We Know the Cost: Do we Know the Value? Measuring the Education SDGs

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Scheme

- Background/Goals of the research
- Numerical Motivation
- The Model
- The Data
- Some Initial Results
- Conclusions and Caveats

Background/Goals of the research

- MDGs were highly motivational
- SDGs criticized as too many, too hard to measure
- Cost of measurement itself "attacked" (e.g., Copenhagen Consensus) -- $254 bn over 15 years? (Jerven)
- We know the cost
- Education leaders ask: but what is the **value** of having information? (E.g., UNESCO Institute for Statistics).
  - How do we motivate investing $ in having better information?
- Additional this question: how do we demonstrate the value of educational change itself?

- This research looks at both at the same time
  - A method for calculating how much (good) information is worth
  - How to get more value for $ out of the cost of education itself (motivates discussion with MinFin)
- Model is work in progress, many caveats
- Even after finished, heuristic

Some quantitative motivation - 1

- I am getting bored and feeling trite to say: “We have access, now the problem is quality”
  - (Not completely true anyway.)
- But even specialists not aware of just how bad the problems are, and where it starts
- So let me give some numerical “motivation”

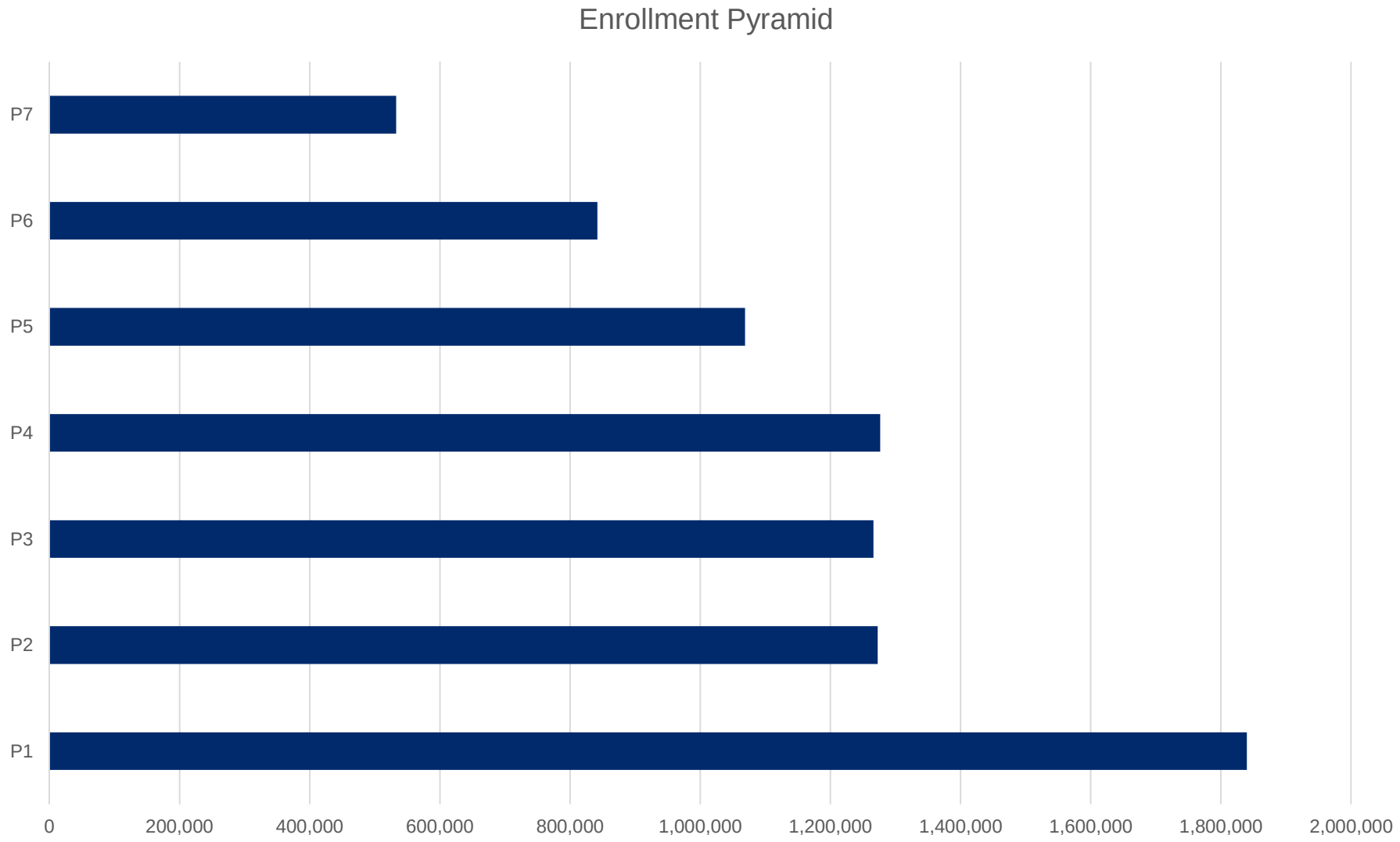
Quantitative motivation 2 – How it “feels”

This
is
how
most
3rd-grade kids
in
low-income countries
read,
at best

This
is
how
most
3rd-grade kids
in
rich countries
(OECD)
read

Note: Comparison is actually much worse, but it is too painful to sit through!

Quantitative motivation 3: What do the most basic numbers tell us? Uganda case



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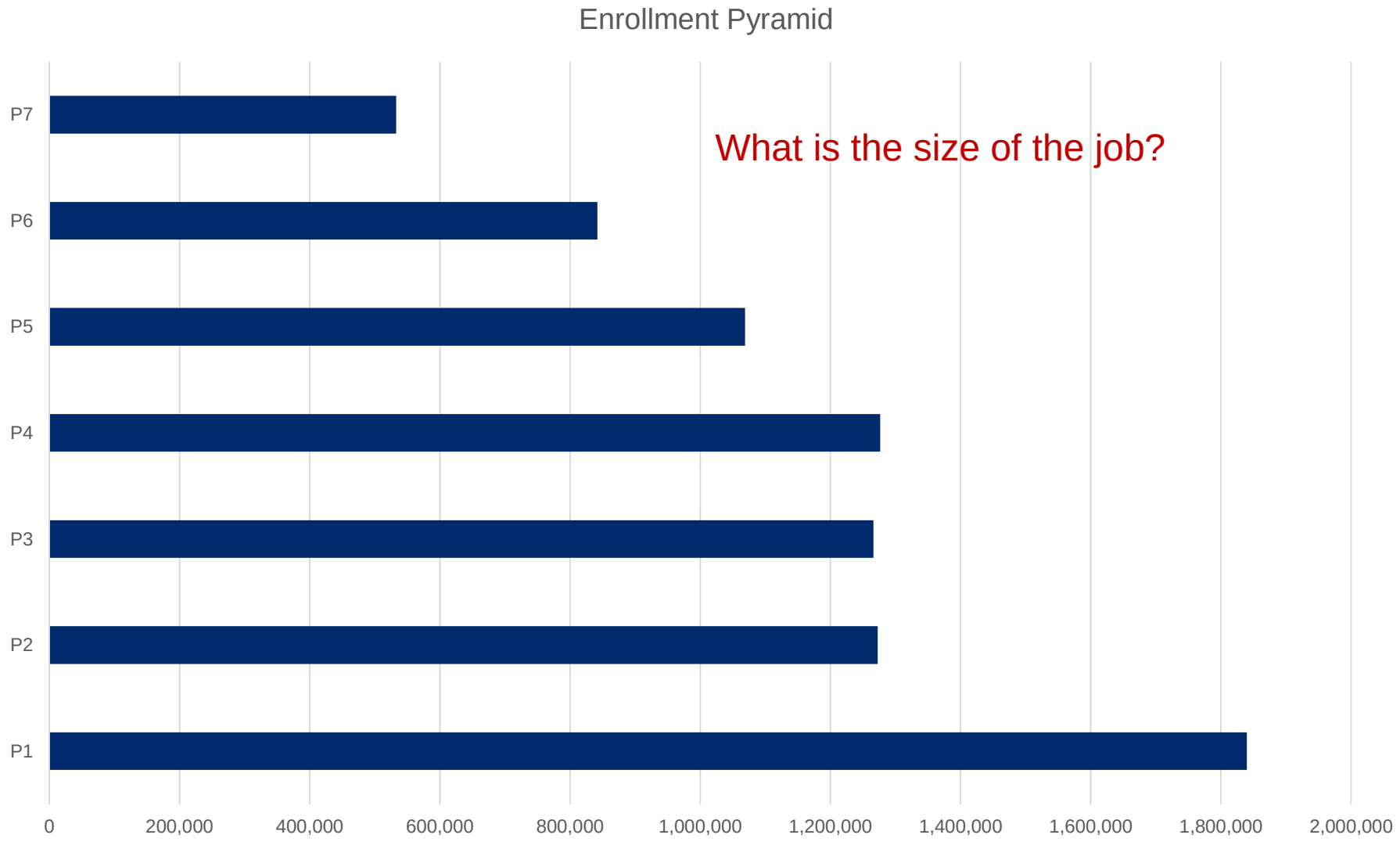

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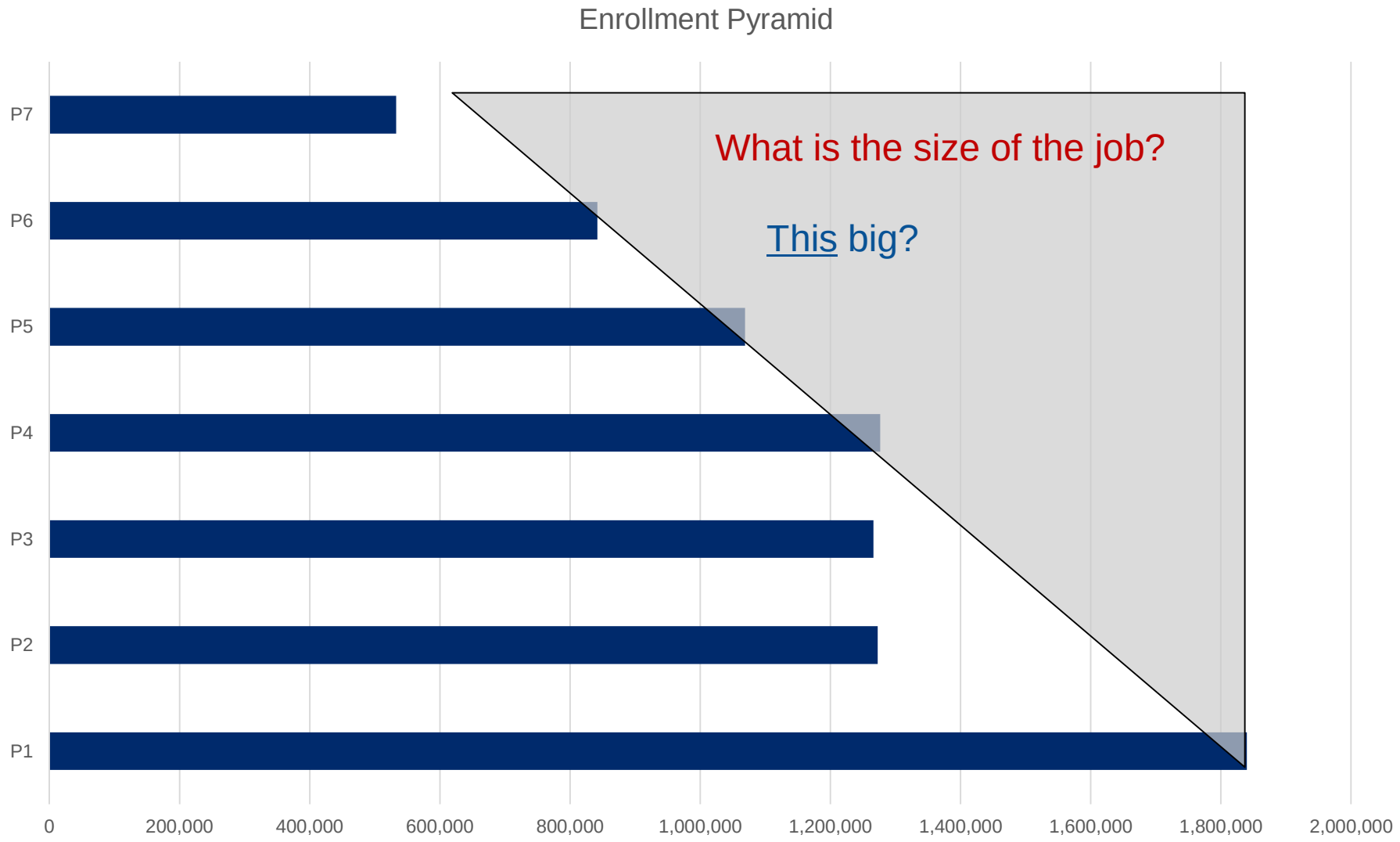

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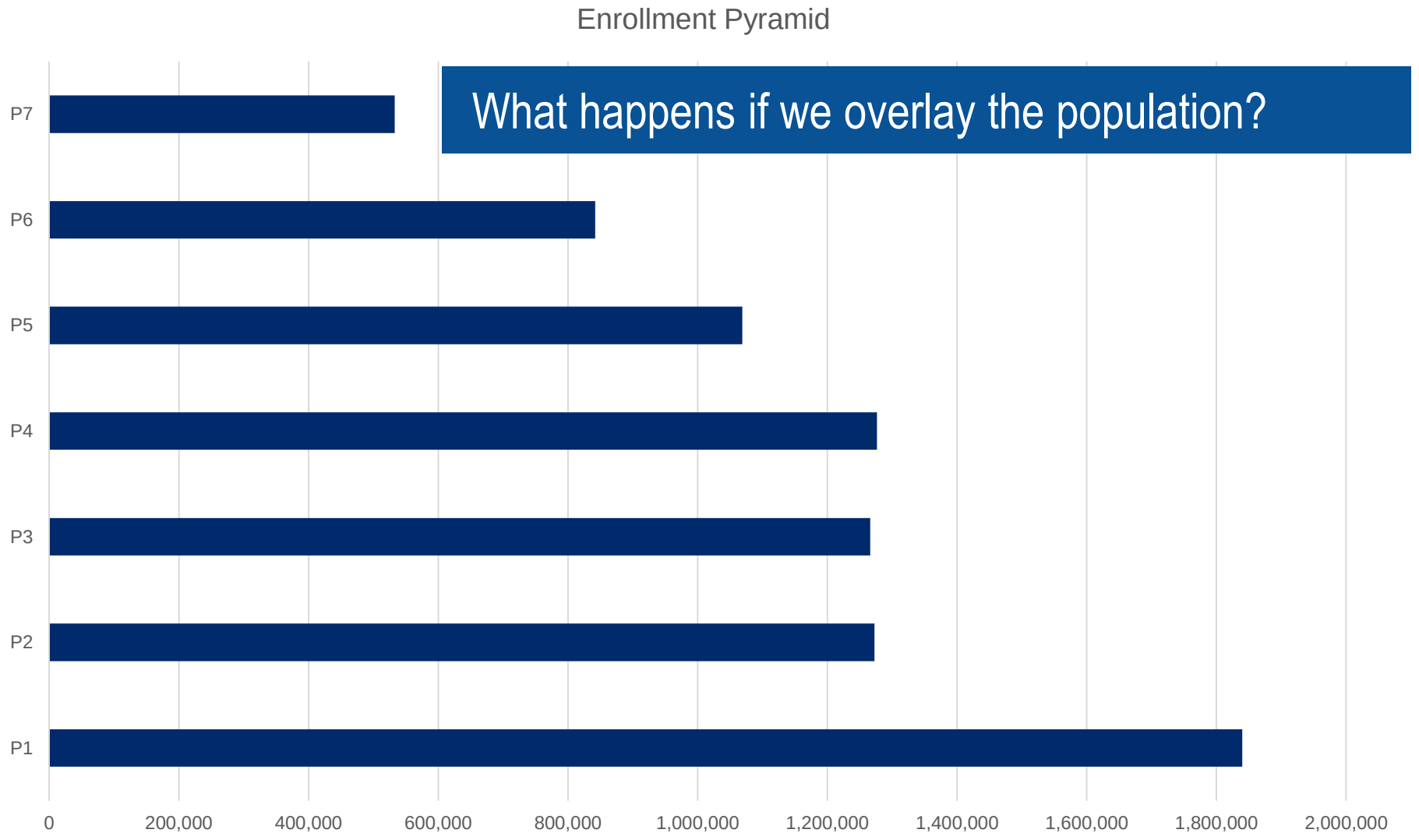

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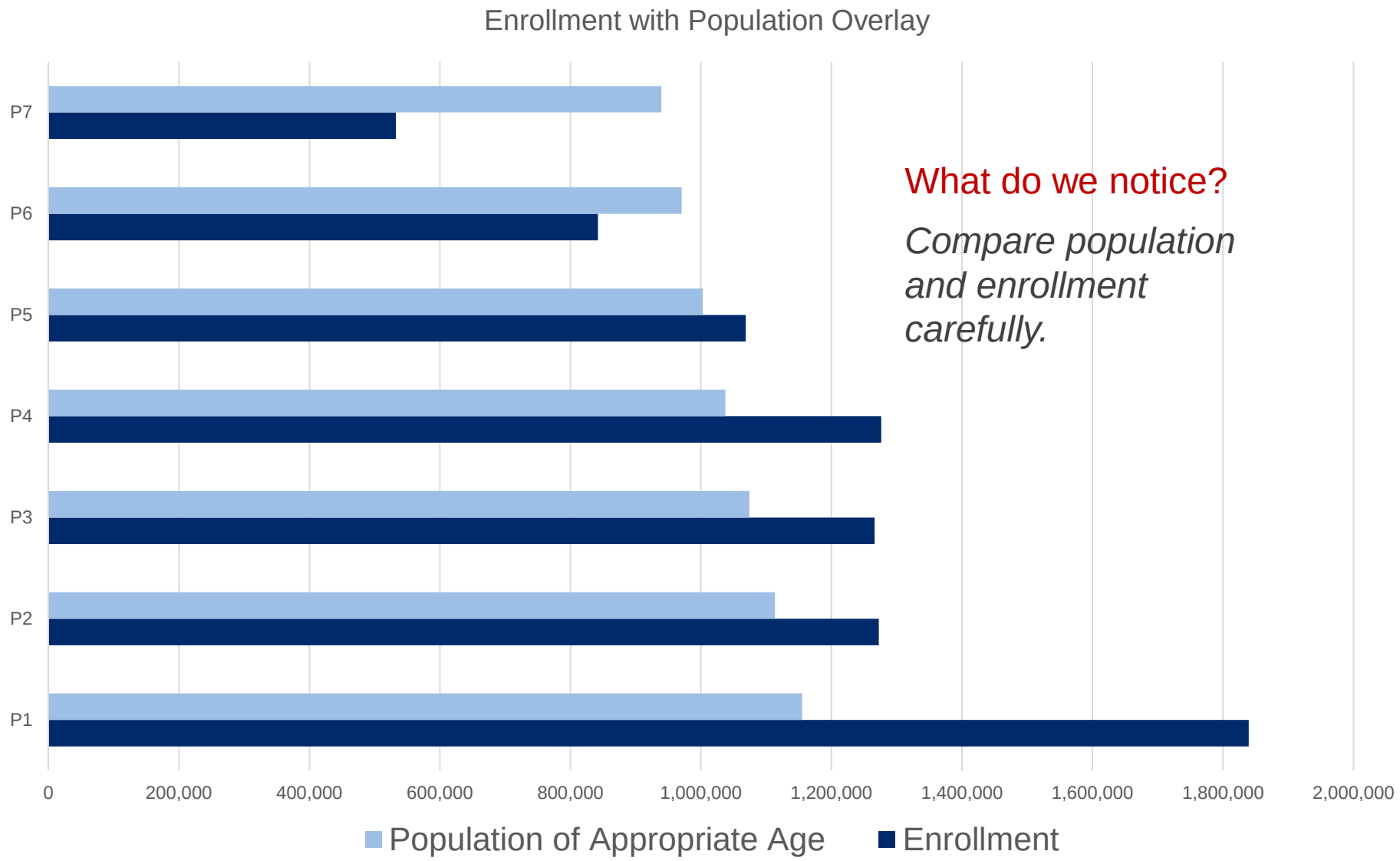
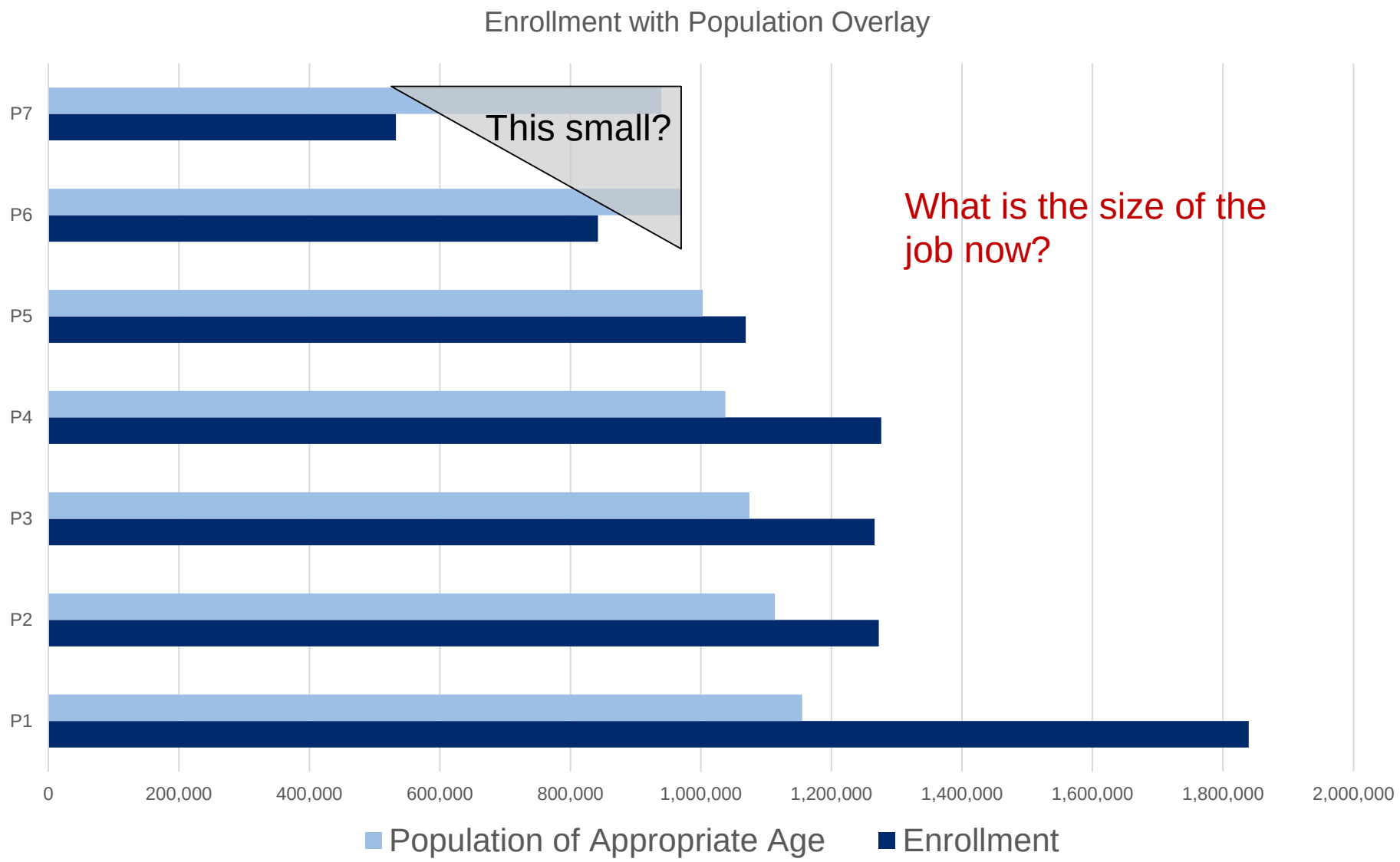


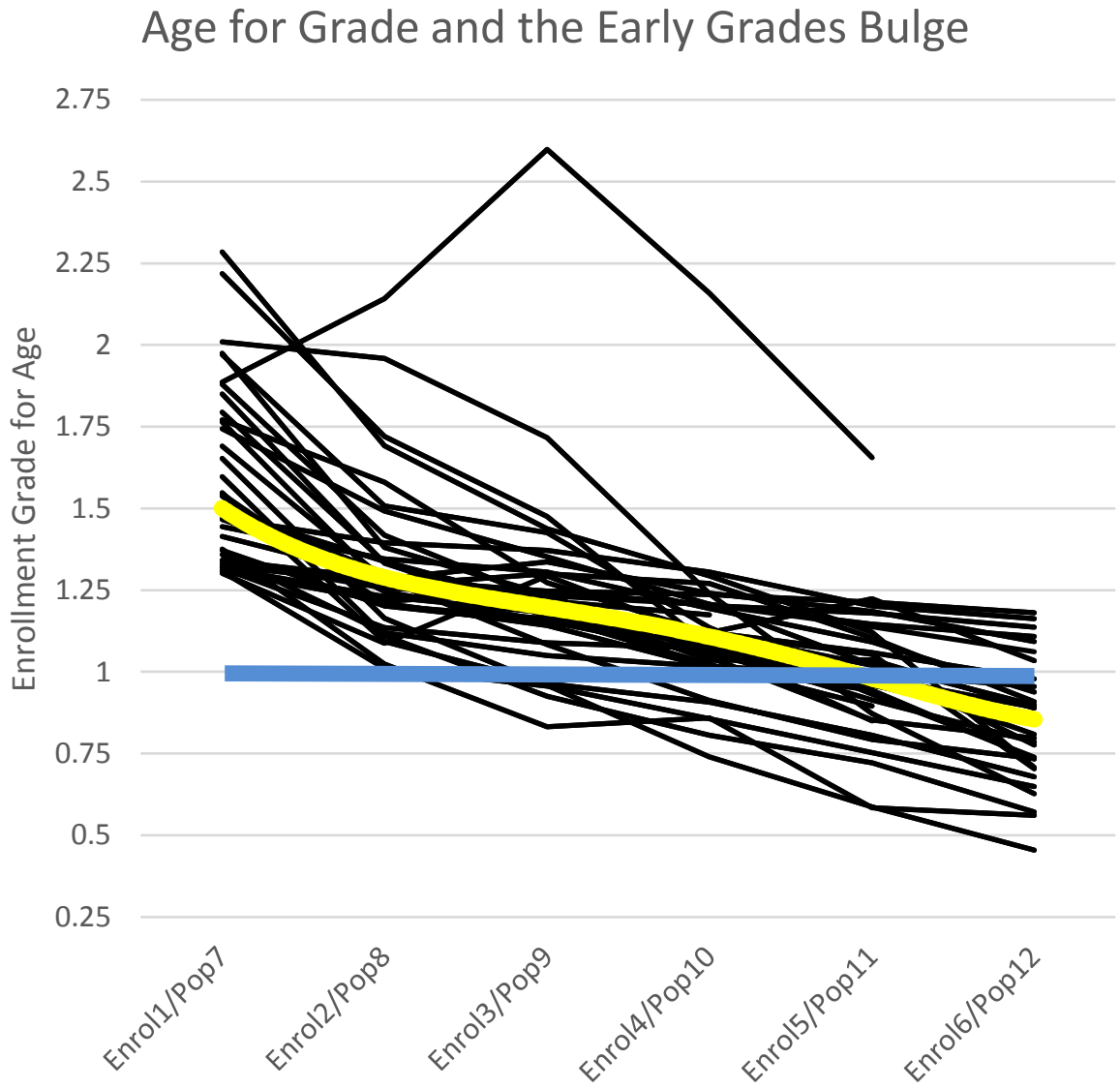
What do we notice?

Compare population and enrollment carefully.

Quantitative motivation 3: What do the most basic numbers tell us? Uganda case



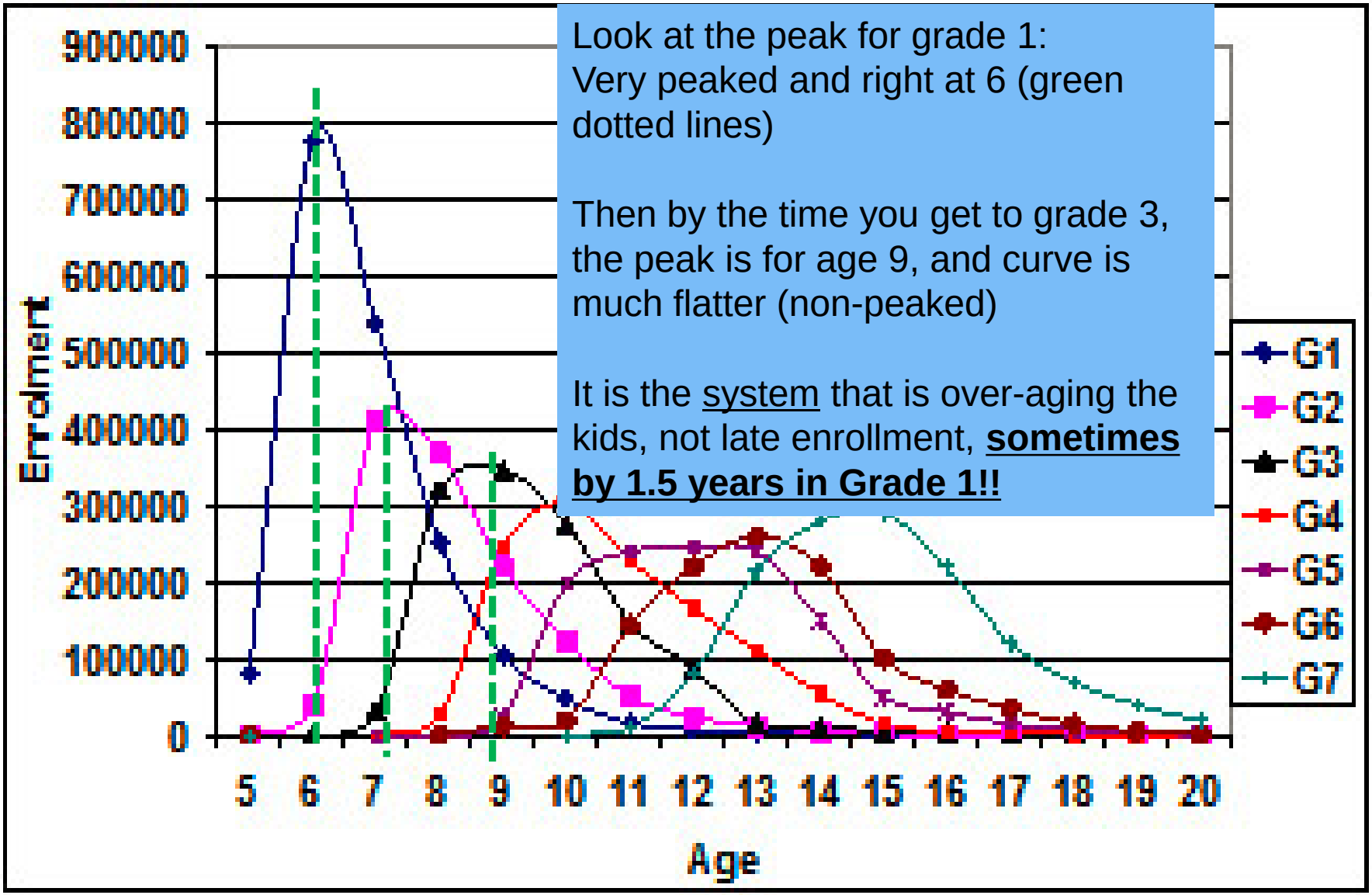
Quantitative Motivation 3 – The same problem in many countries



This means that systems have to deploy an enormous amount of “enrollment effort” to produce one grade 6 completer.

Quantitative Motivation 4 – "Aging at school"

Data from IDS Sussex's (Keith Lewin) "CREATE" project, Uganda, enrollment by age and grade



Look at the peak for grade 1:
Very peaked and right at 6 (green dotted lines)

Then by the time you get to grade 3, the peak is for age 9, and curve is much flatter (non-peaked)

It is the system that is over-aging the kids, not late enrollment, **sometimes by 1.5 years in Grade 1!!**

Quantitative motivation 5 – Some evidence on how to improve

- Evidence seems to be piling up. My read of selected "well evaluated" literature (not systematic, but sampling some 70 papers from WB, and various NGO implementers).

Type of intervention	Median Effect Size	1st Quartile Effect Size	3rd Quartile Effect Size
"**Accountability**" (governance, market incentives, community voice, etc.) and pure **inputs** ("traditional" teacher training, "more books")*	.17	.13	.22
Pedagogical*	.33	.15	.61

*Notes:

- Not at scale, but neither are accountability experiments.
- Pedagogical: mostly "triple cocktail" (Brahm Fleisch) of scripted lesson plans, aligned texts and instructional materials, and coaching for teachers – I would add appropriate but un-ashamed measurement

Quantitative Motivation - Summary

- The “quality” situation is much worse than normally thought by most Ministers, and international agencies
- The problem is in the Foundations
- Shows up as huge enrollment effort per completer: 14 or so student-years per primary completer in Uganda
- Shows up in radical inability to master, on time, even the most simple and foundational skills such as reading decoding and fluency
  - In low-income areas, 25% to 75% of end-of-2nd grade kids cannot read a single word
- Other correlates:
  - low preparedness (little or low-quality ECD)
  - permanently high but fictional “intake” rate
  - real repetition much higher than reported repetition (may be 2 or 3 X)
  - kids “aging at school”, not (necessarily) enrolling late

The model - 1

- Ask two questions:
  1. What is the difference in “social profit” provided by an education system that uses “best practices” based on best-available-knowledge
  2. How sensitive is the “social profit” provided by a system to various asssumptions?
- Cast as a non-linear optimization model
  - Note: not a statistical model, more OR
- Maximize the “social profit” produced by a “business as usual” system
- Maximize the “social profit” produced by a “best practice” system
- Compare the difference
- The two problems are characterized by different
  - Prices
  - Pedagogical “constraints” and relationships
  - “Internal efficiency” concerns (e.g., how many enrollees it takes to produce one completer)

The model - 2

$$V = \max\left(\sum_{l=1}^{3} y_l^{'} C_l^{'} - \sum_{l=1}^{3}\sum_{i=1}^{n} p_{i,l}^{'} {}_{i,l} X_{i,l}^{'}\right) - \max\left(\sum_{l=1}^{3} y_l C_l - \sum_{l=1}^{3}\sum_{i=1}^{n} p_{i,l} X_{i,l}\right)$$

The primes ' on all the symbols characterize “best practice”, un-primed is “business as usual.

y = income per completer for level l*

C = completers for level l

p = prices of inputs i for level l

X = usage of inputs i for level l

Only 3 levels (pre-primary, primary, lower secondary, for reasons noted)

Each maximization is subject to its own constraints, as follows.

A key one characterizes the effort, in Enrollment (E) that the system must make to produce completers C. (Notation is a bit “weird” in traditional LP notation.

$$C_l - \alpha_l E_l = 0 \text{ for } l = 1,2,$$

$$C_l - E_l = 0 \text{ for } l = 0, (\text{thus } \alpha_l = 1)$$

*Actually, PDV of incremental income over no education so as to bring the income forward in time to when the expenditure is taking place

The model - 3

Enrollment in one level is characterized by efficient or inefficient flow between levels. This is also a key driver of "cost per completer."

$$E_1 = \beta_1 i_1 P_5,$$

$$E_2 = \beta_2 (i_2 P_6 + b_{1\to 2} E_1),$$

$$E_3 = \beta_3 i_3 C_1,$$

This set of equations is what makes it non-linear

There is a budget constraint (otherwise the system might be unbounded).

$$\sum_{l=1}^{3} \sum_{i=1}^{n} p_{i,l} X_{i,l} \leq B$$

Many simple equations of the following form characterize the relationship between enrollment and also amongst the inputs. E.g., to characterize a system that uses the "triple cocktail" (hence "best practice") versus one that does not.

$$X_{i,l} - \gamma_{i,l} E_l = 0,$$

The data - 1

- Characterize a “business as usual” model
  - More or less a “typical” case in point, using for now Uganda as approximate reference point
- Characterize a “best practice” (reasonable best practice for a developing country—not anchoring on Finland or Korea!) case
  - Large scale pilots from international agencies, NGOs, or government’s own “best case” experiments, if successful
  - “Better practice” cases at scale, implemented by countries, e.g., Thailand
  - “Macro” benchmarks such as Fast Track Initiative for improving systems
- Not drawing formal averages or means for impacts—just a heuristic sense of impact and technical profile
- Using some international comparative evidence from the literature (e.g., impact on GDP per capita of learning outcomes)

- Summary of data below, detailed sources in Appendix

The data - 2

Table 1. Model data		
	Standard Practice	**Best Practice**
Transitions		
Entry into Pre-primary	0.2	1
Multiple of enrollment in pre-primary over intake to pre-primary	1	1
Transition from last year pre-primary to primary (P1)	1	1
Transition from population to primary (P1)	0.8	0.05
Primary completers / Primary students	0.065	0.16
Primary dropouts/ Primary students	0.38	0.03
Multiple of enrollment in primary over intake into primary	8.7	7
Transition rate to Lower Secondary	0.6	0.99
Lower Secondary completers / Lower Secondary students	0.3	0.33
Lower Secondary dropouts / Lower Secondary students	0.2	0.05
Multiple of enrollment in Lower Secondary over Intake from Prima	3.3	3
Technical ratios		
Pupil/Teacher Pre-Primary	30	20
Pupil/Teacher Primary	45	30
Pupil/Teacher Lower Secondary	30	25
Pre-Primary teachers/Coaches	1000	30
Primary teachers/coaches	1000	30
Lower Secondary Teachers/Coaches	1000	30
Books/student Pre-primary	0.5	2.5
Books/Students Primary	0.85	5
Books/Student Lower Secondary	1	8
Per pupil expenditure on overall systems improvements	US $1	US$ 10

The data - 3

Prices		
Unit teacher cost as proportion of GDP per capita		
Pre-Primary	1.9	2.5
Primary	3.7	3.4
Lower secondary	5.5	5
Unit coach cost as a proportion of GDP per capita		
Pre-Primary	2.9	3.8
Primary	5.6	5.1
Lower secondary	8.3	6.8
Unit cost of books		
Pre-Primary	US$ 5	US$ 1.5
Primary	US$ 5	US$ 1.5
Lower Secondary	US$ 8	US$ 2
Differential GDP per capita by level of education		
No school	0.9	0.8
Some primary	1.11	1.12
Primary	1.35	1.39
Some lower secondary	1.6	1.67
Lower secondary	1.86	1.94

Results

Table 2. Modeling Results					
Concept	Best Practice	Standard practice	Difference	% diff	Comment
Revenue	5,852,110,424	2,005,597,898	3,846,512,526	192%	
Cost	4,888,145,761	1,892,216,725	2,995,929,036	158%	
"Return" (Not Mincerian RoR)	0.20	0.06	0.14		
Net revenue	963,964,663	113,381,173	850,583,490		Value of information c best practice? Upper only; politics may prev action based on inforn
Cost/student	413	189	224	119%	
Primary cost/primary completer	1,311	2219	(908)	-41%	
Total enrollment	11,842,720	10,019,690	1,823,030		
Gross Enrollment Ratio, Pre-Primary	1.00	0.20			
Gross Enrollment Ratio, Primary	1.05	1.24			
Gross Enrollment Ratio, Lower Secondary	1.16	0.37			

Conclusions and caveats

- Interesting way to look at both value of information?
- And what "determines" the social return to education?
  - ("Best practice" = triple cocktail, more books, better prices for books, etc.)
- Strong caveats
  - Heuristic only.
  - Not econometrically or statistically estimated
    - (This can be improved).
  - Biggest caveat: value of information, or value of ability to act on the information?
  - Only an upper limit on the value of being informed… The real value is a political reality.

More Information

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Detailed explanation of data sources

Click here:

Detailed Data Sources