

## **Probing the Substructures of Gender Inequality in Malta: An Empirical Study of Institutional Affiliation and Sex- Segregation in Maltese Further and Higher Education**

**Matthew Muscat-Inglott**

Malta College of Arts, Science & Technology

matthew.muscat.inglott@mcast.edu.mt

### **Abstract**

In spite of recent progress in the area, Malta scored just below the EU-27 average in a recent European report on gender inequality. Among the key issues flagged, were uneven concentrations of women and men in education, as well as gaps in employment and unadjusted pay. This paper explores some of the prospective underlying mechanisms continuing to drive such forms of inequity in Malta, with a special focus on sex-segregation in further and higher education. An empirical, quantitative research methodology based on various forms of contingency table analysis was selected, combined with a Popperian post-positivist approach to null hypothesis-testing. Binary logistic and log-linear modelling techniques were applied to secondary public data from the Maltese National Statistics Office, on the distributions of student and worker populations by sex and field from the 2016/17 academic year. The findings showed that Maltese women in the academic track were more than twice as likely to challenge gender stereotypes by taking up traditionally masculine-labelled courses than their peers in the vocational tracks. Women in the academic track were also less likely to end up in feminine-labelled roles in the workplace. The Maltese further and higher education system was nonetheless heavily sex-segregated overall when compared to the workplace, with Maltese women three times as likely to find themselves in feminine-labelled fields at college or university, than they were at work. Declining occupational sex-segregation was interpreted within the context of ever-increasing competition for available work, and thereby construed as a symptom of the devaluation of labour power inherent in capital-labour relations. In an increasingly neoliberalist and gender-essentialist ideological climate, the paper goes on to argue that such a devaluation places women, specifically, at heightening risk of

intensifying capitalist exploitation, engendering a heightened impetus towards emancipatory curricular reform, and authentic system-wide deconstruction of enduring gender stereotypes in Maltese further and higher education.

**Keywords:** Malta, gender equality, horizontal and vertical inequality, inequity, critical gender theory, further and higher education, vocational education and training.

## **Introduction**

More people in Malta than ever, regardless of their sex or gender, are now graduating from further and higher education (FHE), and proceeding into gainful work each year. Nevertheless, Malta scored just below the EU-27 average on the European gender equality index (EIGE, 2020), with several important gender inequality issues duly flagged. Little progress has been registered over the past decade (EC, 2012), for instance, in the enduring gaps between women and men in employment and unadjusted pay. Similarly, uneven concentrations of women and men across educational and occupational fields also prevail. A chief concern among critical gender theorists about such sex-segregation by field, is that fields themselves tend to become differentiated in terms of social status and financial earnings. This raises concerns for Malta about the potentially problematic long-term socio-economic effects of systemic sex-segregation, to which women and men are being exposed at crucial stages of their development as fledgling social and economic actors. If systemic segregation is channelling women and men into predetermined and disparate pathways towards inequitable outcomes, then despite much-lauded advances in inclusive educational practices in recent years, gender inequality nonetheless prevails in revived and inexorable forms.

This paper therefore takes the phenomenon of sex-segregation in Maltese FHE settings as its primary focus, with a special interest in the prospective role played by institutional affiliation as a key factor in the reproduction of gender inequality in society. More broadly, the study aims, within the general context of promoting a more just and equitable society, to explore gender issues from an educational perspective, and thereby contribute to a more nuanced understanding of the mechanisms of gender inequity in Malta.

## The nature of gender inequality at home and abroad

Upon entering the labour market, women generally tend to fare worse than men in terms of unadjusted pay and long-term career progression (Jacobs, 1996; Fuller & Unwin, 2013). So despite a virtually ubiquitous increase in female participation in higher education worldwide since the 1990s (Conger & Dickson, 2015), with the exception of some parts of central and East Asia and sub-Saharan Africa (UNESCO, 2021), scholars maintain that women still partake less of the general socio-economic benefits associated with graduating from colleges and universities than men (Becker, Hubbard & Murphy, 2010). The apparent failure of educational institutions to mitigate broader inequitable socio-economic outcomes among women and men, has forced scholars to move the conversation beyond relatively superficial and “misleading” (Myers & Griffin, 2018) assessments of purely quantitative parity, typically reflected in overall college and university admissions data. A more effective explanation of current observations and trends, indeed, has generated more nuanced theoretical considerations, including the important notions of vertical and horizontal forms of inequality, as well as a firm rebuttal of the popular assumption that an effective or systemic “degendering” process has in fact taken place (Charles & Bradley, 2009).

In confronting the degendering myth, Moorhouse (2017) insisted that the cultural norms underpinning gender inequality have remained remarkably resilient in the face of other societal changes over the years. Niemeyer and Colley (2015), for instance, showed that it is still viewed as natural for mothers to take on the bulk of child-rearing as well as “elder-care” duties, leaving males comparatively free to engage in paid work, and assume the role of “breadwinner”. In fact, the EIGE (2020) report showed that Malta had the widest employment gap in Europe, specifically between women and men with children. Since women are expected to bear the brunt of unpaid work at home, only 56% of women (as opposed to 95% of men) with children, were actually in registered employment. The higher odds that women will consequently leave work due to family commitments, has resulted in reluctance among some employers to be supportive of long-term female progression at work (Estevez-Abe, 2011). This has been at least one contributing factor to what is now known as *vertical* inequality, which is characterised by observations of general shortages of women in senior or high-ranking positions (Reisel, Hegna & Imdorf, 2015).

## Sex-segregation and horizontal inequality

*Horizontal* inequality, on the other hand, results from disparities across different occupational fields, when some fields come to represent higher status and higher pay than others (Reisel, Hegna & Imdorf, 2015). The feminist position has contended that this particular form of inequality typically occurs when certain female-dominated fields become inherently undervalued and underpaid. Women, for instance, tend to be over-represented in humanistic and care-based fields, and conversely under-represented in those fields conceptualised as scientific or technical (Barone, 2011). Nursing and early childhood education are particularly apt examples of strongly feminised, “sex-typed” fields. Such roles have consequently become “feminine-labelled”, and acquired a stigma of low status (Niemeyer & Colley, 2015). Vertical and horizontal forms of gender inequality can also intersect, as appears to be the case in education. Since women are over-represented in educational occupations overall, one would reasonably expect to also see proportional over-representation of women in the senior, higher-status positions within that sector. This, however, is not the case, as evidenced by reports of persistent shortages of females in senior academic and research roles (Peterson, 2011; UNESCO, 2021).

Manifestations of inequality, particularly the horizontal form, have prompted educators and educational theorists to acknowledge the potential complicity of existing educational systems within the broader context of gender inequity in society. Behind the veil of virtually ubiquitous increases in *overall* female representation in colleges and universities worldwide (UNESCO, 2021), educational sex-segregation has emerged as a correlate of occupational sex-segregation in wider society (Smyth & Steinmetz, 2008), and therefore, a logical precursor to systemic horizontal gender inequality. Locally, EIGE (2020) have officially reported uneven concentrations of women and men across educational fields, with a distinctive over-representation of women in education, health and welfare, humanities and the arts. Malta also mirrors international trends of under-representation of women in Science, Technology, Engineering and Mathematics (STEM) fields, where only about a quarter of STEM students in most countries happen to be female (UNESCO, 2021). Such reports provide an important impetus for local researchers, to more intimately discern the underlying mechanics of gender inequality in Malta.

## **Institutional affiliation and the reinforcement of gender inequality**

Smyth and Steinmetz (2008) highlighted the substantive link between education and work in the reproduction of gender inequity, by showing that, in a study of 17 European countries, *educational sex-segregation* and *labour market sex-segregation*, were associated. While critical gender-based research has, as such, consistently foregrounded the interplay between education and work, it has done so primarily by focusing on mainstream academic colleges and universities. The presumably more direct links between *vocational* (as opposed to *general/academic*) programmes, and their concomitant occupational roles, meanwhile, remain under-researched (Niemeyer & Colley, 2015). Scholars suspect that vocational education and training (VET) exacerbates (more so than mainstream academic higher education), the effects of educational sex-segregation on gender inequality in the workplace, questioning the widely-held view of VET as the generally more inclusive educational sector (Reisel, Hegna, & Imdorf, 2015). Este´vez-Abe (2011), for instance, argued that VET programmes involving employers are more biased against women than school-based programmes, and likewise, specialist vocational programmes are, in turn, more segregating than general programmes. A period of steadily increasing popularity of VET programmes, and the reintroduction of vocational tracks in secondary state schools in Malta (Cedefop, 2017), meanwhile raise the compelling additional question about what role, if any, VET is playing in the reproduction of gender inequality in Malta.

### **Questions**

Given what we already know about the existence of uneven concentrations of women and men in FHE fields in Malta, as well as fair assumptions about the likely influence of institutional affiliation (more specifically, the existence of distinctive academic and vocational tracks in the Maltese educational system) on the reproduction of gender inequality in society, an empirical study of secondary public data was conceived to address the following main research questions:

*Question One:* What is the current general state of horizontal gender inequality in Maltese FHE?

1.1. What is the overall shape of sex-segregation by field, in Maltese FHE?

1.2. How does institutional affiliation influence such sex-segregation patterns in Maltese FHE?

*Question Two:* How are FHE institutions affecting broader gender inequity in Malta?

2.1. What is the general relationship between educational and occupational sex-segregation in Malta?

2.2. How does institutional affiliation influence the relationship between educational and occupational sex-segregation in Malta?

Various additional hypotheses were formulated in direct conjunction with the above questions, according to the methods used, and are therefore explained below.

## **Methodology**

A quantitative research methodology employing various forms of contingency table analysis and categorical data modelling techniques was selected to explore the two main research questions. The resulting hypotheses were tested using a Popperian post-positivist approach. Given that the scope of the study was grounded in the tradition of social justice research, with a philosophical stance mainly rooted in critical theory (and its inherent denial of classical liberal humanism), I preface my use of quantitative empirical data analysis as my methodological “language” of choice, in the spirit expressed by La Rocque (1993, p.xxvi), in justification of her use of the English language in her capacity as a post-colonial activist and Canadian woman of First Nations descent; “I have sought to master this language so that it would no longer master me.” As such, while much research originating in the Western academic tradition has faced the fair charge of subtly reinforcing marginalising and de-humanising views of individuals and groups, I acknowledge my own positionality as a researcher in this same tradition, along with the biases it inevitably entails, and adopt its “language” in the general hope and spirit of emancipation.

That said, the empirical basis of the study was founded on the use of secondary publicly available data, sourced from two annual regional reports from the Maltese National Statistics Office (NSO 2019; 2020). The NSO annual reports do not publish data in identical formats from year to year, yet typically include accumulated data spanning several preceding years, presenting a degree of overlap between editions. For data on FHE participation by sex and field, the NSO (2019) annual regional report included counts for students exclusively

attending the University of Malta (UM). The next edition (NSO, 2020), showed the same distribution by sex and field for the same academic year, albeit for Maltese FHE institutions *overall*, excluding only the academic post-secondary sixth form colleges. This enabled, for the 2016/17 academic year specifically, organisation of the data for FHE students by sex and field, across two main categories; UM and 'other'. A full list of institutions included in the data is provided in the annual report's own methodological note 10 (NSO, 2020, p.85).

The fields of study, defined according to the International Standard Classification of Education (ISCED) used by the NSO, were then collapsed into the four main categories adopted by Charles and Bradley (2009, p.966), as shown below in Table 1. The four categories were; (1) engineering, (2) math/natural science (including computer science), (3) humanities/social science (education, humanities, art, law, social and behavioural sciences, business, mass communications, home economics and service trades), and (4) health/other (health, architecture, trade, craft, transport, agriculture and other).

The NSO's (2020) annual regional report was also used to extract data about workplace sex-segregation for 2017. The occupational fields were manually and qualitatively classified according to Charles and Bradley's (2009) four groups for the sake of comparison with their associated educational fields. Table 1 also shows how the classifications for occupational fields were organised, using relevant NSO codes and nomenclature. Judgments about masculine and feminine 'labelling' of the fields are also based on Charles and Bradley's work.

<i>Categorisation of educational and occupational fields</i>		
Labelling	Charles and Bradley's (2009) Fields Categories	NSO Educational Fields / NSO Occupational Fields
Masculine 1 - Engineering	07 (Engineering, manufacturing and construction)	B+C+D+E (Mining and quarrying, manufacturing, electricity gas steam and air conditioning supply, water supply, sewerage waste management and remediation activities F (Construction)
2 - Math /	05 (Mathematics,	M+N (Professional scientific

natural science	science and statistics)	and technical activities, administrative and support service activities)
	06 (Information and communication technologies)	J (Information and communication)
Feminine	3 – Humanities / social science	01 (Education)
		02 (Arts and humanities)
		03 (Social sciences, journalism and information)
		04 (Business administration and law)
		10 (Services)
4 – Health / other	09 (Health and welfare)	R+S+T+U (Arts entertainment and recreation, repair of household goods and other services)
		K (Financial and insurance activities)
		G+H+I (Wholesale and retail trade, repair of motor vehicles, transportation and storage, accommodation and food service activities)
		L (Real estate activities)
		O+P+Q (Public administration and defence, compulsory social security, education, human health and social work activities)
		A (Agriculture, forestry and fishing)
		C (Manufacturing)

Table 1: Charles and Bradley's (2009) four categories (left), with matched educational and occupational field as reported by the NSO (2019; 2020)

The data extracted from the above sources were organised in two contingency tables, one for each of the two main research questions, as shown in Tables 2 and 3, below. All contingency table data were imported into *LibreOffice Calc* (6.1.6.3) open-source spreadsheet software, and finally, *R Studio* (1.1.141) open-source statistics software for analysis.

*Question One*

For Question One, which was aimed first at assessing the overall shape of student-distributions by field, the data were modelled according to Charles and Bradley’s (2009) study, as shown in Table 2, facilitating a comparison between Malta and other countries.

<i>Contingency table for Question One</i>									
	1 - Engineering		2 - Math/ natural science		3 - Humanities / social science		4 - Health/ other		Totals
	F	M	F	M	F	M	F	M	
<b>UM</b>	254	681	438	595	3920	2614	1674	854	11030
<b>Other</b>	148	1160	198	1152	2418	1894	1040	227	8237
<b>Total</b>	402	1841	636	1747	6338	4508	2714	1081	19267

Table 2: Student counts by sex, field and institutional affiliation

The aim was to express, according to Charles and Bradley’s method, in  $A$ , for each field  $j$ , the contrasting male ( $M$ ) to female ( $F$ ) ratios, according to the “average field”, as follows:

$$A_j = \ln(F_j/M_j) - (1/J \times \sum \ln(F_j/M_j)) \quad (1)$$

$J$  refers to the overall number of fields. Negative field-specific values indicate female under-representation, while positive values indicate female over-representation. An overall sex-segregation index,  $A$ , denoting the multiplicative factor by which women or men were over-represented in the average field in each country, was also calculated, as follows:

$$A = \exp(1/J \times \sum (\ln(F_j/M_j) - [1/J \times \sum \ln(F_j/M_j)])^2)^{0.5} \quad (2)$$

Charles and Bradley’s models were built using ‘=ln’ and ‘=exp’ functions in *LibreOffice Calc*. All the remaining models were generated using the basic ‘glm’ function in *R Studio*, specifying the dependent variable as ‘freq’ in the case of the log-linear models (Equations 4 and 5). To address the second part of Question One, and explore the prospective effects of sex and institutional affiliation on participation in each field, binary logistic regression modelling

was used, as shown below, where  $y$  denotes the field,  $x_1$  is sex, and  $x_2$  is institutional affiliation.

$$y = \ln\left(\frac{p}{1-p}\right) = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2 \quad (3)$$

The model contained one interaction term ( $b_3 x_1 x_2$ ), to test for the effects of sex and institutional affiliation combined, on participation in field  $y$ . In binary logistic regression,  $y$  represents the natural log odds ('logit') for the outcome of interest, in this case, the odds of a woman studying in each field. In other words, the four logit models explained the change in natural log odds ( $y$ ) of being a student in each of the four fields, when taking into account sex ( $x_1$ ), institutional affiliation ( $x_2$ ), as well as the interaction between them ( $x_1 x_2$ ). This phase of the analysis thereby facilitated testing of the following hypothesis:

$$\text{Hypothesis 1.2} - (H_0) b_3 = 0, (H_a) b_3 \neq 0$$

When applied in the case of each educational field, this hypothesis was intended to ascertain if sex and institutional affiliation interact to exert a statistically significant effect on the odds of female representation in that field. In other words, for, say, engineering, it was hypothesised that being female *and* attending UM, would have a significant effect on the odds of enrolment in an engineering-related programme.

Institutional affiliation was defined simply as, UM or "other". In order to make inferences about the "other" category, therefore, a closer examination of the constituent data and underlying logic, is warranted here. Aside from UM, the second major FHE provider in the country is the Malta College of Arts, Science and Technology (MCAST). It is worth noting that MCAST typically reports admissions of around 8,000 students at all levels in its official annual reports (2018; 2019). Given that the "other" category in this study was ultimately comprised of 8,237 students, it is a fair assumption that MCAST (and by extension, VET), represents the lion's share of the "other" category. Apart from MCAST, the remaining minority of students in the "other" category, represent smaller institutions offering mainly vocational and business-related qualifications (see NSO, 2020, p.85, methodological note 10). Some of these institutions include, for instance, the Institute of Tourism Studies (ITS) and Jobsplus. Post-secondary general sixth-form colleges are *not* included in this category. So, the UM category was therefore used to make inferences in the

analysis of results, about the general/academic track of FHE in Malta, while the “other” category was contrarily used to make inferences about the vocational/professional track.

*Question Two*

Table 3, below, shows the data operationalised for Question Two. The data were again organised around the main classifications shown previously in Table 1, and cross-tabulated according to the logic of Smyth and Steinmetz (2008), based on the proportions of women found in feminine-labelled fields. In other words, the contingency table enabled calculation of the odds of actually finding a women in a feminine-labelled field, both in education, as well as in the workplace.

<i>Contingency table for Question Two</i>			
		<b>Women in feminine-labelled field</b>	
		<b>Yes</b>	<b>No</b>
<b>Occupational/ educational affiliation</b>	UM	5594	692
	Not UM	3458	346
	Education Total	9052	1038
	Work	76717	25446

*Table 3: Counts for women who were (Yes), and were not (No), in a feminine-labelled field, by affiliation to either educational or workplace settings*

To address Question Two regarding the relationship between educational sex-segregation, and workplace sex-segregation, a saturated log-linear model was used to model the data in Table 3. The *b* coefficients were used to explore the natural log odds of expected frequencies (*f*) for *x*<sub>1</sub> (women in feminine-labelled field), and *x*<sub>2</sub> (work or education), as shown below in Equation 4:

$$y = \ln(f) = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2 \quad (4)$$

The *b* coefficients and related statistics enabled calculation of the odds of finding a woman in a feminine-labelled field, in education as opposed to industry. As such, Hypothesis 2.1 was formulated to posit an association between feminine-sex-typing, and women’s status as student or worker, or, more formally defined:

$$\text{Hypothesis 2.1 - (H}_0\text{) } b_1 + b_3 = 0, \text{ (H}_a\text{) } b_1 + b_3 \neq 0$$

For further exploration of the differential effects of educational institutional affiliation on workplace sex-segregation, a second model was built to incorporate, over and above  $x_1$  (women in feminine-labelled field), the inclusion of the dummy variables  $x_2$  for attendance at UM, and  $x_3$  for employment in the workplace. Interaction terms were also included as follows:

$$y = \ln(f) = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_1 x_2 + b_5 x_1 x_3 \quad (5)$$

This second model enabled an estimation of the overarching odds-ratio between, the probability of finding a woman in a feminine-labelled field in *UM* as opposed to the workplace, and the probability of finding a woman in a feminine-labelled field in *non-UM* institutions as opposed to the workplace. In other words, as posited in Hypothesis 2.2, educational affiliation would have an effect on women's odds of being in a feminine-labelled field in the workplace. Or, as more formally stated:

$$\text{Hypothesis 2.2 - (H}_0\text{) } b_1 b_2 = 0, \text{ (H}_a\text{) } b_1 b_2 \neq 0$$

According to social science convention, null-hypothesis testing was carried out using a confidence level of 95% ( $\alpha = .05$ ).

## Results and Discussion

### *Question One*

#### *The descriptive contours of sex-segregation in Maltese FHE*

The first research question sought to ascertain the general shape of sex-segregation across fields in Maltese FHE. Charles and Bradley's (2009) sex-segregation method yielded the values for Malta shown in the first row of Table 4, below. Several other countries from their study are included in the table, for sake of comparison. For the field-specific values, negative numbers denote under-representation of women, while positive number denote their over-representation. The summary sex-segregation index on the right indicates the multiplicative factor of over-or under-representation, with a value of 1 representing perfect parity.

<i>The descriptive contours of sex-segregation in Malta and other countries</i>					
Country	1 - Engineering	2 - Math/ natural science	3 - Humanities / social science	4 - Health/ other	Summary sex segregation index
<i>Malta</i>	-1.20	-.69	.66	1.24	2.68
Colombia	-.63	-.10	.34	.39	1.51
Bulgaria	-.65	-.05	.71	-.02	1.62
Tunisia	-.73	-.14	.38	.47	1.62
Switzerland	-1.88	.09	.97	.81	3.11
South Africa	-1.96	.36	.81	.79	3.15
Hong Kong	-1.87	-.20	1.35	.71	3.35
Finland	-1.67	-.80	1.00	1.47	3.60
North Macedonia	-.89	.54	.38	-.03	1.74
Slovenia	-1.42	.14	.91	.37	2.38
Cyprus	-1.56	.37	1.51	-.32	3.04
US	-1.44	.02	.73	.69	2.40
Ireland	-1.54	.49	.99	.06	2.58
Italy	-1.69	.43	.77	.49	2.67
UK	-1.50	-.29	.56	1.23	2.78

Table 4: Sex-segregation across countries, according to Charles and Bradley's (2009) method

Overall, countries exhibited remarkably similar trends, with significant under-representation of women in engineering appearing, at least until 2009, as a virtually ubiquitous cross-nation phenomenon. The values from Charles and Bradley's study reinforce the general notion that fields one and two (engineering, maths and natural science) tend to be masculine-labelled, while fields three and four (humanities, social science, health and other) tend to be feminine-labelled, with few exceptions. The first group of countries in Table 4 (Colombia, Bulgaria and Tunisia) are included because, according to the summary sex-segregation index, they showed the lowest sex-segregation overall in Charles and Bradley's study, while the second group of countries (Switzerland, South Africa, Kong Kong and Finland) showed the highest. North Macedonia, Slovenia and Cyprus are included due to their small (albeit larger than Malta's) population sizes. The US, UK, Ireland and Italy are included for sake of additional general comparisons.

Ultimately, the overall shape of sex-segregation in Maltese FHE does not appear to differ significantly from international trends, when organised statistically according to Charles and Bradley’s method for the purpose of direct comparison with the other 44 countries (not all of which are shown here) in their study. The situation in Maltese FHE would appear to reflect Barone’s (2011) generalisation that women are systemically under-represented in technical and scientific fields in most countries, albeit to varying degrees. Charles and Bradley, incidentally, found an inverse correlation between such varying female representation in masculine-labelled fields, and GDP. In other words, as female representation in *masculine*-labelled fields (like engineering) increases, GDP tends to decrease. When female representation in *feminine*-labelled fields increases, on the other hand, so does GDP. It should be noted, however, that the segregation values by field presented in their study as well as here, are standardised, and do not take into account the overall size of workforce participation in respective countries. High participation in the labour market has, in this sense, been associated with higher sex-segregation values since more women participate overall, and subsequently become channelled into feminine-labelled occupations. In other words, the more women enter the labour market, the more segregation tends to occur, which would explain the high segregation rates observed in economically advanced countries. Somewhat disconcertingly for Malta, this insight suggests that local sex-segregation actually runs deeper than it would initially appear when comparing these figures quantitatively to those of larger countries. Charles and Bradley also reported stronger over-representation of women in service-based economies, another poignant factor for Malta, given its own continuing transition to an increasingly service-based economy (Cedefop, 2017).

<i>Female representation by institutional affiliation in Engineering</i>					
<b>Term</b>	<b>Description</b>	<b>Coeff.</b>	<b>S.E.</b>	<b>Z</b>	<b>Sig. Odds</b>
$b_0$	(Intercept)	-1.04	.03	-30.36	p<.001.35
$b_1 x_1$	Female	-2.17	.09	-23.96	p<.001.11
$b_2 x_2$	Studies at UM	-.75	.05	-13.95	p<.001.47
$b_3 x_1x_2$	Female * Studies at UM	.79	.12	6.66	p<.0012.20

Table 5: Logit model for engineering

*The effects of institutional affiliation on the shape of FHE sex-segregation*

For Question 1.2, the binary logistic (logit) regression model defined above in Equation 3, was applied in the case of each field. The main aim was to explore the effects of sex and institutional affiliation combined, as an interaction term.

In other words, what was the effect of affiliation with UM (as opposed to any other institution), on the likelihood of a women selecting, say, engineering? The four logit models are presented below, one for each field.

The results show that the gender-institutional interaction term in the case of engineering, was significant ( $b_3=.79$ ,  $p<.001$ ), allowing the first rejection of the null for Hypothesis 1.2 ( $b_3=0$ ). The coefficient  $b_3$  indicates that, for women, attending UM (as opposed to other institutions), effectively doubled the likelihood of following an engineering-related programme ( $\exp[.79]=2.2$ ). In other words, the converted odds of studying engineering if you were both female and studying at UM (as opposed to studying anywhere else) are 2.2 to 1.

<i>Female representation by institutional affiliation in Math/natural science</i>					
Term	Description	Coeff.	S.E.	Z	Sig. Odds
$b_0$	(Intercept)	-1.05	.03	-30.56	$p<.001$ .35
$b_1 x_1$	Female	-1.86	.08	-23.01	$p<.001$ .16
$b_2 x_2$	Studies at UM	-.90	.06	-16.10	$p<.001$ .41
$b_3 x_1x_2$	Female * Studies at UM	1.21	.10	11.56	$p<.001$ 3.34

Table 6: Logit model for maths and natural science

In the case of maths and natural science, the odds appeared even better for women at UM. The null for Hypothesis 1.2 ( $b_3=0$ ) could also be rejected here, since  $b_3=1.21$  ( $p<.001$ ), which means that for women, attending at UM (as opposed to anywhere else), increased the likelihood of studying maths or natural science by a factor of more than 3 ( $\exp[1.21]=3.34$ ).

<i>Female representation by institutional affiliation in Humanities/social science</i>					
Term	Description	Coeff.	S.E.	Z	Sig. Odds
$b_0$	(Intercept)	-.29	.03	-9.65	$p<.001$ .75
$b_1 x_1$	Female	.85	.05	18.73	$p<.001$ 2.34
$b_2 x_2$	Studies at UM	.50	.04	11.82	$p<.001$ 1.65
$b_3 x_1x_2$	Female * Studies at UM	-.55	.10	11.56	$p<.001$ .58

Table 7: Logit model for the humanities and social science

According to the previous findings concerning the general shape of sex-segregation in Maltese FHE, the remaining fields (Humanities, social science, health and other) can be considered feminine-labelled. So the effect of studying

at UM, was again significant, permitting another rejection of Hypothesis 1.2 ( $b_3=0$ ), since UM had the effect of reducing sex-segregation when compared to the remaining FHE institutions in Malta ( $b_3=-.55$ ,  $p<.001$ ). In other words, by studying at UM, women were nearly half as likely ( $\exp[-.55]=.58$ ) to choose humanities and social science as they would have been studying elsewhere.

<i>Female representation by institutional affiliation in Health/other</i>					
<b>Term</b>	<b>Description</b>	<b>Coeff.</b>	<b>S.E.</b>	<b>Z</b>	<b>Sig. Odds</b>
$b_0$	(Intercept)	-2.92	.07	-42.84	$p<.001$ .05
$b_1 x_1$	Female	1.94	.08	25.14	$p<.001$ 6.96
$b_2 x_2$	Studies at UM	1.40	.08	18.01	$p<.001$ 4.07
$b_3 x_1x_2$	Female * Studies at UM	-1.44	.09	-15.88	$p<.001$ .24

Table 8: Logit model for health and other

The emerging trend appeared even stronger for health and other fields, where Hypothesis 1.2 ( $b_3=0$ ) was again rejected, showing that women were even less likely (over four times less) to be in health or other fields if they studied at UM ( $b_3=-1.44$ ,  $p<.001$ ,  $\exp[-1.44]=.24$ ). Based on the logic presented earlier regarding the UM and 'other' categories, the evidence ultimately supports the claim that sex-segregation in Maltese FHE is more pronounced in the vocational track, lending credence to the concerns of Reisel, Hegna, & Imdorf (2015), that VET may be complicit in the reinforcement of gender inequality in society. These findings also support Este'vez-Abe's (2011) claim, at least in the Maltese context, that specialist vocational programmes are more segregating than general programmes. It should be noted that social class is omitted here as an important confounding variable. More research is needed to evaluate the effects of class on women's propensity to attend UM (as opposed to vocational institutions) in the first place, having a likely significant effect on their chances of duly succeeding to transcend gender stereotypes.

The reintroduction of vocational tracks in secondary schools in Malta (Cedefop, 2017), meanwhile, naturally exacerbates concerns about VET's complicity in the reproduction of gender inequality. The earlier career choices are made, the more deep-rooted gender stereotypes are reinforced via the reluctance of young people to stand out from the crowd as wanting to do a job that is associated with the "opposite" sex (Fuller and Unwin, 2013). Charles and Bradley (2009) have argued, in this sense, that "gender-essentialism", has remained a remarkably resilient ideology, perpetuating gender stereotypes by

shaping individual choices on the basis of misguided assumptions about fixed and immutable (essential) gender qualities.

Reisel, Hegna, & Imdorf (2015) meanwhile have made the important distinction between coordinated labour markets and liberal labour markets in the organisation of VET systems. In the former, VET institutions tend towards apprenticeship systems with firm- or industry-specific skills. In the latter, they favour the development of more general skills in school or college settings. They contended that firm- and industry-specific systems tend to be biased against women because they concentrate men in male-oriented jobs. Given the overt expressions of commitment by major VET stakeholders in Malta towards cultivating stronger ties with employers, and increasing their focus on apprenticeships and work-based learning (MCAST, 2021), therefore, the question of gender equity raises at least one cause for restraint in this line of policy-making.

### **Question Two**

#### *Sex-segregation in educational and workplace settings*

To test Hypothesis 2.1 (and thereby address Question 2.1), a saturated log-linear model for the higher-order terms in the contingency table shown above (Table 3) was evaluated. The parameters for this first model are shown below in Table 9.

<i>Women in feminine-labelled fields in education and the workplace</i>					
<b>Term</b>	<b>Description</b>	<b>Coeff.</b>	<b>S.E.</b>	<b>Z</b>	<b>Sig. Odds</b>
$b_0$	(Intercept)	10.14	.006	1618.2	$p < .001/$ 0
$b_1 x_1$	Sex-typed	1.10	.007	152.55	$p < .0013.01$
$b_2 x_2$	Education	-3.20	.03	31.65	$p < .001.04$
$b_3 x_1x_2$	Sex-typed * Education	1.06	.03	31.65	$p < .0012.89$

Table 9: Saturated log-linear model for Question 2.1

The coefficients are again presented in logits, indicating the degree to which the average overall frequency was affected by a given parameter, while controlling for all others in the model. The converted odds are also presented in the final column on the right. Closer examination of these odds reveal a number of key insights. According to coefficient  $b_1$ , women in the workplace were 3.01 times more likely ( $p < .001$ ) to be in a feminine-labelled field, than in a non-feminine-labelled field. The coefficients  $b_1 + b_3$ , however, show that the

odds rose to 8.72 for women in Maltese FHE. In other words, in Maltese FHE overall, women were 8.72 times more likely to be in a feminine-labelled field than in a non-feminine-labelled field.

Coefficient  $b_3$  (1.06,  $p < .001$ ) shows the odds-ratio between these two sets of odds. The null for Hypothesis 2.1, that sex-segregation and educational/occupational status were not associated ( $b_3=0$ ), could thus be rejected, suggesting that women were nearly three times more likely ( $\exp[1.06]=2.89$ ) to be in a feminine-labelled field in FHE than they were in the workplace. So, while both sectors were sex-segregated, Maltese FHE appeared to be *more* sex-segregated than the workplace, indeed, nearly three times as much. Further to the descriptive contours of sex-segregation explored in Question One, these findings appear to increasingly implicate FHE sex-segregation as a potentially significant factor in the reinforcement of broader horizontal gender inequality in Maltese society (albeit with UM doing so to a slightly lesser degree).

Smyth and Steinmetz (2008) argued that “sex-typing” specific educational pathways along the same lines as those in the workplace, has reinforced sex-segregation in FHE, despite on-going and widespread delegitimation of overt exclusionary educational practices. The present findings meanwhile warrant some further examination of this logic, at least in the Maltese context. If sex-segregation in FHE is a result of institutions modelling themselves on the workplace, then *deeper* segregation in FHE itself when compared to the workplace, would seem unlikely.

It could be argued, therefore, that a degree of dynamism in the modern workplace may have somewhat eroded gender stereotypes, as both women and men are forced to respond to ever-adapting labour market forces by abandoning traditional notions of what jobs they “should” be doing as women and men. While it comes with an important caveat, this interpretation suggests that, in their attempts to serve industry, FHE institutions may be operating more on the basis of detached, underlying assumptions and stereotypes surrounding gender, rather than on any effective grasp of real, present-day labour market forces. Consequently, one might earnestly question the general enterprise of attempting to closely model FHE curricula on a changeable and fast-moving labour market in the first place, given the difficulties of doing so effectively, due, in part, to the continuing surreptitious influence of persistent underlying gender-essentialist ideology. Changing deep-seated attitudes and

assumptions about gender roles, in this sense, would appear to be the more promising strategy for addressing systemic discrimination.

The aforementioned dynamism of modern labour markets with regard to gender, meanwhile, should be interpreted with extreme caution. Indeed, what could be seen as dynamism from the perspective of gender, ignores the crucial aforementioned perspective of social class that is so integral to capital-labour relations (Smith, 2016). If absolute maximisation of profits engenders steady devaluation of labour power, then in a situation where women’s labour is already at heightened risk of devaluation, as evidenced by subtle yet observable forms of vertical and horizontal inequality, the interaction of gender and class places women at especially heightened risk of capitalist exploitation. Smith’s report on the “super-exploitation” of women already well underway in the global south, represents a dire warning for vulnerable economies everywhere. High sex-segregation in Malta, in this sense, may be conceptualised as a sort of kindling, for a potentially explosive combination of unfettered neoliberalism and gender-essentialism.

*The effects of institutional affiliation on workplace sex-segregation*

To further examine the effects of specific institutional affiliation on sex-segregation in Maltese FHE and the workplace, the following model, as defined in Equation 5, was built.

<i>Saturated log-linear model for Question 2.2</i>					
<b>Term</b>	<b>Description</b>	<b>Coeff.</b>	<b>S.E.</b>	<b>Z</b>	<b>Sig. Odds</b>
$b_0$	(Intercept)	5.85	.05	108.75	p<.001/
$b_1 x_1$	Sex-typed	2.30	.06	40.83	p<.0019.99
$b_2 x_2$	UM	.69	.07	10.52	p<.0011.99
$b_3 x_3$	Work	4.30	.05	79.41	p<.00173.70
$b_4 x_1x_2$	Sex-typed * UM	-.21	.07	-3.06	p<.01 .81
$b_5 x_1x_3$	Sex-typed * Work	-1.20	.06	-21.08	p<.001.30

Table 10: Saturated log-linear model for Question 2.2

The odds for coefficient  $b_1$  show that women who attended Maltese FHE institutions other than UM, were 9.99 (p<.001) times more likely to be in a feminine-labelled field than in a non-feminine-labelled field. The odds for those at UM ( $b_1+b_4$ ), on the other hand, as already indicated by the findings of the logit models for Question One, were somewhat lower, at 8.08. It could be further extrapolated from the reverse odds of  $b_5$  (p<.001), that women

attending FHE institutions other than UM, were 3.32 times more likely to be in a feminine-labelled field as their working counterparts. Women attending UM, on the other hand, according to the subtraction of  $b_4$  ( $p < .01$ ) from the previous logged odds, were 2.68 times as likely to be in a feminine-labelled field as their working counterparts.

The reversed, exponentiated odds of  $b_5$  ( $p < .001$ ), further define the relationship between UM and other FHE institutions, by permitting a rejection of the null hypothesis that educational institutional affiliation did not affect women's odds of being in a feminine-labelled field in the workplace ( $b_4 = 0$ ). The evidence, therefore, supports Hypothesis 2.2 ( $b_4 = -.21$ ,  $p < .01$ ). In other words, the odds-ratio between feminine-typing at other institutions and the workplace, as opposed to UM and the workplace, was (by reversing the exponentiated odds derived from  $b_4$ ), 1.24. More simply put, women were 1.24 times as likely to be in a feminine-labelled field at work if they did not attend UM. These findings are consistent with the notion that vocational/professional tracks, as opposed to general/academic, serve to exacerbate gender inequality (Este 'vez-Abe, 2011; Reisel, Hegna, & Imdorf, 2015). This would further intimate that approaches towards gender currently in place at UM, may prove insightful in helping to facilitate reduced sex-segregation elsewhere in Maltese FHE.

## Conclusion

The data used in this study were limited to the 2016/17 academic year. Changes in the manner in which FHE data were collected by the NSO in subsequent years, rendered data from 2016/17 the most recent of its kind for suitably addressing the main research questions. Possible systematic changes in sex-segregation since then, perhaps resulting from the global pandemic, represent an enticing avenue for additional research, building on the pre-COVID findings presented here. Similarly, the comparisons made between Malta and other countries with regard to the general shape of sex-segregation by field, take into account data from Smith and Bradley's (2009) study. Interpretation of the comparative data should therefore take the intervening decade into account, along with any likely systematic changes that may have occurred in the nominated countries over that period. It should also be noted as a limitation, that Question Two and its associated hypotheses (2.1 and 2.2) were based on a qualitative sorting of the occupational fields presented in the NSO reports in order to correlate educational and occupational fields. Categorisation may have resulted in some crossover and loss of resolution in

the findings, diluting their validity. The categories are therefore fully explicated in Table 1 for the sake of transparency. The study findings should, ultimately, also be delimited as only part of the complex story of gender inequity in Malta, with additional qualitative work needed to more fully and intimately understand sex-segregation patterns and their underlying structures.

In summary, according to the main findings, women in Malta were between two to three times as likely to take up traditionally masculine-labelled courses at UM as they were in other FHE institutions. Given the observable decreased propensity for gender stereotyping at UM, the contrary claim can be made, that choosing to study VET programmes in Malta increases the likelihood of conformity to traditional gender stereotypes. More research is needed to understand how social class and other factors affect women's choice of college or university in Malta, for a more effective and controlled appraisal of the interaction between sex and institutional affiliation in the future. And finally, the present study showed that, based on the propensity for women to be channelled into feminine-labelled fields, overall, *both* categories of FHE institutional affiliation (UM and "other") have manifested significant sex-segregation rates. Maltese women were around three times as likely to be in a feminine-labelled field in FHE than they were at work.

The findings are presented under the assumption that the production of new knowledge about the dynamics of sex-segregation in Maltese FHE, may contribute in part to the development of a more just and equitable Maltese society. On an individual level, sex-segregation makes it harder for both women and men to succeed in fields dominated by the "other" sex, rendering sex and gender as obstacles to the development of interests, talents and abilities. On a broader social scale, if every occupational field had equal representation, then every field would have a larger pool of labour power from which to draw. While the latter assertion assumes a somewhat impoverished human-capital perspective of socially valid work, it is partly motivated by the substantive need to highlight the problematic nature of current gender inequity, in a "language" that is understood by key education and economic actors currently in ascendancy.

It has been argued in this paper, that when taking into account the inherent class dynamics of capital-labour relations, the apparent dynamism of the workplace, as evidenced in this study by lower workplace sex-segregation,

conceals unwitting submission by women and men alike, to the machinations of a continuing system-wide devaluation of labour power. In a climate sullied by unrestrained neoliberalist and gender-essentialist ideologies, the intersection of gender and class, in this sense, appear to place women at heightened risk of intensifying capitalist exploitation. In the broader intersectional context, therefore, addressing sex-segregation in FHE clearly assumes a heightened sense of urgency. Curricular reform with the goal of deconstructing gender stereotypes has been argued as a viable means of addressing systemic gender inequity in Maltese society. Observably lower sex-segregation in the academic as opposed to the vocational track, as evidenced in this study, meanwhile provides potential clues for affecting more homogeneous approaches to gender equality across all Maltese FHE institutions.

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