

Measuring Education Services as Intangible Social Infrastructure

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Motivation and Overview

- Starting point is work by Corrado, Haskel and Jona-Lasinio (2017) on public intangibles.
- It sees education services as producing a societal asset that should be included in saving and wealth.
- We apply the Jorgenson Fraumeni model to this framework to measure investment in education services.
 - Discussion of a number of conceptual issues
 - Issues in applying the approach to UK data
 - Some preliminary results

Measuring Human Capital Stocks

- It employs the Jorgenson-Fraumeni framework.
- It calculates the values of human capital stocks based on lifetime incomes by sex (s), age (a) and education level (e).

Let emp = employment rate

y = current market income

li = lifetime income

δ = the discount rate

g = average income growth

senr = the enrolment rate

sr = the survival rate.

The Jorgenson-Fraumeni Framework

In general the lifetime income of those who are not currently in education (assumed aged 35+) is given by:

$$li_{s,a,e,t} = y_{s,a,e,t} + sr_{s,a+1,e,t} \frac{1+g}{1+\delta} li_{s,a+1,e,t} \mid a \geq 35$$

This assumes that the best estimate of a person's income next year is that earned by a similar person this year who is one year older.

The Jorgenson-Fraumeni Framework (cont.)

For persons aged between 5 and 34, lifetime income takes account of if they are enrolled in education or not. For these age groups:

$$li_{s,a,e,t} = y_{s,a,e,t} + sr_{s,a+1,e,t} \frac{1+g}{1+\delta} \left[senr_{s,a,e,t} li_{s,a+1,e+1,t} + (1 - senr_{s,a,e,t}) li_{s,a+1,e,t} \right] \quad | \quad 5 \leq a < 35$$

Their income depends on if they stay in education, in which case they earn li associated with education level $e + 1$, or leave school and earn li associated with education level e .

Investment in Education

Following Christian (2010), we estimate “investment from education of persons enrolled in school” as:

$$VES_t = \sum_s \sum_a \sum_e enr_{s,a,e} (li_{s,a+1,e+1,t} - li_{s,a,e,t})$$

where *enr* are enrolments. These are multiplied by the amount by which lifetime earnings at that age, sex and education change with the addition of one extra year of education and the one extra year of age required to achieve that additional education.

Investment in Education (cont.)

- In order to estimate this equation, we need to address a number of issues
 - Attribution of earnings to education
 - Employment probabilities
 - Education progression
 - Foreign students
- We also want to compare these outcome based estimates with the expenditure on education.

Issues in Calculating Investment in Education

Attribution

- Some part of lifetime earnings is a return to experience or employer provided training.
- To capture the component arising from education, we assumed income is constant at the earnings a few years after graduation.
- We are experimenting with a more systematic treatment using Mincer wage equations.
 - First estimates suggest similar results to the crude method.

Issues in Calculating Investment in Education (cont.)

Employment probabilities

- The equations for lifetime income are the potential earnings of those currently in education.
- However, some persons will not be employed throughout their working lives due to unemployment or because they are not in the labour force (maternity leave, illness, retirement, etc.)
- We deal with this by multiplying current income by employment rates, as is standard in human capital stock calculations.

Issues in Calculating Investment in Education (cont.)

Education progression

- The UK data are available by type of qualification rather than years of education, divided into 4 groups:
 - GCSE
 - A-level
 - Further education (FE)
 - Higher Education (HE)
- GCSEs are compared to no qualifications, A-levels to GCSEs, FE to GCSEs and HE to A-levels.
- We only consider full-time FE.

Issues in Calculating Investment in Education (cont.)

Foreign students

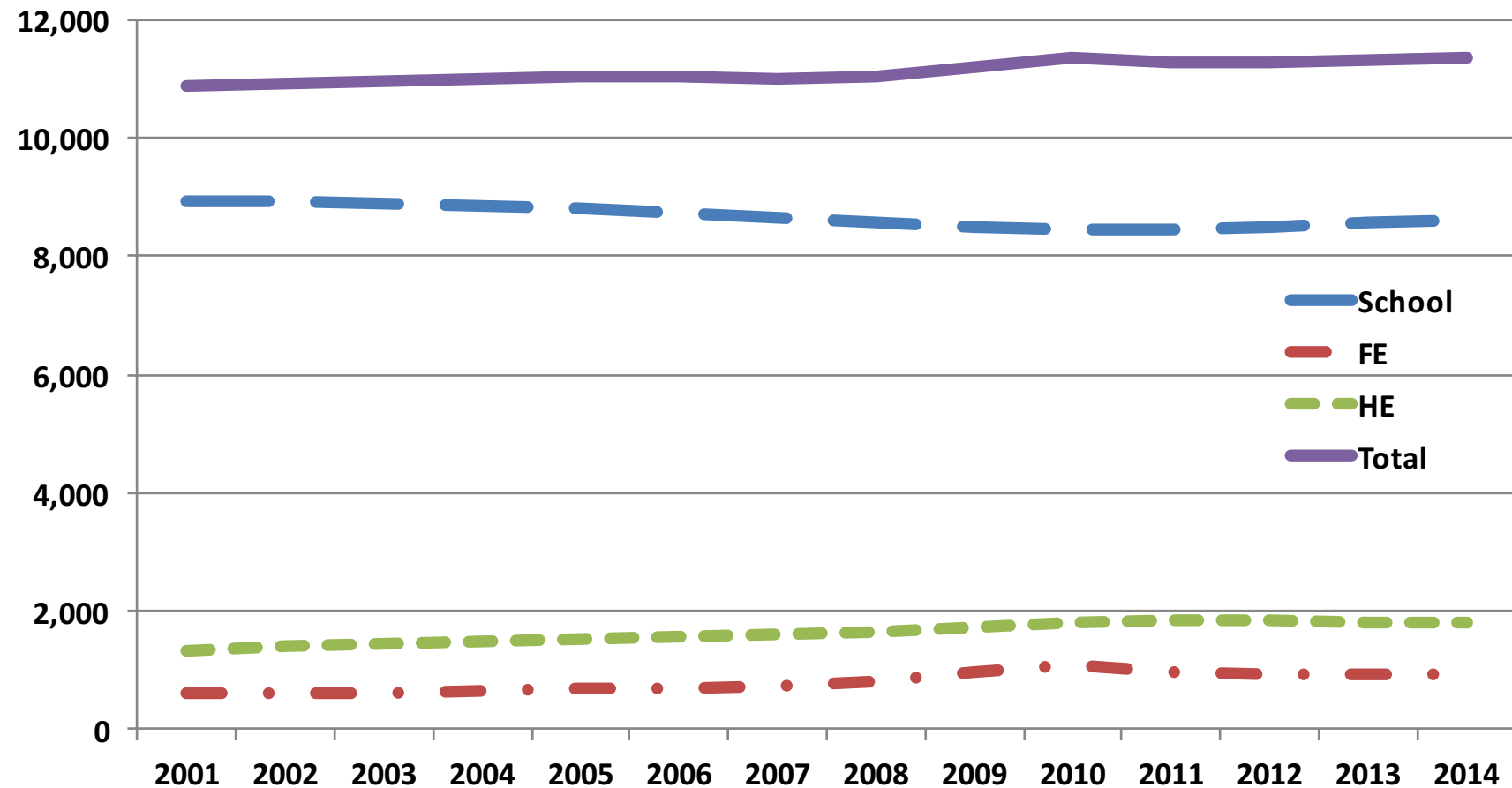
- Some students receive education and afterwards go back to their home country, so arguably should be removed from the estimates.
- We distinguish between EU and non-EU students – only the latter are considered ‘foreign’.
- In the UK ‘foreign’ students pay the full cost of their tuition, so they are also removed from the public expenditure side.

Data Sources: UK estimates

- Enrolment rates from Education statistics
- Unpublished tabulations from HESA for foreign students
- UK Labour Force Survey was used to estimate earnings by age, gender and qualification level
- Life tables for survival probabilities
- COFOG data for expenditures on education

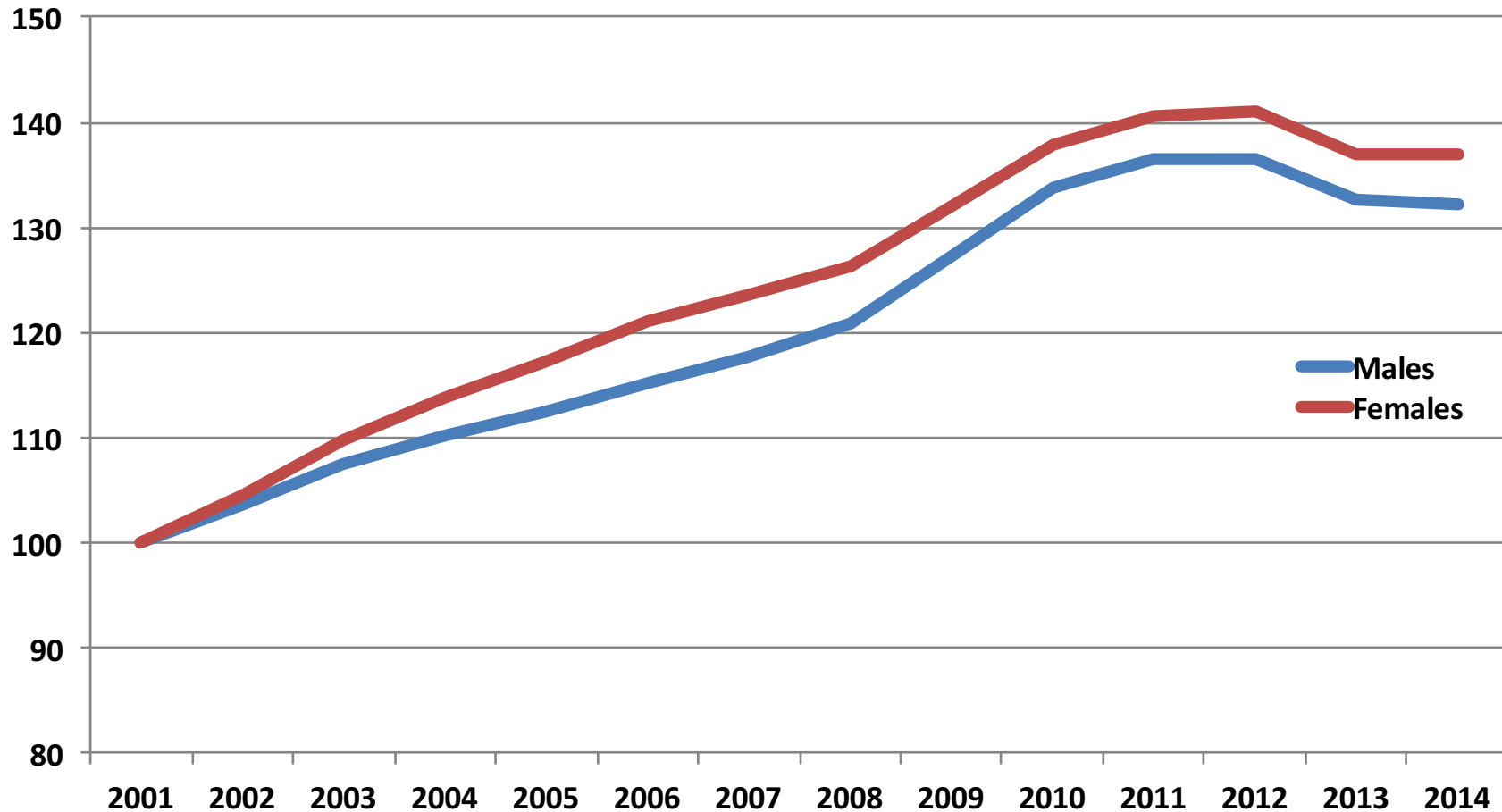
Enrolments by Education Type

(in thousands)



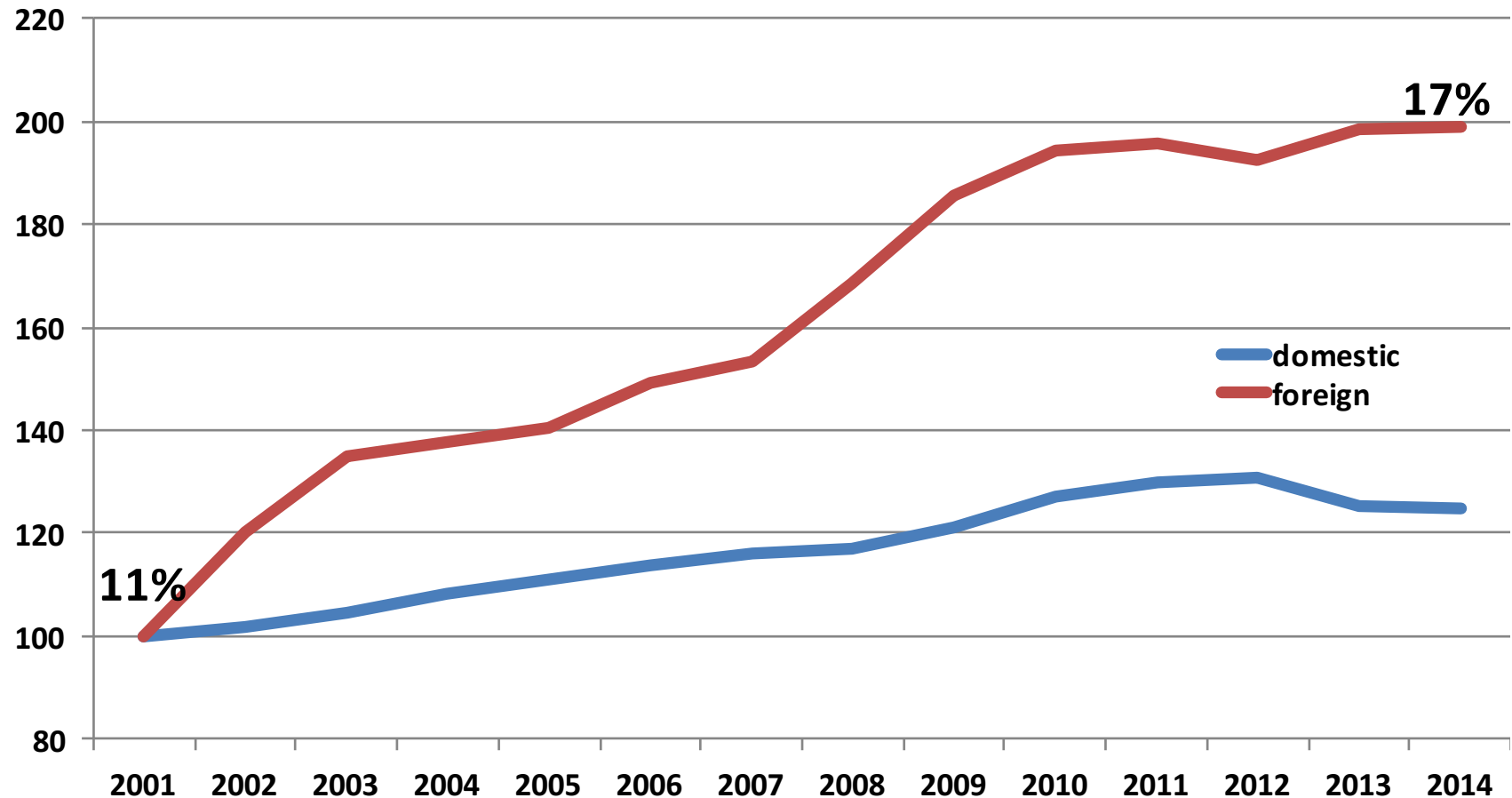
Enrolments by Gender: HE

Index (2001=100)



Enrolments by Domicile prior to Study: HE

Index (2001=100)



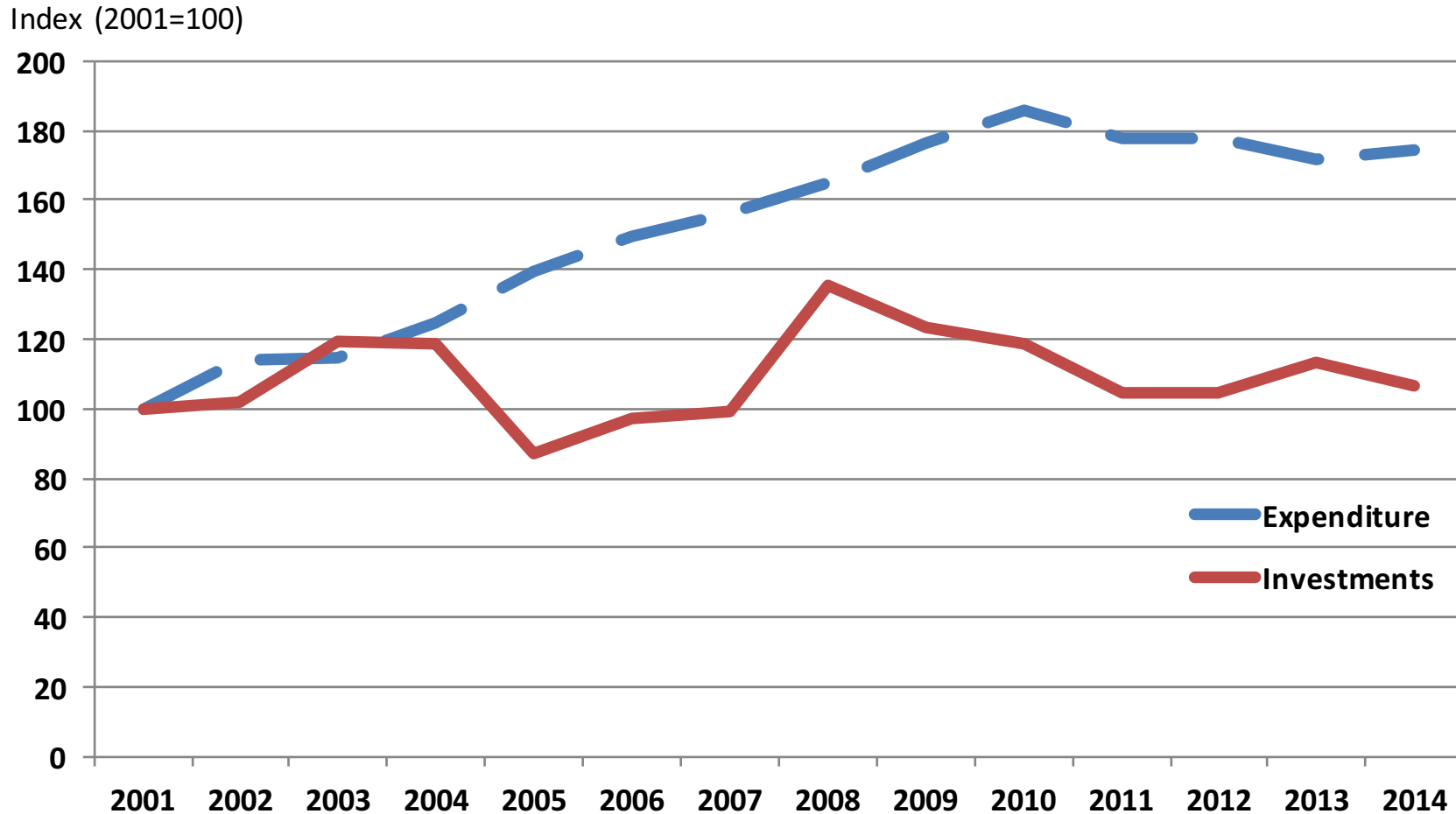
Education Services and Education Costs, 2013

PRELIMINARY: PLEASE DO NOT CITE

	Education investments (in million £)	Ratio to baseline A	Ratio to expenditures
A) baseline: incl. emp. propensity	428,851	1.00	5.37
B) A + attribution	379,680	0.89	4.76
C) A + adj. foreign students	375,108	0.87	4.70
D) A + attribution + adj. foreign students	332,361	0.78	4.17

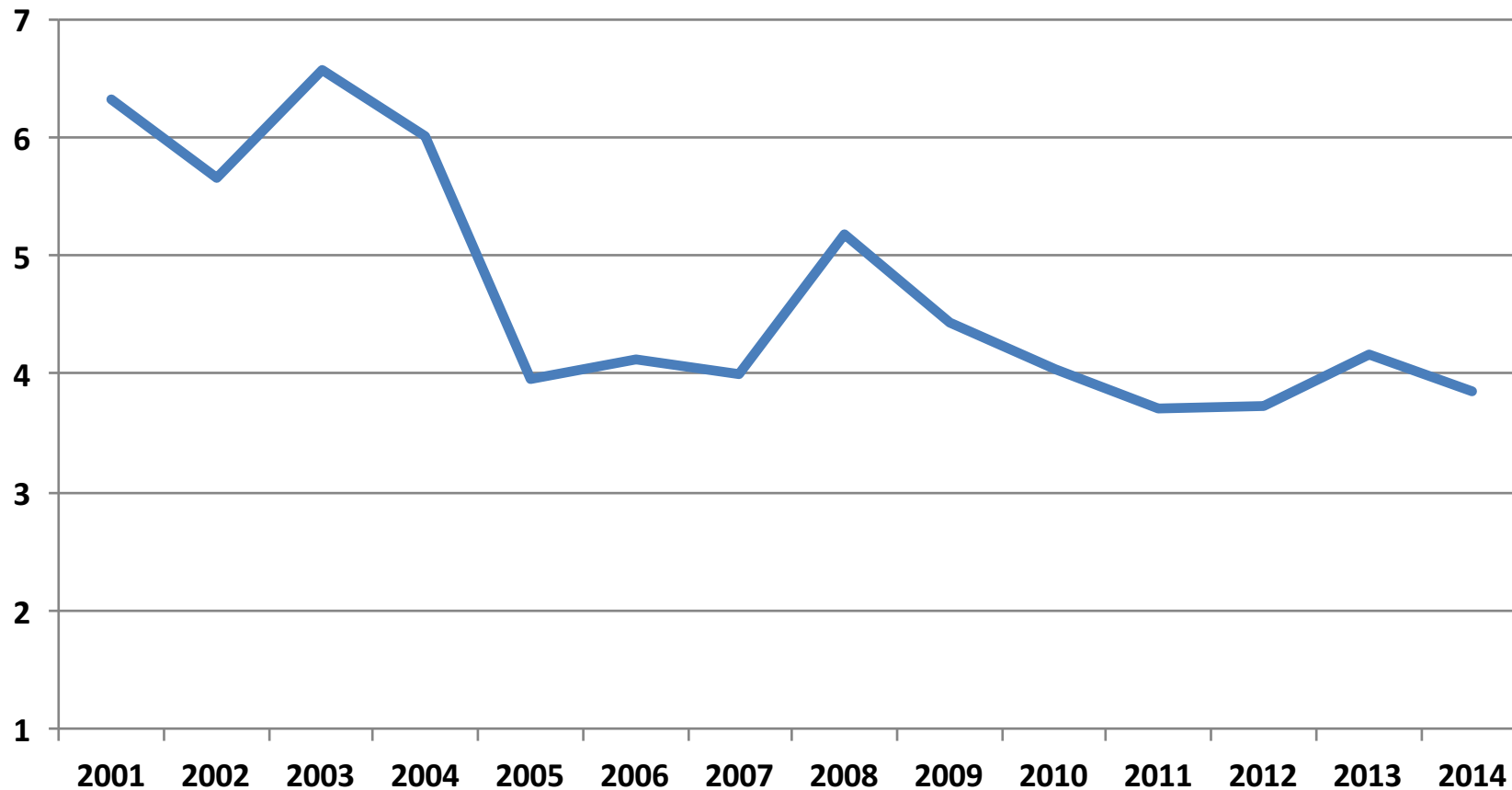
Education Services and Education Costs: Time Series

PRELIMINARY: PLEASE DO NOT CITE



Education Services and Education Costs: Investment to Expenditure Ratio

PRELIMINARY: PLEASE DO NOT CITE



Conclusions

- Estimates are sensitive to the underlying assumptions:
 - The treatment of foreign students
 - How much of the difference in earnings by qualification group can be attributed to education rather than experience
- Next steps:
 - Refine the attribution estimates
 - US comparison
 - Aggregate productivity impacts

Closing Slide

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