Supplementary Chapter:

Other Household Decisions

Summary

This supplement is to be read after Chapter 6 of the Ragan/Lipsey text. In Chapter 6 we developed a set of tools for examining the consumption decisions of households. This allowed us not only to study in detail the behaviour that lies behind the demand curve, but also to examine the effect of various price and income changes and their effect on consumer choices and welfare.

We can also use these tools to study the decisions household make regarding factor supplies. Recall that in the circular flow of income households are "demanders" in the product markets, but act as "suppliers" in the factor markets. The next section uses the tools of consumer theory to examine household labour supply decisions, while the following section does the same for savings supply decisions.

Labour Supply

The Basic Set-Up

In Chapter 6 the problem we studied was that of how households allocated their limited income across the purchases of various consumer goods. Their income was assumed to be a fixed amount determined outside the model of consumer behaviour. This income was the "endowment" of the household. When studying the labour supply decision of a household, the endowment is no longer money but rather time. We will assume that the household has H amount to time (hours in a day, or hours in a week, or weeks in a year) to allocate between labour, L, and leisure, R. Of these two activities, leisure is considered to be a "good" and labour is considered to be a "bad". (We like our leisure but work is necessary to earn income.) When the household allocates a unit of its time to the labour market it earns a wage, w. Thus its total income in a given period is wL. The household can then spend this income on the other "good" in the model, consumption, C, which is assumed to have a price equal to 1. (That is, consumption is the amount of money spent on consumption goods.)

Variables and Definitions

H – the time endowment of the household to be split between labour and leisure, so $H = R + L$

R – time spent in leisure activities, a good

L – time spent working, a bad

w – the wage rate faced by the household

wL – the labour income earned by the household

$C = wL$ – consumption by the household, a good

Preferences

Preferences over the two goods in the model, leisure and consumption are defined by normal (convex to the origin) indifference curves. In addition, it is usually assumed in this model that both consumption and leisure are normal goods.

Budget Line

The maximum amount that consumers can spend on consumption is what they earn in the labour market, so

$$C = wL$$

Since labour supply is limited by the total amount of time available and the amount the household decides to take in leisure, we can rewrite the budget constraint:

$$C = wL = w(H - R) = wH - wR$$

The budget line is shown as BL in diagram S1-1. The intercepts are as shown in the diagram. If the household decides to spend all of its time in leisure, it would have H units of leisure and zero consumption, while if it spent all of its time in paid work, it would have zero units of leisure and wH units of consumption. The slope of the budget line is given by $-w$.

We are used to thinking about the wage rate as the reward for labour. While this is certainly one way of looking at the wage, there is another interpretation of the wage rate that becomes evident when we examine Figure S1-1. Since each extra hour of leisure reduces the amount of income available for consumption, then the wage rate can also be interpreted as the opportunity cost (or relative price) of leisure. So, as with all budget lines, the slope of the budget line (here $-w$) represents the relative price of one good (leisure) in terms of another (consumption).

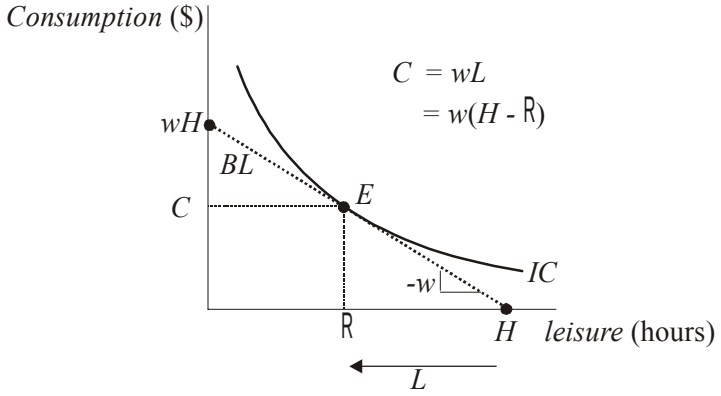

Figure S1-1 Household Labour Supply Equilibrium

Consumer Equilibrium

The household maximizes its utility by consuming at the point where it reaches its highest possible indifference curve. In Figure S1-1 this occurs at point *E* where *IC* is tangent to the budget line. At *E*, because the slope of the indifference curve is equal to the slope of the budget line, then at equilibrium $mrs = w$. This has the usual interpretation. In equilibrium, the marginal rate of substitution (the internal trade-off in terms of taste) is equal to the relative price ratio (the external trade-off in terms of possibilities).

The equilibrium point *E* shows the bundle of consumption and leisure that the household chooses, $\{C, R\}$. But we can also illustrate the household's labour supply. Since the household has *H* units of time to begin with and chooses *R* units of time in leisure, the labour is simply $H - R$. This is shown on the diagram by measuring backwards along the leisure axis from the endowment point *H* to the chosen amount of leisure *R*.

Non-Labour Income

Suppose the household now has access to some non-labour income (income it can consume regardless of how much it chooses to work). This could take the form of income generated from saving, a government benefit of some kind, etc. How the household responds is shown in Figure S1-2, where the household now can consume $\$X$ even if it chooses to supply no labour.

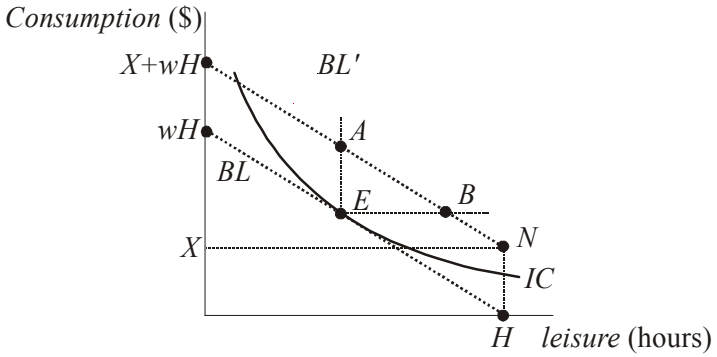

Figure S1-2 Non-Labour Income

The budget line shifts up by *X* to *BL'*. The end points are now given by the consumption axis intercept, $X + wH$, and the point *N*, which shows that the household could choose $\$X$ of consumption and *H* hours of leisure. The slope of the budget line remains unchanged because the wage is unchanged. Since both leisure and consumption are considered to be normal goods, then, if the original consumption bundle was *E*, then the household would choose some point on the new budget line between *A* and *B*, denoting a new bundle with more of both goods. Not that "more leisure" implies less labour.

Wage Changes

Now suppose that the household faces an increase in the wage rate. The effect on the budget line is shown in Figure S1-3. The budget line pivots out around the no-labour end point (*H*) from *BL* to *BL'*. As with all price changes, this will have both a substitution effect and an income effect. To illustrate the substitution effect examine the "imaginary" budget line *BL"*, which has the new slope *–w'* but is tangent to the original indifference curve *IC(E)*. If faced with this budget line, the household would choose a bundle like *S* with more consumption and less leisure. This is because the increase in wages means that leisure has become more expensive relative to consumption. The income effect can be illustrated by the move from *S* to a point on the new budget line *BL'*. Since both consumption and leisure are normal goods, this new bundle will lie somewhere between *A* and *B*. Note that this includes possible bundles with more leisure (therefore less labour) than Re. To sum up, both the substitution and income effects are pushing the household to increase consumption (so we can be sure that consumption will rise), but with the substitution effect favouring less leisure and the income effect favouring more leisure, we cannot be sure whether leisure (and therefore labour supply) will rise or fall in the face of a wage increase.

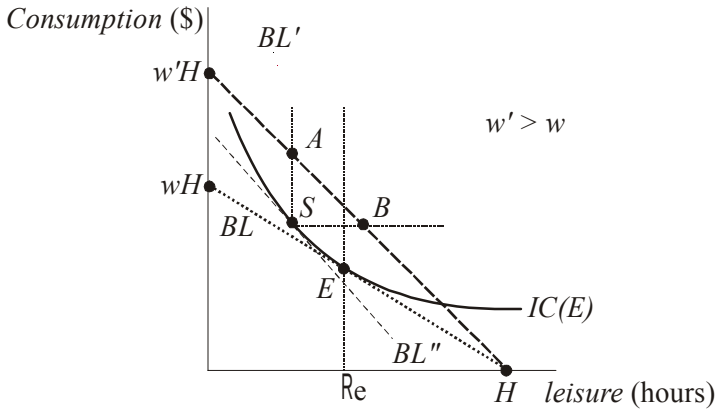

Figure S1-3 The Substitution and Income Effects of a Wage Change

Reservation Wage

The reservation wage is defined as the wage below which the household will choose not to participate in the labour market. To illustrate this concept, examine Figure S1-4. If the household chooses not to participate in the labour market, it consumes at point *N* and achieves utility shown by *IC(N)*. Suppose that the household faces the low wage *w*. Given this wage, it is better off with bundle *N*, so it chooses to supply no labour. If the wage rate rises to *w'*, the household will maximize utility by choosing point *E*, supplying some labour. The reservation wage *w**, is the wage at which the budget line is tangent to *IC(N)* at point *N*. At the reservation wage, the household is just indifferent between choosing point *N* and supplying the first unit of labour. There is one additional point to note. Since the increase in wage from *w** to *w'* has resulted in an increase in labour supply (from none to some), then it is clear that at low wages

just above the reservation wage, the substitution effect of a wage increase outweighs the income effect.

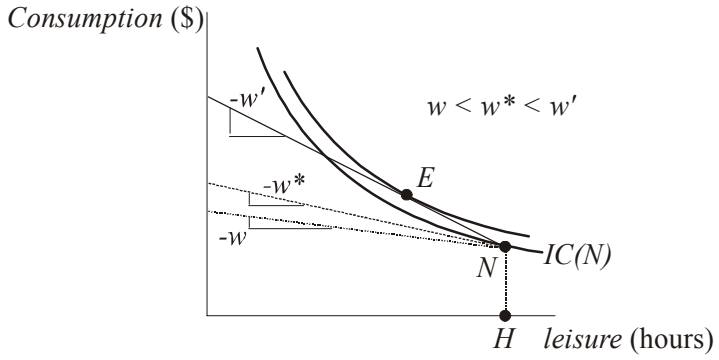

Figure S1-4 – The Reservation Wage

Summing-Up: The Labour Supply Curve

Household Labour Supply

Examine Figure S1-5. As our discussion concerning the reservation wage establishes, at wages below *w**, the household will choose to supply no labour and for a least some wages above *w**, the substitution effect outweighs the income effect and labour supply increases. However, as our discussion concerning the effect of wage changes establishes, there may come a wage (like *w'*) above which the income effect outweighs the substitution effect and labour supply actually falls in the face of increasing wages. This raises the possibility that the labour supply curve that is "backward-bending" as shown.

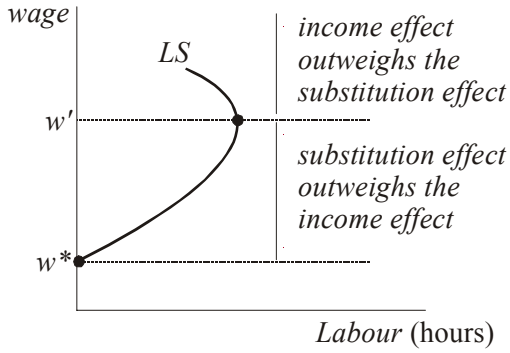

Figure S1-5 – A "Backward Bending" Household Labour Supply Curve

Market Labour Supply

It is important to note that both the reservation wage for a household and the wage rate (if any) where the labour supply "bends back" are based on the individual household's preferences. Therefore we would not expect the market labour supply curve to look as above in Figure S1-5.

However, given the opposing nature of the substitution and income effects of a wage change, we would expect the market supply curve to be fairly inelastic. This indeed is what most empirical studies have found.

Saving Supply

The Basic Set-Up

The inter-temporal consumption model we use to study saving is quite powerful and in various forms can be used to study, saving, borrowing, and financial asset choices. In its overlapping generations form it can be used to study bequest behaviour, and even to analyze the intergenerational effects of various government expenditure and tax policies. In this section, since we are focusing on the supply of saving, we will use the model in its simplest form.

We will assume that the household lives for only two periods, the present or working life and the future during which it will be retired. We will assume that the household has income equal to I that it will earn in the present and that it must decide how to allocate this between saving, S, and present consumption, Cp. Of these two, present consumption is considered to be a "good" and saving is only useful because it provides a method for transferring some of its current income to consumption in the future, Cf. Saving earns a return in the market equal to the interest rate, r. Thus its total consumption in the future is equal to $(1+ r)S$.

Variables and Definitions

I – endowment of the household in terms of income earned in the present to be split between saving and present consumption, so $I = Cp + S$

Cp – present consumption, a good

$S = I – Cp$ – saving

r – the interest rate faced by the household

$(1+ r)S$ – the total return to saving earned by the household

$Cf = (1+ r)S$ – future consumption by the household, a good

Preferences

Preferences over the two goods in the model, present consumption and future consumption are defined by normal (convex to the origin) indifference curves. In addition, it is usually assumed in this model that both future consumption and present consumption are normal goods.

Budget Line

The maximum amount that consumers can spend on future consumption is what they earn in the saving market, so

$$Cf = (1+ r)S$$

Since saving supply is limited by the total amount of income available and the amount the household decides to consume in the present, we can rewrite the budget constraint:

$$Cf = (1+ r)S = (1+ r)(I - Cp) = (1+ r)I - (1+ r)Cp$$

The budget line is shown as *BL* in diagram S2-1. The intercepts are as shown in the diagram. If the household decides to consume all of its income in the present, it would have *I* units of present consumption and zero future consumption, while if it saved all of its income for the future, it would have zero present consumption and $(1+ r)I$ future consumption. The slope of the budget line is given by $-(1+ r)$.

We are used to thinking about the interest rate as the reward to saving. While this is certainly one way of looking at the interest rate, there is another interpretation of the interest rate that becomes evident when we examine Figure S2-1. Since each extra dollar of present consumption reduces the amount of saving to generate future consumption, then one plus the interest rate can also be interpreted as the opportunity cost (or relative price) of present consumption. So, as with all budget lines, the slope of the budget line (here $-(1+ r)$) represents the relative price of one good (present consumption) in terms of another (future consumption).

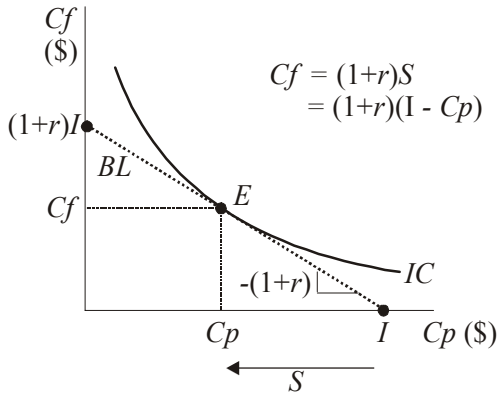

Figure S2-1 Household Saving Supply Equilibrium

Consumer Equilibrium

The household maximizes its utility by consuming at the point where it reaches its highest possible indifference curve. In Figure S2-1 this occurs at point *E* where *IC* is tangent to the budget line. At *E*, because the slope of the indifference curve is equal to the slope of the budget line, then at equilibrium $mrs = 1+ r$. This has the usual interpretation. In equilibrium, the marginal rate of substitution (the internal trade-off in terms of taste) is equal to the relative price ratio (the external trade-off in terms of possibilities).

The equilibrium point *E* shows the bundle of future consumption and present consumption that the household chooses, $\{Cf, Cp\}$. But we can also illustrate the household's saving supply. Since the household has income equal to *I* to begin with and chooses *Cp* in present consumption, then saving is simply $I - Cp$. This is shown on the diagram by measuring

backwards along the present consumption axis from the endowment point *I* to the chosen amount of present consumption *Cp*.

Income Changes

Suppose the household's current income increases. How the household responds is shown in Figure S2-2.

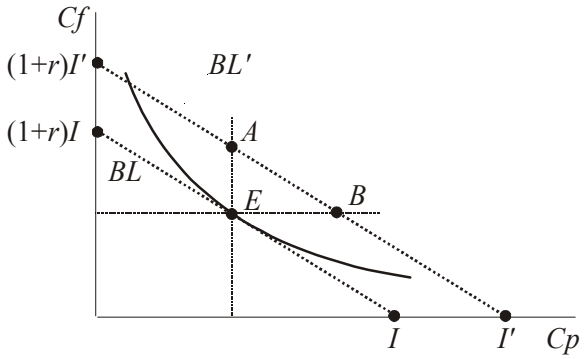

Figure S2-2 Non-Saving Income

The budget line shifts out to *BL'*. The end points are now given by the future consumption axis intercept, (1+*r*)*I'*, and present consumption axis intercept, *I'*. The slope of the budget line remains unchanged because the interest rate is unchanged. Since both present consumption and future consumption are considered to be normal goods, then, if the original future consumption bundle was *E*, then the household would choose some point on the new budget line between *A* and *B*, denoting a new bundle with more of both goods. Not that "more future consumption" implies more saving. This is because, given that the interest rate is unchanged, the only way to increase consumption in the future is to save more.

Interest Rate Changes

Now suppose that the household faces an increase in the interest rate. The effect on the budget line is shown in Figure S2-3. The budget line pivots out around the no-saving end point (*I*) from *BL* to *BL'*. As with all price changes, this will have both a substitution effect and an income effect. To illustrate the substitution effect examine the "imaginary" budget line *BL"*, which has the new slope –(1+*r'*) but is tangent to the original indifference curve *IC(E)*. If faced with this budget line, the household would choose a bundle like *S* with more future consumption and less present consumption. This is because the increase in the interest rate means that present consumption has become more expensive relative to future consumption. The income effect can be illustrated by the move from *S* to a point on the new budget line *BL'*. Since both future consumption and present consumption are normal goods, this new bundle will lie somewhere between *A* and *B*. Note that this includes possible bundles with more present consumption (therefore less saving) than *Cpe*. To sum up, both the substitution and income effects are pushing the household to increase future consumption (so we can be sure that future

consumption will rise), but with the substitution effect favouring less present consumption and the income effect favouring more present consumption, we cannot be sure whether present consumption (and therefore saving supply) will rise or fall in the face of a interest rate increase.

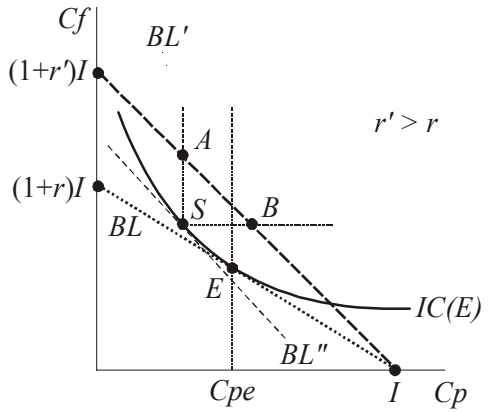

Figure S2-3 The Substitution and Income Effects of an Interest Rate Change

There is one final note to make about the effect of an increase in the interest rate. Although our analysis of the income and substitution effects tells us that we cannot be sure whether saving rises or falls, it tells us that we can be certain the consumption in the future rises. This is possible because, given the increase in the interest rate, each dollar of saving is now more productive at generating future consumption than before. Therefore we can have an increase in future consumption, even with less saving.

Summing-Up: The Saving Supply Curve

Household Saving Supply

In this basic model there is no analog to the reservation wage – no reservation interest rate as it were. This is because the only way to have consumption in the future is through saving. A richer model with endowment income in both periods would allow us to examine the interest rate at which the household switches from being a saver to a borrower. However, our analysis of the income and substitution effects establishes that individual household saving supply is likely to be fairly inelastic and may have a "backward-bending" range.

Market Saving Supply

Again, it is important to note that the interest rate (if any) where the saving supply "bends back" is based on the individual household's preferences. Therefore we would not expect the market saving supply curve be backward bending. However, given the opposing nature of the substitution and income effects of an interest rate change, we would expect the market supply curve to be fairly inelastic. This indeed is what most empirical studies have found.