experimentals)
        4) members of the control group faced their original budget constraint (faced the existing tax and transfer system)
    b. Pencavel (1986) points out several limitations with the experiments
        1) used selective, low-income samples
        2) some non-random allocation between treatment and control groups
        3) significant external changes in some locations
        4) non-random attrition
        5) some incentives to misreport income

6) experiment was only temporary
7) no "saturation" models were used

c. Treatments, which generally increased effective wage rates, had negative effects on labor supply
   1) range of uncompensated wage elasticities was -0.16 to 0.21
   2) introduced many questions about selectivity and the empirical treatment of nonlinear budget constraints
   3) impetus for second generation of studies

4. Empirical findings from second generation studies (see Tables 4.2-4.4 in Killingsworth 1983)
   a. As mentioned, studies typically used formal methods to control for selectivity
   b. Killingsworth (1983) gives the following 3-step approach as an example methodology
      1) estimate reduced-form probit model for employment
      2) use results from this model to construct λ and estimate a selectivity-corrected wage regression
      3) use results from second-stage model to impute wages for non-workers; use imputed wages and λ in a final, generalized Tobit labor supply model
   c. In addition to employment selectivity, models also considered other things, like nonlinear budget constraints
   d. Studies led to a much wider range of findings

5. Mroz (1987) reconciliation study
   a. Wide range of second generation results
      1) Studies were successful in demonstrating the sensitivity of labor supply estimates to alternative empirical techniques (e.g., showing that corrections for selectivity and nonlinear budget constraints led to different findings)
      2) Studies, however, did not rigorously test their specification assumptions and were not able to reconcile their different findings
      3) Mroz conducted an analysis of specification issues in the context of married women's labor supply
   b. Key features of study
      1) examined a simple model of married women's labor supply

$$H^* = \alpha_0 + \alpha_1 \ln W + \alpha_2 N + \alpha_3 Z + \varepsilon$$

      2) considered the following specification issues:
         - exogeneity of wages, non-wife income, fertility and work experience
         - selection into employment
         - budget nonlinearities from taxes
      3) examined annual hours for a single cross-section (1975) from the PSID
         - sample consisted of 753 women (428 workers)
         - use of a single sample ruled out sampling differences

c. Results
    1) wage instruments
        - using polynomials in experience substantially increased the estimated wage effect
        - however, models that used experience as an instrument appeared to be over-identified
        - little evidence of endogeneity bias in specifications based on other instruments
    2) Similarly, could not reject exogeneity of non-wife income and fertility
    3) Selection
        - compared standard (ML) Tobit, truncated regression and generalized (two-stage) Tobit
        - also examined relaxed distributional assumptions in standard Tobit
        - rejected standard Tobit
        - found little evidence of selectivity in other models
    4) Found that the treatment of taxes had little effect on estimation results
d. Final results
    1) among specifications that could not be rejected
        - Wage effects: maximum of 150 hours per year per extra dollar in wages
        - Income effects: maximum of 22 hours per year per extra $1000 in income
    2) overall results suggested that married women's work behavior was very similar to married men's –

that is, relatively insensitive to wage and non-labor income changes