The capacity curve

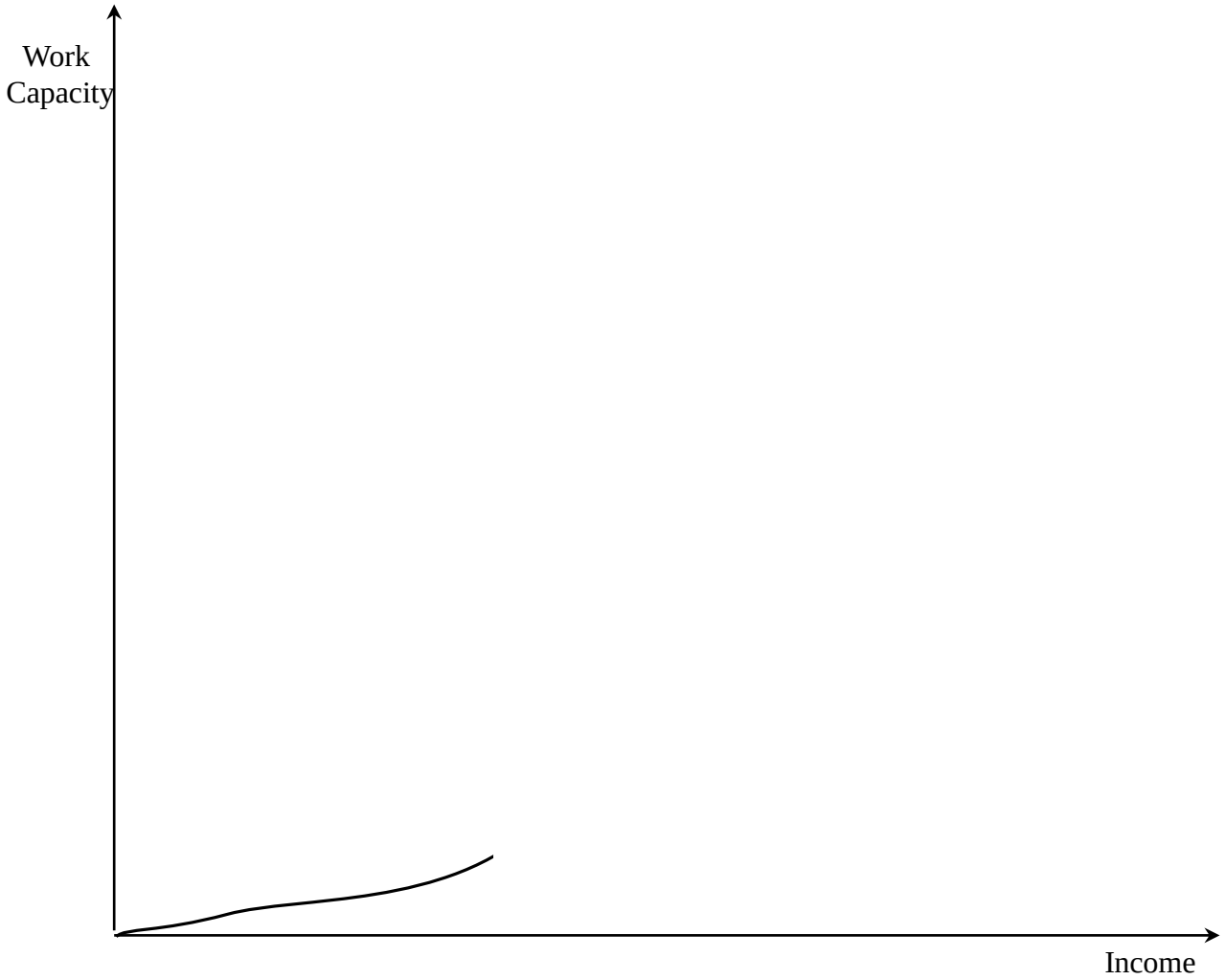
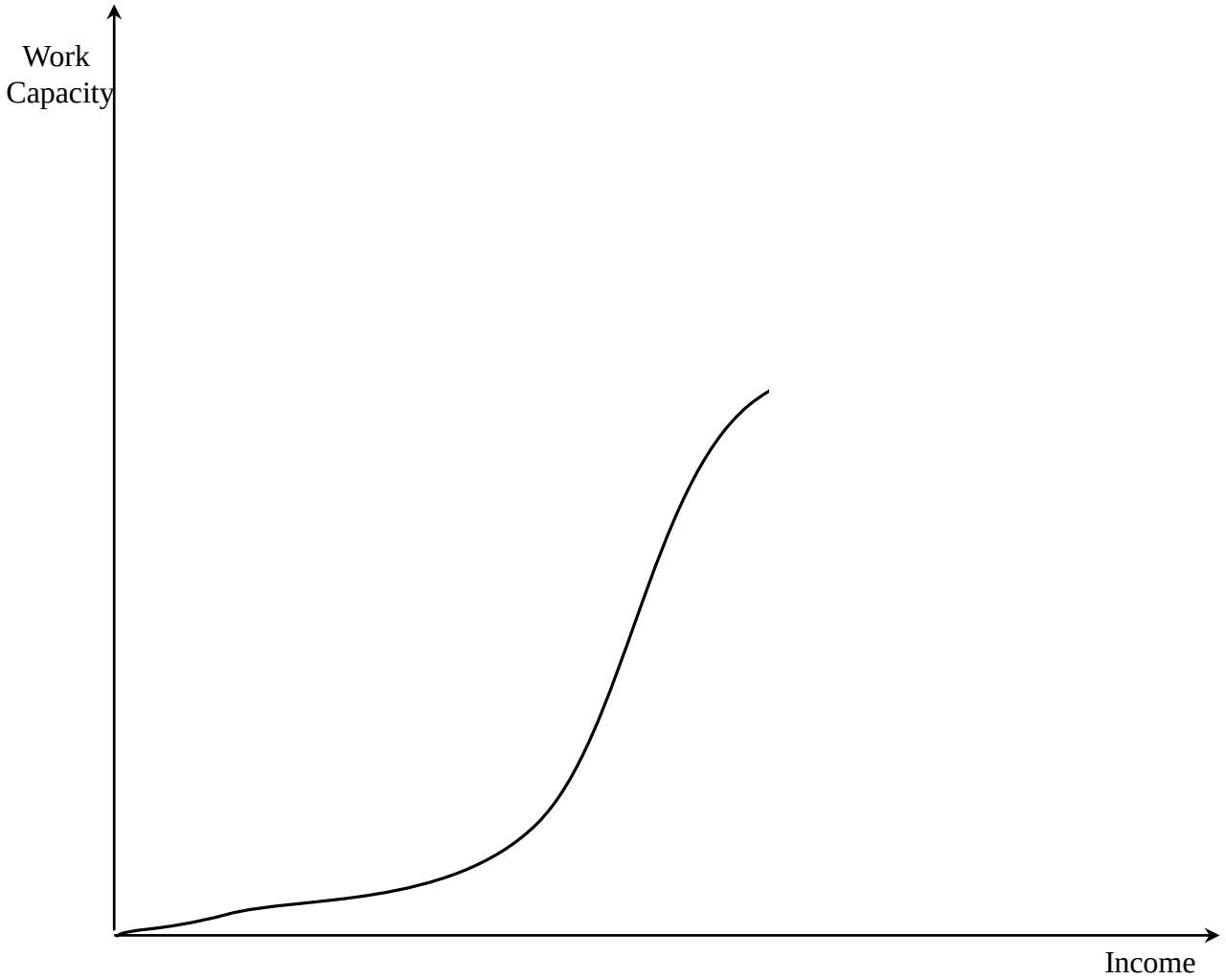


Figure 1: The Capacity Curve
The Piece Rate



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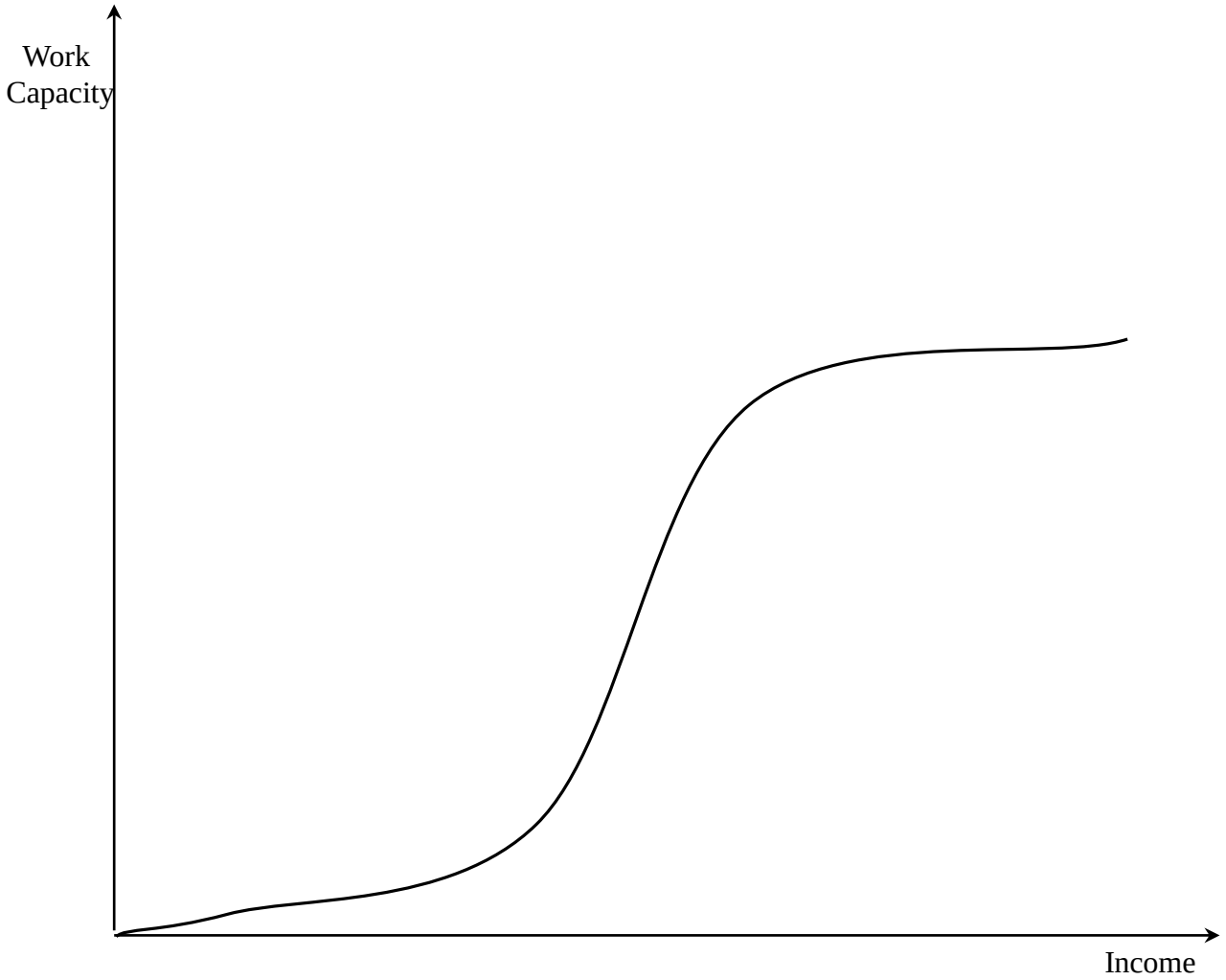

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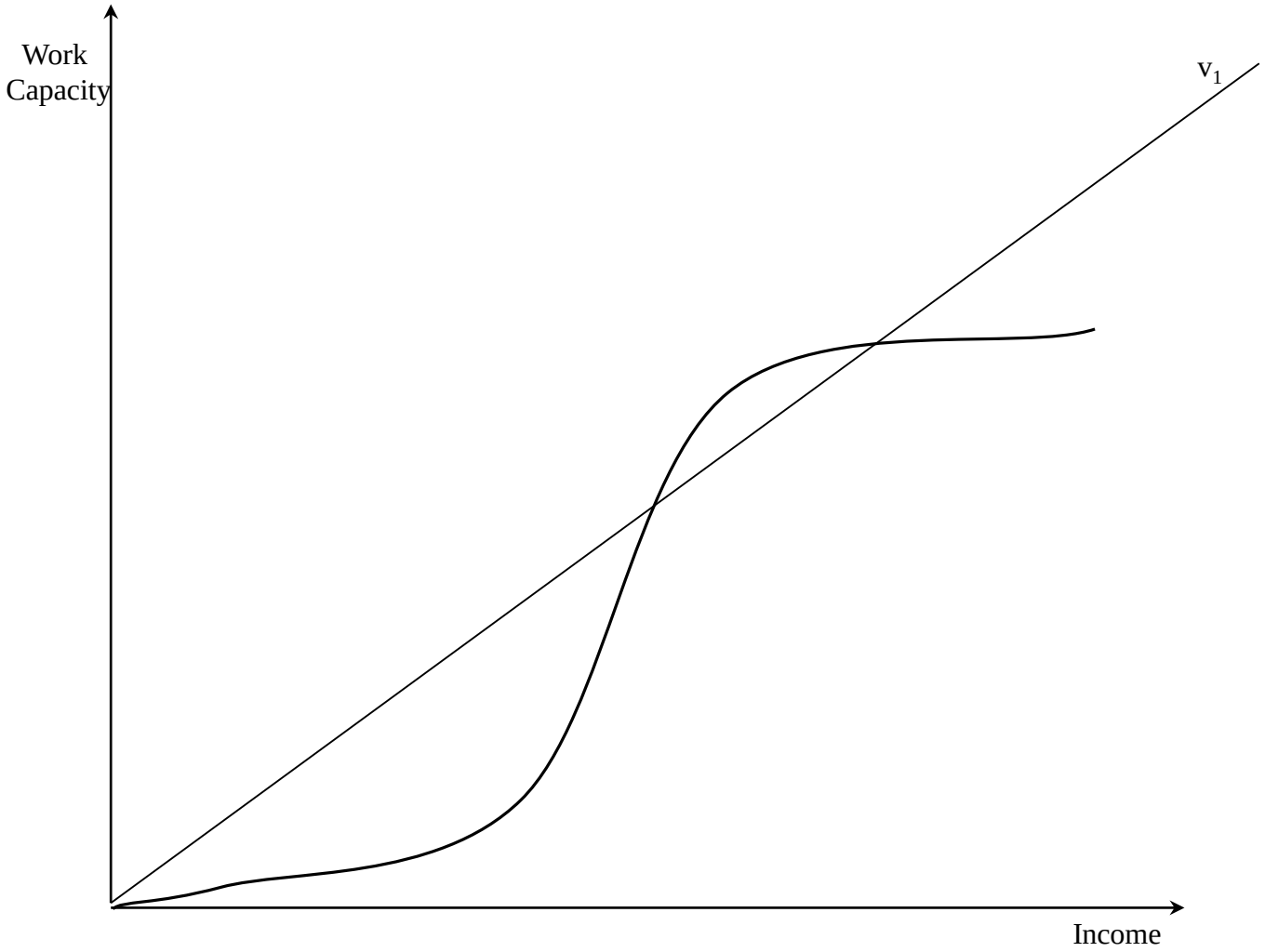

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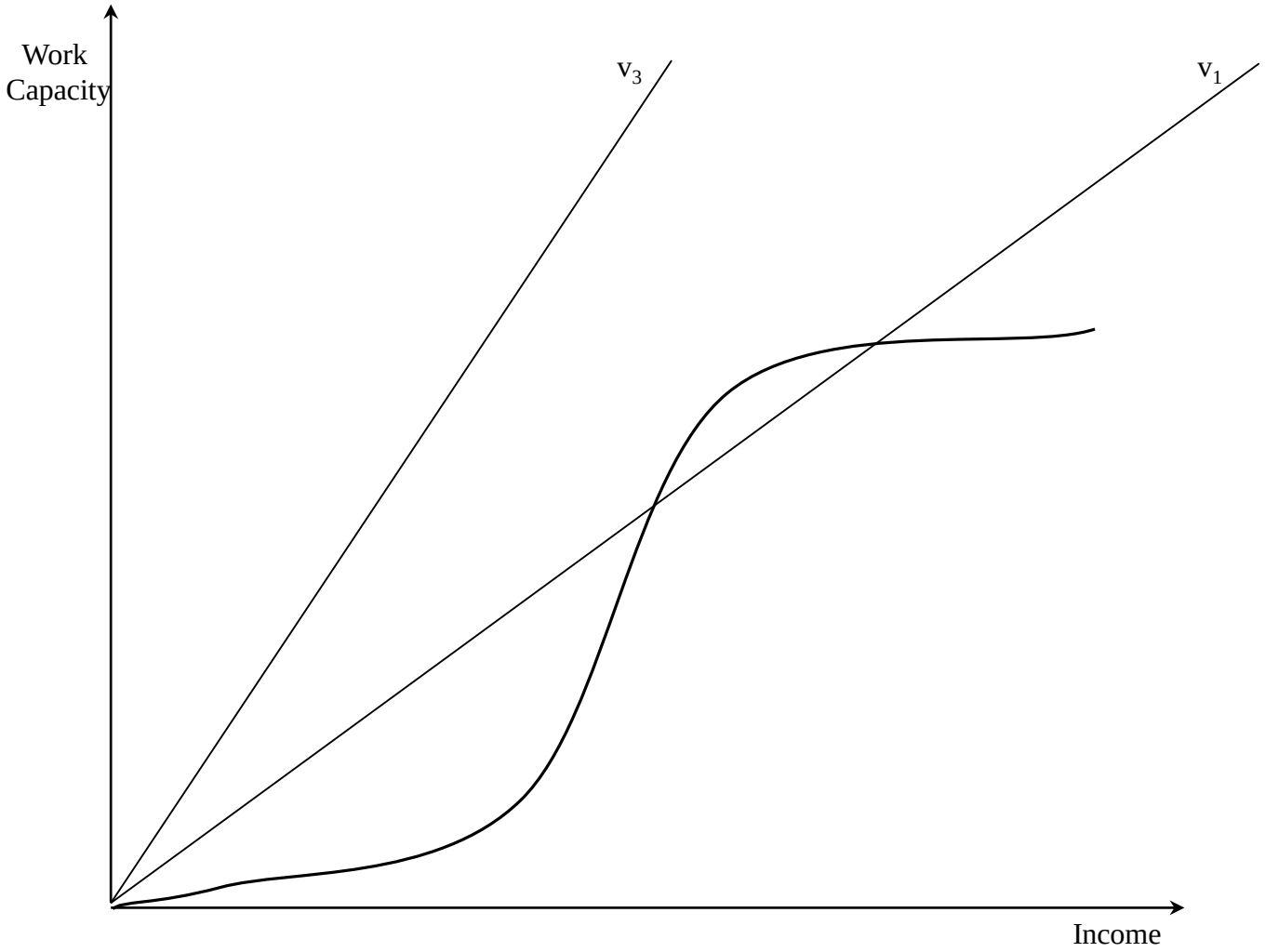

Figure 1: The Capacity Curve
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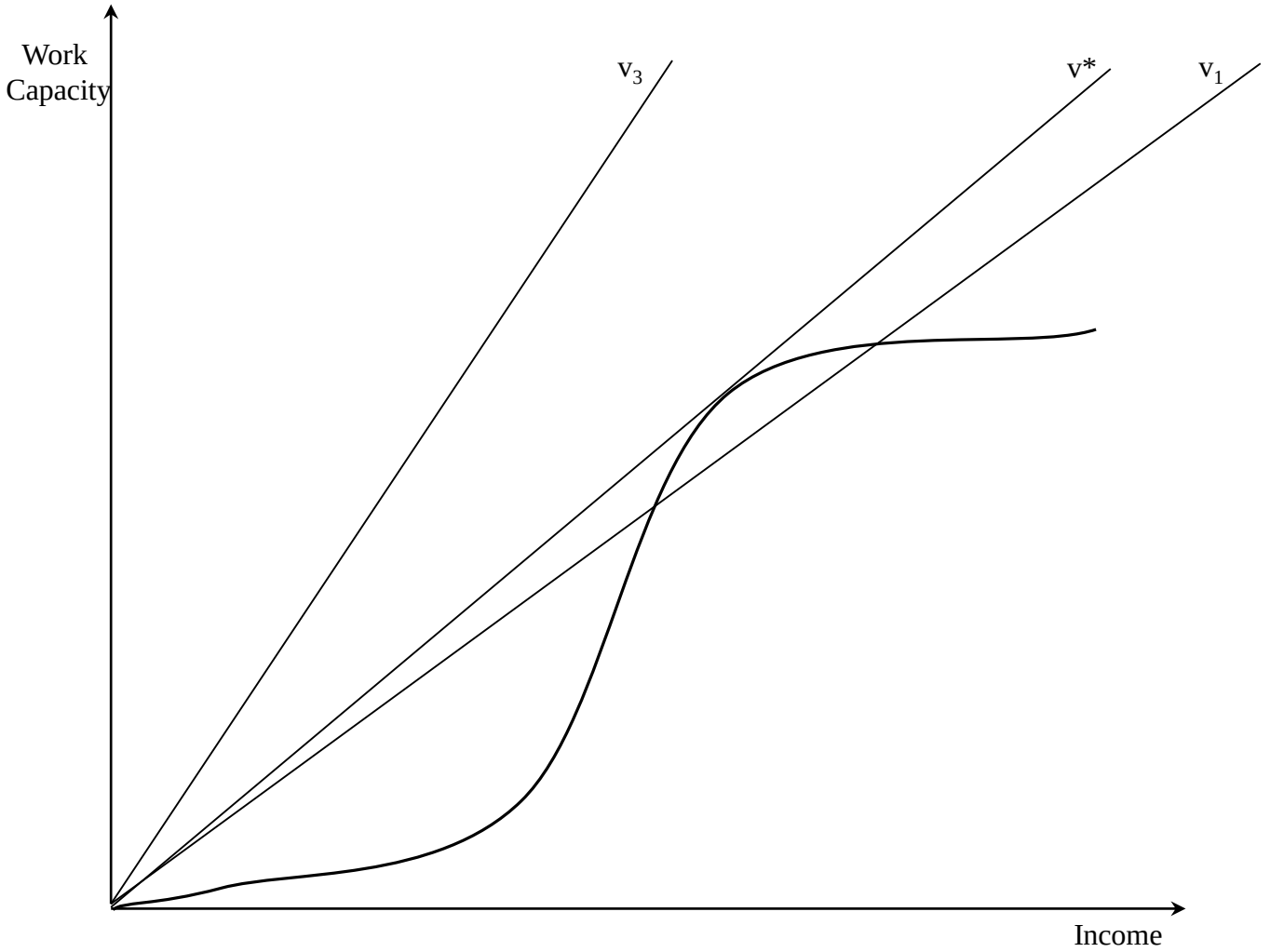


Figure 1: The Capacity Curve
The Piece Rate

Aggregate labor supply

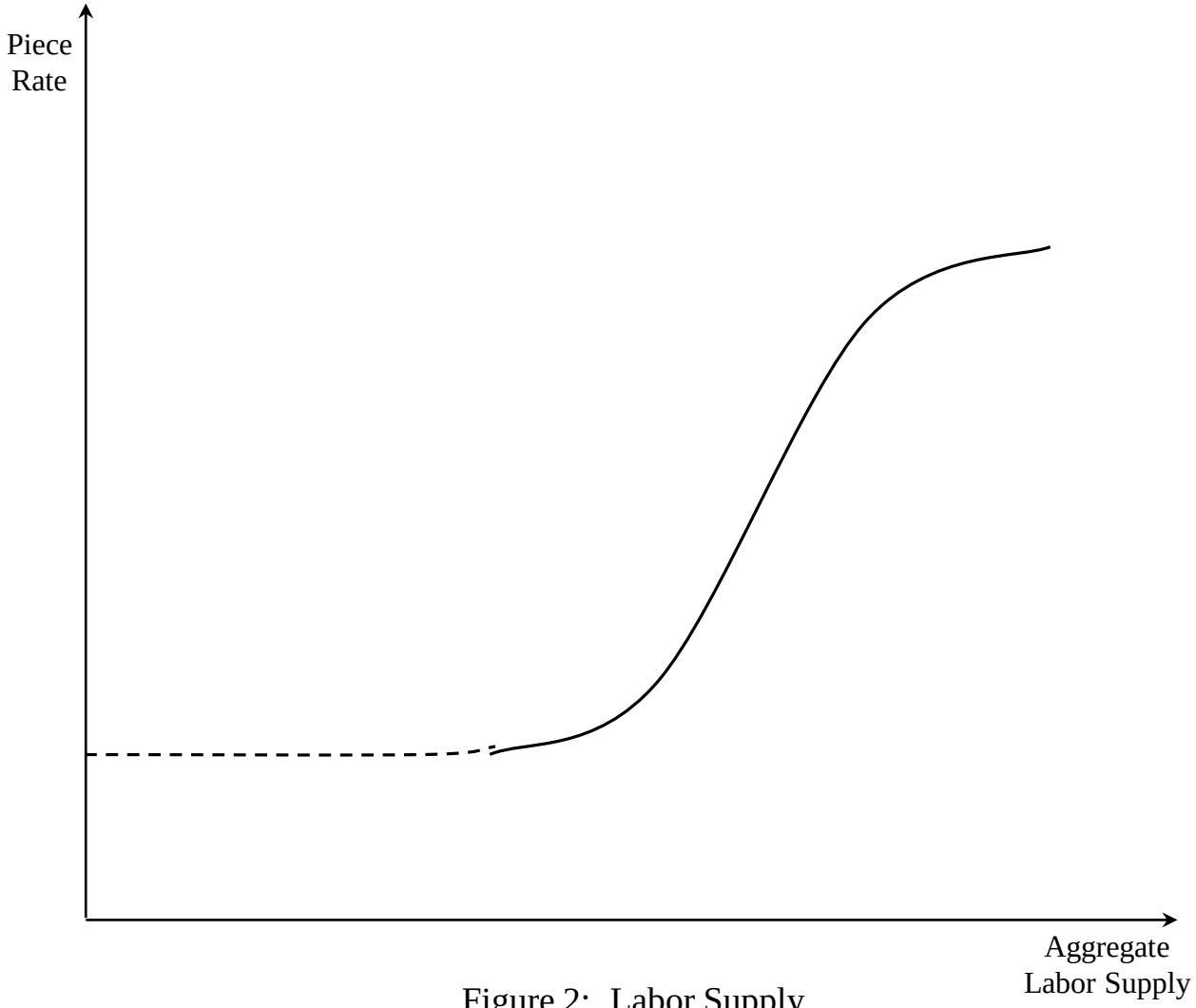


Figure 2: Labor Supply

Possible equilibria

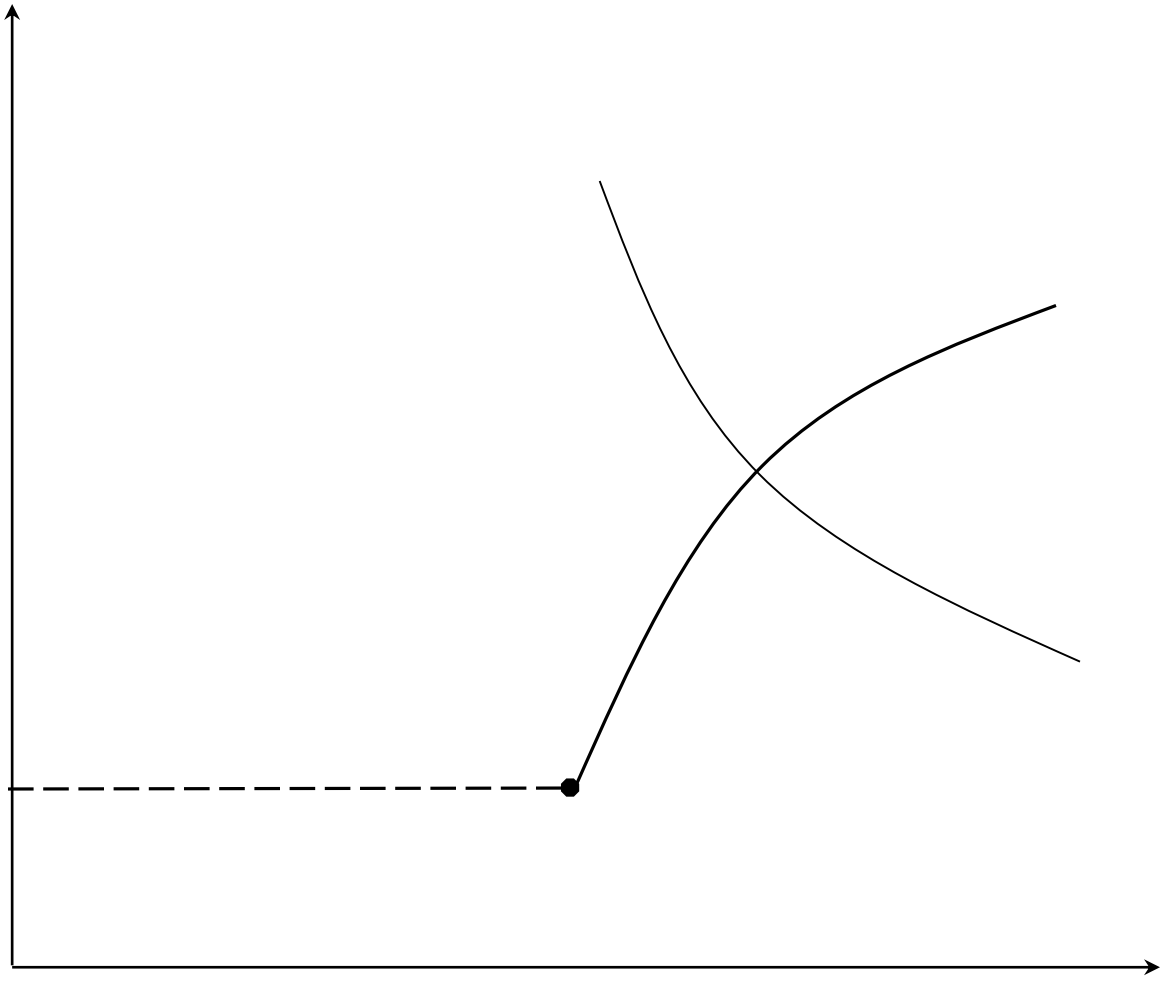


Figure 3: Possible Equilibria

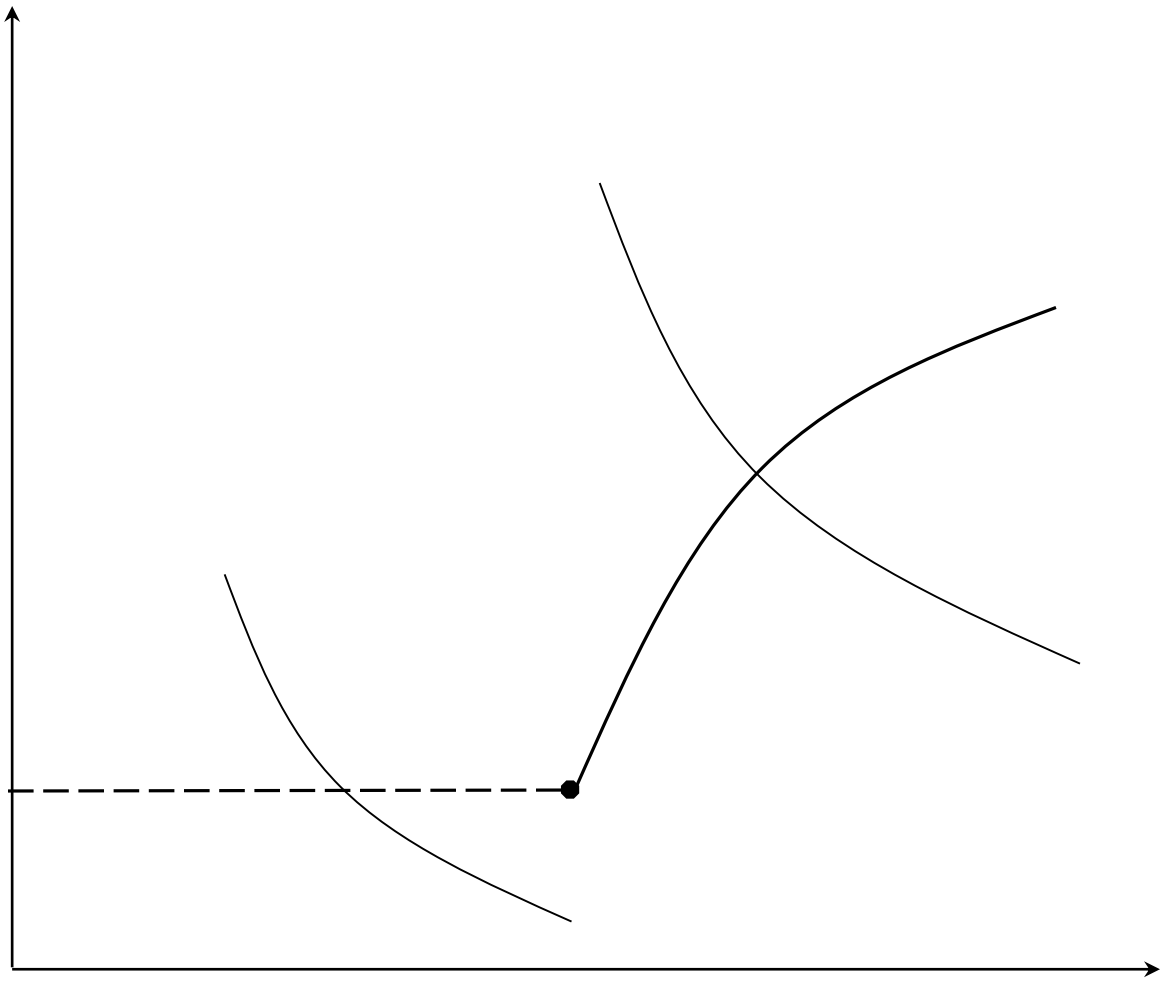


Figure 3: Possible Equilibria

The effect of non-labor income

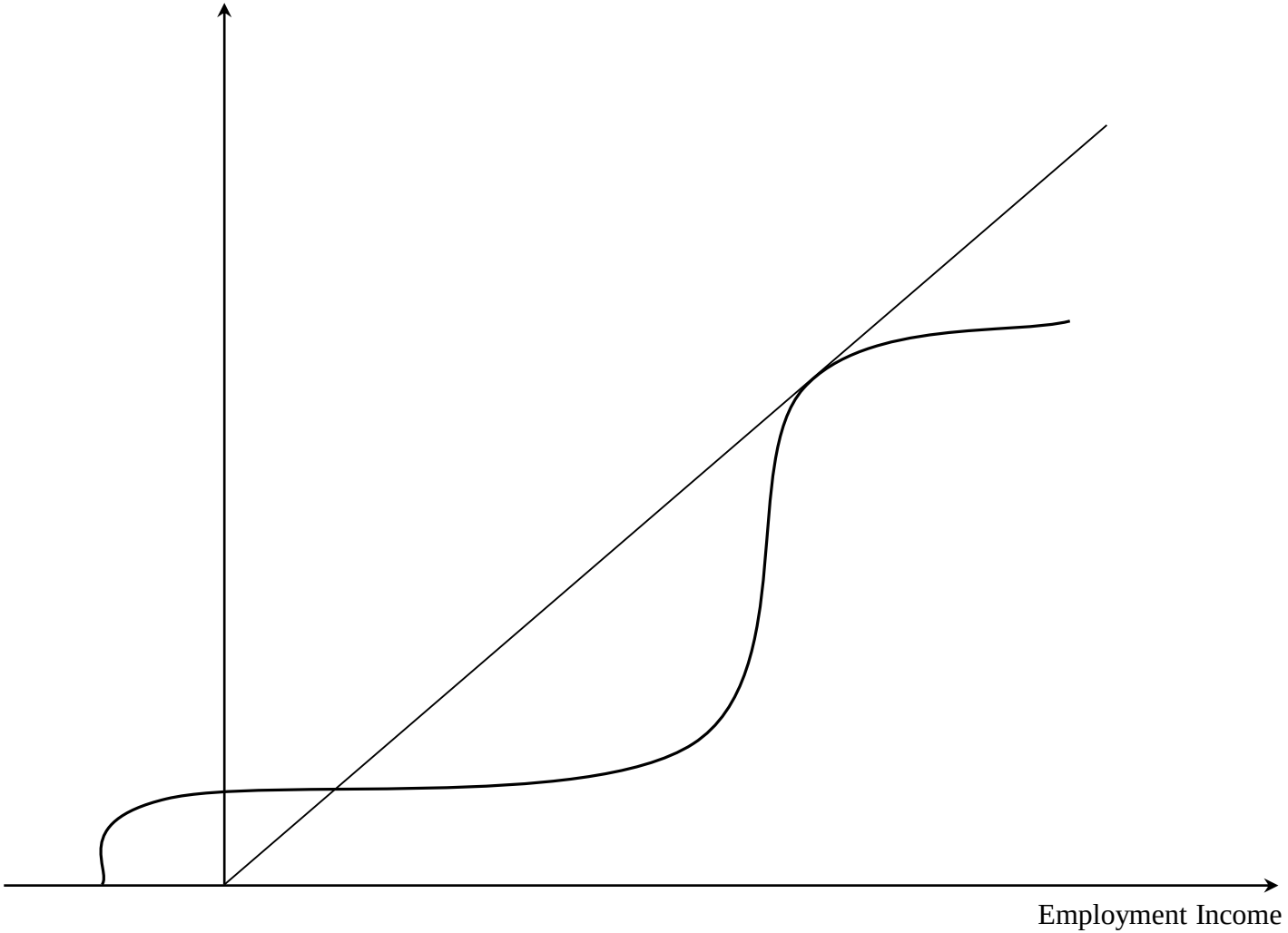


Figure 4: Effect of Non-Labor Income on the Capacity Curve

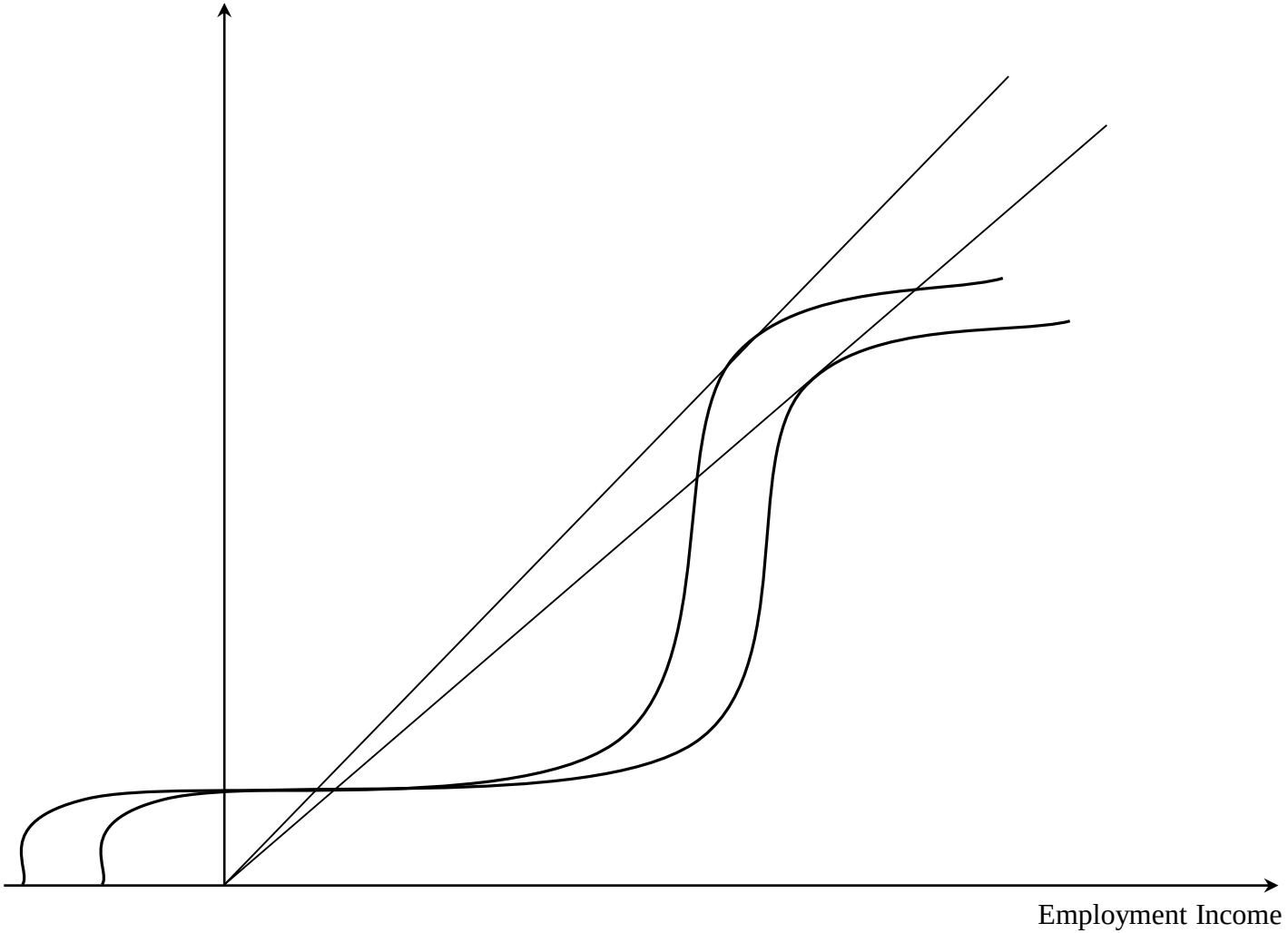


Figure 4: Effect of Non-Labor Income on the Capacity Curve

Distribution of land

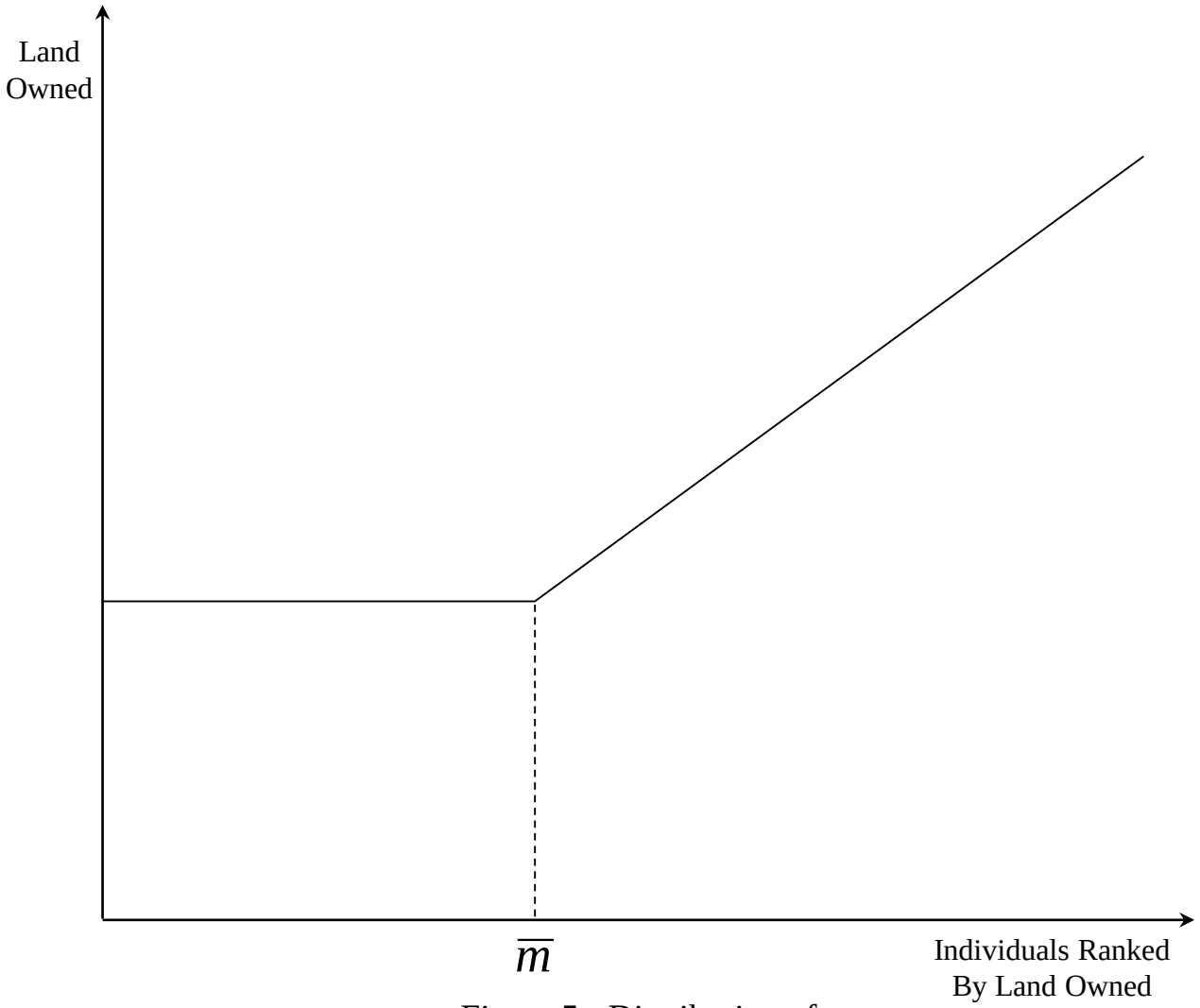


Figure 5: Distribution of Land

Labor supply as function of land owned

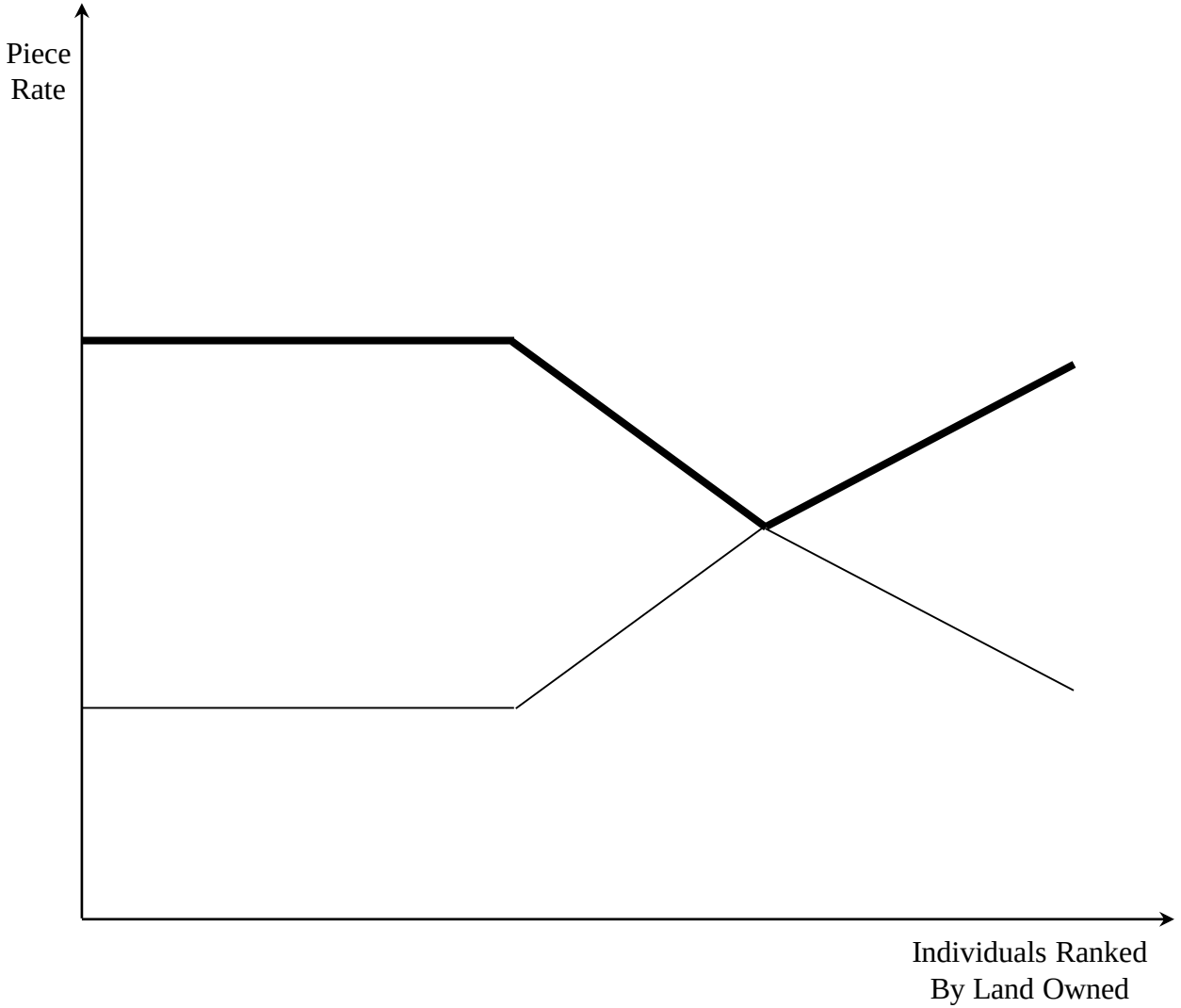


Figure 6: Effective
Reservation Wage

Different types of equibria

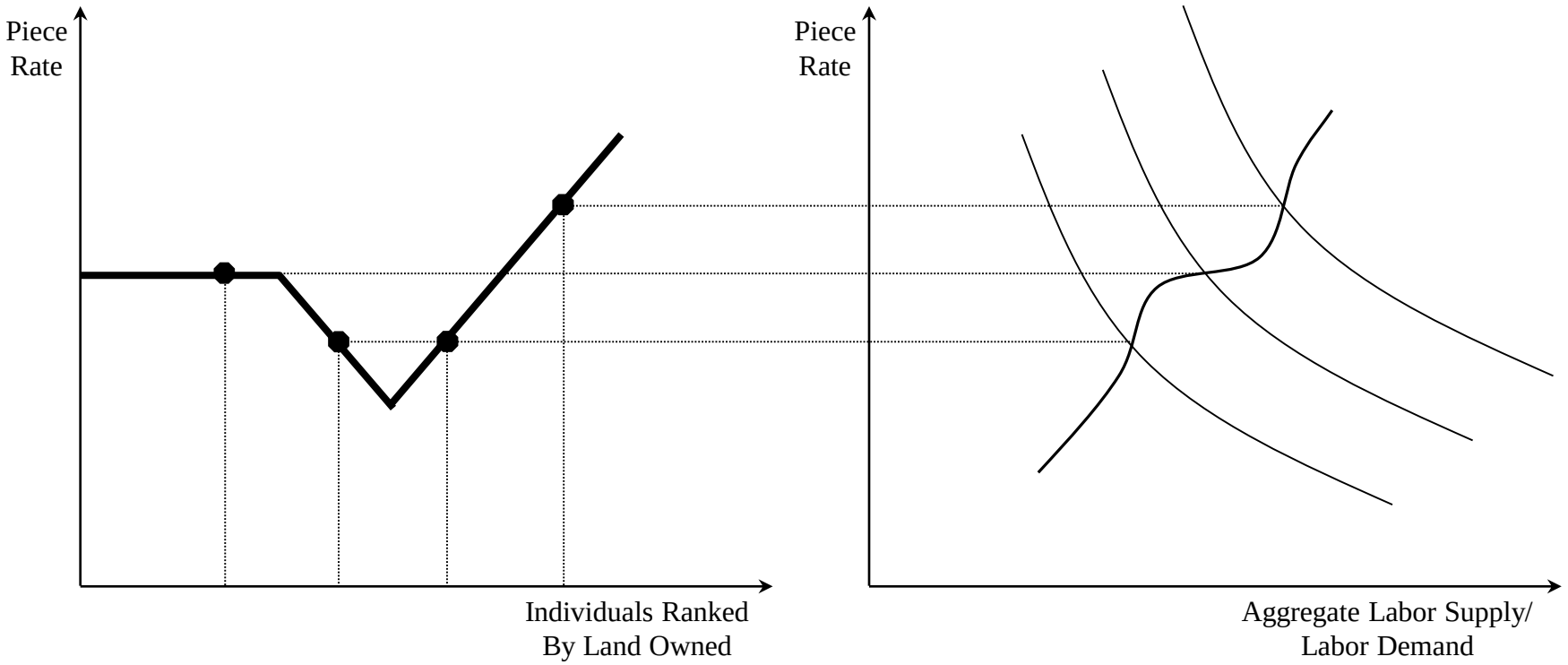


Figure 7: Types of Equilibria

Policy experiments

- Land Reform:
  - MAY improve production and employment (how?)
  - CAN improve production without reducing unvoluntary un-employment (how?)
- Is it possible to improve the lot of the poor without decreasing someone's lot?
  - The economy is PARETO EFFICIENT: it is impossible to improve the welfare of someone without decreasing the welfare of someone else
- Minimum wage
- Cash tranfer

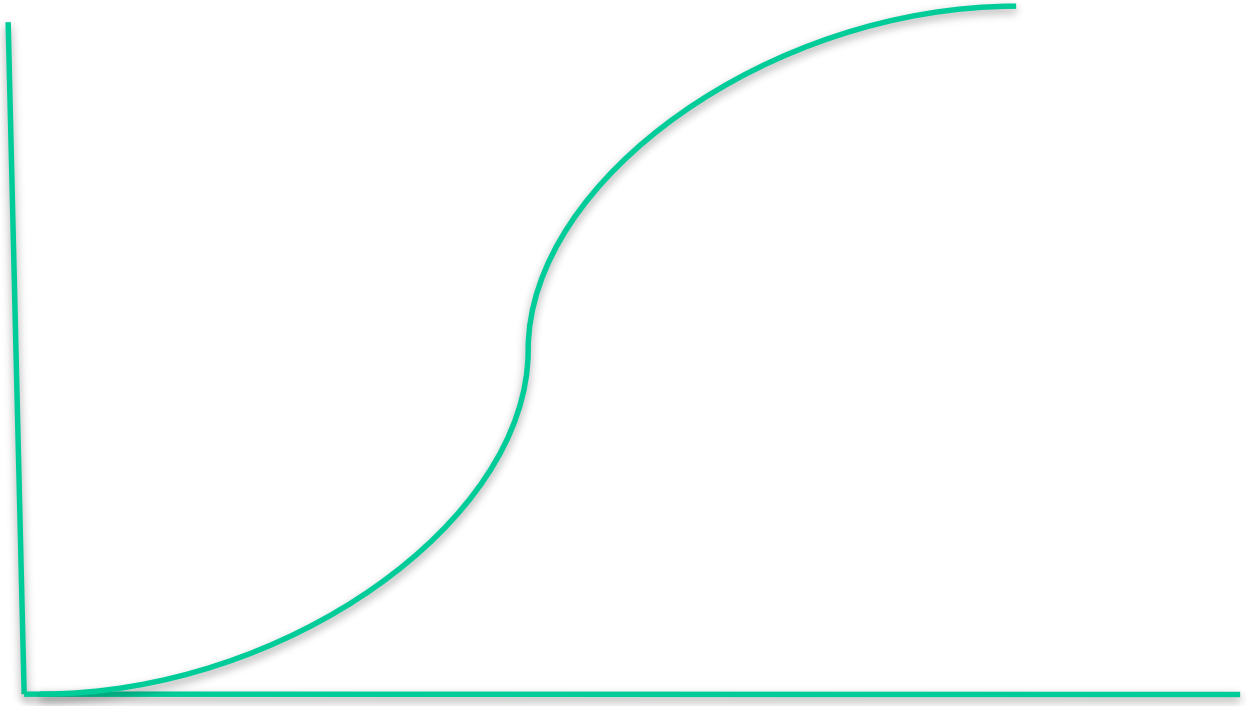
Intra family issues

- Suppose you have a family of two, how should they share resources?

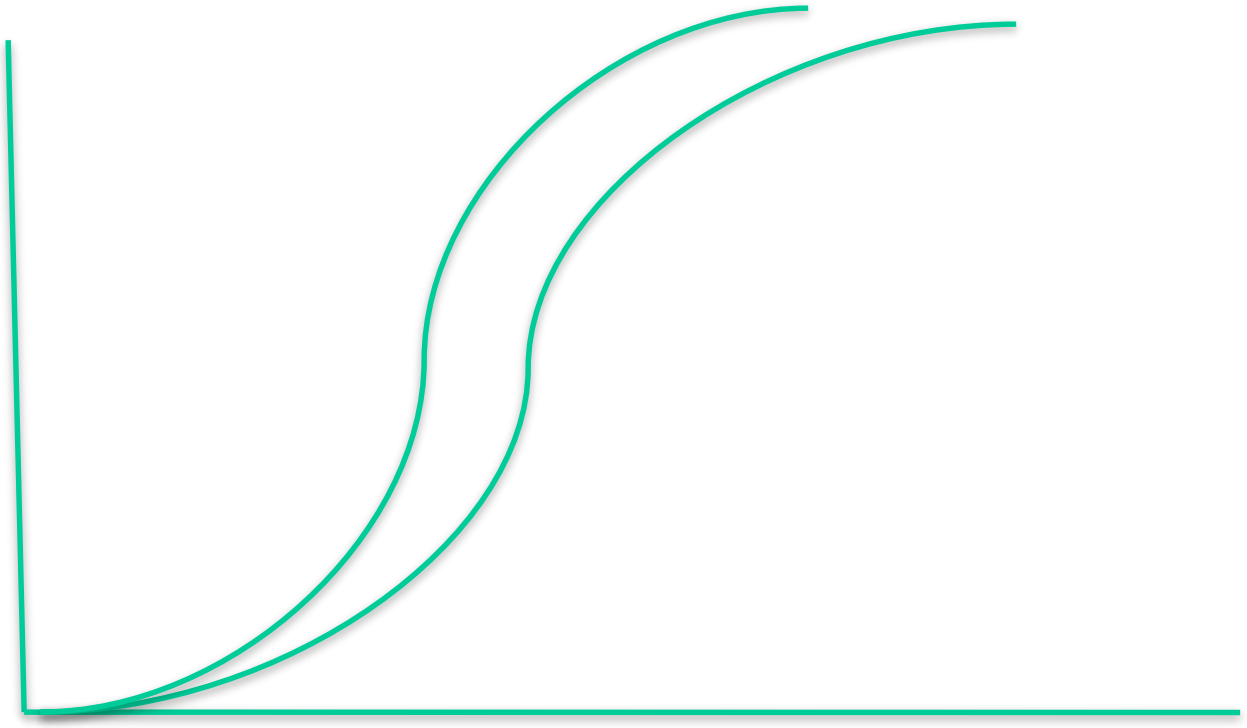
A dynamic version

- Introduce some dynamics: you can "borrow" or "invest" in your capacity
- What may happen to the capacity curve of *tomorrow* as a function of how you eat *today*?

Capacity curve with different nutrition histories



Capacity curve with different nutrition histories



Implications

- With better nutrition history, can produce more for each level of nutrition
- Long term effects of short term investments: potentially very high returns
- Returns to investing in children:
  - Long term impacts of deworming for a short period of time: 23% increase in wage for just two extra years with deworming
  - Special example: in utero nutrition.

Labor Markets

- Suppose an employer could reap the benefit of investing in a worker, what would they now want to do?
- Do they have incentives to do so in a casual labor market?
- Possible arrangements:
  - Borrowing: what is the difficulty?
  - Long term contracts (bonded labor; slavery: *Time on the cross*)

Interpretation

- Resources may not be shared equally within the family
  - Gender discrimination
  - Widows: “Witch Killings” in Africa (Ted Miguel)
  - Children and Adults: households may decide to feed adults. Combined with the dynamic version of capacity curve, this may perpetuate the cycle.

Conclusion

- Convexity (S shape) of capacity curve can generate poverty trap
- Next time: we will empirically examine the components of the capacity curve and see whether there is evidence of convexity.
- What we need for a poverty trap
  - Strong relationship between income and nutrition
  - Strong relationship between nutrition and productivity

References

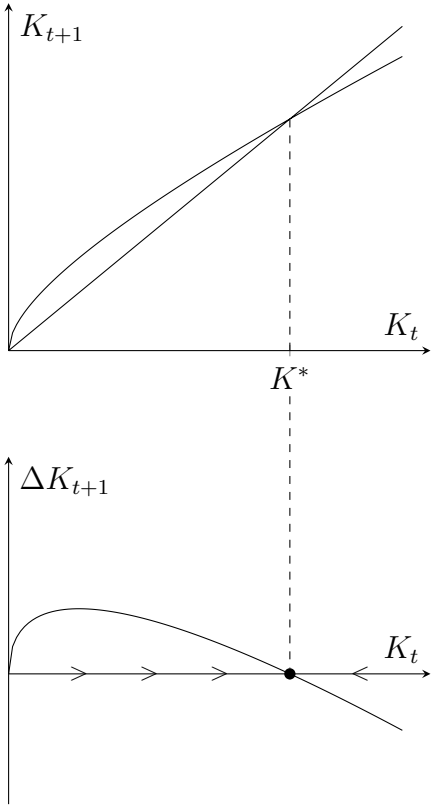
- Ray, D. (1998). *Development Economics*. Princeton University Press: Princeton, NJ.

- Dasgupta, P. (1997). Nutritional status, the capacity for work, and poverty traps. *Journal of Econometrics*, *77*(1), 5-37.

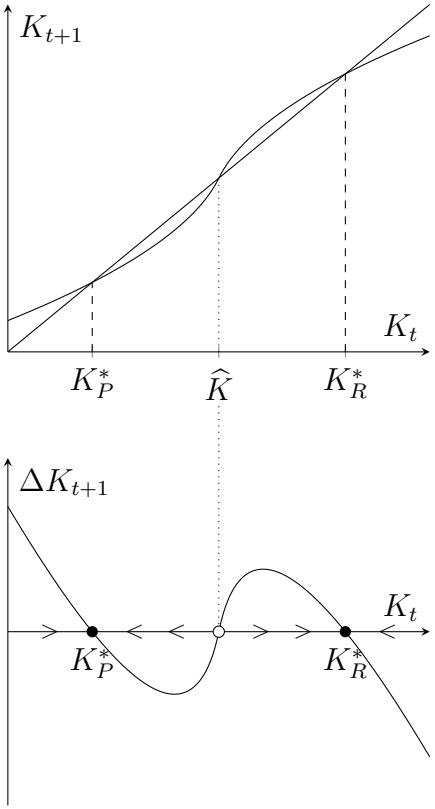
From Theory to Mechanisms and Evidence

- This model wants us to think about one particular mechanism of poverty traps based on a non standard production function
- This is not the only form that poverty trap can take but it is a frequent one
- Other sources ?
- fixed investment in small business; increasing returns to education; impact of poverty on productivity through mental health/ability to focus (bandwidth)/environment
- Two ways to think about testing a poverty trap idea of that kind:
  - Are the underlying mechanisms present, and is the underlying production function of the right shape ?
  - Do you see a persistent impact of asset on income growth/productivity that has the right shape

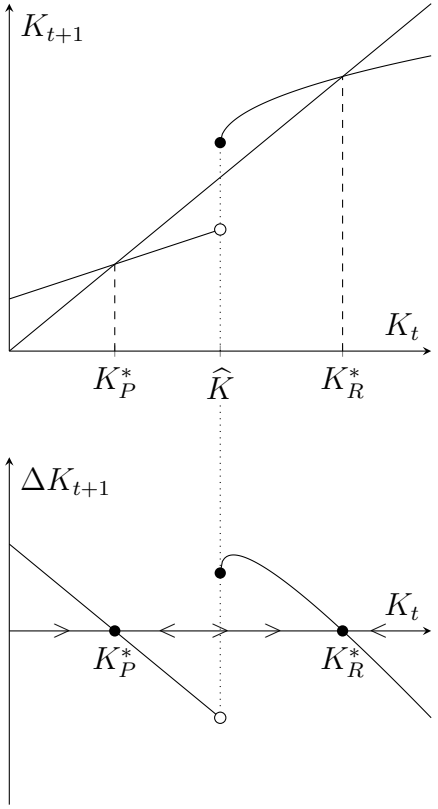
Figure 3: Three Transition Equations and Implied Asset Dynamics



(a) Globally Concave Production Function



(b) S-shaped Production Function



(c) Production Function with Indivisibilities

Formalization of this argument

- For multiple Steady state, the curve that links income today to income tomorrow must intersect the 45 degree line from below.
- $y_t = f(g(t)$.
- At steady crossing point, we must have that the product of the two elasticity is above 1.
- This means we must pay attention *quantitatively* to the elasticity of the relationship between nutrition and income and between income and nutrition.

How about the purely nutrition based idea? TN Subramanian Critic to Das Gupta and Ray

- Food is too cheap: nutrition based poverty trap cannot be real
- Lottery argument: work some days, don't work some days
- Return to nutrition are not steep enough

Estimating income effect

- Best descriptive evidence: Deaton Subramanian on calories in India.
  - Clear relationship between total expenditures per capita and calorie consumption: ▸ figure
  - The relationship does not appear to be non-linear, at least in this range (despite the fact that it is probably an over estimate due to the reverse causality): ▸ Elasticity
  - There is also a strong relationship between price of calories and expenditures (see ▸ figure, indicating a lot of substitution towards more expensive calories: not clear that households' back is against the wall, even very poor households.
  - Since the relationship is more or less log-linear, they proceed to estimate a log-linear relationship, which allows them to add control variables: ▸ Table.
  - When you become 10% richer, you spend 7% more on food, and half of those goes into better food, half of those into more calories.
  - Engel curse seems to fall down in India ▸ figure.

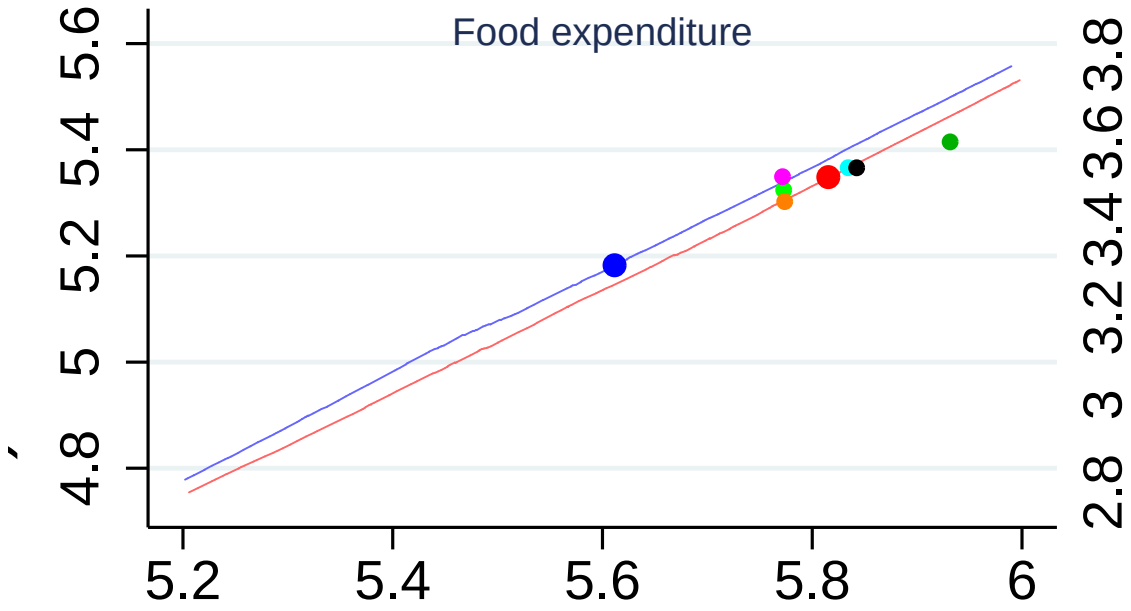
Is the true relationship even lower? Jensen Miller

- Price Experiment in China: subsidize staple food in two region for randomly selected household. Survey food consumption after a few month.
- In both regions, substitution towards more expensive calories: ▸ Hunan ▸ Guansu.
- In one region, calories consumption actually worsens. No perceptible improvement on the other items except fat. In the other region, no change in calories consumption ▸ Table.
- What can explain these results? What does this imply for the income effect on calorie consumption in this context? This is a sample of urban poor who may eat enough.
- Caveats: short term decrease in food prices: people may be using the windfall to have good food rather than to improve their nutritional status. Long term increase/decrease may have very different impacts.

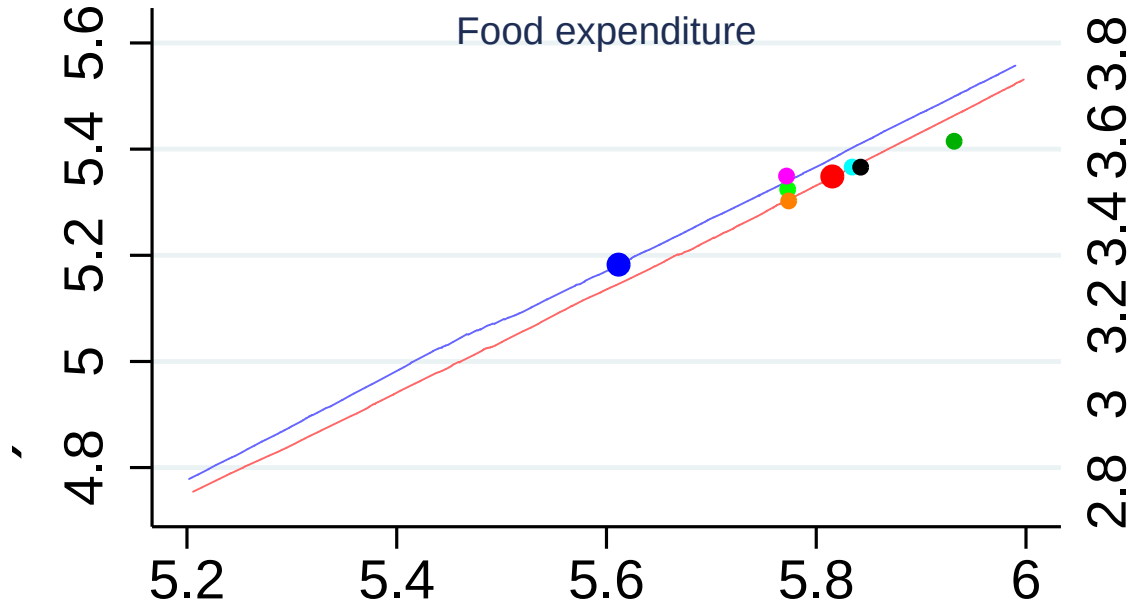
Experimental estimates of income effects give higher numbers

- Give Directly : lump sum or monthly transfer
- Randomized evaluation.

Haushofer and Shapiro: Consumption



Haushofer and Shapiro: food expenditure elasticity



Haushofer and Shapiro: food expenditure elasticity

	Entire sample		
	(1) OLS	(2) IV	(3) Hausman p-value
Food total	1.00***	0.83***	0.05**
	(0.02)	(0.08)	
Food own production (USD)	0.92***	1.10***	0.53
	(0.09)	(0.31)	
Food bought (USD)	1.03***	0.87***	0.18
	(0.04)	(0.10)	
Cereals (USD)	1.20***	0.75**	0.29
	(0.09)	(0.33)	
Meat & fish (USD)	1.17***	2.07***	0.01**
	(0.09)	(0.37)	
Fruit & vegetables (USD)	0.95***	0.76***	0.30
	(0.06)	(0.19)	
Dairy (USD)	1.44***	1.41***	0.95
	(0.11)	(0.45)	
Fats (USD)	0.89***	0.62***	0.32
	(0.07)	(0.24)	
Sugars (USD)	0.89***	0.68***	0.46
	(0.08)	(0.25)	
Other food (USD)	1.14***	0.80***	0.16
	(0.06)	(0.18)	
Alcohol (USD)	0.53***	−0.13	0.36
	(0.13)	(0.56)	
Tobacco (USD)	0.24**	−0.19	0.35
	(0.09)	(0.36)	

Conclusion

- The purely nutrition base poverty trap may not be directly the most relevant (unless we have a HUGE elasticity of productivity with respect to nutrition)
- But there are many other potential source of this S-curve
- Is there a direct evidence of a poverty trap?

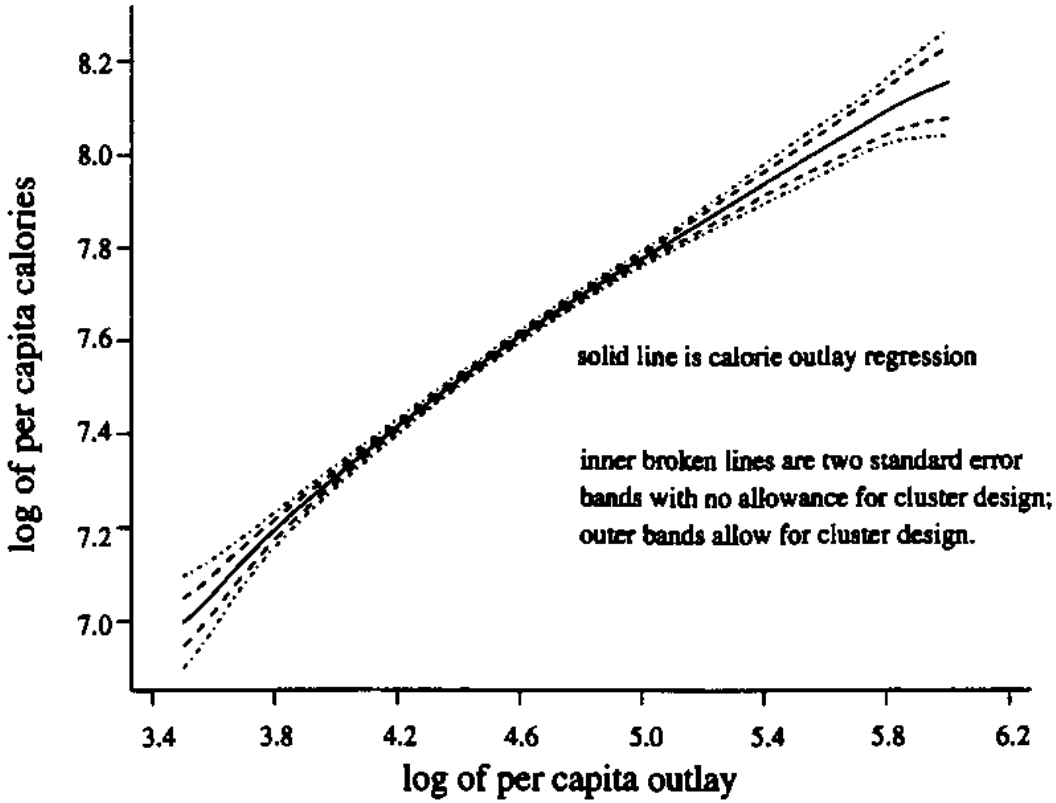


FIG. 2.—Regression function for log calories and log per capita expenditure, Maharashtra, India, 1983.

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Deaton and Subramanian, Figure 3

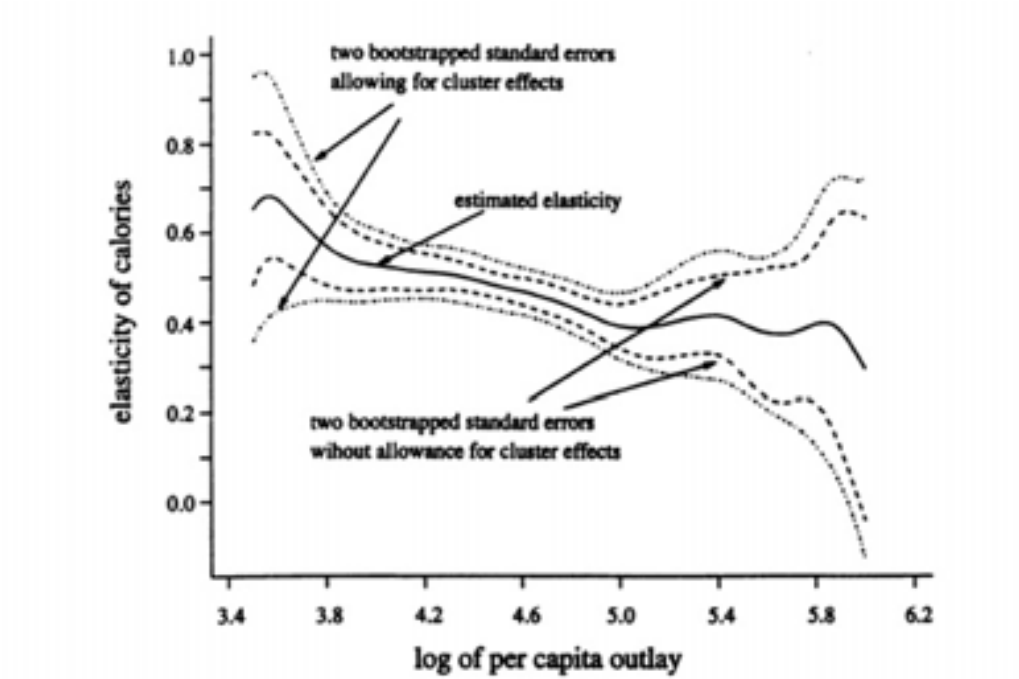

FIG. 3.—Elasticity of per capita calories to per capita expenditure, Maharashtra, India, 1983.

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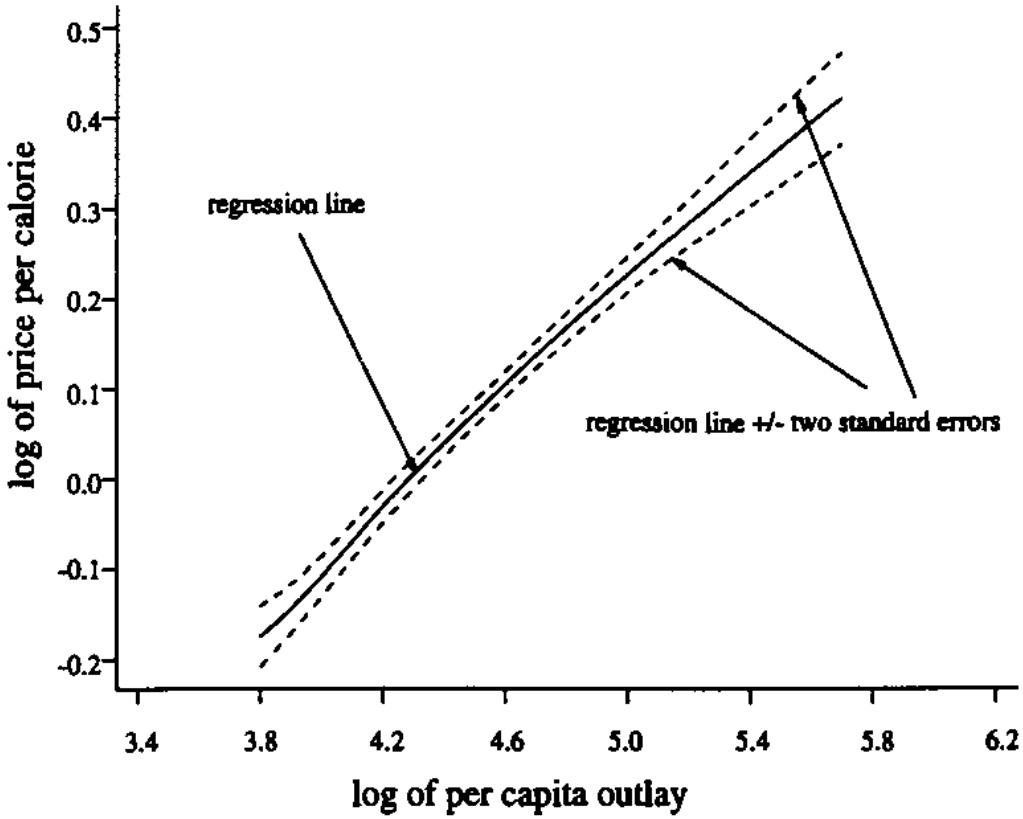

FIG. 4.—Log of price per calorie and log of per capita expenditure, Maharashtra, India, 1983.

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TABLE 2

OLS Estimates of Double Log Calorie and Calorie Price Regressions with Other Covariates

	Log Calorie Availability				Log Price per Calorie			
	All Data (1)		Within Village (2)		All Data (3)		Within Village (4)	
	β	|t|	β	|t|	β	|t|	β	|t|
Constant	6.028	(78)			−1.5934	(18)		
ln PCE	.3655	(29)	.3407	(27)	.3799	(25)	.3217	(23)
ln household size	−.1572	(14)	−.1630	(21)	.0839	(6.8)	.0661	(8.4)
rm04	−.0967	(2.2)	−.1461	(4.1)	.1024	(2.3)	.1008	(3.3)
rm59	.0488	(1.2)	.0321	(1.0)	−.0467	(1.2)	−.0331	(1.2)
rm1014	.0891	(1.9)	.0612	(1.9)	−.1120	(2.3)	−.0842	(2.9)
rm1555	.1636	(5.1)	.1634	(5.9)	−.1700	(4.3)	−.1347	(5.0)
rm55+	.1406	(3.0)	.1213	(2.8)	−.1565	(3.6)	−.1074	(2.9)
rf04	−.1359	(3.1)	−.1869	(4.9)	.0460	(1.1)	.0742	(2.2)
rf59	.0176	(.4)	−.0040	(.1)	−.0648	(1.4)	−.0476	(1.4)
rf1014	.1140	(2.8)	.0679	(2.0)	−.1108	(2.7)	−.0873	(3.0)
rf1555	.0420	(1.6)	.0514	(2.1)	.0085	(.3)	−.0021	(.1)
Scheduled caste	−.0083	(.8)	−.0179	(2.0)	.0020	(.2)	−.0071	(.8)
Hindu	.0114	(.7)	.0302	(2.1)	−.0562	(2.6)	−.0605	(4.4)
Buddhist	.0237	(1.1)	.0400	(2.0)	−.1080	(4.0)	−.0760	(4.0)
Self-employed nonagriculture	.0187	(1.0)	.0064	(.4)	−.0270	(1.1)	.0079	(.5)
Agricultural labor	.0433	(2.2)	.0222	(1.4)	−.0837	(3.4)	−.0418	(2.7)
Nonagricultural labor	.0275	(1.1)	.0293	(1.5)	−.0210	(.8)	−.0315	(1.7)
Self-employed agriculture	.0618	(3.5)	.0389	(2.7)	−.0610	(2.8)	−.0118	(.8)
R^2	.5532		.6706		.4254		.6414	

Note.—Variables beginning with r are demographic ratios, so that, e.g., rf59 is the ratio of females aged 5–9 to total household members, and rm55+ is the ratio of males older than 55. There are four labor type dummies, self-employed or employed, in agriculture or not. The omitted category is "other labor." The omitted religion/caste variable is Jain and other. The within regressions contain 563 dummy variables for the villages and do not contain a constant term. The (uncorrected) F-tests for the exclusion of the village effects are 3.19 with 562 and 5,043 degrees of freedom for the calorie regression and 5.39 with 562 and 5,042 degrees of freedom for the calorie price regression. The reported absolute t-values are corrected for heteroskedasticity and, in the case of the all-data regressions, for the cluster structure of the sample.

Deaton and Dreze, Figure 1

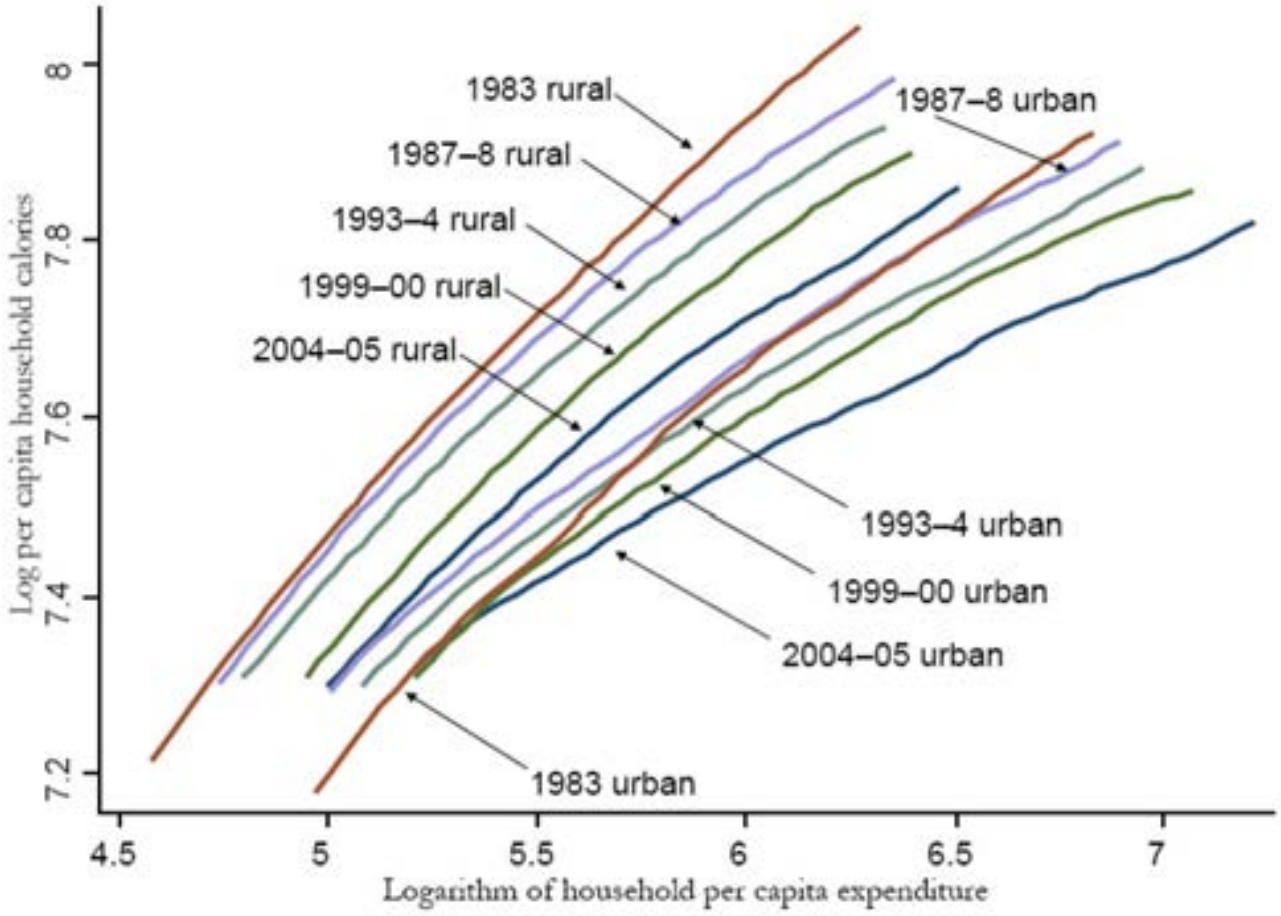

Figure 1: Calorie Engel curves, rural and urban India, 1983 to 2004–05

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Table 4. Consumption Response to the Price Subsidy

	HUNAN									
	Rice	Other Cereal	Fruit & Veg	Meat	Seafood	Pulses	Dairy	Fats	Food Out	Non-Food
%Subsidy(rice)	-0.235*	0.397	-0.623***	0.377	0.482**	-0.791*	-0.054	-0.567*	0.117	0.200
	(0.140)	(0.355)	(0.227)	(0.415)	(0.230)	(0.476)	(0.069)	(0.313)	(0.347)	(0.200)
%ΔEarned	0.043***	-0.001	0.058***	0.002	0.036	-0.052	-0.006	0.022	0.059	0.014
	(0.014)	(0.040)	(0.021)	(0.043)	(0.022)	(0.050)	(0.004)	(0.031)	(0.044)	(0.025)
%ΔUnearned	-0.044*	-0.087	-0.018	0.076	-0.004	-0.037	-0.021	-0.007	0.020	0.089**
	(0.025)	(0.065)	(0.040)	(0.071)	(0.042)	(0.075)	(0.019)	(0.055)	(0.057)	(0.038)
%ΔPeople	0.89***	0.46**	0.63***	0.05	-0.07	0.48**	0.09	0.88***	-0.18	0.15
	(0.08)	(0.19)	(0.11)	(0.24)	(0.10)	(0.23)	(0.05)	(0.16)	(0.18)	(0.13)
Constant	4.1***	7.5***	-0.3	-5.7**	-0.2	8.8***	0.2	-8.3***	-3.5	-52.6***
	(1.0)	(2.5)	(1.4)	(2.8)	(1.4)	(3.0)	(0.6)	(2.1)	(2.5)	(1.5)
Observations	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258
R^2	0.19	0.06	0.11	0.07	0.02	0.03	0.02	0.09	0.02	0.20

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GANSU

	Wheat	Other Cereal	Fruit & Veg	Meat	Seafood	Pulses	Dairy	Fats	Food Out	Non-Food
%Subsidy(wheat)	0.353	-0.283	0.049	0.130	-0.017	0.240	0.282	0.507**	0.109	-0.021
	(0.258)	(0.335)	(0.190)	(0.299)	(0.017)	(0.320)	(0.207)	(0.251)	(0.276)	(0.180)
%ΔEarned	0.079**	-0.067	0.061**	0.085*	0.000	-0.047	-0.025	0.091***	0.070	0.040
	(0.036)	(0.049)	(0.027)	(0.044)	(0.000)	(0.043)	(0.029)	(0.033)	(0.043)	(0.025)
%ΔUnearned	-0.017	0.130	0.046	0.314***	0.025	0.012	0.108	-0.110	-0.077	0.229***
	(0.092)	(0.106)	(0.077)	(0.091)	(0.025)	(0.104)	(0.073)	(0.091)	(0.097)	(0.070)
%ΔPeople	0.58***	0.52*	1.01***	-0.10	-0.01	0.44**	0.10	0.66	0.00	-0.04
	(0.22)	(0.29)	(0.15)	(0.28)	(0.01)	(0.18)	(0.12)	(0.15)	(0.19)	(0.19)
Constant	-26.1***	23.8***	11.0***	2.4	-0.2	6.0**	-3.4*	7.2	7.5***	-38.2***
	(2.3)	(2.8)	(1.6)	(2.5)	(0.2)	(2.6)	(1.9)	(2.1)	(2.4)	(1.4)
Observations	1269	1269	1269	1269	1269	1269	1269	1269	1269	1269
R^2	0.08	0.06	0.07	0.05	0.03	0.06	0.03	0.07	0.05	0.17

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Table 2. Calorie Response to the Price Subsidy

	HUNAN					GANSU				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Full Sample (Calories)	Below Median (Calories)	Above Median (Calories)	Bottom Quartile (Calories)	Full Sample (Protein)	Full Sample (Calories)	Below Median (Calories)	Above Median (Calories)	Bottom Quartile (Calories)	Full Sample (Protein)
%Subsidy(rice/wheat)	-0.206*	-0.042	-0.339**	0.004	-0.096	0.154	0.169	0.132	0.070	0.091
	(0.108)	(0.144)	(0.164)	(0.207)	(0.133)	(0.100)	(0.143)	(0.138)	(0.261)	(0.112)
%ΔEarned	0.031***	0.026*	0.036**	0.037*	0.040***	0.028**	0.027	0.029	0.053	0.017
	(0.011)	(0.014)	(0.018)	(0.021)	(0.013)	(0.014)	(0.021)	(0.019)	(0.034)	(0.016)
%ΔUnearned	-0.022	-0.025	-0.023	-0.037	-0.010	0.046	0.020	0.071*	0.101	0.069
	(0.020)	(0.027)	(0.028)	(0.034)	(0.023)	(0.035)	(0.056)	(0.043)	(0.119)	(0.033)
%ΔPeople	0.94***	1.07***	0.80	1.04***	0.93***	0.91***	1.01***	0.81***	1.08***	0.88***
	(0.07)	(0.08)	(0.11)	(0.10)	(0.07)	(0.08)	(0.10)	(0.12)	(0.13)	(0.09)
Constant	0.9	1.6	0.5***	2.8*	0.8	-1.9	0.1	-3.9	0.6	-4.0
	(0.8)	(1.1)	(1.1)	(1.5)	(0.9)	(0.8)	(1.1)	(1.1)	(1.7)	(0.9)
Observations	1258	633	625	317	1258	1269	634	635	320	1269
R^2	0.26	0.34	0.21	0.39	0.20	0.18	0.23	0.15	0.29	0.16

Notes: Regressions include county*time fixed-effects. The dependent variable in columns 1-4 and 6-9 is the arc percent change in household caloric intake and in columns 5 and 10 it is the arc percent change in household protein consumption. Standard errors clustered at the household level. %Subsidy (rice/wheat) is the rice or wheat price subsidy, measured as a percentage of the average price. %ΔEarned is the arc percent change in the household earnings from work; %ΔHH Unearned is the arc percent change in the household income from unearned sources (government payments, pensions, remittances, rent and interest from assets); %ΔPeople is the arc percent change in the number of people living in the household. *Significant at 10 percent level. **Significant at 5 percent level. ***Significant at 1 percent level.

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How the poor spend their money

As a Share of Total Consumption

	Food	Alcohol/ Tobacco	Education	Health
Cote d'Ivoire	64.4%	2.7%	5.8%	2.2%
Guatemala	65.9%	0.4%	0.1%	0.3%
-	56.0%	5.0%	1.6%	5.1%
India - UP/Bihar	80.1%	3.1%	0.3%	5.2%
Indonesia	66.1%	6.0%	6.3%	1.3%
Mexico	49.6%	8.1%	6.9%	0.0%
Nicaragua	57.3%	0.1%	2.3%	4.1%
Pakistan	67.3%	3.1%	3.4%	3.4%
Panama	67.8%		2.5%	4.0%
Papua New Guinea	78.2%	4.1%	1.8%	0.3%
Peru	71.8%	1.0%	1.9%	0.4%
South Africa	71.5%	2.5%	0.8%	0.0%
Timor Leste	76.5%	0.0%	0.8%	0.9%

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