Request that you should not refuse

- PLEASE SWITCH OFF AND PUT AWAY YOUR CELL PHONES
- LAPTOPS OK IF WORK IS ACADEMIC
- REMOVE BAGS AND OTHER MATERIALS THAT CAN CAUSE DISTRACTION
- STOP HAVING SIDE CONVERSATIONS
- PARTICIPATE IN CLASS

Class 12

Demonstration of Finding a Literature

Supply of Labor: Supply Elasticities

Returns to Education

- **Read for Monday's Class (Class 13)**

Work on selecting a Literature for final project

For upcoming Weekend

Vive Le Revolution & Bertrand and Mullianathan Paper (Emily and Greg), Miles Corak (Income Inequality)

$$U = l^{\alpha} c^{\beta}$$

$$pc = wh + V$$

$$T = h + l$$

$$\frac{\partial U}{\partial l} = \alpha l^{(\alpha-1)} c^{\beta} = MU_l$$

$$\frac{\partial U}{\partial c} = \beta l^{\alpha} c^{(\beta-1)} = MU_c$$

$$\rightarrow \frac{MU_l}{MU_c} = \frac{\alpha c}{\beta l}$$

α **elasticity of utility w.r.t leisure;**

β **elasticity of utility w.r.t consumption;**

RW is the value of the slope of IC at the endowment point

$$\rightarrow RW = \left|\frac{MU_l}{MU_c}\right|_{l=T, c=\frac{V}{p}} = \frac{\alpha c}{\beta l}_{l=T, c=\frac{V}{p}} = \frac{\alpha V}{\beta p T}$$

$$\ln(RW) = \ln\alpha + \ln V - \ln\beta - \ln p - \ln T$$

$$\frac{\partial RW}{\partial \alpha} > 0; \frac{\partial RW}{\partial \beta} < 0; \frac{\partial RW}{\partial T} < 0; \frac{\partial RW}{\partial V} > 0; \frac{\partial RW}{\partial p} < 0$$

Decision Function/Participation Condition

$$If \;\; RW < w \;\; then \;\; work \;\; i.e. \;\; h^* > 0$$

$$\frac{\alpha V}{\beta p T} < w \rightarrow V < \frac{w \beta p T}{w}$$

Comparative Static # of Kids: n

$$\rightarrow RW = \frac{\alpha(n)V(n)}{\beta(n)\,pT(n)}$$

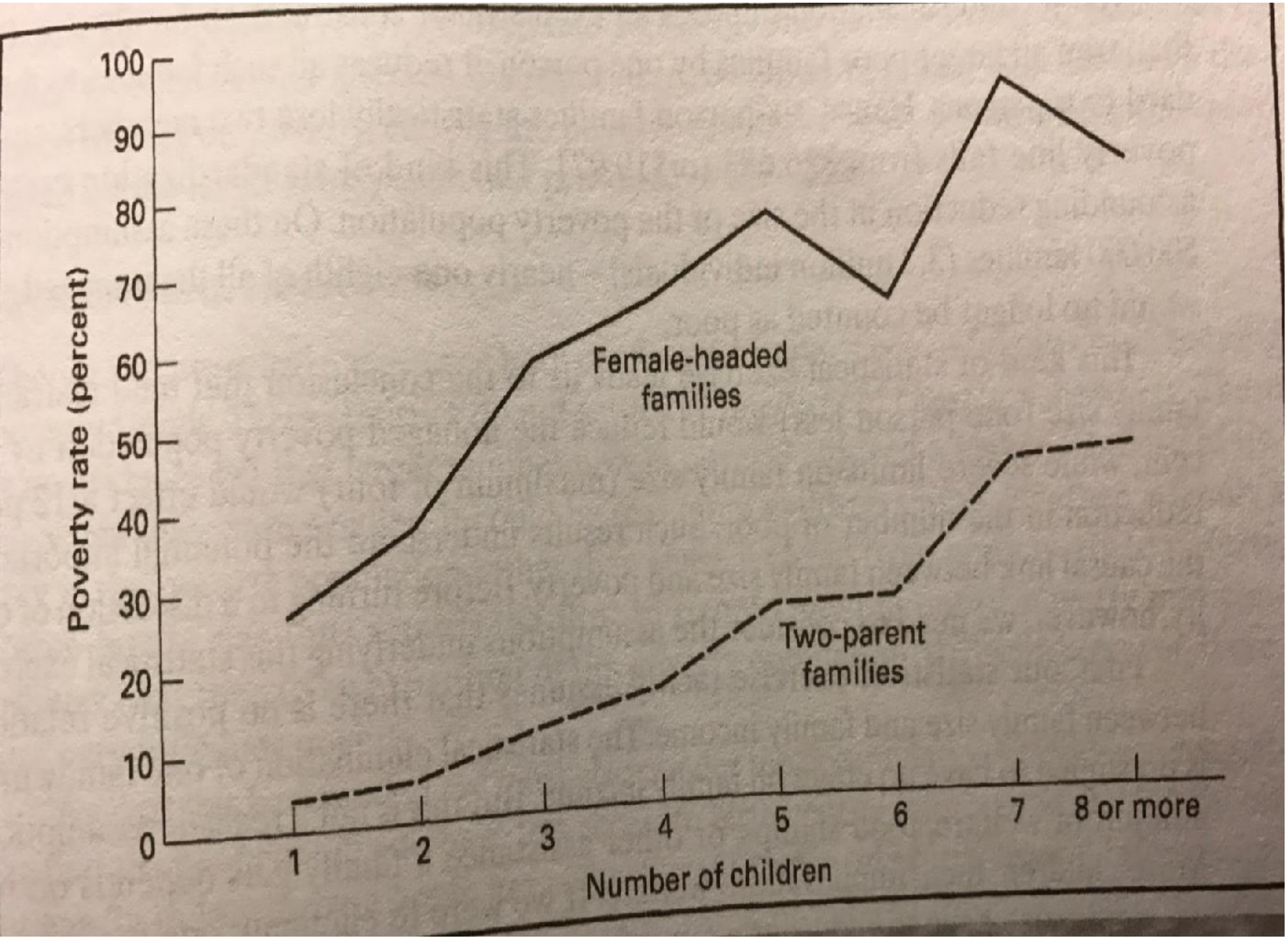
$$\frac{\partial RW}{\partial n} = ?$$

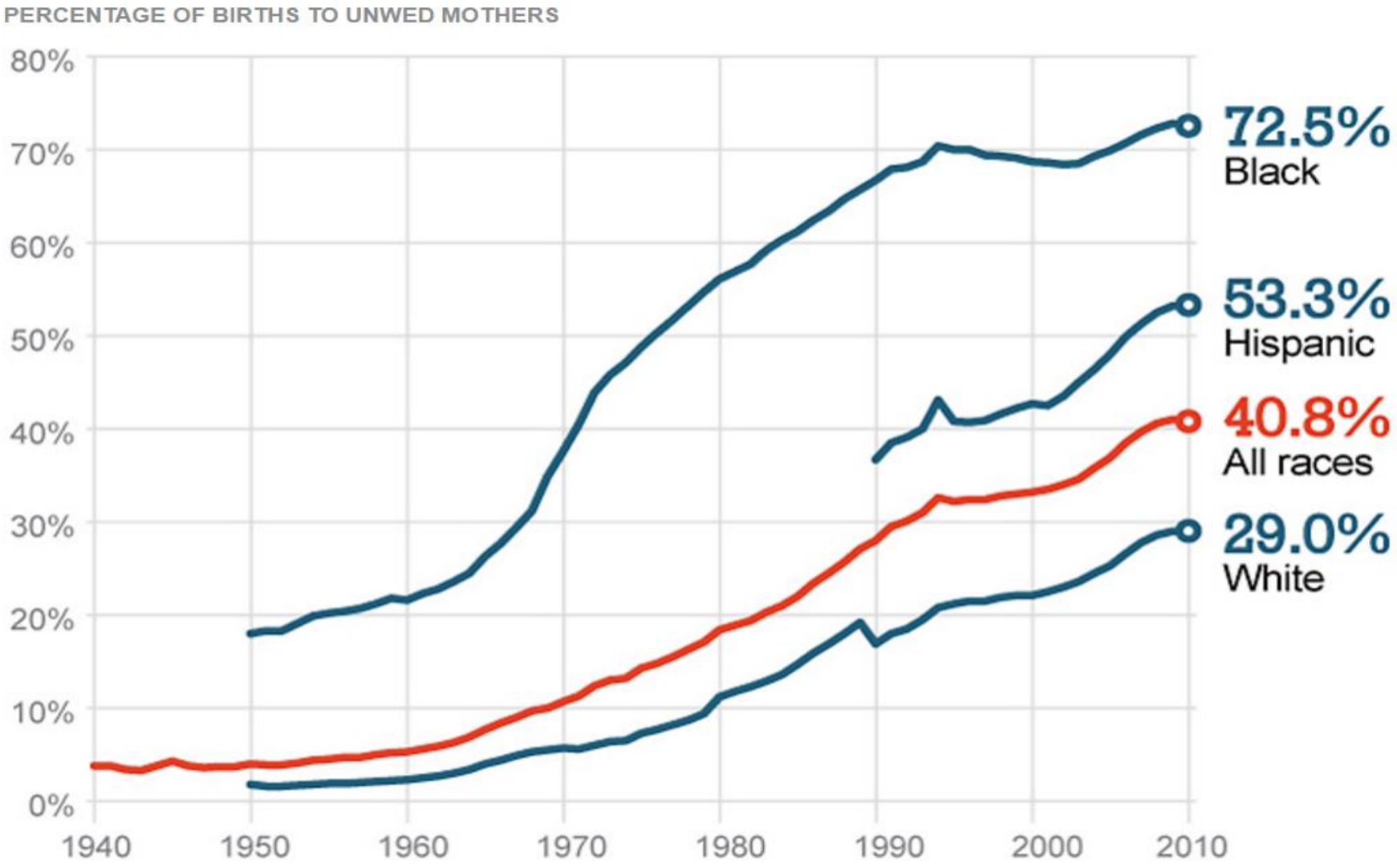
Before Kid (s)

$$If \;\; RW = w \; then \; indifferent \; to \; work \; versuss \; no \; wor$$

After Kid (s)

$$RW > w? \;\; OR \;\; RW < w$$


Poverty rate (percent)
100
90
80
70
60
50
40
30
20
10
0
Female-headed families
Two-parent families
1
2
3
4
5
6
7
8 or more
Number of children



Sources: U.S. Census Bureau, National Center for Health Statistics, 2011.

$$T = h + l$$
$$pc = wh + V$$

$$U = l^{\alpha} c^{\beta}$$

$$\frac{\partial U}{\partial l} = \alpha l^{(\alpha-1)} c^{\beta} = MU_l$$

$$\frac{\partial U}{\partial c} = \beta l^{\alpha} c^{(\beta-1)} = MU_c$$

$$\Gamma = U + \lambda[w(T-l) + V - pc]$$

$$\frac{\partial \Gamma}{\partial l} = MU_l - \lambda w = 0 \ldots.(1) \rightarrow pMU_l = \lambda w$$

$$\frac{\partial \Gamma}{\partial c} = MU_c - \lambda p = 0 \ldots.(2) \rightarrow MU_c = \lambda p$$

$$\Bigg\} \rightarrow \frac{\alpha c^*}{\beta l^*} = \frac{w}{p} \quad \ldots\ldots\ldots\ldots(4)$$

$$\frac{\partial \Gamma}{\partial \lambda} = 0 \Rightarrow w(T - l^*) + V - pc^* = 0 \ldots\ldots\ldots(3)$$

l* will give Leisure Demand Function. Using 3 and 4

$$pc^* = w(T - l^*) + V$$

$$c^* = \frac{\beta w}{\alpha p} l^*$$

$$\Bigg\} \; p\frac{\beta w}{\alpha p} l^* = w(T - l^*) + V = wT + V - wl^*$$

$$l^* = \frac{(wT + V)}{w\left(1 + \frac{\beta}{\alpha}\right)} = \frac{T}{\left(1 + \frac{\beta}{\alpha}\right)} + \frac{V}{w\left(1 + \frac{\beta}{\alpha}\right)}$$

$$l^* = \frac{(wT+V)}{w\left(1+\frac{\beta}{\alpha}\right)} = \frac{T}{\left(1+\frac{\beta}{\alpha}\right)} + \frac{V}{w\left(1+\frac{\beta}{\alpha}\right)}$$

$$c^* = \frac{\beta w}{\alpha p}\left[\left(\frac{T}{1+\frac{\beta}{\alpha}}\right) + \frac{V}{w\left(1+\frac{\beta}{\alpha}\right)}\right]$$

$$U^* = l^{*\alpha} c^{*\beta}$$

h* = T-l* will give Labor Supply Function.

$$h^* = T - l^* = T - \frac{(wT+V)}{w\left(1+\frac{\beta}{\alpha}\right)} = T - \frac{T}{\left(1+\frac{\beta}{\alpha}\right)} - \frac{V}{w\left(1+\frac{\beta}{\alpha}\right)}$$

$$\frac{\partial h^*}{\partial w} = \frac{V}{w^2\left(1+\frac{\beta}{\alpha}\right)} > 0$$

$$\varepsilon^S = \frac{w}{h^*}\frac{\partial h^*}{\partial w} = \frac{w}{h^*} \times \frac{V}{w^2\left(1+\frac{\beta}{\alpha}\right)} > 0$$

Substitution Effect (SE) & Income Effect (IE)

Substitution Effect From a wage change

$w\uparrow \rightarrow l\downarrow \rightarrow h\uparrow$: *Leisure More Expensive*

$w\downarrow \rightarrow l\uparrow \rightarrow h\downarrow$: *Leisure Less Expensive*

Income Effect From a wage change

$w\uparrow \rightarrow l\uparrow \rightarrow h\downarrow$: *Leisure Normal Good*

$w\downarrow \rightarrow l\downarrow \rightarrow h\uparrow$: *Leisure Normal Good*

Clash of SE and IE

$w\uparrow$ *Leisure Normal Good*

Substitution Effect $>$ *Income Effect* $:\rightarrow l\downarrow \rightarrow h\uparrow$

Substitution Effect $=$ *Income Effect* $:\rightarrow l$ *unchanged* $\rightarrow h$ *unchanged*

Substitution Effect $<$ *Income Effect* $:\rightarrow l\uparrow \rightarrow h\downarrow$

$w\downarrow$ *Leisure Normal Good*

Substitution Effect $>$ *Income Effect* $:\rightarrow l\uparrow \rightarrow h\downarrow$

Substitution Effect $=$ *Income Effect* $:\rightarrow l$ *unchanged* $\rightarrow h$ *unchang*

Substitution Effect $<$ *Income Effect* $:\rightarrow l\downarrow \rightarrow h\uparrow$

Practice Problems: Find l*,h*, U*, Elasticity of Labor supply for the following utility functions

1] $\underset{\{l,c\}}{Max}\ \ q = f(l,c) = l^{\alpha} + c$

2] $\underset{\{l,c\}}{Max}\ \ q = f(l-\bar{l}, c-\bar{c}) = \left(l-\bar{l}\right)^{\alpha} + \left(c-\bar{c}\right)$

3] $\underset{\{l,c\}}{Max}\ \ q = f(l,c) = \alpha l + \beta c$

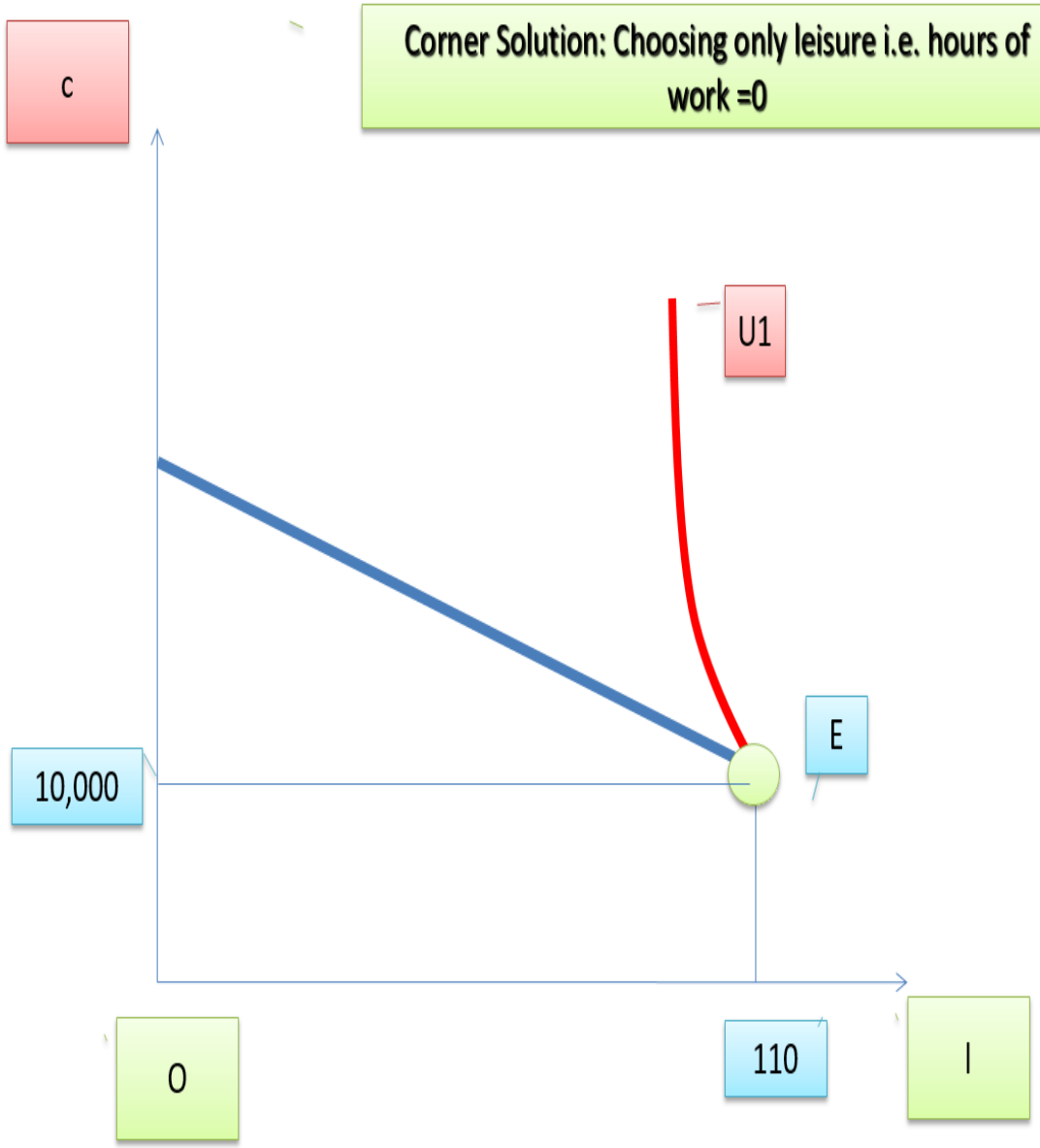
4] $\underset{\{l,c\}}{Max}\ \ q = f(l,c) = Min\{\alpha l, \beta c\}$

The constraints are the same in each case of utility function

$s.t\ \ pc = wh + V$

$s.t.\ T = l + h$

Graphical and Parametric : Corner Solution: Little More Detail



$$w \leq RW$$

OR

$$|MRS| > |Real \quad Wage|$$

$$Or, \frac{MU_l}{w} > \frac{MU_c}{p}$$

All Play No Work

$$l^* = T.....(3)$$

$$h^* = T - l^* = 0..(4)$$

$$c^* = V.....(5)$$

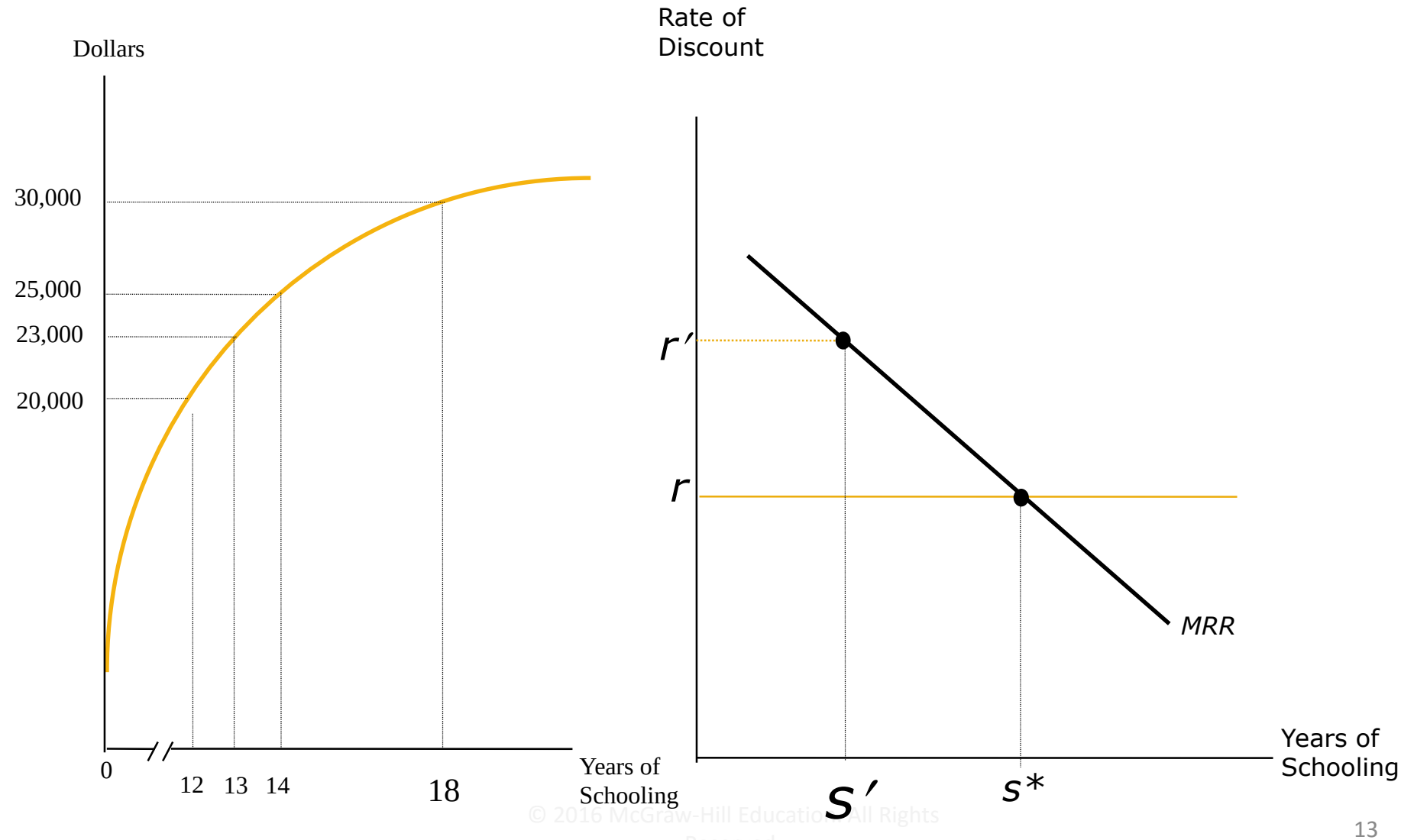
$$U^* = (l^*)^{\alpha} \times (c^*)^{\beta}$$

$$U^* = T^{\alpha} V^{\beta}....(6)$$

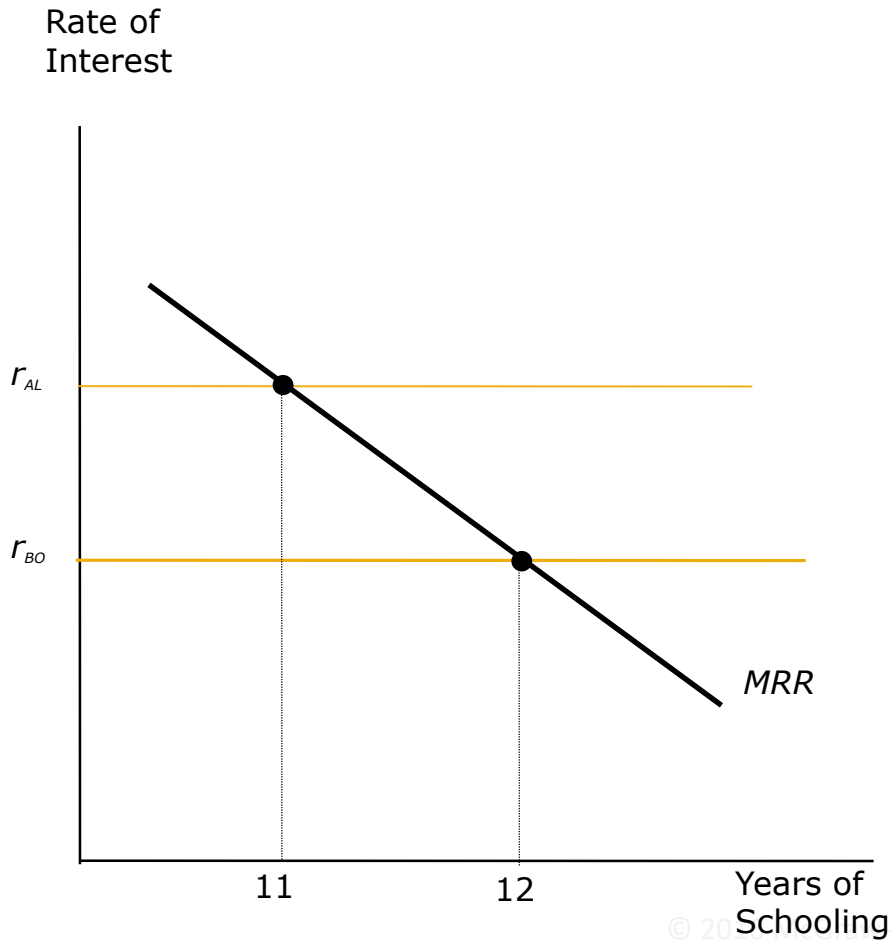
Policy Question: Returns to Education: Human Capital/ Signaling

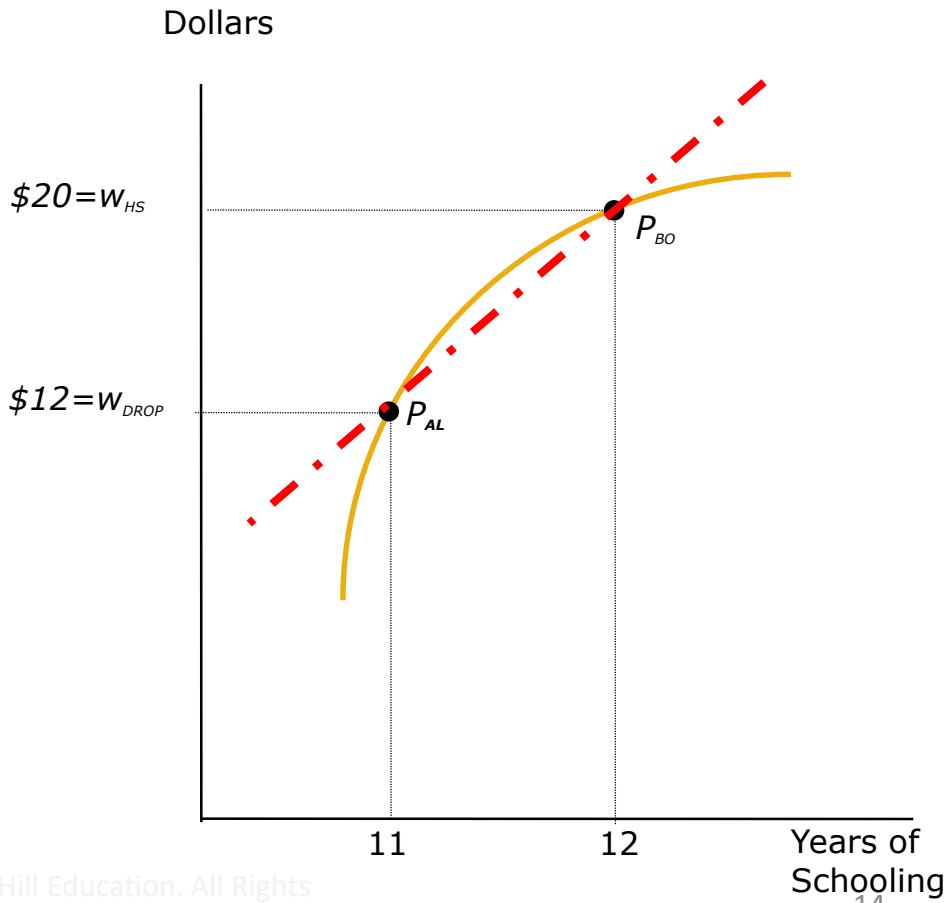
If your years of schooling increases by 1 unit how much does your per hour wage increase?

Schooling Model: The Wage-Schooling Locus & it's slope [Marginal Rate of Return (MRR)]

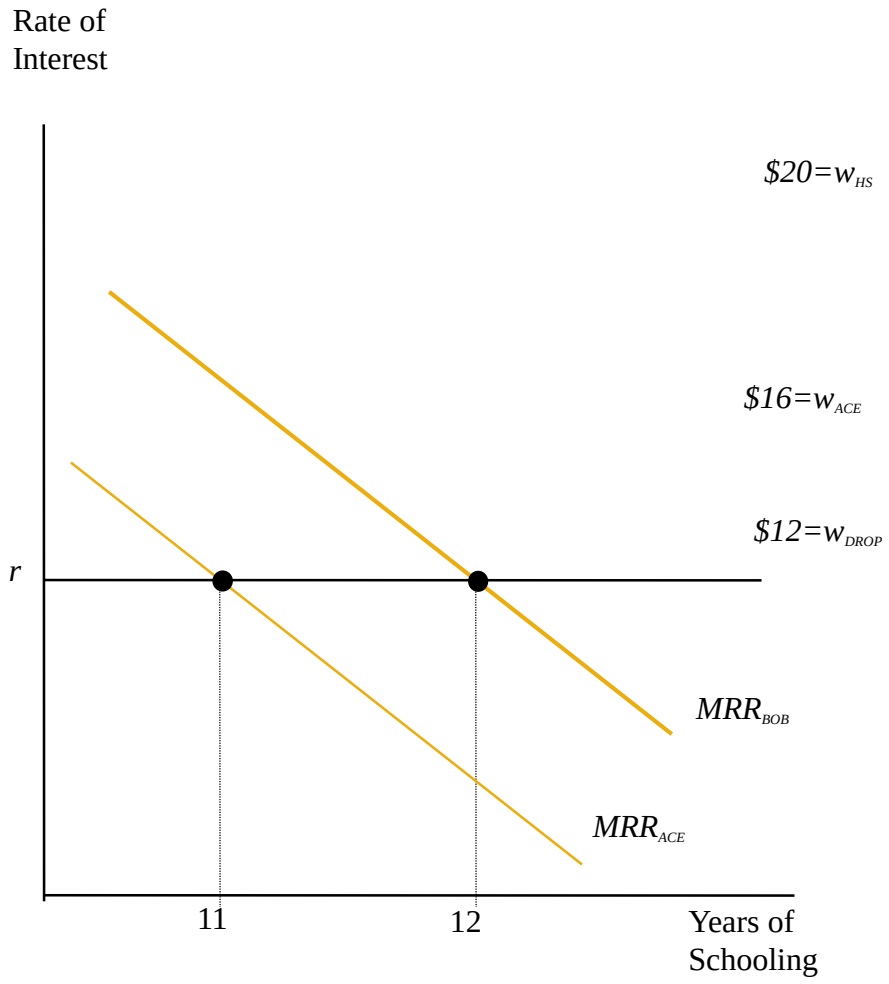


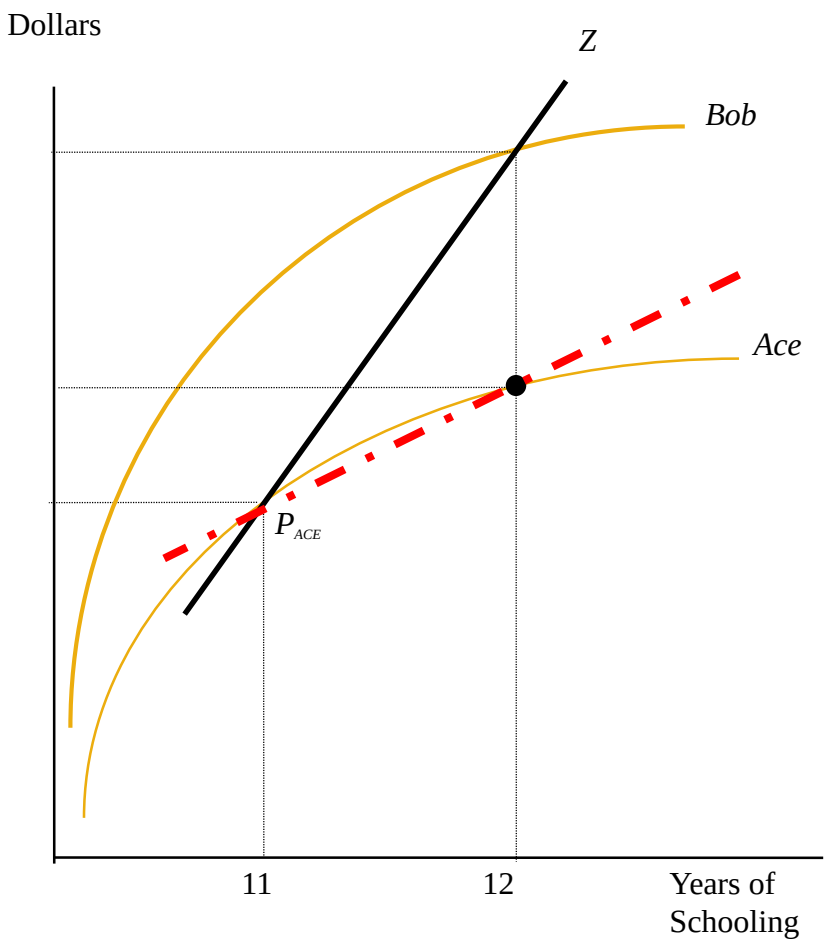
Schooling and Earnings When Workers Have Different Rates of Discount (what do discount rates depend on?)





Schooling and Earnings When Workers Have Different Abilities (what is ability?)

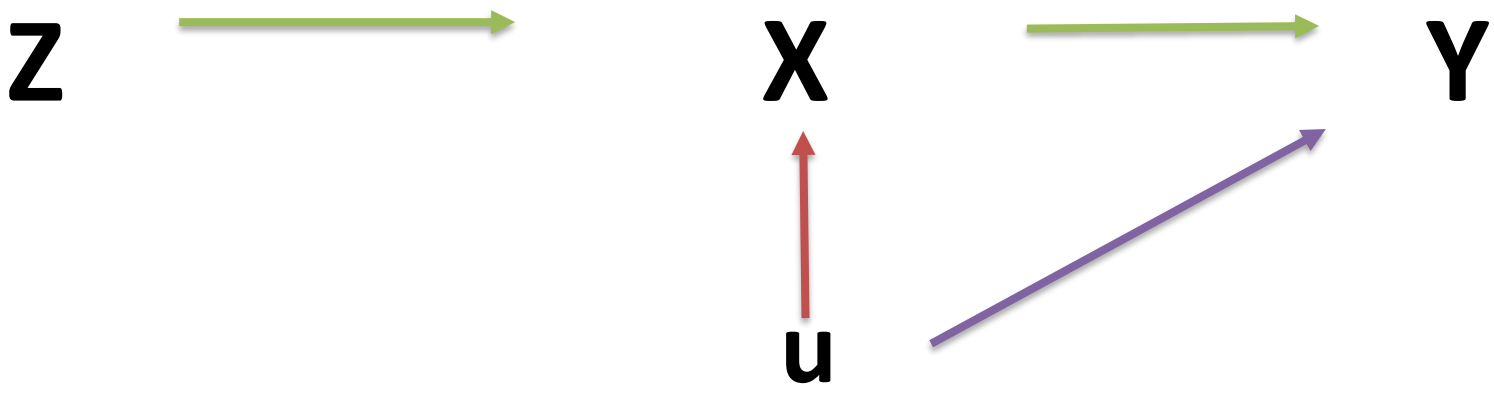




Consequences of Ability Bias

- The extent to which unobserved ability differences exist affects estimates on returns to schooling, since the ability difference may be the true source of the wage differential.
- Suppose high school grads earn $15,000 more than high school dropouts. Should government fund programs for high school completion? Appears that program may “pay for itself”(erroneous perception)

Visual Demonstration of the Solution: IV/Natural Experiment (DiD)/RD/:



$$IV: Strong / Weak$$

$$\text{cov}(z_i, x_i) \neq 0$$

$$IV: Valid / Invalid$$

$$\text{cov}(z_i, u_i) = 0$$

Today's Paper: Vive la Re´volution

Table 1
Descriptive Statistics

Variable	Mean	Standard Deviation
Cohort dummy:		
1946	.128	.33
1947	.140	.35
1948	.145	.35
1949	.148	.35
1950	.145	.35
1951	.145	.35
1952	.148	.35
Education dummy:		
Less than *baccalauréat*	.718	.45
Baccalauréat only	.096	.29
University diploma (*bac* + 2)	.074	.26
University degree	.111	.31
Years of higher education	1.440	2.47
Wage (log)	9.170	.49
Middle-class family background	.246	.43
N	26,371	26,371

SOURCE.—Labor Force Survey 1990, 1993, 1996, and 1999.
NOTE.—Sample is male wage earners born between 1946 and 1952.

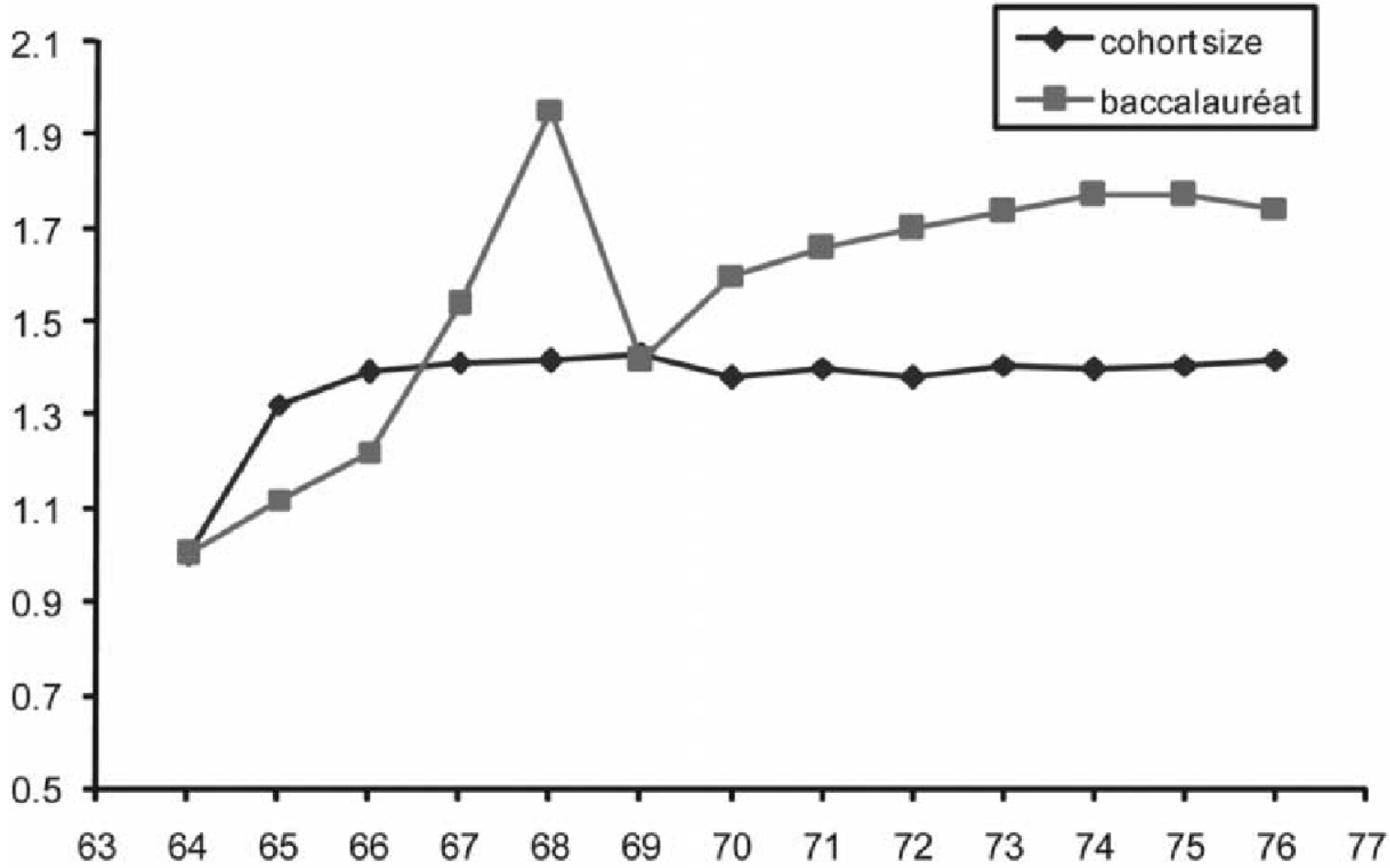


FIG. 1.—Trends in the number of *bacheliers* and in cohort size. The size of the cohort for year t corresponds to the number of persons born at $t - 19$ (19 is the median age of candidates). The two series are normalized to one in 1945. Source: French Ministry of Education (number of *bacheliers*) and the French Statistical Office (cohort size).

Table 2
Distribution of Education across Male Workers, by Year of Birth (%)

		Greater than *Baccalauréat*		
	Baccalauréat Only (1)	All (2)	Diploma (*Bac* + 2) (3)	Degree+ (> *Bac* + 2) (4)
1946	9.9 (.4)	17.4 (.6)	6.3 (.3)	11.0 (.5)
1947	9.0 (.4)	18.8 (.6)	7.1 (.4)	11.8 (.5)
1948	9.1 (.4)	19.0 (.6)	6.9 (.4)	12.1 (.5)
1949	9.8 (.4)	20.3 (.6)	8.6 (.4)	11.6 (.5)
1950	9.8 (.4)	18.4 (.6)	8.0 (.4)	10.4 (.5)
1951	9.8 (.4)	17.9 (.6)	7.5 (.4)	10.4 (.5)
1952	9.8 (.4)	17.8 (.6)	7.3 (.4)	10.4 (.5)

SOURCE.—Labor Force Survey 1990, 1993, 1996, and 1999.
NOTE.—Sample is male wage earners. Standard deviation is in parentheses.

IV 1: Birth Cohorts

- 1949 birth cohorts were the treatment cohorts
- In 1968 the affected cohort should be 19 years old (repeating class in secondary education system is pretty common)
- In our analysis we choose 1946 and 1952 as comparison cohorts as they are less likely to be affected by the relaxation of examination standards in 1968

Equations/ Empirical Strategy

We write the labor market outcomes (w_i) of worker i from cohort c_i at age a_i as follows:

$$w_i = \alpha n_i + \beta a_i + \gamma c_i + u_i, \quad (1)$$

where n_i represents years of education and u_i represents unobserved determinants of wages (such as ability). In what follows, w_i will represent either the wage earned or occupational status of i.

$$n_i = d_{47}C_{i47} + d_{48}C_{i48} + d_{49}C_{i49} + d_{50}C_{i50} + d_{51}C_{51} + \theta c_i + v_i, \quad (2)$$

$$w_i = \alpha n_i + \beta a_i + d_{c_i} + e_{f_i} + u_i, \quad (3)$$

Main assumption

- *C* does not affect labor market outcomes *i*49 other than through an individual's educational attainment
- If weaker students would join the political process (& bargaining with authorities for lax exams) more to change exam standards; then it would have an impact on this cohorts wages

Data

- French Labor Force Survey (LFS) for the years 1990, 1993, 1996, and 1999.
- These 4 years were selected because the sample rotates every 3 years, and we wish to observe each person only once.
- The LFS is a large representative sample of the French population of age 15 and above. There are around 10,000 respondents per cohort in our pooled sample.
- Only **male workers** considered

Table 4
Impact of Birth Cohort on the Education and Labor Market Outcomes of Male Workers

	Baccalauréat Only (1)	At Least University Diploma (*Bac* + 2 or More) (2)	At Least University Degree (*Bac* + 3) (3)	Years of Higher Education (4)	Log Wage (5)	*Cadre* (Upper-White-Collar Occupation) (6)
1947	−.009 (.006)	.014 (.008)	.008 (.006)	.060 (.050)	.006 (.010)	.001 (.008)
1948	.007 (.006)	.015 (.008)	.012 (.006)	.080 (.050)	.031 (.010)	.008 (.008)
1949	−.001 (.006)	.027 (.008)	.009 (.006)	.150 (.050)	.021 (.010)	.016 (.008)
1950	−.001 (.006)	.008 (.008)	−.002 (.006)	.030 (.050)	.005 (.010)	.000 (.008)
1951	−.005 (.006)	.002 (.008)	−.001 (.006)	.010 (.050)	.003 (.010)	.003 (.008)
Trend	−.000 (.001)	.001 (.008)	−.001 (.001)	.005 (.010)	.010 (.002)	−.005 (.001)
Age	−.000 (.001)	.001 (.008)	.000 (.001)	.004 (.005)	.023 (.001)	.003 (.001)
N	26,370	26,370	26,370	26,370	26,370	26,370

SOURCE.—Labor Force Survey 1990, 1993, 1996, and 1999.

NOTE.—Sample is male wage earners born between 1946 and 1952. Coefficients for the worker's cohort dummy are relative to the comparison cohorts of 1946 and 1952. Standard deviation is in parentheses.

Table 5
Evaluation of the Return to Education Using 1949 as an Instrumental Variable

	Log Wage		Upper-White-Collar Occupation (*Cadre*)	
	OLS (1)	IV (2)	OLS (3)	IV (4)
Years of higher education	.0940 (.0020)	.1400 (.0600)	.0970 (.0010)	.1030 (.0410)
Cohort trend	.0100 (.0020)	.0100 (.0200)	−.0056 (.0015)	−.0057 (.0017)
Age	.0230 (.0010)	.0230 (.0020)	.0034 (.0009)	.0033 (.0011)
N	11,171	11,171	11,171	11,171
R^2	.25	. . .	.36	. . .

SOURCE.—Labor Force Survey 1990, 1993, 1996, and 1999.

NOTE.—OLS = ordinary least squares; IV = instrumental variable. Sample is male wage earners born in 1946, 1949, or 1952. Standard deviation is in parentheses.

Academic Contribution

- The intervention is one-off, unexpected, and temporary: it has no consequences for cohorts coming after the 1968
- the treatment group in this article is composed of those on the margin of the higher education system
- 14% return to higher education
- Issues with the paper?