STEM Human Resources: Increasing capacity for competitiveness and growth
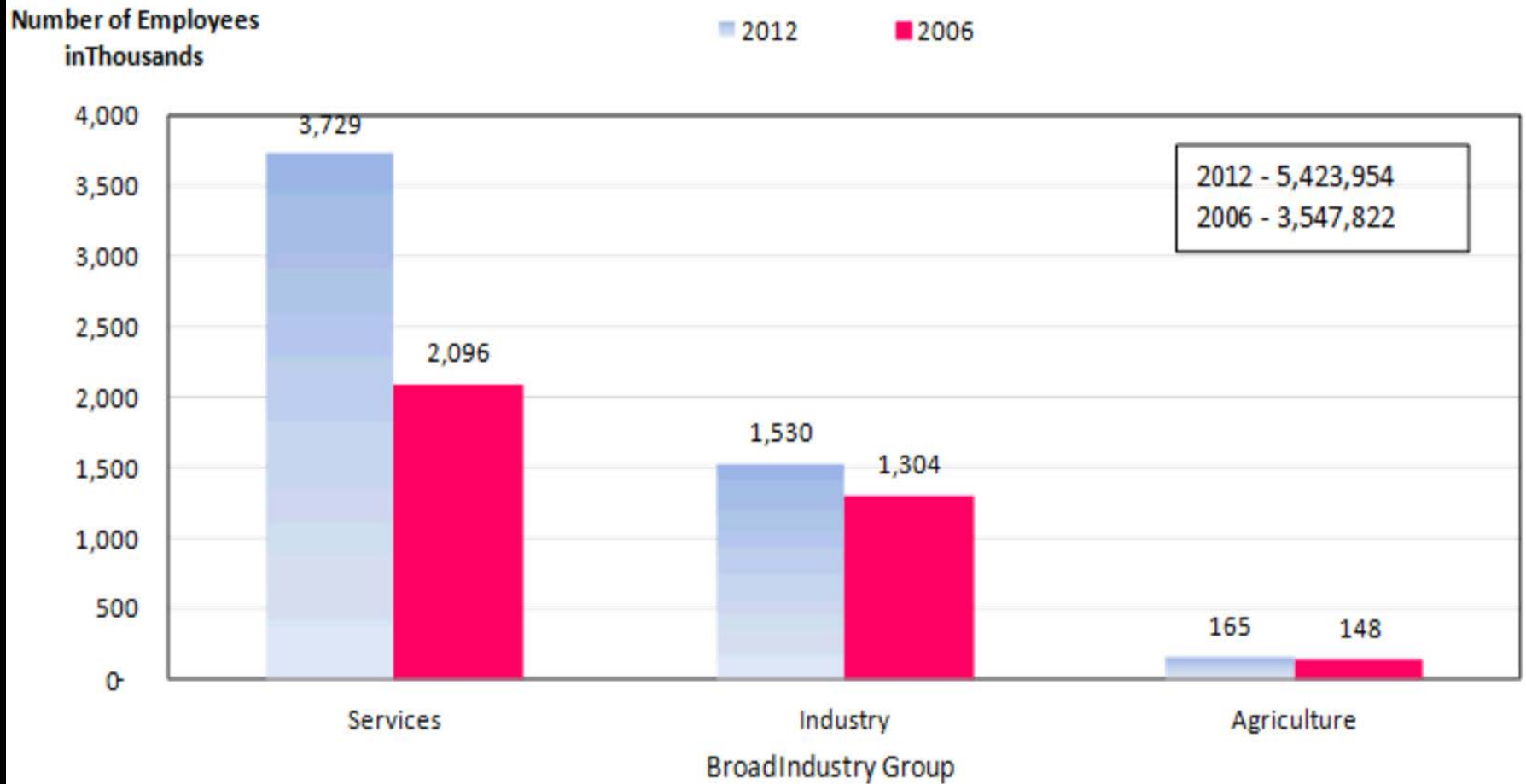
William G. Padolina

Skills Policy Dialogue

British Council

26 October 2015

FIGURE 2 Distribution of Total Employment for All Establishments by Broad Industry Group, Philippines: 2012 and 2006

https://psa.gov.ph/content/2012-census-philippine-business-and-industry-economy-wide-all-establishments-final-results

National **S**cience and **T**echnology **P**lan
2002-2020

NATIONAL SCIENCE AND TECHNOLOGY PLAN
2002-2020

MANILA, PHILIPPINES
JULY 8, 2002
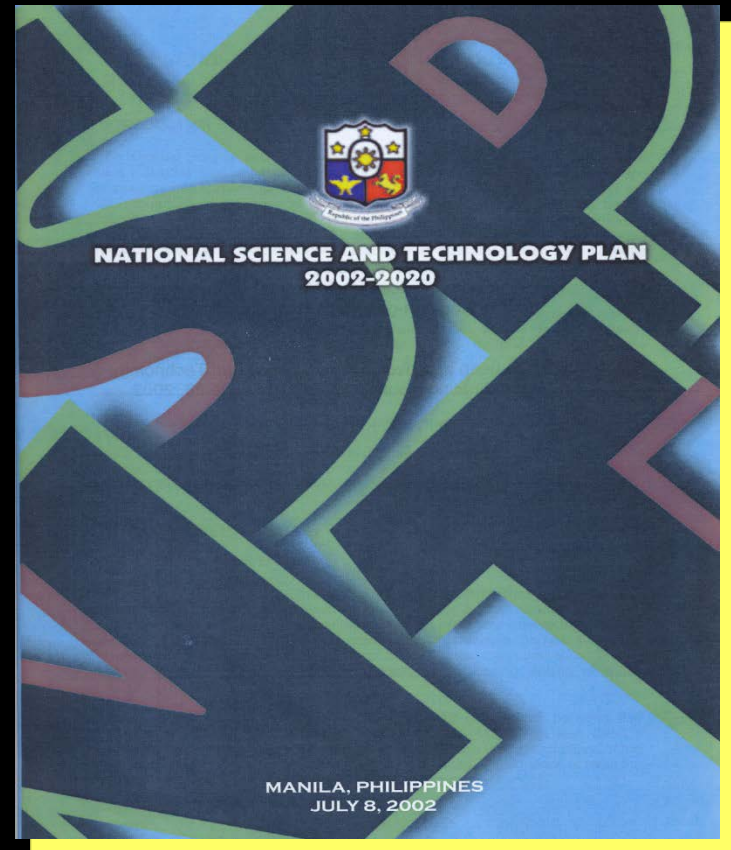
Courtesy of Usec. F.T. de la Pena

Indicators	2000-2001	2004	2010	2020
6. No. of R&D Personnel Per Million Population	157	200	250	350
7. No.of World-class S&T Universities		3	9	15
8. Value Added in Leading High Technology Exports	30%	40%	50%	70%
9. Philippine Ranking in the Global Technology Index	31st	27th	20th	15th
10. Philippine Ranking in Knowledge Jobs	3rd	3rd	2nd	1st
11. Philippine Ranking in the Transformation to a Digital Economy	39th	34th	30th	20th

Courtesy of Usec. F.T. de la Pena

APEC Member Country	Indicator		World Rank based from the Global Innovation Index (2014)
	GERD as % of GDP	Researchers in R&D (per million people)	
United States (2010) [3]	2.73827	3,838	6
Singapore (2010) [3]	2.054	6,307	7
Hong Kong SAR, China (2010) [3]	0.74927	2,925	10
Canada (2010) [3]	1.86008	4,579	12
Korea, Rep. (2010) [3]	3.73781	5,451	16
Australia (2008) [1]	2.40778	4,280	17
New Zealand (2009) [1]	1.28	3,724	18
Japan (2010) [3]	3.25394	5,151	21
China (2010) [3]	1.75899	890	29
Malaysia (2010) [3]	1.0674	1,459	33
Chile (2010) [3]	0.41722	317	46
Thailand (2009) [2]	0.21	575	48
Russian Federation (2010) [3]	1.1302	3,078	49
Mexico (2010) [3]	0.45592	382	66
Vietnam (2002) [2]	0.19	511	71
Peru (2004) [1]	0.15	181	73
Indonesia (2009) [2]	0.08	173	87
Brunei Darussalam (2004) [2]	0.04	686	88
Philippines (2007) [2]	0.11	143	100

*Papua New Guinea and Chinese Taipei were not included in the list

█ Researchers in Headcounts (HC)   █ Researchers in Full Time Equivalents (FTE)

Sources: [1]UNESCO Institute for Statistics (www.uis.unesco.org), [2]DOST Compendium of S&T Statistics, 2012, [3]The World Bank (www.worldbank.org), [4]Global Innovation Index 2014 (www.globalinnovationindex.org)

OTHER S&T INDICATORS TO BE MONITORED

1. No.of Publications by Filipino Scientists and Engineers included in the Science Citation Index

2. No. of Registered Scientists and Engineers (PRC Data)

3. No. of Filipino PhDs in Science and Engineering

4. No.of Internationally Accredited Laboratories

5. Technology Balance of Payments

6. Investments in High Technology Areas

Courtesy of Usec. F.T. de la Pena

1. Supply-Driven S&T Undergraduate Scholarship Program

2. Excellence in S&T Education at the Higher Education Level to Stimulate ICT Industries

3. Science and Mathematics Competitions Nationwide at the Basic Educational Level

Courtesy of Usec. F.T. de la Pena

8 DOST OUTCOMES (CONTINUED)

5. ICT-based transformation of governance broadening access to government services (i.e. health and education) for those in the countryside (PH in the top 50 global ranking of e-government by 2016).

6. Improved quality healthcare and quality of life thru science, technology and innovation.

7. Highly skilled and globally competitive S&T human resources in support of the national S&T programs (PSHS to be the leading science high school in ASEAN by 2015 and every town to have at least one DOST scholar by 2016).

8. Science-based weather information and climate change scenarios with associated impact assessments that enable concerned agencies to develop appropriate mitigation strategies for a disaster and climate change resilient Philippines.

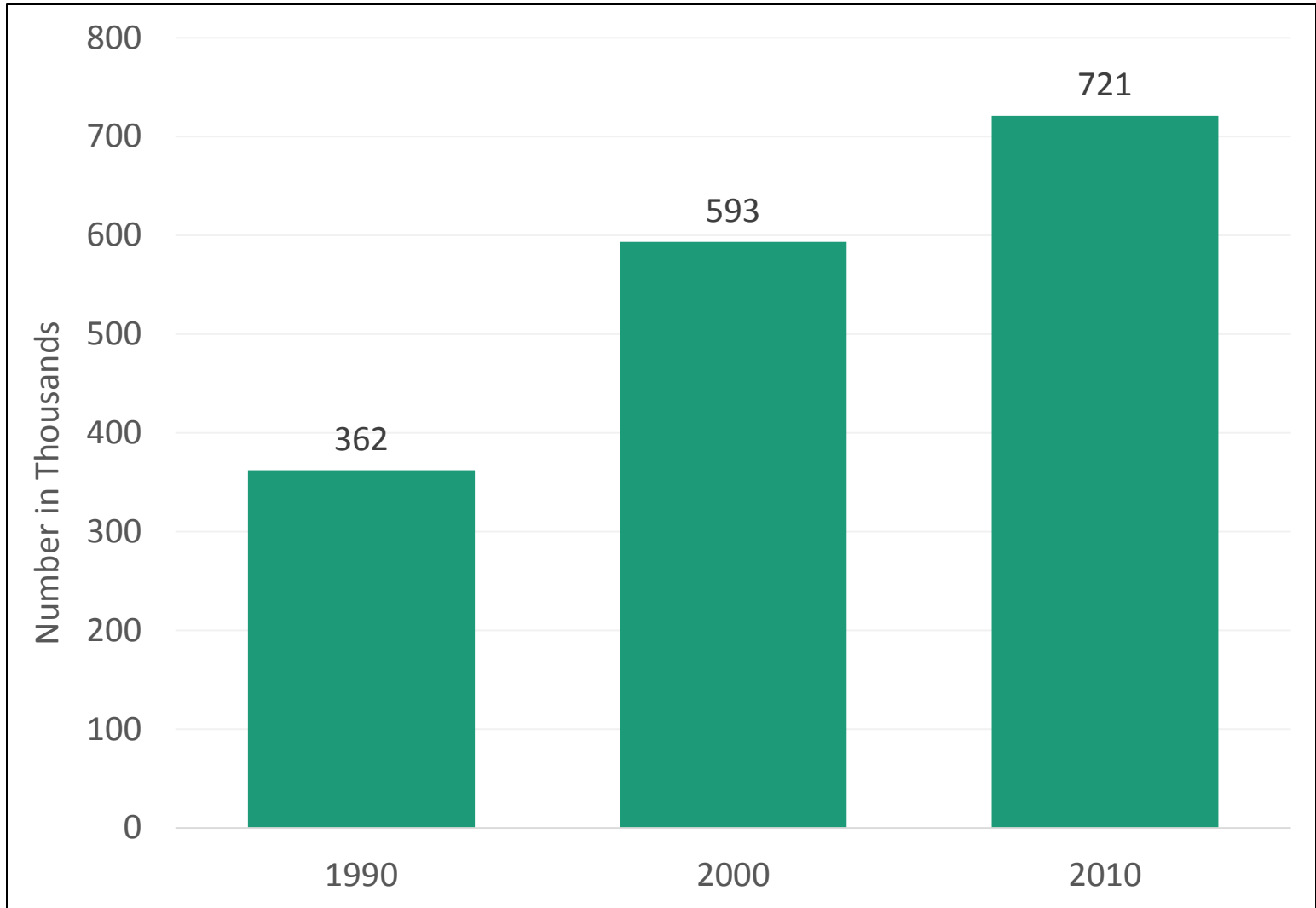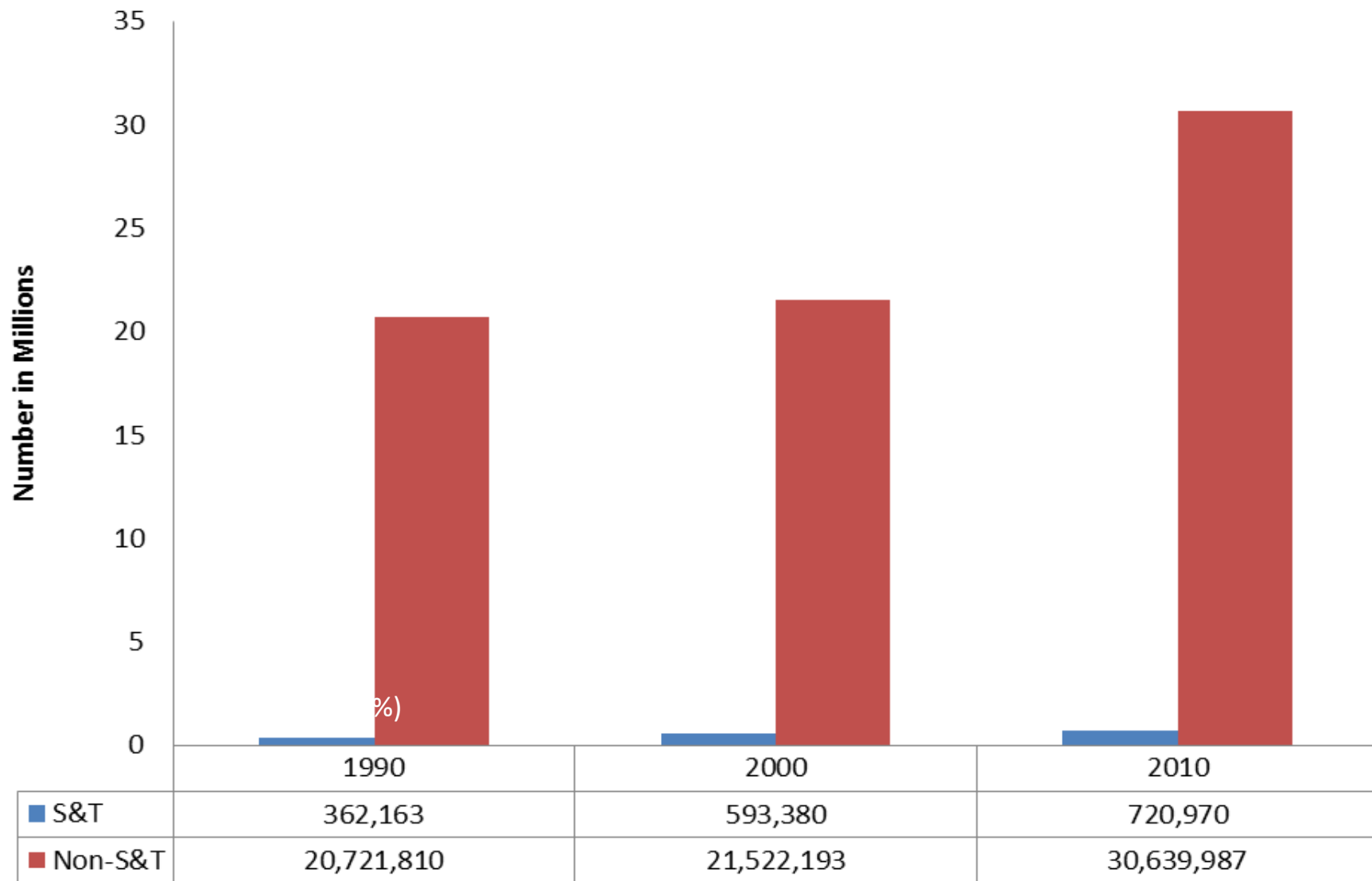# HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY IN THE PHILIPPINES

DEPARTMENT OF SCIENCE AND TECHNOLOGY
SCIENCE EDUCATION INSTITUTE

Estimates on the number of HRST: 1990, 2000, & 2010

SEI, 2015

Filipino Workers 15 Years Old and Over by S&T/Non-S&T Classification: 1990, 2000 & 2010

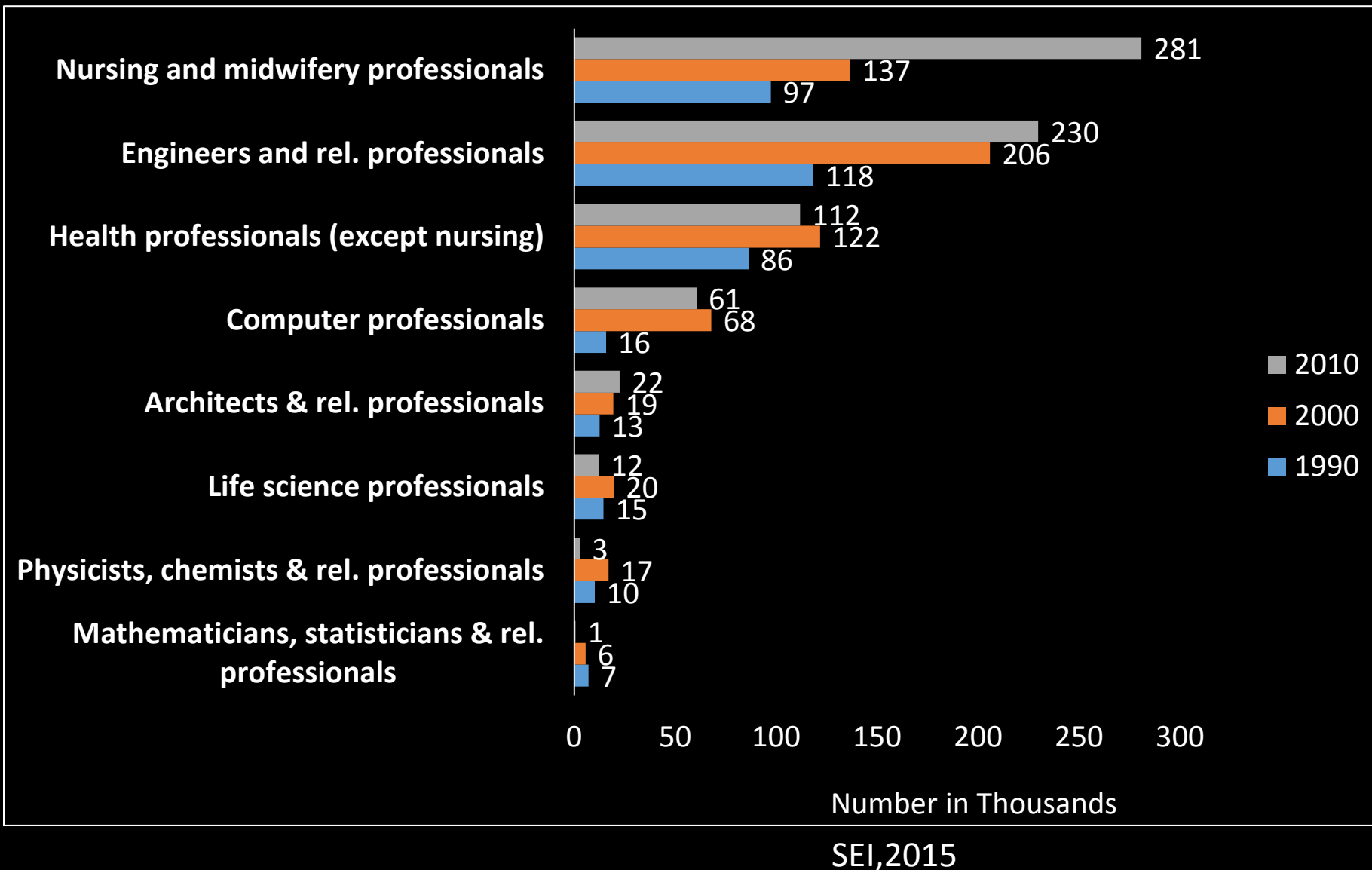|	1990	2000	2010
■ S&T	362,163	593,380	720,970
■ Non-S&T	20,721,810	21,522,193	30,639,987

n = 21,083,973   n = 22,115,573   n = 31,360,957   18

SEI, 2015

Distribution of HRST by Occupational Group: 1990, 2000, 2010
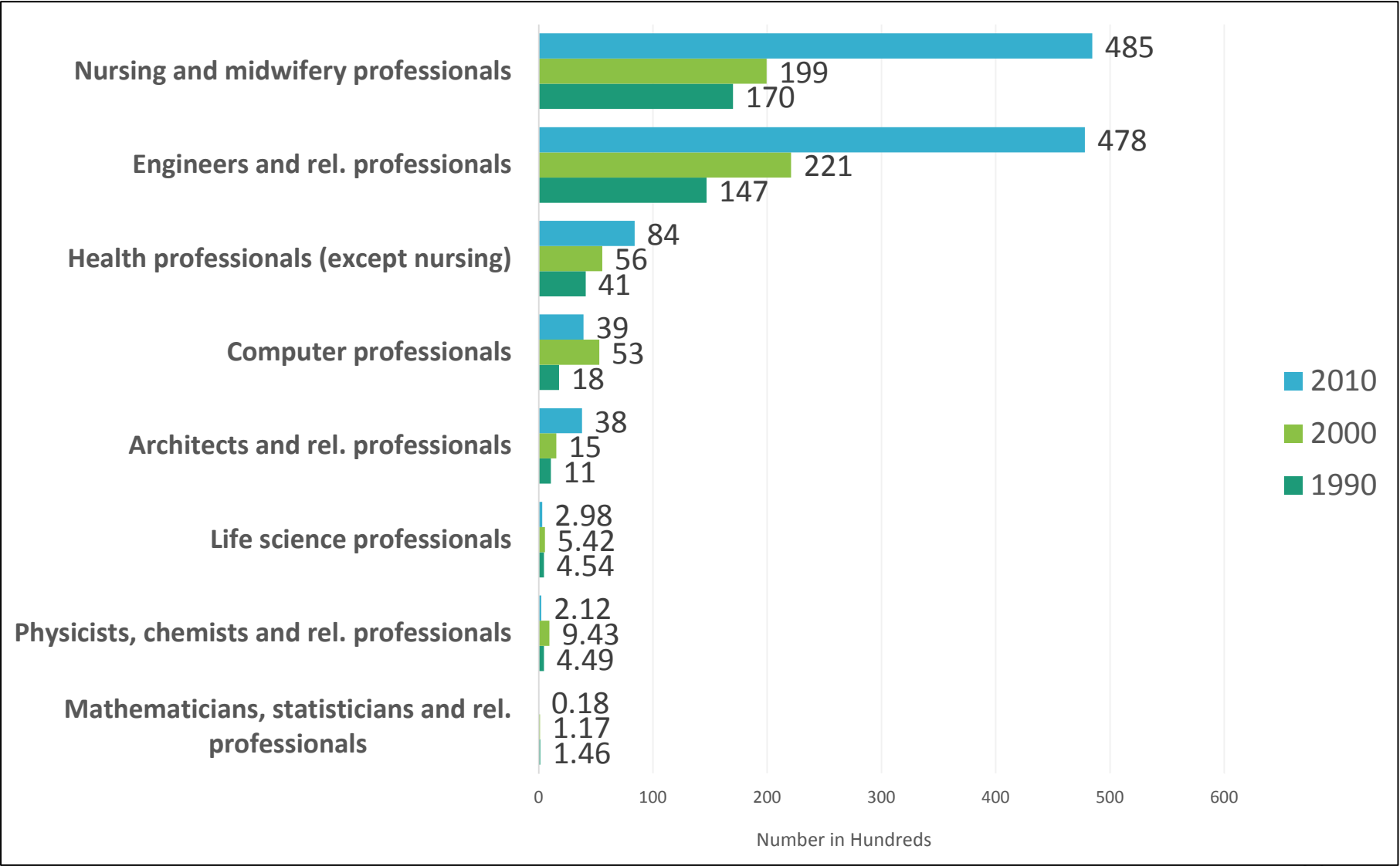
Number in Thousands

SEI,2015

Median Age of HRST: 1990, 2000, & 2010

SEI, 2015
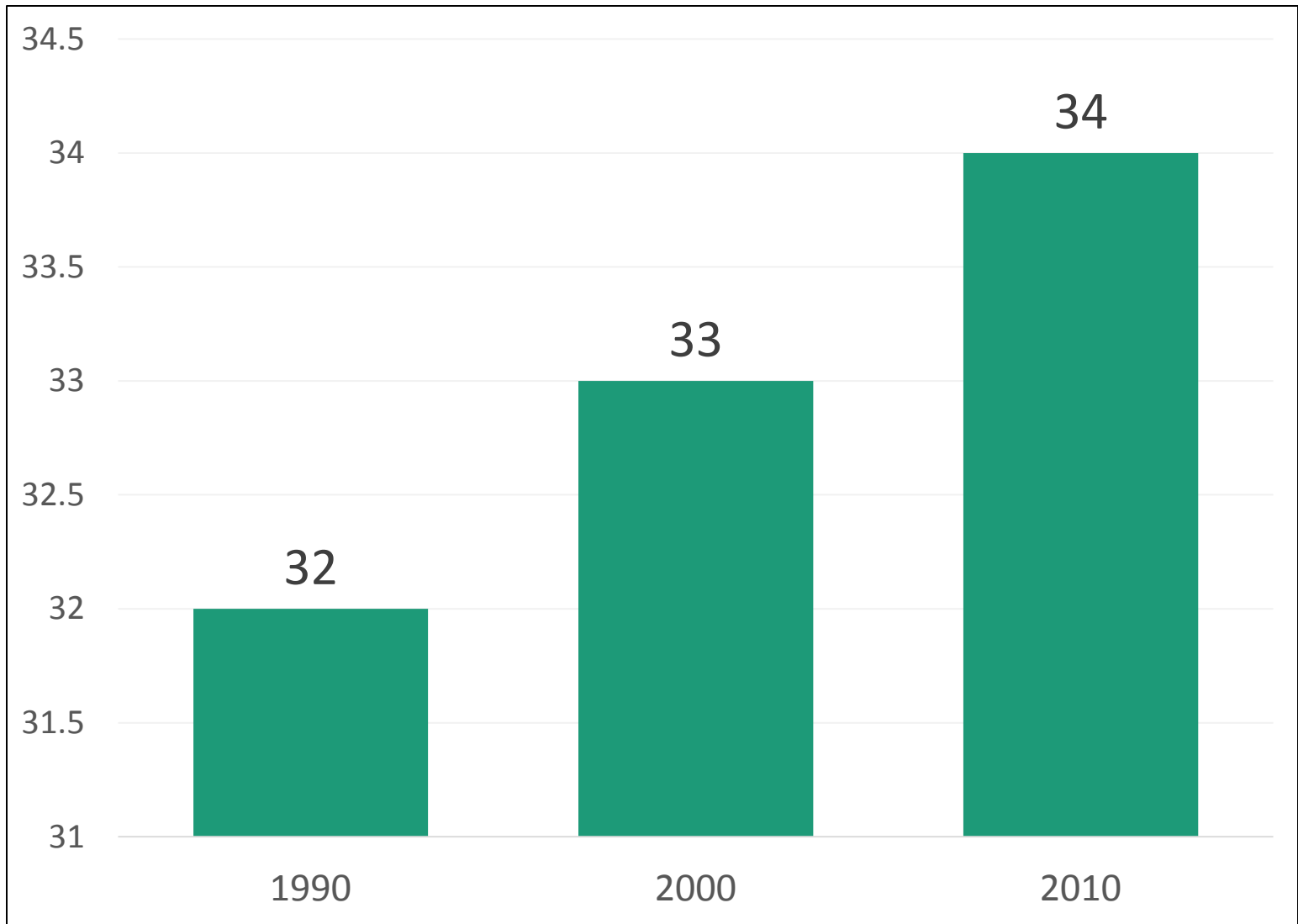
Distribution of HRST by Overseas Work Status: 1990, 2000, & 2010
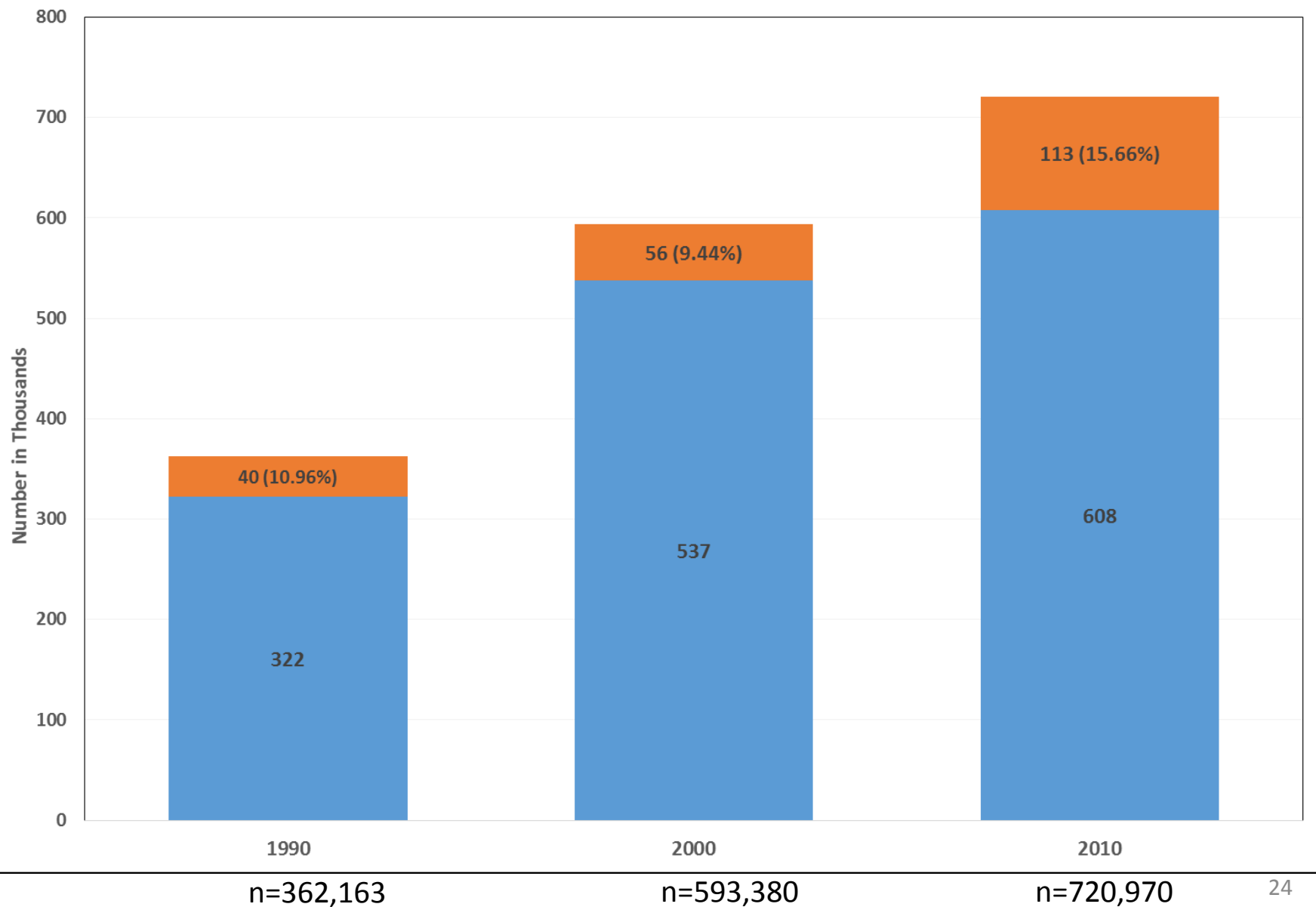
Distribution of S&T OFWs by Occupational Group: 1990, 2000, & 2010

Number in Hundreds

Occupational Group	2010	2000	1990
Nursing and midwifery professionals	485	199	170
Engineers and rel. professionals	478	221	147
Health professionals (except nursing)	84	56	41
Computer professionals	39	53	18
Architects and rel. professionals	38	15	11
Life science professionals	2.98	5.42	4.54
Physicists, chemists and rel. professionals	2.12	9.43	4.49
Mathematicians, statisticians and rel. professionals	0.18	1.17	1.46

Correcting our Talent Deficit in Science Technology, Engineering and Mathematics

- PROMOTING SCIENCE AND MATHEMATICS IN PRIMARY, SECONDARY AND TERTIARY EDUCATION

- ENHANCING CAREER STRUCTURES AND REWARDS FOR SCIENTISTS AND ENGINEERS

- ADEQUATE SUPPORT FOR HIGHER EDUCATION AND VOCATIONAL TRAINING

- ENCOURAGEMENT OF SCIENTIFIC ENTREPRENEURSHIP

- FOSTERING THE APPRECIATION OF SCIENCE THROUGHOUT SOCIETY

The Philippine K-12 Basic Education Program

Philippine Science High School, 2015

KINDS OF UNDERGRADUATE SCHOLARSHIPS

DOST-SEI Merit Scholarship Program

- Formerly known as the NSDB or NSTA Scholarship, began in 1958. Merit scholars pursue priority courses in the basic sciences, engineering, other applied sciences, and science and mathematics teaching at identified universities.

RA 7687 Science and Technology Scholarship Program

- Also known as the Science and Technology Scholarship Act of 1994, provides for scholarships to talented and deserving students whose family's' socio-economic status do not exceed the set cut-off values of certain indicators. Qualifiers must pursue priority fields of study in the basic sciences, engineering, other applied sciences, and science and mathematics teaching.

RA 10612 Junior Level Science Scholarship (JLSS) Program

- These are scholarship grants to qualified third year students who are enrolled in priority fields of study in engineering, basic and applied sciences, and science and mathematics teaching at identified universities and colleges. There are two component scholarships namely:
  - *Project GIFTS for the Disadvantaged – RA 7687, and*
  - *Junior Level Science Scholarships-Merit.*

DOST Science Education Institute, 2015

KINDS OF GRADUATE SCHOLARSHIPS

Accelerated Science and Technology Human Resource Development Program (ASTHRDP)

- ASTHRDP-NSC is a university based MS/PhD program as well as a grant support for thesis/dissertation for research and development priority areas of DOST. The priority areas of study range from agriculture, biology, chemistry, space science, and microelectronics. Learn more about ASTHRDP-NSC

- Deadline for Filing of Application Form for ASTHRDP-NSC:First Semester AY 2014-2015 – April 18, 2014
  Second Semester AY 2014-2015 – September 5, 2014

Accelerated Science and Technology Human Resource Development Program-Science Education Consortium (ASTHRDP-SEC)

- This is a consortium among four (4) universities in Visayas and Mindanao which aims to establish common graduate programs in science and mathematics education (SME) and to accelerate the development of critical mass of SME in these areas. Learn more about ASTHRDP-Science Education Consortium.
- Deadline for Filing of Application Form for ASTHRDP-SEC for First Semester AY 2014-2015 is on May 20, 2014.

Accelerated Science and Technology Human Resource Development Program-Science Education (ASTHRDP-SE)

- The program aims to develop researches and other personnel involved in science and mathematics education and increase the number of faculty in the Teacher Education Institutions (TEIs).

Engineering Research and Development for Technology (ERDT) Consortium

- The ERDT Consortium is for those looking to take a BS/MS degree in engineering or any related field, with priority for various disciplines such as computer science, agricultural engineering, agricultural engineering. Learn more about ERDT Consortium.

DOST Science Education Institute

CHED: THE PCARI PROJECT

The PCARI Project is a new approach to enhance the skills and expertise of faculty, students and staff of Philippine universities and colleges through scholarships, training and research partnerships with top-notch research universities in California, USA, initially, with the University of California San Francisco (UCSF) and the University of California Berkeley (UCB) in the areas of health, innovation and translational medicine and in information infrastructure and development.

Republic of the Philippines
Congress of the Philippines
Metro Manila

Tenth Congress

Republic Act No. 8439   December 22, 1997

AN ACT PROVIDING A MAGNA CARTA FOR SCIENTISTS, ENGINEERS, RESEARCHERS AND OTHER SCIENCE AND TECHNOLOGY PERSONNEL IN GOVERNMENT

Higher Education Enrollment by Discipline Group and Academic Year (STEM): 2008/09 - 2012/13
as of July 12, 2013

Discipline Group	2008/09	2009/10	2010/11	2011/12	2012/13
Engineering and Technology	319,775	344,662	354,218	372,003	406,965
Information Technology	300,882	348,462	376,046	390,826	409,544
Mathematics	14,636	12,154	12,611	13,358	13,860
Medical and Allied	517,319	440,335	363,147	281,038	241,976
Architectural and Town Planning	18,004	20,441	23,103	26,601	31,296
Natural Science	22,641	24,127	25,425	27,304	30,071
Agricultural, Forestry, Fisheries, Vet Med.	63,315	59,692	63,679	68,133	81,348
Subtotal	**1,256,572**	**1,249,873**	**1,218,229**	**1,179,263**	**1,215,060**

Source: CHED, 2014

Higher Education Graduates by Discipline Group and Academic Year (STEM): 2008/09 - 2011/12
as of July 12, 2013

Discipline Group	2008/09	2009/10	2010/11	2011/12
Engineering and Technology	48,448	49,705	58,637	56,760
Information Technology	45,830	49,913	54,113	67,727
Mathematics	2,105	1,995	1,874	2,024
Medical and Allied	128,057	115,466	102,782	80,487
Architectural and Town Planning	2,286	2,217	2,263	2,278
Natural Science	4,194	3,912	3,927	4,285
Agricultural, Forestry, Fisheries, Vet Med.	9,842	10,107	9,650	11,575
Subtotal	**240,762**	**233,315**	**233,246**	**225,136**

Source: CHED, 2014

POST-BACCALAUREATE ENROLLMENT AND GRADUATES

Discipline	Masters		Doctoral	
	Enrollment	Graduates	Enrollment	Graduates
	(AY 2011-2012)	(AY 2010-2011)	(AY 2010-2011)	(AY 2010-2011)
Agriculture, Forestry, Fisheries	1,889	261	271	39
Engineering and Tech	2,615	317	272	16
IT-Related Disciplines	2,901	286	124	3
Mathematics	992	142	114	15
Medical and Allied	11,458	2,660	85	4
Natural Sciences	1,507	239	275	37
Other Disciplines	3,114	377	481	101
TOTAL	**24,476**	**4,282**	**1,622**	**215**

Data compiled by IPD-OPPRI, 2013

Enrollment of Non-School-Based Technical Vocational Education and Training Philippines

- 2009: 1,703,988

- 2010:   707,698

- 2011:   696,282

- 2012:   762,782

- 2013:   903,899

QS Asian University Rankings (AUR) 2015 and 2014
UP and Selected Philippine Universities

2015 University	AUR Overall Rating		Academic Reputation		Employer reputation		Faculty Student		Citations per Faculty		International Faculty		International Students	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
UP	70	62.0	48	81.1	42	87.5	116	65.1	91	76.5	201+	-	201+	-
ADMU	114	48.3	72	65.3	47	86.0	137	59.4	201+	-	201+	-	201+	-
UST	143	43.5	124	43.8	66	72.4	201+	-	9	98.4	129	30.8	201+	-
DLSU	181-190	-	201+	-	201+	-	201+	-	201+	-	201+	-	201+	-

2014 University	AUR Overall Rating		Academic Reputation		Employer reputation		Faculty Student		Citations per Faculty		International Faculty		International Students	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
UP	63=	60.7	46	80.3	41	87.6	155	55.5	73	82.7	201	5.30	201	5.40
ADMU	115	46.4	66	67.7	48	82.8	184	48.7	201	18.2	201	18.9	201	16.3
UST	141	42.4	120	45.1	74	66.5	201	18.6	12	98.1	116	34.6	201	9.7
DLSU	151-160	-	ND		ND		ND		ND		ND		ND	

University of the Philippines, 2015

COLLABORATE

Recognize and enhance permeability of national boundaries to knowledge and capital

Empower the STEM workforce and implement optimum organization of work to foster high productivity and efficiency

Focus:Economic Efficiency

- **Technological efficiency** occurs when it is not possible to increase output without increasing inputs.

- **Economic efficiency** occurs when the cost of producing a given output is as low as possible.

- Economic efficiency depends on the prices of the factors of production.

- Something that is technologically efficient may not be economically efficient.

- But something that is economically efficient is always technologically efficient.

Pardin and Bade, 2015

HRST: a critical element of the National Quality Policy

Ensure that goods and services that are exported from or traded in a country are designed, manufactured and supplied in a manner that meet the needs of the market,

as well as those of regulatory authorities.

UNIDO

The tasks ahead

- Identify opportunities in the global market

- Empower the STEM workforce and implement optimum organization of work to foster high productivity

- Correct the talent and skills deficit: produce, employ and retain

Thank you