

Which Secondary Education Systems Work Best? United States or Northern Europe

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Best Practices in Secondary Education

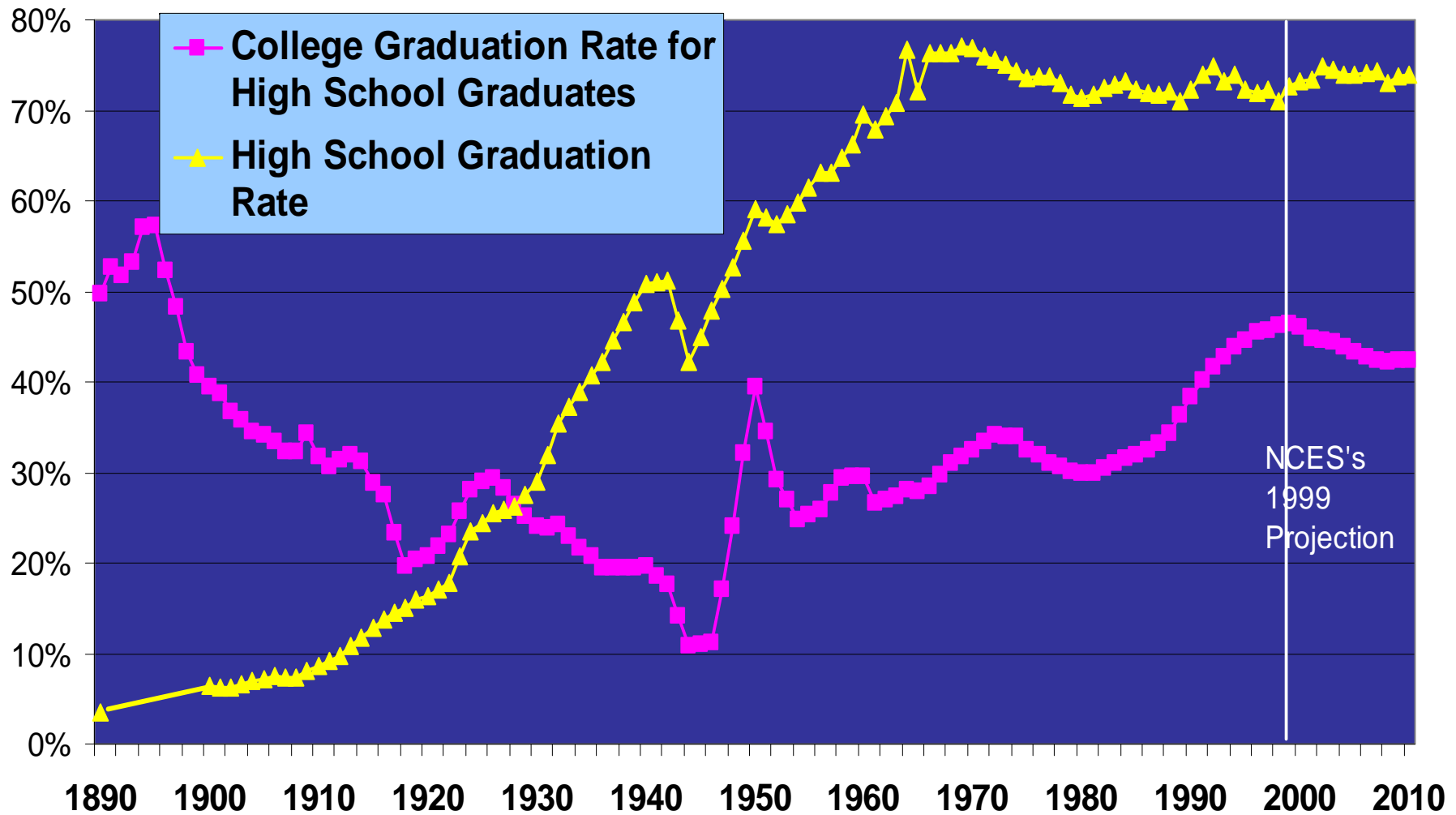
International Seminar, Brasilia, May 3-4, 2010

From 1900 to 1970, American high schools were engines of social change & economic growth.

- **Immigrant children got an education not available in Europe. Many rose to become captains of industry.**
- **Elected school boards introduced metalworking, farming and clerical skills as optional courses and ended the Latin requirement. This accelerated enrollment growth.**
- **Public universities expanded business, science, engineering & teacher education programs.**

This huge public investment in job relevant education is one of the reasons for U.S. productivity leadership during the 20th century.

Figure 6: High School and College Graduation Rates: 1890-2010



After WW 2, Europe aggressively expanded secondary education—France is a good example

- 1950: Fewer than 8% of French youth were taking & passing the Baccalaureat (national exam taken in final year of Lycée)
- 1985: French Minister of Education (Jean-Pierre Chevènement) set the goal of “80% of a generation to successfully passing the BAC”
- 1987: Creation of the Professional Baccalaureat
- 3 possible final exams:
 - Baccalaureat
 - BEP (Certificate of Professional Studies)
 - CAP (Certificate of Professional Aptitude)
- Average cost of a Lycée student: €10,000

Lycée (15 -18)

French Senior High Schools

General

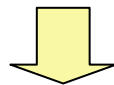
- Seconde (2^{nde})
 - Same programm
 - Choice of one option (Latin, Economy...)
- Première (1ere): 3 possible “majors”
 - Literature
 - Economy
 - Maths and Science
- Terminale



General Baccalaureat

Technology

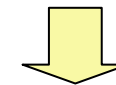
- Technology and science programs to be chosen:
 - Health and social science
 - Industry
 - Laboratory research
 - Management
 - Biology
 - Hospitality
 - Arts



Baccalaureat in technologies

Professional

- Extremely various programs according to school and topic



BEP and CAP (Professional Baccalaureats)

Chart A2.1. Upper secondary graduation rates (1995, 2005)

The chart shows the number of students completing upper secondary education programmes for the first time in 1995 and 2005, as a percentage of the age group normally completing this level; it gives an indication of how many young people complete upper secondary education compared to ten years before.

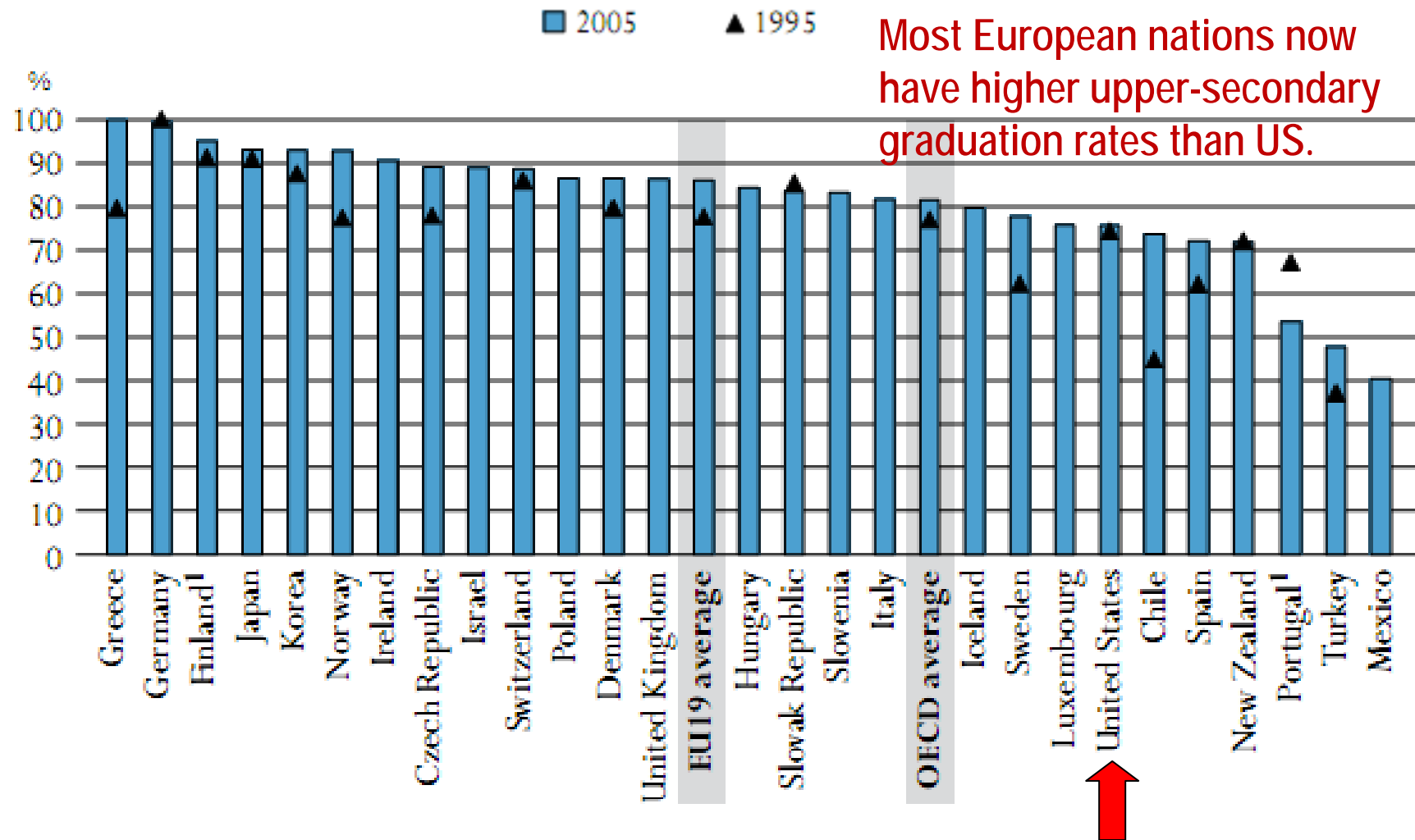
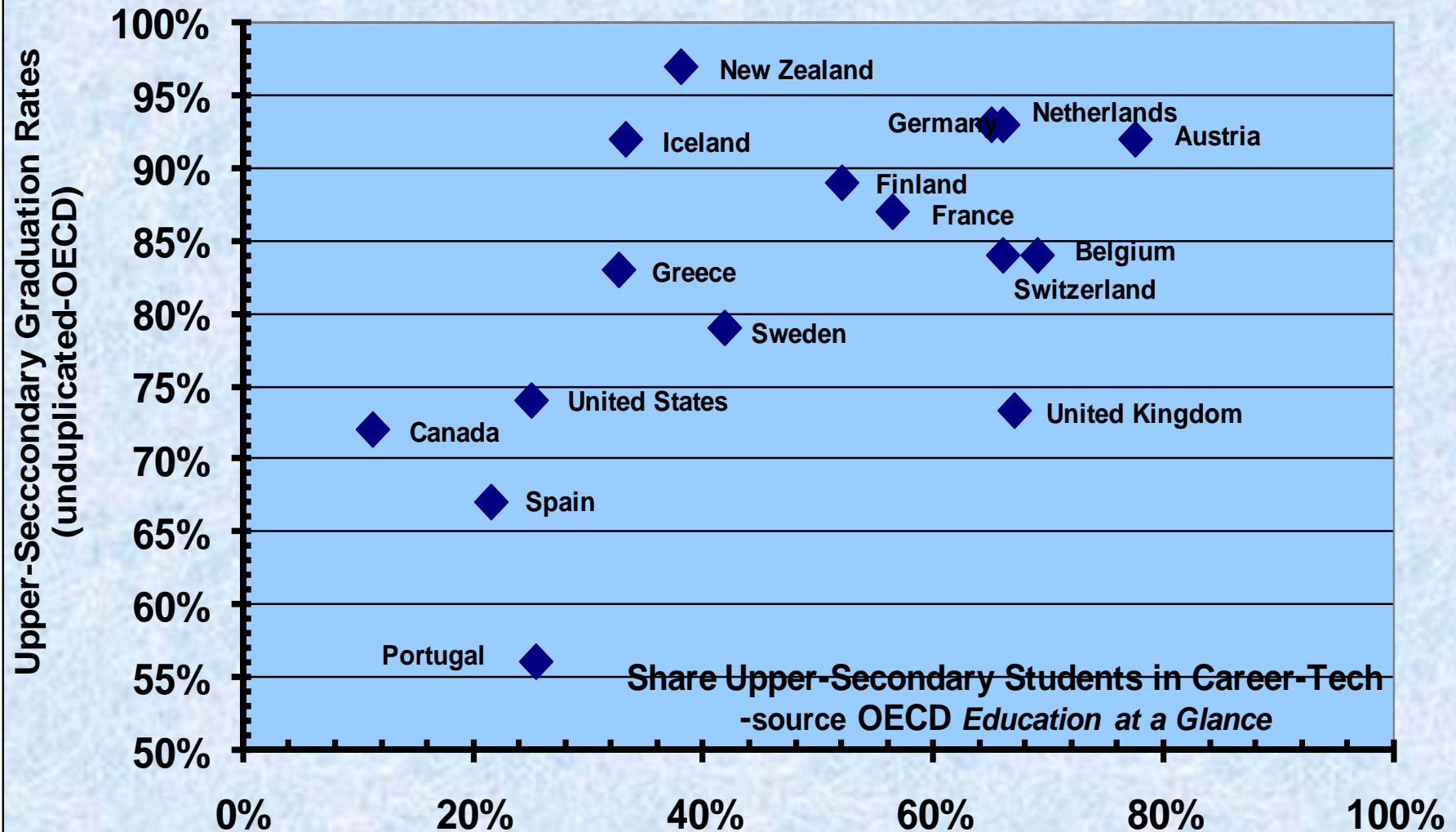


Fig. 2--Availability of Career-Tech in Secondary School Increases Upper-Secondary Graduation Rates



Share Upper-Secondary Students in Career-Tech
-source OECD *Education at a Glance*

Do Institutional Differences contribute to North Europe's higher graduation rates? Yes

- **Greater availability of vocational education.**
- **Greater choice of school and program of study.**
Because €s follow students, schools are incented to retain & graduate students.
- **Students choose their program, what they will study and how demanding their learning goals will be.**
Employers & colleges judge the graduate's record accordingly.
- **Failing an exit exam does not prevent graduation.**
- **Pursuing a specialized goal together develops a positive pro-learning class spirit and enhances respect for the programs occupational goals.**

2004-07 U.S. **Lead** / **Lag** relative to:

	Nether-lands	Swe-den	UK	France	Korea	Brazil
% Attend School 15-19	-10	-9	3.5	-7	-8	1.5
% Grad Upper Secondary	<-10	0	-11	<-10	-15	19
Math 8 th grade	-32	17	-5	-38	-89	--
Science 8 th grade	-9	9	-22	15	-33	--
Reading at 15- 2003	-18	-19	-19	-1	-21	92
Math at age 15	-57	-28	-21	-22	-73	104
Science at age 15	-36	-14	-26	-6	-33	99

STANDARD DEVIATIONS



FIGURE 1. IOWA TEST SCORE TRENDS FOR IOWA STUDENTS. + = ITED, GRADE 12. Δ = ITED, GRADE 9 AND ITBS, GRADE 8. ◇ = ITBS, GRADES 3 AND 4. ABSCISSA = STANDARD DEVIATION UNITS; ORDINATE = YEARS.
 ◇◇◇◇ = GRADES 3 AND 4. ■■■■ = GRADES 8-9, ++++ = GRADE 12

European systems differ from U.S. systems--1

- 1. Centralized Funding *versus* 15,000+ local school boards propose the local property tax levy that pays about half of school costs.** Despite compensatory formulas, wealthy districts spend a lot more.
- 2. National Teacher Contracts *versus* Different salary schedules in each district.** Best teachers seek jobs in high paying districts.
- 3. National Curriculum *versus* Teacher decides what to teach—**Annual basic skills tests given to ‘raise’ standards.
- 4. School Choice without having to change residence *versus* Parent’s residence determines the school a child attends.**

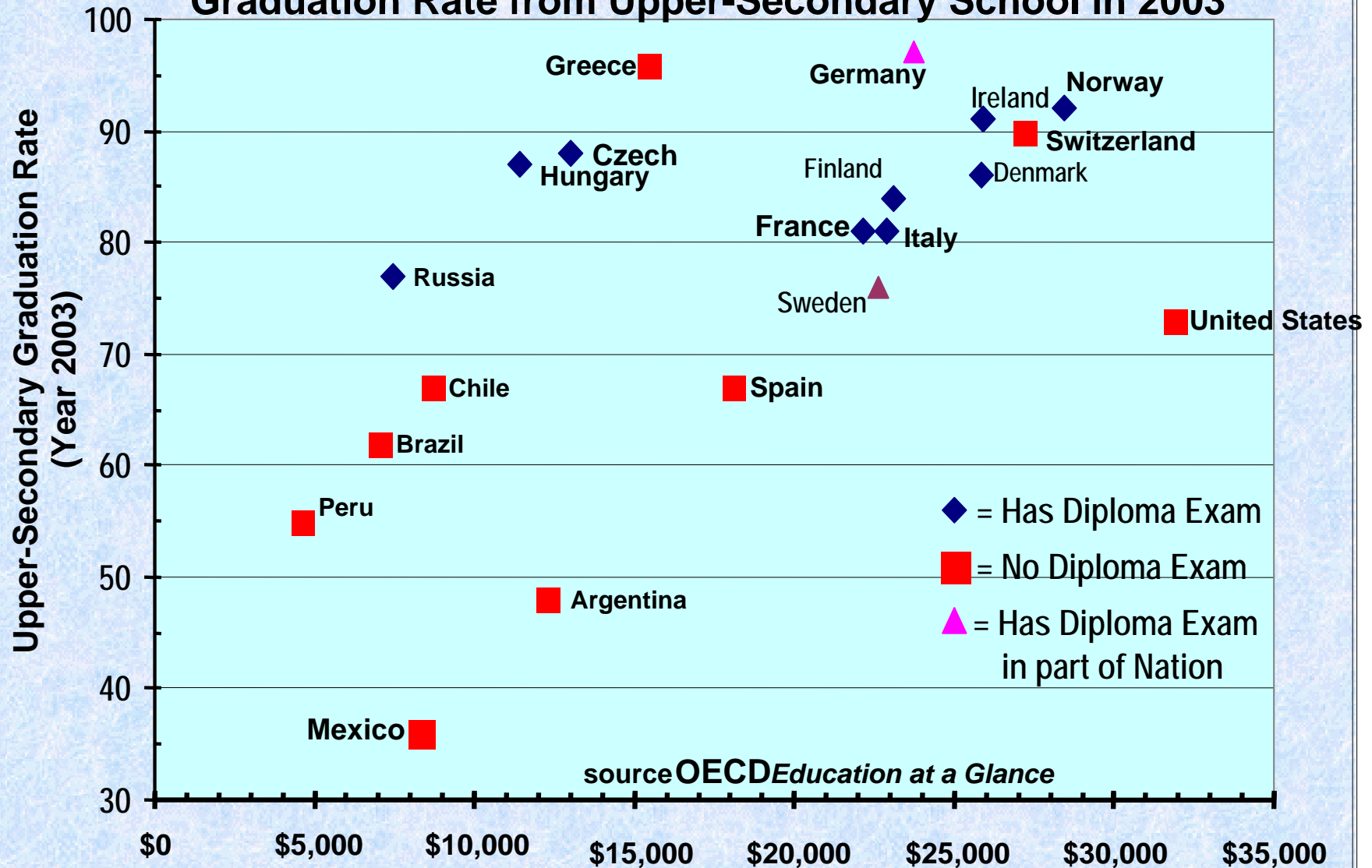
European Secondary Schools differ from the U.S.--2

- 5. Different types of secondary schools with different majors *versus* Tracking within one comprehensive high school.**
- 6. Depending on interest and ability students choose a major & associated set of exams *versus* All students must pass the same battery of minimum comp tests to graduate.**
- 7. College admission decisions are heavily influenced by grades on senior year curriculum-based external exams (CBEE) (students choose how many & which 3 hr exam to take, varies by major) *versus* A computer-scored 3 hour aptitude test (SAT/ACT), class rank, GPA and athletic prowess influence admissions.**

European Secondary Schools differ from U.S.--3

8. **EU firms expect CBEE grades to be on resumes.**
versus U.S. firms seldom ask for SATs or GPA.
9. **In EU failing a CBEE signals lower achievement, but one graduates anyway.** *versus* In many US states, diploma not awarded till you pass battery of MCTs.
10. **Once school & major are chosen, child is part of a class/cohort that takes most classes together. Choice of courses is constrained.** *versus* Every course has a different group of classmates.
11. **In France, Germany & Holland (not Britain and Sweden), those who fail two courses typically repeat the grade or switch to an easier school or program.**

Relationship of Per Capita GDP and Diploma Exams to Graduation Rate from Upper-Secondary School in 2003



Relationship of Per Capita GDP and Diploma Exams to School Enrollment Rate of 15-19 year olds in 2003

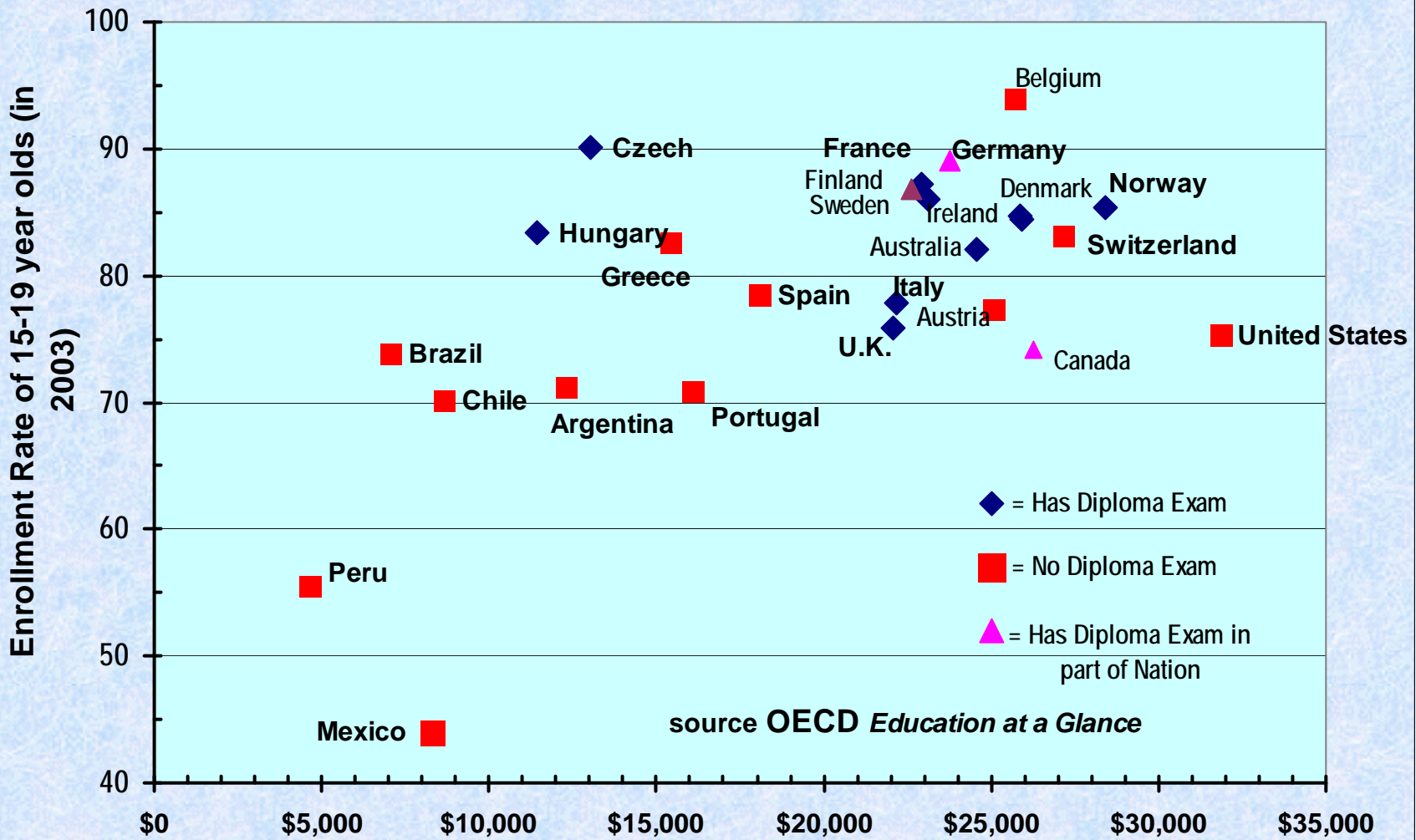


Fig. 5—Relationship of Per Capita GDP and Diploma Exams to Mathematical Literacy of Native-Born 15 yr olds in PISA

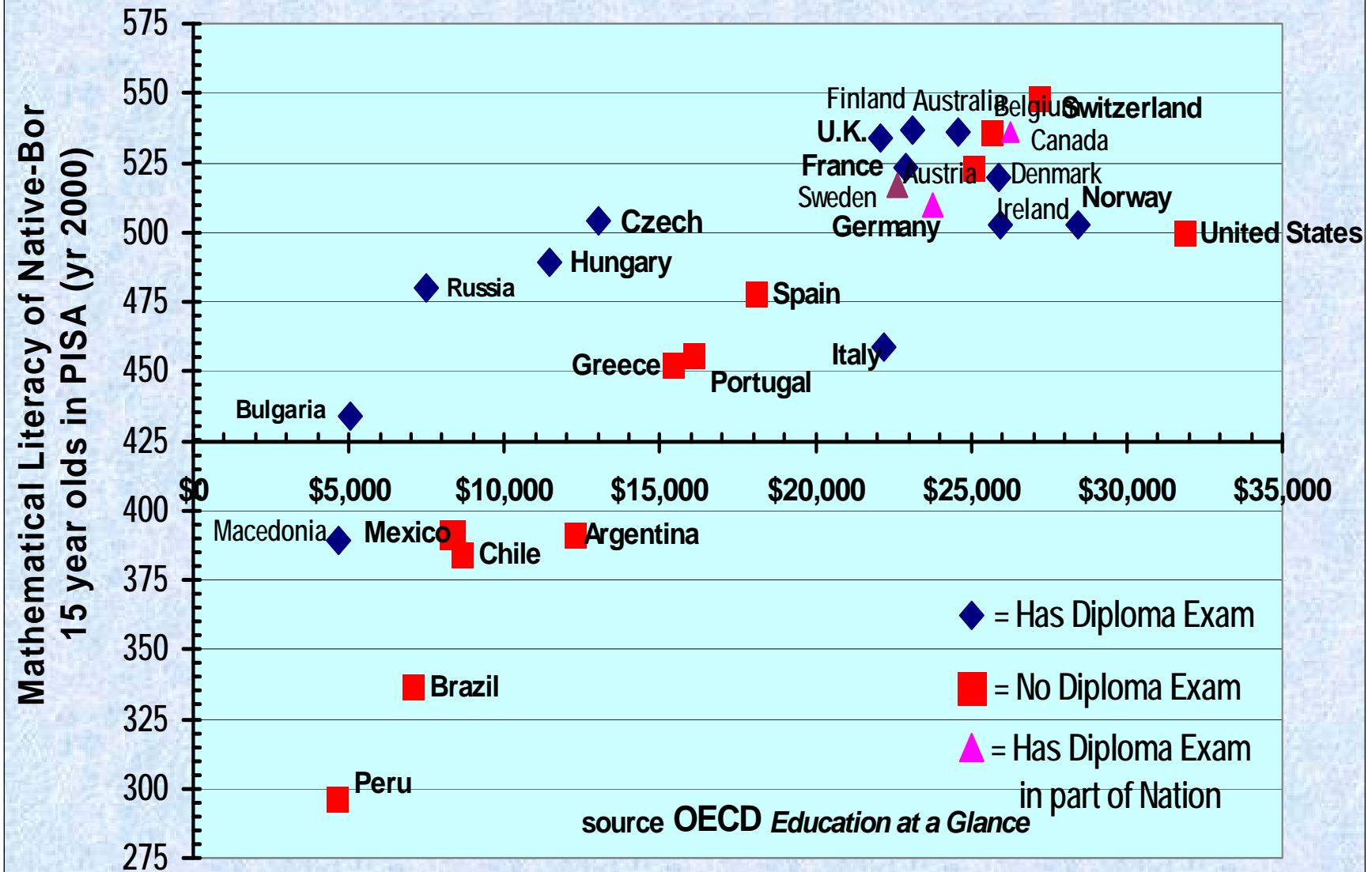


Fig 6--Relationship of Per Capita GDP and Diploma Exams to Scientific Literacy of Native-Born 15 yr olds in PISA

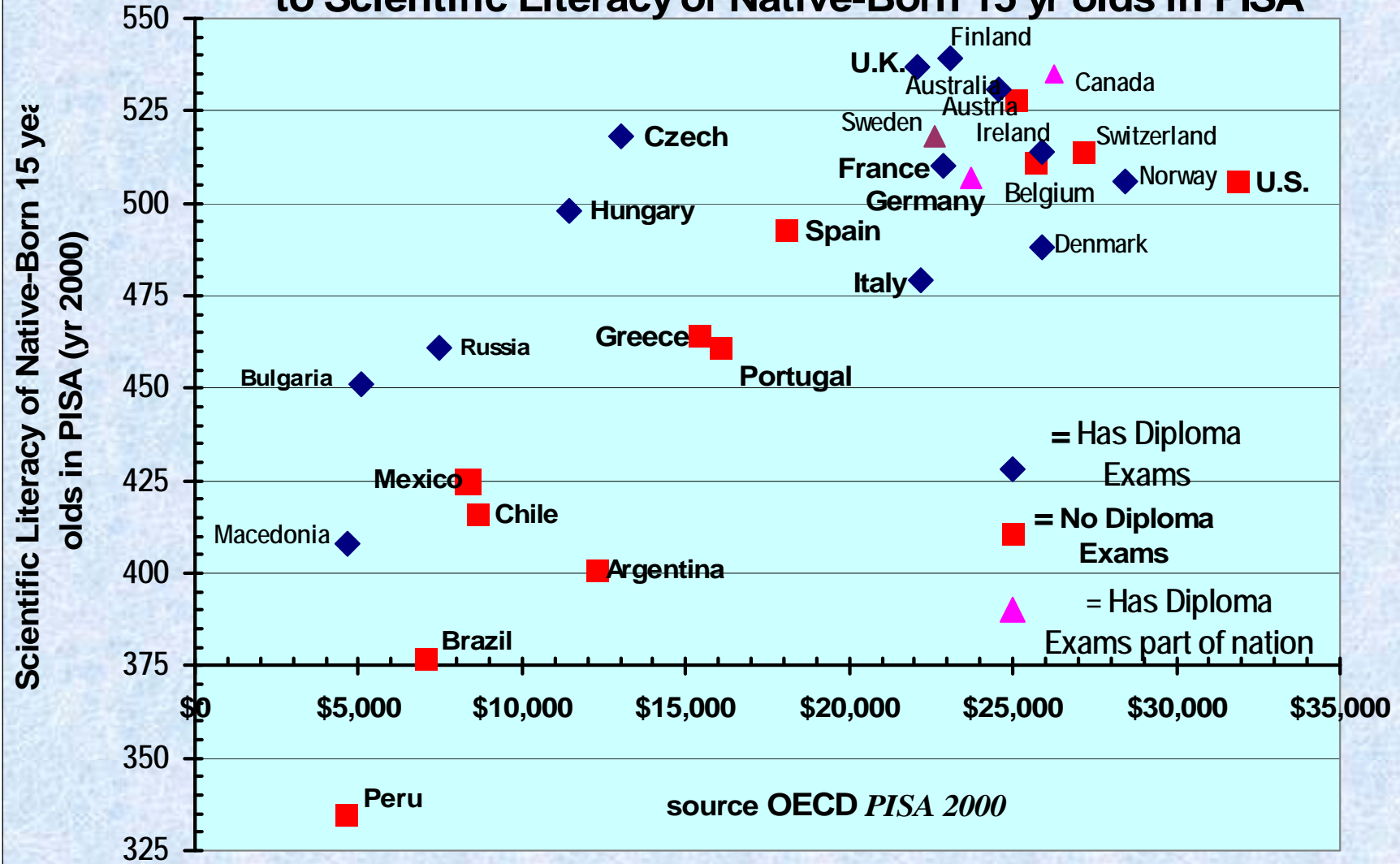
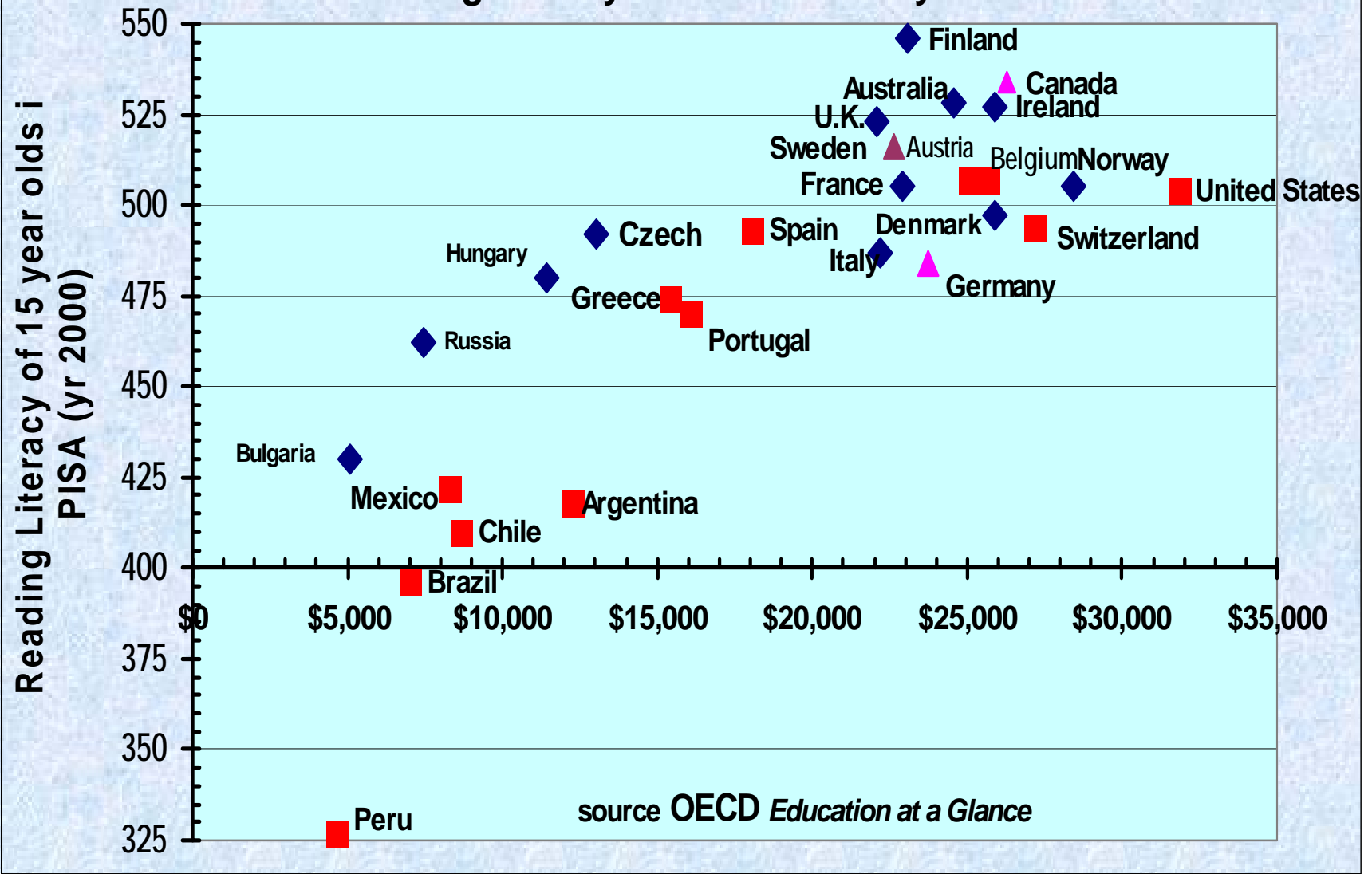


Fig 7--Relationship of Per Capita GDP and Diploma Exams to Reading Literacy of Native-Born 15 yr olds in PISA



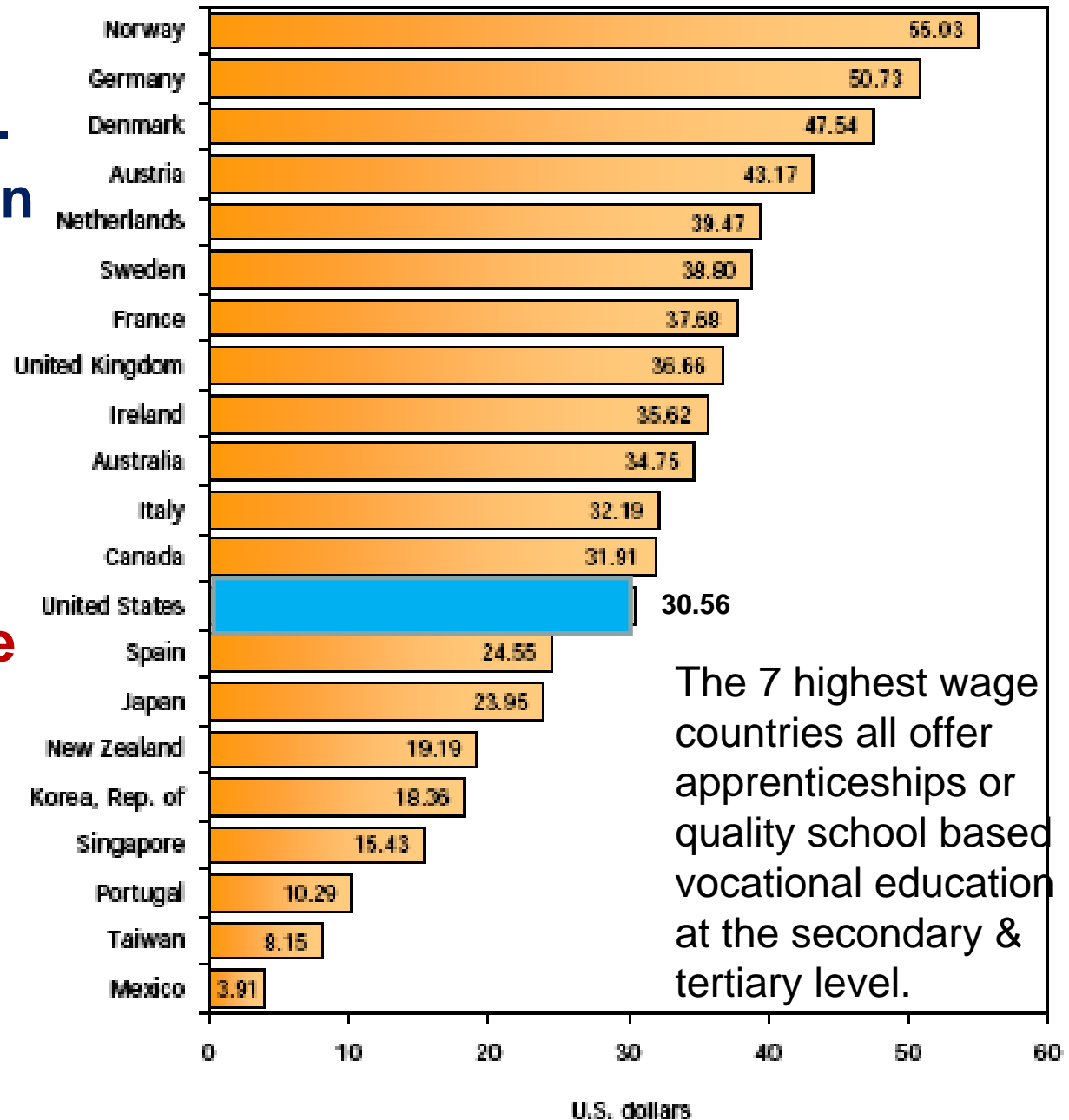
Literacy of Native Speakers: Europe, Australia, NZ and the Americas

	CBEEE	<i>ln[per cap GDP/ppi]</i>	AdjR2
Science	33.2** (10.6)	46.5*** (9.1)	.660 n=31
Math	42.9*** (15.2)	83.6*** (13.1)	.679 n=31
Reading	34.7*** (10.9)	69.1*** (8.9)	.739 n=31

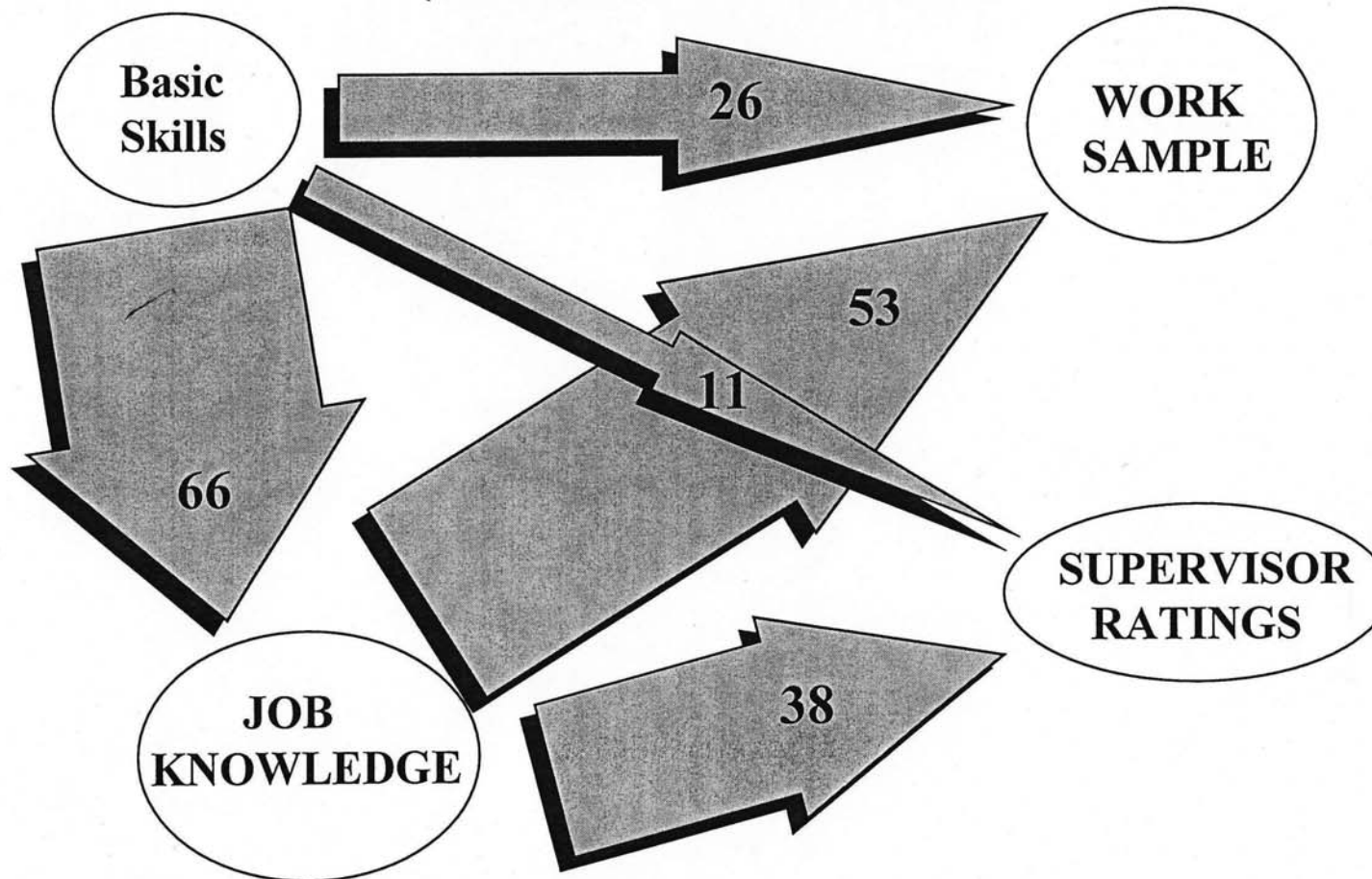
*** = significant at .01 level, *= sig. at .10 level

2007 Hourly Compensation- all employees in manufacturing

The 9 North European nations pay mfg. wkrs more than the U.S. This suggests the European mfg wkrs. are more productive.

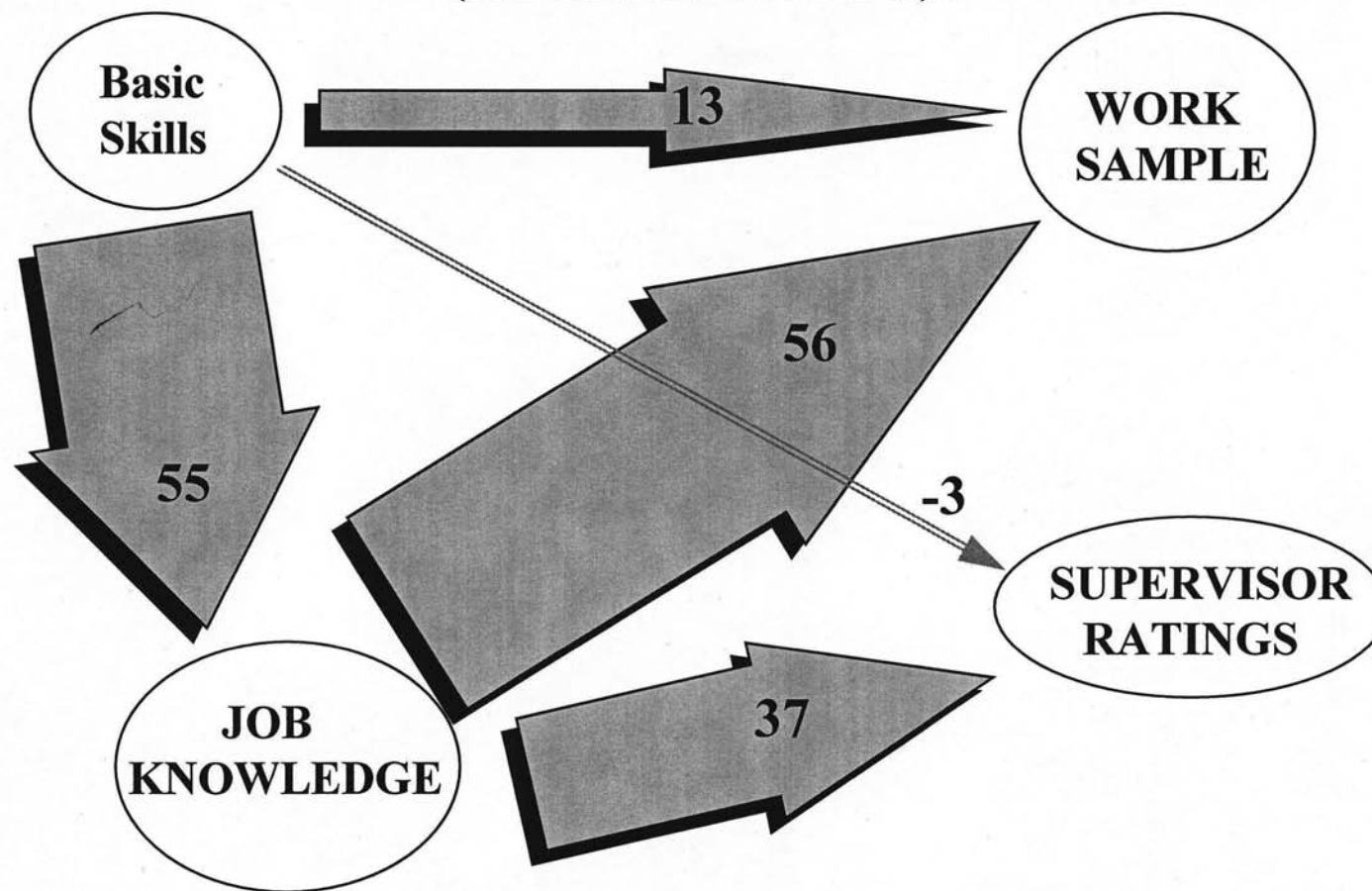


**FIGURE 6: PATH MODEL FOR ABILITY, JOB KNOWLEDGE, AND PERFORMANCE
(NONMILITARY STUDIES)**



Source: John E. Hunter, *A Causal Analysis of Cognitive Ability, Job Knowledge, Job Performance, and Supervisor Ratings*, Chapter from F. Landy, S. Zedeck, J. Cleveland, *Performance Measurement and Theory*, Lawrence Erlbaum Associates Publishers, New Jersey, 1983, pp. 257-266.

FIGURE 5: PATH MODEL FOR ABILITY, JOB KNOWLEDGE, AND PERFORMANCE (MILITARY STUDIES)

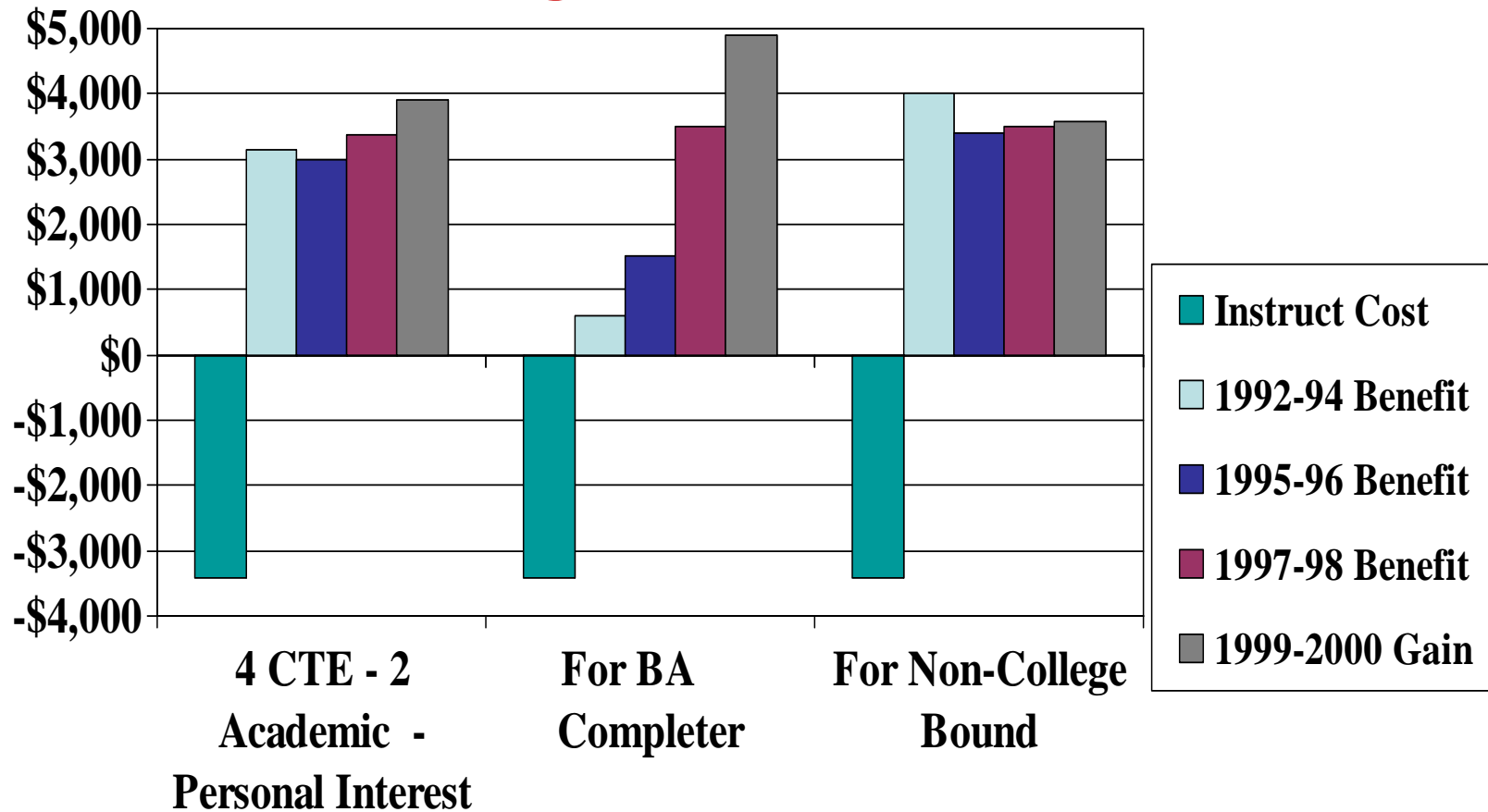


Source: John E. Hunter, *A Causal Analysis of Cognitive Ability, Job Knowledge, Job Performance, and Supervisor Ratings*, Chapter from F. Landy, S. Zedeck, J. Cleveland, *Performance Measurement and Theory*, Lawrence Earlbaum Associates Publishers, New Jersey, 1983, pp. 257-266.

The things taught in colleges and schools are not an education, but a means of education-- Ralph Waldo Emerson, 1831

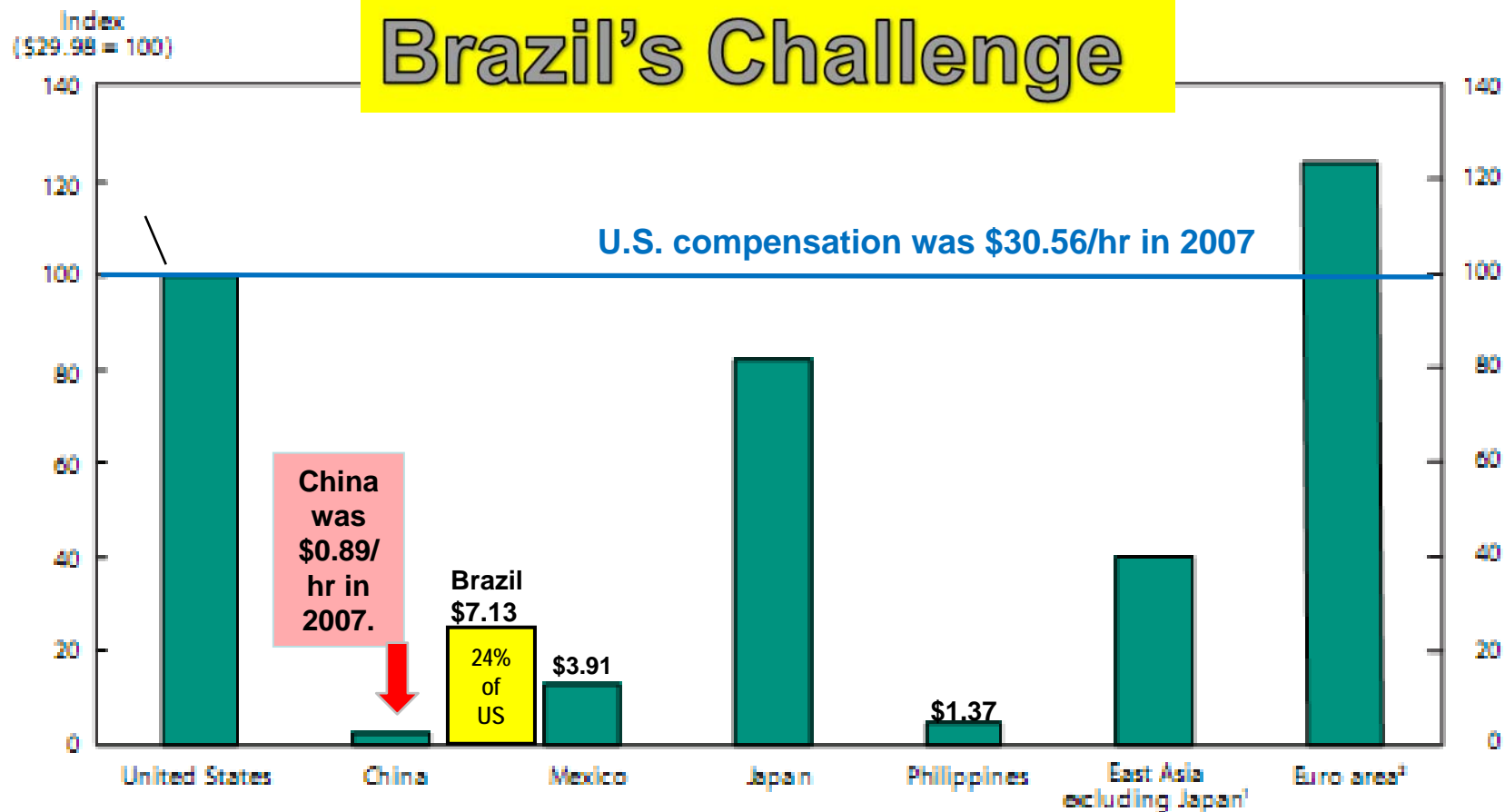
- **Generic Academic Skills cannot substitute for Occupational Skills**
- **Verbal and math abilities have only small direct effects on the productivity of most workers**
- **Basic academic skills help workers learn the Occupation and Job Specific skills that are directly productive.**
- **Brazil should offer more high quality career-tech options.**

Fig D--Costs and Benefits of taking Four Career-Technical Education Courses---First 8 years after graduation



Source: Analysis of NELS:88 data by Bishop & Mane, EER, 2004--controls for college attendance, high school completion, socio-economic status, GPA & test scores in 8th grade, state & high school characteristics.

Chart 2. Average hourly compensation costs of manufacturing employees, selected economies and regions, 2006



¹“East Asia excluding Japan” comprises the Republic of Korea, the Philippines, Singapore, and Taiwan.

²“Euro area” refers to European Union member countries that had adopted the euro as the common currency as of January 1, 2009.

Sources: U.S. Bureau of Labor Statistics, “International comparisons of hourly compensation costs in manufacturing, 2007” (Bureau of Labor Statistics, Mar. 26, 2009), on the internet at www.bls.gov/news.release/pdf/ichcc.pdf. The data in this chart refer to the all-employees series rather than the production worker series. For China, data are from this article and are not from the BLS series.

What matters most for Economic Growth?

- **Increasing years of schooling of the population? OR**
- **How much students learn per year in school?**
- **Brazilian enrollment rates & test scores rose a good deal in the last decade.**
- **But 15 year olds still score 3 to 5 grade-level equivalents behind North Europe and North American students**

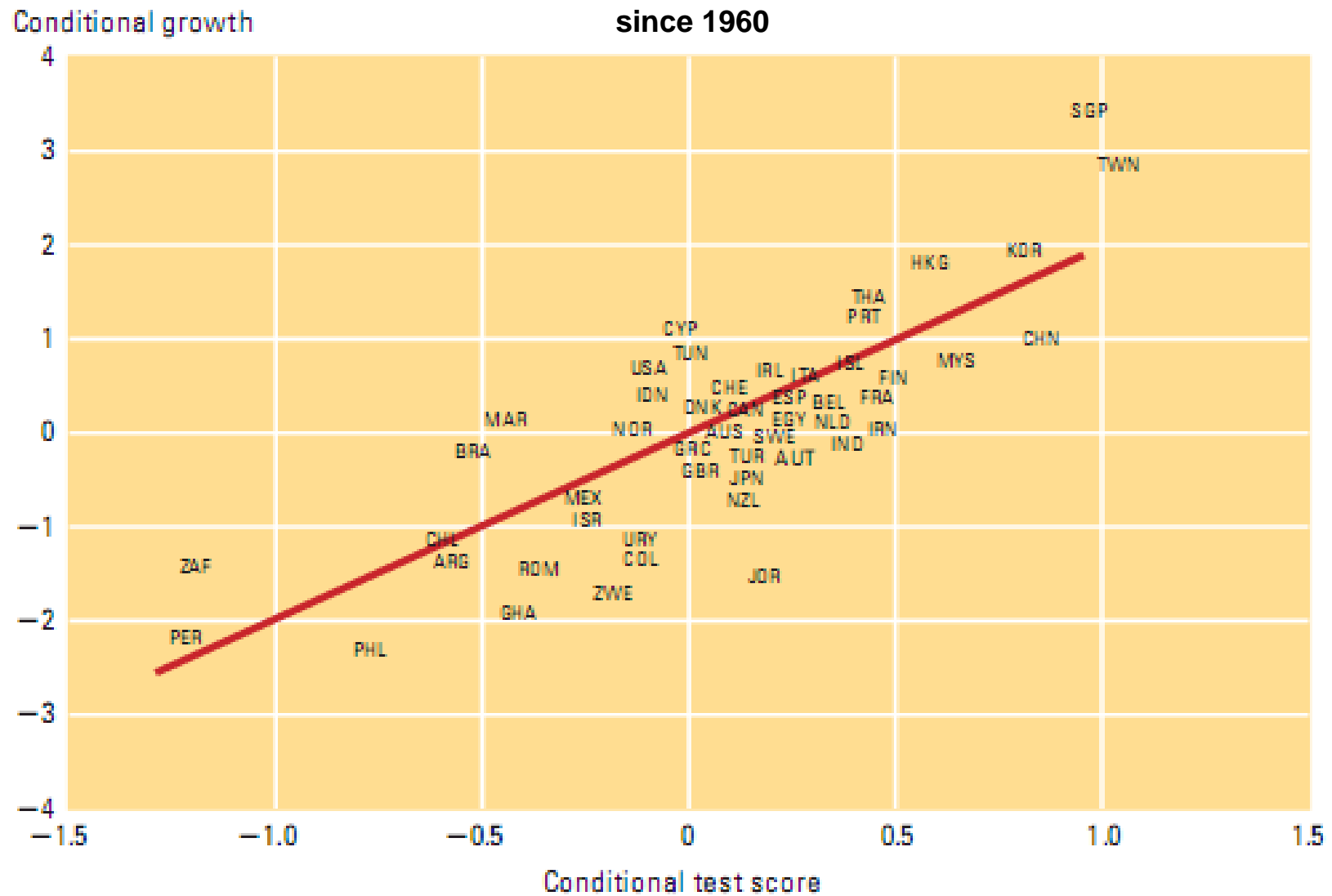
Findings of Hanushek/Woesmann study of test scores, years of schooling and Economic Growth

- 1. Countries with high achieving secondary school students grow faster.**
2. When test scores in HS and 1960 productivity levels are held constant, average years of schooling in 1960 had no significant effect on subsequent growth rates.

http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099079934475/Edu_Quality_Economic_Growth.pdf

Figure 4 Test scores, as opposed to years of schooling, have a powerful impact on growth

a. Impact of test scores on economic growth



coef = 1.9804387, se = .21707105, t = 9.12

Literacy Skills are linked to Faster Growth Rates

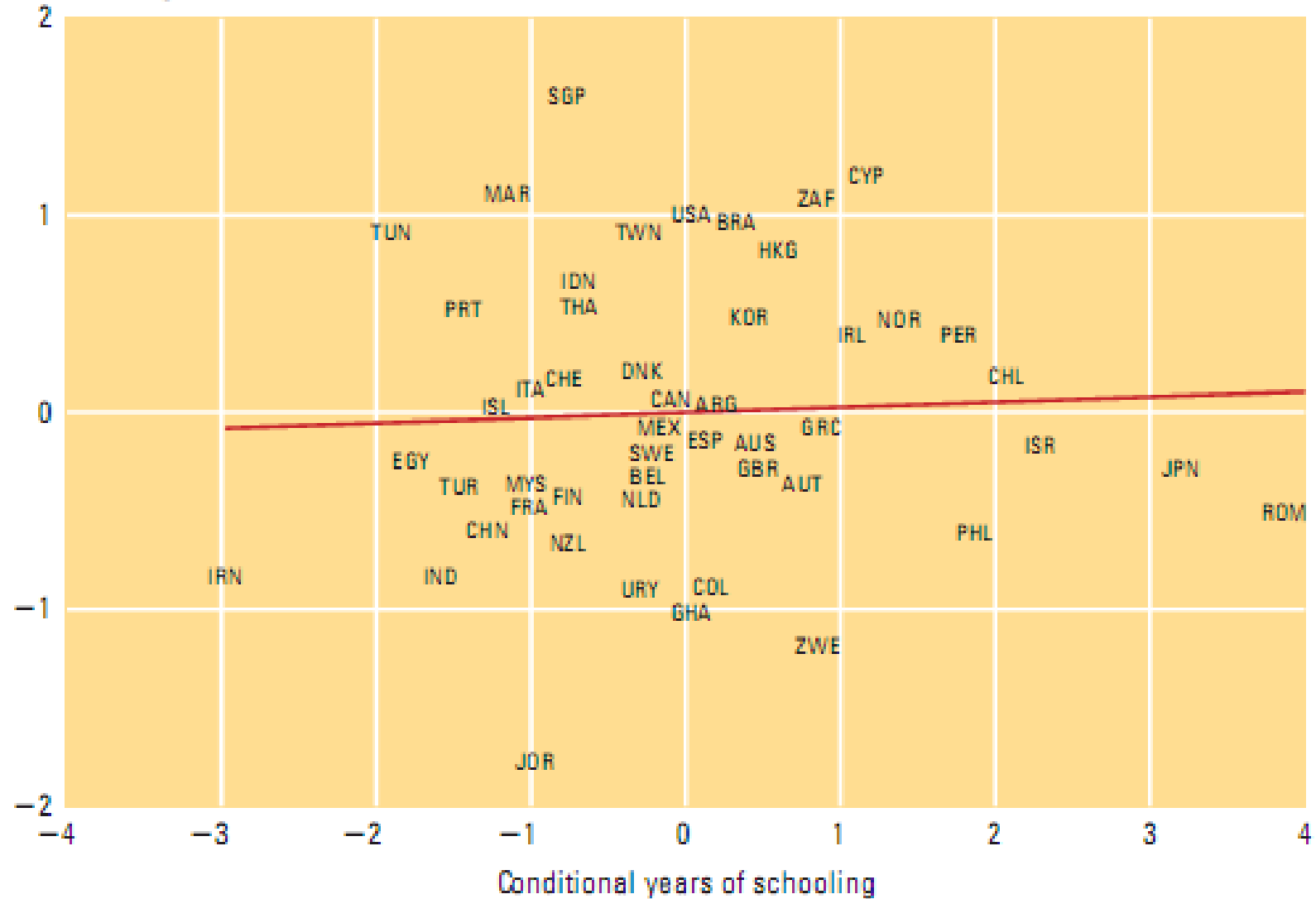
2. When test scores & 1960 productivity levels were held constant, Average years of schooling in 1960 had no significant effect on subsequent growth rates.

3. These findings remain significant when other variables are added, when post 1980 growth is studied or sample is limited to countries with low per capita GDP in 1960.

http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099079934475/Edu_Quality_Economic_Growth.pdf

b. Impact of years of schooling on economic growth

Conditional growth since 1960



coef = .0264058, se = .07839797, t = .34

How to compete with China, India & Indonesia where workers are paid less than 12% of what Brazilian manufacturing workers are paid?

Improve Worker Skills: but how?

1. More years in school?

2. Learn more per year?

3. Learn the skills that enhance productivity the most?

Brazil's PISA scores are low,
possibly because

- **Avg. weekly classroom hours are 19.1 versus 25 in Mexico and 30.3 in Korea.**

(Rodriguez, Knowledge and Innovation for Competitiveness in Brazil, World Bank, 2008, p. 114)

- **Students were on task only 69% of scheduled class time.** (Ed at a Glance: 2009, Chart D6.6)

- **In 2001, Brazil's classroom disciplinary climate was fourth lowest of the PISA nations.** (Willms, Student Engagement at School, p. 78)

Questions for Students on Disciplinary Climate

- 1) ***Teacher has to wait a long time for students to become quiet***
- 2) ***Students cannot work well***
- 3) ***Students don't listen to what the teacher says***
- 4) ***Students don't start working for a long time after lesson begins***
- 5) ***There is noise and disorder***

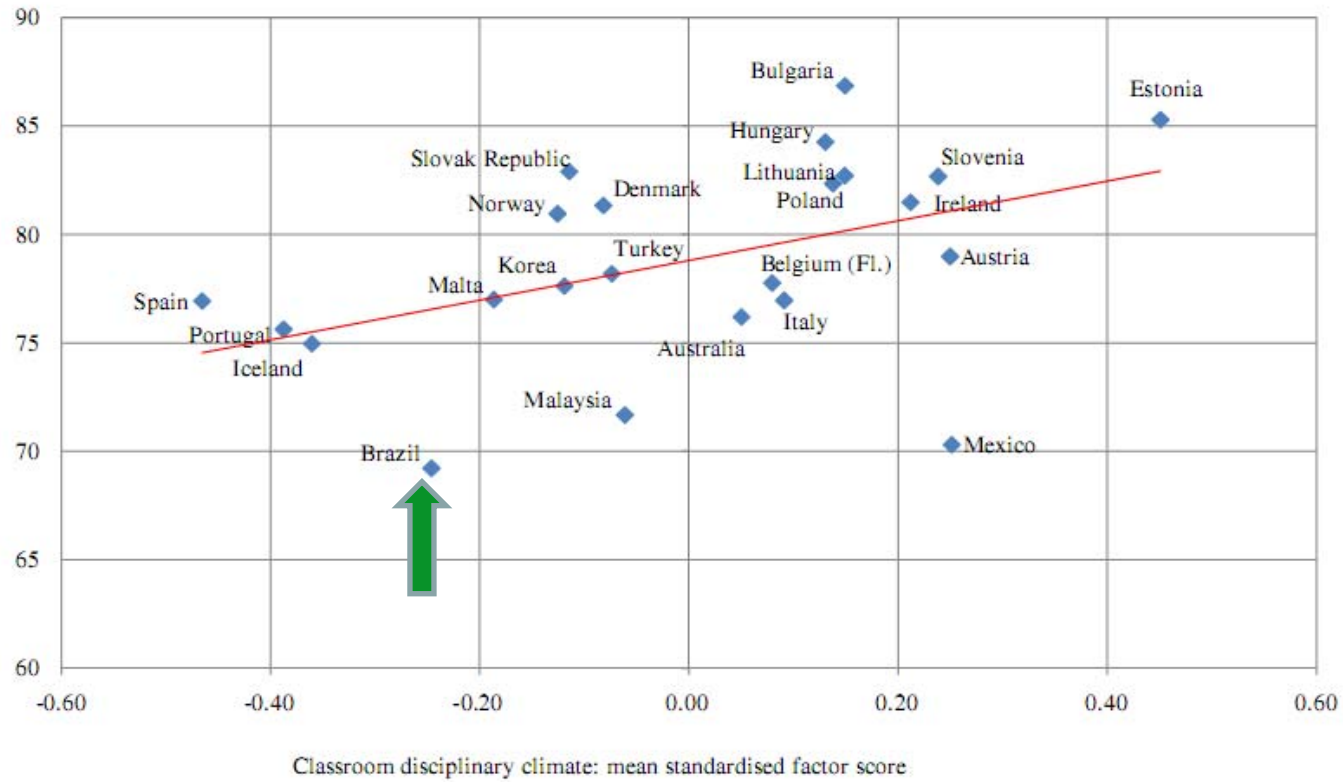
Table 3—Academic Achievement in Nations with and without Curriculum-Based External Exit Examination Systems: Program for International Student Assessment 2000 Data

	<i>Effort Index</i>	<i>Curriculum-Based External Exit Exam</i>	<i>Log GDP/Pop 1995</i>	<i>East Asia</i>	<i>Share Upper Secondary Students in CTE</i>	<i>Adj R² RMSE</i>	<i>#of Obs</i>
Native Born Students							
Mathematics—15 Yr Olds		39.9*** (12.1)	84.9*** (7.9)	36.6** (16.7)		.764 32.7	41
	19.6*** (6.6)	38.2*** (11.0)	85.2*** (7.2)	12.8 (17.1)		.805 29.7	41
	21.9*** (5.8)	40.2*** (10.6)	95.4*** (7.1)			.807 29.6	41
Science—15 Yr Olds		32.4*** (9.9)	71.3*** (6.5)	29.7** (13.9)		.756 27.1	41
	12.9** (5.7)	31.2*** (9.4)	72.1*** (6.2)	14.2 (14.9)		.780 25.7	41
	15.4** (5.1)	33.5*** (9.8)	71.4*** (6.2)			.780 25.7	41
Combined Reading Literacy —15 Yr Olds		25.2*** (8.8)	76.6*** (5.6)	15.7 (11.9)		.828 23.1	41
	3.7 (5.2)	24.8** (8.9)	76.9*** (5.6)	11.2 (14.6)		.826 23.3	41
	5.7 (4.6)	26.7*** (8.6)	76.3*** (5.6)			.827 23.2	41
School/College Enroll. of 15-19 yr olds (percent)		-5.7 (4.8)	13.1*** (4.3)	-1.1 (7.7)	.18* (.10)	.552 10.3	30
Expected FTE Yrs of Schooling: 5-65		-.11 (.47)	2.51*** (.40)	.27 (.73)	.020* (.010)	.700 1.10	32
Upper-Secondary Graduation Rate		4.9 (6.9)	27.2*** (4.5)	14.3* (8.2)	.23* (.12)	.725 11.7	26

Source: Data on PISA is from OECD, *Literacy Skills for the World of Tomorrow: Further Results From PISA 2000*, 2003. Upper-secondary graduation rates, enrollment rates and expected FTE years of schooling are from OECD, *Education at a Glance 2000 and 2001*. The full-time equivalent number counts part-time enrollment as 0.5 years.

Chart D6.6. Country means for two indicators of the quality of the classroom environment (2007-08)

Average percentage of lesson time spent teaching and learning

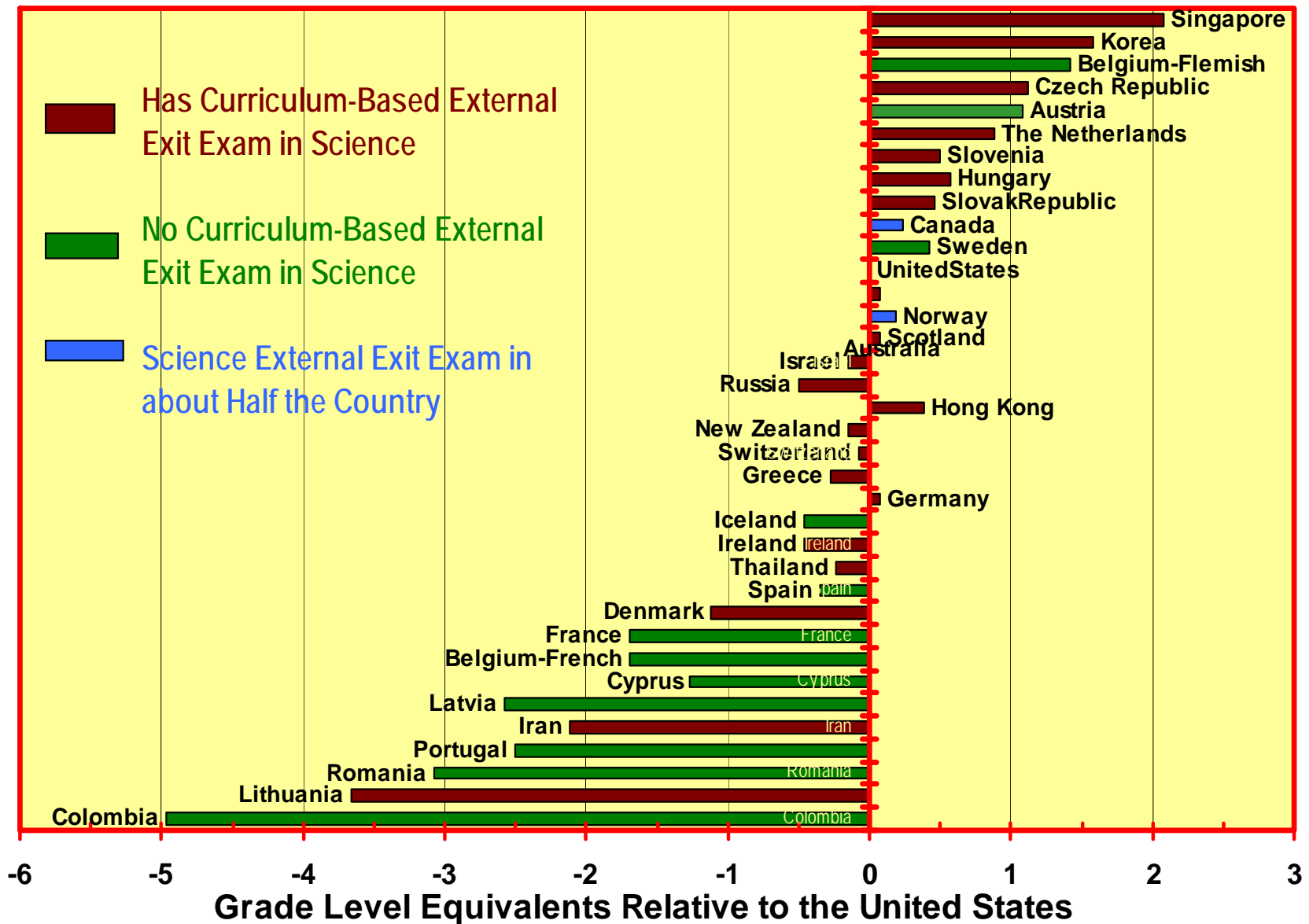


Source: *Education at a Glance: OECD Indicators 2009*, Chart D6.6

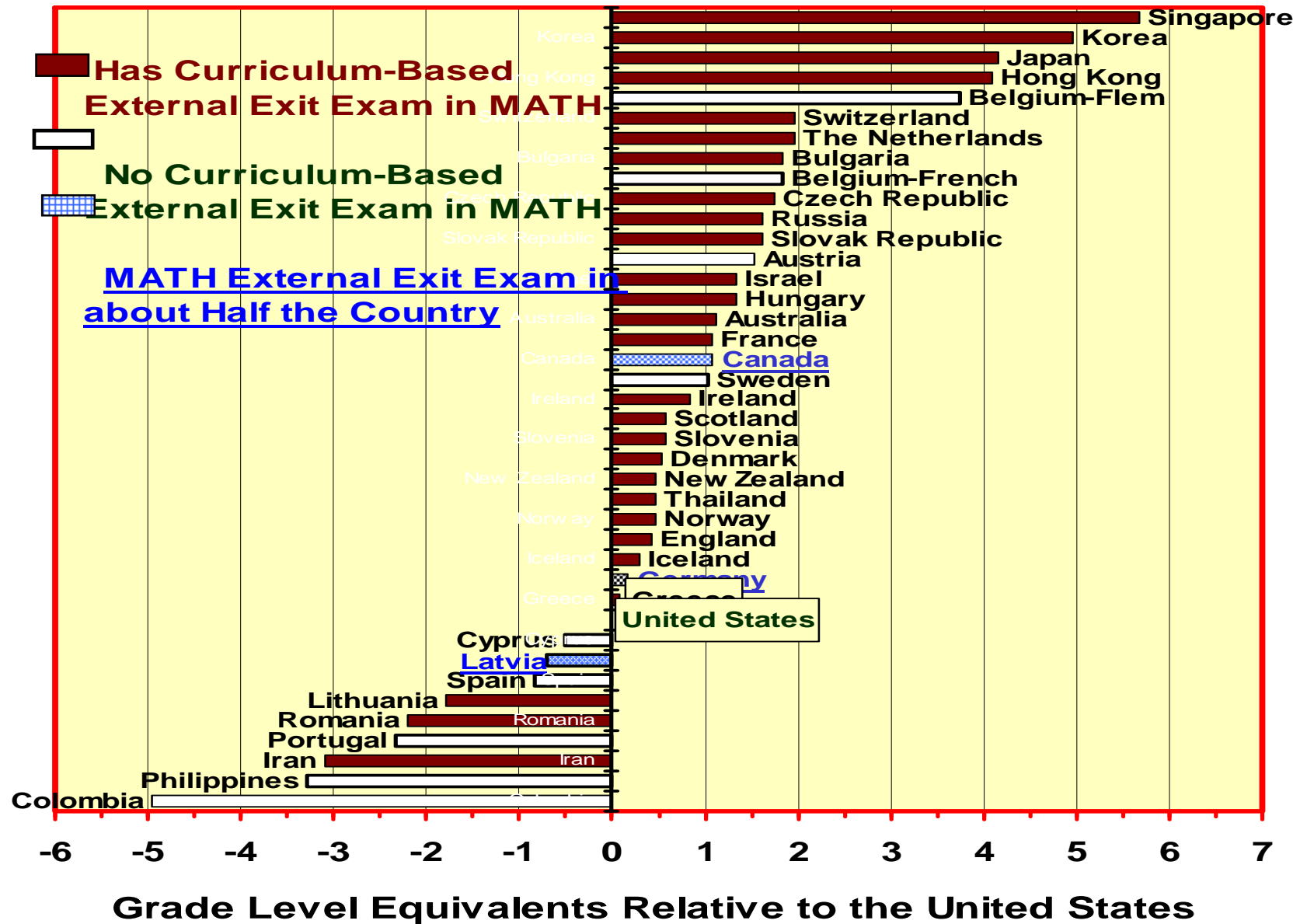
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1995 Science Achievement-age 13: Parents High School Grads



1995 Math Achievement at Age 13



How US Ranks in OECD--2006/7?

- Reading 4th grade- **# 9 of 28** nations
- Reading age 15- **# 15 of 27** nations-2003
- Math 4th grade- **# 7 of 20** OECD & Russia
- Math 8th grade-- **# 8 of 22** OECD & Russia
- Math at age 15- **# 25 of 30** OECD nations
- Science 4th grade- **# 7 of 20** OECD & Russia
- Science 8th grade- **# 8 of 18** OECD & Russia
- Science at age 15- **# 21 of 30** OECD nations

Analysis of TIMSS Data

- Dep. Var.--Median Scores of 13 yr olds
- Treatment Var.--CBEEE in subject.(1-0)
 - partial value where practice differs across states/provinces
- Control Var.--
 - GDP per capita in 1987-90 /PPP index
 - East Asian nation (1-0)

Analysis of TIMSS, TIMSS-R & IEA Reading data on 13-14 yr olds

	CBEEE	<i>ln[per cap GDP/ppi]</i>	East Asia	AdjR2
Science (GLE=26)	45.4*** (4.02)	30.5*** (3.65)	3.8 (.09)	.429 n=42
Math (GLE=24)	41.0*** (1.79)	43.6*** (4.61)	47.5*** (2.97)	.470 n=42
Reading (GLE=24)	24.5*** (3.06)	24.2*** (3.46)	-21.6* (2.04)	.618 n=25

GLE = Grade Level Equivalent, *** = significant at .01 level, * = sig. at .10 level

Predicting Achievement Gains from 4th to 8th Grade

	CBEEE	<i>Yrs of Streaming before 9th</i>	4 th Grade Score	AdjR2
Science (GLE=26)	26.8*** (8.8)	5.7** (2.0)	-.67*** (.09)	.738 n=24
Math (GLE=24)	24.0*** (8.3)	-1.1 (2.1)	-.01 (.08)	.292 n=24
Reading (GLE=24)	15.2** (6.0)	.62 (1.54)	-.60*** (2.04)	.587 n=23

GLE = Grade Level Equivalent, *** = significant at .01 level, * = sig. at .10 level

How to compete with China, India & Indonesia where workers are paid less than 12% of what Brazilian manufacturing workers are paid?

Improve Worker Skills: but how?

1. More years in school?

2. Learn more per year?

3. Learn the skills that enhance productivity the most?

Payoff to Cognitive Skills: International Evidence

- **Since 1980 Real wage growth in the U.S., Brazil and other Latin American Countries has been very slow. Why?**
 - **Productivity Leader Firms (PLs) have built plants in Asian NIEs or outsourced manufacturing to suppliers in the Asian TIGERs.**
 - **Asian firms are now productivity leaders in some industries (eg. lithium batteries, consumer electronics).**
 - **The rapid growth of high tech manufacturing in Japan and the Asian Tigers raised wages and strengthened currencies.**
 - **Competition from High Tech Asian TIGERs (eg. Korea, Taiwan) and from very low wage Emerging Economies (eg. China, Indonesia, Philippines) have slowed wage increases at manufacturing plants in North and South America.**

Chart A1.2. Population that has attained at least upper secondary education¹ (2005)

Percentage, by age group

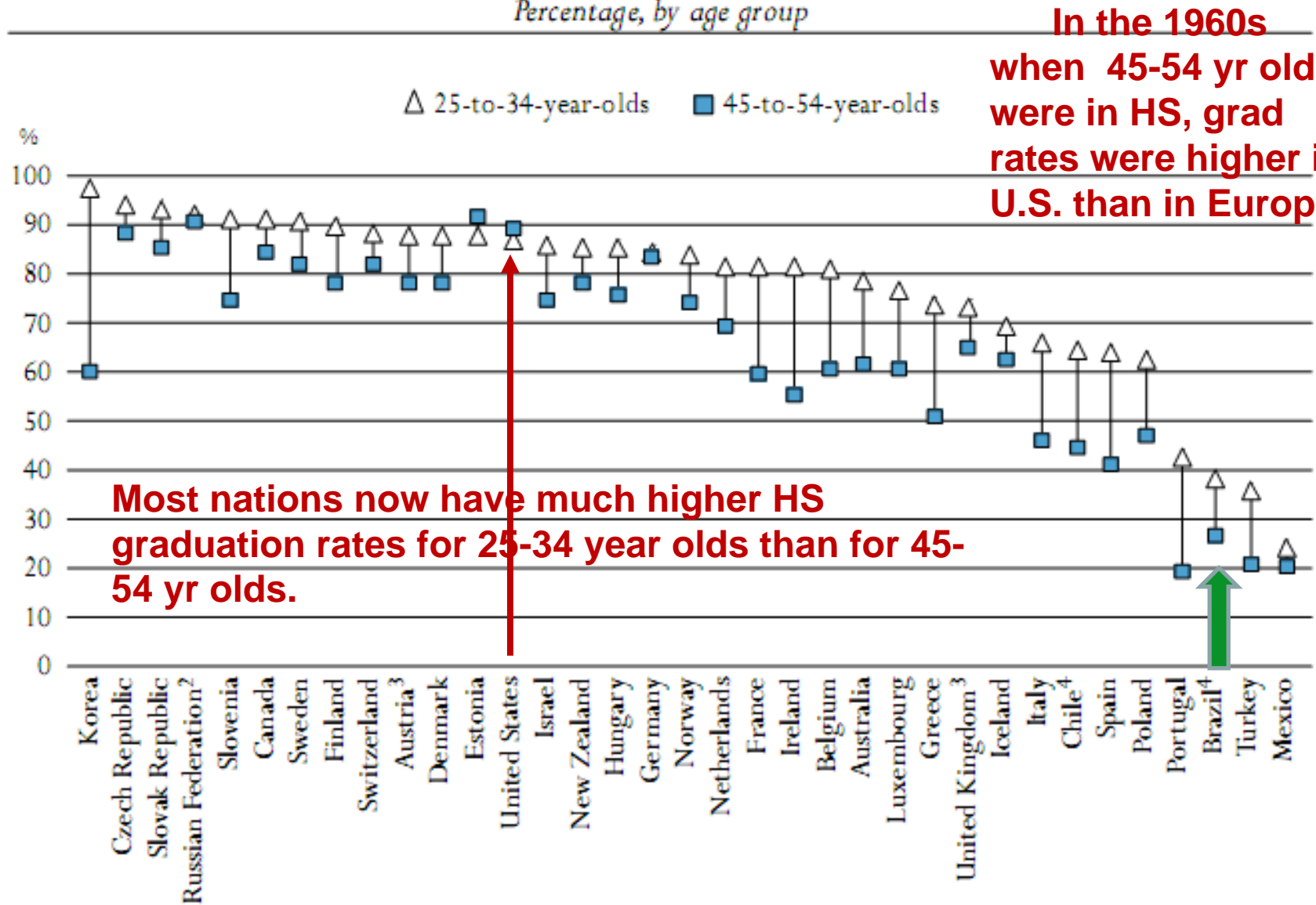
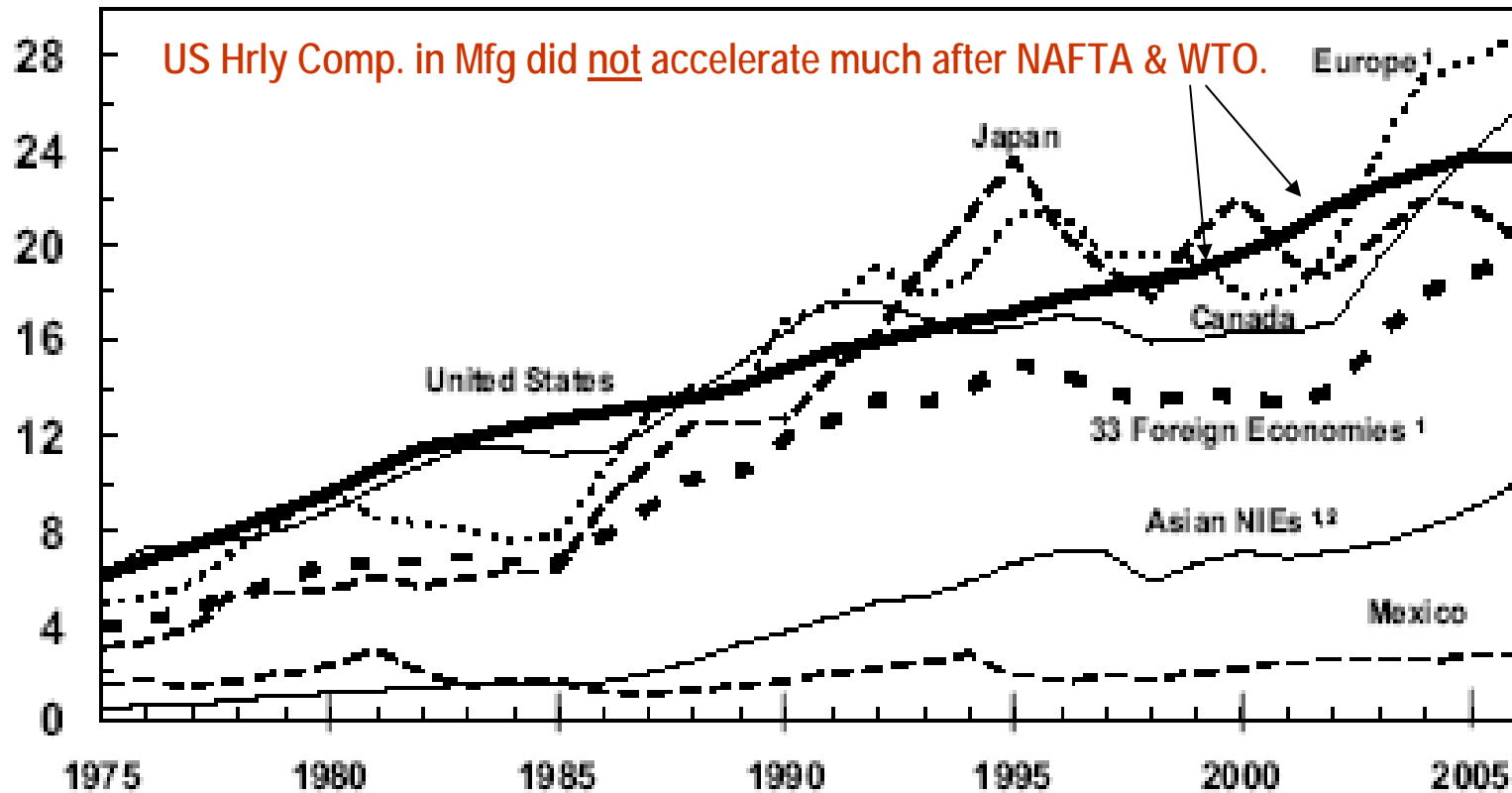


Chart 1. Hourly compensation costs in U.S. dollars for production workers in manufacturing, 1975-2006

Hourly costs (\$)



¹ Trade-weighted average

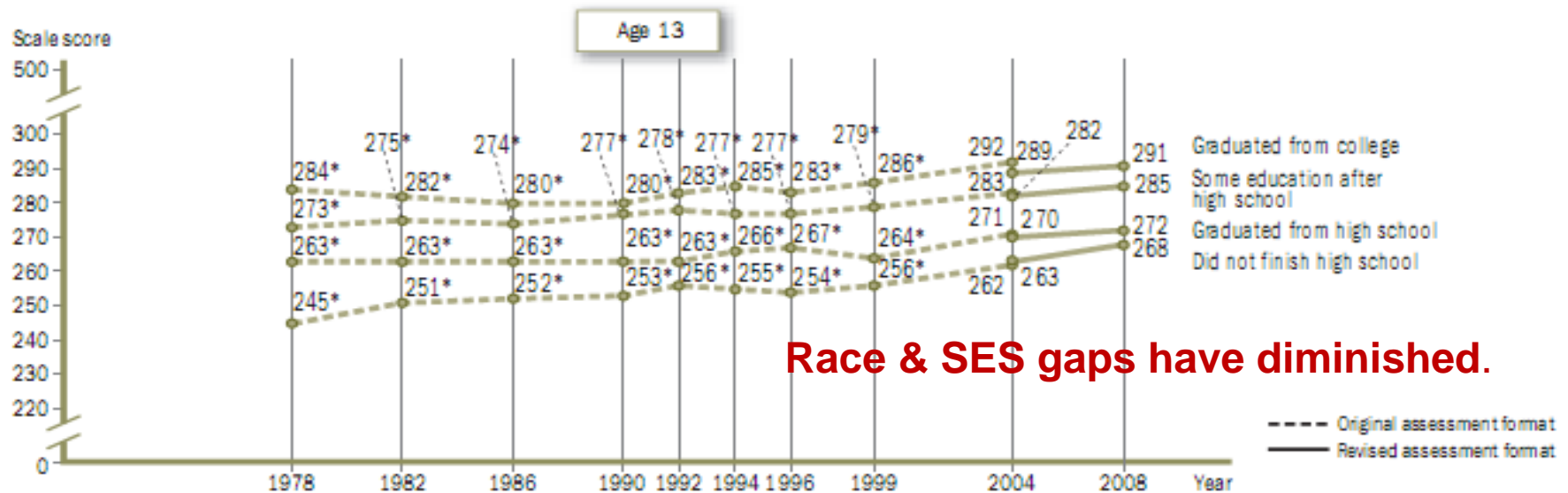
² The Asian NIEs are Hong Kong SAR, Republic of Korea, Singapore, and Taiwan.

Why did Mexican & Brazilian wages rise less than the Asian NIEs?

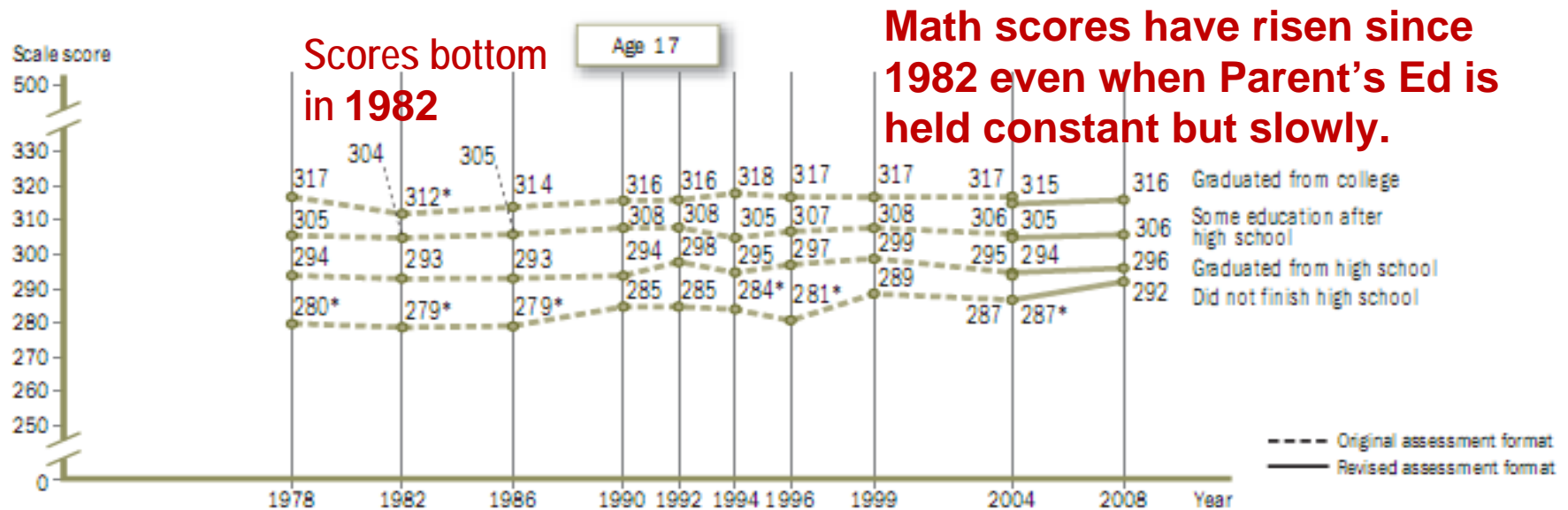
Low Test Scores?

RE 13.

Trend in NAEP mathematics average scores for 13- and 17-year-old students, by highest level of parental education



Race & SES gaps have diminished.



Scores bottom in 1982

Math scores have risen since 1982 even when Parent's Ed is held constant but slowly.

* Significantly different ($p < .05$) from 2008.

Reading skills of high school students have not improved since 1980-84

TABLE 3. Average scores in NAEP reading, by student age group and type of school: Various years, 1980–2008

Age group and type of school	1980	1984	1988	1990	1992	1994	1996	1999	2004 ¹	2004 ²	2008
Age 9											
Public	214*	209*	210*	208*	209*	209*	210*	210*	217	214*	218
Private	227*	223*	223*	228*	225*	225*	227*	226*	‡	‡	237
Catholic	226*	221*	223*	225*	223*	223*	227	225	228	230*	235
Age 13											
Public	257	255*	256	255*	257	256	256	257	257	255*	258
Private	271	271	268	270	276	276	273	276	‡	‡	275
Catholic	270	270	266*	273	275	273	275	279	278	276	275
Age 17³											
Public	284	287*	289*	289*	288*	286	287	286	283	281*	284
Catholic	300	301	300	307	308	301	‡	305	‡	‡	303

‡ Reporting standards not met.

* Significantly different ($p < .05$) from 2008.

¹ Original assessment format. Results prior to 2004 are also from the original assessment format.

² Revised assessment format. Results after 2004 are also from the revised assessment format.

Reading improves less in secondary school than primary school