


Achieving  niversity
Public Economics
in
Wisconsin

Paul Glewwe, Meng Zhao, and Melissa Binder

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1 CHAPTER 1

Aining University Publishing, 2011
An v i n . C i e

Paul Glenwe and Meng Zhao

35 CHAPTER 2

The C v i n g U n i v e r s i t y e c n c i n
in v e i n g C n i e

Melissa Binder

69 CONTRIBUTORS

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Aining University in Chengde 2012 Cinema

PAUL GLEWWE AND MENG ZHAO

ne he i enni eve en e he ni e
 i n in i h eve chi c ee i ch 2 hi
 e e ine eve ecen ie h e c c e he c
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 he i i c i c i n

Table 1: Distribution of Developing Countries by Income Level and Region

Region	Low Income		Middle Income	
	Number of Countries	Population (millions)	Number of Countries	Population (millions)
Sub-Sahara Africa	39	608	8	50
East Asia and Pacific	9	380	13	1469
South Asia	6	1338	2	19

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 ...n... e... n... e... he... ge... e...
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 ...e... i... c... e... e... i... n... c... h... e... h... i... c... h... c... e... i... n...
 ...e... n... e... n... e... e... i... c... h... c... e... i... n... e... 2... in... e...
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n i e inc ec n ie c eg i e he ein , e m ●●●
/ e cen / chi en in, c. inc ec n ie c ee / i
ch n hi n e i / e ce ince e / e cen , 2 ● n
in he c n ie h e e i c. g / h i e in e
/ / / i n i e i h e i in, e e he e c n ie h / i
c e i n e / e cen im ●●● e h i / e ce / 2
/ e cen , 2 ● n inc ec n ie he ve / i ch c
/ e i n e i e i e h ve, een / e cen im ●●● n i e, / e ce
in ce e / e

li n c n i e n e cen he i ch ge i n
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Table 4:

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 ☞ C i n i e / e i n e / 2 ● e en ing h i v i e c
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Total Current Cost

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 h A ic n i i e h h ve e i n e C n / en n
 ve ge e en e e n n e c n e che e h i c h
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 / en ing e / i h i c h g g e i e c i n
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Table 5:

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// ie // n // ve // ge // e // en // e // e // hi // ve // ge // i // ve // i // i
// c // c // n // ie // eg // e // hei // C // nec // n // ic // ne // i
// h // n // n // en // en // 22 // e // en // e // e // hi
// c // n // i // in // he // c // eg // Ai // in // e // n // c // he
// c // n // ie // h // h // ve // e // ch // i // e // C // en // igh // e // e // i // e
// e // hi // e // h // e // n // c // in // C // i // n // n // h // e
// h // e // c // en // he // ig // e // i // i // e // ec // e // c // i // n
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// h // A // ic // n // — // in // A // me // ic // n // he // C // i // en // en // ch // e // e
// en // e // e // n // e // e // c // i // ve // A // e // i // ne // ve // hi
// e // en // ic // en // Cen // Ai // in // e // i // ning // — // in
// A // me // ic // ge // e // en // ing // e // en // c // e // i // h // i // n // en // in
// i // ch // i // ie // h // 2 // i // i // ni // en // e // e // in // h // egi n
// n // ie // he // c // c // e // i // n // e // en // en // ing // e // e // i // i // n

Teacher Costs and Non-Teacher Costs

he ic i n h e h e, ine c g ve n, en vi ing

An Earlier World Bank Estimate

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 c ve eve ingc n ie, ine, ivi ing ec en
 / en ing n, i e c i n in he ec n ie, hen e chi
 enen e 2 he e inc e, i ch / i c c e e
 e e ch egi n he ve gec e en c c e e e
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 n gencie

A UNICEF Estimate

e nic eh n ne e e 2 ●● c c e hec
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 / eing en e in, i ch hei ge, chieving A i ne
 en en e ●● e cen ne en en e e e ch ●● e
 / i e / e e e i e, ingc c n he e, ne
 en en e g ven en e, en i e n, i e c i n n in e, e
 i n hi A he i, i c i, i n, e n he hi e, e i n hi give c e i
 e e i in, i in e e, he, e en c i h he e i
 e, e, en e i

cen n he e en g e e i i n hen eve chi ini h i
ch n h C , e ine
he h he C e he i i ing

The first part of the text is a series of fragmented words and symbols, including:

 • n e i e , in i e n n e h e h c i c

 e c n n / / i n e c e n c

 • n G c g n e c n i e h e e c e n i e i e h e c

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 h h h e / i e c h e i i n c h n g e n e c h c n i

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 in n e i e n e n e e e c e n i n g h i c e n i h e

 h e i e h n n c i n c e e , 2 , i i n , ,

 , i i n i n , , 2 , i i n i n •

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 i n g i n h e e n e c h e h i e n e h e e c n i n c n

 e i n e c e n h c e n e c h e e i h i e c e h e

 c C , 2 , i i n n h e c e h e i n n i n g g , 2 , i i n A

 c i g e i n e c h h e e c e n i e a n n u a l i g e g i n c e

 e e g i n i n h e n v e h e e n i e e z e i e c h c e

 n i e 2 , i i n , i i n n 2 • , i i n e e c i v e

Some Problems with these Estimates

A h e e h e e i e n e e e i i i n g i n i n

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h e v e n e h e g e e n e i i i n g

 i n i g n e c i c e c n i c g h h e e A i n

 n h n A i n c n i e i v e c h n g e e e i i n

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 c h e e e c e i n e i n g h e e i v e c h g n i n g c i

 c c e n e e i e h e c g n i n g h e e A

 n e e i e h e c e c e n e c h e i h A i e e n

 n g e i i e e i e e i c c e n i i e n e g e

 h i c h i e h n e c h e e i n e A h g h i g n i n g e c

 n i c g h i g n c e e v e i e c e c e

 g i n g e c n i e h v e e e c e c i n g i n g

 e c n g e n e h i g h e g e h i c h e n i n c e e i n e c h e

 i e g n i n g g e e e i i n n e e i e c e c e c h i e n h

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 i n c e e h e n e c h i e n i n c h n i n i n i e g n i n g h e

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h e e i g e e c c e i i n g h e n n i g e i e i n e h e

 e

Table 7: Selected Characteristics of the Four Cost Studies

	Devarajan	UNESCO	UNICEF	Bruns
Includes capital costs?	No	Yes	Yes	Yes
Allows for economic growth?	No	No	No	Yes
Include AIDS & orphan cost?	No	No	No	Yes
Adjusts for private schools?	No	No	No	Yes
Accounts for repeaters?	No	No	Yes	Yes
Scenarios to raise school quality?	No	Yes	Yes	Yes
Cost comparison made	Adding new students, relative to current students	Adding new students, relative to current students	Adding new students, relative to current students	Gap in what countries can finance and what is needed
Number of countries included in cost comparison	About 150	151	128	47
Annual cost estimate, billions US\$	10–15	9	14–17	0–6

Sources: Authors' summary based on the four studies.

...ive ch... n he... h n e... n ve e i... e... c
ive ch... e in nce... en... iv e g ni i n e g ch ch
e... n in ce e n... e... en in... iv e ch... e e e he in n
ci... en n... ic ch... n h... n he g ve n... en... ge
... n... c... gn e i... ve n... ev... ne... inc... ing
c... i c... h gh hei... eh... ing i n ce... e c i e
he e... i c i... ec g ni e hei... i i n... i i n c... e... ing... he
... e... A... he ign e ec n... ic g... h g... e... e i i n n... iv e
ch... e... n i c e... e... he i... ve... en... he cc n...
g... e... e i i n n c... i c... n c... e... A... hei... c...
ec n... ic g... h n c... n chi en... h... en... iv e ch
he e he e... ie... ive e i... e... he nn... c... chieving
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... e... e i... e... e... e... n... he h... c... i n g... i e in hi... ec
i n h gh n... c... n v i n c i n g

The Most Serious Problem with these Estimates

...n... n e... he e he e... ie... n he... n e... e... e...
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h gh... e... ec n i e... e... e... che... e i... he
n i n... eve... he... e... i... h... he... en... e... n... e... he i
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i ch gechi en hec cc ing he e en hi
in iningc en i e che i n he c e e
n e hi n e ne hec ining C ec e
he ic i e h eve i e h ve c e ve he
c c i n e h he gin c e c ingchi en h e
c en n en e in ch i e he ve gec c en
en e chi en hichi nie e e

he ec n cen i h e che e c i e e i ne in hich he
in e n h chi en i ch ge en en e in ch i
h he e en ch vi e i he he ne e ch i
he ne e ch i n c n n i n e en ne
h e hi cen i i i he ch he i c e .

n n e he i n chin hi ec n in e e i n i
nie e e in n eve ingc n ie n e n
e e n h chi en ini h i ch e n
in n h eh e i n n i e i n i e e i m
h eh in n i c i i e e cen h eh e e h he
ne e i ch i i hin in e n e cen e e
h he ne e i ch i i hin in e ch cce i
n e even in c n i e he e i ch c e i n
e e Acc ing e i n n i e i n i e e in he e n i c i
i i e i m h e ing ig e e h e n i c i i e h
e e he c n g ng chi en ge e cen h
e ch e cen he e chi en h e n
h n i n i h i ch en e e he in e n hei
chi en h e he h ee in e n e e chi n in e e
in ch e cen ec n i c e cen n chi
e cen ne e cen n e

chi i nee e h e cen n en vie e c i n
h ving i ev e e cen n e cen e e h he ch i
i hen i ch he e che e e e
he e e in e cen e ne h he in e n chi en e e
n en e h ch i e en ive n he chi i nee e
h e n e cen i h he ch i i i
n nei e c nee e 2 00 in h
e nin in hen e ch in n nei in he c inci
e i h n inc e e in he i en en e e cen in
e cen in e ch c n c i n n ne ec
ge n e e c i n e e in he n nei n
g ve n en e ve i ch en en ee e ve he
ive inc e e in i ch c n c i n hich e hen e
i ch in n nei in even e i i n e e cen
en en e ven inc n ie h c n in e h ve e i e
i h ch vi i i he n nei ne ei ie e he e in
evi ence h i ing e ch i i cien in C
he n n e c n c i n h e c e i e he
ie i c e ve e he n e i c e e i h
he ei he eg he e in h C i e chieve he e e n
he g in c e e i n h he n ce Ci h ge
ch A i e en e h e i ing he c ining C
e c n ie i e e n e e i c i n h e c e i e e
n e

C NICS N N C S S I S

he c ehen ive e i e he c ining C 2 e
h e eve e he n n ing n
2 00 he e h g e in hi i e ine in e i e i h
e h i n he i n e n hei i c i n A h gh he e
e i e e e i ec he i n c i c i e ve he n
e i e een in n i n e ining he e h g e
i i n e e n e e n e h n e ie he e
ce hi e

Assumptions

A e h e e i e he c ining C e e
i n e h he i c i n i h he in
g h e i e ec e h e e ine h n chi en ch
ge he e i e in e ch e e he n e n ch nge in
he ing h e ve i e hi n h he in
g h ei e e in nch nge e e n 2 00 hi
e c n ie he ing h e i n he e 2 00 n he
e

i e n \ e in given h he / ec i n e e n he
e 2 • n / ing h e ch nge ve i e eve /
ing c n i e h e he / ing h e ch nge ve i e .
• • • • ing . e cen e cen h gh he e
e e e ic • 2 • • • e cen

An he in h h i n i ic i n c i he
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n ve ge h chi en in i ch he n / e en
cen i e cen i hich e e i n e e e e
c n n • • • • 2 • n e i c i e n c i ve e n . cen i he
ec n cen i e n ch nge . c n i e i h e e i n e e
• e cen n g e c i n i n g e e e i n e cen i n •
c n i e i h e ge e h n • e cen i n • • •

A hi i n c n c e n e c n ic g h A c n i h g
ing e c n i h ve e i n e n e ce e c i n ,
g ing e c n i e i n cen h gh he e

.c nē^vc ×clsc_t 2

hec .c .c n c n c i n ,clsc_t i i n i c i n i c e h h i v i
enee n . he c c i n . e ch c n . n e e clsc_t v
e h . egi n e , e c n i e . e g . c i c e e v e . 2 ●●
c c e h e v i , e nē^vc i n e i n 2 h e . h g
h e h h e c e i n c e i n h e e . e e h e nē^vc . e
i e h h e n . e nē^vc . c n c e i n e i e e
ine . h e i n c e e i n h e n . e . e . e
e . i e c h e i n h e n . e . e c h e i n e c h
i n n e v e i n g c n i e e v e c e e c h^v i h h e i^v n
e c h e . e e i n h e . e c . h e n . e nē^vc .
e i e e n n c h n g e i n h e n . e . e c h e n . c h n
c h n g e i n h e n . e . e c h e . e c . tchpcls h e e . i n g
n e i n i c . c h . i .

nē^vc n . ch . tchpcls . n . ch . tchpcls .

h e n . e . e c h e i n n e . n . c h i e e i n e . h e n . e
e n i n . i . c h . i v i e . h e . i . e v e . i
e c h e i . puptchrat .

n . ch . puptchrat_t .

h e n . e . e n i e e i n e . h e . i n . h e c n
.totpop h e . c i n . h e . i n h e . i . c h g e . prim-
age% h e g e n . e n e . g e n h e e c e n . i . c h
e n^v h e i n . i v e c h . priv% .

.primage% ×totpop_t ×ge × . priv% .

h e e i c c e h e g e n . e n e . c h i e n e n i n
. i . c h h e n . g e . e g e . n h e e^v e e n g e
e e i i n i^v e h e v e g e v e i e e n g e . e . e
e c . h e n . e . c h i e n e n e i v i e . h e n . e . c h i
e n h g e h e i e . i . c h i n g h i^v . e h e
i n . e e . i n r a t e i n . i . c h . h e . i n . c h i e n^v h
e v e n e n i n . i . c h . n . h e e . i . c h

c x,

$\Delta e = gdp \times gvr\%gdp \times edsp\%gvr \times prsp\%edsp$

In the Δe in $gvr\%gdp$ is the Δe in the Δe in Δe

contribution to the Δe in Δe in Δe in Δe

h ing n hing. e n n n h en n n i e i e . he n e
 e e n ive cen i e he in chi en en e
 e ive he n e ch ge chi en i n ch nge, n 2 he
 en n n en . 2 2 . he he ine en h i
 e . 2 2 he e e cen i n c e ecive
 ne ch e he c gge h e inc e n g i
 i n n he n i i n n he e hich e ce he n n c
 i n n i n e ecive
 he cen i h eeive he en i n n he n e i
 cen i e e h i c c e he c chieving C, 2 .
 h i e i n e i v i n g ch i e n h n c i n g e i c i e n c n
 i n c e i n g i i n . e i c i n n c i e ce n e h i cen i
 he c i n i n g C, 2 . i n c e e 2 i i n
 e i c e ce i n c e e 2 i i n he i n n c i n g g i
 i g h e i i n v e e 2 i i n e e
 cen i 2 n e e e he he cen i e e n e
 h e n e cen i e e e i e n . h c n i e h
 h e n he e i e h e n e e e ch nge n e n i
 c i c i h e n . cen i i h he e g h e
 e cen hich e i i c e e c i h n A i c n
 c n i e cen i e he i n cen i e h
 g h . 2 2 i e he v e g e g h e .
 . 2 2 i n e i n g e cen g h e i e h e n
 h e n h i i n i ch nge e i c e ce e c i n e i g h
 c e c i n e e e e che i e e c c i e c i n e
 i g h cen i e e c i n he g h e e c
 i n e i i c i n i n g h i g h e h n e cen g h i n
 e g i n . he i n c e e i n e ce i che i n c e e c i n e che
 i e g i n h e i i e e e c n h e g cen i . e e
 e i i c g h n e cen A e e e e i c e ce
 he i n e i c c i h e h h e i v e
 i e ch nge i n h e i n n c i n g g c e cen i cen i .
 e e c i n e n i n i v e ch h i h i e
 e e c n h e i i n e
 A ch i e e n i c e e g e i e che i e e h e c n n e v n
 h g h g h i e cen cen i i e n h e e c e
 cen i h i n e ch nge e che i e e h e c n n h e i n
 ch nge i n e i c e ce e i c c i i n
 h i e i n n v e i i n h g h i i h e
 c e h h n A i c h i n n c i n g g i i n
 v e n i n ch i i n c e i i h g h e c i n i n h e
 i e che i n c n i e h e h n e i h i g h e h n . h g h n
 i n c e e i n e che i e n n n e che e n i n g e c n i e
 i c i e n c e n i c c e e c i n i n e che i e i n c n i e h i
 e i v e h i g h e che i e n i n i n g i e che i i n c n i e h e
 h e e e h n .

Region	Total Cost (millions US \$)	Domestic Resources (millions US \$)	Financing Gap (millions US \$)
Scenario 7:			

Region	Total Cost (millions US \$)	Domestic Resources (millions US \$)	Financing Gap (millions US \$)
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cen i p e, fine he e i / i e che i e e i e
 e en een e, he in e he e h ein
 cen i hi en h n ne ch e, i n n ne e che e
 hi e, in e ec e chi en ec e in e i ing c e
 hi cen i c e ch e h n e ic e ce e ing
 in ncing / i i n ven h n A ic h ch
 i i n e ve he i e i e che i e e i e high in

he in, ein c ch h igh iin n, e
e ince e ch en en ne, iii i, iie ch ing
, vi ing, en en c n i i n n hei chi en, eing
en e hi, i h, een ee in eve c n ie eg ng eh
i Chie n, e, ic n ic g n, he ec n ie
icie, vi ing, i ie e ei, e, en e ing n, i e i
hich, vi e he, e e i, e, hei, c ch, icie n
ch en, n n ic g, vi e ecen e, e
e n, i n e, ze, he, i ie e n n, en c, n, e hei

, e ch ee en ive hen he , i he ch n he ^ψ i c .
 // ch
 he e , e he ^ψ c chi en ch , he ei c
 en ve i e e e ch n hi , ec Ani n e ce i n ,
 i n , ec ei e , ine / A ic n c n i , ig e
 n e e 2 ● he i c h / vi ing e ic e en in e
 in / i e h n ch en nce he n h / vi ing ^ψ
 c // cen e en e e ^ψ ing e icine inc e e ch
 / ici i n ^ψ hich inc / e , h en nce n en en , even
 / e cen ge in hi e hi i c i n ve ge he vie ^ψ / in
 e ching C i high igh ne e e , en ive en ive , i ie hi
 / ic en ive // ie n in e ing ^ψ he e high / e cen ge chi
 en h ve e e he v eve in e in / i e ^ψ hich i n he
 c e . eve / ing c n ie , i gge h he h , e ig
 ni ic n c in e e , ining ^ψ he he chi en en n / ici e in i
 ch i / i e h / g i i v ing chi he h ^ψ i nee
 , e // icie chieve C n he e e he c ch
 g e inc / e in e i e he c ining C
 he // ch e , he ie evie ^ψ e in hi / e i , e n n
 inc ec e inc e e n e n ing ^ψ h n chi en in
 eve / ing c n ie n c e e i ch ne n ^ψ h ^ψ
 chi ^ψ i c in nive / i ch c e i n , ec en
 ne n ^ψ h / icie c n chieve h g ec ive / icie / e
 nive / i e c i n n he c c i n i c , e , e
 n n ^ψ e e ch n he e e in n ch en en in eve / ing
 c n ie

C NC USI N

/ eve / ing c n ie e , ing e / ge ^ψ C , he c
 en e i ve en i i nie h he ^ψ i in h g , 2 ●
 -gging , ehin he e he ^ψ , h n A ic h n ve ge
 / i ch c e i n e / e cen in ●●● n hi n e i /
 ec e e in / e cen in ● n he egi n he , ec e / i
 c e i n e , 2 ● i ne , ● e cen highe , he ^ψ e , eing
 h A i n he i e n h A ic , h ^ψ hich h ve /
 ec e e / e cen he in ci n hi / e / e ^ψ e i n
 h / ic ch nge c n , ing , C in eve / ing c n ie ^ψ
 ch i i n ne ^ψ i , e nee e i e en h e / icie
 h gh he c i n ne he ecen ie evie ^ψ e in
 hi / e e e n ^ψ e he ec n e i n , ec en nei en i e
 / icie h c n , ing , C he e ie c n h ^ψ chi ^ψ i
 ig e n e e e in e c i n eve 2 ● i i n i i n e en ing n
 he / e / i e c e e i n in eve / ing c n ie , i
 i n , he n e h he e in e c i n e , igh .

c i n e c n h i e n e che cc e chi
 enc en n in ch i ing n e ch e n e n
 h chi en i c e n n eve / ing c n ie ch e vi e
 i i n en ch en en hei chi en in h e ch
 n h gh inve ig i n he ch ice e / en e / eci in
 he c n ie h n A ic i eve h i e i e e e
 / en en hei chi en n n hen i i e i e c c e
 he c chieving C hi e e chi ci ic e e che n
 eve / en gencie ecen e e ch — in A e ic n he e
 i ie gge h hi e h c n e e ec ive he c h e e
 i e high e h n he e / en e i ing n e c n h i ing
 e e che A h gh he e i e evi ence h n A ic n
 he e ec ivene i ie n ch en en ecen / i inc e e in
 i ch en en ing he e v i ch ee in
 h ee A ic n c n ie / en n ni n g n gge h
 ne incen ive e i e h ve nge ec in h egi n e e
 v ge2 2 2 n2
 vi ing i ec ne incen ive en in i ch i n
 ne i e e ining C he e ec ive / icie e vi
 e e e in c n ie he e chi en h ve high eve in e in
 i e / vi i n e ing e icine c n i e en en e
 e e e en ve c e gene i ch
 e e ec ive / vi ing i n he e n h e i e
 high en gh / en c n in e en hei chi en n ing h
 ch e ec ive e ch i i he e n i i e

ch i e e , icg hich i e h e g v e n e n g e n c
g e n c i e h v i e n i n g n e n i n e v e e n g e n c i e c h
h e n n h e n i e i n e , v i c e c h n
i n g h e n h e g e n c i e e h i n c n c e i h , i e i g e n c i e
v i e n g e n e n i e i e e i h v e e n
e n c c i n g h e c i n i n g n i v e i c e i n
n i e

	Country	UPC Status	Income Level	Most Recent PCR	(year)	PCR 2015
7	Korea, Dem. Repub.	no data	low	—	—	—
8	Korea, Republic of	already achieved	middle	96	2000	100
9	Laos	on track to achieve	low	69	2000	100
10	Malaysia	off track	middle	90	1994	85
11	Marshall Islands	no data	middle	—	—	—
12	Mongolia	off track	low	82	1998	—
13	Myanmar	no data	low	—	—	—
14	Papua New Guinea	off track	low	59	1995	83
15	Philippines	on track to achieve	middle	92	1996	100
16	Palau	no data	middle	—	—	—
17	Samoa	already achieved	middle	99	1997	100
18	Solomon Islands	off track	low	66	1994	71
19	Thailand	off track	middle	90	2000	86
20	Tonga	no data	middle	—	—	—
21	Vanuatu	off track	middle	86	1992	52
22	Viet Nam	already achieved	low	101	2001	100

Europe and Central Asia

1	Albania	off track	middle	89	1995	57
2	Armenia	off track	low	82	1996	—
3	Azerbaijan	already achieved	low	100	1998	100
4	Belarus	off track	middle	93	1996	74
5	Bosnia & Herzegovina	on track to achieve	middle	88	1999	—
6	Bulgaria	on track to achieve	middle	92	1996	98
7	Croatia	already achieved	middle	96	2001	100
8	Czech Republic	already achieved	middle	109	1995	100
9	Estonia	off track	middle	88	1995	55
10	Georgia	off track	low	82	1998	—
11	Hungary	already achieved	middle	102	1995	100
12	Kazakhstan	no data	middle	—	—	—
13	Kyrgyzstan	no data	low	—	—	—
14	Latvia	on track to achieve	middle	86	1996	100
15	Lithuania	already achieved	middle	95	1996	100
16	Moldova	on track to achieve	low	79	1999	100
17	Poland	already achieved	middle	96	1995	100
18	Romania	already achieved	middle	98	1996	100
19	Russia	already achieved	middle	96	2001	100
20	Serbia & Montenegro	already achieved	middle	96	2000	100
21	Slovakia	already achieved	middle	97	1996	100
22	Tajikistan	off track	low	77	1996	—
23	Macedonia	no data	middle	91	1996	100
24	Turkmenistan	no data	low	—	—	—
25	Ukraine	on track to achieve	low	94	2002	—
26	Uzbekistan	no data	low	—	—	—

Latin America and the Caribbean

1	Antigua & Barbuda	already achieved	middle	98	2000	—
2	Argentina	already achieved	middle	96	2000	100
3	Belize	off track	middle	82	1999	69
4	Bolivia	on track to achieve	middle	72	2000	98
5	Brazil	on track to achieve	middle	72	1999	100
6	Chile	already achieved	middle	99	2000	100
7	Colombia	on track to achieve	middle	85	2000	100
8	Costa Rica	on track to achieve	middle	89	2000	100
9	Cuba	already achieved	middle	—	—	—
10	Dominica	already achieved	middle	103	2000	100
11	Dominican Republic	off track	middle	62	2000	—
12	Ecuador	already achieved	middle	96	1999	100
13	El Salvador	on track to achieve	middle	80	2000	100
14	Grenada	already achieved	middle	106	2001	100

15	Guatemala	off track	middle	52	2000	67
16	Guyana	off track	middle	89	2000	85
17	Haiti	off track	low	40	1997	71
18	Honduras	off track	middle	67	2000	69
19	Jamaica	on track to achieve	middle	94	2000	100
20	Mexico	already achieved	middle	100	2000	100
21	Nicaragua	on track to achieve	low	65	2000	95
22	Panama	on track to achieve	middle	94	2000	100
23	Paraguay	on track to achieve	middle	78	2000	98
24	Peru	already achieved	middle	98	2000	100
25	St. Kitts & Nevis	already achieved	middle	110	2001	100
26	St. Lucia	already achieved	middle	106	2001	100
27	St. Vincent & Grenadines	off track	middle	84	2001	—
28	Suriname	no data	middle	—	—	—
29	Trinidad & Tobago	off track	middle	94	2000	94
30	Uruguay	already achieved	middle	98	2000	100
31	Venezuela	off track	middle	78	1999	55

Middle East & North Africa

1	Algeria	on track to achieve	middle	91	1996	100
2	Bahrain	off track	middle	91	1996	59
3	Djibouti	seriously off track	middle	30	1999	26
4	Egypt	already achieved	middle	99	1996	100
5	Iraq	middle	middle	47	1996	84
16	Guyana	middle	middle	84	2000	84
26	St. Lucia	middle	middle	84	2001	100
16	Guyana	middle	middle	84	2000	84
28	Suriname	no data	mi	9	1999	—

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6, / eve / men n nen in ic ee ch n i e

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i n . i c c i n in Ch n . Hing n / C he
i n .

2002 ●● , en , eng hening he n i n . c i n n ining in

The Cost of Providing Universal Secondary Education in China: Evidence from Cognitive

MELISSA BINDER

hi / e / vi e e i e . he i i n e , e n e h e v e / i n g
c n g v e n e n ^W i n c i n / / i n g e n g h / c e i n e c n
ch c c e e c h i e n e c n c h g e n e c
e n e e i i n e n c c e n n c e e i e e e
i i n i e , n i n i c c v e e h i n n 2 i i n
v e 2 e h i n h e e i e e e , e n i e . 2 n 2 i
i n e , e c i v e n e c e n i i n ^W h i c h c h e e c e e i
i n e A . h e e c i n i n c 2 n 2 i i n e e
c c ^W h e n h e e i e e e n h e e e i e n c e e / c i e .
c n i e h h v e h i g h e e n h n e i c e h e i n c e n
e g i n h e e i e e i n h i / e n e e e n h e c c h i e v
i n g n i v e e c n e c i n h e n i n c e h e e n c n i
e , e e , e n e e i e e n i n g c h i e n c h n h e c n
i e h e i i n e , e n e g v e n e n c h i e v i n g n i v e / i
e c i n e v e h e h i e i i n h e e , e n e / v i n g h e
n e c e e c n c h / c e i n e e n i n g , i n n e
n i n g h e c n i v e e c n e c i n

—^W e v e e c i n n h e ^W c n i e c n i n e / v e
i i n e e e e ● i i n c h i e n i n e v e / i n g c n i e
e ^W e e n h e g e 2 n n e n e c n c h A c c i n g
n e e n i v e i e e h e c h i e n ^W i e e e c n i c / c i v e
n ^W i h v e ^W e h e h c e n h i g h e e i i e h n h e ^W i h
e e c i n h e e i e e v i e n c e h h e i ^W e v e e c i n
^W i i n h i e c n i c g ^W h h e n i n e v e h e c n i e i n ^W h i c h
h e i v e 2 n h ^W e v e e c i n h v e h i g h c i n e e e
g n e / n i n ^W e , i n g

e n h e e c n i c e n c h i n g e e c h e v i e ^W
h e h n e i i e e c e e c i n e e n n n ; c h n n 2 ●
2 n n n ; c h n n 2 ● e v i e ^W h i i e e

en c hec en e c i n e n hen i ie hi ni
 c hen e chi en n en e in ch A h gh igh
 c c i n c i i n g n i c i c i c e c n i e c
 n c n i e he eve n n i c 2 ●●
 e h c en n i c ec n ch ing e cen e
 c i i n c e i n n n he eve i n g c n i e i n h i
 e e i n h e c i n n i c g
 h e g n i i n c n i c C e i n n eve n C
 n h e n i e i i c v i e n i
 c he eve i n g c n i e i c n e n c n
 n i c i n ch i n g e i
 C e 2 ●● e. A h gh h e c n i e i h n i
 c e h e cen h e ec n ch g e i n
 h e e i n eve i n g c n i e h e e e n n e
 cen eve i n g c n i e n i n c e n h e e i n c e n i e
 n n n e A i c n c n e v e v i i n g
 c i n e e i i c e h e c n i i n e e n
 n A h n e h e c e ch e i n n
 c e n c n v e e e c n i e
 n h i e i e n i c c c i n g h e i n g c e e
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Table 1: Data Available for Calculating Unit Costs

	Number of Countries	Children 12–17 Years of Age in 2000			
		All		Not enrolled	
		Number in millions	Percent	Number in millions	Percent
Complete data in at least one year between 1998 and 2000	60	405.5	64.5	198.2	60.9
Complete data in different years between 1998 and 2000	9	16.1	2.6	8.9	2.7
Imputed based on partial data	61	187.9	29.9	107.5	33.1
Insufficient data to impute	14	19.0	3.0	est. 10.6	3.3
TOTAL	144	628.5		325.2	

Source: Author's calculations based on World Development Indicators and UNESCO-UIS and Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2000 Revision*, and *World Population Prospects: The 2000 Revision*. Available online: <http://esa.un.org/unpp>.

Note: Population figures for this age group are provided directly by the UN Population Division (see above). The estimate of those not enrolled was derived as follows. First, I estimated the number of children 12–17 who were enrolled in school by multiplying the total population in this age group by the most recently available net enrollment rate between 1998 and 2000 for the 96 countries reporting this statistic directly. I imputed the net enrollment rate for an additional 35 countries that reported the gross enrollment rate, using the predicted value from a regression of the ratio of the net to gross enrollment rate on per capita income, 12–17 year-old population, spending on secondary schooling as a percent of GDP, and five regional dummy variables. For 13 countries with no enrollment data, I used the average regional enrollment rate. Second, I subtracted the estimated number enrolled from the total 12–17 population.

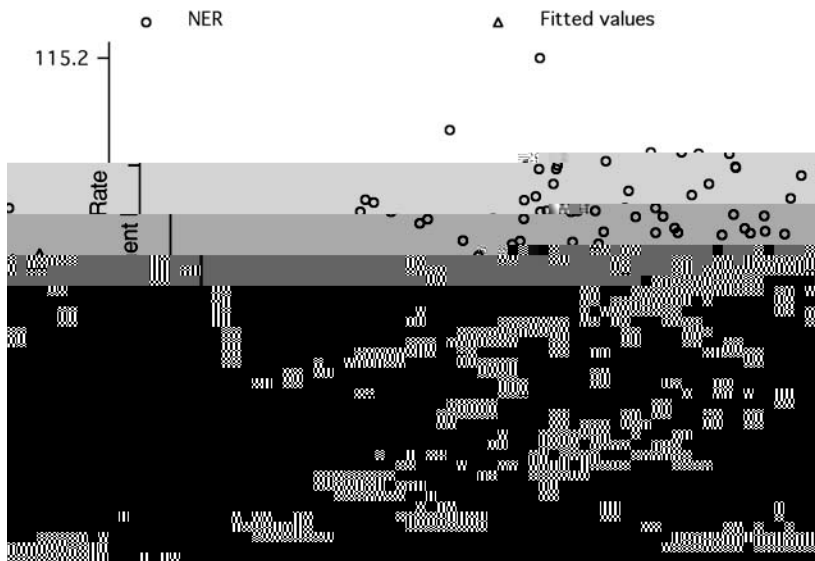
Children in Africa aged 12–17 are estimated to be 198.2 million, or 60.9 percent of the total population in this age group. This estimate is based on data from 60 countries that provided complete data for at least one year between 1998 and 2000. For 9 countries, complete data were available for different years between 1998 and 2000. For 61 countries, data were imputed based on partial data. For 14 countries, data were insufficient to impute. The total number of children 12–17 years of age in Africa in 2000 is estimated to be 628.5 million. The number of children 12–17 years of age who were enrolled in school in 2000 is estimated to be 325.2 million, or 51.8 percent of the total population in this age group. The number of children 12–17 years of age who were not enrolled in school in 2000 is estimated to be 303.3 million, or 48.2 percent of the total population in this age group. The number of children 12–17 years of age who were not enrolled in school in 2000 is estimated to be 303.3 million, or 48.2 percent of the total population in this age group.

Table 2: Summary Statistics by Region, TIMSS Participation, and Income Group

	SSA	SA	EA&P	ME&NA	LA&C	E&CA	ALL		TIMSS	
							Not weighted	Weighted	Not weighted	Weighted
Number of countries										

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Figure 1: NER, Predicted NER, and Log Per Capita GDP

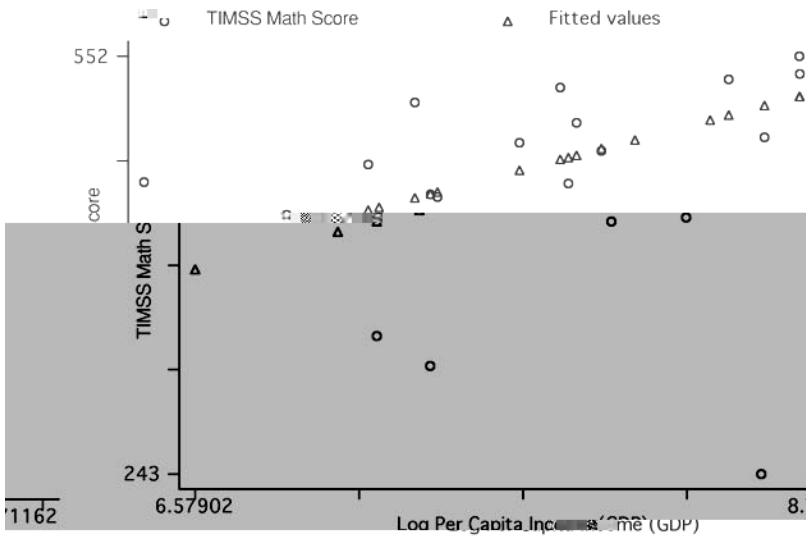


Source: Author's calculations based on enrollment rates and per capita income reported in the World Development Indicators.

Figure 1 shows the relationship between Net Enrollment Rate (NER) and Log Per Capita GDP. The plot includes a legend with 'o' for NER and 'Δ' for Fitted values. A vertical line is drawn at a Log Per Capita GDP value of 115.2. The plot area is divided into three horizontal bands: a top light gray band, a middle dark gray band, and a bottom black band. The data points are scattered across these bands, with a higher density in the middle and bottom bands.

The figure illustrates that as Log Per Capita GDP increases, the Net Enrollment Rate (NER) also tends to increase. The fitted values (represented by triangles) show a positive correlation between the two variables. The vertical line at 115.2 on the x-axis highlights a specific threshold of per capita income. The horizontal bands suggest different levels of enrollment rates, with the top band representing higher enrollment rates and the bottom band representing lower enrollment rates.

Figure 2: TIMSS Math Score, Predicted Score, and Log Per Capita GDP



Source: Author's calculations based on test scores from the 1999 Trends in International Mathematics and Science Study (TIMSS) and per capita income reported in the World Development Indicators.

Note: Predictions based on a regression model that uses region and income interactions.

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Table 4: Education Finance and Service Variables for Countries with Better and Worse than Predicted Net Enrollment Rates Relative to Income and Region, by Income

	Low income			Lower-middle income			Upper-middle income		
	N	Better than predicted	Worse than predicted	N	Better than predicted	Worse than predicted	N	Better than average	Worse than average
GER	38	48.9	29.6	30	79.6	58.6	24	88.0	79.0
NER	38	42.8	24.6	30	66.1	47.1	24	76.2	63.5
Public expenditure on education (% GDP)	32	4.1	3.5	24	4.9	4.0	23	5.2	5.3
Spending on secondary schooling (% of total education spending)	17	41.8	27.9	19	31.1	48.1	18	34.1	40.2
Unit cost in 2002 U.S. dollars	38	\$95	\$130	29	\$364	\$378	24	\$1102	\$1280
Unit cost as % of per capita income	38	23.4	33.6	29	16.1	23.2	24	19.3	23.5
Transition rate from primary to secondary levels	26	90.0	62.7	21	87.5	85.4	18	88.1	91.8
Trained teachers	9	68.1	74.5	8	70.7	86.5	0	NA	NA
Pupils per teacher	22	26.4	24.7	22	20.9	17.2	22	16.3	14.8
Repetition rate	22	7.1	13.9	21	6.5	6.7	18	5.8	6.8
Per capita GDP	38	\$386	\$23	92	\$2150	\$1678	24	\$5730	\$5158

Source: WDI and UNESCO-UIS. Unit costs are author's calculations from these sources.

Note: Significant differences in bold font. Significance using one-tailed tests is at the 5 percent level for all variables except spending on secondary schooling as a share of total education spending for low income and upper-middle-income countries, pupils per teacher for lower-middle-income countries, and GER for upper-middle-income countries, which are all significant at the 10 percent level.

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Table 6: Unit Costs (in Constant 2002 U.S. Dollars) under Different Scenarios, by Region and Income Group, per Enrolled Student

	SSA	SA	EA&P	ME&NA	LA&C	E&CA	Total per country	Total per student
Present Unit Costs								
Low Income	\$128	\$86	\$136	\$249	\$122	\$125	\$127	\$126
Lower-Middle Income	417	82	382	369	325	307	337	244
Upper-Middle Income	820	—	1417	2180	919	1157	1219	884
Country mean	199	85	307	927	544	505	412	—
Mean cost per student	257	117	168	571	577	462	—	296
Best Practice by Income Group								
Low Income	66	66	66	66	66	66	66	66
Lower-Middle Income	290	290	290	290	290	290	290	290
Upper-Middle Income	877	—	877	877	877	877	877	877
Country mean	139	122	203	459	505	398	302	—
Mean cost per student	138	71	247	338	725	329	—	292
Best Practice by Region and Income Group								
Low Income	75	67	23	249	222	93	76	64
Lower-Middle Income	637	82	139	384	312	219	299	221
Upper-Middle Income	785	—	1417	1555	877	902	1014	938
Country mean	171	69	145	741	527	384	336	—
Mean cost per student	231	67	132	492	734	300	—	268

Source: Author's calculations based on data from WDI and UNESCO-UIS.

Note: Best-practice country cost is the median unit cost by income group or region and income group for countries with net enrollment rates higher than predicted by regressions of region and income interactions.

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Table 7: Additional Spending (in Constant 2002 U.S. Dollars) to Achieve Immediate 90 Percent Net Enrollment Rates at the Secondary Level under Alternative Cost and Absorption Assumptions

Present costs			Best practice by income group	Best practice by region and income group
Population to be enrolled (1000s)	Cost per new enrollee	Total cost (millions)		

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Repetition rates unchanged

Repetition 7% or less

Table 9: Indicators of Median Country Burden and External Aid Requirements for Achieving 90 Percent Net Enrollment Rates, Average Annual Spending over 25 Years (Spending in billions of constant 2002 U.S. dollars)

	Repetition rates unchanged				Repetition rates 7% or less			
	15-year horizon		25-year horizon		15-year horizon		25-year horizon	
	Present costs	Best practice costs	Present costs	Best practice costs	Present costs	Best practice costs	Present costs	Best practice costs
Low Income Countries								
Total present spending=\$15.3								
Additional spending needed	\$20.3	\$8.6	\$13.8	\$6.1	\$16.9	\$7.0	\$13.2	\$5.9
As factor of present spending	3.2	2.0	2.2	1.3	2.5	1.4	2.2	1.2
As share of GDP	2.8	1.2	2.0	0.6	2.1	0.8	1.9	0.6
Foreign aid required after country spends best practice GDP	\$16.9	\$6.7	\$11.1	\$4.7	\$13.6	\$5.1	\$10.5	\$4.5
Country burden as factor of present spending after foreign aid paid	0.20	0.08	0.19	0.03	0.16	0.06	0.14	0.02
Lower-Middle Income Countries								
Total present spending=\$35.9								
Additional spending needed	\$10.9	\$13.5	\$6.5	\$9.6	\$6.4	\$9.3	\$5.4	\$8.6
As factor of present spending	0.25	0.12	0.11	0.01	0.11	0.06	0.07	0
As share of GDP	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Foreign aid required after country spends best practice GDP	\$5.3	\$5.8	\$3.3	\$4.1	\$2.9	\$3.5	\$2.7	\$3.5
Country burden as factor of present spending after foreign aid paid	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Upper-Middle Income Countries								
Total present spending=\$41.8								
Additional spending needed	\$13.4	\$12.7	\$7.9	\$9.3	\$6.0	\$8.5	\$5.7	\$7.8
As factor of present spending	0.05	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
As share of GDP	0.07	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Foreign aid required after country spends best practice GDP								

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Table 1: Study Population Countries by Region, Income Classification, and Population 12–17 Years of Age

Table 1: Study Population Countries by Region, Income Classification, and Population 12–17 Years of Age, continued

	Income group	Population 12–17 Years of Age (1000s)
South Asia		
Afghanistan	Low	2,902
Bangladesh	Low	19,019
Bhutan	Low	295
India	Low	127,056
Maldives	Lower-middle	44
Nepal	Low	3,176
Pakistan	Low	19,830
Sri Lanka	Lower-middle	2,134
East Asia & Pacific		
Cambodia	Low	2,196
China	Lower-middle	132,931
Dem. People's Rep. of Korea	Low	2,228
Fiji	Lower-middle	104
Indonesia	Low	26,201
Lao PDR	Low	739
Malaysia	Upper-middle	2,725
Micronesia, Fed. Sts.	Lower-middle	16
Mongolia	Low	367
Myanmar	Low	5,884
Papua New Guinea	Low	700
Philippines	Lower-middle	10,267
Samoa	Lower-middle	25
Solomon Islands	Low	62
Thailand	Lower-middle	6,738
Timor-Leste	Low	130
Tonga	Lower-middle	14
Vanuatu	Lower-middle	29
Viet Nam	Low	10,534
Middle East & North Africa		
Algeria	Lower-middle	4,370
Djibouti	Lower-middle	89
Egypt	Lower-middle	9,630
Iran, Islamic Rep.	Lower-middle	11,046
Iraq	Lower-middle	3,292
Jordan	Lower-middle	690
Lebanon	Upper-middle	427
Libyan Arab Jamahiriya	Upper-middle	804
Malta	Upper-middle	34
Morocco	Lower-middle	3,930
Oman	Upper-middle	333
Palestinian Autonomous Territories	Lower-middle	443
Saudi Arabia	Upper-middle	2,788
Syrian Arab Republic	Lower-middle	2,631
Tunisia	Lower-middle	1,269
Yemen	Low	2,697

Table 2: Study Population Countries included in TIMSS

	Income group	Region
Bulgaria	Lower-middle	E&CA
Czech Republic	Upper-middle	E&CA
Hungary	Upper-middle	E&CA
Indonesia	Low	EA&P
Iran, Islamic Rep.	Lower-middle	ME&NA
Jordan	Lower-middle	ME&NA
Latvia	Upper-middle	E&CA
Lithuania	Upper-middle	E&CA
Malaysia	Upper-middle	EA&P
Morocco	Lower-middle	ME&NA
Philippines	Lower-middle	EA&P
Republic of Moldova	Low	E&CA
Romania	Lower-middle	E&CA
Russian Federation	Lower-middle	E&CA
Slovak Republic	Upper-middle	E&CA
South Africa	Lower-middle	SSA
Thailand	Lower-middle	EA&P
Former Yugoslav Rep. of Macedonia	Lower-middle	E&CA
Tunisia	Lower-middle	ME&NA
Turkey	Lower-middle	E&CA

Source: 1999 TIMSS and World Bank 2003 list of developing countries.

Table 3: Best Practice Countries by Performance Criteria

	Net Enrollment Rate		TIMSS
	High relative to income	High relative to income & region	High relative to income ¹
<i>Sub-Saharan Africa</i>			
Botswana	X	X	
Eritrea		X	
Gambia		X	
Ghana		X	
Liberia		X	
Malawi		X	
Mauritius	X	X	
Namibia		X	
Sierra Leone		X	
South Africa		X	0
Swaziland		X	
Zimbabwe		X	
<i>South Asia</i>			
None			
<i>East Asia & Pacific</i>			
Indonesia			X
Malaysia	X	X	0
Mongolia	X	X	
Philippines	X	X	0
Samoa	X	X	
Tonga	X	X	
Viet Nam	X	X	
<i>Middle East & North Africa</i>			
Algeria	X	X	
Egypt	X	X	

Table 3: Best Practice Countries by Performance Criteria, continued

	Net Enrollment Rate		TIMSS
	High relative to income	High relative to income & region	High relative to income ¹
Chile	X	X	
Colombia		X	
Jamaica	X	X	
Nicaragua		X	
Panama	X	X	
Peru	X	X	
St. Lucia	X	X	
Trinidad and Tobago	X	X	
Uruguay	X		
<i>Europe & Central Asia</i>			
Albania	X		
Armenia	X		
Azerbaijan	X	X	
Belarus	X		

Table 4: Derivation of Spending Calculations

Unit Costs

1. Total Education Expenditure = [Share of GDP in Education Spending (current and capital)] X [2000 Country

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