Economics 480
Analysis of Labor Markets
Professor Woodbury

3. Labor Demand

3.1. Production Technology and the Firm
   a. derived demand
   b. production functions (equation, table, graph) show the maximum output that can be obtained from given inputs
   c. isoquants and their characteristics
      • an isoquant is a locus of points showing combinations of inputs that allow production of a given level of output
      • they are downward-sloping and convex
      • the slope of an isoquant has a specific interpretation: $\frac{\partial K}{\partial L} = \frac{MP_L}{MP_K} = MRTS$

3.2. Perfect Competition
   a. the firm is one of many sellers of the product it produces
   a'. the firm is one of many buyers of the inputs it buys
   a''. the implication is that the firm is a price-taker (can't influence the prices of inputs or output)
   b. information about inputs, outputs, and prices is good
   c. inputs are homogeneous
   d. labor and other inputs are mobile
3.3. Short-Run Demand for Labor
   a. in the SR, some factor is fixed and cannot be adjusted
   b. in the LR, all factors are variable
   c. assuming that K is fixed at some level gives the SR Production Path
   d. the SR Production Path maps into the $MP_L$ curve (which has a negative slope in the relevant range)
   e. if we assume that output price ($PQ$) is fixed, then VMP (value of marginal product) equals $MP_L \cdot PQ$
   f.* the VMP curve is the firm's SR demand curve for labor
   g.* the firm is in SR equilibrium when it sets VMP equal to the wage rate: $w = VMP$ (i.e., this condition gives the optimal demand for labor)
   h. footnote on the correspondence between the labor market and the output market

3.4. Long-Run Demand for Labor: Factor Prices and Isocost Lines
   a. in the LR, both L and K are variable, so we need to consider both the wage ($w$) and the price of capital ($r$)
   b. an isocost line shows combinations of K and L that the firm can buy for a given total outlay (TC)
   c. the slope of an isocost is $w/r$ (or $P_L/P_K$)
   d. higher isocost lines indicate greater TC
   e. if $w/r$ changes, the slope of the isocost lines changes
   f. even though isocosts are mechanically similar to wage lines (or budget constraints), there is an important difference: the firm does not face an expenditure constraint; it chooses output and expenditure
3.5. LR Expansion Path and LR Equilibrium  
a. superimposing the isocost lines on the isoquant map allow you to derive the LR expansion path, which is the locus of tangencies between the isocosts and isoquants  
b. the LR effect of a change in the wage can be decomposed into a substitution effect and a scale effect (see Figures 4-10 and 4-12 in Borjas, for example)  

3.6. Elasticity of Demand for Labor  
a. the elasticity of demand for labor (E_{ld}) is defined as the percentage change in labor demand that results from a given percentage change in the wage:  
\[ E_{ld} = \frac{\%LD}{\%w} \]  
b. See the handout (taken from various editions of Hamermesh) showing estimates of the LR elasticity of demand for labor
3.7. Elasticity of Substitution
   a. the elasticity of substitution can be defined in either of two ways:
      \[ s = \left( \frac{\% D_K}{L} \right) / \left( \frac{\% D_{MP_L}}{MP_K} \right) \]
      This is just a measure of how the isoquants bend — when \( s = \infty \), the isoquants are straight lines; when \( s = 0 \), the isoquants are right angles.
   b. In equilibrium, \( MPL/MP_K = w/r \), so \( s \) can also be defined as:
      \[ s = \left( \frac{\% D_K}{L} \right) / \left( \frac{\% D_w}{w} \right) \]
   c. Don't get hung up on the formal definition; \( s \) is just a measure of how easy it is for firms to substitute K for L.

The following material was not covered:

3.8. Decomposing the labor demand elasticity into a substitution elasticity and a scale elasticity
   a. Once you know the definition of the elasticity of substitution, you can decompose the labor demand elasticity into its components:
      \[ E_{ld} = SK(\bar{s}) + SL(EQ) \]
   b. The notation is as follows:
      \[ SK = \text{capital's share of total cost } [\frac{(K\cdot r)}{(K\cdot r + L\cdot w)}] \]
      \[ SL = \text{labor's share of total cost } [\frac{(L\cdot w)}{(K\cdot r + L\cdot w)}] \]
      \[ EQ = \text{the elasticity of demand for output } [\frac{(\% D_Q)}{(\% D_P)}] \]