31E00700 Labor Economics:
Lecture 1

Matti Sarvimäki

30 Oct 2012

Practicalities

Lecturers

- Matti Sarvimäki, Tuomas Pekkarinen

Grading

- problem sets (30%): TBA
- final exam (70%): January 9th at 9am (4 hours)
- retakes: March 7th, May 24th

Material

- Lectures
- Journal articles (see syllabus)
- Borjas: Labor Economics (5th Edition)

The Labor Market

- Arguably the most important market
  - time
  - income / wealth
  - friends, spouses, identity...

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- Arguably the most important market
  - time
  - income / wealth
  - friends, spouses, identity...
- and one of the most regulated ones
  - minimum wages, maximum hours
  - pensions, unemployment insurance, social benefits
  - public provision of education, qualification requirements
  - parental leaves, safety regulations, immigration policy...

Labor Economics

- Exchange of labor is assumed to take place in a market where:
  - utility maximizing workers sell labor in exchange of compensation $\rightarrow$ **labor supply**
  - profit maximizing employers buy labor to produce goods and services $\rightarrow$ **labor demand**
  - conflicting interests balanced out in the market **equilibrium**
  - **government intervention** may affect the equilibrium

Theory and Empirics

A good model is

- relevant (addresses an important question)
- simple (carricature, not description of everything)
- testable

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A good empirical study is

- relevant (documents important facts, tests a model, measures a key parameter or evaluates a policy intervention)
- plausible
- transparent

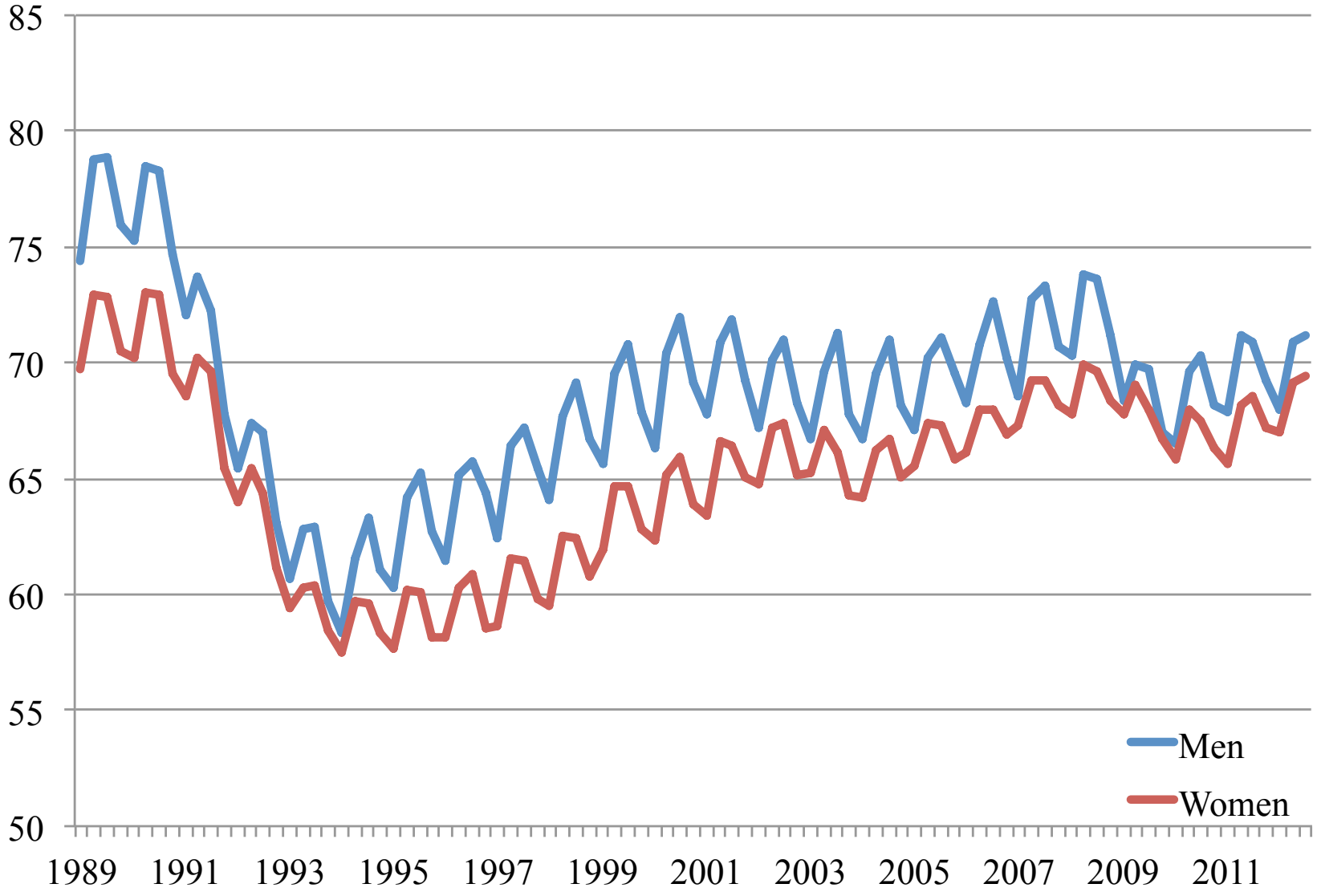
Topics of This Course

Sarvimäki	10/30	Introduction; Basics of Static Labor Supply
	11/1	Static Labor Supply: Welfare Programs
	11/6	Intertemporal Labor Supply
	11/8	Labor Demand
	11/13	Labor Market Equilibrium: Immigration
	11/15	Labor Market Equilibrium: Minimum Wages
	11/20	Labor Market Equilibrium: Technological Change
Pekkarinen (prelim.)	11/22	Human capital & Signaling
	11/27	School Quality
	11/29	On The Job Training
	12/4	Turnover/Matching
	12/6	Intergenerational Mobility
	12/11	Labor Market Discrimination
	12/13	Gender discrimination

Today: Static Labor Supply

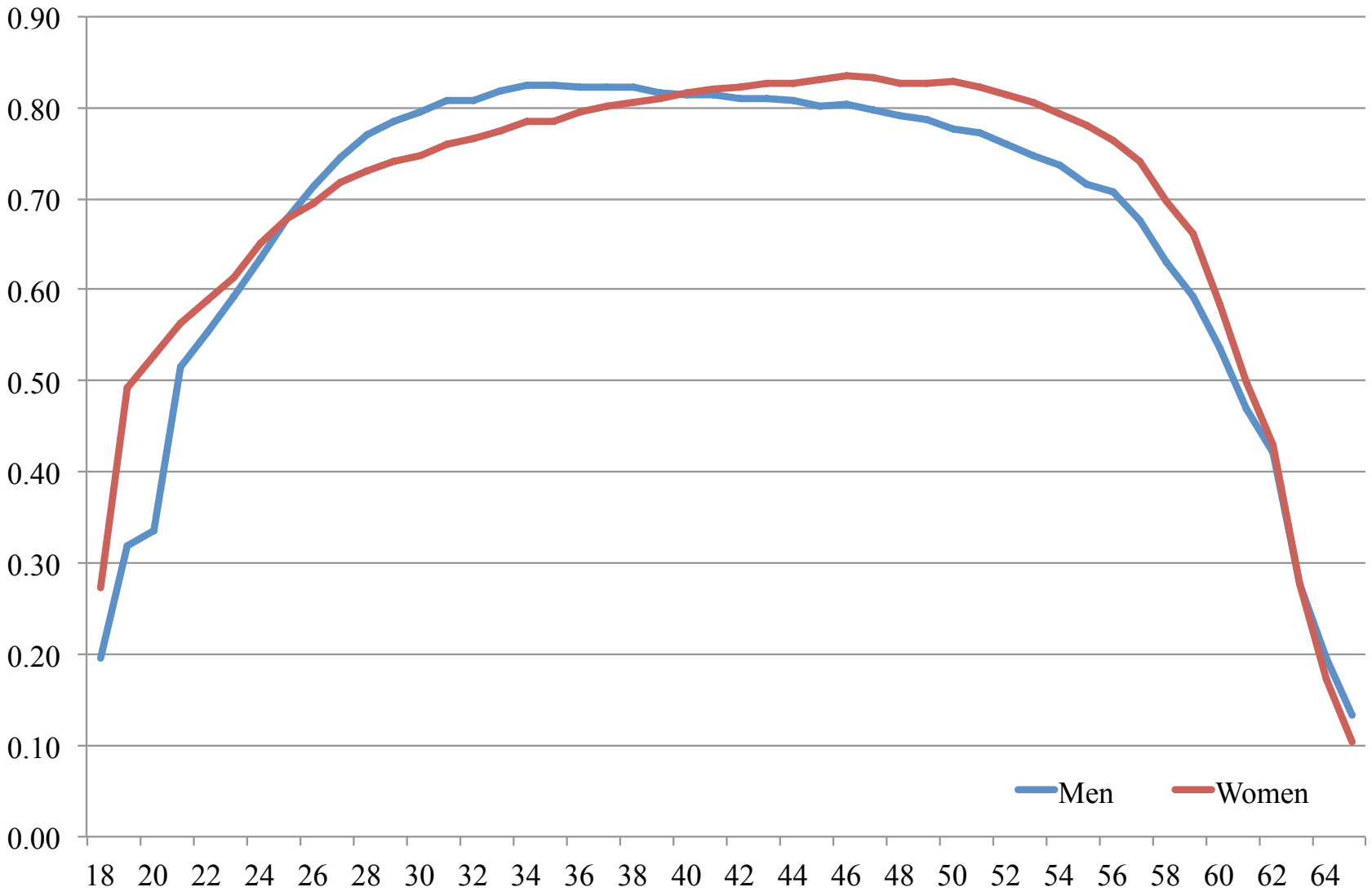
1. Stylized facts
2. The neoclassical model of labor supply
3. Application: the impact of non-labor income on labor supply

Stylized Fact 1: Employment Rate Varies over Time (Finland 1989–2012)



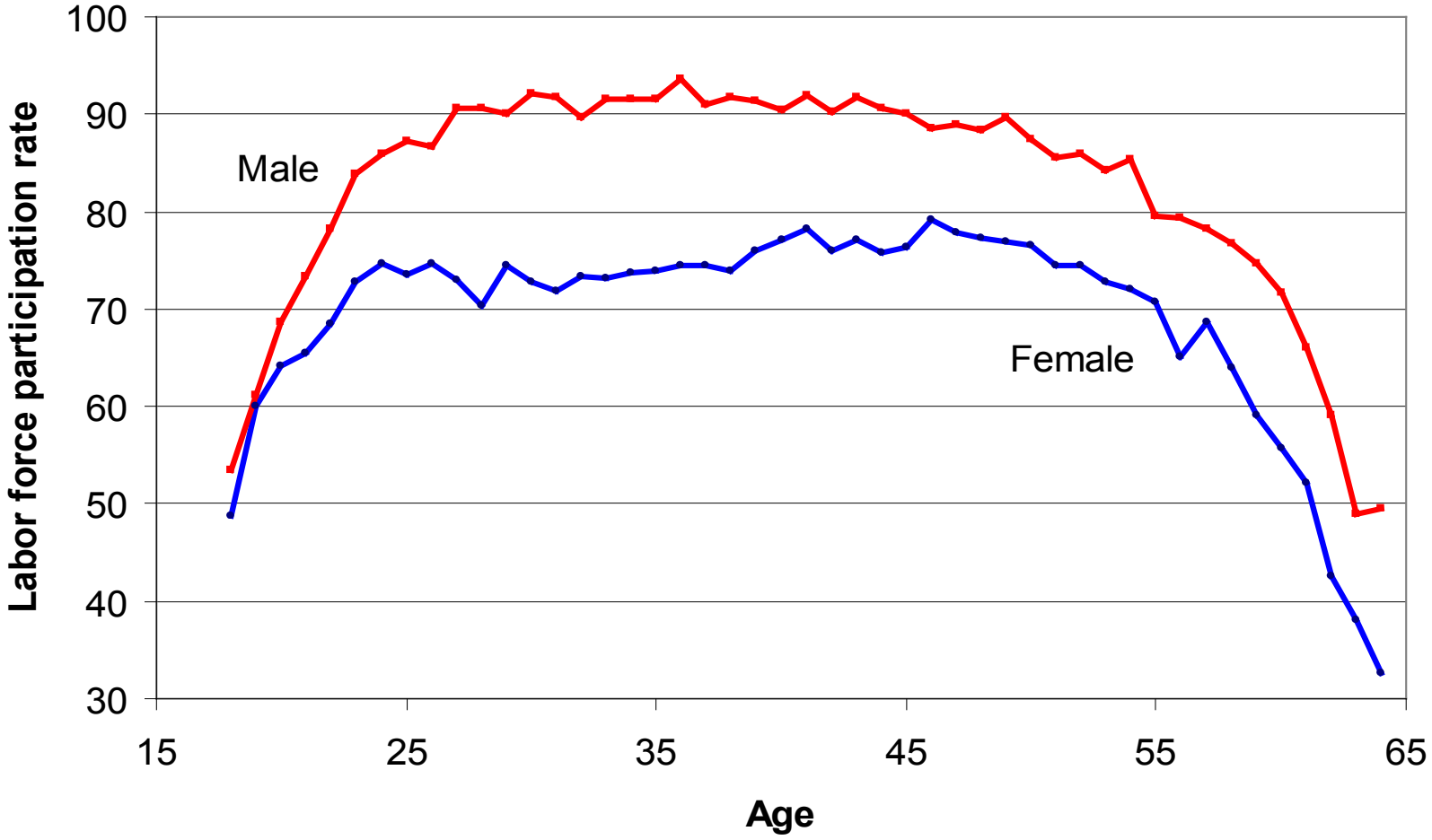
Source: Statistics Finland (http://pxweb2.stat.fi/database/StatFin/tym/tyti/tyti_fi.asp)

Stylized Fact 2: Employment Rate Varies by Age, Sex (Finland 2010)



Source: Statistics Finland
(http://pxweb2.stat.fi/database/StatFin/vrm/tyokay/tyokay_fi.asp)

Stylized Fact 3: ... and by country (United States 2005)



Source: Borjas (2010), Figure 2-20

The neoclassical model of labor and leisure

- Workers value
  - consumption
  - leisure
- They choose
  - whether to participate in the labor market (extensive margin)
  - how many hours to work (intensive margin)
- ... to maximize utility subject to a budget constrain
  - tradeoff between consumption and leisure

Preferences

Utility function

$$U = U(C, L)$$

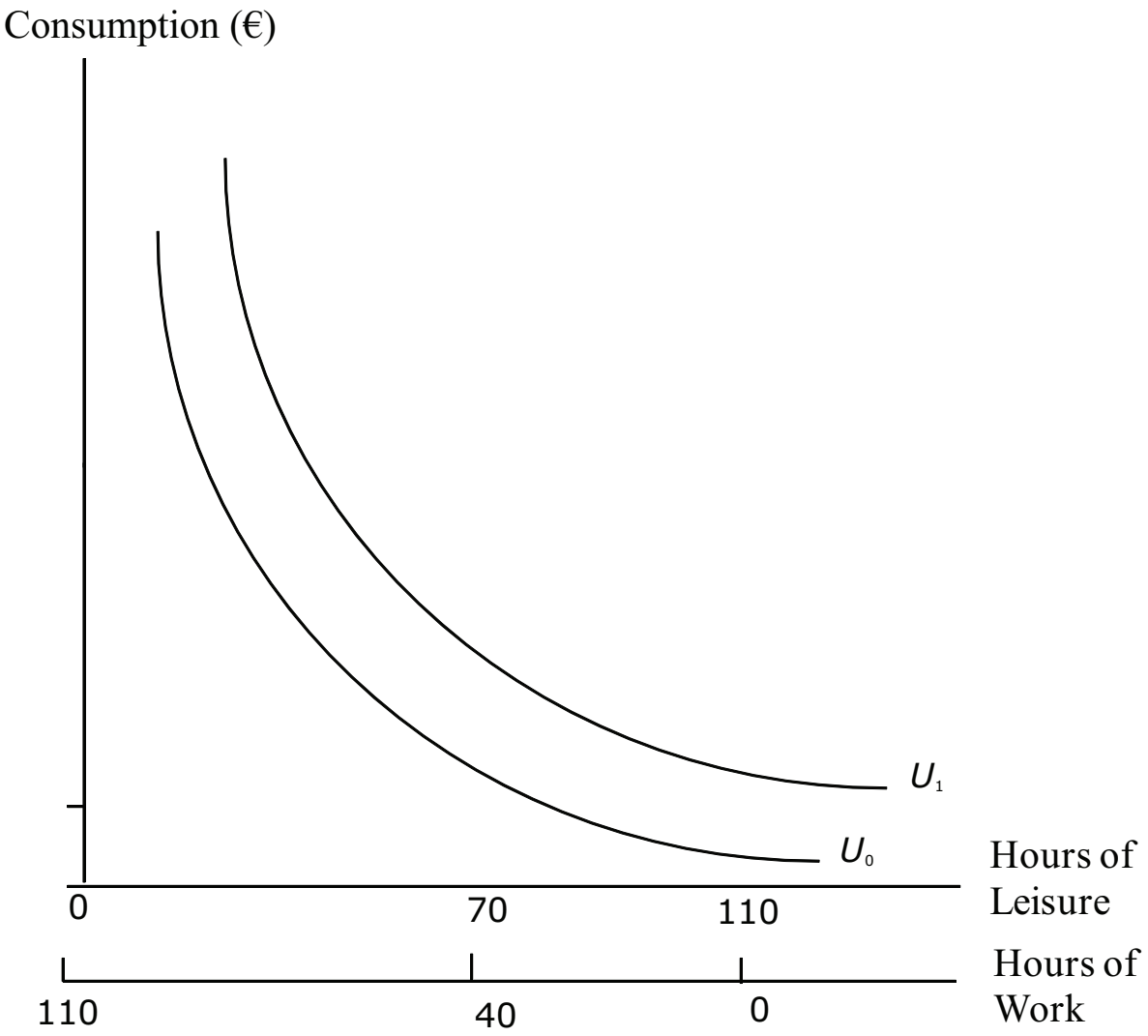
where C is bundle of consumption goods and L is leisure and

$$U_C > 0 \quad , \quad U_L > 0$$
$$U_{CC} \leq 0 \quad , \quad U_{LL} \leq 0$$

ie. more is beter, but marginal utility is decreasign

- This yields indifference curves with the following properties
  - Higher IC indicates higher levels of utility
  - ICs are downward sloping in C,L-space
  - ICs are convex to the origin
  - ICs do not intersect

Indifference Curve



Source: Borjas (2010), Figure 2-2

Budget Constraint

Money and time constraints

$$\begin{aligned} C &\leq wH + V \\ H &= T - L \end{aligned}$$

where C is consumption, H is hours worked, w is the wage rate, V is non-labor income, T is the maximum time available and the price of consumption is normalized to one

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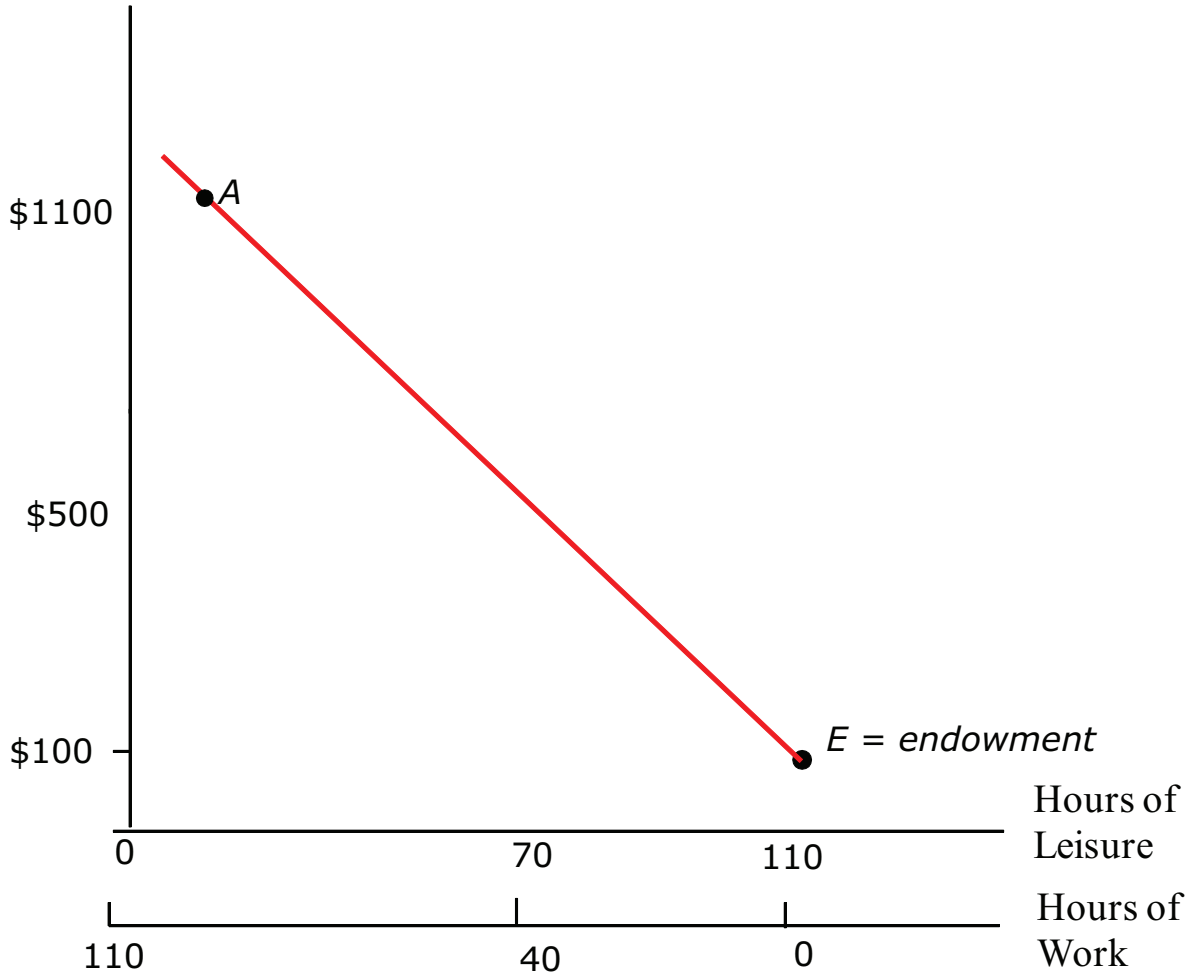
Plugging-in the second constraint to the first one yields

$$C + wL \leq wT + V = R$$

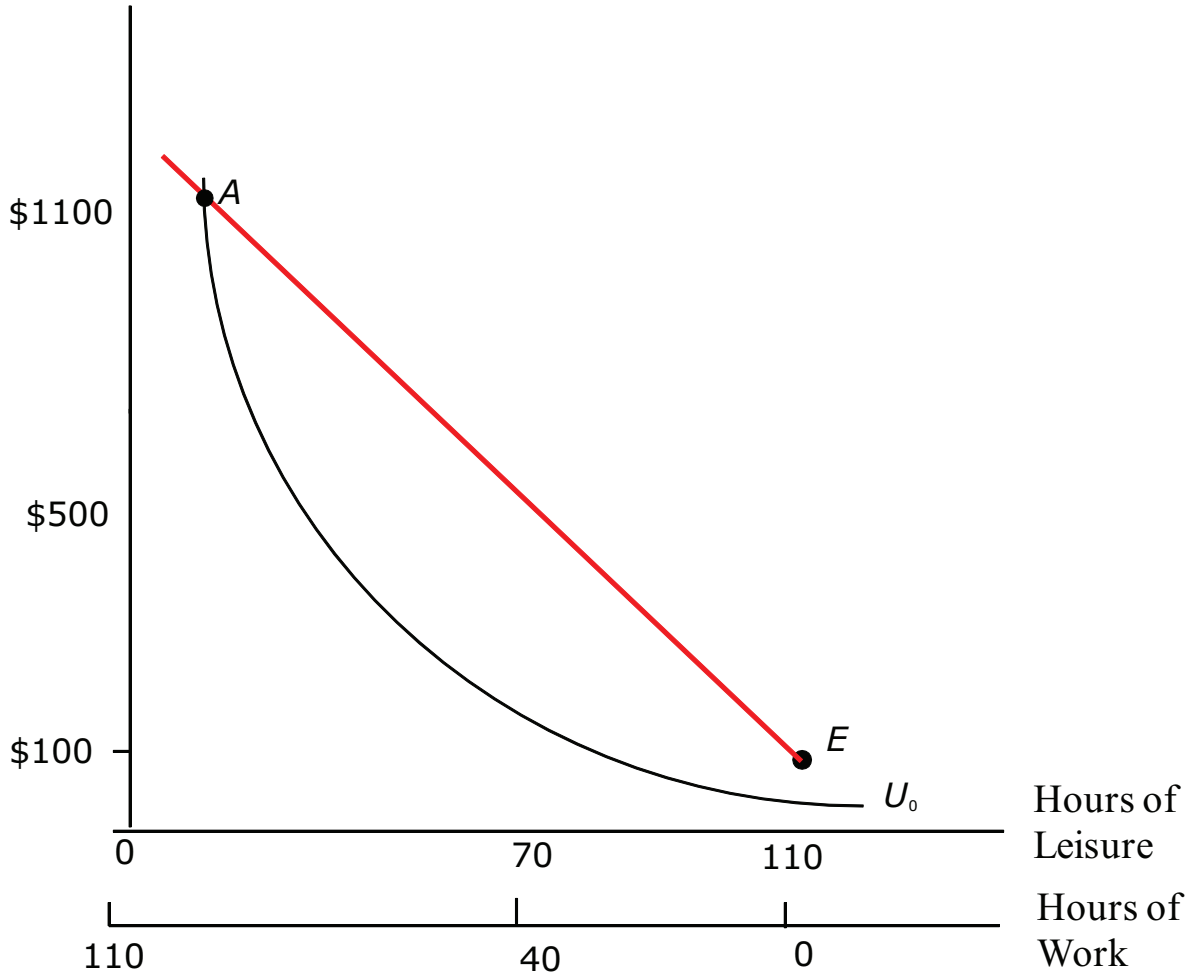
where R is the potential income (if all time dedicated to working)

Budget Constraint



Source: Borjas (2010), Figure 2-6

Optimal consumption and leisure



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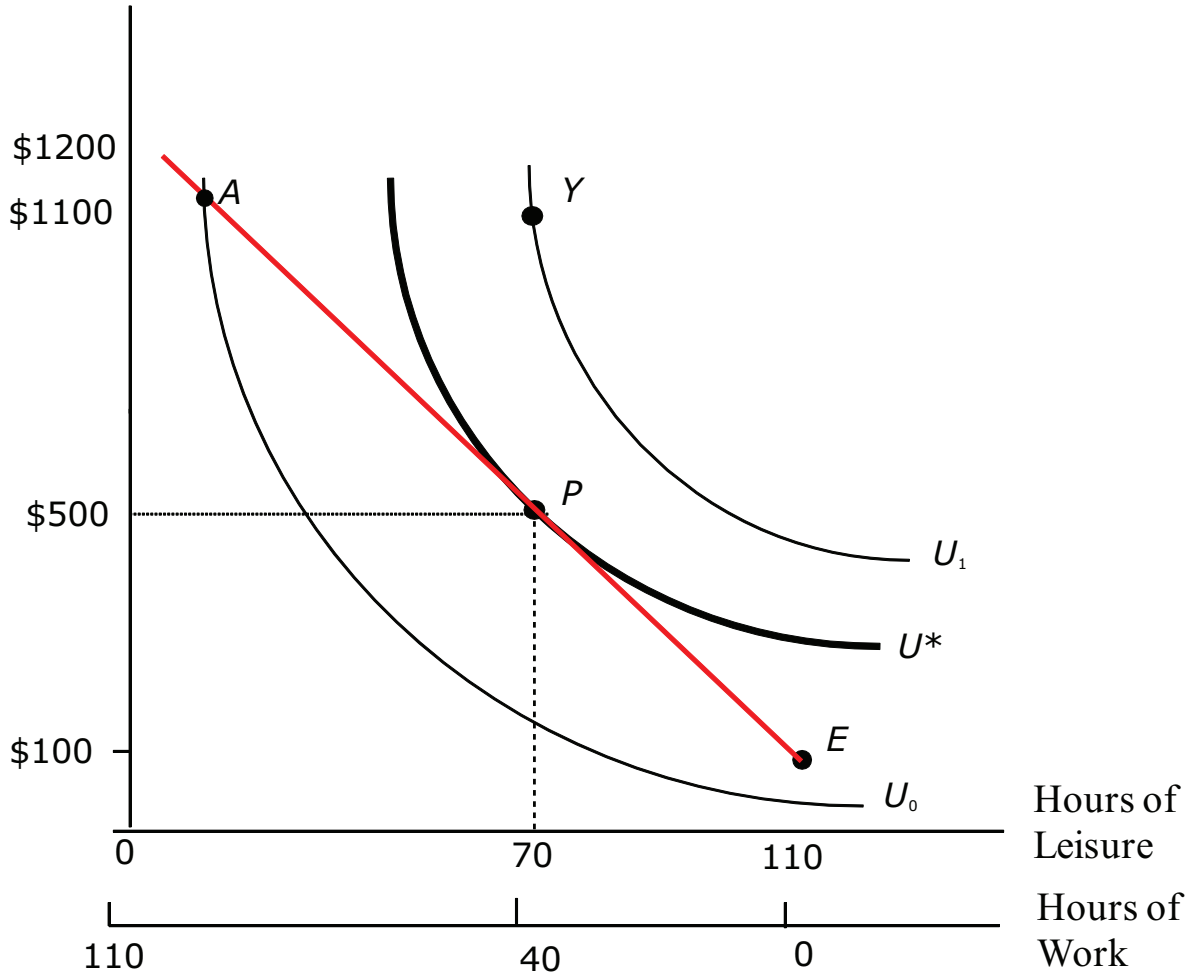

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Optimal consumption and leisure

Worker's decision problem

$$\max_{\{C,L\}} U(C,L) \text{ s.t } C + wL \leq wT + V$$

[the Lagrangian: $\mathcal{L}(C,L,\lambda) = U(C,L) + \lambda(R - C - wL)$]

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[the Lagrangian: $\mathcal{L}(C,L,\lambda) = U(C,L) + \lambda(R - C - wL)$]

First-order conditions

$$\begin{aligned}
\frac{\delta \mathcal{L}(C,L,\lambda)}{\delta C} &= U_C - \lambda = 0 \\
\frac{\delta \mathcal{L}(C,L,\lambda)}{\delta L} &= U_L - \lambda w = 0 \\
\frac{\delta \mathcal{L}(C,L,\lambda)}{\delta \lambda} &= R - C - wL = 0 \text{ with } \lambda > 0
\end{aligned}$$

Demand for leisure and consumption

The FOCs imply

$$\begin{aligned} \frac{U_L(C^*, L^*)}{U_C(C^*, L^*)} &= w \\ C + wL &= R \end{aligned}$$

First equation: marginal utility of leisure equals the marginal utility of consumption that one would get from slightly increasing labor supply. Second equation: all potential income is used either for consumption or leisure

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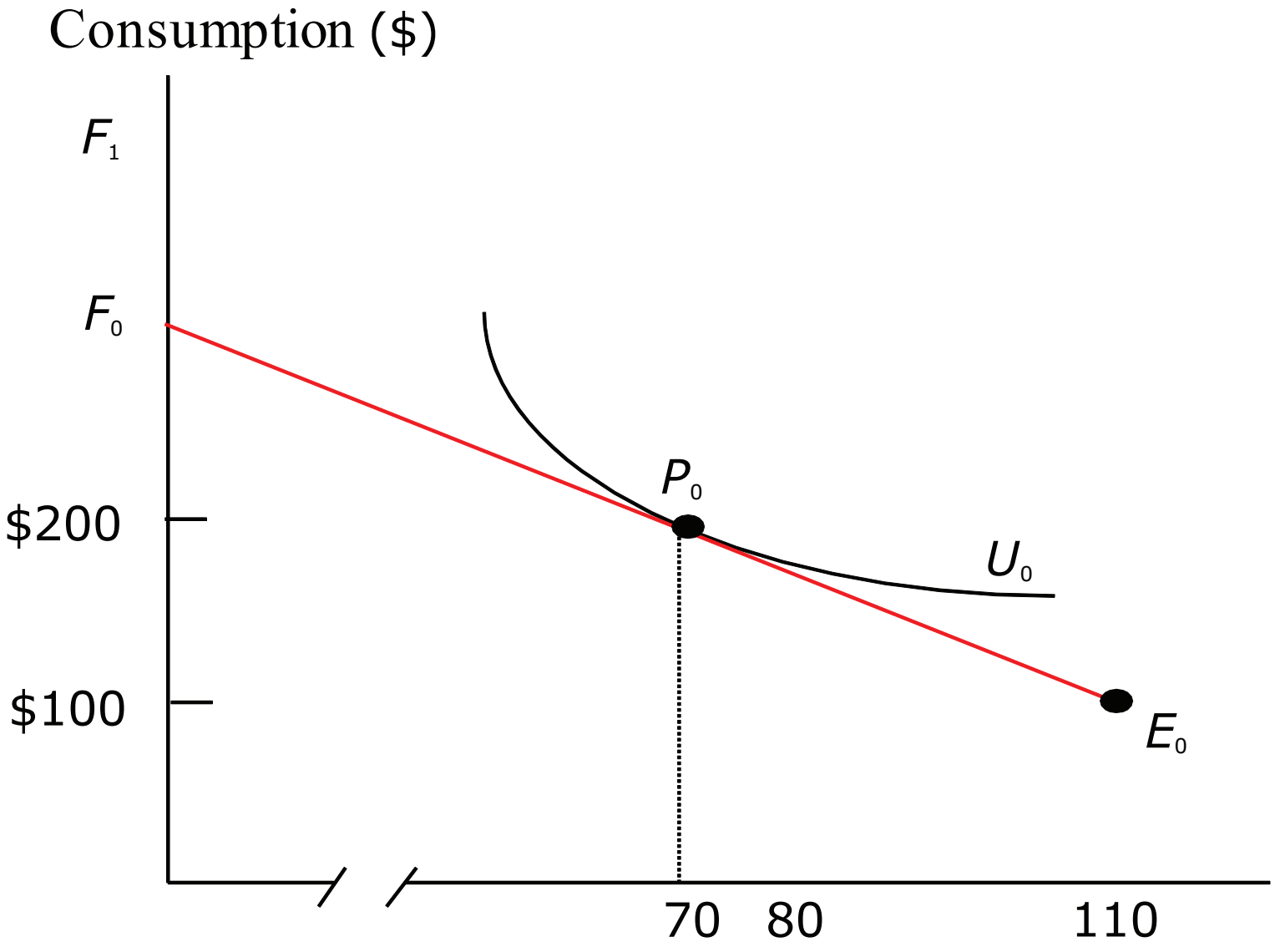
This gives us the demand for leisure and consumption

$$\begin{aligned} L^* &= L(w, R) \\ C^* &= C(w, R) \end{aligned}$$

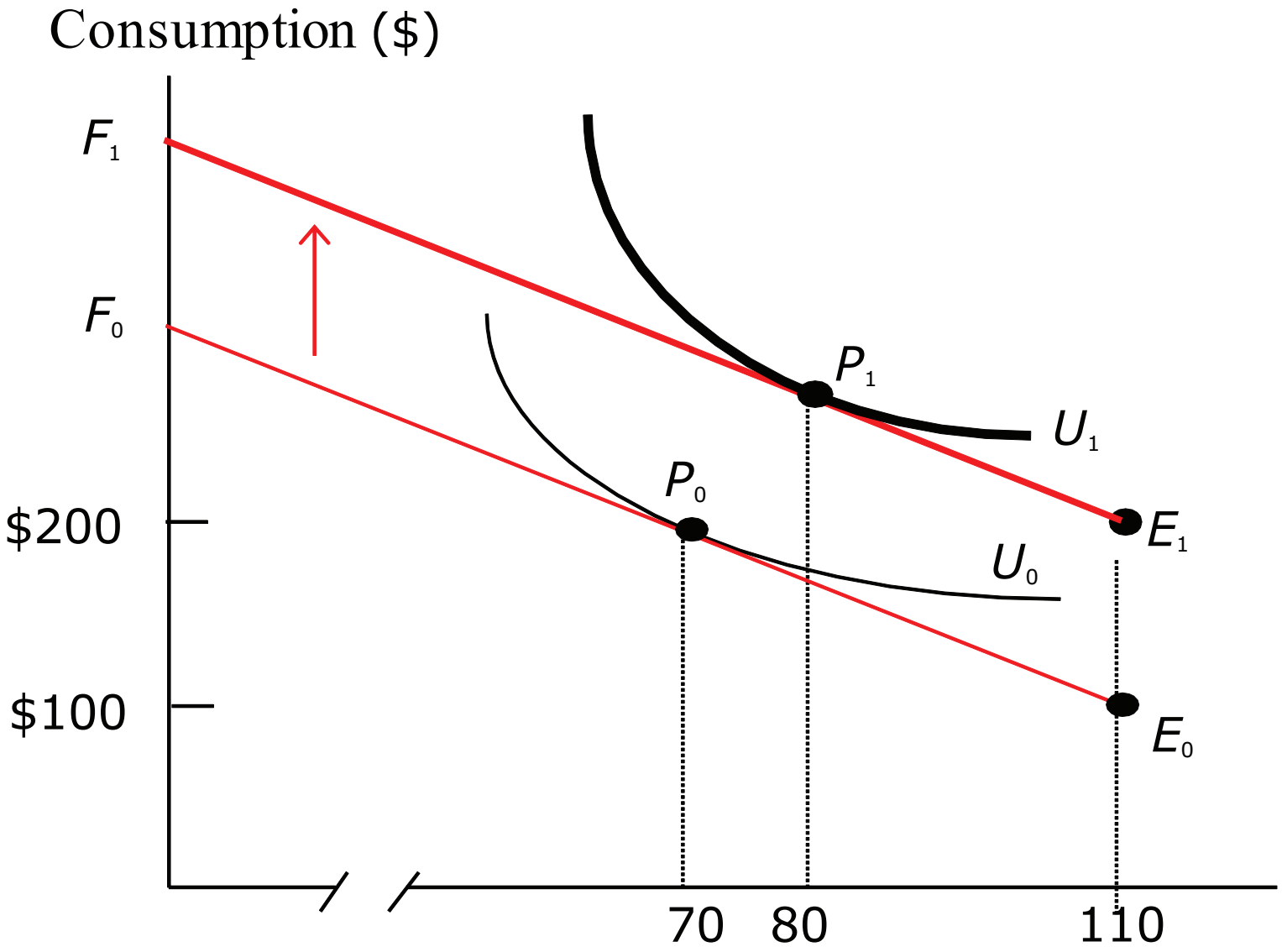
i.e. both are functions of only wages and non-labor income (recall that $R = wT + V$)

Non-labor income and labor supply



Source: Borjas (2010), Figure 2-7

Non-labor income and labor supply



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Non-labor income and labor supply

Increase in non-labor income

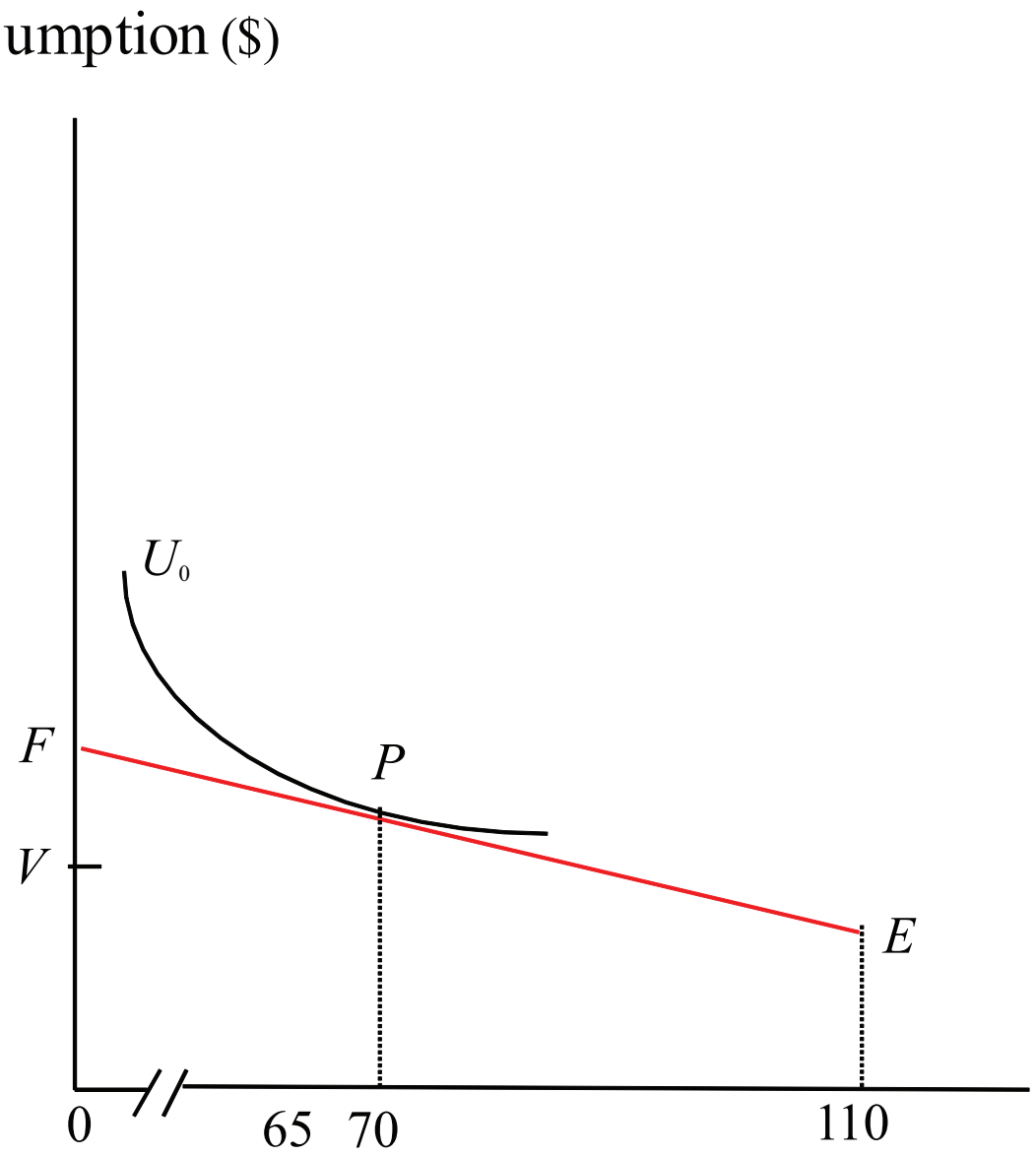
- Pure income effect (expansion of the opportunity set)

Non-labor income and labor supply

Increase in non-labor income

- Pure income effect (expansion of the opportunity set)
- Impact on labor supply depends on whether leisure is
  1. a normal good $\rightarrow$ labor supply decreases
  2. an inferior good $\rightarrow$ labor supply increases
- Seems reasonable to think that leisure is a normal good (and this is confirmed by the empirical application discussed later in the lecture).

Wages and labor supply



Source: Borjas (2010), Figure 2-8

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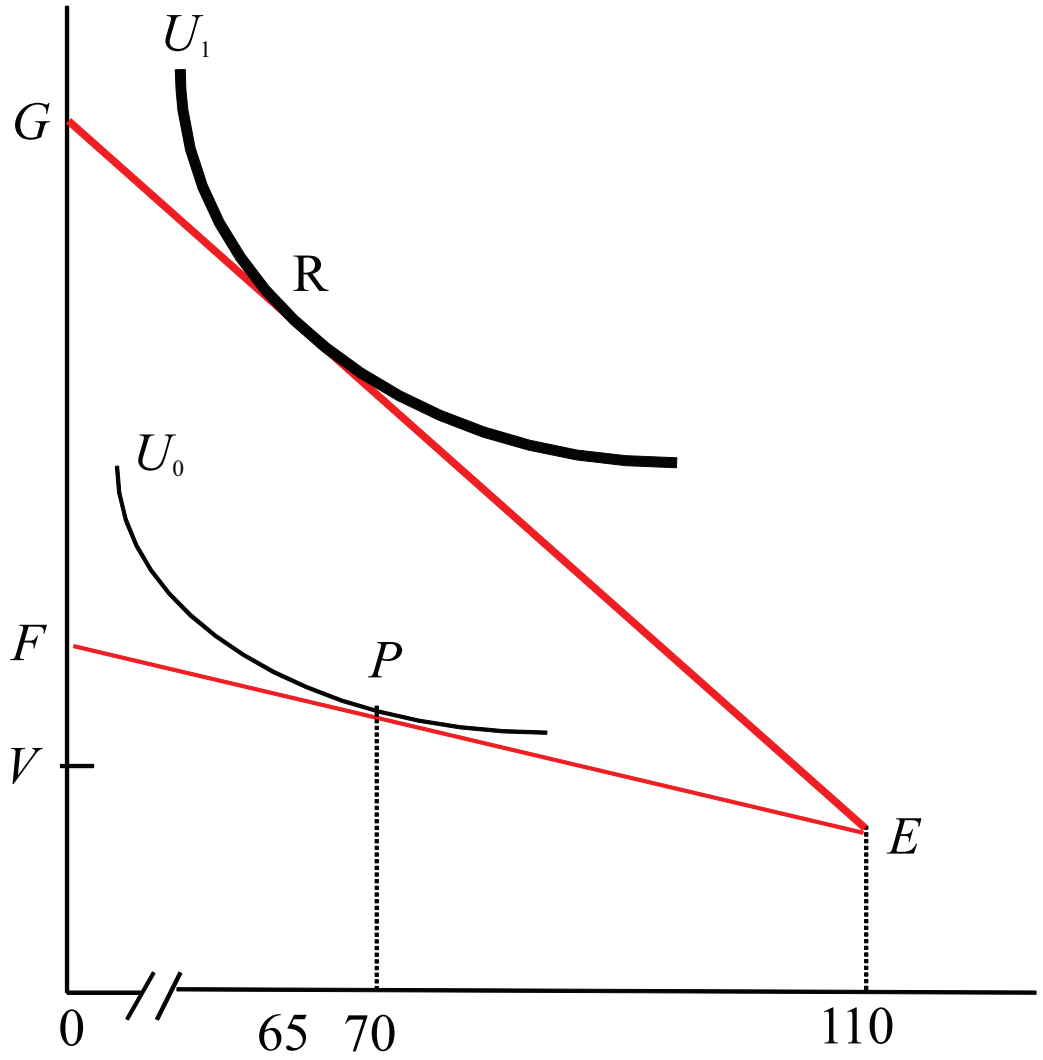

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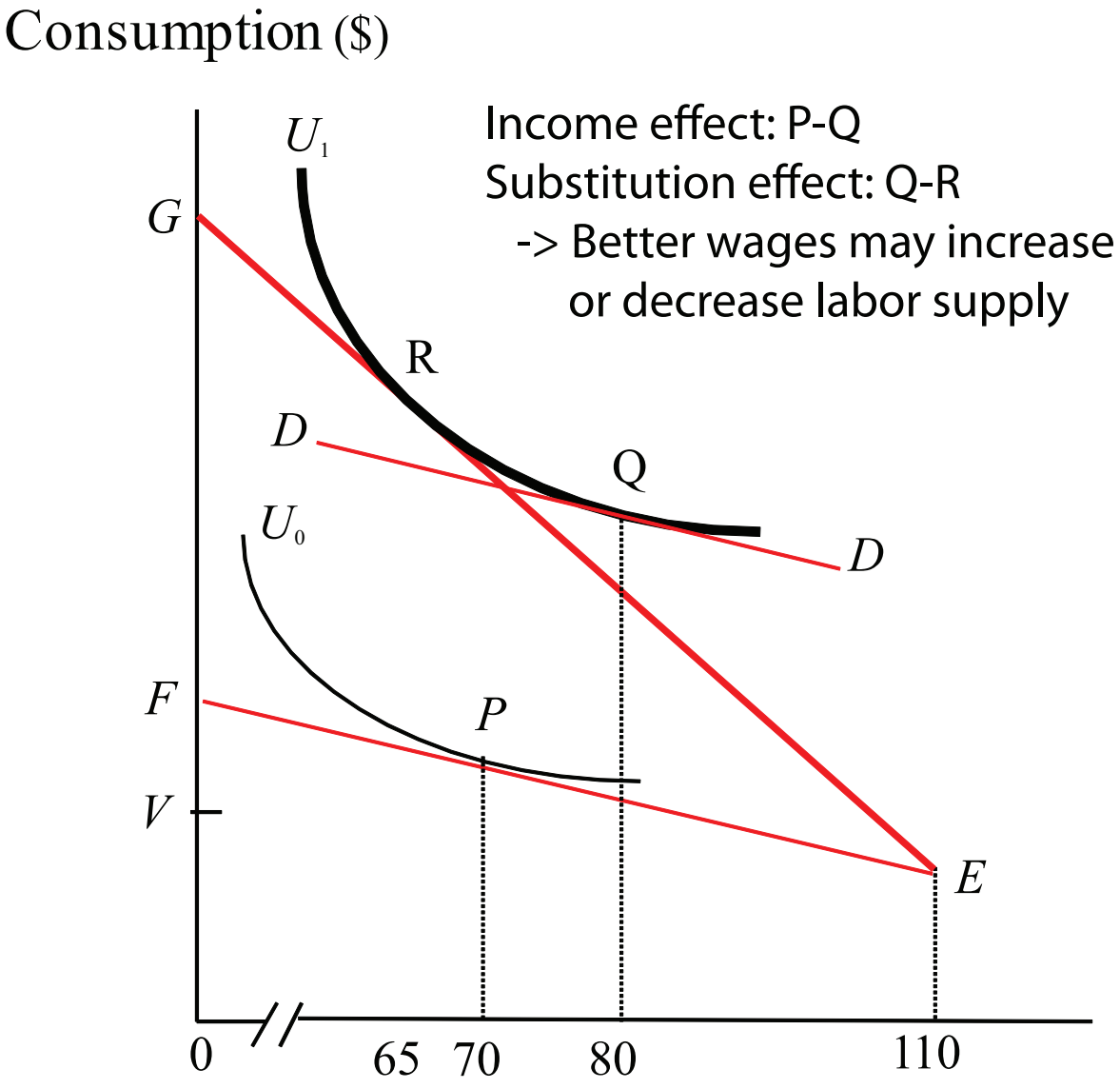

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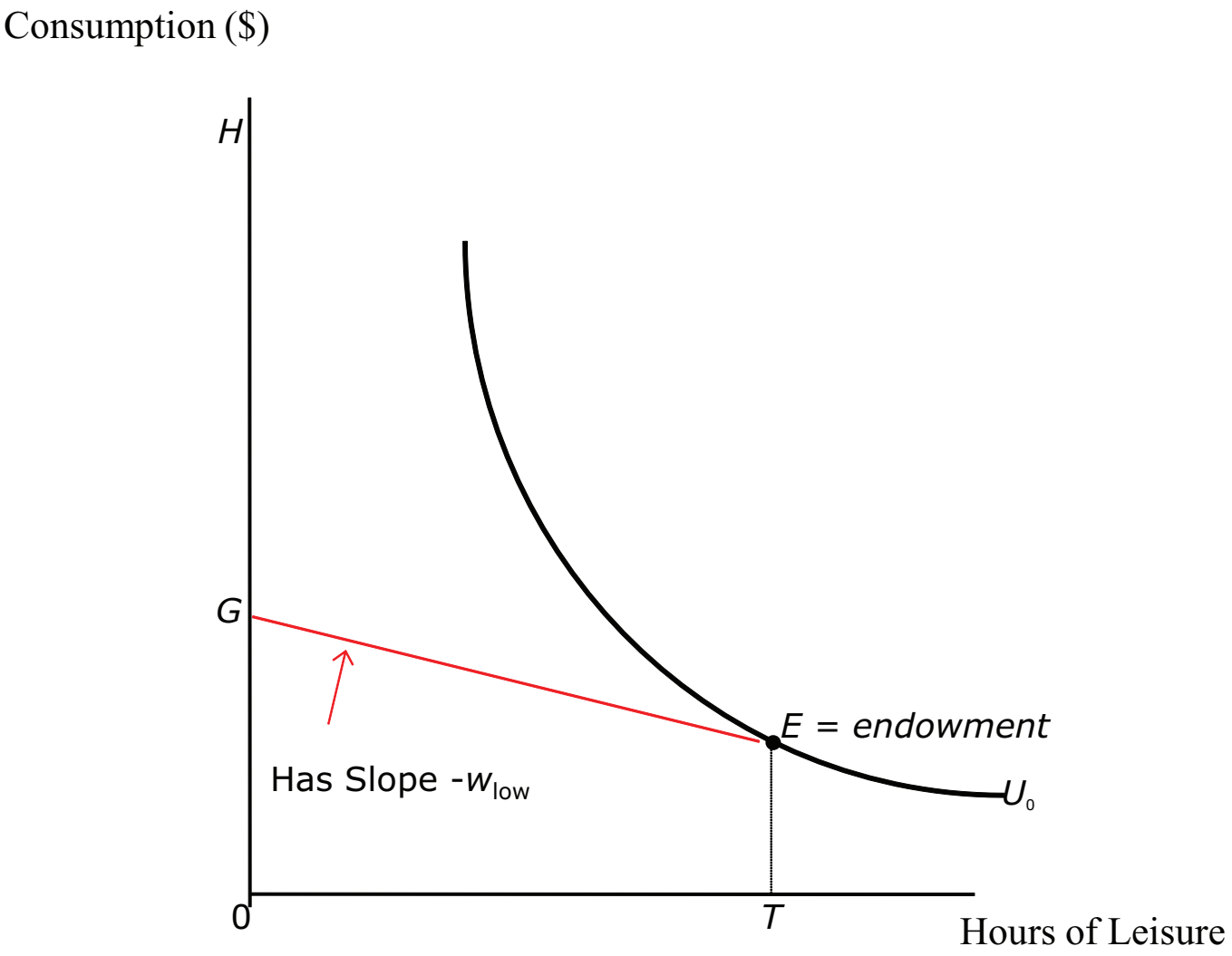
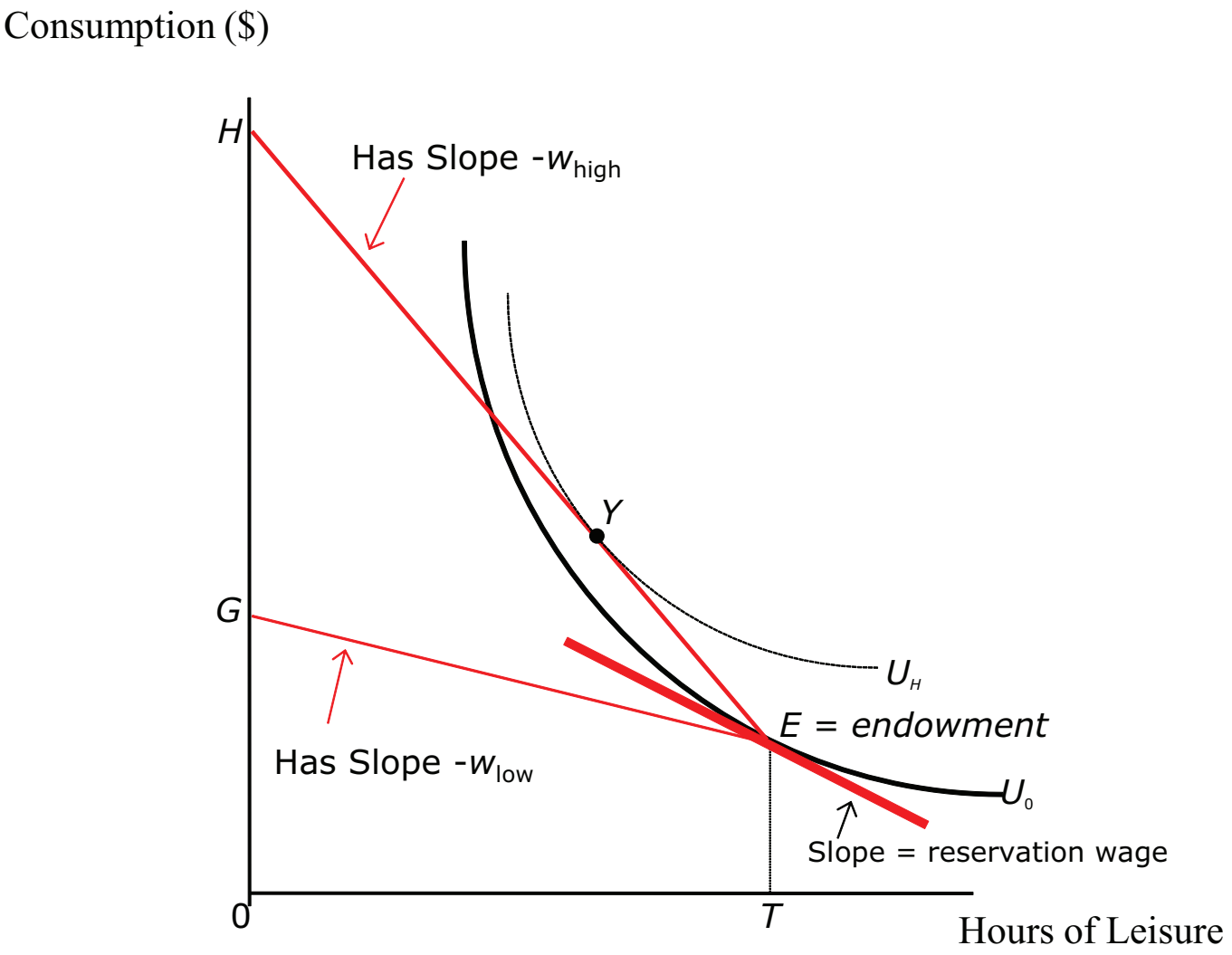
Reservation wage



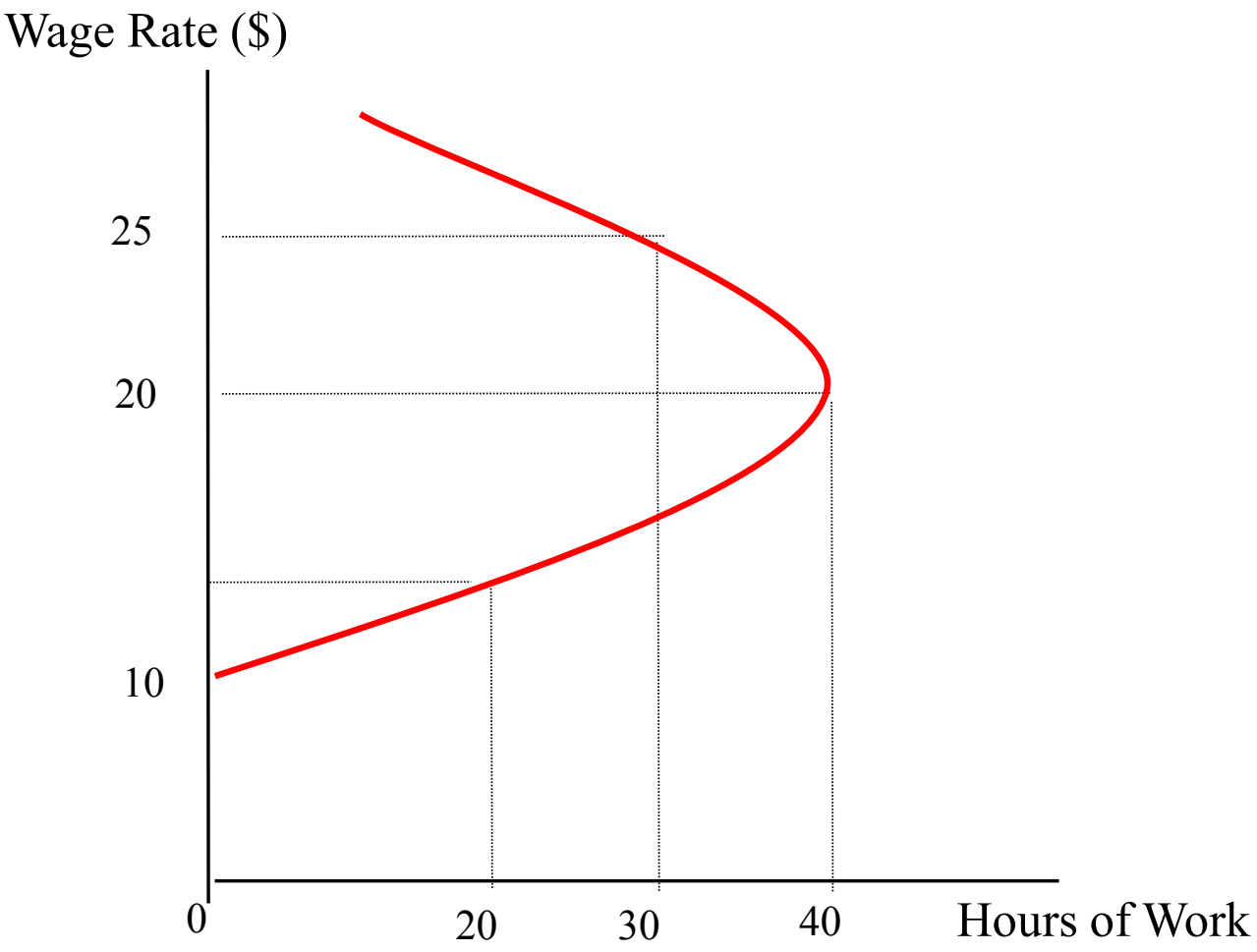
Source: Borjas (2010), Figure 2-10

Reservation wage



Source: Borjas (2010), Figure 2-10

(Individual) labor supply curve



Source: Borjas (2010), Figure 2-11

Labor supply elasticity

Responsiveness of hours of work to changes in the wage rate

$$\sigma = \frac{\Delta h/h}{\Delta w/w} = \frac{\Delta h}{\Delta w} \times \frac{w}{h}$$

i.e. percent change in hours worked divided by the percent change in wage rate.

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- e.g worker's wage initially 10€ per hour and she works 1,900 hours per year. After she gets a raise to 20€ per hour, she decides to work 2,090 hours per year $\rightarrow$ 10%/100%=0.1
- When we run regressions where the outcome (e.g. hours) and the treament (e.g. wages) are in logarithms, the resulting estimates can be directly interpretted as elasticities

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- When we run regressions where the outcome (e.g. hours) and the treament (e.g. wages) are in logarithms, the resulting estimates can be directly interpretted as elasticities
- BUT: Identification requires us to compare *differences between counterfactual states of the world*
  - How much more/less would *you* work if your wages would be x instead of y ... but we only observe one state of the world
  - See the additional notes on empirical strategies

Estimating labor supply elasticities

We would like to estimate

$$h_i = \alpha + \beta w_i + \gamma V_i + \delta X_i + \epsilon_i$$

where h_i is a logarithm of the hours worked by individual i, w_i is the logarithm of her hourly wage rate, V_i is her non-labor income, X_i is a set of observable characteristics and ϵ_i an index of unobservable characteristics that also affect h_i. The parameters of interest are β (elasticity of labor supply w.r.t w_i) and γ (elasticity of labor supply w.r.t V_i)

- Is this labor supply function consistent with utility maximization?
  - Yes, if you choose a specific functional form for utility function. Stern (1986) shows how to recover the utility function behind the estimation equation
- But just running this regression for a typical dataset is unlikely to identifty these parameters because...

Challenges in estimating β

1. Measurement error ("division bias")
   $\rightarrow$ exaggerate income effects
   - wages typically calculated as $\frac{\text{annual salary}}{\text{annual hours}}$
   - people unaware of their true hours
   - overreporting: denominator too large $\rightarrow$ hourly wage too small $\rightarrow$ spurious negative correlation between hours and wages
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2. Marginal vs. average wage
   - Wages from an additional hour may differ from average wage
3. Selection
   - people work only if wage offer above reservation wage
     - nonworking people dropped from data OR selection correction methods used (which often rely on implausible assumptions)
   - but: also nonworking people react to wages that would be available for them

Challenges in estimating γ

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2. Selection
   - see above

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  - Average elasticity of labor supply w.r.t wage is negative $\rightarrow$ income effect dominates
  - Average elasticity is small $\rightarrow$ labor supply is inelastic
- Note that the model suggest large heterogeneity across individuals and demographic groups
- Estimates of γ also vary hugely. Propably the best available estimate (discussed next) is -0.1.

The effect of unearned income on labor earnings (Imbens, Rubin, Sacerdote, AER 2001)

Identification problem

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Takeaway

- average income elasticity of labor supply is around -0.11

Caveats and comparison to previous literature

Potential caveats

- Representativeness of the lottery players
- Do people treat lottery prizes differently than other sources of income?

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- Representativeness of the lottery players
- Do people treat lottery prizes differently than other sources of income?

However, likely to be significantly better than previous attempts

- Using capital income or spouse's earnings
  (Difficult to believe that these are exogenous)
- Negative income tax experiments
  (Short duration, modest size)
- War repatriations, inheritances
  (selection, representativeness)

Summary statistics (Table 2, Figures 1 and 2)

- Average annual prize (for winners) was $55,000
- Winners bought more tickets than non-winners
- Non-winners more educated and older than winners
  - non-winners are a sample of season ticket holders
- However, there are little difference between winners of small and big prices
- Average earnings and the propensity of having postive earnings (i.e. labor force participation) declines sharply among big winners

The Model

- A life-cycle version of the model discussed above
  - Parametrizaiton of utility function: instantenous uility of leisure is $\beta_l \ln(l_{it} - \gamma_l)$, where γ_l is the subsitence level. Utility from several types of consumption takes a similar form. Note that this γ has nothing to do with the notation used above.
- The model implies that labor earnings are

$$y_{it} = \alpha - \beta_l \overline{\lambda}(L_i/20) + \epsilon_{it}$$

where y_{it} is labor earnings of indivudal i at time t, β_l is the preference parameter for leisure, $\overline{\lambda}$ is the population average of a discounting term, L is the total lottery prize (which is divided over 20 years) and ϵ captures variation in wages, other unearned income and life span

Identification

Estimation equation

$$y_{it} = \alpha + \beta \left(L_i / 20 \right) + X_i \theta + \epsilon_{it}$$

where $\beta = -\beta_l \overline{\lambda}$ and X_i is a set of observable factors

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- Identifying assumption
  - L_i independent of ϵ_i (after conditioning on X_i)
- Potential caveats
  1. L_i is a function of #tickets bought $\rightarrow$ control for the #tickets
  2. season ticket holders (non-winners) and single ticket buyers (winners) may differ $\rightarrow$ drop the non-winners from the sample and exploit the variation in the *magnitude* of the prize

Results (Table 4)

- Estimates of the marginal propensity to earn out of unearned income
  - i.e. how much labor earnings change as a response to a change in non-labor earnings
- Difference between columns 1–4 and 5–6: winners of very large prices dominate the linear specification
  - similarly columns 6 vs 7–8
- The takeway estimate: **-0.11**
- It takes about a year for adjusting the labor supply to the desired level

Application 2: Demand for Sleep
(Biddle and Hamermesh, JPE 1990)

- Sleep is the largest single use of time for most people
  - An avarage respondent in the B&H data spends more time sleeping than in market work
- Biddle and Hamermesh ask whether labor market opportunities affect the demand for sleep

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  - An avarage respondent in the B&H data spends more time sleeping than in market work
- Biddle and Hamermesh ask whether labor market opportunities affect the demand for sleep
- The data and some instructions available at https://noppa.aalto.fi/noppa/kurssi/31E00700/
  - If you haven't worked with microdata before, this will help you to get through the exercises
  - Stata available at computer classes G113 ja PC250
- Stata will be used in excercise classes, but you are free to use whatever software you like, e.g R is a powerful and free statistical software (http://www.r-project.org/)