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**Lecture 10: Income and Substitution Effects**

1. Unpacking changes in the price
   1. While the effect of a change of price has different effects based on the indifference curve, we can uncover some of the reasoning behind the changes.
      1. People buy more of a good when it has become the price falls and less for goods which have become more expensive.
      2. People buy more of a good when they enjoy an increase of real purchasing power due to the fall of price in another good.
   2. The *substitution effect* is how the consumption of goods change when the price changes, holding utility constant.
   3. The *income effect* is how the consumption of goods changes when purchasing power changes, holding prices constant.
   4. To find each effect from a price change, hold the new budget constraint.
      1. The difference between A and B is the substitution effect.
      2. The difference between B and C is the income effect.

*Games*

*Movies*

**A**

**B**

**C**

*Substitution Effect*

*Income Effect*

*Substitution Effect*

*Income Effect*

* 1. The total effect, what we’ve been examining, is the substitution plus the income effect. If the income effect is negative, the good is inferior. If positive, it is normal.

1. Giffen Goods
   1. Most of the time, the substitution effect will be greater than the income effect. But when the income effect is greater (and negative), you get a Giffen good.
   2. A *Giffen good* is a good with an upward sloping demand curve.

*Games*

*Movies*

**A**

**B**

**C**

* 1. Giffen goods are a theoretical possibility, requiring this inferior good is also a large enough part of the budget so that the income effect is very large. Most income effects are small since most goods are just a small part of the budget.

1. Mathematical Indifference curves
   1. Since we will be covering the mathematics behind consumer choice theory next class, now is a good time to return to indifference curves.
   2. Indifference curves all have the same utility, originating from the combination of two goods. In other words, U = U(X,Y).
   3. Recall that indifference curves have requirements such as convexity (for a pair of goods which are not perfect substitutes). For any random possible utility function, how can you tell if it’s “well behaved?” For some requirements, such as continuity, it is clear. But checking for convexity and downward sloping requires a bit of math.
      1. Consider this example: U = X0.5 + Y. Is this a well-behaved utility function?
      2. First, let’s isolate Y so we can perform some operations on it. Since U is a fixed value, this is straight forward: U – X0.5 = Y.
      3. To determine if it is downward sloping, we take the first derivative: -0.5X-0.5. Since it is negative, it is downward sloping.
      4. To determine convexity, we take the derivative again, or the second derivative. That’s (-0.5)(-0.5)X-1.5, or 0.25X-1.5. Since the result is positive, the curve is convex.
   4. Here’s a slightly more difficult one: U = (XY)0.5
      1. U2 = XY

U2/X = Y

* + 1. 1st derivative: -U2/X2 √
    2. 2nd derivative: 2U2/X3 √