The Crisis in Education Research Capacity

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Disclaimer

Nothing I am about to say

- represents current US policy,
- is about to represent policy, or
- has even been talked about at NBES

Context

Education is finally being taken seriously on the national policy agenda

Both parties acknowledged its importance in the campaign that just ended

We have very serious educational problems

This is not entirely good news for the research community

- Will we blow it?
- Who will provide evidence (what kinds of solutions will they provide)?
- Who will ultimately benefit?

Four Major Points

1. We face major problems in education that require new knowledge

2. Big challenges require big responses

3. We need to be realistic about what can be achieved

4. There is a shortage of human capital to do this

Be bold in our vision, modest in our expectations, and wary of our ability to generate the human capital needed

Assumptions

1. We (as a nation) need to dramatically improve our education system

2. We don’t know everything we need to know to do this
   - Systematic research is needed

3. Education is at least as complicated as physical or biological science or other social sciences

4. We (as a nation) have ***the will*** to do what is necessary to improve education

The Challenge to Education Research

(We must not blow this opportunity!)

We must think as big as the problem demands

But we must also encourage reasonable expectations (even under-promise what can be accomplished)

- This involves educating the public (and ourselves)
- We must remember that effects are proportional to causes (big effects rarely come from small, cheap causes)

We (real *education* researchers) must take the lead

We must deliver results

What Expectations are Reasonable?

How should we judge what effects are large enough to be important?

Let's talk about an intervention of some sort

We describe effects in terms of a counterfactual—we say:

> The group that got the intervention had *this* average achievement and it is *that* much higher than it would have been without the intervention (the counterfactual)

In experiments, the counterfactual comes from a real control group

What Expectations are Reasonable?

We tend to describe effects in terms of variation

The effect size describes the effect (difference between the observed and the counterfactual) in terms of standard deviation units

$$d = \frac{\bar{Y}^T - \bar{Y}^C}{S}$$

This relativization can be misleading if it is reified

For example, Cohen's guidelines

- d = 0.2 is small
- d = 0.5 is medium
- d = 0.8 is large

What Expectations are Reasonable?

Relativization can also focus attention on the wrong thing

Consider three reading interventions:

- Intervention A has an effect of 10 NAEP scale points (national *SD* = 38.4)
- Intervention B can eliminate 34% of the parental education (<HS versus > college) achievement gap
- Intervention C can move a school from the 10th percentile nationally, to the 50th percentile

Which one has a bigger (most important) impact?

What Expectations are Reasonable?

Intervention C looks like it has a huge effect

Intervention B looks like it has a modest effect

It might help to judge B if you know that the parental education gap is about ¾ of the national SD in NAEP

Intervention A is hard to interpret (maybe you computed *d* = 10/38.4 = 0.26 which sounds small)

What Expectations are Reasonable?

These are actually three ways to describe the same intervention effect!

They all correspond to an effect size of $d = 0.26$ (when we use the student SD of $S = 38.4$)

They also correspond to the effect size of $d = 0.61$ (when we use the between school SD of $S = 16.4$)

What is the point here?

Effects are Usually Proportional to Causes

We evaluate effects by comparing them to something

Sometimes the something is an absolute (such as a proficiency standard)

Sometimes it is relative to a group (like all students or all schools)

Sometimes it is relative to the effects of other interventions

We need to be very careful about the standards of comparison we use and encourage others to use

Modest effects that can be replicated are important

Scientific Lesson

For scientific reasons, big intervention effects that can be replicated are hard to believe

(An intervention effect big enough to erase the parential education gap would be big enough to move the 10th percentile school to the 99th percentile nationally)

We should not evaluate our success, or encourage others to do so, based on finding ***big*** effects

Political Lesson

There is a big lesson from President Obama's handling of the economy

His policies rescued the country from a potential depression

But much of the country believed the policies failed

During the campaign, we kept hearing his critics say, "Obama told us unemployment would be 6% by now and it is 7.9%!"

Do not over-promise what can be achieved!

Effects are Usually Proportional to Causes

Reasonable people expect that effects are proportional to causes

Except in social and educational programs

People want to believe that social and educational programs are magic

We need to emphasize that there are no magic bullets (or that magic bullets are ***very*** expensive)

Moving Forward

How should we encourage the nation to move ahead?

1. Think big
2. Mobilize political and moral support
3. Argue that
   - Educational health is every bit as important as physical health
   - Human capital is crucial to fiscal health of the nation
4. Deliver results (and explain our successes)

If We (as a Nation) are Serious About Improving Education

Two rather different visions of research are possible

Vision I: Highly Centralized

- A war on educational inequality (like the war on cancer)
- A theory of knowledge that is broadly generalizable
- One or a few large agencies with broad mission
- A budget of a fraction of 1% of education expenditures

Model: National Cancer Institute

NCI is the only National Institute of Health focusing on a single disease (a political creation)

NCI has about 4,000 employees

NCI budget is over 6 billion dollars/year

Conducts internal research in its own labs

Awards grants to universities and research institutes to conduct research

Is This Scale Plausible?

Education spending is over 600 billion dollars/year

1% of that is over 6 billion dollars/year

0.5% of that is 3 billion dollars/year

Current spending on educational research is well under 1 billion dollars/year

Minimum additional support: 2.15 billion dollars/year

Even the 0.5% rate would multiply the size of the educational research community by 3 to 5

Human Capital Implications

Average researcher salary (with benefits and overhead)
$200,000/year

Support staff ratio 1:1

Support staff salary (with benefits and overhead)
$100,000/year

Total cost per researcher $300,000/year

$2.15 billion translates into 7,000 researchers, 7,000 staff

This is ***in addition*** to what we have already

If We (as a Nation) are Serious About Improving Education

Vision II: Highly decentralized

(A Chicago Consortium type of model)

- A theory of local knowledge situated in local context
- A research collaboration between education researchers, schools, and universities
- A serious research center in every large urban area (say the 100 largest cities in America)
- Smaller expenditures with a small staff of researchers and support personnel in each city

Blends are possible and perhaps even desirable

Model: Chicago Consortium

This model is already being emulated in NY, DC, and a few other cities

Chicago may have 20+ researchers and 15 support staff (almost no cities have this kind of research operation)

Sites in the 100 largest cities yield 2,000+ researchers and 1,500+ support staff

Scale and cost is only slightly smaller than that in vision I

The idea of 100 largest cities is not too crazy: Rochester, NY is the 99th largest city

If We (as a Nation) are Serious About Improving Education

Human capital infrastructure requirements (***new*** personnel)

2,000 – 7,000 PhD level researchers, plus support staff

- Education research is at least as hard as disciplinary research
- Research training of the same intensity is needed
- Research training of the same quality is needed

Can we produce the human capital needed?

Needed Research Competencies

Need researchers who can work in teams of people with different perspectives and different research training, but some technical competencies need to represented

- Analysis of Instruction/Learning sciences
- Curriculum analysis/development
- Field work methods/ethnography/community researchers
- Policy analysis
- Measurement
- Educational statistics

Needed Research Competencies

Some of these are core research competencies taught in both education and in other social sciences

- Fieldwork
- Policy analysis

Others are more the domain of education

- Analysis of curriculum and instruction
- Measurement and assessment

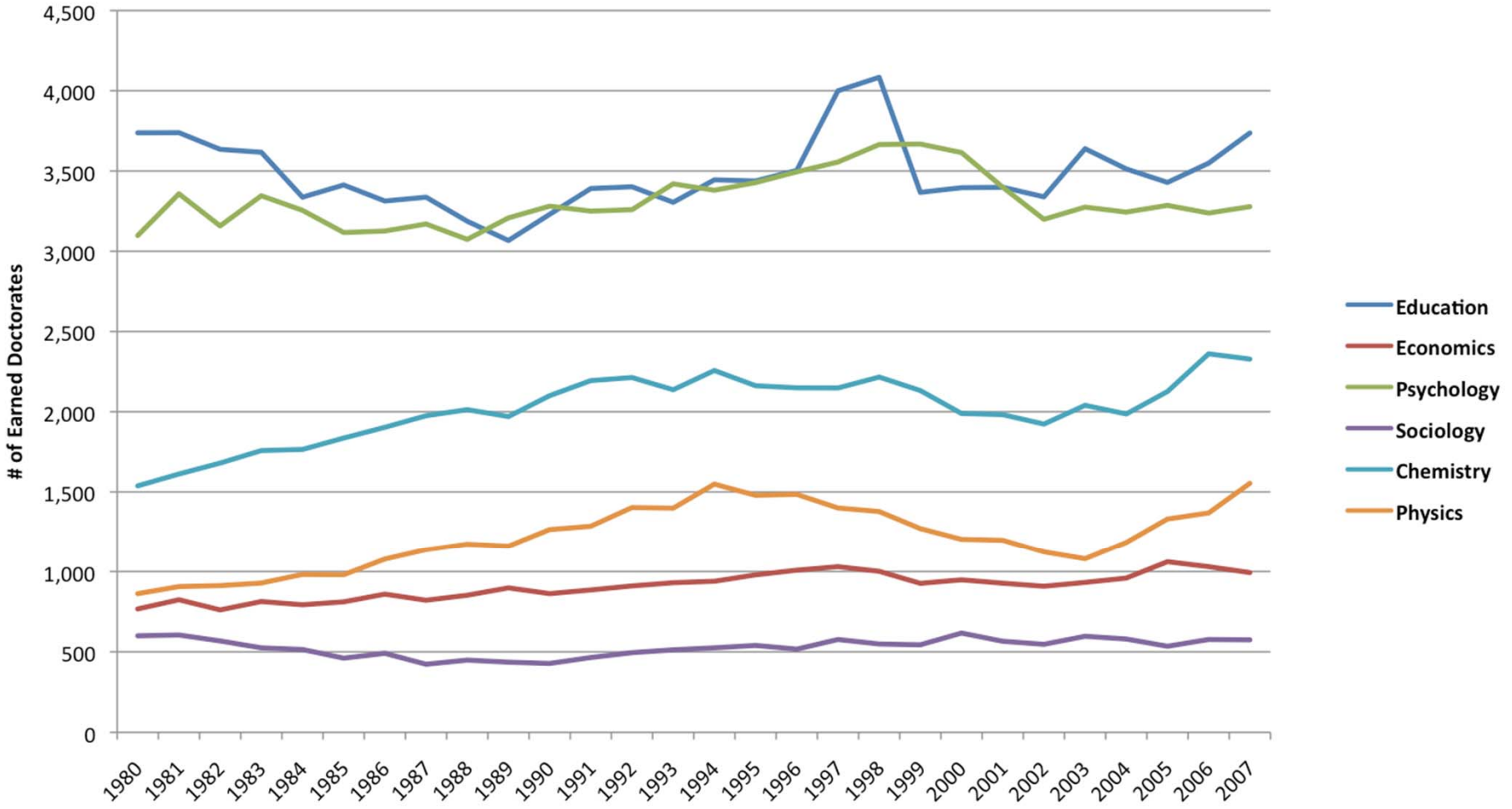
Where will the New Researchers Come From?

American universities produce more education PhDs than PhDs in any other field

The following graph shows PhD production in three areas since 1980

- Education
- Allied social sciences (economics, sociology, and psychology)
- Two physical sciences (chemistry and physics)

PhD Production in Six Fields: 1980-2007



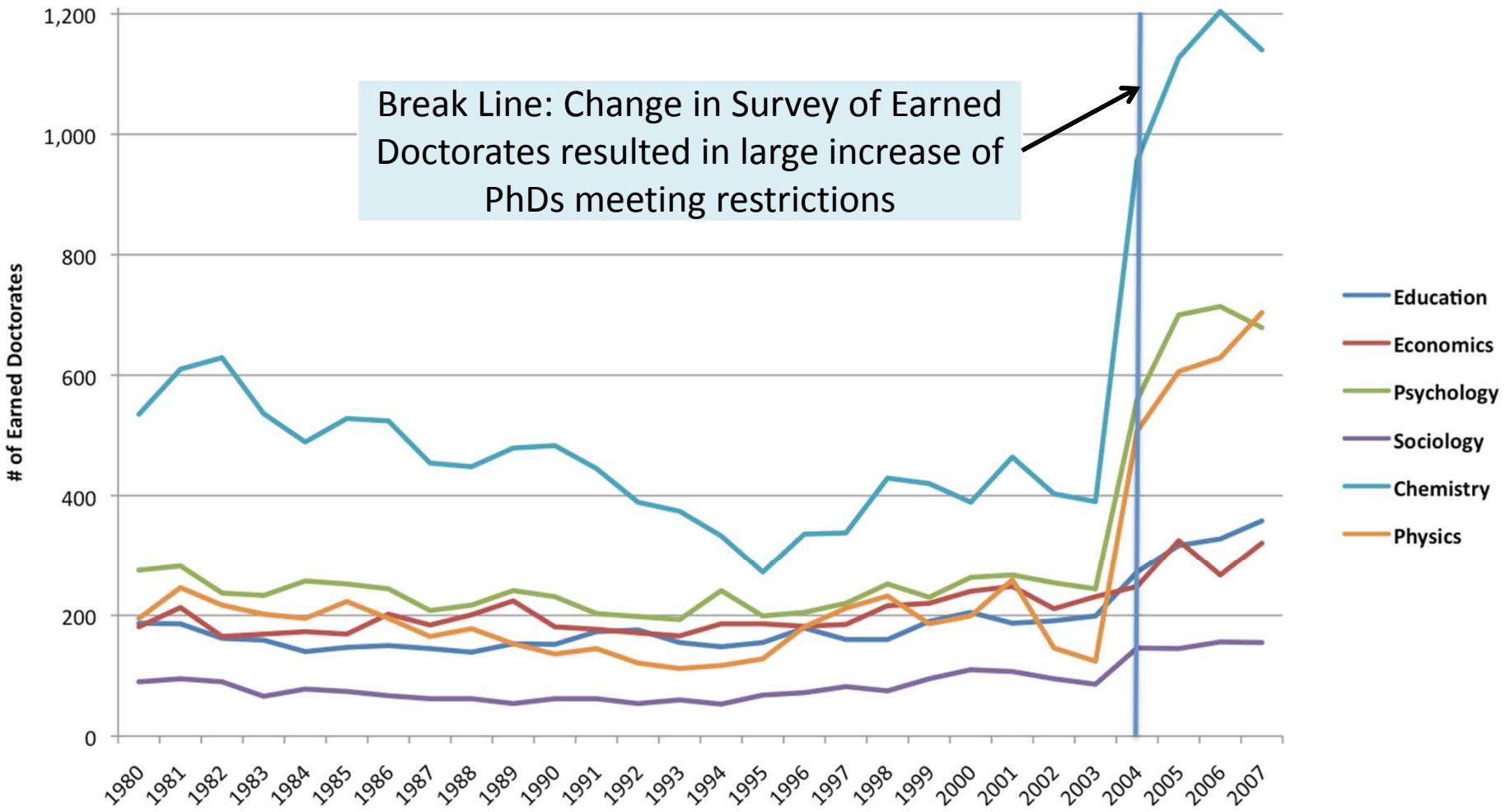
Not So Fast!

But these figures are misleading for three reasons

- Not all PhDs go into research
- Not all PhDs are trained in research universities
- Not all PhDs seek employment in the US

The next graph shows PhD production in research universities employed in research in the US

PhD Production in Six Fields: Employed in US Research



What About Quality of Training?

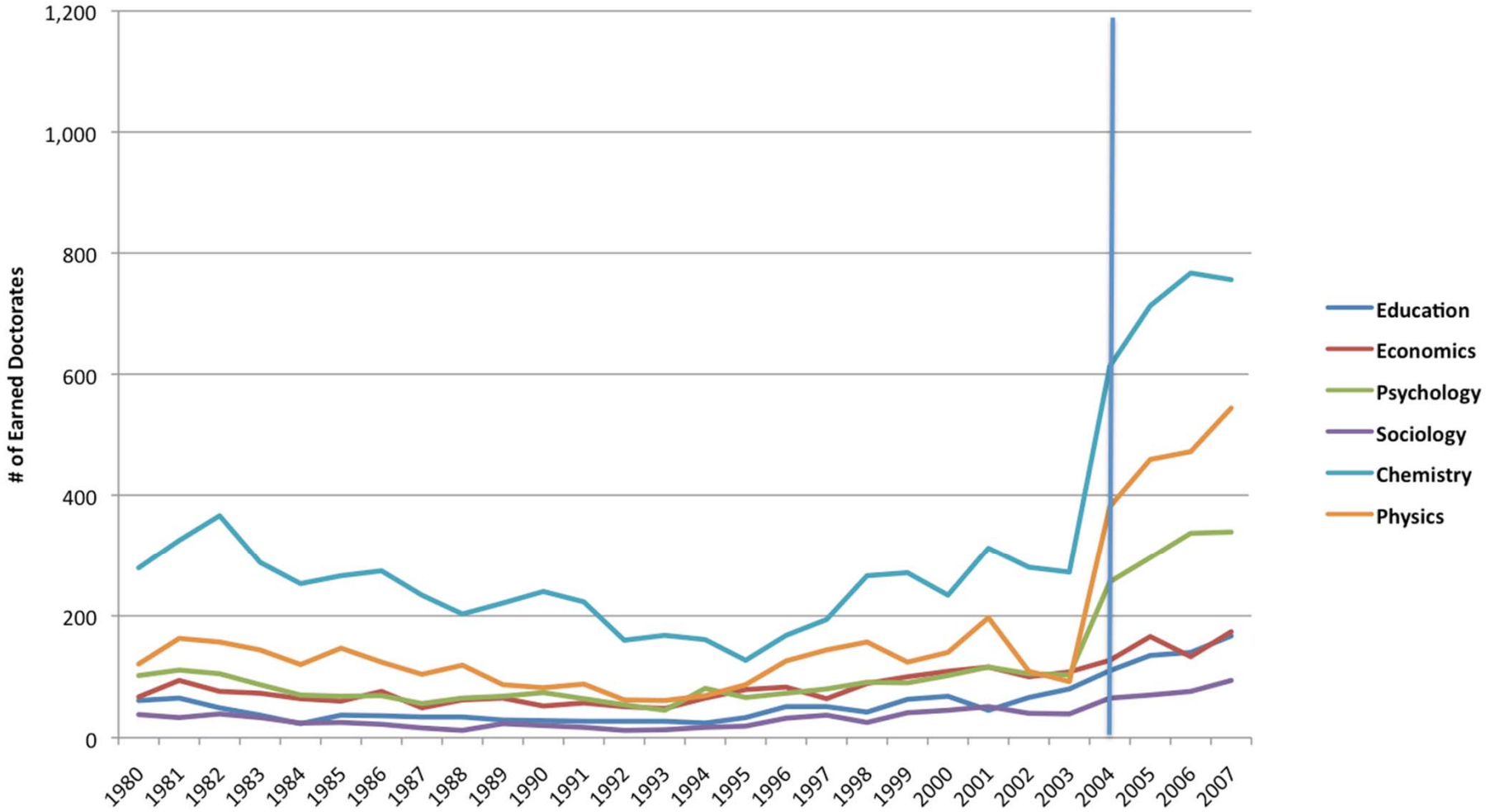
Developing research competence requires competent trainers and research apprenticeships

Not all education PhD's are granted in research universities

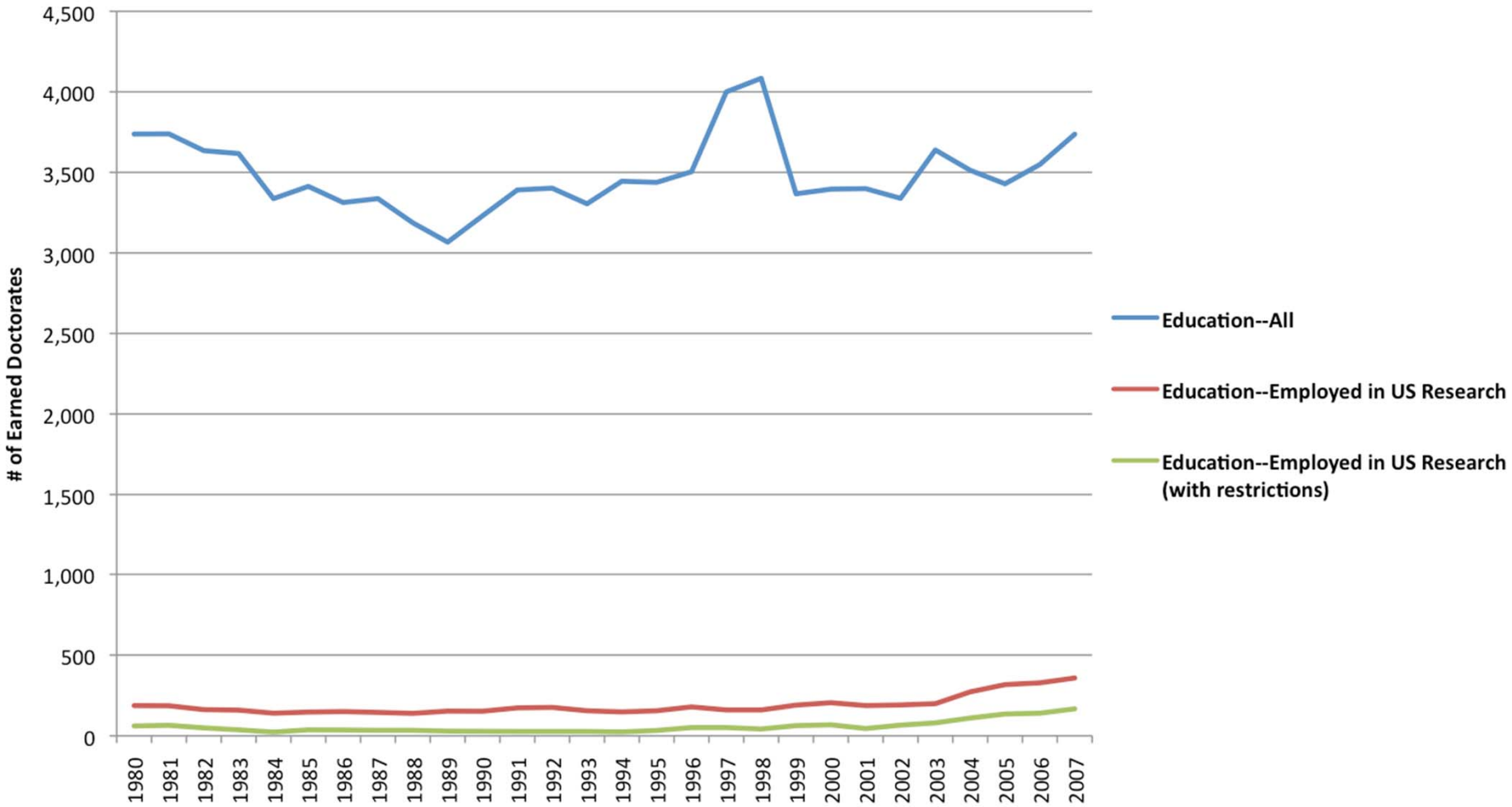
Some of the biggest producers of PhDs in education have no research capacity at all

This is reasonable given that PhDs in education have become a necessary credential for administrative positions

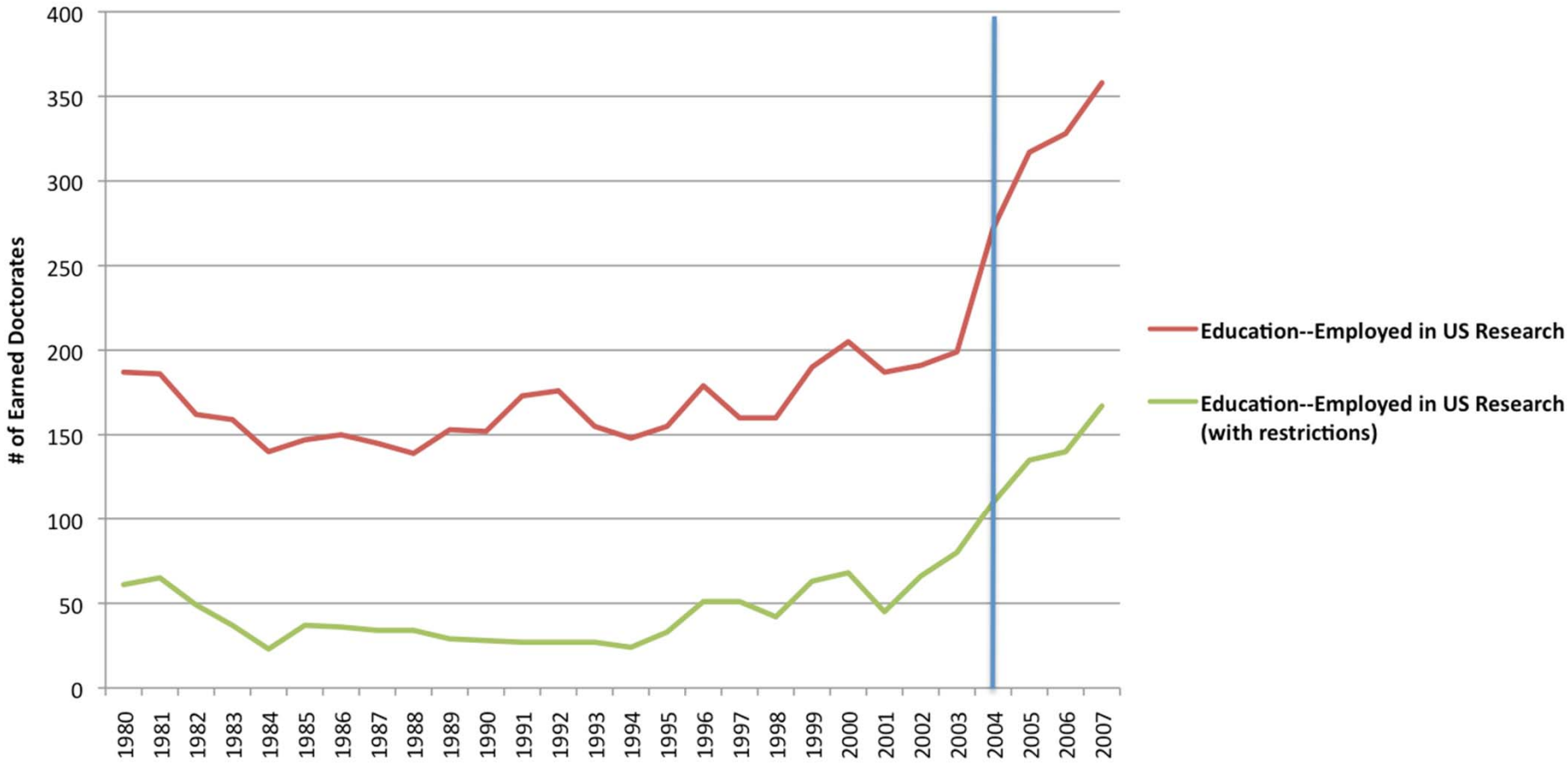
PhD Production in Six Fields: Employed in US Research & Trained in Research Universities



PhD Production in Education



PhDs in Education: Employed in US Research



Some Technical Fields May be in Shorter Supply

How many researchers are trained with various specific research specialties?

The Survey of Earned Doctorates tells us about only three:

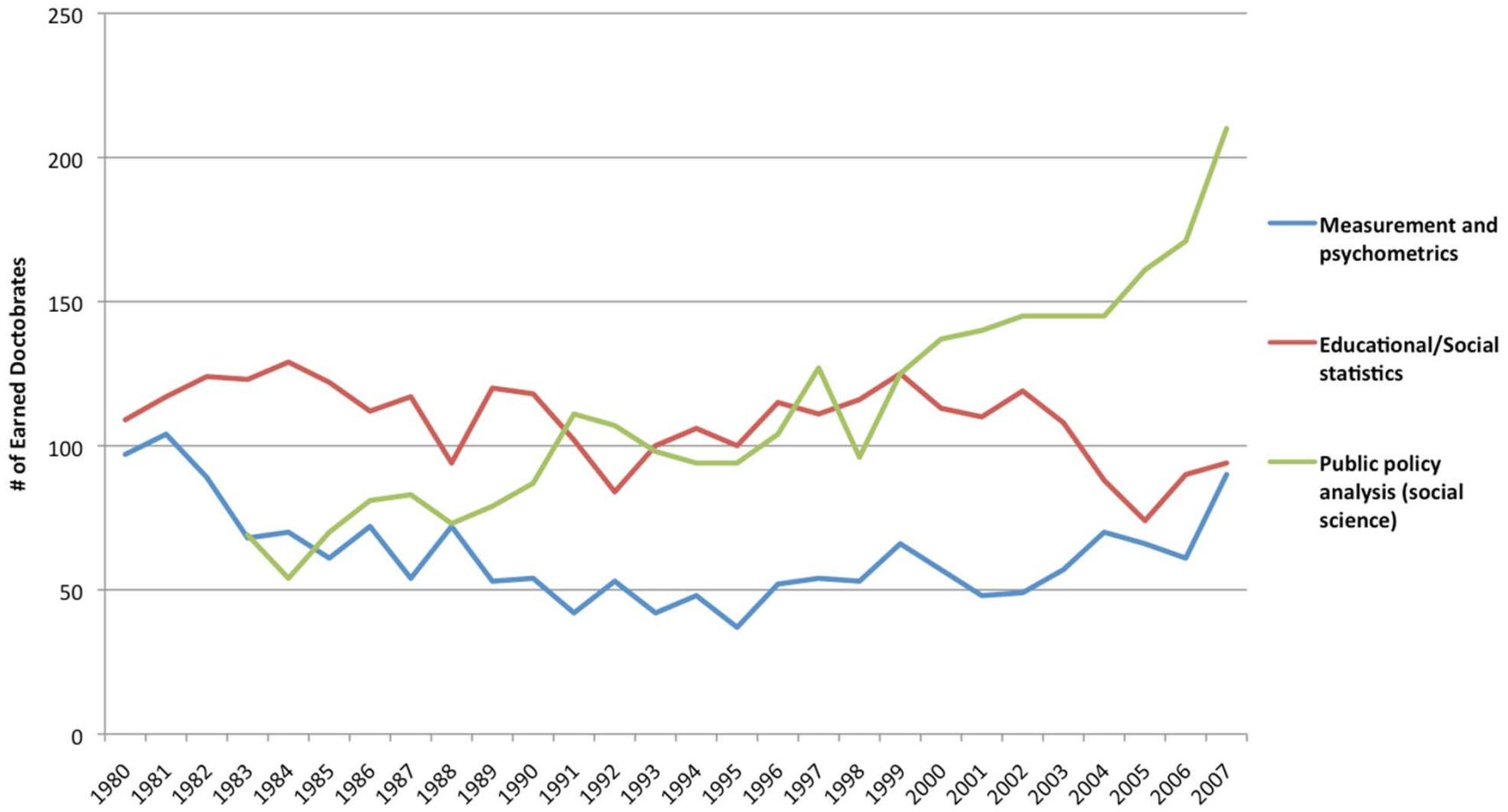
- Policy analysis
- Measurement
- Educational statistics

We could use 200+ new researchers in each of these areas

These are ***not*** the only critical subfields

The next graph show PhD production in these subfields

PhD Production in Critical Sub-Fields



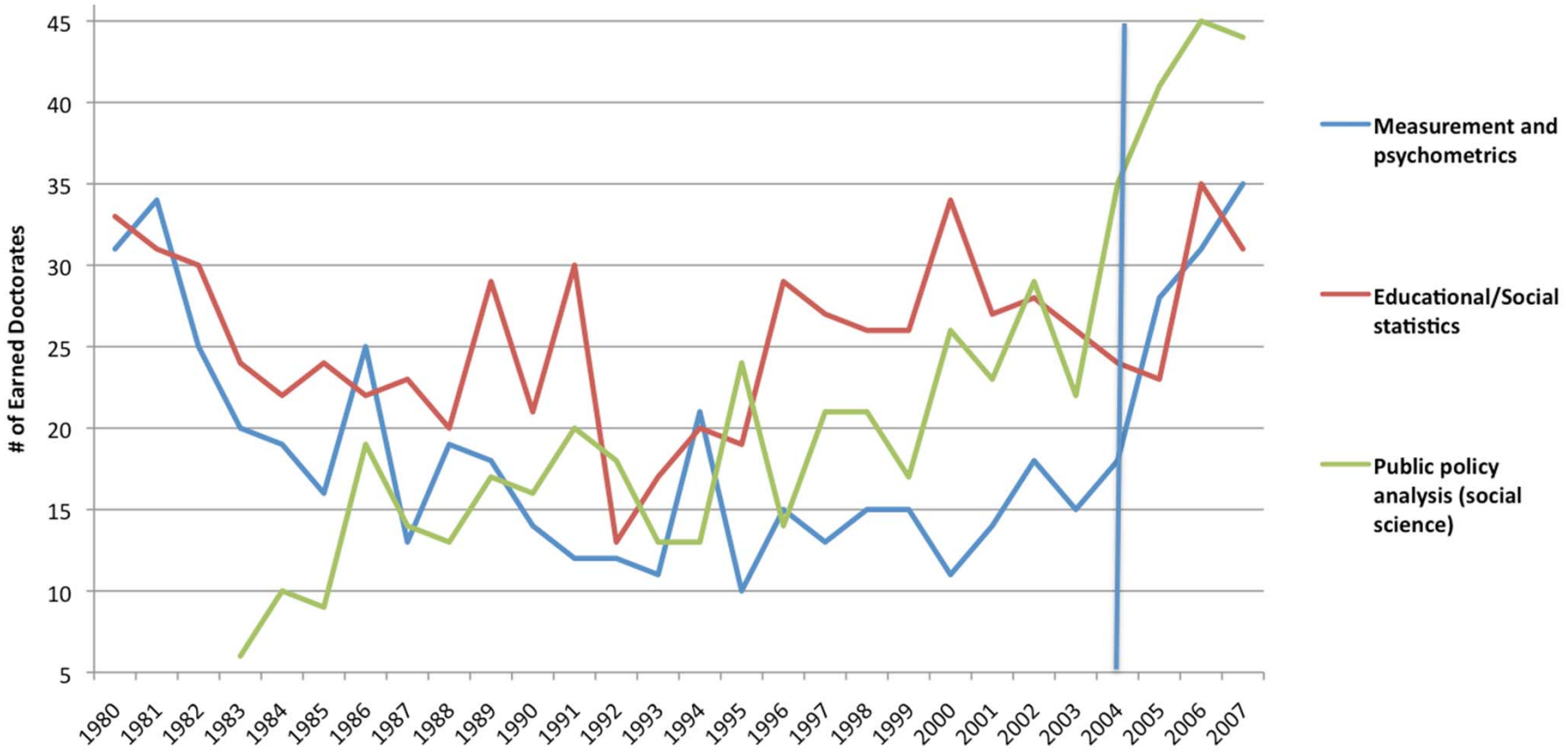
Not So Fast!

But these figures are also misleading for the same reasons as those in the first figure

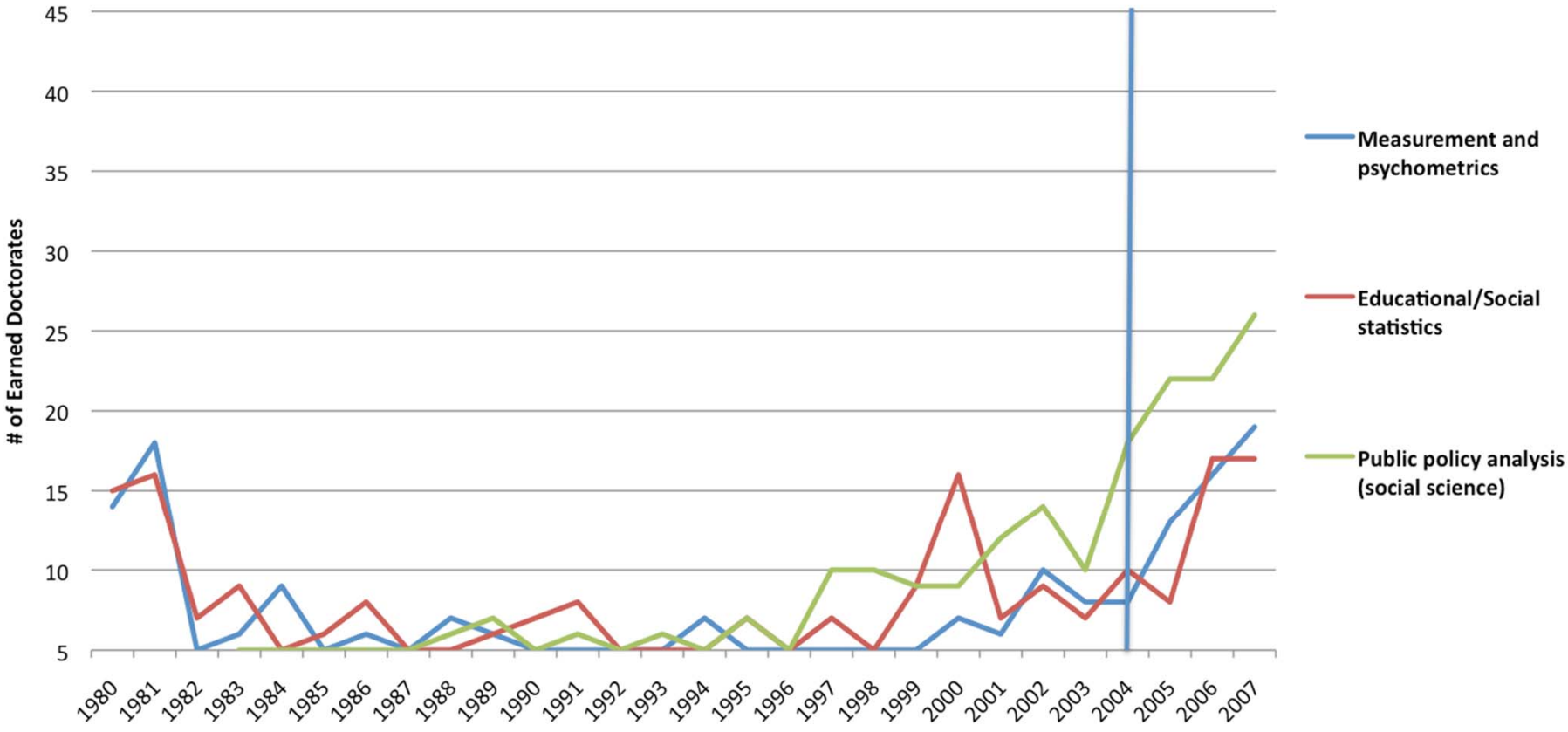
The next graph shows PhD production in research universities employed in research in the US who specialized in

- Measurement
- Educational statistics
- Policy analysis

PhD Production in Critical Sub-Fields: Employed in US Research



PhD Production in Critical Sub-Fields: Employed in US Research & Trained in Research Universities



Conclusions

At the current rate of production it could take 7 – 20 years to fill ***additional*** human capital infrastructure needs in education research, using **all new PhDs**

Many PhDs are needed elsewhere (e.g., for replacement of an aging professoriate)

We never produced many more relevant PhDs, even in the massive expansion of higher education in the 1960's

We must pay attention to increasing human capital supply

Conclusions

It is crucial that a large fraction of these PhDs be trained in education schools or departments

Disciplines influence how research problems are formulated

Education (and perhaps psychology) is likely to focus on curriculum and instruction

My bias: What children learn has something to do with ***what*** is taught and ***how*** it is taught

I believe we need to focus a lot of research attention on curriculum and instruction, not just organization (although that is important too)