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Background and Major Choice in Tertiary Education: Evidence from Ireland

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Abstract: While prior research has established a strong link between background and academic success, the impact of background on specific academic decisions, particularly college major choices, remains less explored. With the use of the *Growing Up in Ireland* dataset, I investigate whether children from different backgrounds make systematically different college choices from each other. Applying a multinomial logistic regression, I find that background measures such as parental education and income impact choices in several college majors. Maternal education is significantly associated with choosing Education and Arts and Humanities, while household income significantly influences choices in Social Sciences. Robustness checks indicate that these relationships differ by gender and type of tertiary institute, with the definition of background considerably impacting the shape and significance of estimates. Overall, the findings from this paper highlight the need for targeted policies to support students from disadvantaged and less educated backgrounds. Such policies may need to be major-specific to ensure equal opportunities for all students.

I INTRODUCTION

One of the most important decisions an individual can make is whether they attend tertiary education. A long line of evidence has shown that possessing a qualification from a higher education institution can substantially improve the subsequent wages and career choices of an individual (Van Der Velden and Bijlsma, 2016; Donovan and Bradley, 2018). Included in the decision to attend tertiary education is what

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major or field does one study.[1] Different fields have historically shown to vary considerably regarding career and wage trajectory. Specific fields offer more (or less) financial security and opportunity than others (Carnevale *et al.,* 2012). One's choice of field is often related to the choice of occupation, especially in areas that require a considerable amount of investment in occupation-specific human capital (Patnaik *et al.,* 2020). Choosing a field of study is, therefore, of extreme importance to an individual and their future.

While several factors impact the overall education someone receives throughout their lifetime, family (in particular parents) is noted as one of the most influential (Kalil *et al.*, 2016; Antman, 2012). Although previous research has highlighted the role that one's family can play in providing an educational advantage, little work has explored the direct effect of family on the educational decision-making process, particularly on choice of college majors.

This paper explores the impact of background on the choice of college major in tertiary education in Ireland. I examine the role of background on major choice and whether children from different backgrounds are more or less likely to major in a particular programme in post-secondary education. I also run a series of robustness tests, which help me investigate issues such as whether there are differential effects by gender and tertiary institution type, as well as the impact of the background measure used. For the main analysis, however, maternal education and family income are included as the primary background measures, with this study utilising a balanced panel from the nationally representative *Growing Up in Ireland* (GUI) dataset. The GUI dataset, the first longitudinal study of its kind in Ireland, provides rich data on parental characteristics and various aspects of the young participants' childhoods, including items on health, education and personal experiences. The young people in this study were entering into tertiary education in Ireland between 2015-2018.

There are several motivations for studying how background can influence major choice. Firstly, higher education institutions invest heavily in promoting diversity and inclusion among students and staff, particularly those from marginalised backgrounds. This study's findings can shed light on potential inequalities in access to educational opportunities based on these backgrounds. Secondly, governments are currently facing significant difficulties regarding employment and skill shortages. For example, Ireland has (and is) facing significant supply-side shortages in Healthcare, Engineering, and Construction (for example, see Krings *et al.*, 2011). Major choice affects the skill composition of a workforce, which in turn has serious consequences for the dynamics in an economy (Patnaik *et al.,* 2020). Thirdly, gender segregation and under-representation within specific majors are widely prevalent. Female participation is significantly lower in Science, Technology, Engineering, and Mathematics (i.e. STEM) (Card and Payne, 2021). Historically,

[1] I use 'college major' and 'field of study' interchangeably.

women have been concentrated in specific disciplines, often associated with lower financial returns compared to male-dominated fields (Grogger and Eide, 1995). This "gendered field concentration" has been linked to the persistent gender pay gap (Machin and Puhani, 2003; Francesconi and Parey, 2018).[2] Therefore, this research's findings can help to understand and address issues regarding gendered disparities in educational and employment outcomes.

Most existing literature examining the impact of background on major choice focuses on the United States.[3] The Irish case, however, provides an interesting expansion to the existing work due to its college admissions system. In Ireland, entry to a higher-level institution is carried out via a single centralised system.[4] Individuals wishing to enter higher education provide a ranking of their preferences for specific programmes through this centralised system. Admission to a programme is based on the grades a young person achieves in a set of examinations taken at the end of the post-primary cycle and the preference ranking of programmes.[5] Studying this admission system is, therefore, of particular interest as I can examine those from all backgrounds without the confounding factor of unequal opportunity. This centralised application system ensures that all students compete on the same platform, irrespective of background. Additionally, standardised tuition fees across institutions remove cost as a decision-making factor. Furthermore, financial barriers are minimised for less advantaged students through fee waivers and maintenance grants, allowing them to focus on academic merit when applying.

While no previous research has examined the research question at hand using Irish data, work by Delaney and Devereux has explored various other factors influencing major selection within the Irish context. Delaney and Devereux (2021a) investigate how within-school rank in English and Mathematics, controlling for absolute achievement at the end of secondary school, influences college major choice. They find that students with higher Mathematics rank are more likely to choose STEM majors and less likely to choose Arts and Social Sciences majors. Conversely, students with higher English rank are more likely to choose Arts and Social Sciences majors and less likely to choose STEM majors. Delaney and Devereux (2021b) explore how equally achieving male and female students differ in their college choices. Their findings suggest that females tend to prioritise field of study over specific institutions. This is reflected in their top three college choices, which are more likely to be clustered within a particular field of study rather than focused on a specific institute. Finally, Delaney and Devereux (2020) examine the

[2] Francesconi and Parey (2018) conclude that the single most important proximate factor that explains the wage gap is the field of study in higher education.

[3] In the US system, students often have until the end of the second year of their undergraduate to declare a major. Irish students, however, choose their field of study at the same time as they choose their higher-level institution.

[4] This admission system is described in detail in a supplementary Appendix which is available upon request.

[5] These examinations are known as the Leaving Certificate.

differences in college application behaviour between students from disadvantaged and advantaged secondary schools. Controlling for academic achievement and college opportunities, the authors find that students from advantaged secondary schools are more likely to apply to universities and more selective college programmes.

I find that family background significantly influences the selection of several college majors. Maternal education significantly influences major choices, particularly towards Arts and Humanities, Education and Social Sciences. Students from families with higher levels of maternal education are more likely to pursue these fields, potentially reflecting a preference for majors with perceived social value. Conversely, maternal education has a limited impact on STEM and Life Sciences choices, suggesting that other factors may be more influential in these areas. Family income also plays a crucial role in shaping major choices. Students from higher-income families are more likely to choose Social Sciences, while those from middle-income families are more likely to pursue Education. In contrast, higher income is associated with a decreased likelihood of choosing STEM and Life Sciences. The above findings highlight the need for targeted policies to support students from disadvantaged and less educated backgrounds, ensuring equal opportunities for all students.

The rest of this paper is structured as follows. A review of the existing literature is presented in Section II. The data, model, and empirical specification are described in Section III. The results of this study are presented in Section IV. Section V outlines a series of robustness checks. A detailed discussion is provided in Section VI while Section VII concludes before commenting on limitations and future research.

II LITERATURE REVIEW

There is limited work exploring the impact of background on educational decisions, particularly relating to an individual's chosen field of study. Though sparse, the existing literature does hint at the relationship between background and major choice. Existing work focusing on parental background uses education and income as factors of influence. Georg and Bargel (2017) find that the education level of a father has a weak effect on an individual's choice of college major. Leighton and Speer (2023) find that the influence of family background, especially education, is related to major choice and that this does not weaken as students progress throughout their college career. The authors of this paper also explore the influence of background on the earnings age profiles of majors. While both education and income are positively correlated to major earnings, education is much more strongly related to the earnings growth of a major. Those from backgrounds of higher parental education are selecting majors with much faster earnings growth and are less likely to choose safe, low-downside majors.

Additional research on major choice has focused on occupation as a factor of influence. Leppel *et al.* (2001) explores whether having a parent with a professional or executive occupation affects an individual's choice of major. They find that females are more likely to choose the Sciences and Engineering or Health if their father possesses such an occupation. In contrast, males whose fathers are in similar-ranking occupations are more likely to choose the Social Sciences, Engineering, or Health. Although not directly related to occupation, Georg and Bargel (2017) investigated field of study choice inheritance.[6] Looking at academic (i.e. university) versus non-academic (i.e. non-university) programmes, the authors observed a significantly strong association between a student's chosen field and their father's field of study in academic disciplines (university programmes). In contrast, a much weaker effect is found for non-academic programmes.

Other research has used socioeconomic status as their background variable of choice (Dar and Getz, 2007). Socioeconomic status is often constructed as a mixture of variables, with items such as parental education, income and occupation commonly used. Examples of this work include Ma (2009), who finds that children from a lower socioeconomic status were more likely to choose a more lucrative college major, with the overall effect of family socioeconomic status being different for males and females. Additional work by Leppel *et al.* (2001) found that women from a family with a higher social status are less likely to major in a business degree, with the reverse holding for their male counterparts.

Other work has examined how parental involvement or influence can impact major choices. Lowinger and Song (2017) find that higher parental involvement saw students more inclined to major in a STEM programme than liberal arts. Separate work by Ma (2009) does not find any significant effects for general involvement measures but does find that parental involvement in domain-specific activities significantly affects the eventual choice of college major. Porter and Umbach (2006) do not find any significant effects of influence on major choice, however Simpson (2001) finds significant results when analysing a mother's influence. The author finds that higher scores of maternal influence discourage a child from technical majors (e.g. Engineering and Computer Science) and more towards that of a nontechnical or public service major. Additional research in the area of major choice has analysed how the gender of siblings can impact major choices (Altmejd *et al.,* 2021). Work by Anelli and Peri (2015) found that mixed-gender siblings tend to choose college majors that are more gender-stereotypical or male/female-dominated.

Related strands to the above literature have examined the role that family and background play in the educational attainment of a young person (Bredtmann and Smith, 2018; Helin *et al.,* 2023). The literature has looked at various mechanisms

[6] This inheritance refers to the case where children are influenced by their parents' educational backgrounds, particularly the fields of study their parents pursued when making their own major choices.

by which family influences attainment. Factors such as birth order have been shown to significantly influence education (De Haan, 2010; Oliveira, 2019). Kantarevic and Mechoulan (2006) find that being a first-born confers a significant educational advantage. Family size is also a significant factor in attainment levels (Sen and Clemente, 2010). Black *et al.* (2005a) find a negative correlation between family size and children's education; however, this effect becomes negligible when including indicators for birth order or using twin births as an instrument. Non-adopted versus adopted children have displayed differing levels of attainment, although the research results to date have been mixed (see Silles, 2017). Children from single and step-parent households display significantly lower educational attainment, particularly at tertiary level (Ermisch and Francesconi, 2001; Ver Ploeg, 2002). Björklund and Sundström (2006) show that while their analysis does display the expected negative and significant relationship between parental separation and educational outcomes, this finding is due to selection rather than causation. Additional research has also focused on extended family's effect on a child's educational success (Loury, 2006). Parents' educational, occupational and income status has been shown to be positively associated with their children's educational attainment and achievement (Ermisch and Francesconi, 2001; Daouli *et al.,* 2010). However, not all research has supported these findings, with Schildberg-Hoerisch (2011) concluding that they find little evidence to support the idea of parental occupation influencing educational attainment once controlling for household income.

In this research, I differentiate from the existing literature in two ways. Firstly, I focus on choice rather than attainment. Extensive research has focused on educational attainment as the primary outcome variable, thereby producing a gap in understanding how family background shapes students' decisions regarding their academic specialisation. Secondly, this research contributes to the geographical scope of existing literature by utilising data from Ireland. As mentioned above, most of the existing work has focused on the United States, with Ireland providing an interesting study due to its admissions system for tertiary education. Therefore, investigating family influence within the Irish context allows a better understanding of how family dynamics and background may influence major choices.

III DATA AND METHODOLOGY

3.1 Data

This study utilises data from the *Growing Up in Ireland* (GUI) Child / '98 Cohort. GUI is a national longitudinal study of children in Ireland, which aims to provide evidence-based research into various areas of childhood for Irish children. The first wave of the Child Cohort collected information on 8,568 children aged 9 years old,

on average. These children were born between 1 November 1997 and 31 October 1998, with data collection for this initial wave taking place between August 2007 and May 2008. Data collection occurred through interviews with the children, parents, teachers and school principals. Children interviewed were selected from a nationally representative sample of primary school children nationwide. The final sample of over 8,500 children represented approximately 14 per cent (or about one in every seven) of the 9-year-old population residing in the country at the time.

This research uses data from Waves 1 through 4 of the GUI Child Cohort.[7] The Irish Social Science Data Archive (ISSDA) provided the dataset for use, which is approved for distribution by the Central Statistics Office (CSO) of Ireland. The dataset is provided as an Anonymised Microdata File (AMF), with certain items of identifiable and sensitive information removed from the original dataset.

3.2 Dependent Variable

Due to the nature of my research question, my outcome variable is an individual's choice of college major. For this analysis, I define a college major as any course undertaken by an individual in tertiary education (i.e. further or higher education). Tertiary education in Ireland is defined according to the National Framework of Qualifications Framework (NFQ). This system classifies and standardises all educational awards (i.e. introductory education to higher education and vocational training) within the country. The NFQ is structured into ten levels, each representing a different stage of the educational process. Levels 1 through 5 go from basic education (i.e. primary school – Levels 1-2) to the Junior and Leaving Certificate (i.e. Levels 3-5). Tertiary education is completed in Levels 6-10. Levels 6-7 cover advanced certificate courses, higher certificates, and ordinary Bachelor's degrees. Levels 8-10 are higher education qualifications, including honours Bachelor's degrees (Level 8), Master's degrees (Level 9), and doctoral degrees (Level 10). Levels 6-10 are awarded by institutes of technology, with universities only awarding degrees for levels 7 through 10. As such, any individual completing a programme in a Level 6 or above is included in the analysis of this research. While all programmes are straightforward in their definition of level, there is an overlap between non-tertiary and tertiary education levels in the form of Post-Leaving Certificate (i.e. PLC) courses. These programmes, typically one or two years in length, are offered as Levels 5 and/or 6 programmes. These courses can serve as an alternative method to entering tertiary education.[8]

[7] Subsequent waves followed the same group of children at ages 13, 17/18 and 20.

[8] Students are asked in the GUI if they have completed or are still undertaking a PLC Course (NFQ Level 5/6), with no distinction if it is being completed as just a Level 5 or also as a Level 6. Therefore, I cannot clearly distinguish whether they fall into tertiary education. However, if wholly excluded from the sample (approximately 0.5 per cent), results remain unchanged.

I excluded any observations with missing data and restrict my sample to those individuals who reported the tertiary institute they attend, what academic major they are studying and if this course is part-time, full-time or something else.[9, 10, 11]

The GUI reports majors as nine separate, general fields of study and is based on the definitions of broad fields in the International Standard Classification of Education (ISCED): 1. Education; 2. Arts and Humanities; 3. Social Sciences, Business and Law; 4. Science, Mathematics and Computing; 5. Engineering, Manufacturing and Construction; 6. Agriculture and Veterinary; 7. Health and Welfare; 8. Services; and 9. Other. Due to small sample sizes in the GUI, the following majors are combined: Science, Mathematics and Computing combined with Engineering, Manufacturing and Construction; Agriculture and Veterinary combined with Health and Welfare; and Services combined with Other. This leaves me with six major categories: 1. Education; 2. Arts and Humanities; 3. Social Sciences; 4. STEM; 5. Life Sciences; and 6. Services.[12]

The collapsing of majors was based on two factors and is similar to the methods carried out by Ma (2009). The first is in relation to the intensity of Mathematics involved in a given major. The fields of Services and Other typically require minimal levels of Mathematics, while Science and Engineering share a significantly higher and comparable Mathematics component.[13] The second factor concerns graduate wages. Using CSO data I grouped majors which reported similar median weekly earnings for graduates in the first year after graduation.[14]

To confirm whether the earnings one year out are representative of career earnings for graduates, median weekly earnings are also reported for graduates one to ten years after graduation (the real value base here being December 2016). While the merged categories might not perfectly satisfy both criteria, the groupings are generally intuitive (for example, Agriculture and Veterinary grouped with Health and Welfare to create the major Life Sciences).

Table 1 presents descriptive statistics for the collapsed major categories. Enrolment rates for each field of study at the national level are provided to show that this sample is representative of individuals attending tertiary education in Ireland during the sample period. Social Sciences and STEM are the most popular majors, representing over half of the sample. Arts and Humanities follow in third, with approximately one-fifth of the student population, followed by Life Sciences,

[9] See Appendix Table A.5 for a complete breakdown of observations lost.

[10] Additional types of institutions to universities or technology institutes include private colleges or colleges of education. See Appendix Table A.6 for a complete sample breakdown of higher institutes.

[11] From a balanced panel of 4,729 observations, complete responses for the above questions were recorded in 4,215 cases.

[12] See Appendix Table A.1 for full breakdown of college majors by category.

[13] Other includes items such as vocational majors, i.e. Beauty and Hairdressing. These 'Other' majors were collapsed and included under the major of Services.

[14] 2016 wage figures are available at: https://www.cso.ie/en/releasesandpublications/ep/p-heo/highereducationoutcomes-graduationyears2010-2019/whatdograduatesearn/.

with Services and Education possessing significantly lower proportions. See Appendix Table A.1 for a full breakdown of majors by field of study as provided by the GUI.[15]

Table 1: Descriptive Statistics – Dependent Variable

	Freq.	*Sample %*	*Pop %*	*Earnings (1st Year Post)*	*Earnings (1–10 Years Post)*
College Majors					
Education	210	5.86	6.83	€655	€1,015
Arts & Humanities	710	19.80	17.02	€355	€825
Social Science	913	25.47	26.76	€455/€465[16]	€905/€1,015
STEM	927	25.86	23.03	€505/€555	€1,030/€1,065
Life Sciences	565	15.76	20.22	€465/€625	€730/€905
Services	260	7.25	6.14	€380	€725

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: The CSO provided no earnings for graduates in the 'Other' field of study. The Population % statistic comes from the HEA and is the enrolment proportions by ISCED detailed field of study for 2016/2017: https://hea.ie/statistics/data-for-download-and-visualisations/key-facts-figures/.

3.3 Independent Variables

The GUI dataset defines the child participant of the survey as the "Study Child (SC)" and the "Primary Caregiver (PCG)" as the parent responsible for providing the most care and who knows the most about the study child. During the first wave of data collection, the mother or mother figure was mainly recorded as the PCG. I restrict my sample only to include those participants whose mother was recorded as the PCG.[17] Additionally, I only concentrate on singleton children.

I use maternal education and family income as background measures. In the GUI, the PCG was asked to report the highest level of education she had attained at the time of data collection. This measure is a 6-category variable based on the ISCED's definitions in the context of Irish education: 1. None/Primary school; 2. Lower Secondary; 3. Higher Secondary/Vocational; 4. Non-Degree; 5. Primary

[15] Data collection on major choices were recorded while students were pursuing their degree. Due to the timing of data collection, the year a student sat their Leaving Certificate and whether they transitioned straight from second to tertiary level education, a student may have been undertaking any possible year of their degree upon data collection. However, the majority were likely in their second or third year. Therefore, this analysis focuses on students' initial major choices, not necessarily whether they completed their degree. While degree completion rates vary significantly by field, institution, and cohort, completion data are unavailable for the students in this analysis.

[16] While Social Science was already grouped with Business and Law in the GUI dataset, the CSO provided separate earnings for graduates Social Science (€455) and Business and Law (€465).

[17] Approximately 1 per cent of the sample had a father as the Primary Caregiver.

Degree; and 6. Postgraduate.[18] Maternal education is used as a background measure for two reasons. The first is due to data constraints, where items relating to the child's Secondary Caregiver (i.e. SCG/the father) were not recorded in several cases.[19]

Secondly, however, there is a line of previous work (see: Karki Nepal, 2018; Chevalier *et al.,* 2013; Black *et al.,* 2005b) that has noted that a mother's education is a good predictor regarding a range of outcomes relating to a child (such as health and education), and is usually a better predictor than a father's, even when both are available.[20] I exclude any observations with missing or incomplete data for this measure. For the sake of this study, I combined None/Primary with Lower Secondary.[21]

For my measure of family income, I include equivalised income, which is the net weekly household income adjusted for the composition of each household. This measure assigns a "weight" to each household member. A weight of 1 is assigned to the first adult in the household, 0.66 to each subsequent adult (aged 14 years or older living in the household) and 0.33 to each child (aged below 14 years). The sum of these weights gives a household's equivalised size and allows for household size and structure to be taken into account approximately. Income is recorded as total gross household income less statutory deductions of income tax and social insurance contributions and is reported in the GUI rounded per thousand (e.g. €10,000 or €23,000). I divide and report this variable by quintiles (i.e. five segments of equal proportion). Due to income reported per thousand, several observations fell on the borderline between quintiles. These were randomly assigned to a specific quintile (above or below the threshold) to ensure an approximately equal distribution across all income groups.

I additionally control for a range of characteristics relating to the SC. These include demographics and pre-college outcomes. Demographics consist of three dummy variables: gender (i.e. female), disability status and foreign-born. I restrict my sample only to include observations that report all three items. Additional (and traditional) demographics such as race and age are absent from the analysis due to the sample following a nearly entirely white group of Irish children with a plus/minus one-year age difference from one another.[22]

[18] Numbers 4-6 of the ISCED's definition fall under tertiary education. The GUI classifies a Non-Degree as a National Certificate, Diploma NCEA/Institute of Technology or equivalent, Nursing Diploma. A Primary Degree is classified as a third-level Bachelor Degree.

[19] Education data were available for approximately 71 per cent of the final sample of SCGs. Testing which uses paternal education as a background measure was also carried out. The results of this analysis are available upon request.

[20] While Black *et al.* (2005b) observe a causal relationship between maternal attainment and a son's education, no causal relationship was found between a mother's and daughter's.

[21] Such action is carried out due to few observations reporting the lowest form of maternal education: between 1–2 per cent of the total population.

[22] Age is reported as the year of birth rather than by a specific month.

I include the pre-college outcomes of Leaving Certificate (LC) Mathematics and English results to account for potential "ability" differences. The LC is the final set of standardised examinations that Irish students take at the end of secondary school (post-primary cycle). The overall secondary cycle typically lasts five to six years, starting when a child is aged 11-13, with the LC cycle taking place during the final two to three years. For the LC, students complete exams typically in six or seven subjects, with English, Mathematics, and Irish being mandatory. The student chooses the remaining three or four subjects. These centrally administered exams are based on the Irish national curriculum, with grades awarded via a points system. All subjects can be taken at a higher or ordinary level. English and all other subjects have a maximum score of 100 points at the higher level (Mathematics being the only exception to this).[23] The maximum score for the ordinary level was 60 points prior to 2017, with a new grading system then being implemented, which saw this maximum change to 56. I exclude any observations with missing data across several factors. These include whether the SC sat any formal examination, the type of exam SC took in their final year of school and whether they reported the points they achieved in Mathematics and English.[24]

Descriptive statistics for each background measure are reported in Table 2. Maternal education is highest at the Higher Secondary level, with over 35 per cent of the sample population. Non-Degree and Primary Degrees closely follow one another, with Postgraduate and Lower Secondary or Less combined representing just over a fifth of the sample. As previously mentioned, equivalised income is reported by quintile. The summary statistics for the rest of the control variables are in Table 3. In the accompanying Appendix, I have provided several additional tables and figures. Appendix Table A.2 defines the respective variables used in this analysis. Appendix Table A.3 lists the corresponding questions from the GUI survey used to calculate each variable. Appendix Table A.4 highlights the key characteristics of college majors by parental education/income and gender of SC.

3.4 Statistical Method

Given that my dependent variable – college major choice – is a categorical outcome with unordered categories, I applied a multinomial logistic regression as my statistical method. This is standard practice in similar research examining influences on discrete choices. Using the notation as provided by Long and Freese (2014), the multinomial logistic model (MNLM) is written as:

$$ln\Omega_{m|b}(x) = ln\,\frac{\Pr(y = m|x)}{\Pr\,(y = b|x)} = x\beta_{m|b} \text{ for } m = 1 \text{ to J}$$

With *J* equations being solved to compute the probabilities for each outcome:

[23] Mathematics has a maximum of 125; 100 plus an additional 25 bonus points awarded if the subject is taken at a 'higher' level.

[24] The Leaving Certificate Applied (LCA) does not follow the same system of points allocation as the LC and Leaving Certificate Vocational Programme (LCVP).

$$\Pr(y = m \mid x) \frac{\exp(x\beta_{m|b})}{\Sigma_{j=i}^{J} \exp(x\beta_{j|b}}$$

With J dependent categories, where b is the base category and β being a vector of estimated regression coefficients. For this analysis, I employ a multinomial regression to a baseline model focusing on parental background as the primary factor of interest. My baseline model estimates outcomes for background, controlling for pre-college outcomes and the demographic variables of the young person. The empirical analysis of this paper models background measures separately. I first estimate outcomes with maternal education as my background measure before including family income as an alternative measure of background.

Table 2: Descriptive Statistics – Independent Variables

	Freq.	*%*	*Cum.*
Maternal Education			
Lower Secondary or Less	272	7.59	7.59
Hi Sec/TechVoc//UppSec+Tech/Voc	1,284	35.82	43.40
Non-Degree	769	21.45	64.85
Primary Degree	752	20.98	85.53
Postgrad	508	14.17	100.00
Family Income			
1st quintile	650	20.01	20.01
2nd quintile	650	20.01	40.02
3rd quintile	650	20.01	60.04
4th quintile	650	20.01	80.05
5th quintile	648	19.95	100.00

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: Quintile 1 is the lowest quintile, with quintile 5 being the highest. Maternal education has 3,585 observations, with family income having 3,248.

Table 3: Summary Statistics – Independent Variables

	Mean	*S.D.*	*Min*	*Max*	*N*
Individual Level – SC					
Female	0.515	0.500	0	1	3,585
Disability	0.120	0.326	0	1	3,585
Immigrant	0.100	0.300	0	1	3,585
English Results	68.874	18.628	0	100	3,585
Maths Results	62.783	35.490	0	125	3,585

Source: Author's calculations based on data from *Growing Up in Ireland.*

Given this research topic, it is essential to acknowledge the intricate relationship between the measures used in this analysis. The factors of education and income are often co-determined; higher levels of maternal education can lead to increased family income, while greater financial resources may enhance educational opportunities for mothers. However, one does not always determine the other; greater financial resources may only result from years of working experience. By analysing these variables independently, I avoid combining their effects as I try to better understand the unique pathways through which these measures contribute to the educational outcome of major choices. However, I also run robustness testing where both background measures are modelled together. Results of these are available upon request.

In a multinomial regression, a model estimates the probabilities of being in each category of a categorical dependent variable relative to a chosen reference category. These results are known as log odds. Exponentiating the estimated parameters from log odd estimates allows you to calculate odds (or relative risk) ratios. One issue with these estimates is that they can be challenging to interpret. These coefficients are relative to a base category and, besides interpretation constraints, they may not be informative. To address this, I calculate and report marginal effects.[25] For a multinomial logit model, the marginal effect is defined as:

$$\frac{\Pr(y = m|x)}{\partial x_k} = \Pr(y = m|x)\left\{\beta_{k,m|J} - \sum_{j=1}^{J} \beta_{k,j|J} \Pr(y = j|x)\right\}$$

The interpretation of these results is more straightforward than any odds calculation. In the context of this study, average marginal effects (AME) are calculated for each specification of my baseline model. The AME is the mean of each effect over all observations.

A common issue when using a multinomial regression analysis is satisfying the Independence of Irrelevant Alternatives (IIA) assumption. As per Hausman and McFadden (1984), the irrelevant alternatives property "states that the ratio of the probabilities of choosing any two alternatives is independent of the attributes of any other alternative in the choice set." In the context of major choice, it could be argued that the IIA is met prior to statistical testing for the property. Preferences for major choices can be viewed as stable, as students choose their major based on strong preferences and interests. Other fields of study are so systematically different that preferences should not change; therefore, the IIA is validated. However, this may not be the case for Irish students due to the centralised system for tertiary education. The consequences of this system and the IIA assumption, along with

[25] Marginal effects display the change in the probability of observing an outcome or falling into a specific category.

details surrounding its statistical testing, are discussed in further detail in a supplementary Appendix document.[26]

In this study, it is important to clarify that this research constitutes a descriptive rather than a causal analysis. While the aim is to explore and illuminate the relationships between my chosen background measures and a child's choice of college major, this research design is constructed to identify patterns, associations, and correlations rather than establishing definitive cause-and-effect relationships. However, to ensure that my descriptive analysis is appropriate, I run a series of robustness checks to ensure my estimates are robust to observables. The results of this analysis are provided in Section V and in the aforementioned supplementary Appendix. The following section presents and discusses the results of the analysis. All outcomes were estimated using Stata 18.

IV RESULTS

4.1 Preliminary Results and Statistics

From a balanced panel of 4,729, 4,215 observations were recorded as attending some form of tertiary education. While the figure for those attending tertiary education in this panel may seem extremely high, it can be viewed as unsurprising in an Irish context.[27] A very high proportion of Irish secondary school graduates go on to tertiary education. According to 2016 Census information, over 56 per cent of the Irish population aged 15 to 39 possessed a third-level qualification.[28] These trends place Ireland among the most highly educated nations in Europe. Of those enrolled in Irish tertiary education institutions, universities accounted for roughly over 66 per cent of this enrolment, with a large majority of the remainder attending an institute of technology.[29] In general, females are slightly more likely than males to attend tertiary education and attend a university, with (social) class differences often observed between those attending tertiary education and what type of tertiary institute they attend.

Table 4 presents descriptive statistics regarding the trends of university attendance in this sample. Similar trends to the overall Irish context are found for this sample regarding gender and background. Table 5 presents average marginal effects calculated from a logistic regression analysis examining the likelihood of

[26] For brevity, several items throughout the paper were moved to this supplementary Appendix, which is available upon request.

[27] Of those who reported attending tertiary education in the overall panel, over 53 per cent reported attending a university.

[28] I use 2016 figures throughout this section as this is the year most GUI participants entered tertiary education: https://www.cso.ie/en/releasesandpublications/ep/p-cp10esil/p10esil/le/.

[29] Data for 2016 are not available. Data provided are from a governmental report for the 2018/19 academic year: https://data.oireachtas.ie/ie/oireachtas/libraryResearch/2020/2020-04-03_l-rs-infographic-education-in-ireland-a-statistical-snapshot_en.pdf.

Table 4: University Attendance

	No	*Yes*	*Total (N)*
Gender			
Male	748	991	1,739
Female	819	1,027	1,846
Maternal Education			
Lower Secondary or Less	194	79	273
Hi Sec/TechVoc//UppSec+Tech/Voc	667	616	1,283
Non-Degree	324	445	769
Primary Degree	237	515	752
Postgrad	145	363	508
Family Income			
1st quintile	375	275	650
2nd quintile	330	320	650
3rd quintile	295	355	650
4th quintile	242	408	650
5th quintile	182	466	648
Social Class			
Semi-Skilled or Less	181	104	285
Skilled Manual	164	115	279
Non-Manual	352	327	679
Managerial and Technical	537	884	1,421
Professional Workers	161	451	612

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: 'Yes' is equal to student being recorded as attending a university, 'No' is recorded if otherwise.

attending a university for tertiary education. Binary variable is used which equals to 1 if they attend a university and 0 otherwise. Results indicate that within the sample, being female is slightly positively associated with university attendance, but the effects are small and statistically insignificant. Having a disability or being foreign-born negatively affects university attendance. However, these results are not statistically significant. The results for Leaving Certificate English and Mathematics are statistically significant. This indicates that higher English or Mathematics exam results increase the probability of attending university by between 4 to 7 percentage points. Each level of maternal education shows a significant and progressively stronger positive association with university attendance. For example, having a mother with a postgraduate degree increases the probability of university attendance by 18.3 percentage points compared to the

Table 5: Marginal Effects – University Attendance

	(1)		(2)		(3)	
Variables						
Female	0.007	(0.015)	0.010	(0.015)	0.005	(0.015)
Disability	–0.024	(0.022)	–0.024	(0.023)	–0.013	(0.023)
Immigrant	–0.015	(0.024)	0.001	(0.025)	–0.004	(0.026)
English Results	0.007***	(0.001)	0.007***	(0.001)	0.006***	(0.001)
Maths Results	0.004***	(0.001)	0.004***	(0.000)	0.004***	(0.000)
Background Measures:						
1. *Maternal Education Ref Group: Lower Secondary or Less*						
Hi Sec/TechVoc	0.098***	(0.030)	–	–	–	–
Non-Degree	0.122***	(0.032)	–	–	–	–
Primary Degree	0.169***	(0.032)	–	–	–	–
Postgrad	0.183***	(0.034)	–	–	–	–
2. *Family Income Ref Group: Lowest quintile*						
2nd quintile	–	–	–0.010	(0.024)	–	–
3rd quintile	–	–	0.007	(0.024)	–	–
4th quintile	–	–	0.037	(0.024)	–	–
5th quintile	–	–	0.088***	(0.025)	–	–
3. *Social Class Ref Group: Semi Skilled or Less*						
Skilled Manual	–	–	–	–	0.011	(0.037)
Non-Manual	–	–	–	–	0.028	(0.031)
Managerial and Technical	–	–	–	–	0.103***	(0.029)
Professional Workers	–	–	–	–	0.147***	(0.032)
Observations	3,585		3,248		3,276	

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Each model specification includes individual characteristics (i.e. gender, disability status, foreign-born, Mathematics plus English grades) and one background measure. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

reference category. Each step up in maternal education significantly increases the likelihood of university attendance. Results also show an income effect, with students in the highest income quintile significantly more likely to attend university. The middle income groups show no statistically significant differences relative to the lowest quintile. Social class also has a strong significant effect in the higher categories, with students from Managerial/Technical and Professional backgrounds having a significantly higher probability of university attendance than those from Semi-Skilled or Less backgrounds (between 10 to 15 percentage points higher).

Tables 6 and 7 present results from a linear regression, with average earnings and average Mathematics scores by college major used as the dependent variables.[30] This preliminary analysis identifies broad patterns of major sorting, examining whether students systematically sort into different kinds of majors.[31]

Results of Table 6 show strong, negative and significant coefficients for females, with a weaker effect for disability status. For example, the results indicate that females tend to choose majors with lower average Mathematics points. The magnitude of the effect on females is considerably large. Conversely, the positive and significant immigrant coefficients suggest that foreign-born students are more likely to enrol in majors with higher average Mathematics points compared to native-born students. Similar results are found for English scores, although the magnitude of this result is small. For each background measure, the lowest category is used as the reference group. Results indicate that higher levels of maternal education are associated with sorting into majors with higher average Mathematics scores (compared to the reference category), with statistically significant results for the Non-Degree and Primary Degree categories. Higher family income is associated with selecting majors with higher average Mathematics scores, with the effects becoming stronger as the income quintiles increase. Similarly, higher social class is positively associated with majors possessing higher average Mathematics scores. Categories like Managerial/Technical and Professional Workers show significant and positive effects. For each background measure, the magnitude of effects is considerably large in the higher categories.

Looking at Table 7, female students are significantly more likely to select majors with lower average earnings compared to their male counterparts, a difference of notable magnitude. Conversely, immigrant students show a marginally significant positive association with the average earnings of their chosen majors, suggesting they tend to select majors with slightly higher earnings than native-born students, although the effect size is small. Disability status has no statistically significant impact on major earnings. Mathematics scores exhibit a strong, positive,

[30] See Appendix Table A.8 for a breakdown of average Mathematics scores (i.e. LC Points) and average earnings by major. Earnings are calculated using "1 – 10 Years Post" figures from Table 1, and are log-transformed for the linear regression.

[31] For example, Table 6 analyses whether students, based on their individual and background characteristics, disproportionately enter majors with higher or lower average Mathematics scores.

Table 6: Average Mathematics Scores By Major

	Coef.(1)		*Coef.(2)*		*Coef.(3)*	
Variables						
Female	–3.670***	(0.433)	–3.628***	(0.459)	–3.723***	(0.451)
Disability	–1.212*	(0.712)	–1.008	(0.751)	–1.227*	(0.739)
Immigrant	1.391*	(0.719)	1.583**	(0.748)	1.767**	(0.746)
English Results	0.064***	(0.013)	0.052***	(0.014)	0.063***	(0.014)
Background Measures:						
1. *Maternal Education Ref Group: Lower Secondary or Less*						
Hi Sec/TechVoc	0.662	(0.927)	–	–	–	–
Non-Degree	2.200**	(0.968)	–	–	–	–
Primary Degree	2.760***	(0.971)	–	–	–	–
Postgrad	1.293	(1.017)	–	–	–	–
2. *Family Income Ref Group: Lowest quintile*						
2nd quintile	–	–	1.079	(0.763)	–	–
3rd quintile	–	–	1.312*	(0.754)	–	–
4th quintile	–	–	2.831***	(0.740)	–	–
5th quintile	–	–	3.343***	(0.728)	–	–
Social Class Ref Group: Semi Skilled or Less						
Skilled Manual	–	–	–	–	1.722	(1.179)
Non-Manual	–	–	–	–	2.006**	(0.940)
Managerial and Technical	–	–	–	–	1.807**	(0.861)
Professional Workers	–	–	–	–	3.283***	(0.935)
Observations	3,585		3,248		3,276	
R^2	0.037		0.038		0.036	

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Each model specification includes individual characteristics (i.e. gender, disability status, foreign-born, Mathematics plus English grades) and one background measure. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

Table 7: Average Earnings By Major

	Coef.(1)		Coef.(2)		Coef.(3)	
Variables						
Female	–0.038***	(0.004)	–0.038***	(0.004)	–0.038***	(0.004)
Disability	–0.002	(0.006)	–0.001	(0.006)	–0.002	(0.006)
Immigrant	0.008	(0.006)	0.007	(0.006)	0.012*	(0.007)
English Results	0.001	(0.001)	–0.001	(0.001)	–0.001	(0.001)
Maths Results	0.001***	(0.000)	0.001***	(0.000)	0.001***	(0.000)
Background Measures:						
1. *Maternal Education Ref Group: Lower Secondary or Less*						
Hi Sec/TechVoc	–0.001	(0.008)	–	–	–	–
Non-Degree	0.005	(0.008)	–	–	–	–
Primary Degree	0.003	(0.008)	–	–	–	–
Postgrad	–0.011	(0.009)	–	–	–	–
Family Income 2. *Ref Group: Lowest quintile*						
2nd quintile	–	–	0.001	(0.006)	–	–
3rd quintile	–	–	0.003	(0.006)	–	–
4th quintile	–	–	0.010	(0.006)	–	–
5th quintile	–	–	0.011*	(0.006)	–	–
Social Class 3. Ref Group: Semi Skilled or Less						
Skilled Manual	–	–	–	–	0.020**	(0.010)
Non-Manual	–	–	–	–	0.017**	(0.008)
Managerial and Technical	–	–	–	–	0.009	(0.007)
Professional Workers	–	–	–	–	0.010	(0.008)
Observations	3,585		3,248		3,276	
R^2	0.146		0.145		0.144	

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Each model specification includes individual characteristics (i.e. gender, disability status, foreign-born, Mathematics plus English grades) and one background measure. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

and statistically significant relationship with the average earnings, indicating that students with higher Mathematics scores are more likely to pursue majors with higher average earnings. English performance, however, does not have a statistically significant effect. Results on background measures indicate that the middle categories of maternal education are associated with selecting majors with higher average earnings (in comparison to the reference group). However, the overall measure shows a complex pattern. While students whose mothers have a non-degree or primary degree education show a positive (but non-significant) association with higher major earnings, those whose mothers have a postgraduate degree show a negative (and non-significant) association. Family income exhibits a positive relationship with major earnings, with students in higher income quintiles tending to choose majors with higher average earnings potential. However, most of these effects are not statistically significant. Social class demonstrates a more robust relationship: students from higher social classes (Skilled Manual and Non-Manual workers) are significantly more likely to select majors with higher average earnings compared to the reference group.

4.2 Main Results – Marginal Effects

As previously mentioned, coefficients from multinomial logit can be challenging to interpret; as such, Average Marginal Effects (AMEs) were calculated based on the previously mentioned model specifications and are visible in Table 8 and Table 9.[32] In the baseline model, controls for gender, disability status, foreign-born, and grades in Mathematics plus English are included in all regressions.

4.3 Maternal Education

Table 8 displays the marginal effects of maternal education on the choice of individual majors. Results show this background measure to be a powerful predictor of major choice in Education and Arts and Humanities. Compared with the reference category of children of mothers with a lower secondary education or less, all other categories of maternal education show a higher probability of majoring in Arts and Humanities. The likelihood of majoring in this field increases with maternal education, with children of mothers with postgraduate degrees 4.1 percentage points more likely to major in Arts and Humanities compared to the reference category. Similarly, maternal education has a strong positive effect on the choice of Education majors. Children of mothers with a higher form of education compared to those in the lowest category have a higher probability of majoring in Education, although the magnitude of this effect (2.5–4.9 percentage points) does not vary systematically by education category.

[32] AMEs compute a predicted probability for each case of a fixed value and the observed value for the variables of interest before averaging the predicted values.

Table 8: Marginal Effects – Maternal Education

	College Major					
	(1) Educ	*(2) Arts & Hum*	*(3) Social Sci*	*(4) STEM*	*(5) Life Sci*	*(6) Services*
Background Measure – Maternal Education						
Ref Group: Lower Secondary or Less						
Hi Sec/TechVoc	0.028**	0.040*	–0.022	–0.015	–0.026	–0.005
	(0.013)	(0.022)	(0.031)	(0.029)	(0.024)	(0.015)
Non-Degree	0.049***	0.051**	–0.049	–0.002	–0.033	–0.016
	(0.014)	(0.024)	(0.033)	(0.031)	(0.026)	(0.016)
Primary Degree	0.025*	0.068***	–0.037	0.002	–0.030	–0.027*
	(0.014)	(0.025)	(0.033)	(0.031)	(0.026)	(0.017)
Postgrad	0.032**	0.141***	–0.053	–0.053*	–0.033	–0.033*
	(0.015)	(0.029)	(0.035)	(0.032)	(0.027)	(0.018)
Observations	3,585	3,585	3,585	3,585	3,585	3,585

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for gender, disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

On the contrary, maternal education has a negative association with the choice of all other majors.[33] For example, children of mothers with a primary degree are 2.7 percentage points less likely to major in a Services programme in comparison to the reference group of Lower Secondary or Less. However, it must be noted that the majority of the negative effects for these remaining majors are not statistically significant.

4.4 Family Income

Family income has a notable influence on major choice, particularly at the highest end of the income distribution. Social Sciences shows the strongest and most statistically significant association with family income, particularly for those from the highest income quintile. Children from the 5th quintile are significantly more likely to major in Social Sciences (8.9 percentage points higher) compared to those from households in the lowest quintile (i.e. the reference group). This relationship suggests a possible nonlinear effect, where income has a noticeable influence at the higher end of the income spectrum. Positive income effects are observed for Education majors in quintiles 2 and 4. Young people from the second lowest income group are 2.6 percentage points more likely to major in Education than those from the lowest threshold. A larger positive effect is found for those in quintile 4.

In contrast, STEM and Life Sciences show consistent negative results. For STEM, all income quintiles are negatively associated with the likelihood of choosing this major, though the effect of these quintiles are not statistically significant. For Life Sciences, the gradient is more negative for the higher quintiles, with the 5th quintile showing a marginally significant negative effect. The results for Arts and Humanities and Services majors are mostly statistically insignificant, showing no clear trend or significant association with family income across the quintiles.

V ROBUSTNESS TESTING AND HETEROGENEOUS EFFECTS

To further analyse the effect of parental background on major choice, I run additional testing on several specifications. This helps to check whether estimates are robust to observables. See Table 10 onwards for results. Further testing is carried out and provided in a supplementary Appendix document.[34]

5.1 Gender

In Tables 10 and 11, I examine whether the observed relationships between background and major choice differ for male and female students. Analysing the

[33] Primary degree of STEM is the only group to display a positive coefficient although it is not statistically significant.

[34] Document is available upon request.

Table 9: Marginal Effects – Family Income

	College Major					
	(1) Educ	*(2) Arts & Hum*	*(3) Social Sci*	*(4) STEM*	*(5) Life Sci*	*(6) Services*
Background Measure – Family Income						
Ref Group: Lowest quintile						
2nd quintile	0.026*	–0.003	0.002	–0.019	–0.018	0.012
	(0.014)	(0.021)	(0.024)	(0.023)	(0.020)	(0.013)
3rd quintile	0.015	0.007	0.023	–0.020	–0.028	0.003
	(0.013)	(0.021)	(0.024)	(0.024)	(0.019)	(0.014)
4th quintile	0.033**	0.000	0.025	–0.014	–0.031	–0.012
	(0.014)	(0.022)	(0.024)	(0.024)	(0.020)	(0.014)
5th quintile	–0.006	0.005	0.089***	–0.018	–0.037*	–0.033**
	(0.012)	(0.022)	(0.026)	(0.024)	(0.020)	(0.013)
Observations	3,248	3,248	3,248	3,248	3,248	3,248

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for gender, disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

interaction between the study child's gender and background allows me to explore whether gender-specific patterns bias results. If gender-specific trends are identified in how background affects major choice, these findings can inform targeted interventions and policies.

Results indicate that background does possess differential effects by gender. The reference group is children with mothers who have Lower Secondary education or Less. For both females and males, the results show that the highest education levels of a mother are generally associated with higher probabilities of majoring in Arts and Humanities and Education. In particular, female children of mothers with a postgraduate degree are significantly more likely to major in Arts and Humanities, with similar trends for males, though not as pronounced. For STEM, there is some indication that children with caregivers who have a higher level of education are less likely to choose this major, especially for females with Postgraduate mothers, where the effect is negative and significant. For Social and Life Sciences, there are no strong significant associations for either gender, though females from a mother of any form of higher education appear less likely to major in both fields, with the opposite holding through for males only in Life Sciences. For Services, male students whose mother has a postgraduate degree are 4.1 percentage points less likely to major in this field compared to the reference category.

While many coefficients are not statistically significant, particularly for lower educational levels of caregivers, the overall trend suggests that higher education levels of caregivers generally promote a higher likelihood of choosing majors in Arts and Humanities and Education for both genders.

5.2 University

As previously described in the NFQ (see Section 3.2 of this paper), universities in Ireland only award higher education certification (i.e. Levels 7-10), with these institutions often considered more prestigious than any other type of higher-level institute. As a result of this, most Irish students plan to try to attend a university. Of all tertiary institutes, universities are the most attended in Ireland, with over 56 per cent of the final sample attending one. They also typically offer a more diverse and comprehensive range of majors than other institutions. Therefore, I rerun my primary analysis on this subgroup. Examining by institution type ensures that the choice of major is not limited by the institution's offerings.

As per Table 12, I find that maternal education has a positive association with Arts and Humanities and Services. Children of mothers with postgraduate degrees are significantly more likely to major in Arts and Humanities (10.0 percentage points) and Services (1.6 percentage points) compared to the reference category. Both effects, including all other education levels of Services, display statistical significance. However, maternal education has little effect on the likelihood of choosing other majors. Specifically, maternal education shows no significant relationship with any of the remaining majors, with the effects size being considerably small across most education categories.

Table 10: Marginal Effects By Gender – Maternal Education

	College Major					
	(1) Educ	(2) Arts & Hum	(3) Social Sci	(4) STEM	(5) Life Sci	(6) Services
Gender of SC – Female Ref Group: Lower Secondary or Less						
Hi Sec/TechVoc	0.023	0.033	–0.005	–0.006	–0.046	0.001
	(0.023)	(0.030)	(0.041)	(0.037)	(0.039)	(0.020)
Non-Degree	0.047*	0.071**	–0.039	–0.008	–0.061	–0.011
	(0.026)	(0.034)	(0.043)	(0.039)	(0.042)	(0.022)
Primary Degree	0.029	0.099***	–0.002	–0.029	–0.056	–0.040*
	(0.027)	(0.036)	(0.044)	(0.039)	(0.044)	(0.022)
Postgrad	0.008	0.163***	–0.024	–0.065*	–0.058	–0.023
	(0.026)	(0.041)	(0.047)	(0.039)	(0.046)	(0.025)
Observations	1,846	1,846	1,846	1,846	1,846	1,846
Gender of SC – Male Ref Group: Lower Secondary or Less						
Hi Sec/TechVoc	0.022*	0.048	–0.037	–0.031	0.007	–0.009
	(0.012)	(0.033)	(0.048)	(0.047)	(0.025)	(0.022)
Non-Degree	0.042***	0.030	–0.055	–0.004	0.009	–0.022
	(0.015)	(0.035)	(0.050)	(0.049)	(0.026)	(0.024)
Primary Degree	0.012	0.037	–0.068	0.023	0.011	–0.015
	(0.012)	(0.035)	(0.050)	(0.050)	(0.027)	(0.025)
Postgrad	0.048***	0.118***	–0.081	–0.050	0.006	–0.041*
	(0.017)	(0.040)	(0.052)	(0.052)	(0.028)	(0.025)
Observations	1,739	1,739	1,739	1,739	1,739	1,739

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

Table 11: Marginal Effects By Gender – Family Income

	College Major					
	(1) Educ	(2) Arts & Hum	(3) Social Sci	(4) STEM	(5) Life Sci	(6) Services
Gender of SC – Female Ref Group: Lowest quintile						
2nd quintile	0.035*	0.032	–0.020	–0.024	–0.032	0.010
	(0.020)	(0.029)	(0.032)	(0.028)	(0.034)	(0.018)
3rd quintile	0.041**	0.033	–0.011	–0.014	–0.056*	0.007
	(0.020)	(0.029)	(0.032)	(0.028)	(0.033)	(0.018)
4th quintile	0.040**	0.033	–0.003	–0.015	–0.069**	0.014
	(0.020)	(0.031)	(0.033)	(0.028)	(0.034)	(0.020)
5th quintile	0.013	0.042	0.057	–0.018	–0.053	–0.040**
	(0.019)	(0.032)	(0.036)	(0.030)	(0.035)	(0.017)
Observations	1,685	1,685	1,685	1,685	1,685	1,685
Gender of SC – Male Ref Group: Lowest quintile						
2nd quintile	0.017	–0.042	0.025	–0.021	0.003	0.017
	(0.019)	(0.031)	(0.035)	(0.039)	(0.021)	(0.020)
3rd quintile	–0.016	–0.023	0.061*	–0.029	0.005	0.003
	(0.016)	(0.031)	(0.036)	(0.039)	(0.022)	(0.021)
4th quintile	0.023	–0.037	0.053	–0.016	0.011	–0.034*
	(0.019)	(0.031)	(0.036)	(0.039)	(0.021)	(0.018)
5th quintile	–0.026*	–0.034	0.123***	–0.026	–0.010	–0.028
	(0.015)	(0.032)	(0.037)	(0.039)	(0.020)	(0.019)
Observations	1,563	1,563	1,563	1,563	1,563	1,563

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

Table 12: Marginal Effects – University

	College Major					
	(1) Educ	(2) Arts & Hum	(3) Social Sci	(4) STEM	(5) Life Sci	(6) Services
Background Measure – Maternal Education Ref Group: Lower Secondary or Less						
Hi Sec/TechVoc	0.015	0.023	–0.007	–0.045	0.001	0.013***
	(0.018)	(0.042)	(0.058)	(0.059)	(0.045)	(0.004)
Non-Degree	0.019	0.024	–0.043	–0.007	–0.007	0.015***
	(0.019)	(0.044)	(0.059)	(0.059)	(0.045)	(0.006)
Primary Degree	0.005	0.014	–0.031	–0.014	0.003	0.022***
	(0.019)	(0.044)	(0.059)	(0.052)	(0.045)	(0.007)
Postgrad	0.021	0.100**	–0.049	–0.087	0.000	0.016**
	(0.020)	(0.046)	(0.060)	(0.060)	(0.046)	(0.007)
Observations	2,018	2,018	2,018	2,018	2,018	2,018
Background Measure – Family Income Ref Group: Lowest quintile						
2nd quintile	–0.003	–0.017	0.068*	–0.040	–0.004	–0.004
	(0.017)	(0.030)	(0.036)	(0.036)	(0.029)	(0.010)
3rd quintile	0.001	–0.017	0.075**	–0.035	–0.011	–0.012
	(0.017)	(0.029)	(0.035)	(0.035)	(0.028)	(0.009)
4th quintile	0.003	–0.020	0.057*	–0.039	–0.003	0.001
	(0.017)	(0.030)	(0.034)	(0.035)	(0.028)	(0.010)
5th quintile	–0.026*	–0.023	0.136***	–0.069**	–0.012	–0.006
	(0.014)	(0.029)	(0.034)	(0.033)	(0.026)	(0.009)
Observations	1,824	1,824	1,824	1,824	1,824	1,824

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for gender, disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

Family income also plays a significant role in major choice. Compared to the lowest income quintile, higher income quintiles are more likely to choose Social Sciences, with children from the 5th income quintile showing a 13.6 percentage point higher likelihood of majoring in Social Science compared to the reference category. Results also indicate a direct, negative influence of higher levels of family income on the likelihood of selecting a STEM or Education major among university students. Someone from the highest quintile of the income distribution is between 2.6-6.9 percentage points less likely to major in one of these programmes than a young person from a household in the lowest income group. Family income has little association with choice of the other majors, with the majority of education categories possessing a negative association compared with the reference group.

5.3 Socioeconomic Status (SES)

I further test for the effect of background by analysing a broader set of indicators for my background measure. I include the measure of social class as an additional indicator because it encompasses elements beyond parental education and income and provides a more robust sense of how background can impact major choices. This social class measure (as provided by the GUI) is derived from the occupation of either the primary or secondary caregiver (where relevant). In the case of a household where both caregivers reside, social class is taken as the higher social class category of the two.[35]

Table 13 shows the marginal effects of social class on the choice of college major. Compared to children from Semi-Skilled or Less (the reference group), children from higher social classes exhibit a higher probability of majoring in certain fields. For example, children of Skilled Manual workers are significantly more likely to major in STEM (7.9 percentage points) as well as Education (5.0 percentage points). However, they are less likely to major in Life Sciences, with a negative and statistically significant effect found across each category of social class for this major. Similarly, children of Non-Manual workers have a higher probability of choosing Education but are less likely to pursue Life Sciences when compared to the reference category.

Children of Managerial and Technical workers are also more likely to choose Education (3.0 percentage points) and show a significant negative association with Life Sciences (–6.2 percentage points). Lastly, children of Professional Workers show a modest positive association with Arts and Humanities, but are less likely to major in Life Sciences, with all other effects for this group of social class being small and statistically insignificant. Overall, social class appears to predominantly influence the choice of major in Education and Social Science, with little to no association found on the remaining majors.

[35] Due to data confidentiality, I cannot see which occupation of which caregiver the GUI has used to calculate this social class measure.

Table 13: Marginal Effects – Social Class

	College Major					
	(1) Educ	*(2) Arts & Hum*	*(3) Social Sci*	*(4) STEM*	*(5) Life Sci*	*(6) Services*
Background Measure – Social Class Ref Group: Semi Skilled or Less						
Skilled Manual	0.050**	–0.012	–0.033	0.079**	–0.107***	0.023
	(0.021)	(0.030)	(0.036)	(0.038)	(0.029)	(0.019)
Non-Manual	0.045***	–0.005	–0.006	0.034	–0.075***	0.007
	(0.015)	(0.026)	(0.031)	(0.030)	(0.027)	(0.015)
Managerial and Technical	0.030**	0.022	0.030	–0.014	–0.062**	–0.006
	(0.013)	(0.024)	(0.029)	(0.028)	(0.026)	(0.014)
Professional Workers	0.008	0.049*	0.022	0.014	–0.071**	–0.021
	(0.014)	(0.028)	(0.033)	(0.031)	(0.028)	(0.016)
Observations	3,276	3,276	3,276	3,276	3,276	3,276

Source: Author's calculations based on data from *Growing Up in Ireland.*

Note: Coefficients are expressed in terms of marginal effects. dy/dx for factor levels is the discrete change from the base level. Robust standard errors in parentheses. Controls for gender, disability status, foreign-born and grades in Mathematics plus English included in all regressions. Statistical significance is at ***p<0.01, **p<0.05, *p<0.10.

VI DISCUSSION

The results of this study indicate that children from households of differing parental backgrounds make systematically different choices for specific college majors. For maternal education and family income, I find that family background influences major choice; but why is this? One plausible explanation is regarding the riskiness of a major in terms of employment and wage outcomes. Previous research has found that those coming from less advantaged backgrounds are selecting what is described as 'safer' majors (Leighton and Speer, 2023; Caner and Okten, 2010; Saks and Shore, 2005). Specific college majors are often considered 'risky' due to limited job opportunities, lower earning potential, or a higher likelihood of unemployment. For example, a degree from an Arts background is often perceived as riskier due to the competitive nature of the field and limited job opportunities. Trying to earn a stable income in this field can be challenging. Some Social Sciences majors, such as Sociology or Psychology, may be considered riskier regarding direct job prospects without further specialisation or advanced degrees. Those coming from less advantaged backgrounds often prioritise items such as stable employment and stable income. Therefore, they are more likely to major in historically safer areas, such as a degree in healthcare, for example.

This fact also holds when we look at those from higher-status classes. One particular finding is that those from more advantaged backgrounds seem more likely to major in Arts and Humanities. One may think that parents with a higher degree of education or coming from the top income groups may want their child to pursue a more rigid or traditional career in something such as business or medicine (rather than that of the arts world). However, previous work alongside this research finds this to be different (Goyette and Mullen, 2006; Ma 2009). For example, those coming from the highest classes can often be seen to be concentrated in more creative fields. One explanation for this is the 'riskiness' of a major, as previously discussed above. These individuals have a higher degree of financial security. This may allow them to be more flexible when choosing majors that align with their interests and passions, even if this major does not necessarily lead to a high or stable-paying career after graduation. These individuals can choose to study such majors as they have this financial buffer against low earnings. All of this aligns with the notion of decreasing absolute risk aversion (i.e. DARA). In this sense, an individual becomes less risk-averse as their wealth increases. In other words, as a person's wealth grows, they become more willing to take on risk because the potential loss represents a smaller proportion of their overall wealth, so a young person may be less worried about the financial consequences of pursuing selective majors.

In addition to the above, there are several other potential reasons why the link between parental background and college major choice may arise:

Role Model Exposure: Students from less-educated backgrounds may have limited exposure to professionals in high-paying fields like medicine or law. This lack of role models could make these careers seem less attainable, influencing them towards majors with more apparent paths to immediate financial security.

Navigating Early versus Later Returns: Parental experiences with education and earning potential can shape their guidance. Parents who experienced delayed financial success in their careers (e.g. academics) might encourage their children towards majors with potentially higher long-term earnings despite lower starting salaries. Conversely, parents with limited educational attainment might prioritise "practical" degrees offering stable early income (e.g. Engineering or Manufacturing).

Parental Values and Aspirations: Parental beliefs about success likely influence their major recommendations. For example, parents who value job security and societal impact might steer their children towards the healthcare field. Conversely, those prioritising strong job prospects and high earning potential might endorse STEM majors. These parental expectations may be influenced by their educational level. Parents wishing their child to achieve educational attainment equal to or greater than their own could push for specific majors perceived as likely to lead to such outcomes.

It is important to note that these factors may not apply to every parent, as individual preferences, values, and beliefs can vary widely. Parents may also consider their child's interests, aptitudes, and passions differently when offering guidance on college majors. The level of involvement and the nature of parents' influence, regardless of their education level or earnings, can be positive, encouraging exploration and personal fulfilment rather than solely focusing on specific majors for financial or societal reasons. Understanding the complex interplay between parental background, socioeconomic factors and individual aspirations is vital in explaining college major choices. While these results suggest a link between background and major selection, the degree and reason to which parents guide their children toward specific fields can be highly diverse.

VII CONCLUSION

The focus of this paper was to explore the impact of background on the choice of college major. Using multinomial logistic analysis, I examine the effects of maternal education and family income on major selection for a selected cohort. Both background measures of education and income were significant predictors across various majors. Higher levels of maternal education positively influence the choice of Education majors while exhibiting a negative association with students choosing Services or STEM fields. Family income, particularly at the highest quintiles, also plays a significant role. Students from the wealthiest families are less likely to

pursue Life Sciences or Services degrees. Conversely, higher family income increases the likelihood of majoring in Social Sciences. A positive income effect is also observed for Education majors in the middle-income quintiles.

Additional analysis in the form of robustness testing revealed gender and background-specific differences. For females, maternal education influences Arts and Humanities choices, while for males it impacts Education choices. Family income also has gender-specific effects. A broader background measure in the form of social class reveals that this alternative definition influences choices in Education and Life Sciences. Furthermore, examining the institutional subgroup of universities revealed positive associations between maternal education and Services, and family income and Social Sciences.

7.1 Study Limitation

This research is not without its limitations. Firstly, this study examined broad academic categories rather than individual majors. Data constraints required combining pre-existing major categories (for example, agriculture and forestry combined with nursing and social care to create Life Sciences). These aggregated categories, while providing a general overview, may obscure potentially important variations within specific disciplines. Secondly, the findings from this study are limited to a single cohort of Irish students. Thus, this study may not account for factors and the changing dynamics that may exist across different populations and periods for Irish children and their parents.

7.2 Future Research

The above analysis does possess some notable points for further research. Going beyond the parental background used in this study and exploring the influence of other factors like neighbourhood characteristics, peer group influence, or access to academic resources can help delve deeper into the understanding by which background influences major choice. Additionally, the GUI data collection was the first of its kind in Ireland. As subsequent waves of data are collected across different generations/cohorts, a comparison analysis can be performed to investigate whether the patterns of major selection have changed over time. Nonetheless, this is a good first step in documenting the impact of the above parental measures on major choices in Ireland and contributes to the international debate to date.

In summary, this study offers one of the first pieces of research to explore the impact of background on the choice of college major in an Irish setting. The findings from this study not only help to expand the theoretical work to date but also provide valuable insights that can inform future research on this topic. Additionally, these findings can help manage the balance between student preferences and labour market needs. While further research is needed to explore this area in greater depth, the findings from this work can provide insight to policymakers and highlight the need for targeted, major-specific policies to support students from different backgrounds and ensure equal opportunities for all.

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APPENDIX

Table A.1: Breakdown of Majors

Major Choice	
1. Education	Teaching – Primary school Subject specialisation teaching (mostly secondary school teaching)
2. Arts and Humanities	Art degree (joint honours) Arts degree (single honours) Art – including fine art, creative and cultural industries, contemporary art Performing arts – music, music production, drama, acting, theatre studies, dance Audio-visual techniques, communications and media production Design – art and design, graphic design, product design, game design Craft skills Religion Foreign languages
3. Social Sciences, Business and Law	Psychology Sociology and Cultural studies Politics and international relations Economics and Economics and Finance Journalism and reporting Business: Commerce, Commerce International, Business and Language, Entrepreneurship Wholesale and retail sales Marketing Finance, Banking and Insurance: Finance, Actuary Accounting and taxation: accountancy, quantity surveyor Management and Administration: Event management, human resource management Secretarial and office work Pure law Law and additional subject – History, politics, business, French law
4. Science, Mathematics and Computing / Engineering, Manufacturing and Construction	Science general incl equine, medical, nano Forensic science Biology incl, biochemistry, biomedical, microbiology, biotechnology

Table A.1: Breakdown of Majors (Contd)

Major Choice	
	Environmental science including zoology Physics incl theoretical physics, astro physics Chemistry including medicinal chemistry Earth sciences: Ecology, marine science Math and Science Mathematics Computer Science Computers, technology, computer game development and software development Engineering: chemical, aero, sound, electrical, civil, mechanical, structural etc Mechanics Electricity and energy Electronics and automation Chemical and process Motor vehicles, ships and aircrafts incl aviation management Fashion: textiles, clothes Materials (wood, paper, plastic, glass) Architecture Construction
5. Agriculture and Veterinary / Health and Welfare	Agriculture Horticulture Forestry Veterinary – medicine/nursing Health and Welfare – public health, optometry, healthand performance science Human nutrition and Dietetics Medicine and Podiatry Nursing, Midwifery and Carer Dentistry – dental nursing, dentist Therapy and Rehabilitation: Physiotherapy, Speech and Language therapy, Occupational therapy Pharmacy Child care and youth services includes early childcare studies Social science, social work and counselling
6. Services / Other	Hotel, restaurant, and catering: Culinary arts, hospitality management Travel, tourism and leisure: recreation and leisure, tourism management, spa and wellness management Sports: sports coaching, sports and media, physical education, sports nutrition, sports psychology

Table A.1: Breakdown of Majors (Contd)

Major Choice	
	Transport services Protection of persons and property: criminology, security, Gardaí, criminal justice studies Vocational – Beauty, Hairdressing, Nail technician, paramedic Not otherwise classifiable

Table A.2: Variable Definition

Individual Level – SC	
Female	1 if female, 0 if male
Disability	1 if possesses disability / health condition, 0 otherwise
Immigrant	1 if not born in Ireland, 0 if born in Ireland
English Result	Leaving Certificate score (i.e. Points) in English
Maths Result	Leaving Certificate score (i.e. Points) in Mathematics
Parental Measures	
Maternal Education	Highest level of education attained by a mother
Family Income	Equivalised Household Annual Income

Table A.3: Survey Questions from GUI

Variable	*Question*
Female	What is respondents gender
Disability	Do you have any on-going chronic physical or mental health problem, illness or disability?
Immigrant	Was the Study Child born in Ireland
Maternal Education	Which of the following best describes the highest level of education (full- time or part-time) which you have completed to date?
College Major	Please give the name of the course or apprenticeship you are/were following (e.g. Level 5 Certificate in Business Studies; Level 8 Bachelor of Arts Honours in History and English):

Note: English and Mathematics grades along with Family Income were provided and/or calculated in addition to the questionnaire.

Table A.4: Descriptive Statistics – % Distribution by Major

	Maternal Education					*Family Income*					*Gender*	
	1	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*	*M*	*F*
College Major												
Education	3.33	31.90	28.57	20.00	16.19	12.83	22.99	20.86	28.88	14.44	30.48	69.52
Arts & Hum	6.48	35.35	20.28	20.14	17.75	22.27	20.12	20.74	18.74	18.13	45.21	54.79
Social Sci	7.67	36.36	20.48	21.47	14.02	16.83	17.55	19.85	20.22	25.54	52.03	47.97
STEM	6.47	32.15	22.87	24.81	13.70	17.71	19.40	19.04	21.33	22.53	68.18	31.82
Life Sci	9.38	37.52	20.53	19.29	13.27	23.98	20.66	19.88	18.71	16.76	21.24	78.76
Services	14.23	47.31	19.23	12.31	6.92	29.88	26.56	21.58	14.11	7.88	48.85	51.15
Total	7.59	35.82	21.45	20.98	14.17	20.01	20.01	20.01	20.01	19.95	48.51	51.49

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: % distribution (in rows) of each major by Maternal Education, Family Income and Gender of SC. Maternal Education: 1 = Lower Secondary and less, 5 = Postgraduate. Family Income: 1 = Lowest Quintile (Q1), Higher Numbers = Higher Quintiles. M = Male and F = Female.

Table A.5: Observations lost per sample restriction imposed

Variable	*Sample*	*Observations dropped*	*Sample Left*
Maternal Education	4,729	26	4,703
Field of Study	4,703	493	4,210
PCG being the Mother	4,210	165	4,045
Disability / Health Issue	4,045	2	4,043
Foreign-Born	4,043	2	4,041
SC is Non-Singleton	4,041	71	3,970
English Result	3,970	283	3,687
Maths Result	3,687	102	3,585

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: Balanced panel of 4,729 participating in all four waves of the GUI. Also note that family income possesses 3,248 observations. PCG = Primary Care Giver. SC = Study Child.

Table A.6: Post-Secondary Institutions

Institution	*Original Sample*	*Sample Left*
UCD – University College Dublin	445	385
UCC – University College Cork	405	355
NUIG – National College of Ireland Galway	264	231
National College of Ireland Maynooth	241	212
UL – University of Limerick	269	232
TCD – Trinity College Dublin	305	269
DCU – Dublin City University	304	269
Other Universities	81	65
Institutes of Technology	1,054	856
Colleges of Education	207	184
PLC Colleges	411	278
Community Colleges	60	37
Private Colleges	58	40
Other	244	163
Total	4,348	3,576

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: From a balanced panel of 4,729 observations, 4,348 reported what post-secondary institution they attend. *Sample Left* refers to the number of observations left after all data restrictions have been imposed.

Table A.7: Descriptive Statistics – Independent Variables

	Freq.	*%*	*Cum.*
Social Class			
Semi-Skilled or Less	285	8.70	8.70
Skilled Manual	279	8.52	17.22
Non-Manual	679	20.73	37.94
Managerial and Technical	1,421	43.38	81.32
Professional Workers	612	18.68	100.00

Source: Author's calculations based on data from *Growing Up in Ireland.*
Note: Semi-Skilled or Less is the lowest ranking group. Social Class has 3,276 observations in total.

Table A.8: Summary Statistics – Average by Major

	Average Maths Score (LC Points)	*Average Earnings (1 – 10 Years Post)*
College Majors		
Services	34.458	€725
Arts & Humanities	48.373	€825
Life Sciences	61.166	€817.50
Social Science	64.666	€960
Education	71.729	€1,015
STEM	78.867	€1,047.50

Source: Author's calculations based on data from *Growing Up in Ireland.*