She Figures– Statistics and Indicators on Gender Equality in Science ***EU vs. Taiwan***

Yen-Wen Peng,
Associate Professor, Public Affairs Management
National Sun Yat-Sen University, Taiwan

before the Introduction

- The tasks of my team in the NSC 2011-2013 project (Chair: Prof. Wu, Chia-Li)
  1. Construct *a Gender and S&T* database of Taiwan, which shall enable international comparison.
     1. Design the framework
     2. Collect the data
  2. Construct a new website to publish the database.
  3. Institutionalize the updating of the database/website (also in English).

Introduction

- She Figures 2009 is the third publication (following She Figures 2003 and She Figures 2006) of a key set of indicators that are essential to correctly comprehend the situation of women in science and research.

- The She Figures data collection is undertaken every three years as a joint venture of the Scientific Culture and Gender Issues Unit of the Directorate-General for Research of the European Commission and the group of Statistical Correspondents of the Helsinki Group.

Introduction

- ***She Figures*** reflects a clear wish to develop pan-European harmonised statistics facilitating cross-national comparisons and to build a base of gender disaggregated data available at the EU-level that allows to track changes over time and that has great value both to increase knowledge and to inform policies.

- Researchers and R&D expenditure data are collected through the R&D Survey, which since 2004 has been carried out as a joint data collection between Eurostat and the OECD.
- R&D data for Japan and the United States come from the OECD's Main Science and Technology Indicators (MSTI).

Table of Contents

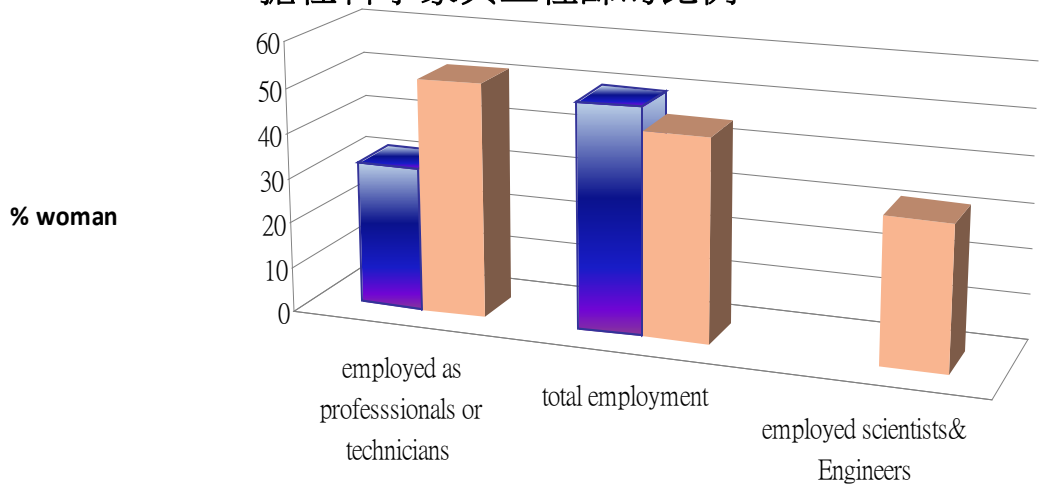
- **Chapters 1 and 2 are concerned with horizontal segregation, and chapters 3 and 4 with vertical segregation.**
- General Introduction
- Chapter 1 Setting the scope
- Chapter 2 Scientific fields
- Chapter 3 Seniority
- Chapter 4 Setting the scientific agenda
- Annex 1-4
- Annex 5 Methodological Notes
- Annex 6 List of the Statistical Correspondents of the Helsinki Group on Women and Science

Chapter 1: Setting the scope

Assesses the presence of women in **research career** from a cross-country perspective

F1.1 Proportion of women in the EU-27 for (1) tertiary educated and employed (HRSTC), (2)total employment,and (3)scientists and engineers in 2007

女性在（1）（受高等教育)被僱用為研發人力，（2）所有就職人口中，（3）擔任科學家與工程師的比例



	employed as professsionals or technicians	total employment	employed scientists& Engineers
TW	31.93	49.89	
EU-27	52	45	32

*source: Council of Labor Affairs (2010)

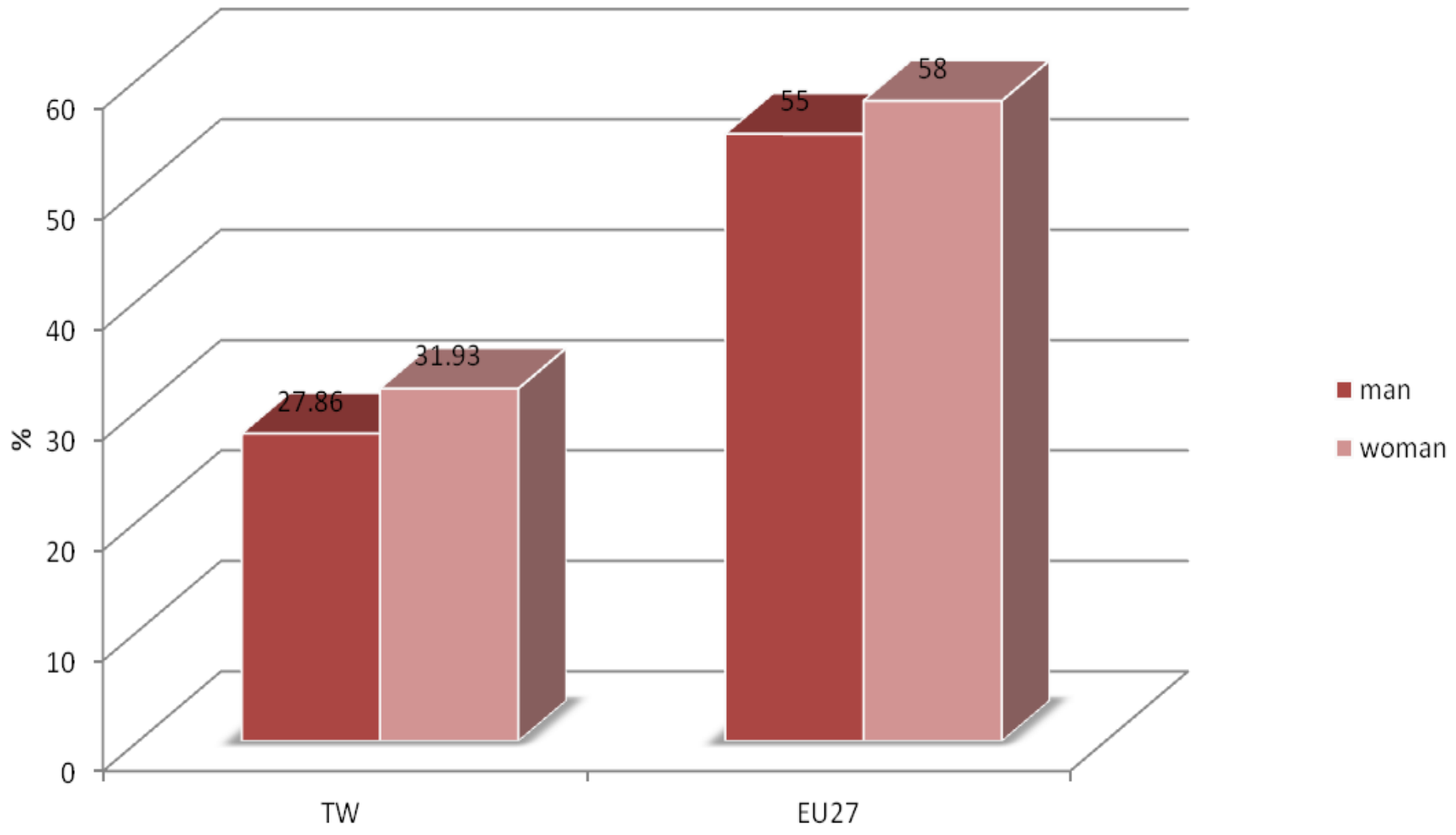
DATA: TW(2010) EU27(2007)

Data unavailable: employed scientists & engineers of TW

HRSTC：P125

TW（1）：HRSTO，not necessarily tertiary educated

F1.2 Employed professionals and technicians (HRSTC) as a percentage of tertiary educated (HRSTE)受高等教育者受雇為專業及技術人員之比例（按性別劃分

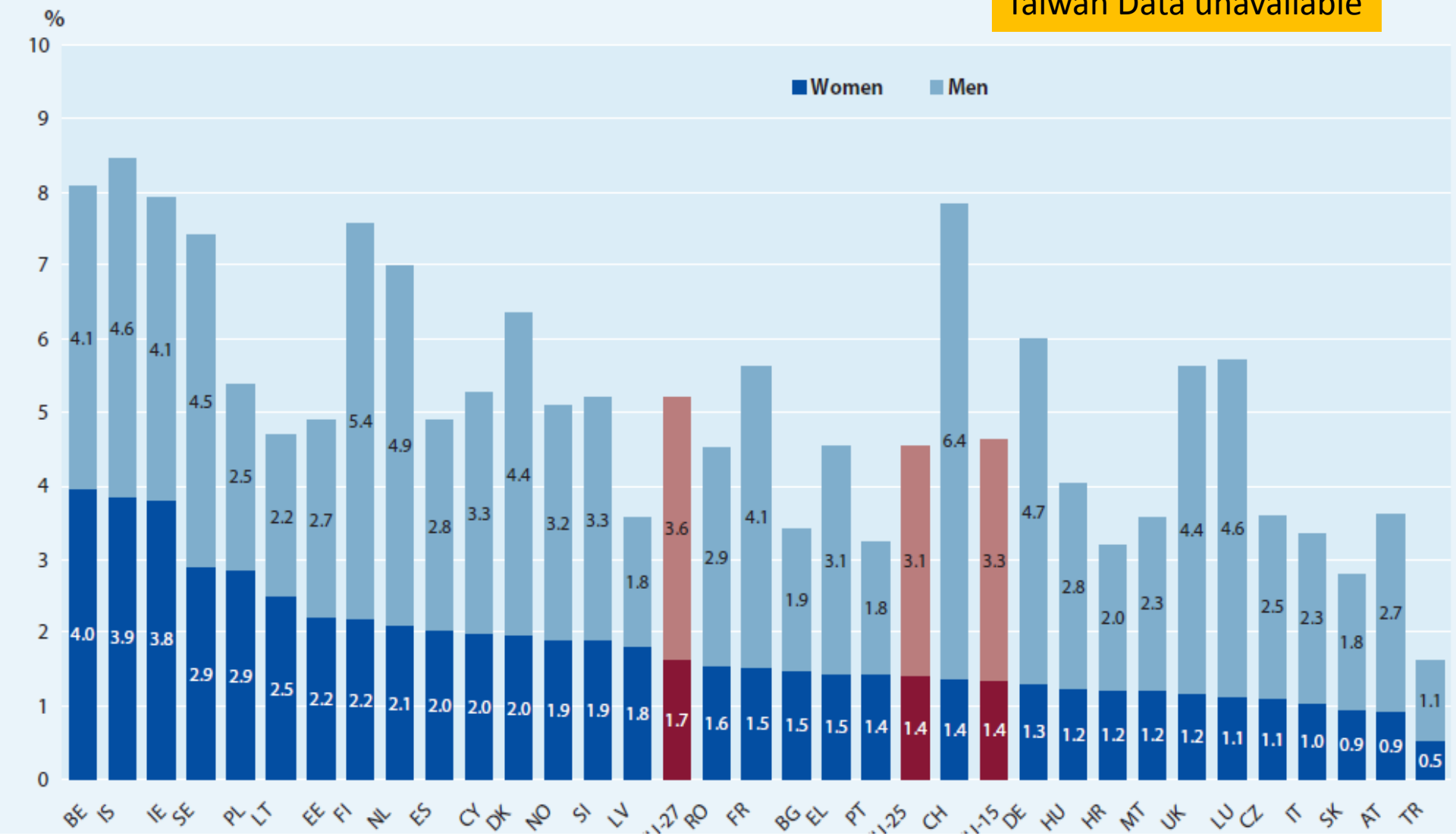


source: CLA

DATA: TW:2009 (only employed as professionals and technicians) EU27:2007

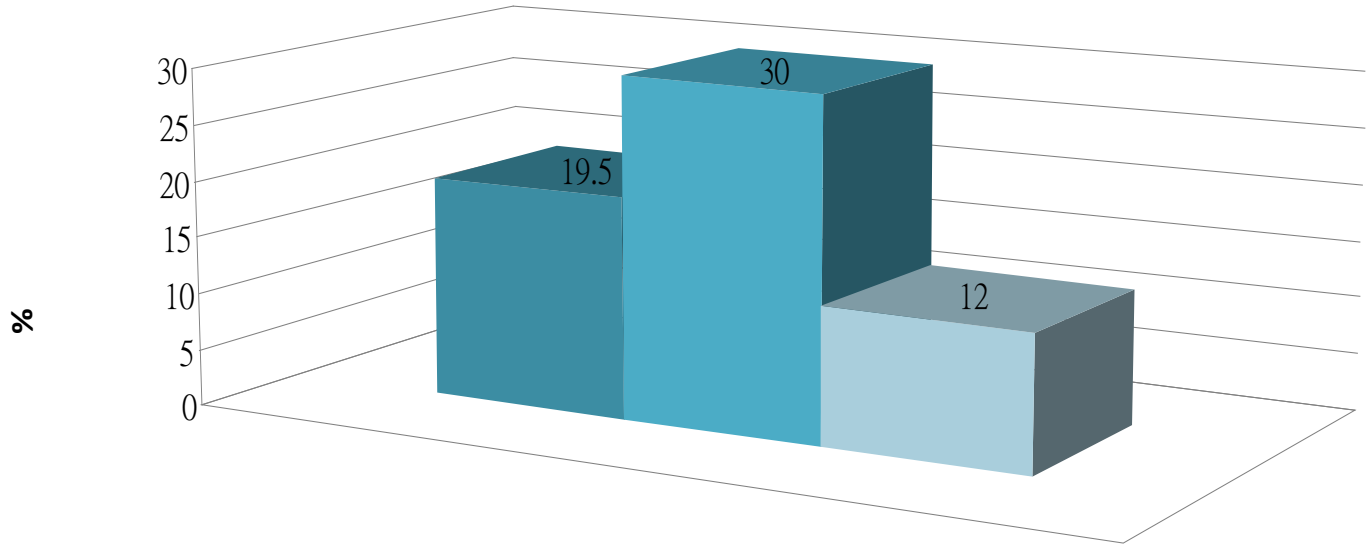
Figure 1.3: Proportion of scientists and engineers in the total labour force by sex, 2007

Taiwan Data unavailable



F1.4 Proportion of female researchers

女性研究員所佔比例

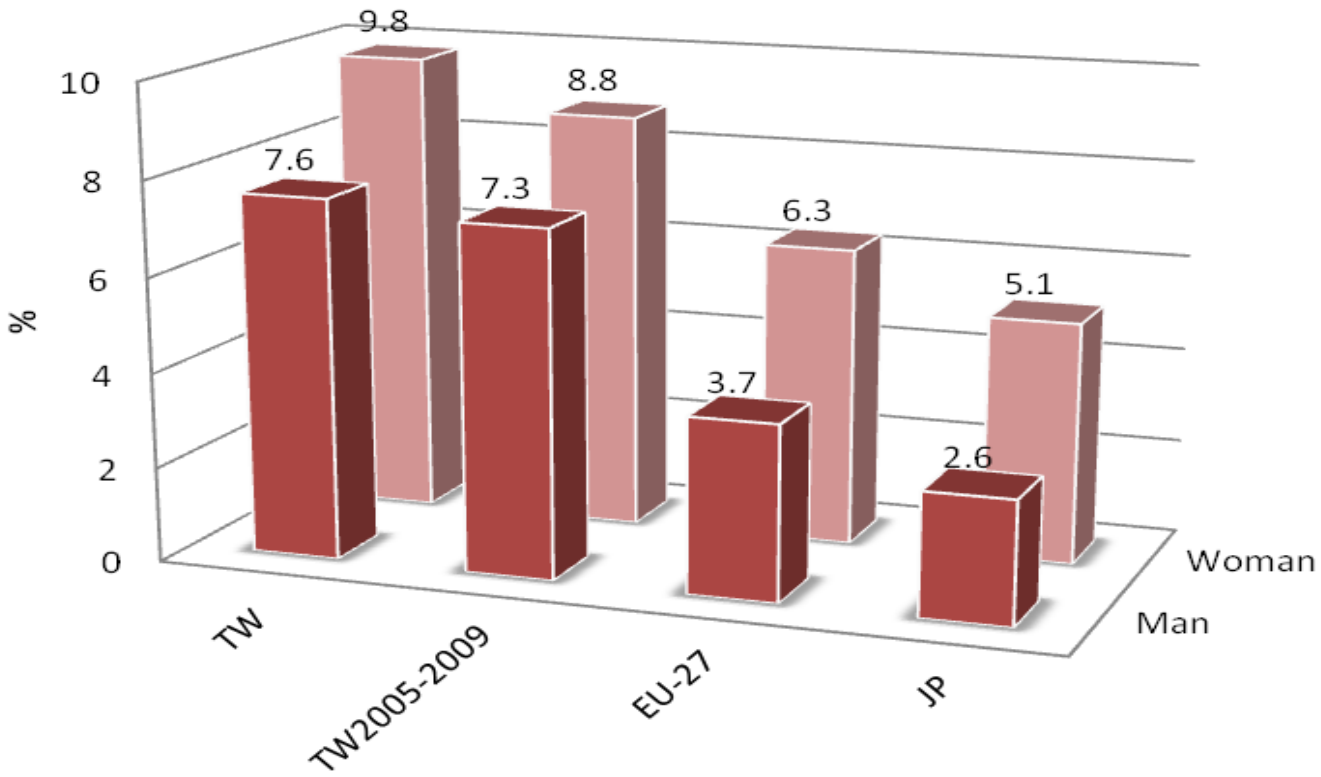


	propotion of female researchers
TW2009	19.5
EU-27 2006	30
JP 2006	12

Source: National Science Council (2010)

RESEARCHER: 18

F1.5 Compound annual growth rate for researchers by sex, 研究員複合年增長率(按性別劃分)

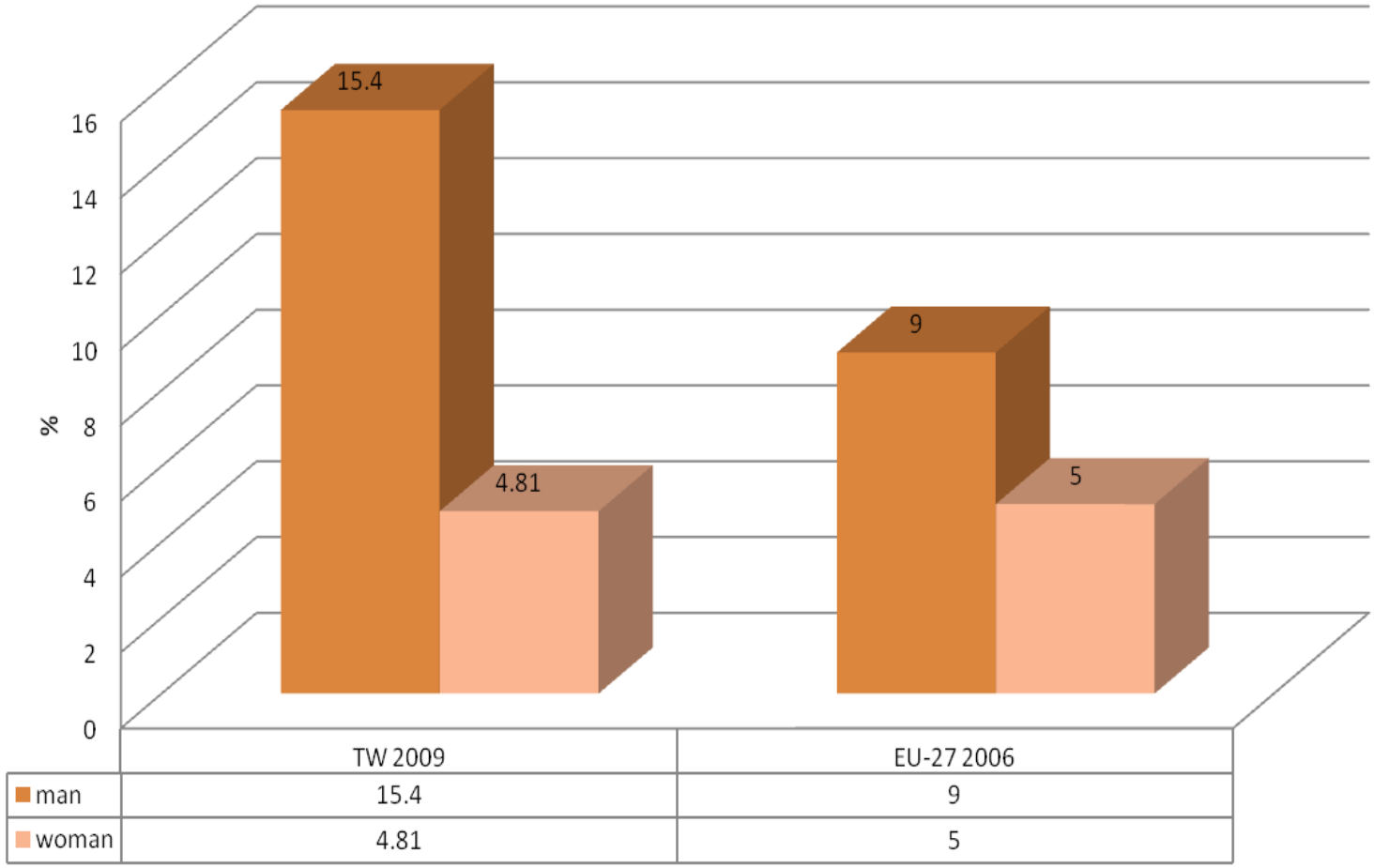


2002-2006 compound annual growth rate

	TW	TW2005-2009	EU-27	JP
Man	7.6	7.3	3.7	2.6
Woman	9.8	8.8	6.3	5.1

Source: National Science Council (2010)

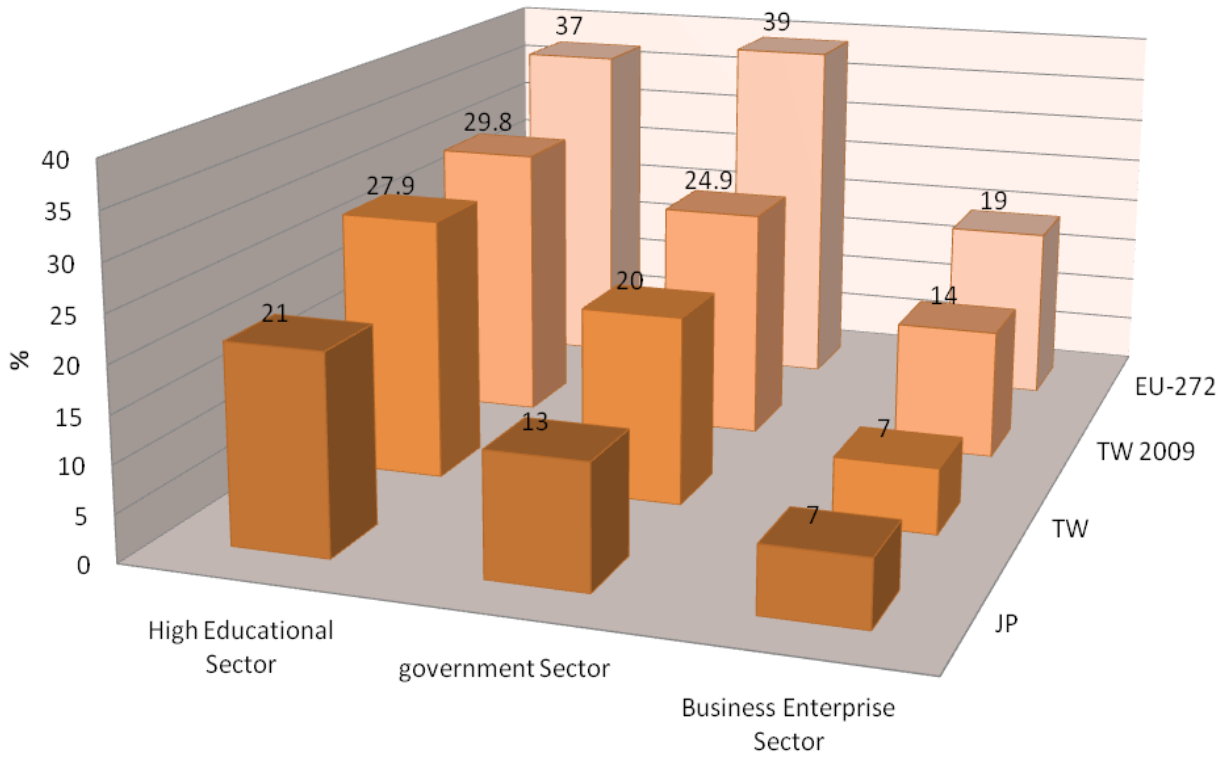
F1.6 Researchers per thousand labour force by sex
每千人勞動力中研究員所佔比例(按性別劃分）



	TW 2009	EU-27 2006
man	15.4	9
woman	4.81	5

Source:Councils of Labor Affairs (2010)

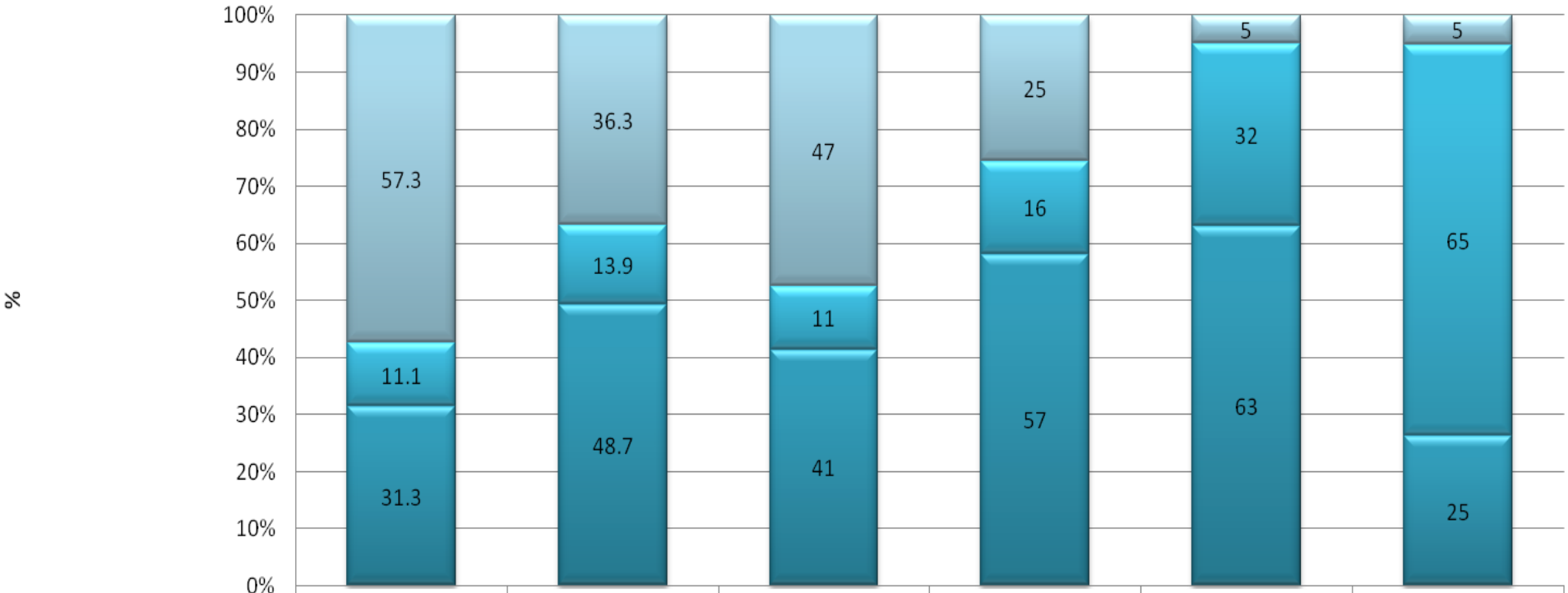
F1.7 Proportion of female researchers by sector,2006
女性研究員於各部門所佔比例（高等教育、公部門、企業）



	High Educational Sector	government Sector	Business Enterprise Sector
JP	21	13	7
TW	27.9	20	7
TW 2009	29.8	24.9	14
EU-272	37	39	19

Source: National Science Council (2010)

F1.8 Distribution of researchers across sectors by sex,跨領域（高教、政府、企業）縱觀研究員男女分配

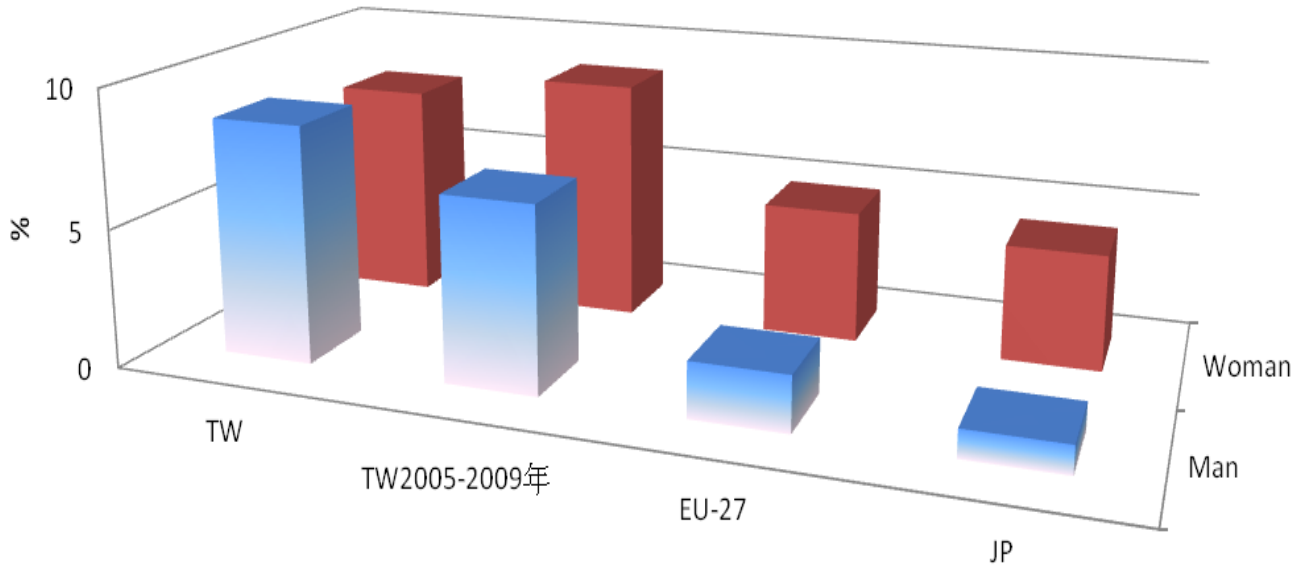


	TW M	TW W	EU27 M	EU27 W	JP M	LP W
Business Enterprise Sector	57.3	36.3	47	25	5	5
Government Sector	11.1	13.9	11	16	32	65
High Education Sector	31.3	48.7	41	57	63	25

* TW :2009 EU,JP:2006

Source: National Science Council (2010)

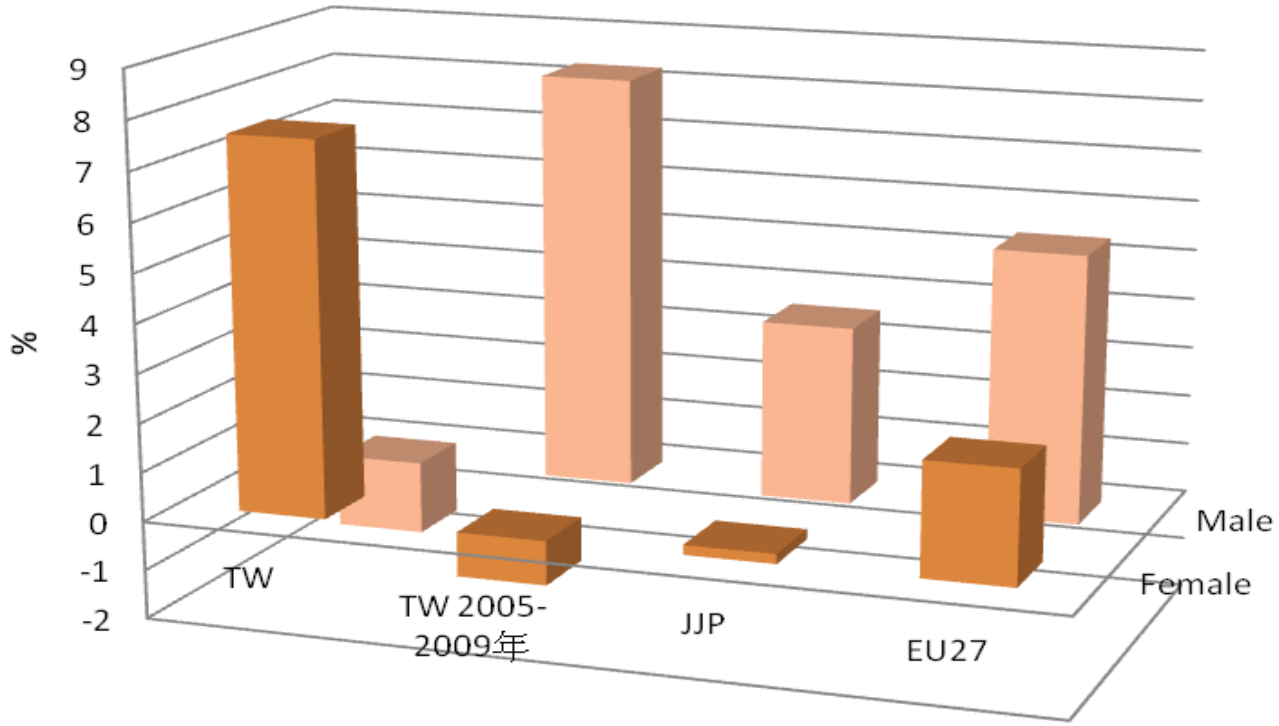
F1.9Compound annual growth rate for researchers in the Higher Education Sector (HES) by sex
高等教育內研究員之複合年成長率(按性別劃分)



	TW	TW2005-2009年	EU-27	JP
Man	8.6	6.7	2	1
Woman	7.9	8.8	4.8	4.2

Source: National Science Council (2010)

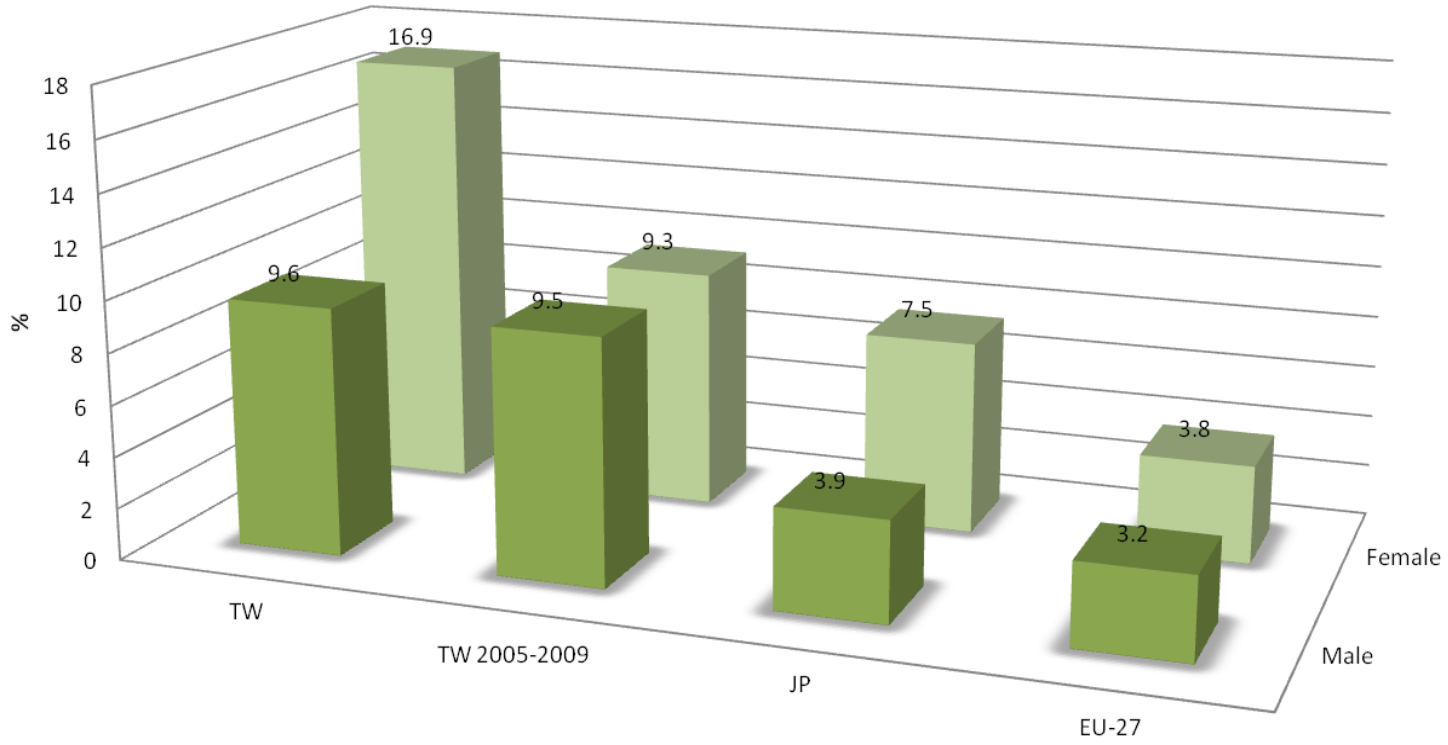
F1.10 Compound annual growth rate for researchers in the Government Sector (GOV) by sex 公部門內研究員之複合年成長率＊性別



	TW	TW 2005-2009年	JJP	EU27
Female	7.6	-0.9	0.2	2.3
Male	-1.5	8.3	3.6	5.4

Source: National Science Council (2010)

F.11 Compound annual growth rate for researchers in the Business Enterprise Sector (BES) by sex 企業界研究員之複合年成長率（按性別劃分）



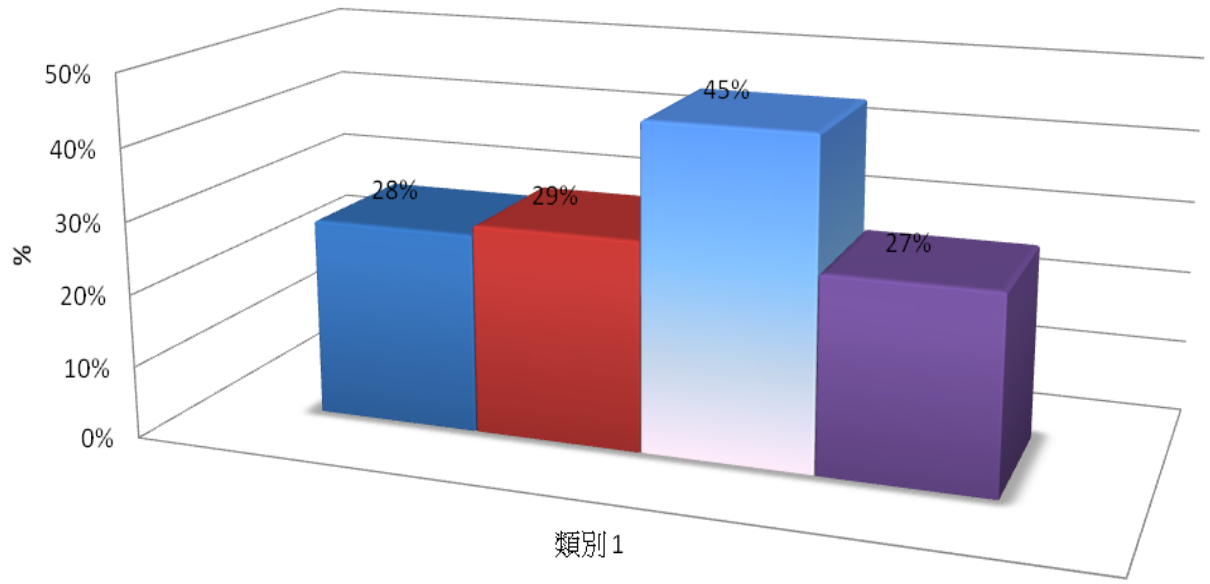
	TW	TW 2005-2009	JP	EU-27
Male	9.6	9.5	3.9	3.2
Female	16.9	9.3	7.5	3.8

Source: National Science Council (2010)

Chapter: 2 Scientific fields

Shows that a rapid catching up movement by women **graduate students** is taking place

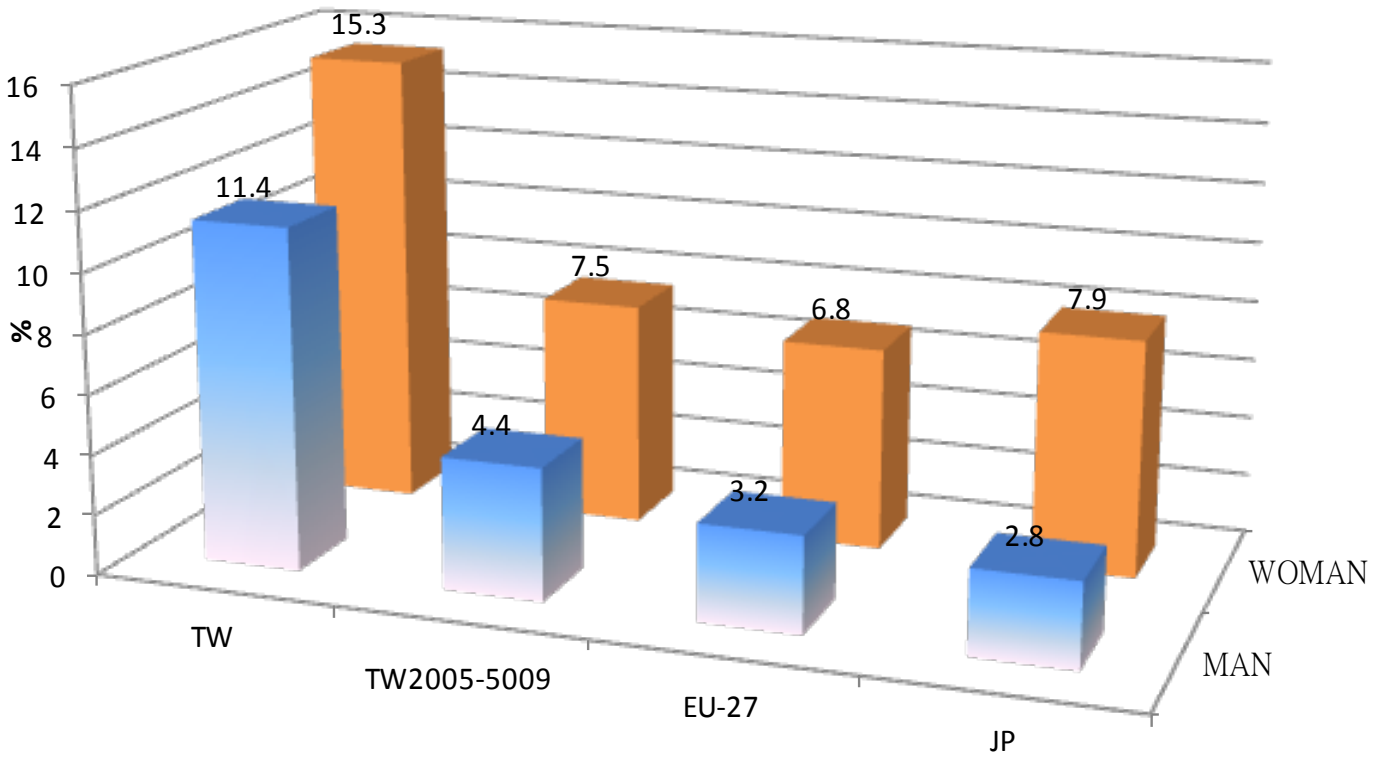
F2.1Proportion of female PhD (ISCED 6) graduates
所有博士中女博士所佔比例



	類別 1
TW 2007	28%
TW 2010	29%
EU-27	45%
JP	27%

Source: Ministry of education (2007/2010)

F2.2 Compound annual growth rate of PhD (ISCED 6) graduates by sex, 2002-2006
博士複合式年成長率＊性別

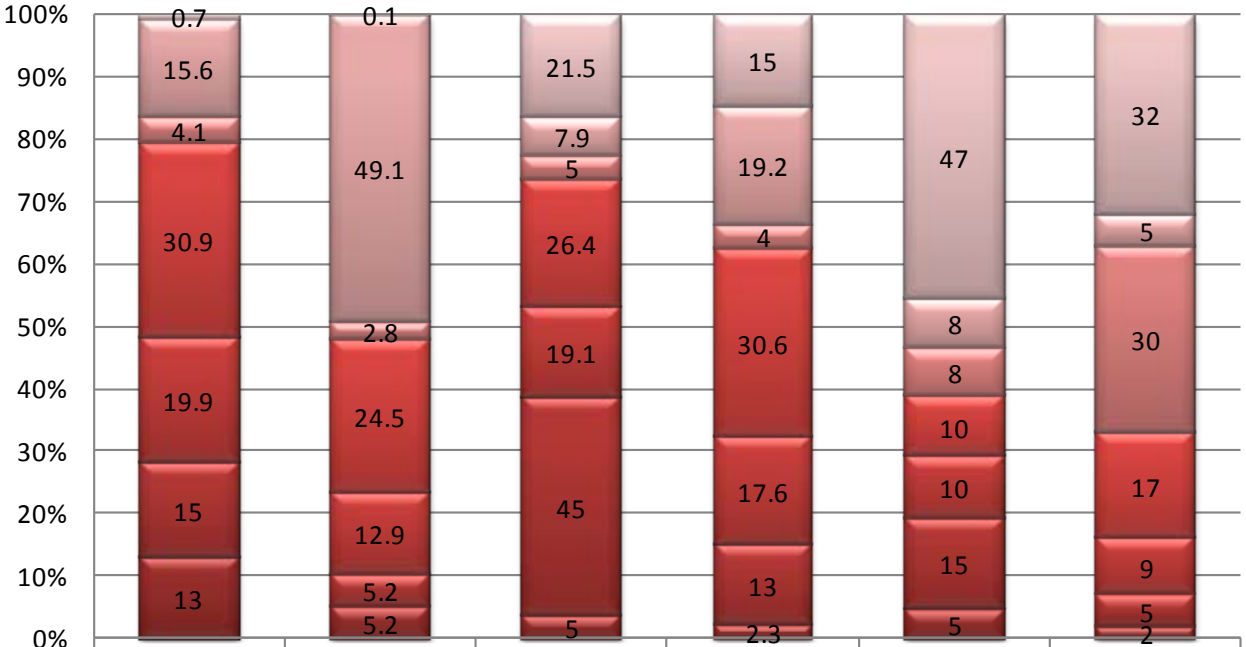


	TW	TW2005-5009	EU-27	JP
MAN	11.4	4.4	3.2	2.8
WOMAN	15.3	7.5	6.8	7.9

Source: Minstry of Education (2010)

F2.3 Distribution of PhD (ISCED6) graduates across the broad fields of study by sex, 2006

各學門中博士的性別分佈（按性別劃分）



	TW W	TW M	EU-27 W	EU-27 M	JP W	JP M
Health&welfare	0.7	0.1	21.5	15	47	32
Engineering,manufacturing&construction	15.6	49.1	7.9	19.2	8	5
Argriculture&veterinary	4.1	2.8	5	4	8	30
Science,mathematics&computing	30.9	24.5	26.4	30.6	10	17
Social sciences,business&law	19.9	12.9	19.1	17.6	10	9
Humanities&arts	15	5.2	45	13	15	5
Education	13	5.2	5	2.3	5	2

T2.2 Compound annual growth rates of PhD (ISCED6) graduates by narrow field of study in natural science and engineering (fields 400 & 500) by sex, 2002-2006

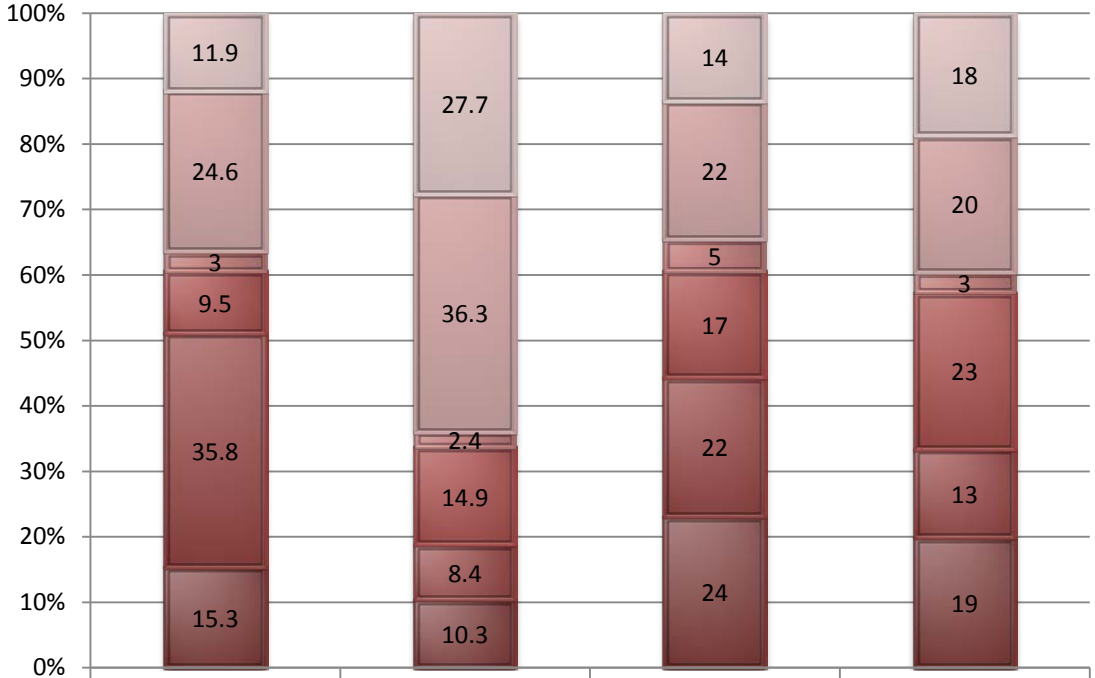
自然科學與工程中，各學科內博士複合式年成長率*性別 (生命科學，物理學、數學與統計、電算，工程、製造與製成、建築）

EU27	Science,Mathematics &Computing								Engineering.Manufacturing&processing					
	Life Science		Physical Science		Mathematics& Statistics		Computing		Engineering& engineering trades		Manufacturing&processing		Architecture & building	
	Woman	Man	Woman	Man	Woman	Man	Woman	Man	Woman	Man	Woman	Man	Woman	Man
	3	0	6	1	12	7	13	9	11	5	3	0	10	3
TW	Life Science			Mathematics& Statistics					Engineering& engineering trades		Manufacturing&processing		Architecture & building	
	Woman	Man	Woman	Man					Woman	Man	Woman	Man	Woman	Man
	39.4	23.4	15.3	14					22	18	18.9	7.4	-8	4.9

T2.3 Evolution of the proportion of female PhD (ISCED6) graduates by narrow field of study in natural science and engineering (fields 400 & 500), 2002-2006
自然科學與工程中女博士比例演變

EU 27	Science,Mathematics &Computing								Engineering, Manufacturing & processing					
	Life Science		Physical Science		Mathematics& Statistics		Computing		Engineering& engineering trades		Manufacturing &processing		Architecture& building	
	2002	2006	2002	2006	2002	2006	2002	2006	2002	2006	2002	2006	2002	2006
	53	56	31	35	30	34	16	18	18	22	30	32	31	37
TW	Life Science			Mathematics & Statistics			Engineering& engineering trades				Manufacturing & processing		Architecture& building	
	2002	2006		2002	2006		2002		2006		2002	2006	2002	2006
	14.2	21.2		21.2	12.6		4.4		5.1		14.3	20	26.9	17.9

F2.4 Distribution of researchers in the Higher Education Sector (HES) across fields of science高等教育中，科學學門內女性研究員分佈（自然科學、工程、醫學科學、農業、社會科學、人文）



	TW man	TW woman	EU27 man	EU27 woman
Humanities	11.9	27.7	14	18
social science	24.6	36.3	22	20
Argiculture sciences	3	2.4	5	3
Medical science	9.5	14.9	17	23
Engineering and technology	35.8	8.4	22	13
Natual science	15.3	10.3	24	19

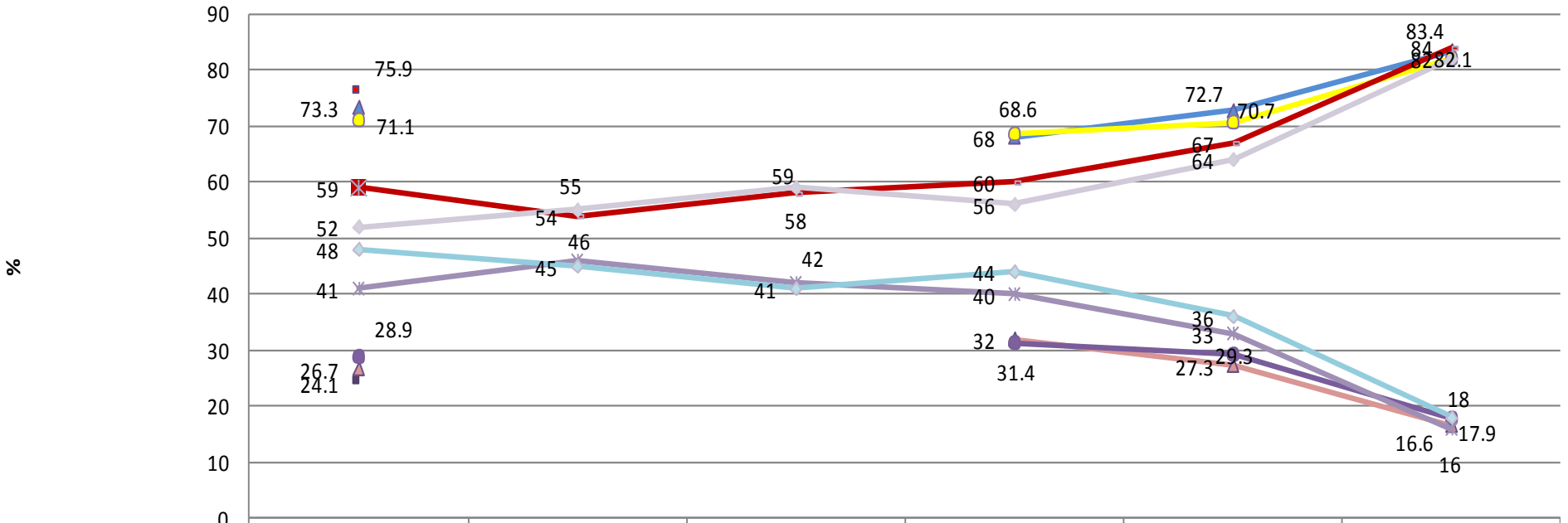
source: Ministry of Education (2010)
TW:2010 EU:2006
台灣:高等教育部門內的學者

Chapter 3: Seniority

Illustrates the workings of a Glass Ceiling that women hit during their ascent in the academic hierarchy

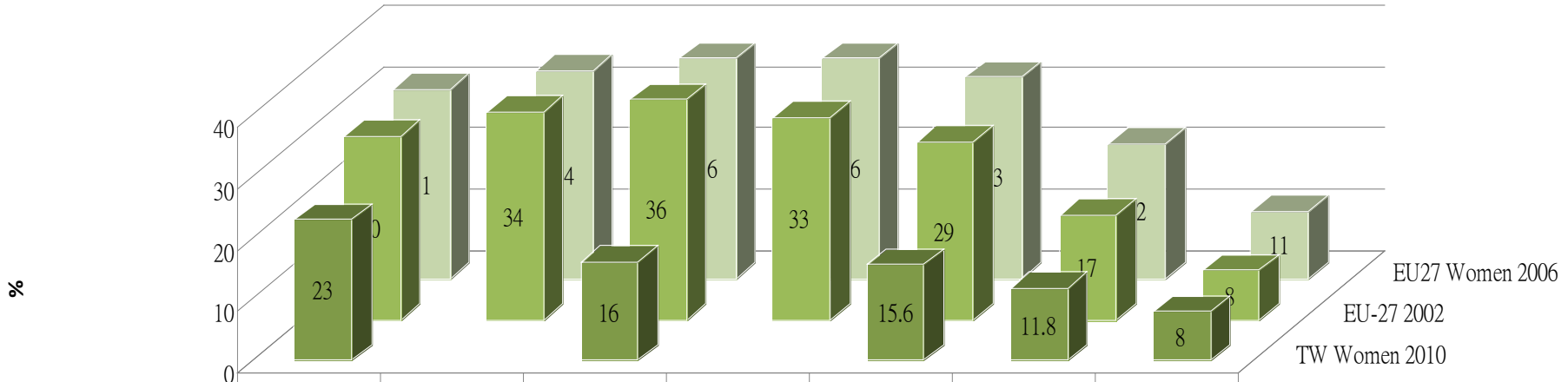
(Pay gender gap is also illustrated here)

Figure 3.1 Proportions of men and women in a typical academic career, students and academic staff 在典型學術生涯內，男性與女性學生和學者的性別比例



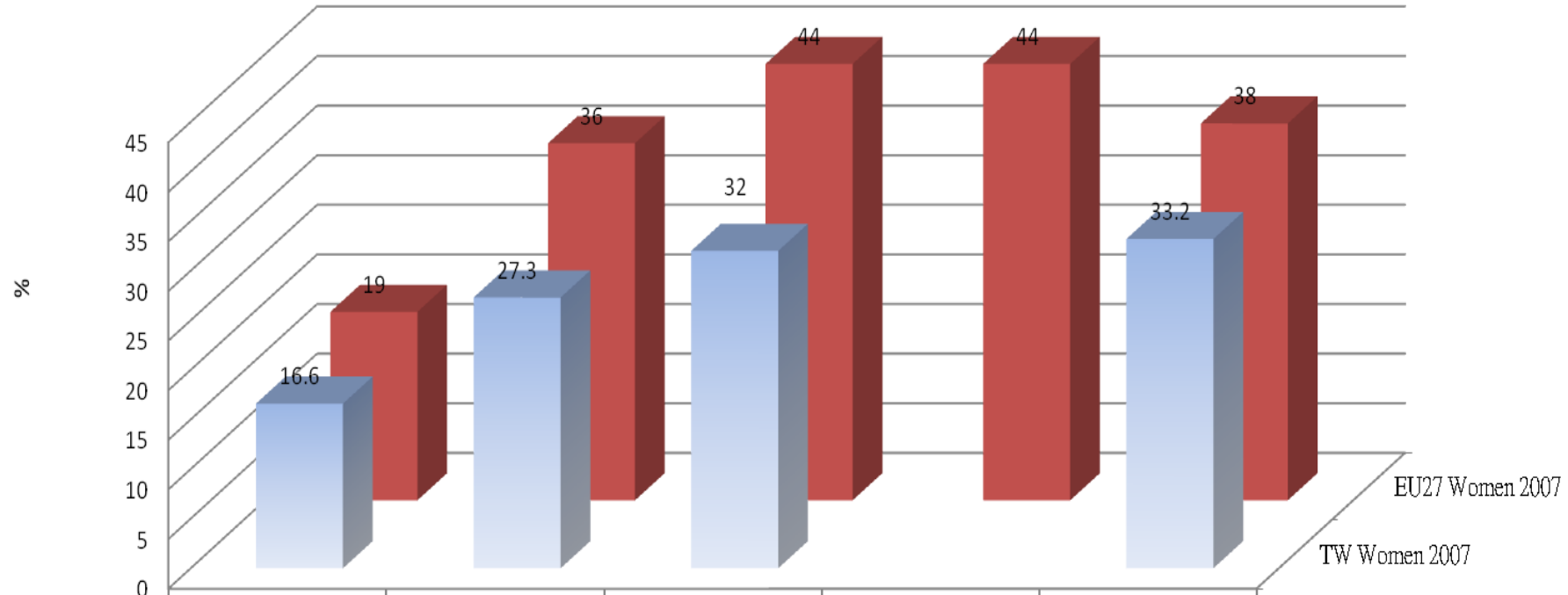
	ISCED 6 students	ISCED 5A Students	ISCED 5A Graduates	Grade C	Grade B	Grade A
TW Women 2002	24.1					
TW men 2002	75.9					
TW Women 2006	26.7			32	27.3	16.6
TW Men 2006	73.3			68	72.7	83.4
TW Women 2010	28.9			31.4	29.3	17.9
TW Men 2010	71.1			68.6	70.7	82.1
EU27 Women 2002	41	46	42	40	33	16
EU27 Men 2002	59	54	58	60	67	84
EU27 Women 2006	48	45	41	44	36	18
EU27 Men 2006	52	55	59	56	64	82

Figure 3.2: Proportions of men and women in a typical academic career in science and engineering, students and academic staff 在工程及科學典型學術生涯中，男性女性學生、教學人員之性別比例



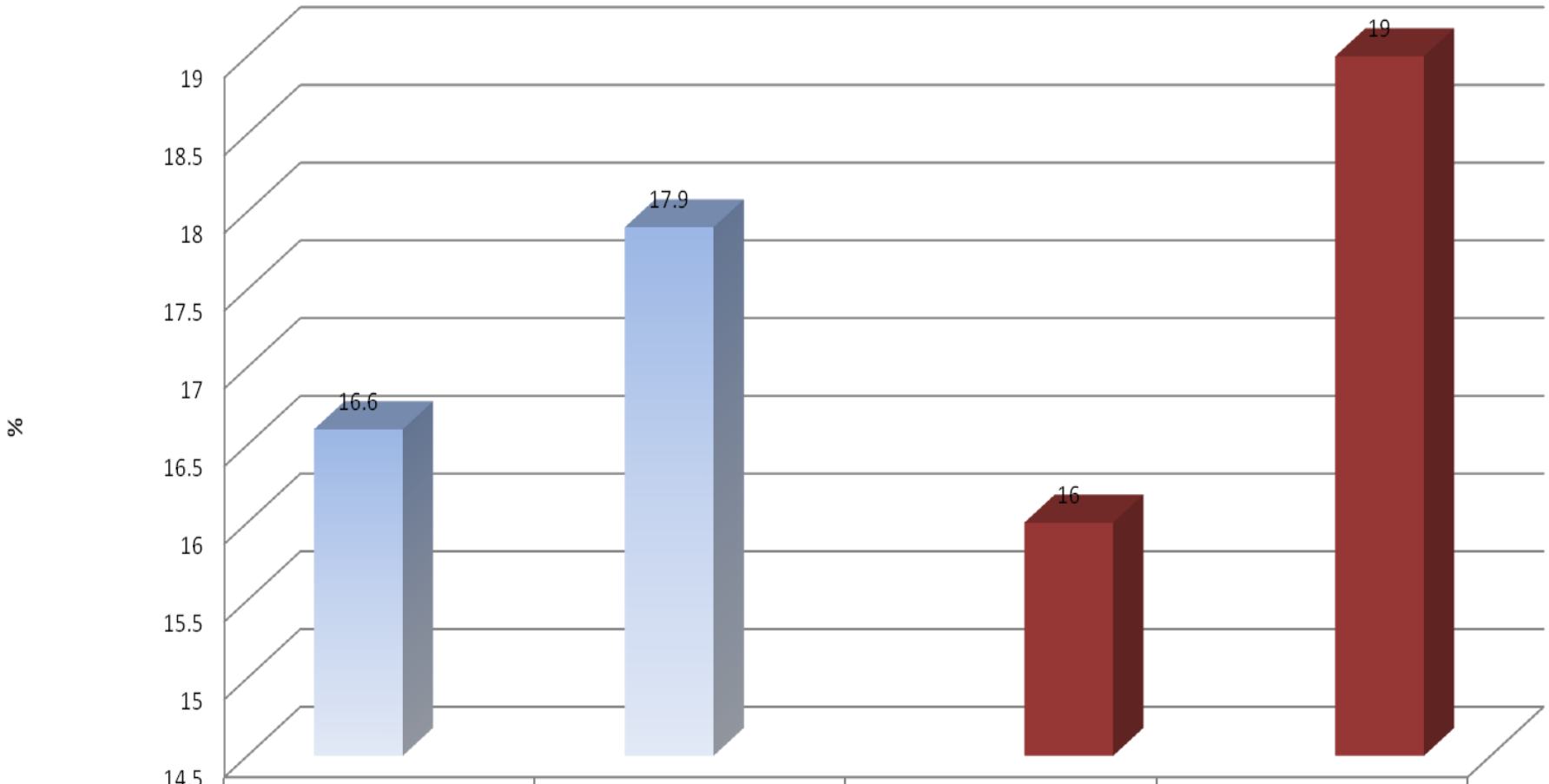
	ISCED 5A Students	ISCED 5A Graduates	ISCED 6 Students	ISCED 6 Graduates	Grade C	Grade B	Grade A
TW Women 2010	23		16		15.6	11.8	8
EU-27 2002	30	34	36	33	29	17	8
EU27 Women 2006	31	34	36	36	33	22	11

Table 3.1 Proportion of female academic staff by grade and total 女性各級等大學學者之比例



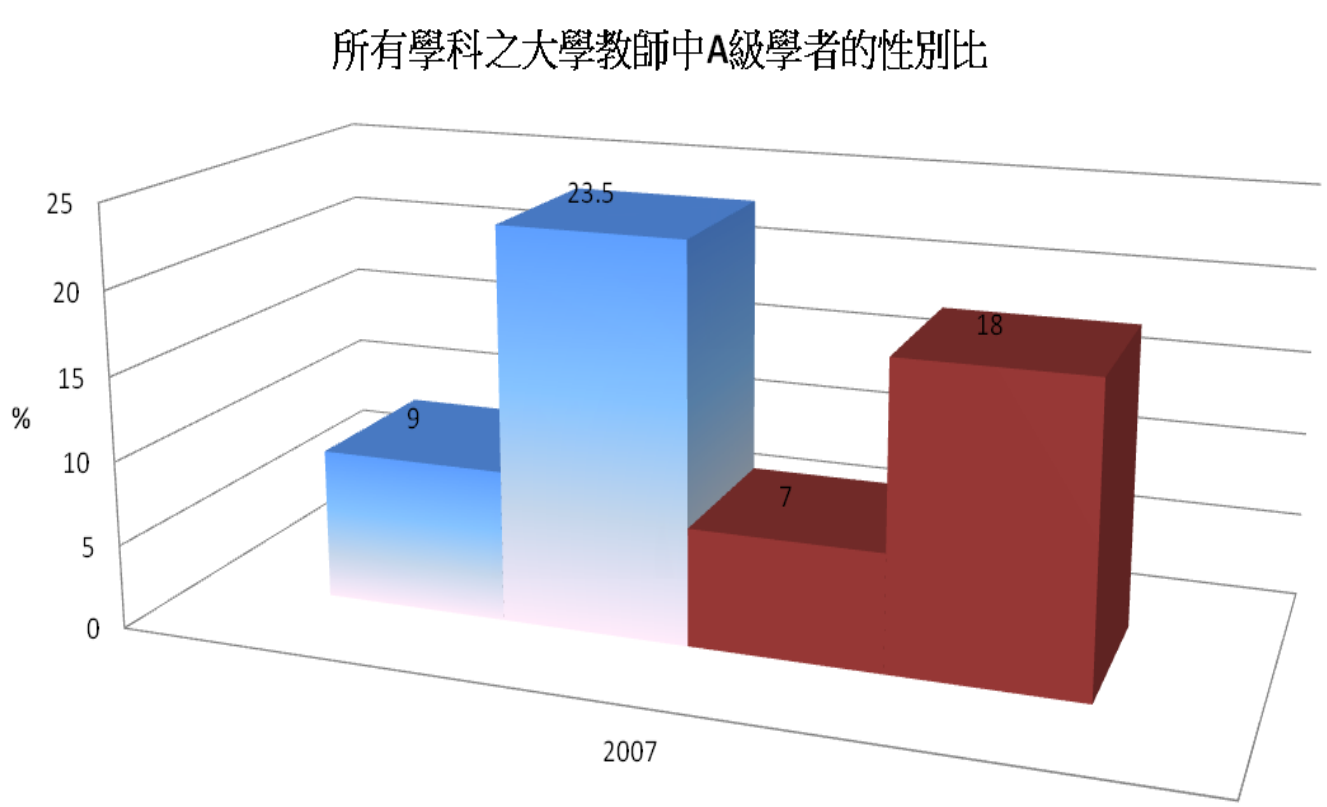
	Grade A	Grade B	Grade C	Grade D	Total
TW Women 2007	16.6	27.3	32		33.2
EU27 Women 2007	19	36	44	44	38

Figure 3.3 Proportion of women in grade A academic positions A級學者中女性比例



	2007	2010	2002	2007
TW Grade A women	16.6	17.9		
EU27 women			16	19

Figure 3.4: Percentage of grade A staff among all academic staff by sex



	2007
TW women	9
TW men	23.5
EU27 women	7
EU27 men	18

Figure 3.5 Glass Ceiling Index

玻璃天花板指數

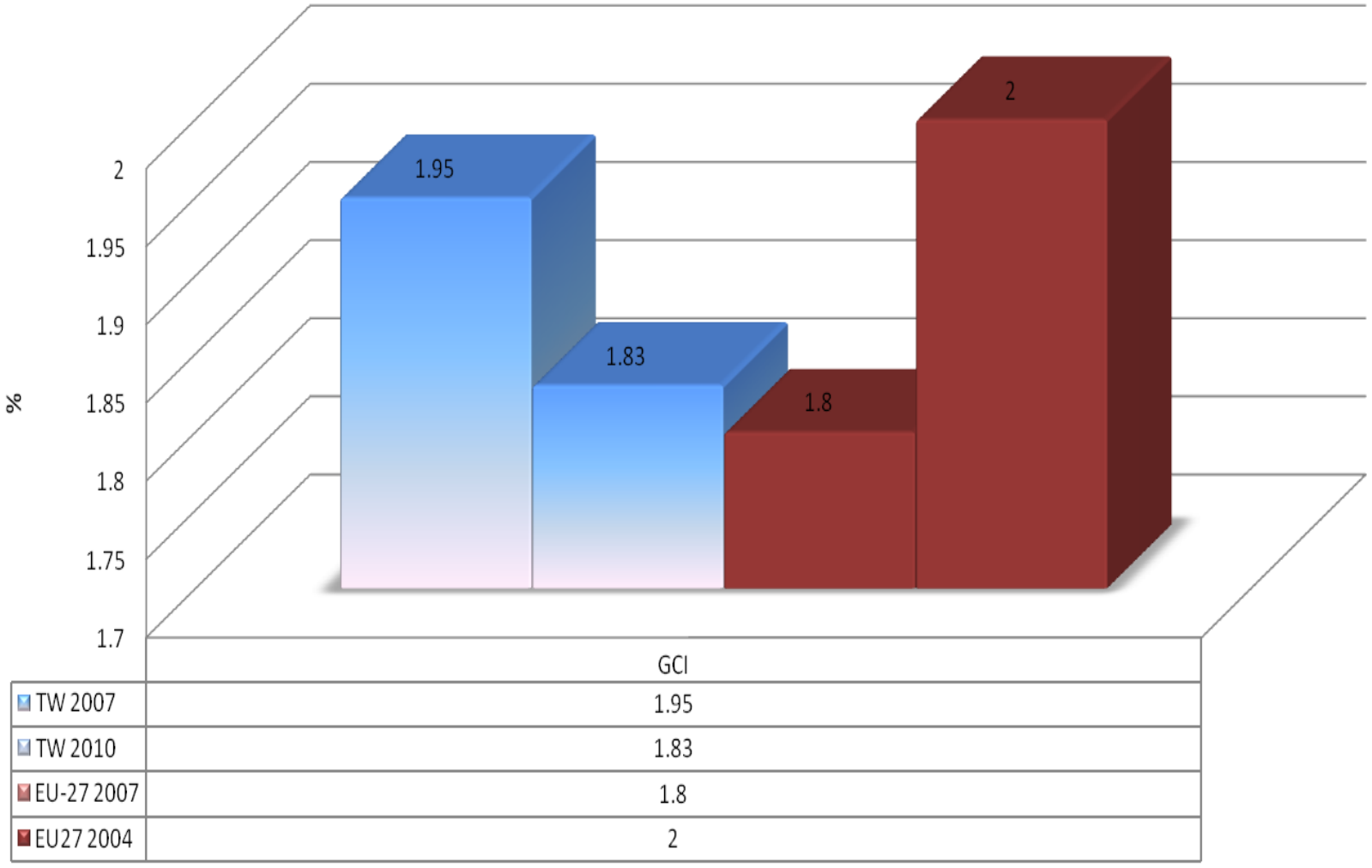
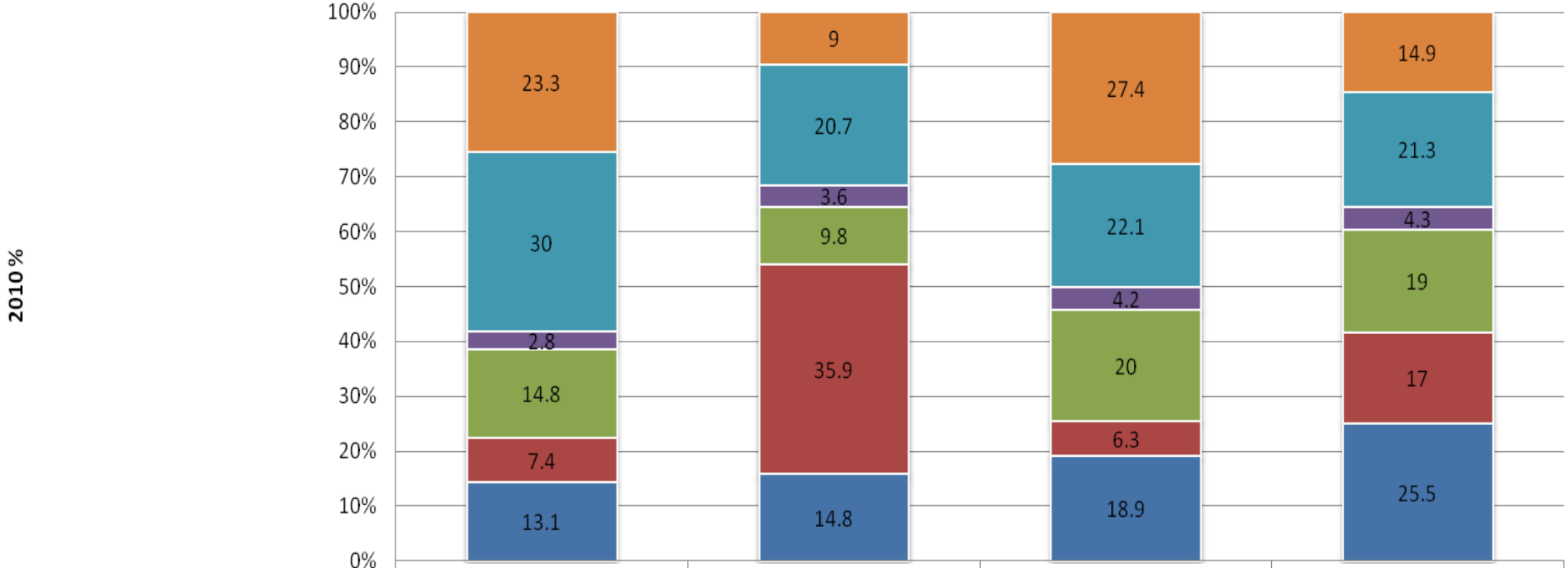


Table 3.2 Proportion of female grade A staff by main field of science,
主要科學領域內女性A級學者所佔比例

	Natural Science 自然科學	Engineering and technology 工程與科技	Medical Science 醫學科學	Agricultural Science 農業科學	Social Science 社會科學	Humanity 人文
(2010)	16.2	4.3	24.9	14.21	24.1	36.5
EU27 (2007)	13.4	7.2	17.0	16.8	18.6	27.0

Figure 3.6 Distribution of grade A staff across fields of science by sex

所有科學領域中A級學者之分布-按性別劃分（自然科學、工程與科技、醫療科學、農業科學、社會科學、人文

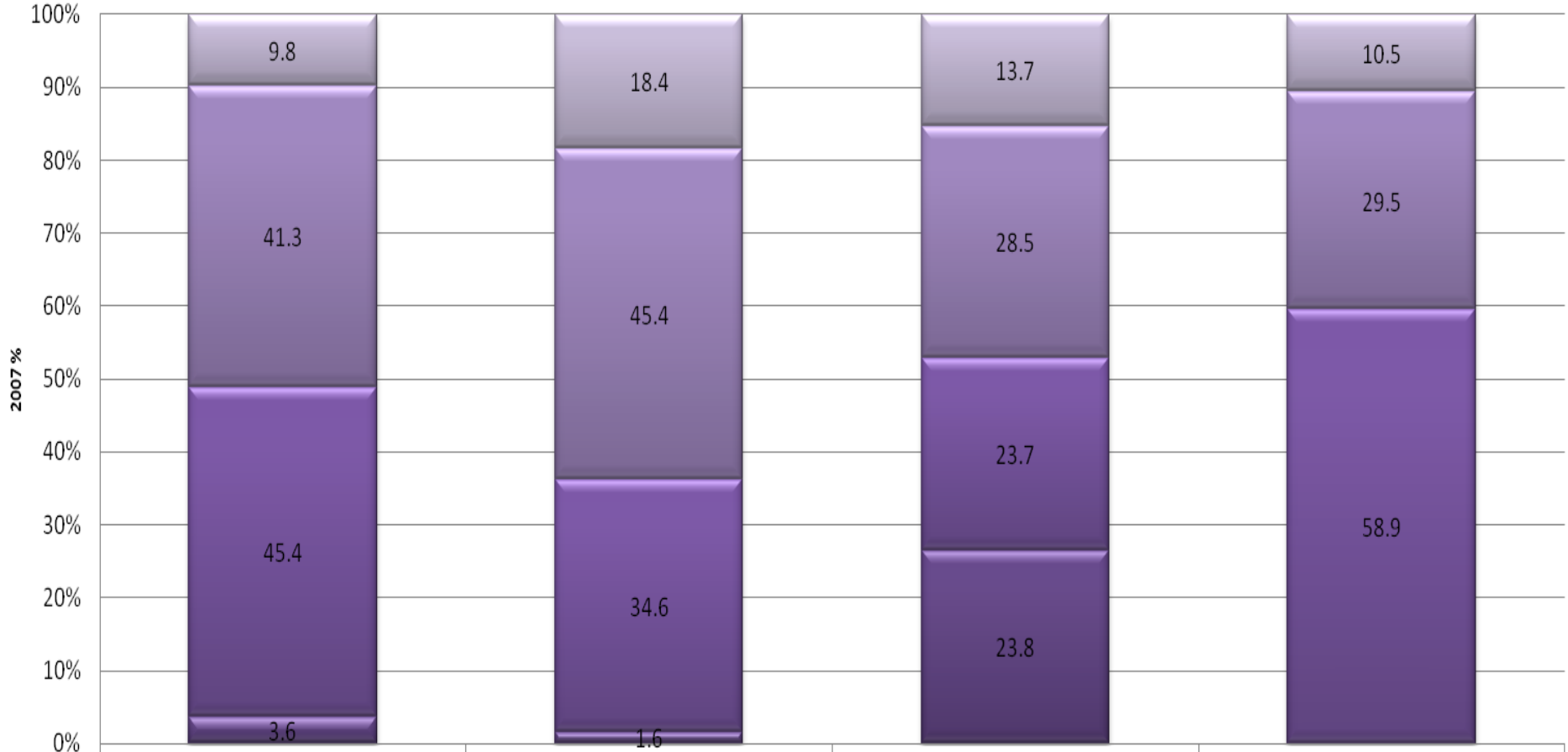


	TW women	TW men	EU27 Women	EU27 Men
Humanities 人文	23.3	9	27.4	14.9
Social Sciences 社會科學	30	20.7	22.1	21.3
Agricultural Science 農業科學	2.8	3.6	4.2	4.3
Medical Sciences 醫學科學	14.8	9.8	20	19
Engineering and technology 工程與科技	7.4	35.9	6.3	17
Natural Sciences 自然科學	13.1	14.8	18.9	25.5

Table 3.3: Proportion of female A grade staff by age group
A級學者各年齡層內，女性佔總數之比例

2007	<35 歲	35-44歲	45-54 歲	55+ 歲	Total
	30.7	20.7	15.4	9.6	16.6
EU27	25	23	21	18	19

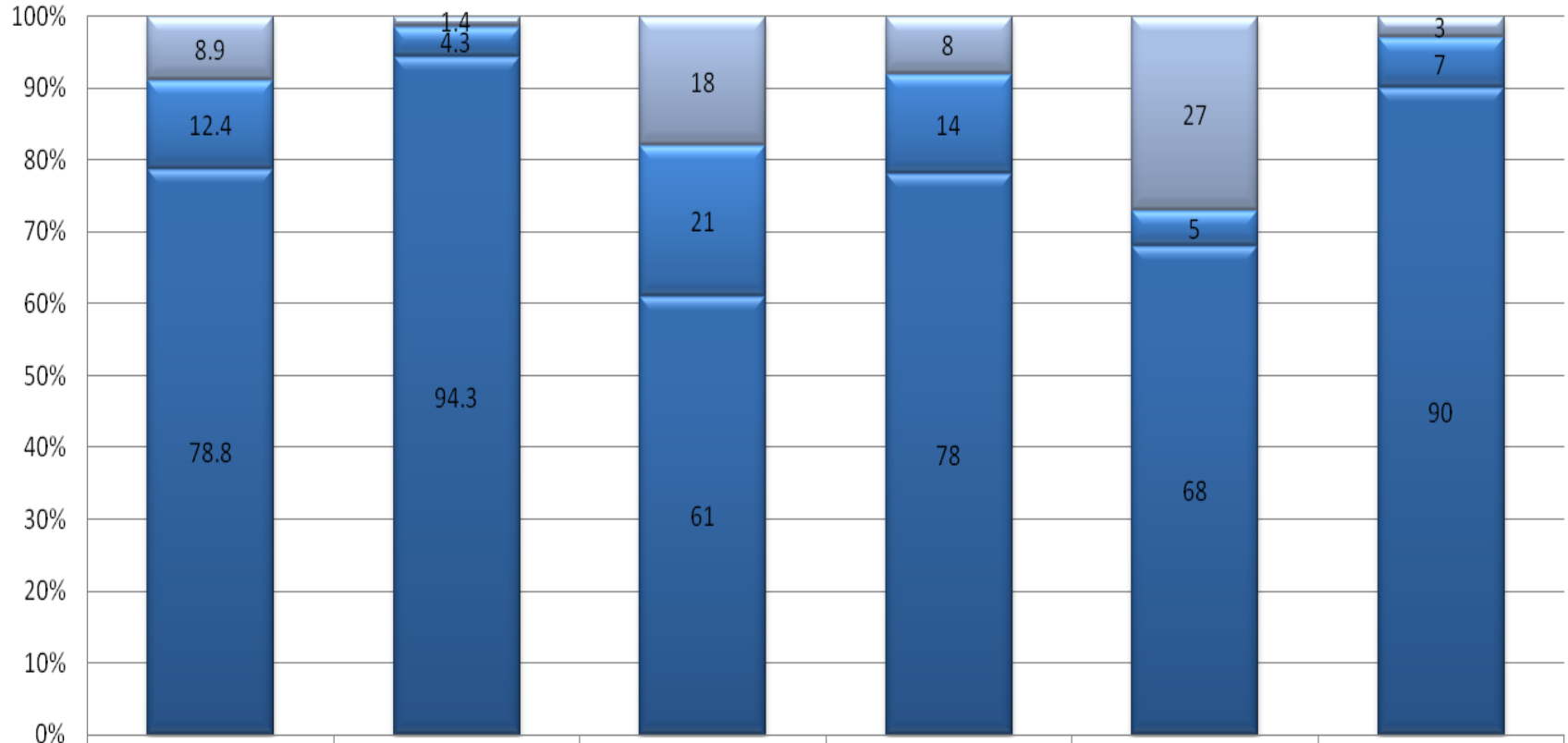
Figure 3.7: Distribution of grade A staff across age groups by sex
各性別層內A級學者之分佈（按年齡劃分）



	TW women	TW men	EU27 women	EU27 men
55+	9.8	18.4	13.7	10.5
45-54	41.3	45.4	28.5	29.5
35-44	45.4	34.6	23.7	58.9
<35	3.6	1.6	23.8	

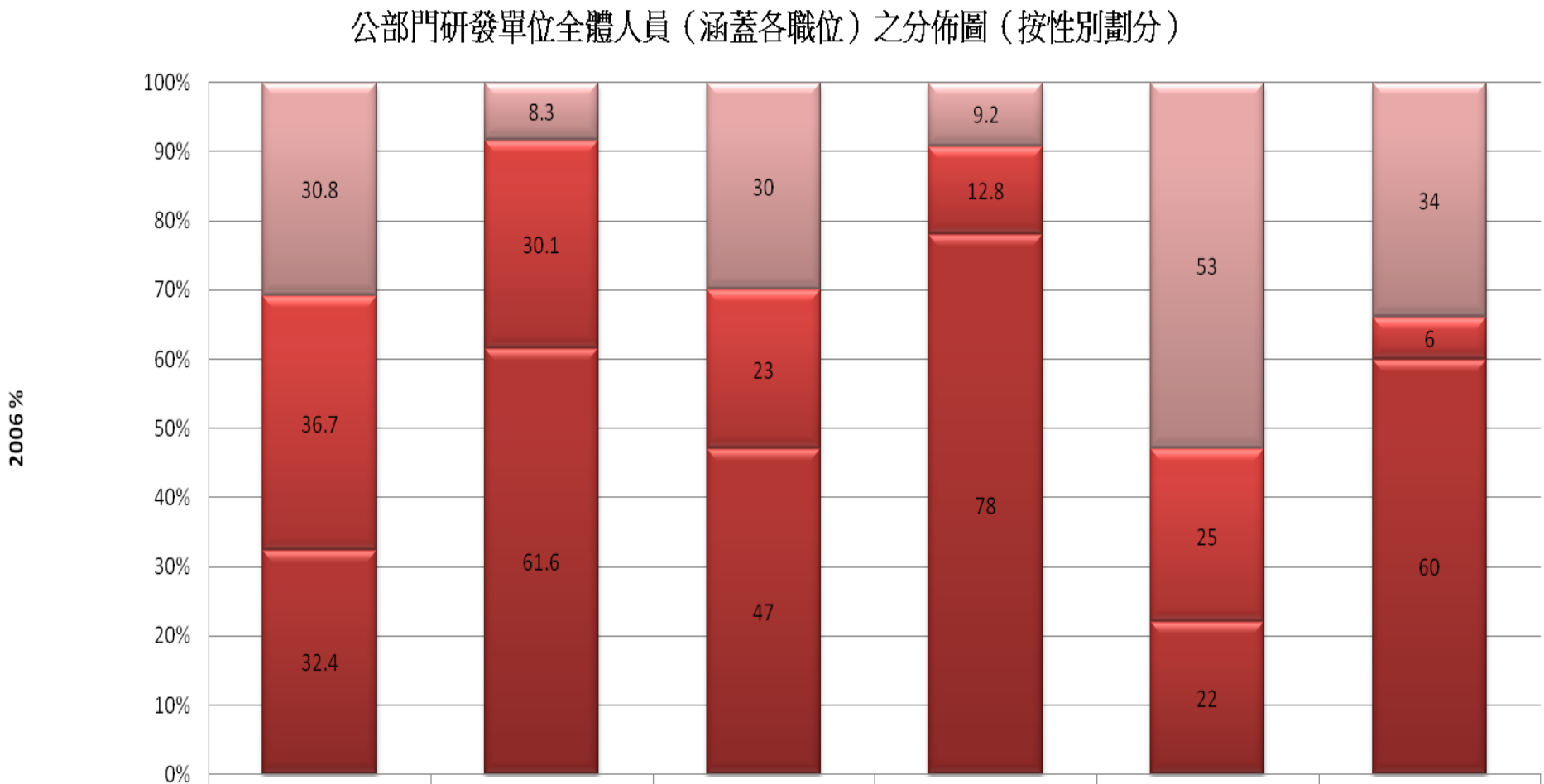
Figure 3.8: Distribution of R&D personnel across occupations for the Higher Education Sector (HES) by sex

高等教育中研發單位全體人員（涵蓋各職位）之分佈圖（按性別劃分



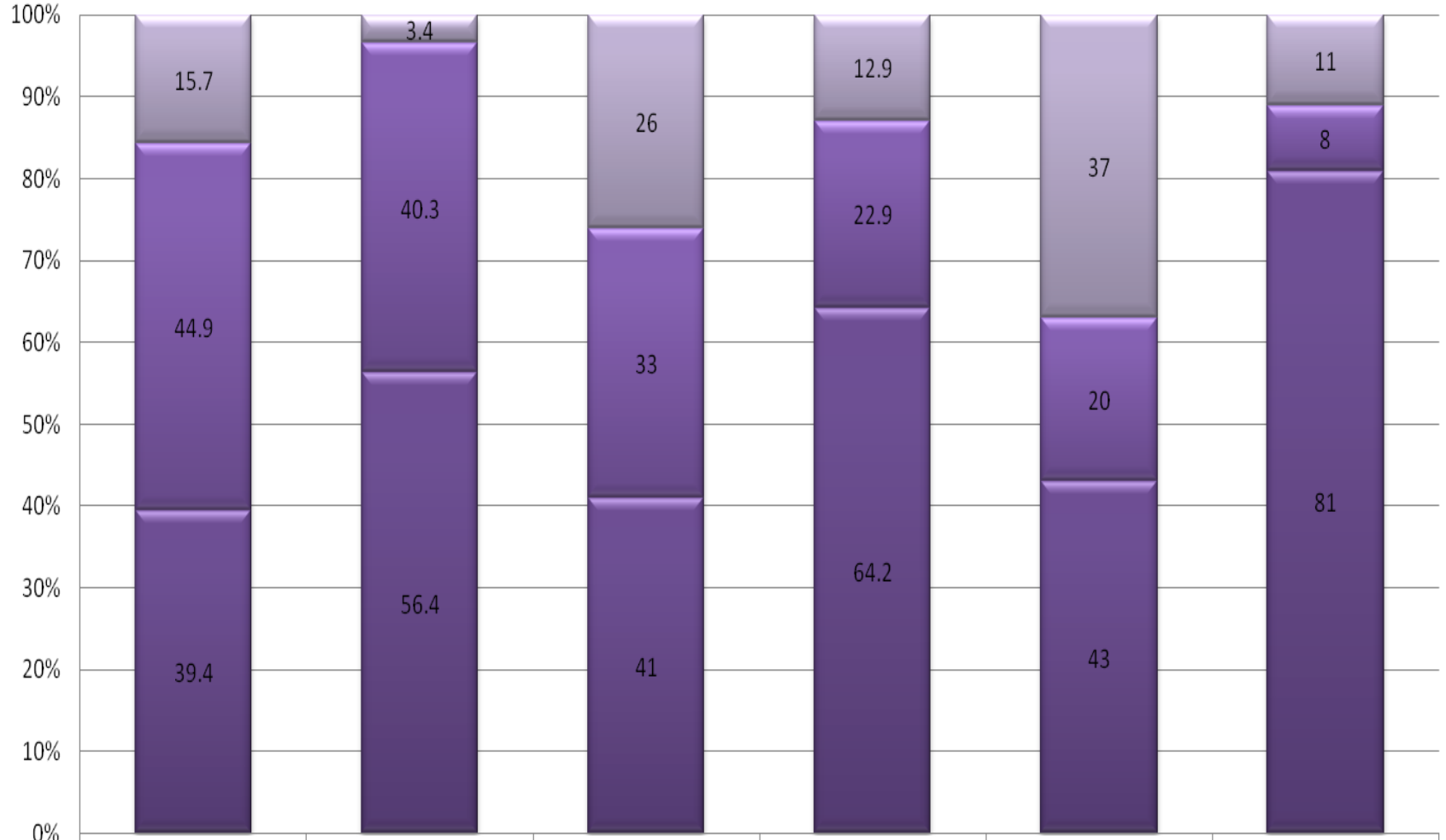
	TW women	TW men	EU Women	EU men	JP women	JP men
Other 其他	8.9	1.4	18	8	27	3
Technicians 技術員	12.4	4.3	21	14	5	7
Researchers 研究員	78.8	94.3	61	78	68	90

Figure 3.9: Distribution of R&D personnel across occupations for the Government Sector (GOV) by sex



	TW women	TW men	EU women	EU men	JP women	JP men
Other 其他	30.8	8.3	30	9.2	53	34
Technicians 技術員	36.7	30.1	23	12.8	25	6
Researchers 研究員	32.4	61.6	47	78	22	60

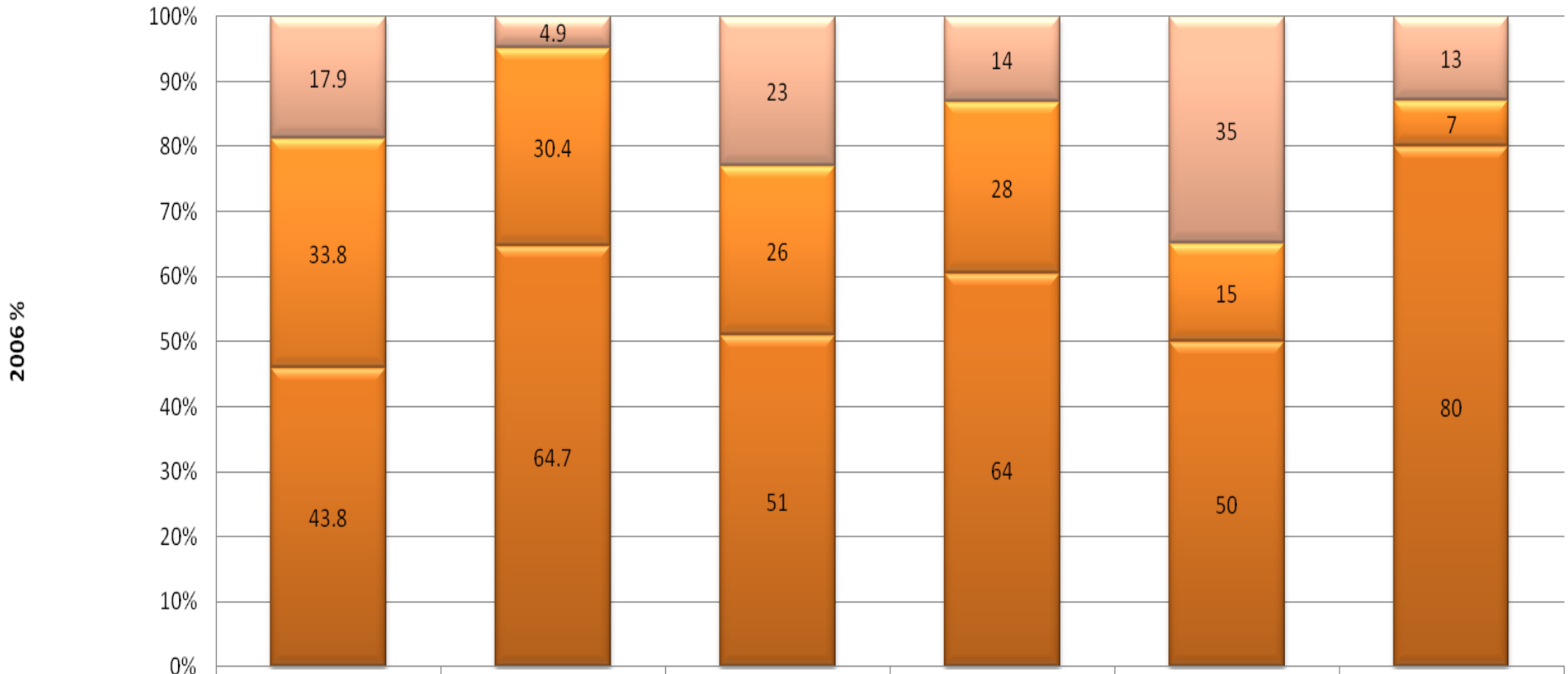
Figure 3.10: Distribution of R&D personnel across occupations for the Business Enterprise Sector (BES), by sex 企業界研發單位全體人員（涵蓋各職位）之分佈圖（按性別劃分）



	women	men	EU27 Women	EU27 men	JP women	JP men
Other 其他	15.7	3.4	26	12.9	37	11
Technicians 技術員	44.9	40.3	33	22.9	20	8
Researchers 研究員	39.4	56.4	41	64.2	43	81

Figure 3.11: Distribution of R&D personnel across occupations in all Sectors (HES, GOV, BES) by sex

三領域合併之研發單位全體人員（涵蓋各職位）之分佈圖（按性別劃分



	TW women	TW men	EU women	EU men	JP women	JP men
Other 其他	17.9	4.9	23	14	35	13
Technicians 技術員	33.8	30.4	26	28	15	7
Researchers 研究員	43.8	64.7	51	64	50	80

Figure 3.12: Gender pay gap in % for total economy

所有經濟結構內性別薪資差異

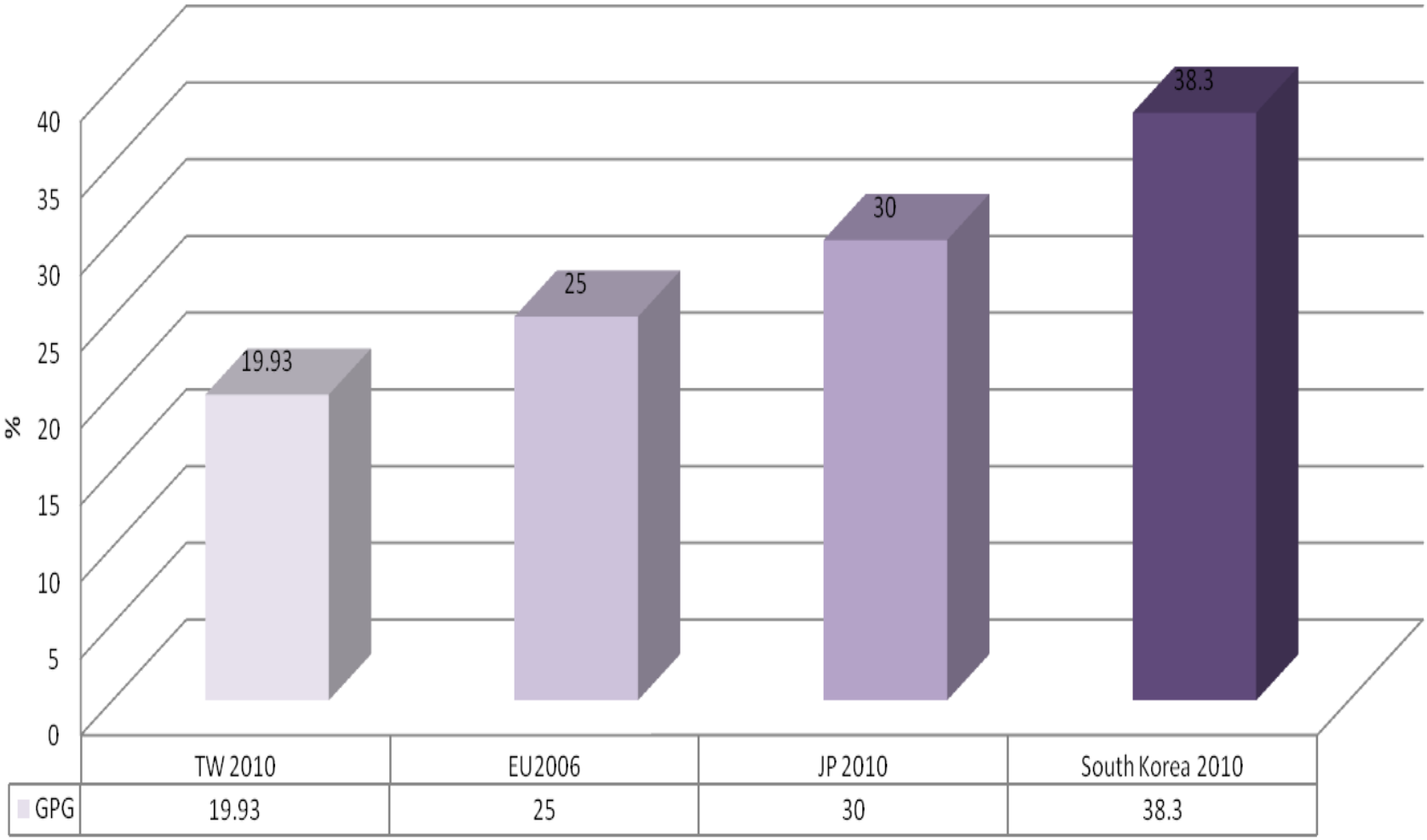
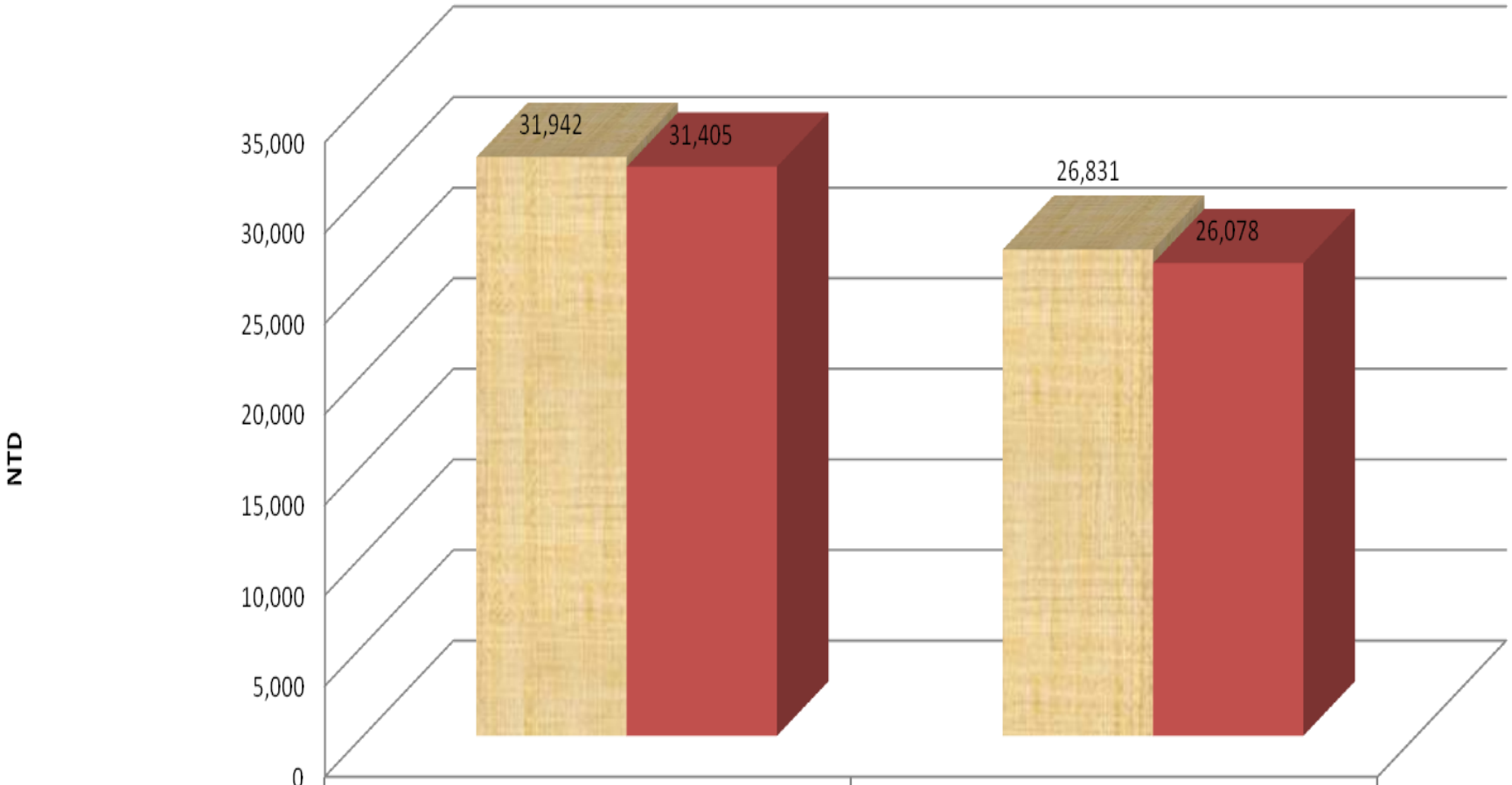


Table 3-6 Gender pay gap in % by selected occupations in private and public enterprise 在所有企業中（公私營）特定職位之性別薪資差異



	Graduate 碩士畢業生	Undergraduate 學士畢業生
Male Salary 男性月平均薪資	31,942	26,831
Female Salary 女性月平均薪資	31,405	26,078

Chapter 4: Setting the scientific agenda

Shows that women's under-representation at the highest hierarchical levels of the academic career severely cuts their chances of being at the head of higher education institutions

Figure 4.1: Proportion of female heads of institutions in the Higher Education Sector (HES) 在高等教育領域中由女性擔任校長之比例

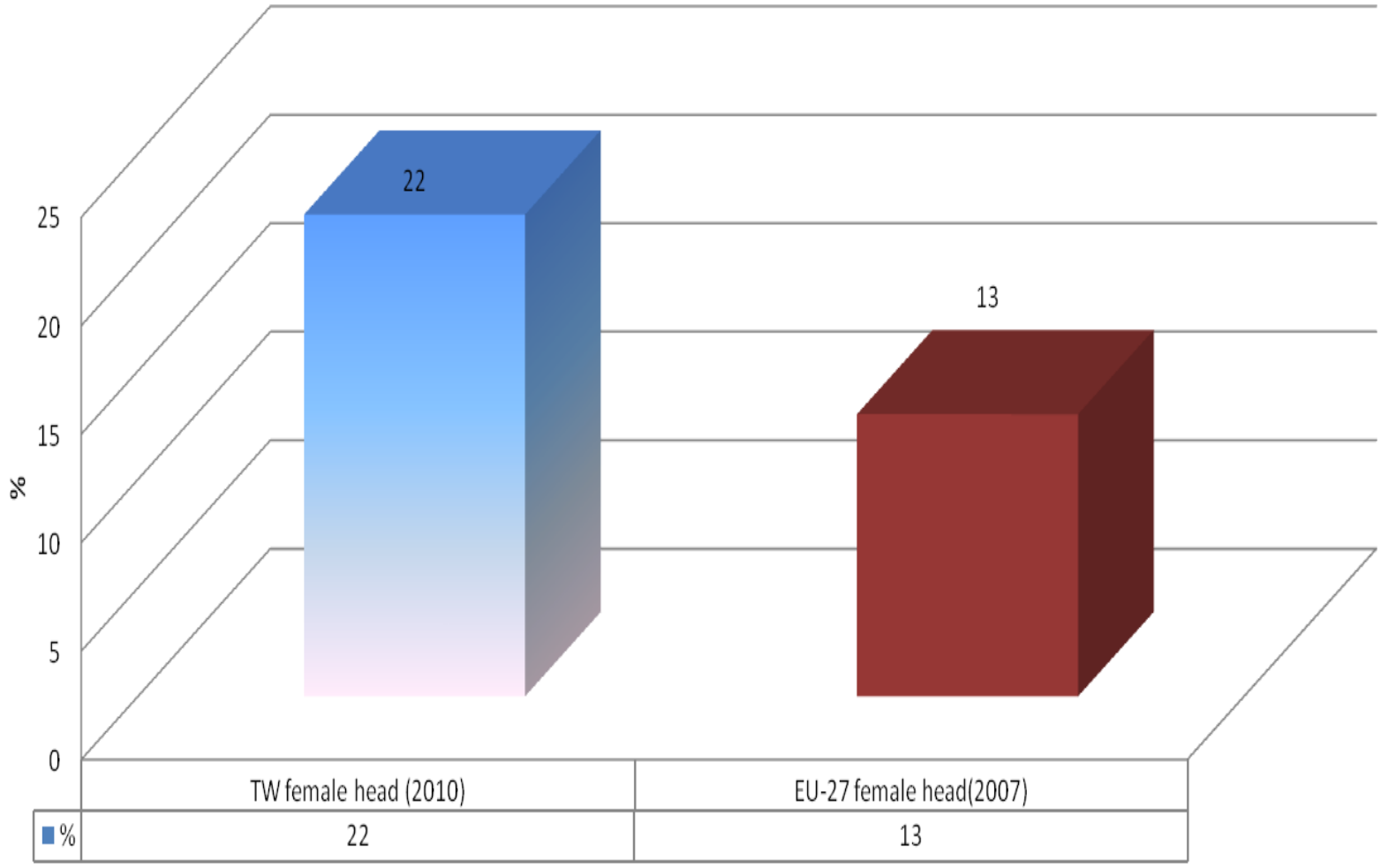


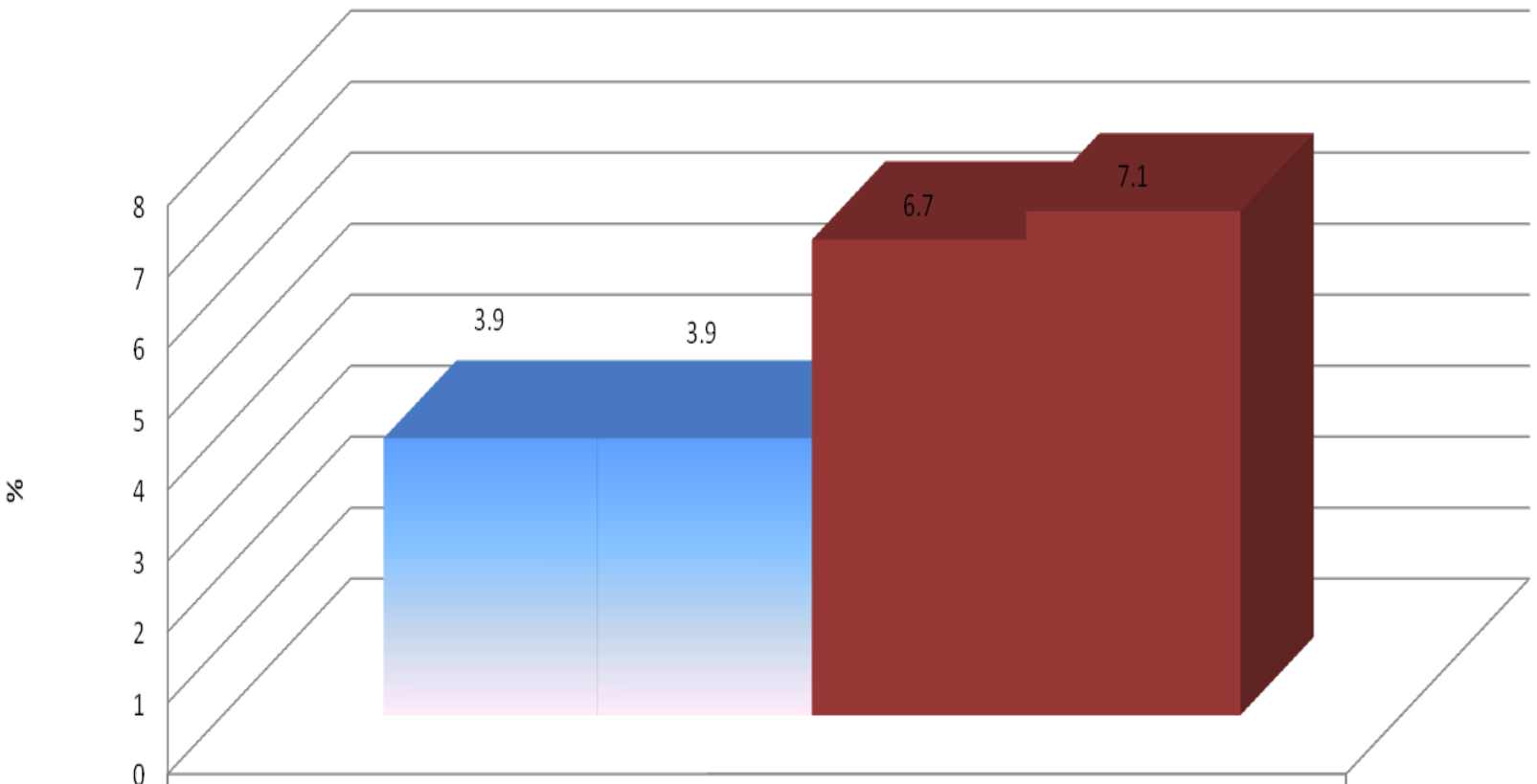
Table 4.1: Proportion of female heads of universities or assimilated institutions based on capacity to deliver PhDs 授予博士學位之大學或類似機構中由女性擔任校長的比例

2010	Women	Men
% EU27	22.2 9	77.8 91

Figure 4.2: Proportion of women on boards, 2007

Taiwan Data unavailable

Figure 4.3: Evolution in research funding success rate differences between women and men 科研經費成功率的性別差異逐年演進



To be discussed…

- Shall we use the framework of She Figures, or shall we develop a pan-East Asian framework/themes?
- Are standardized statistics available in each country? In particular the International Standard Classification of Education (ISCED 97) and International Standard Classification of Occupations (ISCO 88).
- What are the main research purposes and questions?

Other possible research topics…

- Related literatures reviewed:
  1. Does gender matter for academic promotion? evidence from a randomized natural experiment (US) 升等機會、資源有gender gap?
  2. Like Daughter, Like Father: How women's wages change when CEOs have daughters (Denmark)
  3. Analysis of sex and gender-specific research reveals a common increase in publications and marked differences between disciplines. (Germany) 內容分析
  4. Effective Policies for Supporting Education and Employment of Women in Science and Technology **(Korea)**
  5. Why women leave engineering? (US)