

Lecture 14 – Time Allocation, Labor Supply, and Labor Markets

1. Simple Model of Time Allocation and Labor Supply

1) Assumptions

- Leisure time as a consumption good that is “purchased” by spending time not working.
- A worker *forgoes* wages in order to consume leisure, and the cost of leisure is the amount of **foregone wages**.
- Given the ultimate time constraint of 24 hours per day, market wages, and a consumer’s non-labor income, we can construct a budget constraint that defines the consumer’s attainable combinations of purchased consumption goods and leisure.

2) Time Allocation Budget Line

- To maintain a two-dimensional example that we can graph, we lump all purchased consumption goods together and give them a price index (p).

- Definitions of variables and parameters

C = purchased consumption goods,

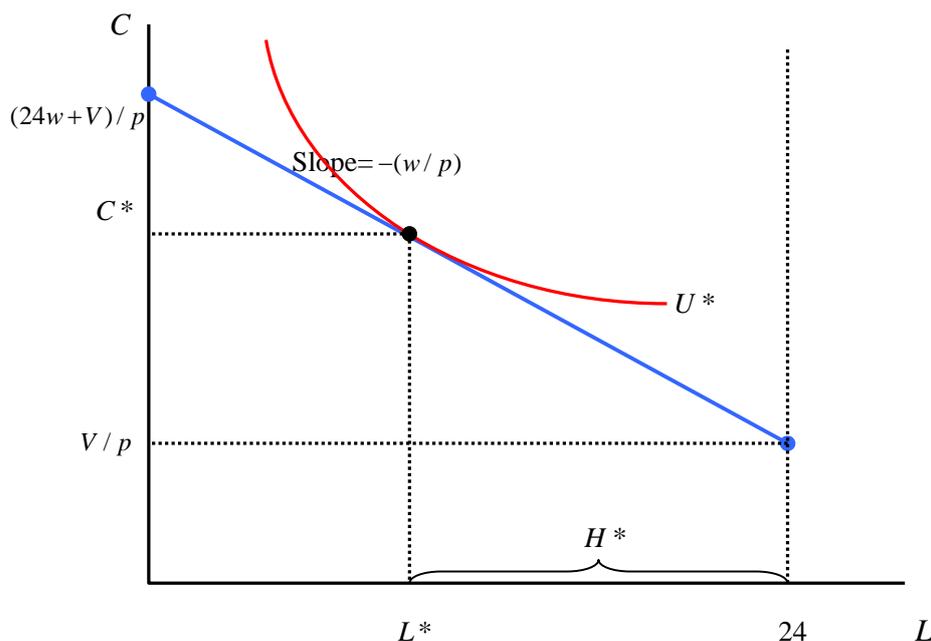
p = price index for consumption goods

L = leisure, w = market hourly wage rate, V = non-labor income

$H = 24 - L$ = hours of work

- Budget constraint

$$pC \leq V + w(24 - L)$$



cf) Should (V/p) be always positive? If an individual has more outstanding loans than savings, the interest on the loans would constitute a fixed cost before any consumption goods could be bought (ex) alimony and child support.

If the budget equation is satisfied with equality when consumption is zero, leisure can be $L = (24w + V)/w$. The budget line will go from the consumption intercept to the leisure intercept. Further leisure is unobtainable because of the prior financial commitments.

3) Utility-maximizing choice of consumption and leisure

From the above budget equation, we get $C = \frac{24w + V}{p} - \frac{w}{p}L$

FOC for the utility maximization is $\frac{dC}{dL} = -\frac{w}{p}$ (relative wage or real wage)

4) Mathematical treatment

Max $U(C, L)$ s.t. $pC = V + w(24 - L) \Rightarrow L = U(C, L) + \lambda[w(24 - L) + V - pC]$

From FOCs of the optimization problem,

$$\frac{\partial L}{\partial C} = \frac{\partial U}{\partial C} - \lambda p = 0 \Rightarrow \lambda = \frac{MU_C}{p} \quad \text{and} \quad \frac{\partial L}{\partial L} = \frac{\partial U}{\partial L} - \lambda w = 0 \Rightarrow \lambda = \frac{MU_L}{w}$$

$$\lambda = \frac{MU_C}{p} = \frac{MU_L}{w} \Rightarrow \frac{MU_L}{MU_C} = MRS_{C,L} = \frac{w}{p}$$

5) Comparative Statics of a change in non-labor income

Parallel shift of budget line \Rightarrow pure income effect (DIY!!)

Empirically leisure is proven to be a normal good.

Ex) Winning a lottery will change leisure choice

/Change in pension benefit and retirement decision

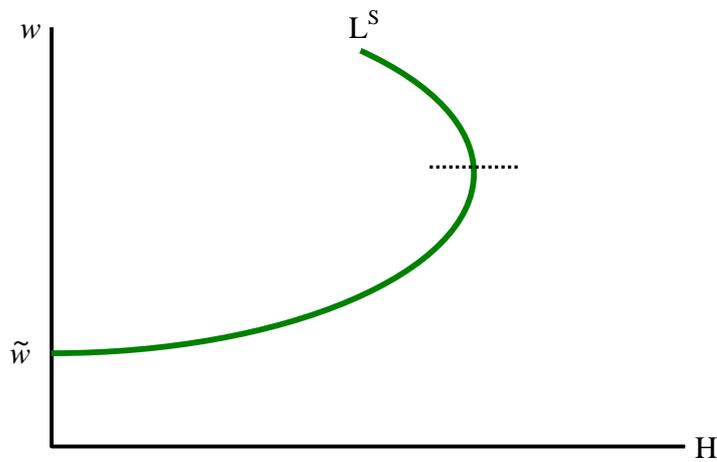
/Inheritance

/Antipoverty policy and labor decision

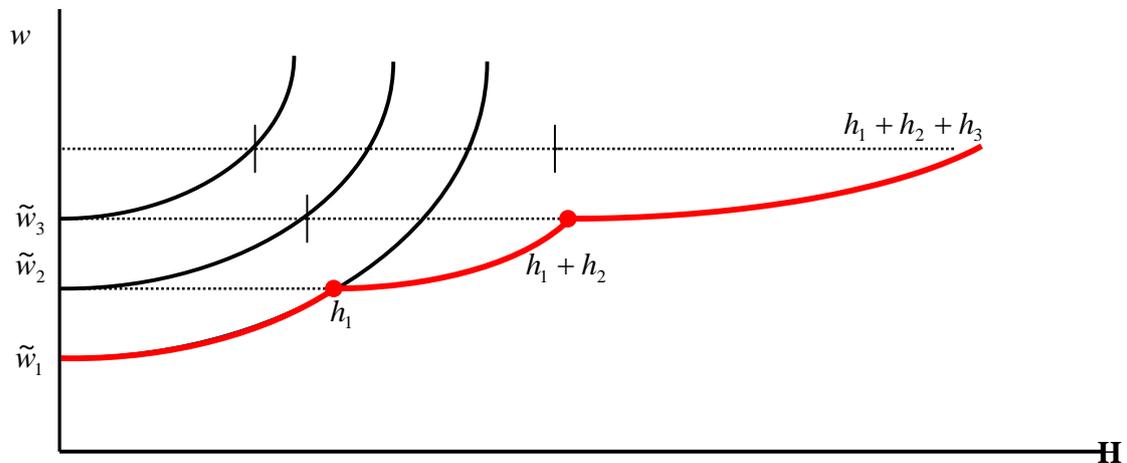
6) Changes in the wage rate: Income and Substitution Effects

If leisure is assumed to be a normal good, the income and substitution effects work in opposite directions. This happens because an increase in wages raises the (shadow) price of leisure, but increases the feasible set at the same time. Thus, if leisure is a normal good, an increase in the wage rate reduces the optimal choice of leisure by the substitution effect, but increases the optimal choice of leisure by the income effect. The net effect is that leisure can increase or decrease as wages go up (Show each case graphically!)

7) Backward-bending Labor Supply Curve



Increase in wage unambiguously increase a group's labor force participation rate, but hours of work for a particular worker may increase or decrease, depending on whether substitution effect or income effects dominate. Market labor supply curve is given by adding up the hours that all persons in the economy are willing to work at a given wage.



To measure the responsiveness of hours of work to changes in the wage rate, we define labor supply elasticity (σ):

$$\sigma = \frac{\% \text{ change in } H}{\% \text{ change in } w} = \frac{\Delta h / h}{\Delta w / w} = \frac{\Delta h}{\Delta w} \frac{w}{h}$$

8) Estimates of the labor supply elasticity (σ):

$$h_i = \beta w_i + \gamma \mathcal{N}_i + \text{other variables}$$

β : marginal impact of a one dollar change in w_i on h_i .

γ : marginal impact of a one dollar change in V_i on h_i .

Sign of β depends on whether substitution and income effects dominate.

- $\beta < 0$, if () effect dominates.
- $\beta > 0$, if () effect dominates.
- $\gamma < 0$, assuming that leisure activity is a normal good.

Several surveys conclude that σ is roughly around -0.1 .

Three key points are worth noting about “ -0.1 ” consensus estimate of σ :

- Negative! So, income effect is dominating. Secular decline in hours of work can be attributed to the income effects associated with rising real wages.
- Labor supply is inelastic.
- Keep in mind that this is the “consensus” estimate of the labor supply elasticity for prime-age men. The available evidence suggests that σ probably differs greatly between men and women and between younger and older workers.

9) Labor Supply of Women

- **Stylized facts about the female labor force in a number of countries**

A) Substantial differences across countries in the women’s labor force participation rates.

⇒ Differences in socio-economic status, cultural factors, institutional framework, etc.

B) Common trend is increasing female labor force participation during past decades.

⇒ Rise in market wage/ decline in reservation wage, Fertility, Time-saving technological advance in household production, Cultural/ legal attitude toward women, Economic and social disruptions from two world wars and GD.

- **Role of changes in the wage rate as a key determinant of the increase in female labor force participation.** As wage rises, nonworking women have an incentive to reduce the time they allocate to the household sector and are more likely to enter the labor force.

- **Empirical Studies**

A) Most studies find that a positive relationship between a woman’s hours of work and her wage rate (substitution effect dominates).

B) Recent studies, which control for selection bias arising from estimating labor supply models in the nonrandom sample of working women, however, tend to indicate that the size of the female labor supply elasticity may not be very large, perhaps on the order of 0.2.

C) Labor force participation rates and hours of work of married women respond to changes in the husband’s wage or income.

10) Compensating Wage Differentials

The impact of differences in the job amenities on the determination of wage and employment Adam Smith in 1776 said, “[T]he whole of the advantages and disadvantages of different employment of labor and stock must, in the same neighborhood, be either perfectly equal or continually tending to equality. If in the same neighborhood there was any employment either evidently more or less advantageous than the rest, so many would crowd into it in the one case, and so many would desert it in the other, that its advantages would soon return to the level of other employments. This at least would be the case in a society where things were left to follow their rational course, where there was perfect liberty and where every man was perfectly free both to choose what occupation he thought proper, and to change it as often as he thought proper.”

- Firms that have unpleasant working conditions must offer some offsetting advantage (such as higher wage) in order to attract workers; firms that offer pleasant working conditions can get away with paying lower wage rates (in effect, making workers “buy” the enjoyable environment).
- Workers differ in their preferences for job characteristics and firms differ in the working conditions they offer. The theory of compensating wage differentials essentially tells a story of how workers and firms “match the mate” in the labor market.

- Assumptions

A) Two Types of Jobs:

Job with completely safe environment – probability of being injured is zero.

Job with inherently risky environment – probability of being injured is one.

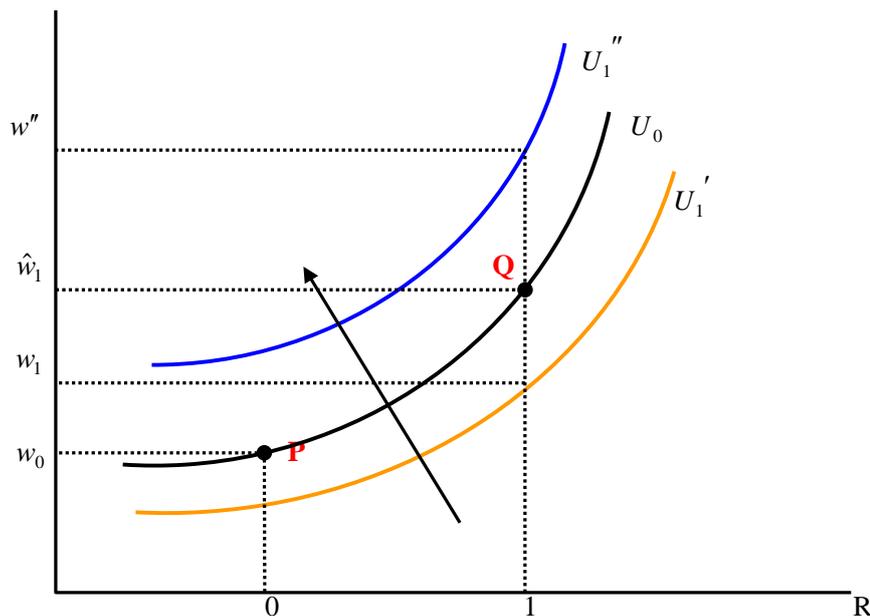
B) Workers have complete information about the risk level associated with every job – the workers know whether they are employed in safe jobs or risky jobs

⇒ This assumption is extremely important because some risks may not be detectable for many years.

C) Model

$$Utility = f(w, R)$$

,where w is wage and R is risk of injury on the job, respectively.



To persuade the worker to move to the riskier job and hold her utility constant is by increasing her wage.

Reservation Price: The amount of money it would take to bribe her into accepting the risky job (P to Q).

$\Delta w = \hat{w}_1 - w_0$: How much would it take to do something that you would rather not do?

11) Factor Price Equalization

While some of these differences may persist over long periods of time, economists predict that factor prices for different occupations requiring the same skills and in different geographical locations will tend to equalize over time. If wages decline for one occupation or in one location relative to wages elsewhere, workers will move to other jobs in other locations and firms will move or hire different mixes of workers in order to utilize the lower-wage workers. The decrease in supply and the increase in demand will tend to raise wages in the previously low-wage occupations and locations. In the higher-wage occupations and locations, on the other hand, the influx of workers and the exit of firms will tend to lower equilibrium wages. Any wage differentials that persist in the long run will reflect the marginal value to the lower-paid workers of the quality of life in their communities, the marginal non-pecuniary benefits associated with their occupations, and the marginal value of any remaining skill differentials.

This theory of factor price equalization explains why U.S. workers want to keep the Mexican border closed and also why they resent the movement of U.S. firms to Mexico. Low wages in Mexico relative to those in U.S. are currently encouraging hundreds of thousands of Mexico

workers to cross the border illegally. These same low wages are also encouraging U.S. manufacturers of a wide variety of different products to build plants just over the Mexican border. Both of these changes can only serve to reduce the equilibrium wages for U.S. workers at the same time that they raise the equilibrium wages for workers remaining in Mexico. The supply of labor is increasing in U.S. and decreasing in Mexico, while the demand for labor is increasing in Mexico and decreasing in U.S.

12) Imperfect Labor Markets: Monopsony

- In monopsony, the marginal cost of hiring an additional worker is the wage paid to that worker plus the cost of raising the wages of all other workers (assuming an upward-sloping supply curve for labor). This can be seen by noting that the total cost of labor is $w(L)L$, where $w(L)$ is the supply curve (inverse supply function) of labor. Thus, we can derive the marginal cost of hiring another worker as

$$MC_L = \frac{d}{dL}TC_L = \frac{d}{dL}[w(L)L] = w + L \frac{dw}{dL} > w, \text{ if } \frac{dw}{dL} > 0$$

Above equation shows that the marginal cost curve for labor lies above the supply curve for labor. If the supply curve is linear, the function for the curve can be written as

$$w = a + bL. \text{ And differentiating w.r.t. } L, \text{ we get } \frac{dw}{dL} = b.$$

Thus, we get $MC_L = a + bL + bL = a + 2bL$, which indicates that the marginal cost curve will have the same wage intercept and twice the slope as the labor supply curve.

• Profit Maximization by a Monopsonist

A monopsonist's short run profit function in terms of choice of labor, holding capital constant. $\Pi = p_x x(L; \bar{K}) - w(L)L - r\bar{K}$. Assuming price is a parameter, the first-order

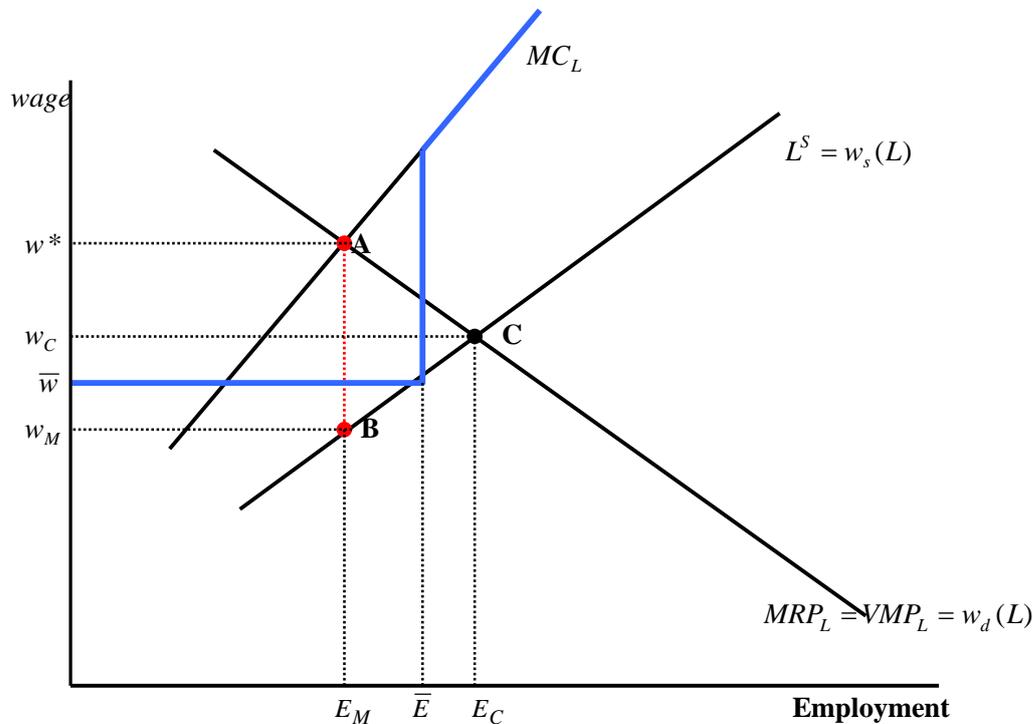
condition is $\frac{d\Pi}{dL} = p_x \frac{dx}{dL} - (w + \frac{dw}{dL}L) = 0 \Rightarrow MRP_L = MC_L$

• Prevalence of Monopsony

On the one hand, there still exist many small towns with only one or two substantial employers. On the other hand, the residents of those towns could leave to find work elsewhere. Thus, in some sense the employers in small towns compete with employers in other locations. Those who stay may work for lower wages, but is the difference due to

monopsony or the value of community? These are difficult to separate empirically. A better case for monopsony can be made where there are real barriers to the movement of labor.

Ex) colleges and universities in small towns



In the monopsony, employees are exploited by the monopsonist by $(w^* - w_M)$, line segment AB in the graph). And if the government sets a minimum wage \bar{w} higher than w_M , it can create new employment as long as the minimum wage is equal to or less than the wage rate in the competitive market (w_C).

13) Labor Mobility

Workers are continually searching for better jobs where they are more productive and they are more appreciated, and firms are searching for better workers. As a result of these search activities, the value of marginal product of labor is equated across firms and across labor markets (for workers of given skills). But, actual labor markets are not quite as neat. Workers often do not know their own skills and abilities, and are ill informed about the opportunities available in other jobs or in other labor markets. Firms do not know the true productivity of the workers they hire. As in a marriage, information about the value of the match between the worker and the firm is revealed slowly as both parties learn about each other. Therefore, the existing allocation of workers and firms is not efficient, and other allocations are possible that would increase national income.

We will discuss the mechanism that labor markets use to improve the allocation of workers to firms, namely labor mobility. There is a great deal of mobility in the labor market. In fact, it seems as if the U.S. labor market is in constant flux: Nearly 4 percent of workers in their early twenties switch jobs in any given month, 3 percent of the population moves across state lines in a year, and about 1 million legal and illegal immigrants enter the country annually. We want to figure out all these “flavors” of labor mobility which may be driven by the same fundamental factors: Workers want to improve their economic situation, and firms want to hire more productive workers. The topics are:

- What are the determinants of migration?
- How do the migrants differ from the persons who choose to stay?
- What factors determine how migrants are self-selected?
- What are the consequences of migration, both for the migrants themselves and for the localities that they move to?
- Do the migrants gain substantially from their decision?
- How large are the efficiency gains from migration?

A) Geographic Migration as a Human Capital Investment

The study of migration decision is a simple application of the human capital framework.

“Differences in net economic advantages, chiefly differences in wages, are the main causes of migration” (John R. Hicks, *The Theory of Wages*, 1932).

Suppose there are two specific labor markets NYC and LA (they may be any two cities or even two countries) where the worker can be employed. Worker in NYC, who is 20 years old is considering the possibility of moving to LA (S)he earns w_{20}^{NY} dollars. If (s)he moves, (s)he will earn w_{20}^{LA} . M is moving cost (airfare and other transportation costs) plus “psychic cost” – pain and suffering that inevitably occurs when one moves away from family, neighbors and social networks.

Mobility decisions are guided by the comparison of the present value of lifetime earnings in the alternative employment opportunities:

$$PV_{NY} = w_{20}^{NY} + \frac{w_{21}^{NY}}{1+r} + \frac{w_{22}^{NY}}{(1+r)^2} + \dots \quad \text{and} \quad PV_{LA} = w_{20}^{LA} + \frac{w_{21}^{LA}}{1+r} + \frac{w_{22}^{LA}}{(1+r)^2} + \dots$$

So, net gains to migration = $PV_{LA} - PV_{NY} - M$. If positive, (s)he will move.

A number of empirically testable propositions follow immediately from this framework:

- An improvement in the economic opportunities available in the destination increases the net gains to migration and raises the likelihood that the worker moves.
- An improvement in the economic opportunities at the current region of residence decreases the net gains to migration, and lowers the probability that the worker moves.

- An increase in migration costs lowers the net gains to migration and reduces the likelihood of a move.

All these implications deliver the same basic message: Migration occurs when there is a good chance that the worker will recoup his human capital investment.

B) Internal Migration in the U.S.

Many studies have attempted to determine if the size and direction of migration flows within the United States (or internal migration) are consistent with the notion that workers migrate in search of better employment opportunities. These empirical studies often relate the rate of migration between any two regions to variables describing differences in economic conditions in the regions (wages and employment rates) and to a measure of migration costs.

- **The Impacts of Region-Specific Variables on Migration** (Aba Schwarz, “Interpreting the Effect of Distance on Migration,” *Journal of Political Economy* 81 (September 1973))

(+) correlation between employment conditions and probability of migration.

(-) correlation between distance and probability of migration.

- **The Impact of Worker Characteristics on Migration**

Age and probability of migration: older workers are less likely to move because migration is a human capital investment with a shorter period of payoff for them. Educational attainment and probability of migration: highly educated workers may be more efficient at learning about employment opportunities in alternative labor markets, thus reducing migration costs. It is also possible that the geographic region that makes up the relevant labor market for highly educated workers is larger than the geographic region that makes up the labor market for the less educated.

- **Return and Repeat Migration**

Workers who have just migrated are extremely likely to move back their original location (generating return migration flows) and are also extremely likely to move onward to still other locations (generating repeat migration flows). Some of these flows arise because the worker has quickly learned that the initial migration decision was a mistake or used it as a “stepping stone.”

C) Immigrant performance in the U.S. Labor Market

Immigrants who can adapt well and are relatively successful in their new jobs can make a significant contribution to economic growth. Moreover, natives need not be concerned about

the possibility that these immigrants will enroll in public assistance programs and become a tax burden. In short, the economic impact of immigration will depend on the skill composition of the immigrant flow.

D) The Decision to Migrate

Two factors account for the dispersion in relative wages across national-origin groups:

- Skills acquired in advanced, industrialized economies are more easily transferable to the American labor market. After all, the industrial structure of advanced economies and the types of skills rewarded by firms in those labor markets greatly resemble the industrial structure of the U.S. and the types of skills rewarded by U.S. employers.
- A strong positive correlation between the earnings of an immigrant group in the U.S. and per capita GDP in the country of origin. Some studies conclude that a doubling of the source country's per capita GDP increases the U.S. earnings of an immigrant group by as much as 4 percent. Because more recent immigrant waves tend to originate in low-income countries, they will be somewhat less successful in the U.S. labor market.