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14.771 Development Economics: Microeconomic issues and Policy Models

Fall 2008

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14.771: Labor Lecture 1

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November 2008

Outline

- Today: how efficient are labor markets
  - Motivation: the surplus labor hypothesis
  - How well do labor markets work in developing countries?
    - Rural
    - Implications of having rural labor markets
    - Urban
  - Labor market regulation
- Next time: migration

Motivation

- Many people have observed high rates of "unemployment" or "underemployment" in rural areas
- For example, data from Walker and Ryan (1990 ICRISAT study)
  - Men – 19% (slack season 39%, peak season 12%)
  - Women – 23% (slack season 50%, peak season 11%)
  - But labor markets exist: 60-80% of labor use is hired

Surplus labor

- Lewis (1954), drawing on even older theories (e.g., Marx), argued that there was "surplus labor" in the countryside. He argued that "about 25%" of labor had zero marginal value.
  - Claim: you can move labor from countryside to cities without decreasing agricultural output
  - This would mean that either:
    - The marginal product of labor is zero because the agricultural production function is Leontief.
    - Labor supply is totally elastic at some reservation wage rate.

Shultz's (1964) test

- One of the earliest natural experiment studies
- Studies the 1917-1918 influenza epidemic, which killed 6% of the population and reduced the workforce by about 8%
- Idea: if there really was 25% surplus labor, then agricultural output would not fall!
- Empirics:
  - Compares output in 1919–1920 to 1916-1917, which had similar weather
  - Looks at whether provinces with greater influenza deaths had greater declines in output
  - Examines acres sown, since does not have direct data on output

Shultz's (1964) test

Deaths Attributed to Influenza Epidemic of 1918-19, and Predicted and Observed Effects on Agricultural Production for India and Major Provinces of India

Province and all India	*A measure of the distribution of deaths (per 100 population)*	*Adjusted distribution of deaths (per 100 population)*	*Predicted reduction in agricultural production (in percent)*	*Observed reduction in acreage sown to crops (in percent)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Central Province and Berar	6.64	15.60	8.32	7.00
Bombay	5.49	12.90	6.88	2.10
Punjab	4.54	10.67	5.69	8.20
North West Frontier Province	4.36	10.25	5.47	7.00
United Province	4.34	10.20	5.44	6.60
Bihar-Orissa	2.05	4.82	2.57	+0.50
Assam	1.86	4.37	2.33	3.60
Madras	1.67	3.92	2.09	2.20
Burma	1.39	3.27	1.74	+4.00
Bengal	0.85	2.00	1.07	1.40
All British India	2.64	6.20	3.30	3.80

Figure by MIT OpenCourseWare.

Shultz's (1964) test

- Finds elasticity of output with respect to population of about 0.4, statistically significant with only 10 states!
- Does this rule out surplus labor? What assumptions would be required?
    - Land would need to be reallocated

Benjamin (1992)

- Question: how effecient are rural labor markets?
- Test of this: are production and consumption decisions 'separable'? This is the 'separation hypothesis'.
- Theoretical idea: with fully functioning efficient markets, households can freely buy or sell labor at wage w.
- Households therefore choose:
  - The labor input for their farms to maximize profits given wage w
  - The optimal labor/leisure tradeoff for the family given w
- With full ability to buy and sell labor at w there is no reason these two decisions should be related
- Empirical test: do household demographic characteristics (which should affect labor supply) affect labor demand for the family firm?
- Related to a milder view of "surplus labor": if there are labor market frictions, you may employ labor on your farm even if the marginal product is below the outside market wage. You'll do you more of this if you have more people available in your household.

Separation

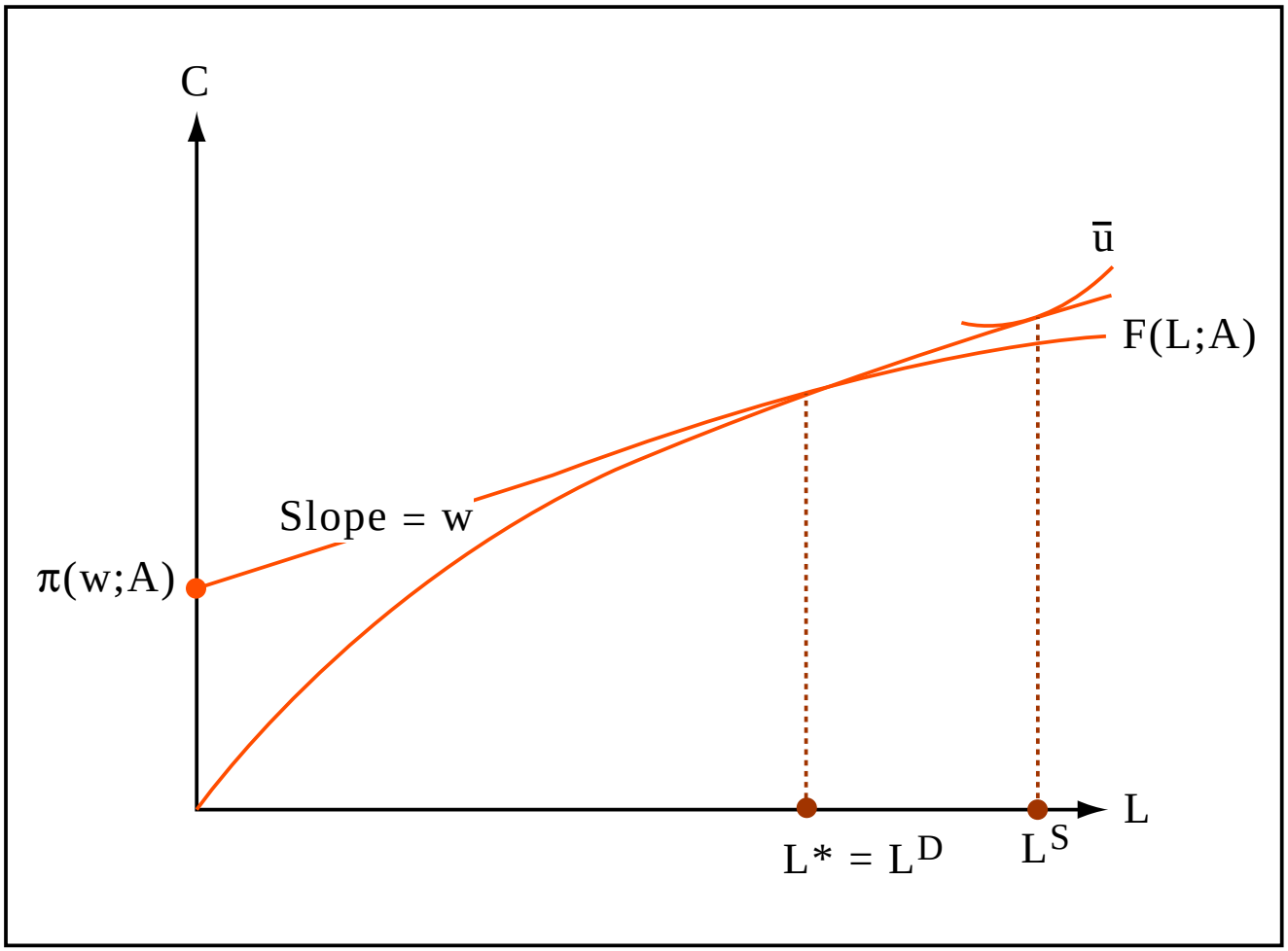


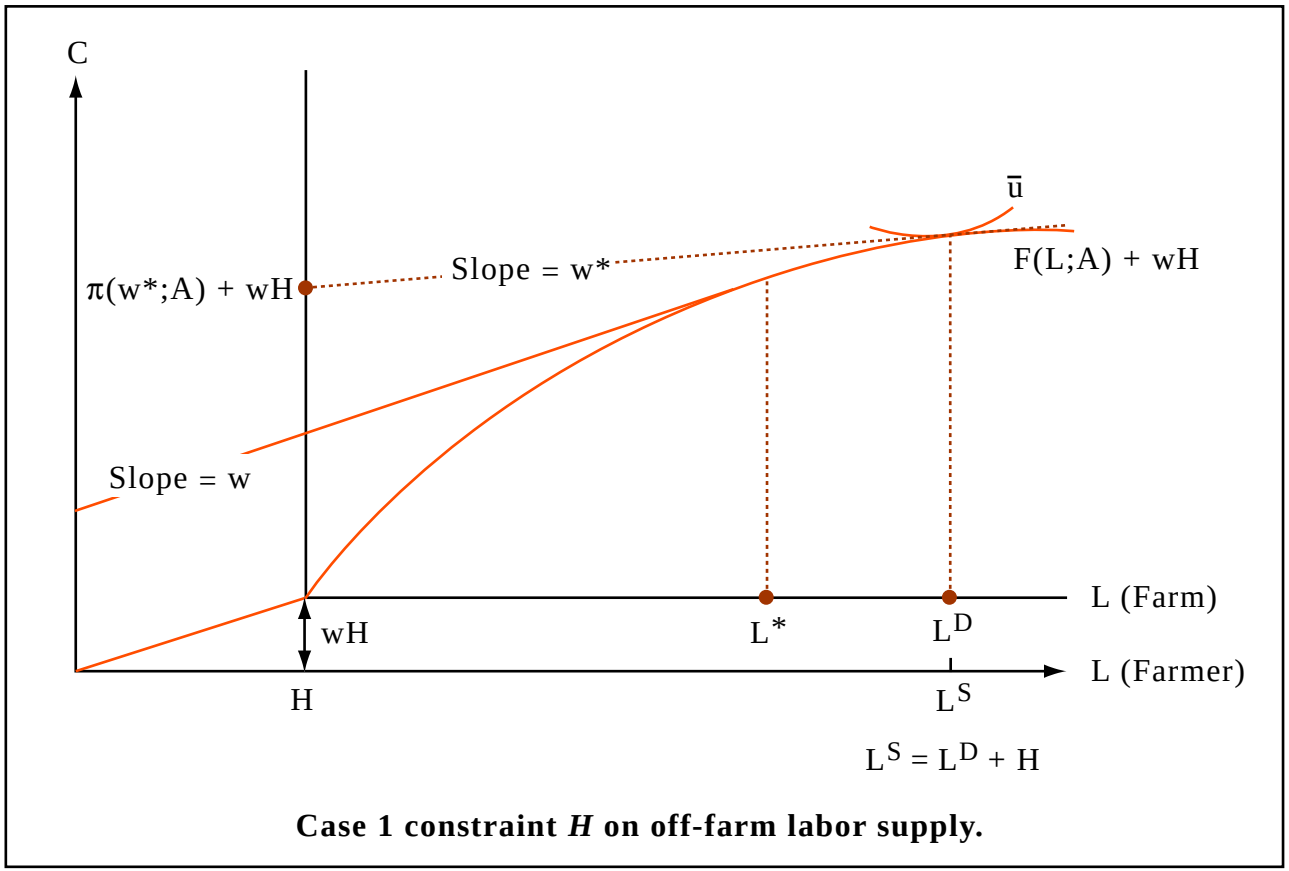
Figure by MIT OpenCourseWare.

Limits to separation

- When might separation not hold?
  - Minimum wage (implies maximum number of hours worked outside farm)
  - Imperfect labor markets (outside wage lower than inside wage)
  - Agency problems on land (efficiency of outside labor is lower)
  - Other market failures?

Examples of non-separation

- Suppose there is rationing (at H) in amount of off-farm work, because off farm wage is "too high". "Slack season"

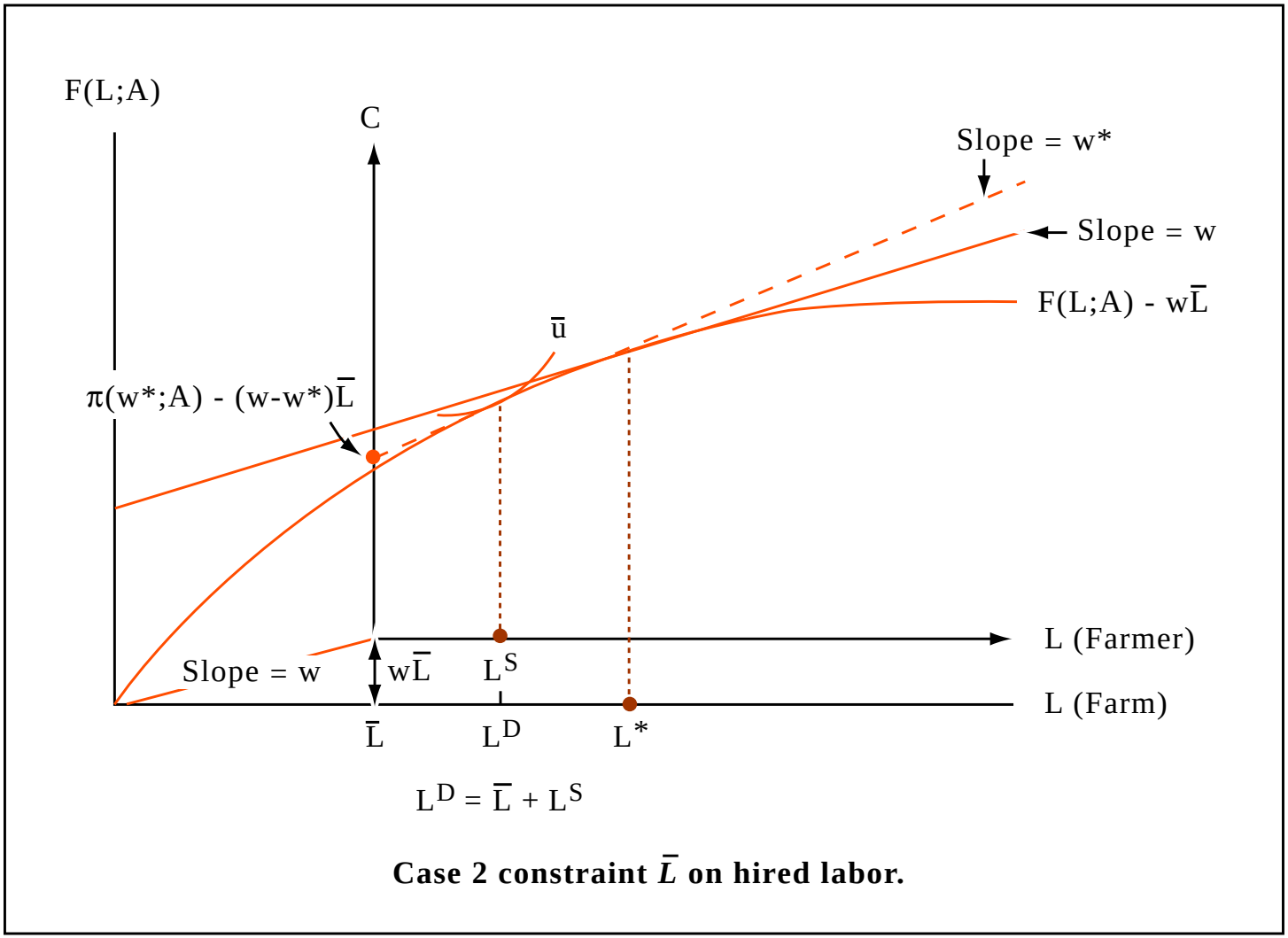


Case 1 constraint *H* on off-farm labor supply.

Figure by MIT OpenCourseWare.

Examples of non-separation

- Suppose there is rationing on hired labor at $\bar{L}$, because market wage is "too low." "Peak season"



Case 2 constraint $\bar{L}$ on hired labor.

Figure by MIT OpenCourseWare.

Limits to separation

- Hired labor costs more than farmer's return to off-farm employment ($w_I > w_O$). E.g., agency problems in farm labor.

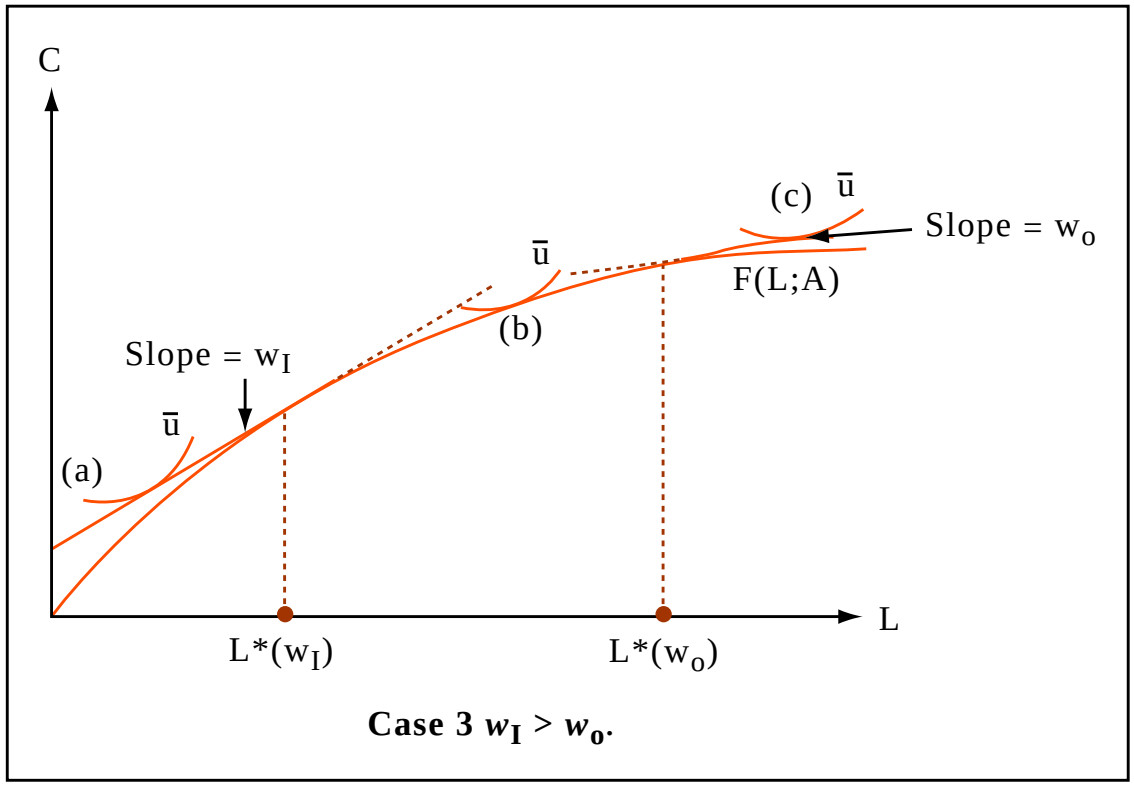


Figure by MIT OpenCourseWare.

- Note: empirics in case (a) depends on whether this is really a different in wage (in which case it looks like separation) or whether it is due to unobserved effective efficiency (in which case it doesn't look like separation)

Empirics

- Data:
  - 1980 SUSENAS from Java
- Estimation strategy:
  - Estimate labor demand, and see if it depends on demographics

$$\log L = \alpha + \beta \log w + \theta \log A + \delta_0 \log n + \sum_{i=1}^{D-1} \delta_i \frac{n_i}{n} + \varepsilon$$

Empirical issues: division bias

- Benjamin mentions a concern about "division bias." What is this?
- He calculates the wage by dividing the total wage bill by labor demand, i.e., $w = \frac{wages}{L}$
- Suppose L is measured with error, i.e., $L = L^* + v$
- You regress

$$L = \alpha + \beta \log w + \varepsilon$$

- Substituting for the measurement you get

$$L^* + v = \alpha + \beta \left(\log wages - \log L^* - \log v \right) + \varepsilon$$

- So now x is negatively correlated with the error term, which yields a downward bias of β
- Solution: instrument for wages with something uncorrelated with L^*, in his case, the wages of everyone else in the village

Empirical issues: simultaneity bias

- Wages are not exogenous – they are determined by the equilibrium of supply and demand.
- Regressing labor quantity on wage does not necessarily recover labor demand elasticity (the object of interest).
- For example, an aggregate labor demand shock, such as a positive productivity shock to agriculture, would increase labor demand and increase the wage, biasing the coefficient upward
- This is the classic argument for IV – we need instruments for labor supply that do not affect labor demand
- Benjamin uses population density to instrument for labor supply. Good instrument?

Empirical issues: endogeneity of household size

- Key question: under the null of separation between labor supply and labor demand ($\delta = 0$), can endogenous household size generate a false rejection of the null?
- Note what is not a problem:
  - Suppose separation does not hold, and household size expands to meet periods of peak labor demand.
  - Then we would find $\delta \neq 0$, because we'd find greater household size leads to greater labor demand.
  - That might be biased in the sense that we're not identifying the causal impact of exogenous household size on labor demand
  - BUT it would lead us to reject the null that $\delta = 0$, and it would do so precisely because $\delta \neq 0$.
- What could be a problem?
  - Family labor is measured more accurately than hired labor.
  - Omitted variables, i.e., better land quality $\rightarrow$ higher income $\rightarrow$ more kids and better land qualtiy $\rightarrow$ more labor demand
- His solution: district controls, cluster fixed effects, etc.

Results

- Most farmers have a mix of hired labor, family labor, and working outside farm: suggests fluid labor market

Cross Tabulation of Hiring-In and "Hiring-Out" for Rice Farmers

		Hired labor	*No hired labor*
Use family labor?	Yes	94.5	5.5
Wage employment last year?	Yes	46.0	2.0
	No	48.5	3.5
Nonagricultural employment last year?	Yes	82.3	4.9
	No	12.2	0.6
Work off-farm last week?	Yes	39.8	1.9
	No	54.7	3.6

Figure by MIT OpenCourseWare.

Results

Demand for Pre-Harvest Labor
Dependent Variable: Log Person Days Employed
(Standard Errors in Parentheses)
(p Values for F Tests)

	Parsimonious OLS	*Full OLS*	*Excluding children OLS*	*Within cluster*	*2SLS (meas. error)*	*2SLS (simultaneity)*	*2SLS (simultaneity and log h)*	*Means*
Intercept	4.780	2.085	2.255		2.343	2.657	2.623	
	(0.119)	(0.533)	(0.532)		(0.543)	(0.682)	(0.663)	
Log area harvested	0.680	0.680	0.682	0.696	0.686	0.757	0.742	-0.823
	(0.018)	(0.017)	(0.017)	(0.018)	(0.018)	(0.036)	(0.038)	
Log wage	-0.296	-0.274	-0.274		-0.315	-0.939	-0.894	0.912
	(0.027)	(0.026)	(0.026)		(0.040)	(0.252)	(0.231)	
Log pesticide price		0.139	0.139	-0.058	0.149	0.157	0.155	2.663
		(0.042)	(0.042)	(0.062)	(0.043)	(0.051)	(0.050)	
Log fertilizer price		0.407	0.409	0.401	0.367	0.409	0.405	4.301
		(0.111)	(0.111)	(0.107)	(0.117)	(0.135)	(0.132)	
Not irrigated		-0.147	-0.147	-0.070	-0.172	-0.156	-0.157	0.385
		(0.034)	(0.034)	(0.053)	(0.035)	(0.042)	(0.041)	
Log household size	0.043	0.078	0.068	0.052	0.097	0.032	0.039	1.471
	(0.045)	(0.046)	(0.044)	(0.045)	(0.049)	(0.059)	(0.057)	
Prime male fraction	-0.058	0.079	-0.075	0.127	0.094	0.015	0.023	0.256
	(0.108)	(0.105)	(0.127)	(0.100)	(0.109)	(0.130)	(0.127)	
Prime female fraction	-0.163	0.019	-0.133	0.106	0.067	0.004	0.004	0.272
	(0.128)	(0.128)	(0.109)	(0.116)	(0.131)	(0.156)	(0.152)	
Elderly male fraction	0.043	0.279	0.129	0.194	0.280	0.208	0.220	0.055
	(0.145)	(0.187)	(0.167)	(0.171)	(0.198)	(0.230)	(0.224)	
Elderly female fraction	-0.076	0.166		0.085	0.129	0.051	0.053	0.051
	(0.151)	(0.163)		(0.150)	(0.173)	(0.203)	(0.198)	
Age of head		0.013	0.014	0.009	0.010	0.012	0.012	45.588
		(0.007)	(0.007)	(0.006)	(0.007)	(0.009)	(0.009)	
Age squared		-0.00015	-0.00010	-0.0001	-0.0001	-0.0001	-0.0001	2241.534
		(0.00008)	(0.00007)	(0.00007)	(0.00008)	(0.00009)	(0.00009)	
F Education of head		2.91	3.06	1.83	2.95	1.38	1.45	
		(0.008)	(0.006)	(0.089)	(0.007)	(0.22)	(0.189)	
F Kabupaten soil		7.92	7.95		8.69	6.76	7.06	
		(0.0001)	(0.0001)		(0.0001)	(0.0001)	(0.0001)	
F Kabupaten climate		13.05	13.34		7.23	3.56	3.86	
		(0.0001)	(0.0001)		(0.0001)	(0.014)	(0.009)	
Sugar regency		0.135	.135		0.115	0.110	0.111	0.447
		(0.033)	(0.033)		(0.035)	(0.041)	(0.040)	
F Dems	1.19	1.03	1.55	0.53	1.03	0.237	0.279	
	(0.311)	(0.399)	(0.18)	(0.756)	(0.396)	(0.948)	(0.924)	
R-Squared	0.525	0.591	.591	0.872	0.6017	0.473	0.408	
Wu-Hausman					3.67	(7.05)	(7.75)	

Figure by MIT OpenCourseWare.

Results

Implied Demographic Elasticities from Table IV
(Standard Errors in Parentheses)

Specification:	*Elasticity of labor demand with respect to additional household members:*						
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Type of member:							
Prime age male	0.012	0.028	0.010	0.027	0.032	0.007	0.010
	(0.024)	(0.025)	(0.018)	(0.024)	(0.026)	(0.031)	(0.030)
Prime age female	-0.016	0.013	-0.004	0.022	0.027	0.005	0.006
	(0.025)	(0.027)	(0.019)	(0.025)	(0.028)	(0.003)	(0.032)
Elderly male	0.008	0.017	0.013	0.010	0.017	0.012	0.013
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)
Elderly female	0.001	0.010	0.006	0.003	0.008	0.003	0.004
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Child (< 15 yrs)	0.038	0.011		-0.007	0.012	0.005	0.006
	(0.018)	(0.017)		(0.016)	(0.018)	(0.020)	(0.021)

Specifications: (1) Parsimonious OLS. (2) OLS with full set of control variables. (3) OLS with full set of control variables, but children under 15 yrs. excluded from household size. (4) Within cluster estimation. (5) 2 SLS for correction of measurement error of wage. (6) 2SLS for correction for potential simultaneity of wage. (7) 2SLS for correction for potential simultaneity of wage and adjustment of area harvested.

Figure by MIT OpenCourseWare.

Results

- Finds demography does not affect labor demand
- Interprets this as evidence that labor demand and labor supply are 'separable' – i.e., rural labor markets actually work pretty well.
- Do you find this persuasive?

Jayachandran (2006)

- Benjamin's paper suggests that rural labor markets exist and are relatively active
- This implies that rural households' earnings depend not just on their own farm's productivity, but are also determined by the aggregate wage rate
- Jayachandran's idea:
  - The rural wage will be more inelastic if workers are unable to smooth shocks. In particular it will be more inelastic if there is:
    - Less access to credit
    - Lower ability to migrate
  - Inelastic wages imply larger impacts of productivity shocks on rural welfare.
  - They also imply a pecuniary externality – it is not just your own ability to smooth that affects your ability to cope with shocks, but the ability of everyone else around to smooth also affects your welfare.

Empirical idea

- Empirical goal: estimate labor supply elasticity
- Therefore we need an instrument for labor demand
- Jayachandran uses rainfall shocks as instrument for labor demand:
  - *Rainshock* $= 1$ if above 80th percentile of rain, 0 if between 20th and 80th, and -1 if below 20th percentile
- Estimating equation:

$$w_{jt} = \beta_1 A_{jt} + \beta_2 S_{jt} + \beta_3 S_{jt} \times A_{jt} + \beta_4 X_{jt} + \beta_5 X_{jt} \times A_{jt} + \delta_t + \alpha_j + \varepsilon_{jt}$$

  where key coefficients of interest are β_3
- Instruments for A_{jt}, $S_{jt} \times A_{jt}$, $X_{jt} \times A_{jt}$ with $Rainshock_{jt}$, $S_{jt} \times Rainshock_{jt}$, $X_{jt} \times Rainshock_{jt}$

First stage

	Dependent variable		
	Log crop yield: OLS (1st stage)	*Log agricultural wage: OLS*	*Log agricultural wage: Instrumental variables*
	(1)	*(2)*	*(3)*
Rainshock	.070*** (.007)		
Rainshock x %Agrarian	.003 (.005)		
Log crop yield		.035*** (.012)	.167** (.084)
Log crop yield x %Agrarian			-.009 (.039)
Observations	8,222	8,222	8,222
District and year fixed effects?	Yes	Yes	Yes

Figure by MIT OpenCourseWare.

Results

Banking and the Elasticity of the Wage
Dependent Variable: Log Agricultural Wage, 1956-87

	Measure of banking		
	Bank deposits per capita	*Bank credit per capita*	*Bank branches per capita*
	(1)	*(2)*	*(3)*
Log crop yield	.162** (.083)	.158* (.083)	.138* (.082)
Banking			-.049** (.021)
Log crop yield x banking	-.091** (.036)	-.075* (.044)	-.033* (.019)
Observations	7,678	7,614	8,080
District and year fixed effects?	Yes	Yes	Yes

Figure by MIT OpenCourseWare.

Results

Access to Neighboring Areas and the Elasticity of the Wage
Dependent Variable: Log Agricultural Wage, 1956-87

	Measure of access to neighboring areas			
	Road density (km/km^2)	*Bus service (% of villages)*	*Railway (% of villages)*	*Closeness to city (km^{-1})*
	(1)	*(2)*	*(3)*	*(4)*
Log crop yield	.133* (.080)	.147* (.076)	.162** (.082)	.171** (.084)
Access	-.026 (.020)			
Log crop yield x Access	-.111 (.083)	-.095* (.046)	-.098* (.051)	-.050 (.039)
Observations	7,965	7,838	7,838	8,222
District and year fixed effects?	Yes	Yes	Yes	Yes

Figure by MIT OpenCourseWare.

Results

Poverty, Land Inequality, and the Elasticity of the Wage
Dependent Variable: Log Agricultural Wage, 1956-87

	District trait			
	Poverty		*Land Inequality*	
	Average expenditure	*Poverty head count*	*%Landless*	*Gini coefficient*
	(1)	*(2)*	*(3)*	*(4)*
Log crop yield	.183** (.090)	.181** (.091)	.121 (.084)	.186** (.091)
District trait			-.059** (.026)	
Log crop yield x district trait	-.034 (.028)	-.002 (.045)	-.157*** (.056)	-.005 (.048)
Observations	7,934	7,934	8,222	7,711
District and year fixed effects?	Yes	Yes	Yes	Yes

Figure by MIT OpenCourseWare.

More on flexible labor markets and shocks

- Jayachandran shows using micro-data that agricultural wages respond to productivity shocks
- Do they respond enough for markets to clear? Is this true for an entire economy?
- Smith et al (2002) examine the case of the Asian financial crisis in Indonesia
  - This is a massive shock: currency drops from Rp.2,500/$ to as low as Rp.14,000, real GDP declines by 13% in 1998
  - Question: how much of this absorbed by unemployment, and how much by changes in real wages?

Results

Provinces:	*% Change between 1986 and 1997*			*% Change between 1997 and 1998*		
	All	*IFLS*	*IFLS2+*	*All*	*IFLS*	*IFLS2+*
	(1)	*(2)*	*(3)*	*(1)*	*(2)*	*(3)*
Males						
Wage	40.3	41.5	42.2	-37.8	-38.1	-36.0
Urban sector	36.2	37.1	37.3	-40.6	-40.9	-38.6
Rural sector	38.2	38.7	39.4	-35.6	-35.9	-33.7
% Working	-0.5	-0.7	-0.3	-0.9	-1.1	-1.7
In wage sector	7.1	7.1	6.4	-3.0	-2.7	-2.5
Self-employed	-3.3	-3.8	-3.5	1.5	1.0	1.3
Unpaid family	-4.1	-4.0	-4.6	0.6	0.6	0.6
Females						
Wage	62.1	63.9	67.7	-37.9	-38.3	-39.2
Urban sector	62.5	64.8	68.7	-41.3	-41.8	-43.3
Rural sector	52.6	52.6	52.7	-33.9	-33.8	-32.7
% Working	-2.3	-0.9	-1.3	1.0	1.3	1.0
In wage sector	3.7	3.8	3.8	-0.3	-0.2	-0.2
Self-employed	1.1	0.6	1.2	0.5	0.4	0.5
Unpaid family	-6.4	-5.5	-6.1	0.8	1.1	0.8

Figure by MIT OpenCourseWare.

- Note: substantial inflation may have allowed more wage flexibility than normal. Still, pretty interesting.

Besley and Burgess (2004): Restrictions on labor market flexibility

- What happens when governments impose labor regulations?
  - Labor regulations seek to provide better working conditions, etc.
  - But may reduce the returns for firms
- Test from India, where labor regulation occurs at state level
- Code each state ammendment to industrial law as pro-worker (1), neutral (0), or pro-firm (-1)
- Run a differences-in-differences regression

$$y_{st} = \alpha_s + \beta_t + \mu r_{st-1} + \varepsilon_{st}$$

Do regulations matter?

TABLE II

LABOR REGULATION AND INDUSTRIAL DISPUTES IN INDIA: 1958–1992

	(1)	(2)	(3)	(4)
	Workdays lost to strikes per worker	Workdays lost to strikes per worker	Workdays lost to lockouts per worker	Workdays lost to lockouts per worker
Method	OLS	OLS	OLS	OLS
Labor regulation	2.564**	1.732*	2.108**	0.965***
$[t-1]$	(2.55)	(1.87)	(2.32)	(3.57)
State effects	YES	YES	YES	YES
Year effects	YES	YES	YES	YES
State time trends	NO	YES	NO	YES
Adjusted R^2	0.08	0.07	0.14	0.15
Observations	547	547	514	514

Courtesy of MIT Press. Used with permission.

Impact on manufacturing

TABLE V

LABOR REGULATION AND EMPLOYMENT, INVESTMENT, AND PRODUCTIVITY IN REGISTERE

	(1)	(2)	(3)
	Log registered manufacturing employment	Log daily employment in registered manufacturing	Log earnings per worker in registered manufacturing
Method	OLS	OLS	OLS
Labor regulation	−0.072*	−0.285***	0.008
$[t-1]$	(1.70)	(3.48)	(0.09)
Log development expenditure	0.076	0.327*	0.207
per capita	(0.64)	(1.82)	(1.52)
Log installed electricity	0.073	0.111	0.019
capacity per capita	(1.34)	(1.51)	(0.34)
Log state population	−0.099	2.122	1.116
	(0.09)	(1.14)	(0.93)
Congress majority	0.008	−0.009	−0.037*
	(0.61)	(0.39)	(1.66)
Hard left majority	−0.028	−0.124***	0.0004
	(1.43)	(3.93)	(0.01)

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Aggregate impact

	(1)	(2)	(3)	(4)	(5)
	Log state output per capita	Log state agricultural output per capita	Log state nonagricultural output per capita	Log state construction output per capita	Log total manufacturing output per capita
Method	OLS	OLS	OLS	OLS	OLS
Labor regulation $[t-1]$	−0.002	0.019*	−0.034*	−0.019	−0.073**
	(0.14)	(1.81)	(1.69)	(0.29)	(2.05)
State effects	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES
Adjusted R^2	0.93	0.84	0.95	0.76	0.93
Observations	509	509	509	509	509

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Conclusions

- Evidence that rural labor markets work pretty well
  - This implies pecuniary externalities from other people's smoothing
- Urban labor regulations don't seem to help workers, but do reduce manufacturing output.