CHAPTER TWO: LABORSUPPLY

2.1. Measurement of the Labor force Participation

Being one of the basic indicators of the performance of the economy, unemployment rate serves as a measure of the extent of the healthiness of the overall economy. So it is important to give a clear definition of the term unemployment rate and related concepts. To begin with, part of the population whose age ranges from 16 years of age can be broadly categorized into the **labor force** and out of the labor force groups. The term labor force can further be divided into **employed** and **unemployed**. To be employed a worker must have been at job with pay for at least an hour, or worked at least 15 hours on a non-paid job such as the family farm. Otherwise, if a worker is actively searching for a job, or is temporarily laid off and expecting recall but not employed for pay, he/she is said to be unemployed and constitutes the labor force. If a person is neither employed for pay not actively looking for a job and is permanently laid off, he/she is said to be out of the labor force.

It is however, important to note that there are sizeable **flows of workers** between groups. We can identify four major flows of people between groups:

1. ***From the employed to unemployed groups***: - some workers may be voluntarily quitting or laid off
2. ***From the unemployed to the employed groups***: - some unemployed workers may be newly hired or recalled from temporary laid off
3. ***From the labor force to out of the labor force***: - some employed or unemployed workers may retire or drop out of work
4. ***From out of the labor force to the labor force***: (new graduates, for example) and some of the drop outs may reinter the labor force

The active rate measures the extent of involvement in economic activities or the population in the production and distribution of economic goods and services. The active status of individuals is determined on the basis of what they have actually been doing during the short time interval (the reference period) of census taking. Only if they were engaged in production and distribution of economic goods and services will they be counted as economically active, or as a part of the currently active population, or the labor force (ILOmanual, 1990).

The labor force participation (LF) is measured by adding up the number of workers being employed (E) and unemployed (U). If we divide the size of the labor force to the entire

population, we arrive at the fraction of the population that is in the labor force, the labor force participation rate.

Labor force participation rate or Economic active rate $\left(\frac{labore\ force}{Working\ age\ population}\right)*100$

Where

- Labor force = non institutionalized individuals aged 16 or above who are either working or actively seeking work.
- Working age population= employed +unemployed +economically in active working age population
- unemployed = those who are not working but are "actively seeking work"

2.2. The Short –Run Theory of Labor Supply

In this section we were concerned with the basic theory of labor supply in the short-run. A simple model will be developed to illustrate the determinant of the individual's decision to work, and of the total number of hours supplied. Subsequently we shall aggregate across all the individuals in order to distinguish the total supply of labor in the short-run.

The theory builds on the everyday maxim that individuals do the best they can under the circumstances! Stated more formally, individuals maximize their utility subject to the constraint that confront them in the labor market. We therefore need to know something about an individual's preference (what it is that gives him or her satisfaction or utility) and to distinguish the opportunities for realizing them that exist in the labor market.

We shall argue that individuals derive utility from the consumption of commodities and that in order to buy these commodities they have to obtain an income. Undertaking paid work is one of the ways of obtaining an income the size of this income is limited by the opportunities that confront the individual in the labor market.

2.3. The Work-Leisure Decision Model (The decision to work model)

Of the 24-hours a day available to us if we allocate 8 hours for biologically and culturally determined activities like sleeping, eating and others, the remaining. 16 hours will be at our disposal. We can spend them either for work or for leisure, or some combinations them. To analyze the workers' behavior in allocating the discretionary hours between

work and leisure, economist employ the neoclassical work-leisure decision model. Having the goal of identifying the factors that determine whether to work at all and, if so, how long to work, the model not only helps us understand the facts about labor supply but also enables us predict the influence of complex policy issues on the labor supply behavior. The model regards workers as having the objective of utility maximization in which preferences of a worker and budget constraints are key concepts.

(a) Preferences of a worker

A worker, as a consumer, generates satisfaction out of the consumption of a wide range of commodities and leisure. For the sake of simplicity, the total dollar value spent on purchasing various commodities is regarded as the total value of all the goods consumed to derive the requisite satisfaction. To depict preferences of workers in a two-dimensional space, we need to decompose the sources of satisfaction in to two groups: money income, C, the total dollar value of all the commodities consumed (it is assumed that the worker uses all his income for consumption, there is no saving), and leisure, L, the number of hours spent for leisure. So the utility function is

$$U = F(C, L).....(2.1)$$

Where U is the level of utility derived; C is the money income and L is the leisure time. Both C and L **are 'goods' not 'bads'** in the sense that the larger the money income given the price of commodities and/or the larger the leisure time, the higher the level of utility will be. These two goods, C and L, are to some extent **substitutes** for each other. This means that various combinations of C and L yield the same level of satisfaction - if a worker were made to forgo some hours of leisure for work, he/she would enjoy an increment on his money income so that his/her satisfaction could keep unchanged. The locus of points that stand for equal utility is termed as an **indifference curve**. If however, the rise in either of the arguments leads to an increment in the utility level or both an arguments rise, the new basket of C and L will yield a higher level of satisfaction that puts the consumer on a higher indifference curve.

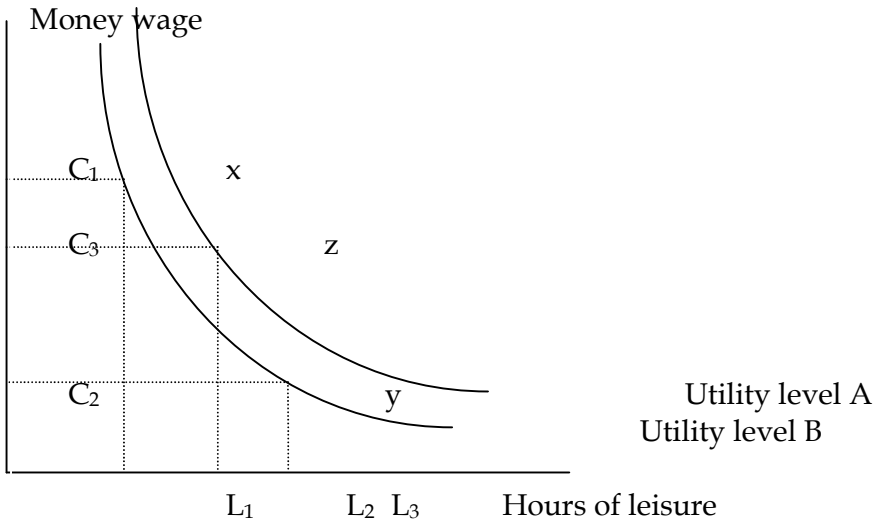


Figure 2.1. The indifference curves of an individual for leisure

Indifference curves have the following important characteristics;

1. Higher indifference curves represent higher levels of utility: every point on the Utility level B yields a higher-level satisfaction than and is preferred to the baskets in utility level A. So any indifference curve that lies to the northeast of another one is preferred to any curve to the southwest.
2. Indifference curves are downward sloping: as both leisure and money income are goods, for an individual to keep utility constant either leisure or money income should increase as the other decrease. The slope of the indifference curves are steep (flat) at the upper left (lower right) segment, implying that the person is not willing to increase the leisure hours by large amount for a given reduction in money income to hold utility constant. The flatter (steeper) the indifference curve, the lower (higher) value the individual places on an additional hour of leisure in order to keep utility constant.
3. Indifference curves do not intersect: If they did, the point of intersection would represent a combination C and L that yield different level of satisfaction.
4. Indifference carves are convex: the curves are steeper at the left and flatter at the right only reflecting that when money income is relatively high and leisure hours

are relatively few, leisure is more highly valued and expensive than when money income is relatively low and leisure hours are relatively large.

The slope of the Indifference curves

The slope of the indifference curve represents the effect on the worker's utility when she/he moves along a given indifference curve. Since both C and L are goods, if we devote more hours for leisure holding constant money income, the marginal utility of leisure contributes positively to the individual's utility. So does the marginal utility of money income, if we devote more hours for work holding constant leisure. However a movement along the indifference curve, say from points Y to point X in figure 2.1, is leading to reduces utility by the product of the number of leisure hours being given up, ΔL, and the associated loss of marginal utility, MU_L. The worker place the forgone leisure hours on work and earn additional money income to be used for consumption. A similar movement, hence, increases the utility of the individual by the product of the additional amount of money income earned by devoting more hours on work. ΔC,, and the additional utility derived out of the consumption of goods purchased by using the additional money income MU_C. Since the movement along the indifference curve involves no charge in total utility, the loss is exactly compensated by the gain

$$(\Delta L \times MU_L) + (\Delta C \times MU_c) = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.2)$$

Upon rearranging, equation (2.2) can be written as

$$\frac{\Delta C}{\Delta L} = \frac{-MU_L}{MU_L} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.3).$$

The absolute value of equation (2.3) represents the slope of the indifference curve, which is also called the marginal rate of substitution in consumption.

(b) The Budget Constraint

If the resources were not scarce, every worker would like to enjoy the ideally highest indifference curve. But the discretionary hours are limited that the number of hours available for leisure and work, and hence the resulting amount of money income are limited. Therefore, the indifference curve the worker can attain is constrained by the limitations of resources.

The resource that is under the command of the worker is constituted from the money income and leisure time. The money income may be obtained from various sources including non-labor income (property income, dividends and lottery prices) and labor income that constitute the person's budget constraint as

$$C = wh + V \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.4)$$

Where w is the hourly wage rate of which value is constant regardless of the number of hours worked and V stands for the non-labor income. The discretionary total time, T can be allocated into different combinations of leisure and work so that

$$T = h + L \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.5)$$

Where L is the number of hours allocated for leisure time. Thus equations (2.4) and (2.5) give the budget constraint equation of

$$C = (wT + V) - wL \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.6)$$

From this budget line, we can derive the ratio of the increment on money income (ΔC) to the increment in the number of hours spent on leisure (ΔL). The absolute value of this ratio is the slope of the budget constraint, **wage rate**.

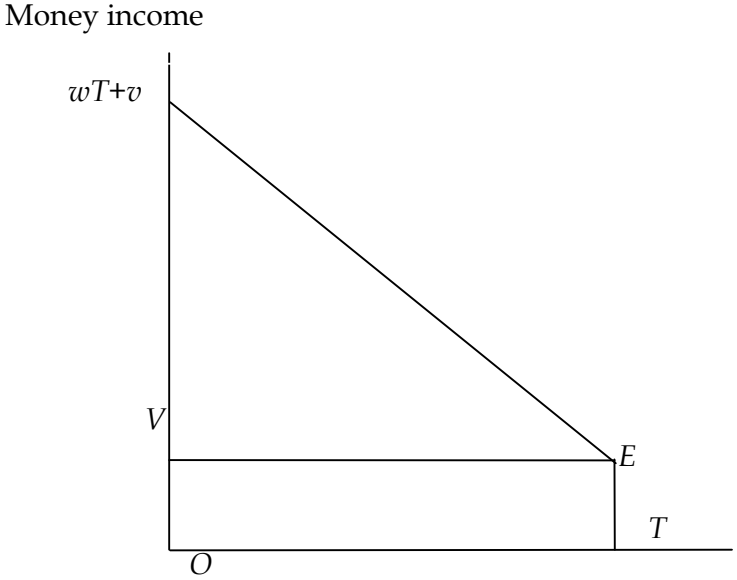


Figure 2.2 the budget constraint line for a worker

Figure 2.2 indicates that the worker has various alternatives on how to allocate his discretionary time. If he prefers to spend the total time, T, for leisure, he/she works zero hours and makes use of V amounts of non-labor income only to purchase commodities, Instead if the worker chooses to spend the total time, T, working, he/she will have zero hours for leisure and his/her command over commodities will become $(wT+V)$ amounts. Any combination of leisure and money income that lie to the right of this budget constraint cannot be attained by the person.

(c) Optimization

Given the budget constraint line, how does the worker maximize utility? Since the set of leisure and money income above the budget line are not affordable, they must be excluded from the possible level of the utility index. To make matters simple, let's take the following example of hypothetical workers. The worker has a non-labor income of Birr 10 per day, faces a constant market wage rate of Birr 10 per hour, and has 16 hours of discretionary time per day. This means that the person could use only his non-labor income of Birr 10 to purchase commodities if he preferred to allocate all 16 hours for leisure. The money income leisure combination of such a choice is given at point E of Figure 2.3 below. It is also possible for the worker to allocate the total time for work, of which decision is located at point F of Figure 2.3, the intercept of the budget constraint line, the total money income of which is Birr 170. Otherwise, the combination of leisure and money income would lie between these two extreme points.

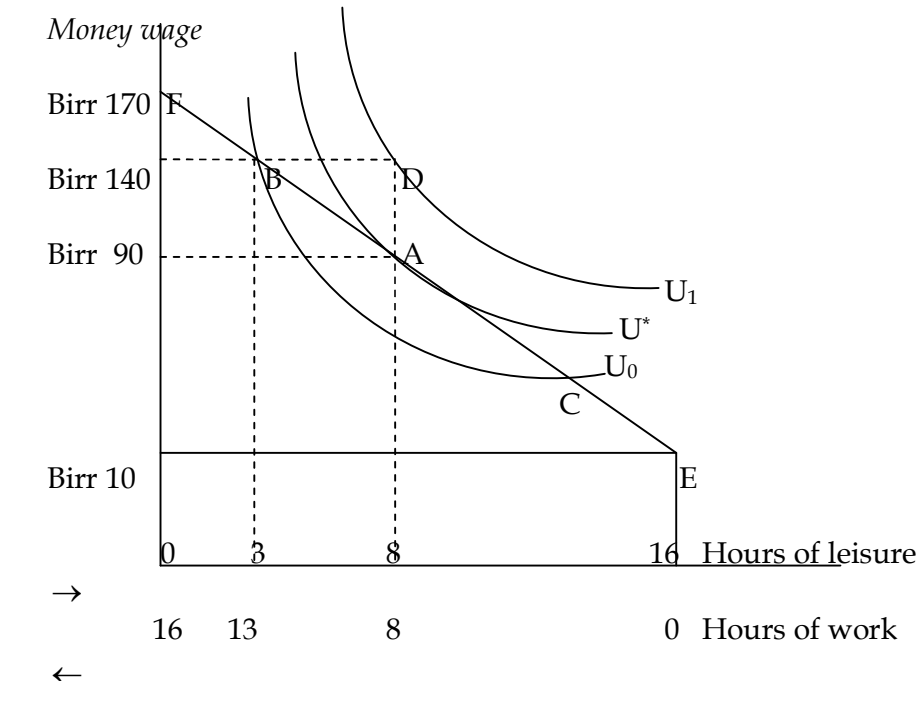


Figure 2.3: The Indifference curves and the budget constraint line of a worker

Since the level of the utility index U_1 cannot be affordable for the worker, he/ she is bound to make a choice between U* and U_0 preferences. This is because under Birr 10 per hour labor income and Birr 10 non labor income the worker could never achieve, for example, the utility level point D, which could only be afforded by purchasing Birr 140 worth of commodities while working only 8 hours. The worker can choose any combinations of utility level Uo, particularly those points between B and C. But he/she would not prefer these combinations because they yield less utility than that can be obtained from the level of the utility index U*. So the highest possible utility level attainable to the worker, working 8-hours per day and earning a daily money income of Birr 90, is given by point A. So the indifference curve that is just tangent to the budget constraint line gives the maximum possible utility level. A movement away from this point along the budget constraint would yield a lower level of utility.

In connection with this, we can say that workers with the same budget constraint line but with different preferences for leisure will have different choices for work, and thus the

point of tangency will be located either to the right or to the left of point A. If the preference curve of a worker was steeper (flatter) signifying that leisure time was (working hours were) more valuable, the tangency point would be to the right (left) of point A. When the tangency point inside the corner points, i.e. between point E and F, neither included, the solution is said to be an interior solution. But some people's preferences for leisure is so strong that their indifference curve is quite steep, in other words utility is maximized at the "corner" (point E), signifying that these people choose not to work at all. Under such a condition the solution is said to be a corner solution.

At the tangency point, the slope of the indifference curve is equal to the slope of the budget constraint line. Mathematically, this equality is given by

$$\frac{MU_L}{MU_c} = w \text{.....(2.6)}$$

The marginal rate of substitution, $\frac{MU_L}{MU_c}$, is the rate at which the worker is willing to give up leisure hours in exchange for additional consumption; and the market wage rate, W, is the rate at which the market is willing to let the worker substitute one hours of leisure for consumption.

Equation (2.6) can be rewritten as

$$\frac{MU_L}{w} = MU_C \text{.....(2.7)}$$

Where MU_L measures the additional utility obtained from consuming an additional hours of leisure. The ratio of these two variables measures the number of utils received by spending an additional money income (Birr) on leisure. Since MU_C measurers the additional utility received by spending an additional money income (Birr) on consumption goods, equation (2.6) states that the last Birr spent on leisure activities buys the same amount of utils as the last Birr spent on consumption goods.

2.4. The Effect of Changes in the Non labor and Labor Incomes

(a) The Effect of Non labor Income

To see what will happen to the labor supply decision of a worker when the non-labor income increases; let us assume that the market wage rate is maintained to be constant. If our hypothetical worker's non labor income increases from Birr 10 to Birr 50 on account of receiving a dividend payment, then the workers money income will equal to Birr 50 plus his/her earnings out of work (= the number of hours worked X the market wage rate of Birr 10 per hour). Consequently, the new budget line will shift upward parallel to the previous one.

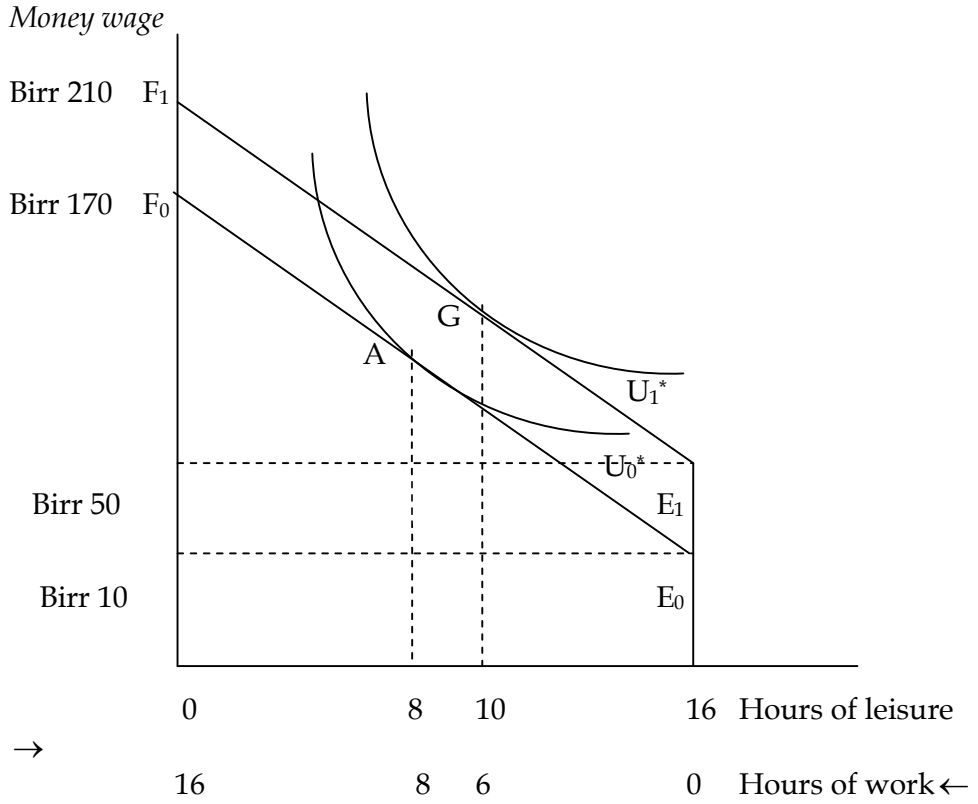


Figure 2.4: The effect of change in the non-labor income

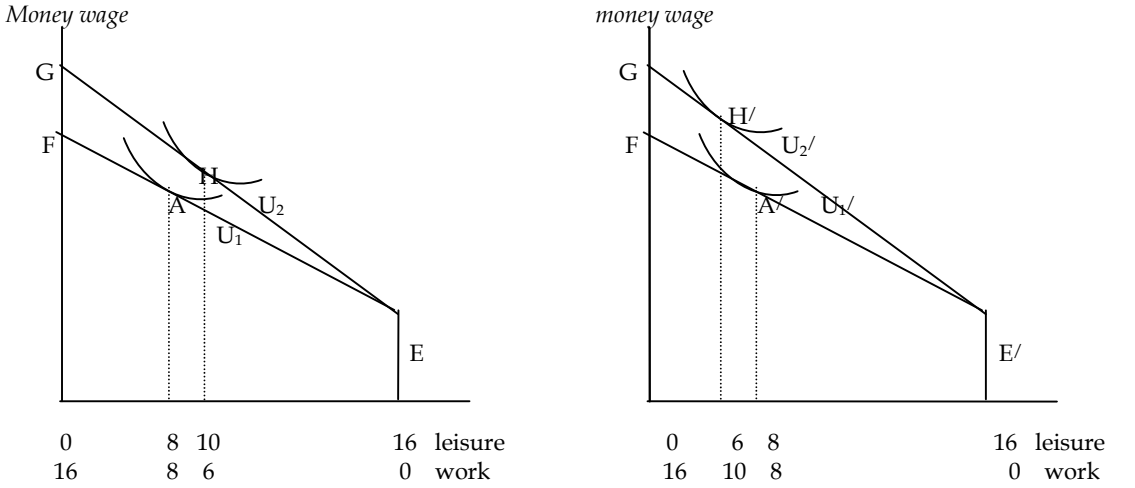
Since the market wage rate doesn't change, the slope of the budget constraint line remains the same. However after the rise in the non-labor income the worker can afford the higher indifference curve U_1*there by becoming better off. The new optimal point, point G, indicates that both expenditures on consumption goods and the number of hours spent for leisure has increased. Now, at point G, the worker spends only 6 hours of working. This implies that leisure is a normal good. If leisure becomes an inferior good, when the non-labor income increased, the number of hours spent on working also increased, and the

optimal point would be located to the left of point A. Thus we can exclude the second alternative by assuming that leisure is a normal good.

In short, the income effect, the impact of non-labor income on the number of hours worked, implies that an increase in non-labor income holding the wage rate constant reduces the hours of work.

(b) The effect of Labor Income

Holding non-labor income constant, if the market wage rate were to be increased from Birr 10 to Birr 20 per hour, such a rise in the labor income would give rise to both an income and substitution effect. Workers would become wealthier than before and be pushed to spend more hours on leisure. This income effect would reduce the number of hours worked. In contrast, the opportunity cost of leisure, the market wage rate, would be so high that the worker would be pushed to work more hours-substitution effect. Whether the effect of market wage rate on leisure time is positive or negative depends on the net effect of income and substitution effects.



(a) Income effect dominating (b) Substitution effect dominating

Figure 2.5: The effect of a change in the wage rate on hours of work

Under panel (a) the income effect is stronger than the substitution effect there upon reducing the number of hours worked. In this panel as the market wage rate increases from Birr 10 to Birr 20 per hour, the worker attains the higher level of utility, U_2, and the

number of hours worked falls from 8 hours to 6 hours. This is because of the fact that an increase in income raises the demand for all normal goods, including leisure.

In panel (b) of the above diagram the substitution affect dominates the income effect as a result the number of working hours increased. As the market wage rate rises from 10 Birr to 20 Birr per hours, the worker can offer the utility level, U_2, the tangency point of which suggests that 10 hours of working is optimum. This is because of the fact that leisure becomes so expensive (the opportunity cost of leisure time has increased to Birr 20 per hour) that high-wage workers have strong incentives to cut back on their consumption of leisure activities. Consequently, the substitution effect of a rise in the market wage rate makes the demand for leisure fall and hours of work rise.

2.5 The Labor Supply Curve

The preceding explanation states that the reservation wage constitutes the starting point for every workers labor supply decision, i.e. for the worker to participate in the labor market the prevailing market wage must be greater than the reservation wage. Once the market wage stars to increase above the reservation wage the worker starts to allocate more and more hours of work. Such a relation between the market wage rate and the number of hours allocated for work provides the labor supply curve.

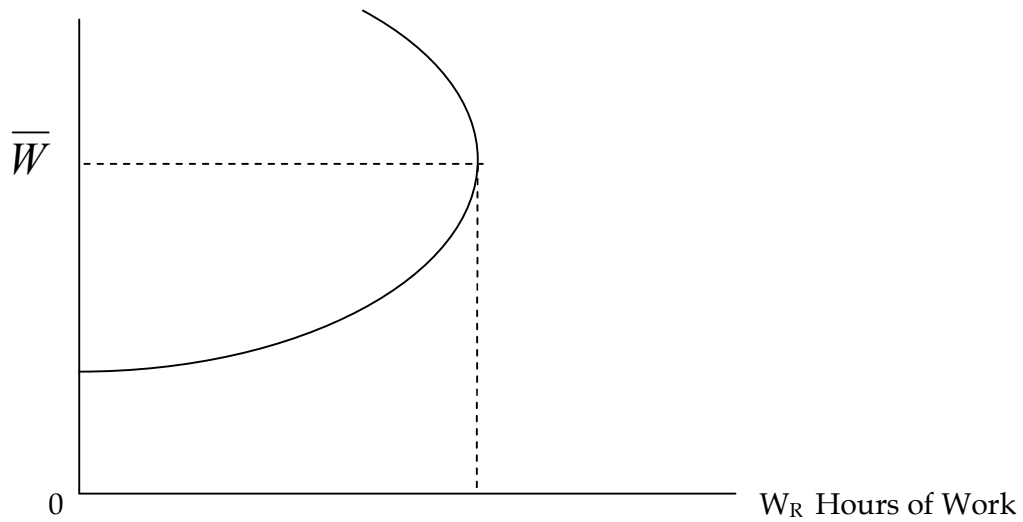


Fig. 2.8 Labor supply Curve

As figure 2.8 depicts, when the market wage rate is below the reservation wage rate, W_R, the hours of work is zero. When the wage rate rises above the reservation wage rate the worker starts to put more hours on work. However the shape of the labor supply curve above W_R wage rate depends on the net effect of income and substitution. When the substitution effect dominates the income affect, the labor supply curve is positively slopped because the wage rate up until $\overline{W}$ makes leisure more expensive than it makes the person wealthier. But the increase in the market wage beyond $\overline{W}$ leads to a fall in the hours of work as the income effect stats to dominate the substitution effect, signifying a negatively sloped labor supply curve. The segment of labor supply curve depicted by the negative slope is termed **as back-word bending labor supply curve.**

The market labor supply curve for the economy as a whole can be generated by horizontally adding the hours of work by ever individual for a given market wage rate.

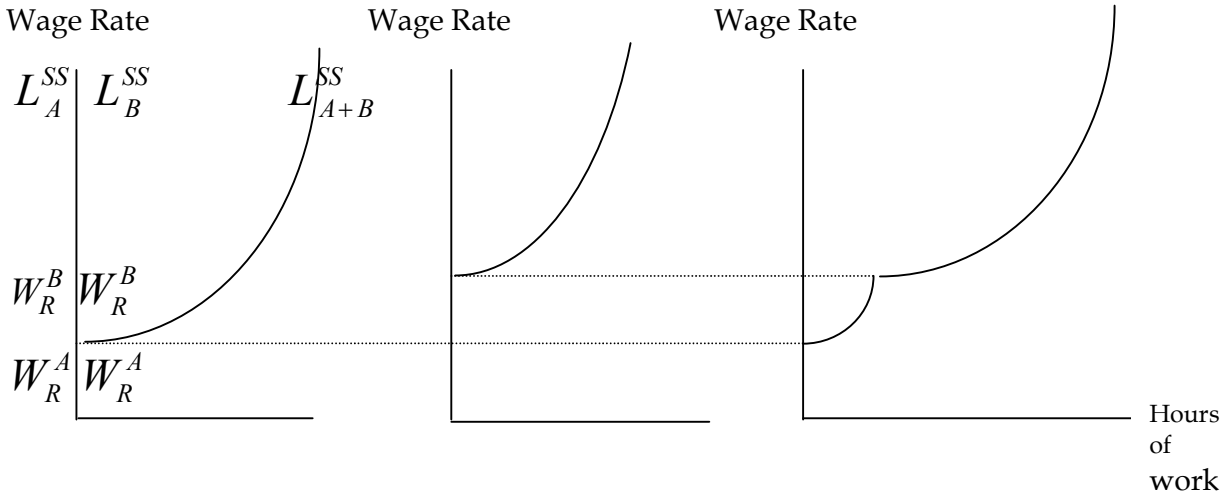


Fig 2.9: The labor supply curves for two persons, A and B, and the market labor supply curve

The above figure indicates that $L_A^{ss}$and L_B^{ss} stands for the labor supply curves for individual A and B, and W_R^A *and* W_R^B stand for their respective reservation wages. The market labor supply is zero if the market wage rate is below W_R^A, is the same as the labor supply of individual A if the market wage rate lies between W_R^A *and* W_R^B, and is the sum of the labor supply of the two individuals if it exceeds W_R^A.

2.6. Elasticity of Labor Supply (Wage elasticity of supply)

The elasticity of labor supply measures the extent of responsiveness of hours of work to changes in the wage rate.

$$\{labour\ \sup ply\ elasticity\} = \frac{\%change\ in hours\ of\ work}{\%change\ in\ wage\ rate} = \frac{\frac{\Delta h}{h}}{\frac{\Delta w}{w}} = \frac{\Delta h}{\Delta w} * \frac{w}{h}$$

Where h and w are hours of work and wage rate respectively. The sign of the labor supply elasticity depends on the slope of the labor supply curve. When the labor supply curve is positively sloped, i.e. when substitution effect dominates the income effect, the labor supply elasticity is positive. In contrast, when the labor supply curve is backward bending, i.e. when the income effect dominates the substitution effect, the labor supply elasticity bears a negative value. Apart from the variation in sign, the labor supply elasticity may vary in magnitude sometimes may exceed a value of one. In the forms case the hours of work are less responsive, or inelastic, to the given change in the money wage rate while in the latter case the coefficient is said to be elastic.

Value of elasticity of supply (Es)	Description	Results from hours of work
Es = ∞	Perfectly elastic	Arise in the wage rate results in an infinitely large rise in hours worked
∞>Es>1	Relatively elastic	Arise in the wage rate results in larger proportions rise in hours of work
Es =1	Unitary elastic 2	Arise in the wage rate results in an equal proportions rise in hours worked
0<Es<1	Relatively inelastic	Arise in the wage rate results in a less than proportion rise in hours worked
Es=0	Perfectly inelastic	No change in hours worked

Table 2.1 the range of elasticity of labor supply