

Do Better Grades in Post-Secondary Education Lead to Better Labour Market Outcomes?

by

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Executive Summary

Post-secondary education (PSE) plays a critical role in developing the skills required to promote economic prosperity for individuals and for society at large. Understanding the returns to skills that are attained throughout PSE is important for evaluating the benefits of investments in skills training and education made by the government and for prospective post-secondary students who are making a decision about whether to invest in higher education.

With the view that higher grades signal better mastery of academic subjects and a superior set of skills than their counterparts with lower grades, one would expect that graduates with higher grades have stronger labour market outcomes in terms of earnings compared to their counterparts with lower grades. This study examines the relationship between skill levels and labour market earnings using PSE student administrative data from eight institutions that are linked with tax files at Statistics Canada.

With this unique dataset, the study employs descriptive and regression analysis to uncover grade-earnings relationships across a wide range of student groups, defined by graduate cohort, gender, credential type and field of study, as well as at various points in time over graduates' post-graduation careers. The results reveal the grade-earnings relationship was highly heterogeneous among different student groups. Key findings include:

- the positive relationship remained fairly stable for their early labour market career for some groups, including men with bachelor's degrees in Business, Mathematics & Computer Sciences, women with bachelor's degrees in Social Sciences, and men with college diplomas in Arts & Education;
- earnings differences among the three grade groups of high, middle, and low narrowed for other student groups such as men with bachelor's degrees in Engineering and the women with diplomas in Arts & Education;
- earnings differences grew larger over time for other groups such as women with bachelor's degrees in Business;
- for some student groups such as those with bachelor's degrees in Fine Arts, better PSE grades did not translate into better post-graduation earnings.

The findings in this report raise several research questions that can have important policy implications for PSE institutions and the labour market. Firstly, it is important to understand what grades capture. If grades truly reflect academic ability along with a certain academic experiences and some productive personality attributes or habits that are rewarded in the labour market, it may be advisable to invest effective student success initiatives and resources in PSE (or even at the K-12 level) that help improve academic performance, create those useful academic experience, and build the attributes or habits that help graduate success in the labour market. Put simply, Future research can help determine factors that help graduate succeed in the labour market, which can lead to the alignment of education and

labour market policies.

Given the range of labour market outcomes, it is also important to understand what drives these diverse observations in order to provide some guidance for future PSE and labour market policy. For example, it is important to understand if and how the structure of the labour market in a certain field affects earnings of students with different grades. Rigid labour market structure may treat all graduates equal regardless of academic mastery while more flexible labour market structures allow for earnings to ability and mastery of subjects. Furthermore, skills gained at the PSE levels in some fields may be more relevant to the labour market than skills gained in other fields. As a result, academic mastery (i.e., as captured by grades) may matter more for those fields. Thus, determining what drives the earnings patterns is important.

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1 Introduction

Post-secondary education (PSE) plays a critical role in developing the skills required to promote economic prosperity for individuals and for society at large. Understanding how skills that are developed through PSE are rewarded in the labour market is important for evaluating the benefits of the public and private investments in skills training and education.

Understanding how academic performance, as captured by grades, relate to labour market outcomes is important because grades are often thought to reflect students' mastery of their discipline and other more general skills. Despite the importance of grades to students and PSE institutions, the relationship between higher grades (and the higher skill levels they presumably reflect) and better labour market outcomes has not been fully established. The contribution of this research is to examine these relationships empirically in an innovative fashion by exploiting the tax-linked PSE datasets that the Education Policy Research Initiative (EPRI) has developed in its previous work.

With the view that higher grades signal better mastery of academic subjects and that graduates with higher PSE grades therefore have a superior set of skills than their counterparts with lower grades, one would expect that graduates with higher grades have stronger labour market outcomes in terms of earnings compared to their counterparts with lower grades (i.e., graduates with higher grades maintain an earnings premium over those with lower grades). This project aims to examine empirically this proposition.

While there is a great deal of research estimating the returns to PSE attendance, much less has been written about the relationship between academic performance and subsequent labour market outcomes of PSE students. There is some American research that has shown a positive association of earnings with PSE grades or rank (James et al. 1989; Weisbrod and Karpoff 1968; Wise 1975). Murnane, Willett, and Levy (1995) reports that 12th grade math test scores are important determinants of earnings, but their models do not include PSE grades. Chia and Miller (2008) look at the effects of both high school performance and PSE grades and find that the leading determinant of graduates' starting salaries is PSE grades, and that a 10-point increase in PSE grade point average is associated with a seven percent increase in starting salaries.

These studies use U.S. data, except for Chia and Miller (2008) who use Australian data.

To the best of our knowledge, however, no such research has been undertaken in Canada.¹ This project aims to fill this gap in the literature by providing the first Canadian research on the relationship between academic performance and labour market earnings.

This study begins with a description of the dataset used for the research, which is followed by a descriptive analysis of the relationship between PSE grades and post-graduation earnings in general and among student groups defined by graduate cohorts, gender, and field of study. This analysis demonstrates how earnings evolve over time for students with different skill levels and explores whether these patterns differ among student groups.

The descriptive analysis is followed by a regression analysis of the relationship between grades and earnings by modeling earnings as a function of PSE grades and other student characteristics (i.e., gender, field of study, institution's location, graduation cohort, and years since graduation). While the results from the descriptive analysis shows patterns in earnings differences across academic performance as they are, regression analysis is a useful framework to understand these patterns concisely.

The results from the descriptive and regression analysis revealed that there was a positive association between PSE grades and post-graduation earnings for a number of student groups especially in early post-graduation years. However, the grade-earnings relationship over years since graduation was highly heterogeneous among different student groups. The positive relationship remained fairly stable for their early labour market career for some groups, including men with bachelor's degrees in Business, Mathematics & Computer Sciences, women with bachelor's degrees in Social Sciences, and men with college diplomas in Arts & Education. Earnings differences among three grade groups of high, middle, and low narrowed for other student groups such as men with bachelor's degrees in Engineering and the women with diplomas in Arts & Education. Conversely, earnings grew larger over time for other groups such as women with bachelor's degrees in Business. For some student groups such as those with bachelor's degrees in Fine Arts, better PSE grades did not translate into better post-graduation earnings.

The remainder of this report is organized as follows. Section 2 describes the dataset used for this study. Sections 3 and 4 present the findings from the descriptive and regression

1. There are also studies which estimate the returns to skill in the form of returns to college or university education (i.e., how much more college or university graduates earn compared to high school graduates) such as Freeman and Needels (1993), Murphy, Riddell, and Romer (1998), Burbidge, Magee, and Robb (2002), and Boudarbat, Lemieux, and Riddell (2010).

analysis, respectively. The study concludes with a discussion of the limitations of this study and provides further research questions with policy implications.

2 Data

This study builds on a pilot project funded by Ontario Human Capital Research and Innovation Fund in 2013 and an extended version of that pilot project which was funded by Employment and Social Development Canada in 2014. The initial pilot project linked student administrative data from the University of Ottawa to tax records at Statistics Canada. The second project included 13 additional PSE institutions. This report uses data from eight PSE institutions that provided the cumulative grade point average variable and agreed to participate in the study.

This section describes the creation of the dataset which links administrative student data from the eight PSE institutions to tax records at Statistics Canada. The dataset covers the taxation years 2006 - 2013 and includes individuals who graduated from all participating institutions over the period 2005 - 2012.

The creation of the linked dataset and Statistics Canada disclosure rules, the definition and creation of the measure of earnings as well as other variables referred to in this report, and the sample inclusions and censoring strategy for graduates that do not file taxes and those that return to school are addressed below.

2.1 Creation of Linked Dataset and Statistics Canada Disclosure Rules

The current analysis builds on a unique dataset created to analyze the post-schooling earnings of Canadian PSE graduates. This dataset is based on administrative student data from eight institutions who agreed to participate in this project.

Each participating institution prepared two datasets: one that included individual identifiers (e.g., full name and precise birth date) of students who graduated from their institution over the 2005 - 2012 period and another that included student and program characteristics such as graduation year, cumulative grade point average, gender, credential type, classification of instructional program (CIP) code. Statistics Canada used the first dataset to link graduate records to their related set of tax files, and then merged this dataset with the second dataset.²

2. As a security measure, once the data that included the student identifiers was linked to the tax data at Statistics Canada, it was destroyed there. All (actual) individual student identifiers were also deleted from the

Once the fully linked data file was created at Statistics Canada, the participating institution's data were ready to be used in the analysis presented in this report.

Statistics Canada's tax record data for this study is available from 2006 - 2013. This tax data represents the adult population well as the rate of tax filing in Canada is very high. Upper and middle-income Canadians are required to file and lower-income Canadians have strong financial incentives to file in order to recover part of the income tax and other payroll tax deductions they make throughout the year, or to receive various tax credits. As a result, more than 95 percent of graduating students from all participating institutions could be matched to at least one tax year record.

The analysis undertaken in this project follows Statistics Canada's disclosure rules. These rules state that the rounded sample size must be at least 20 for the sample average statistic. Furthermore, earnings figures must be rounded to the nearest \$100.

2.2 Analysis Data

The sample used in this study consists of graduates from eight institutions that provided cumulative GPA information: three universities and two colleges located in Ontario, and two universities and one college located outside the province. As stated earlier, the graduates in this dataset graduated in the eight-year period from 2005 - 2012. This study focuses on graduates from either degree or diploma programs that require education credentials no higher than a secondary school diploma. In other words, first-professional degree, graduate, and post-graduate diploma programs are excluded.

In order to include only individuals that worked in a given year, we censor graduates whose total before-tax earnings are lower than or equal to \$1,000, under the assumption that earnings below \$1,000 represent an individual that did not work in that fiscal year. We exclude individuals who did not file taxes in a given year, but allow them to return into the sample for all years for which there is tax information for them.

Additionally, individuals are censored if they returned to school in any given year and for all subsequent years thereafter. We consider individuals to have returned to school if they claim more than \$100 in tuition expenses in a given tax year. This approach ensures that we do not include those who returned to school to upgrade their skills, as we would expect

fully linked file to be used in the analysis. Strict protocols established by Statistics Canada governed access to the data and the release of any information based on their analysis.

these individuals to obtain an earnings premium compared to those who have not completed additional schooling.

2.3 Variable Definitions

2.3.1 Earnings

This project focuses on total before-tax earnings, created by combining three measures of each graduate's yearly income. We combine the earnings from the T4 slips with declared self-employment income and other employment income. The focus on before-tax income ensures that the effects of tax credits and transfer programs, which would disproportionately affect the after-tax earnings of some graduates, are not included. For example, individuals with children could claim a tax credit that would raise their after tax earnings relative to those who do not have children and have the same level of before tax earnings. All earnings are Consumer Price Index (CPI) adjusted to 2011 dollars.

2.3.2 Years Since Graduation

This variable is computed as the difference between the taxation year and graduation year. In order to track each individual's earnings over time, and to capture the effects of labour market experience on earnings, this analysis examines earnings on a cohort-by-cohort basis by year after graduation. As an example: for a student who graduated in 2005 (the 2005 cohort), we observe their earnings at one year after graduation, i.e. in fiscal/tax year 2006, and follow them on a yearly basis for as long as we have earnings information. For this earliest cohort, we have earnings information spanning eight years (until 2013), while for later cohorts we have less information; for example, for the 2006 cohort, we have seven years of earnings information, for the 2012 cohort, we have only one year of earnings information.

2.3.3 Cumulative Grade Point Average

A key challenge in this study is that different PSE institutions use different grading schemes, such that their GPA grading systems are not necessarily comparable. For example, some institutions use a 100-point scale while others use a four-point scale.

In this study, instead of using observed cumulative GPA values directly, we divide the graduate sample into three groups based on their positions in the cumulative GPA distribution

Table 2.1: Field of Study Groups for Degree and Diploma Program Graduates

Degree Program Graduates	Diploma Program Graduates
1. Business	1. Arts & Education
2. Engineering	2. Business
3. Fine Arts	3. Engineering
4. Health	4. Fine Arts
5. Humanities	5. Health
6. Mathematics & Computer Science	6. Personal, Protective and Transportation (PPT) Services
7. Sciences & Agriculture	7. Sciences & Agriculture
8. Social Sciences	

within institution, graduate cohort, and credential type.³ Specifically, we classify them into the top, middle, and bottom third grade groups. This classification reflects a student’s relative position in the overall grade distribution. The lowest category indicates that student’s grade is in the bottom third of the score distribution, while the highest category indicates that the student’s grade is in the top third of the grade distribution.⁴

2.3.4 Field of Study

We use the Classification of Instructional Programs (CIP) code in order to classify each field of study appropriately. We consulted with Statistics Canada and all participating institutions in order to ensure that classifications are meaningful. We also ensured that the fields of study that were combined together have similar earnings patterns and profiles. To keep the analysis tractable, seven and eight fields of study (FOS) groups were created for diploma and degree graduates, respectively, with each group given a category name that reflects it.⁵ These categories are listed in Table 2.1. For a detailed list of subfields in each field of study group, refer to Tables A.1 to A.4 in Appendix.

3. When students’ gender and fields of study are used to group them as well, the cumulative distribution is also conditioned on these two characteristics.

4. Student records with cumulative grade point average values that are below the minimum cumulative grade point average required for graduation are excluded from the dataset.

5. Programs which cannot be entered directly from high school (e.g., law and medicine) are also excluded from the sample.

3 Descriptive Analysis

3.1 Average Earnings by Grade Group

Figure 3.1 presents the average earnings of degree program graduates by graduate cohort, with each panel showing the earnings profiles of the top, middle, and bottom third grade groups. For each cohort, the average earnings for the three grade groups started at approximately \$45,000-\$50,000 after graduation. The average earnings grew at a robust pace over time, e.g., by more than \$25,000 eight years after graduation for the 2005 graduates. The earnings growth was equally robust for other cohorts.

Figure 3.1 illustrates that PSE grades and post-graduation earnings are positively related for the degree program graduates. For each graduate cohort, approximately \$9,000 gaps were observed in the average earnings between the lowest and highest grade group in the first year, with the average earnings for the middle grade group evenly splitting the difference. The average earnings differences stayed at roughly the same level over the eight years, preserving the ranking of the three grade groups.

Figure 3.2 presents the average earnings results for the diploma program graduates in the sample. Like the degree program graduates, the figure shows robust earnings growth, e.g., an approximately \$20,000 increase in the first eight years after graduation for the 2005 graduate cohort.

While Figure 3.2 indicates a positive relationship between PSE grades and average earnings for all graduate cohorts, there were large differences in this relationship among cohorts. For the 2005 graduate cohort, the gaps between the three grade groups' average earnings were roughly evenly spaced. In contrast, for other graduate cohorts, there were large gaps in the average earnings between the top third grade group and the rest, with the middle and bottom third grade groups' average earnings close to each other. In some cases, the bottom third group overtook the middle third group.

Although Figures 3.1 and 3.2 reveal that PSE grades were positively linked with post-graduation earnings for degree and diploma program graduates in general, the sample is comprised of diverse student groups of each gender from different fields of study. It is therefore likely that the earnings profiles presented are masking significant heterogeneity. To account for these differences, we examine the average earnings profiles for each gender

Figure 3.1: Average Earnings for Degree Program Graduates

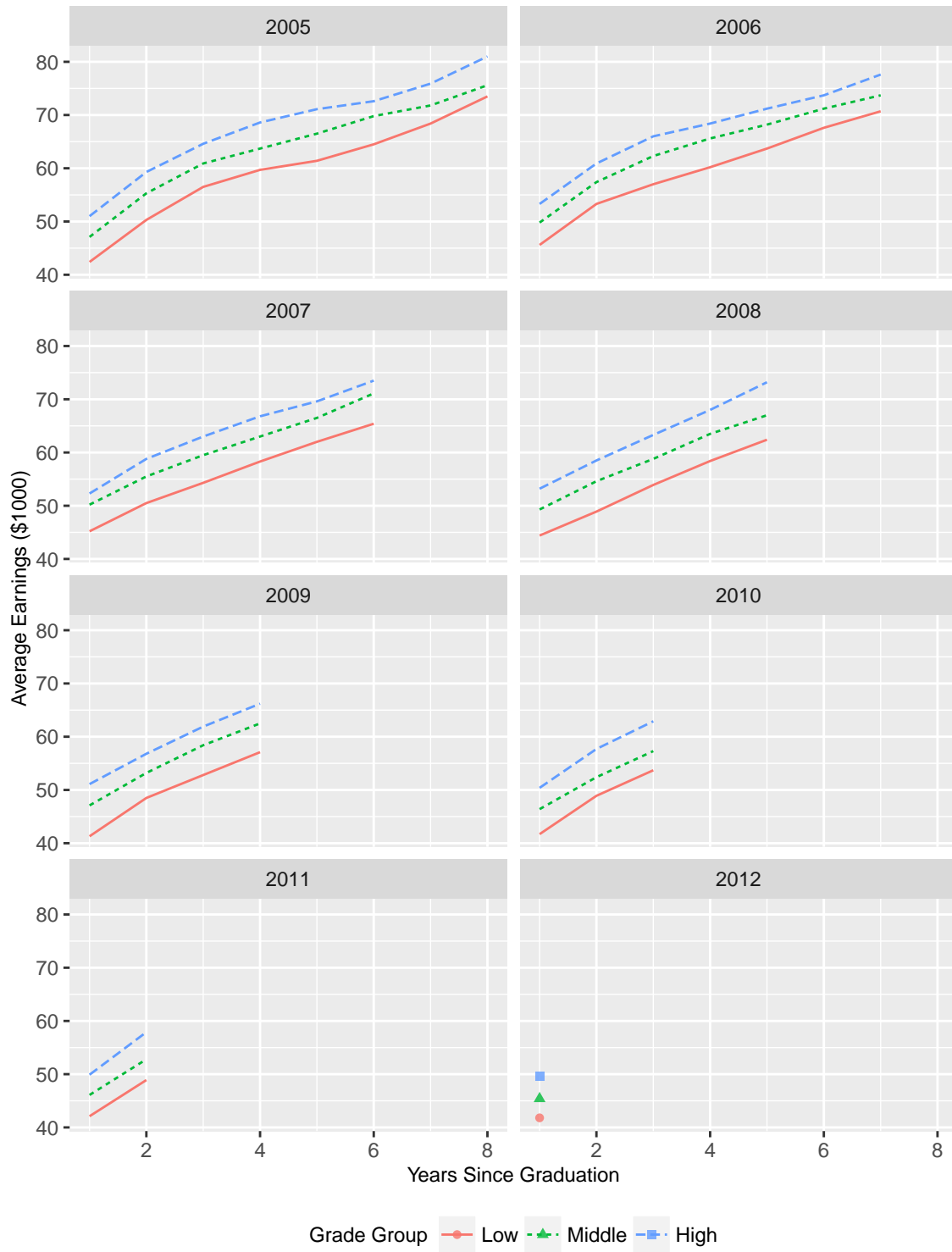
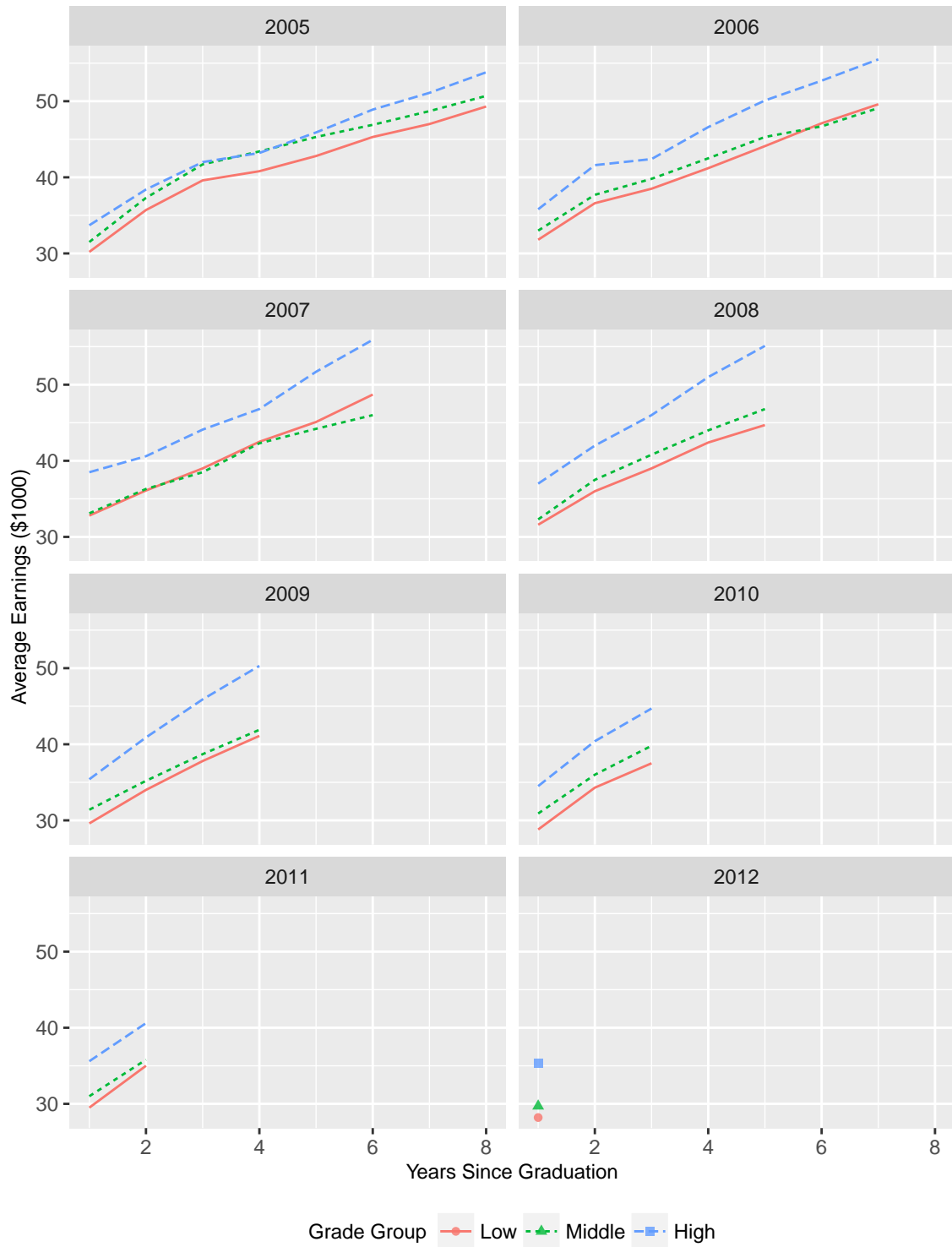


Figure 3.2: Average Earnings for Diploma Program Graduates



and FOS group category in the remainder of the section.

3.2 Average Earnings of Degree Program Graduates

Figure 3.3 presents the post-graduation average earnings of the male 2005 degree program graduates for the eight FOS groups. In general, all eight graphs in this figure suggest that the top third grade group had the highest earnings on average. The initial post-graduation earnings showed a positive relationship with PSE grades for the graduates in Social Sciences, Business, Health, Engineering, Humanities, Mathematics & Computer Science. On the other hand, all three grade groups in Sciences and Agriculture had roughly the same average initial earnings level. For the Fine Arts graduates, the middle third grade group had the lowest average earnings of the three, with a \$3,000 average annual earnings gap from the bottom third grade group.

The observed initial positive grade-earnings relationship held over time for the graduates in Social Sciences, Health, Engineering, Humanities, and Mathematics & Computer Science. Among the Business graduates, the bottom third grade group overtook the middle and top third grade groups after eight years following graduation with the fastest earnings growth of the three.

Between the bottom third grade group and the rest of the graduates in Mathematics & Computer Science, the differences in average earnings widened over time. While the average earnings fluctuated over time for the middle and top third grade groups of the Sciences and Agriculture graduates, the average earnings gaps appeared to grow, resulting in a positive grade-earnings relationship for this student group.

Figure 3.4 presents the post-graduation average earnings of the female 2005 degree program graduates. Overall, there were positive grade-earnings relationships for the Social Sciences, Business, Engineering, Humanities, and Mathematics & Computer Science graduates.

Like the male degree program graduates, there was a large gap in average earnings between the bottom third grade group and the rest among the female Mathematics & Computer Science graduates. Specifically, the bottom third group earned less than the top and middle third groups by at least \$10,000 on average in each of the eight years since graduation.

The average earnings of the three grade groups among the Health graduates were very close to each other, with no clear grade-earnings relationship. The earnings patterns of the Sci-

Figure 3.3: Average Earnings for the Male 2005 Degree Program Graduates

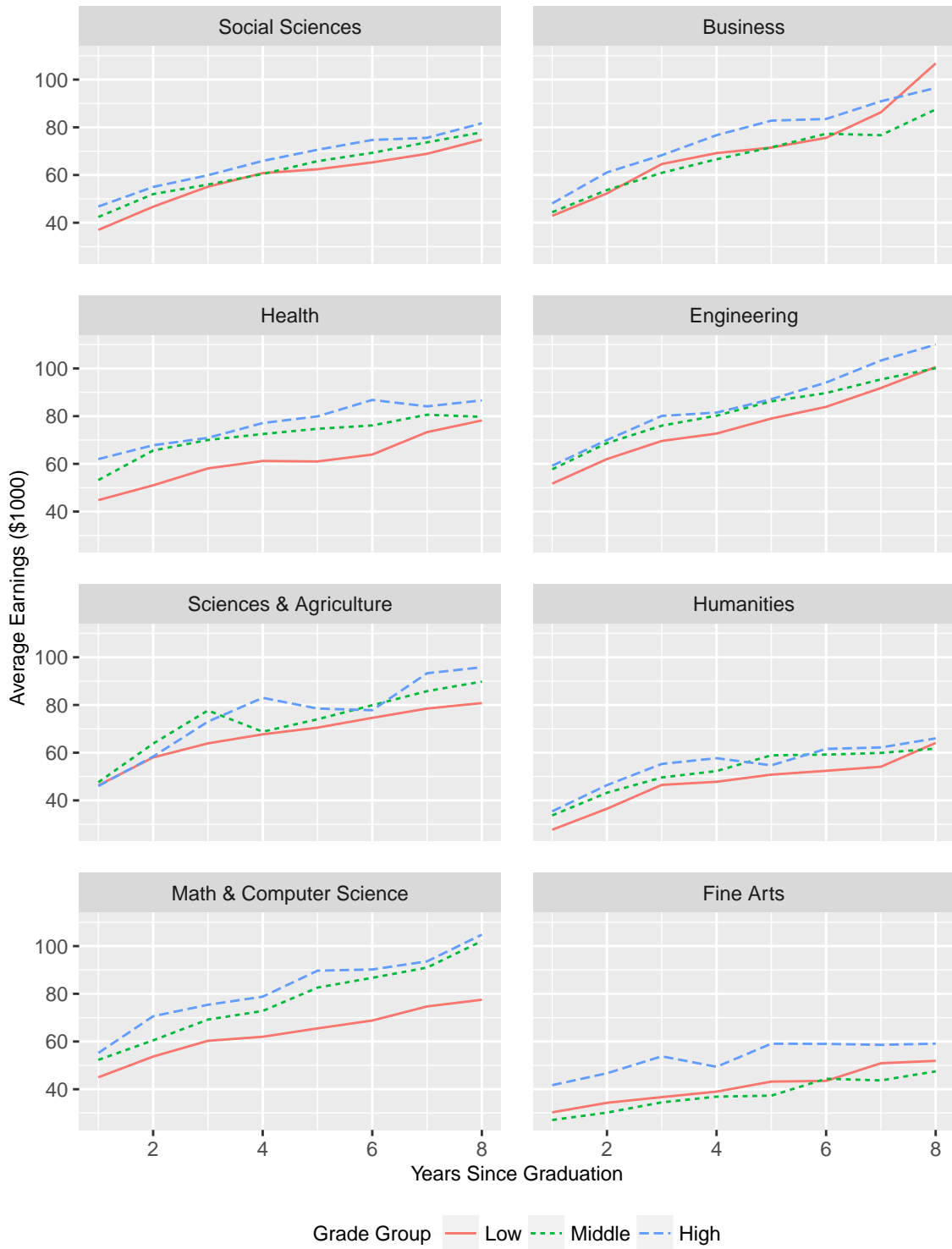
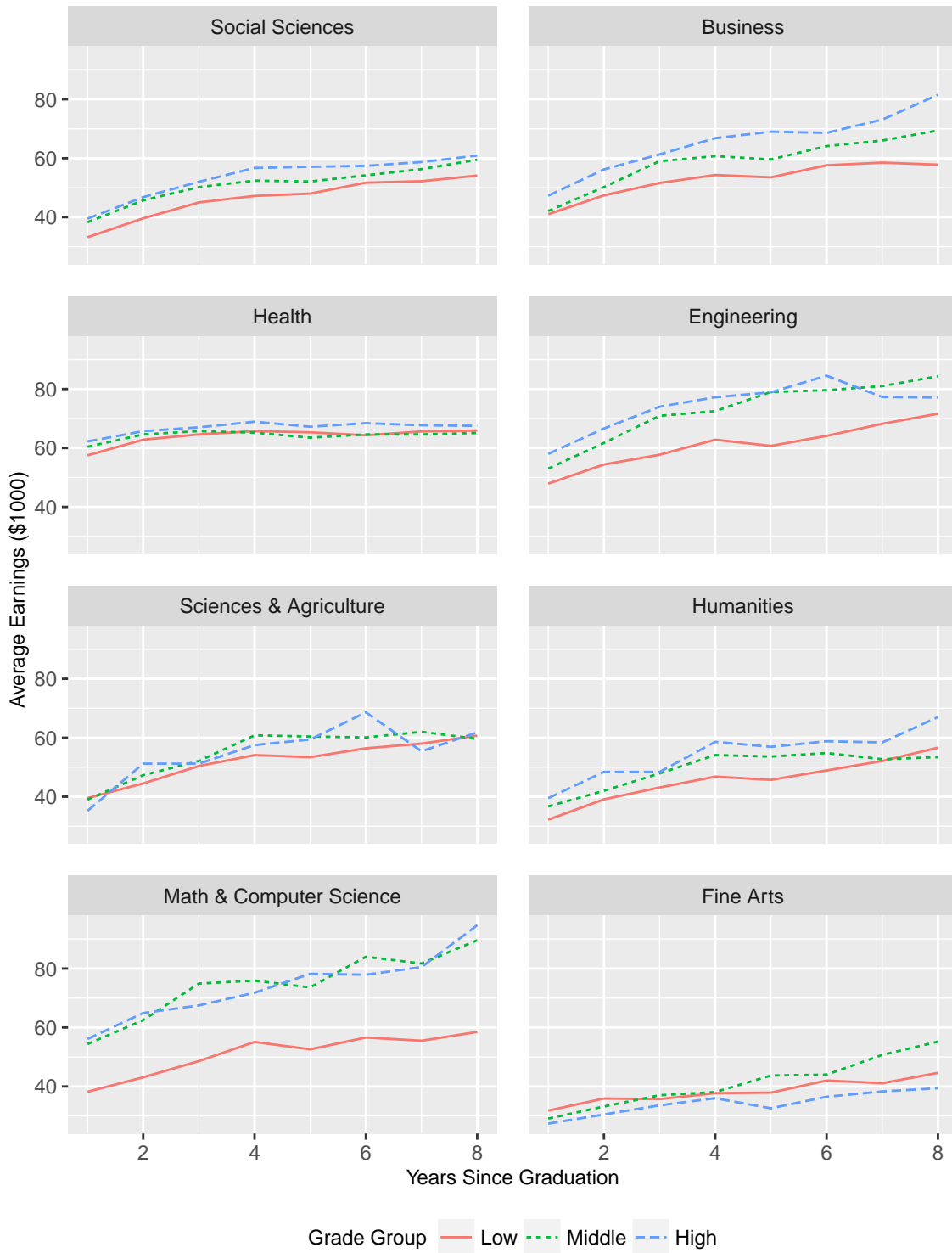


Figure 3.4: Average Earnings for the Female 2005 Degree Graduates



ences & Agriculture graduates were noisy with frequent fluctuations, making it hard to observe a consistent pattern between PSE grades and post-graduation earnings. Among the Fine Arts graduates, the top third grade group consistently had the lowest average earnings of the three.

In order to examine whether the observed patterns in the earnings of the 2005 graduate cohort's hold for other graduate cohorts, Figures A.1 to A.16 in Appendix provide the same set of results for every graduate cohort. In these figures, the results are arranged by FOS category and gender, so that it is straightforward to compare the earnings profiles of different graduate cohorts within a given gender and FOS group.

Overall, the findings from the 2005 graduate cohort are consistent with the average earnings of other cohorts for many FOS categories. In particular, the positive grade-earnings relationships found in Figures 3.3 and 3.4 qualitatively hold for later graduate cohorts.

3.3 Average Earnings of Diploma Program Graduates

Next, we examine the average earnings of diploma program graduates by gender and FOS group. At this level of disaggregation, the results for the Sciences and Agriculture graduates did not meet the minimum sample size requirement set by Statistics Canada. As a result, we omit this group's results in this report, while conducting the analysis for this group in the ensuing regression analysis.

Figure 3.5 presents the post-graduation average earnings of the male 2005 diploma program graduates cohort. As the six panels in this figure show, different FOS groups had different patterns of grade-earnings relationship. For example, the Health and PPT Services graduates had a mostly positive grade-earnings relationship, with the top and bottom third grade groups earning the most and the least, respectively, on average. Among the Arts & Education graduates, the top third grade group earned the most on average, while the middle and bottom third grade groups had similar initial earnings and earnings growth. In contrast, the top third grade groups in Engineering and Fine Arts earned the least on average for most of the eight years since graduation. Indeed, the figure shows an inverse grade-earning relationship for the Fine Arts graduates. Meanwhile, all three grade groups of the male diploma graduates in Business had similar average earnings over the eight years since graduation.

Figure 3.6 presents the post-graduation average earnings of the female 2005 diploma program graduates. Overall, no FOS group other than Health displayed a pattern of positive

Figure 3.5: Average Earnings for the Male 2005 Diploma Graduates

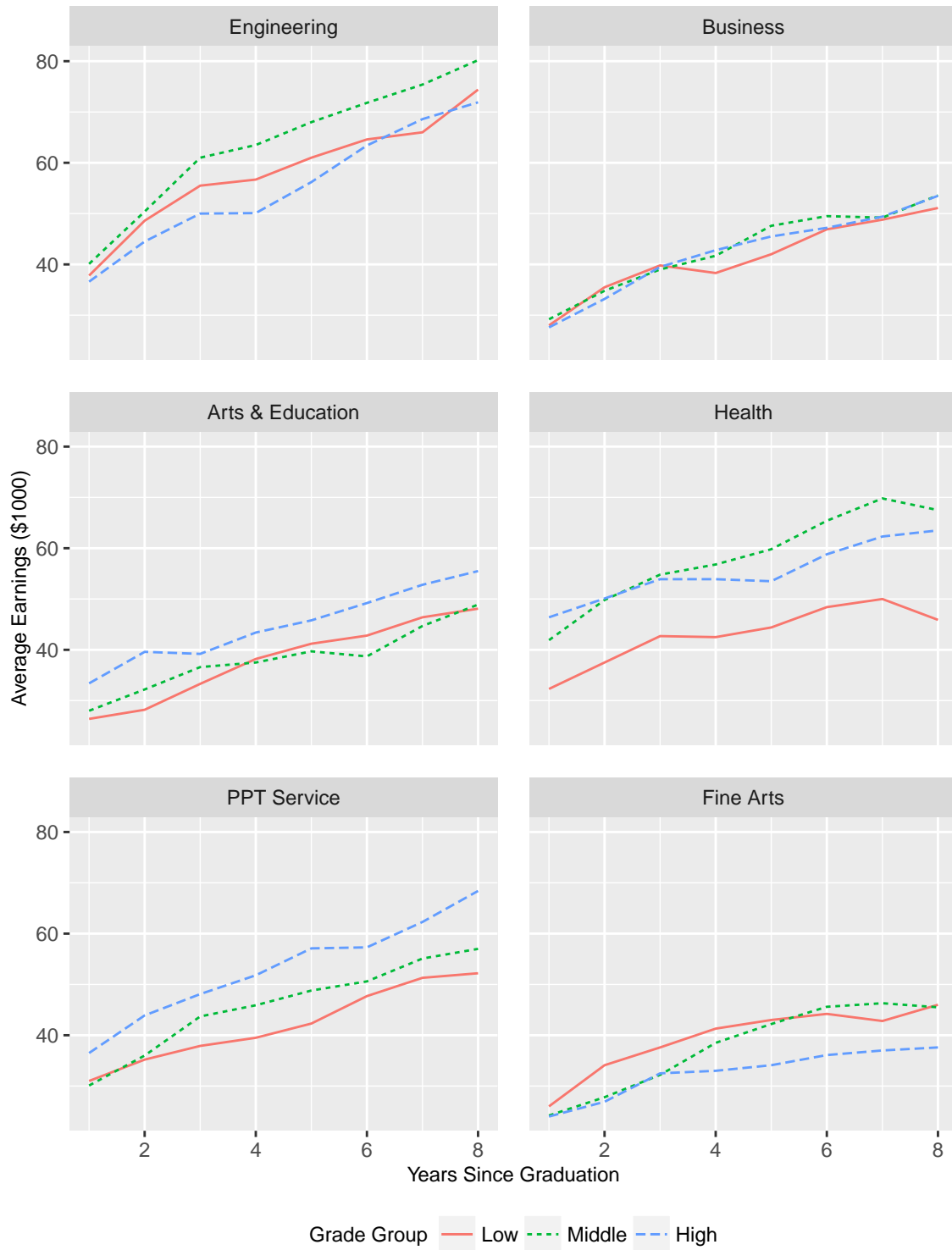
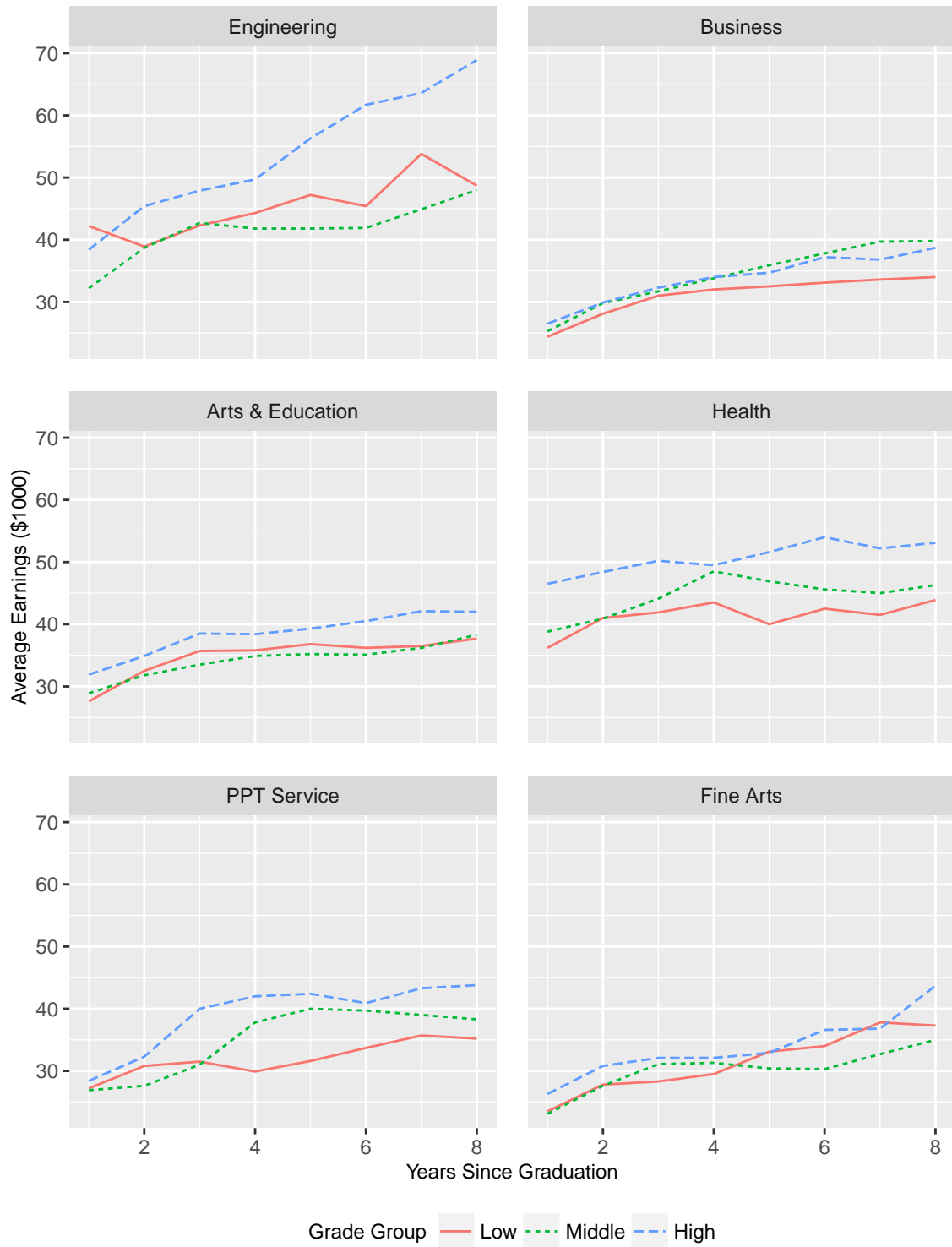


Figure 3.6: Average Earnings for the Female 2005 Diploma Program Graduates



grade-earnings relationship that was stable over the eight years since graduation.

Among the Engineering graduates, there was a widening average earnings gap between the top third grade group and the rest with the middle third grade group earning the least of the three groups on average. The top and middle grade groups of Business graduates had very similar earning profiles, consistently exceeding the bottom third grade group's earnings. For the female graduates in Arts and Education, the average earnings of the bottom and middle third grade groups stayed close to each other over time while the top third group earnings stayed consistently above them. In the PPT Services category, the three grade groups had similar initial average earnings. However, differences in average earnings emerged over time, leading to a positive grade-earnings relationship over the years. In Fine Arts category, the rankings in average earnings among the three grade groups changed many times.

Figures A.17 to A.28 in Appendix provide the same set of results for every graduate cohort. Possibly due to the smaller sample size of the diploma graduates than that of the degree graduates in the data, the patterns between grades and earnings were more variable across cohorts for the diploma graduates. Moreover, these figures display positive grade-earnings relationships for some student groups that did not hold for the 2005 graduates. Unlike Figures 3.5 and 3.6, these graphs show that PSE grades and earnings were positively related for both male and female Business graduates, and to a lesser extent, the female Arts and Education graduates.

4 Regression Analysis

4.1 The Model

A regression analysis provides a means to uncover the relationship between grades and earnings using every graduate cohort's data in a concise manner while accounting for cohort differences. Moreover, although the sample size issue precluded us from presenting any descriptive results for the diploma graduates in Sciences and Agriculture, by pooling data we are able to examine the grade-earnings relationship for this student group as well.

We build on the log-earnings regression framework widely used to study labour market earnings in labour economics. Specifically, the following regression model presents the

basic framework:

$$y_{it} = \alpha + \beta(t - 1) + G_i^M [\delta_M + \gamma_M(t - 1)] + G_i^T [\delta_T + \gamma_T(t - 1)] + \varepsilon_{it}. \quad (1)$$

The dependent variable y_{it} is the logarithm of earnings of individual i after t years since graduation. The explanatory variables are t , years since graduation, in addition to G_i^M and G_i^T , which are binary variables equaling 1 if individual i belongs to the middle and top third grade groups, respectively, or 0 otherwise. The variable ε_{it} is an error term capturing remaining factors affecting earnings and assumed to have a mean of zero.

In equation (1), the coefficients δ_M , δ_T , γ_M , and γ_T capture the differences in earnings among the three grade groups. Coefficients δ_M and δ_T represent the differences in initial earnings. If δ_M and δ_T are both positive and $\delta_M < \delta_T$, initial earnings has a positive relationship to grades. Conversely, if δ_M and δ_T are negative and $\delta_M > \delta_T$, initial earnings has a negative relationship to grades. Otherwise, the relationship between them is not monotonic.

The coefficients γ_M and γ_T describe the differences in earnings growth among the three grade groups. As shown in equation (1), β is a common earnings growth component among the three groups. While this alone drives the earnings growth for the bottom third group, the earnings growth is augmented by γ_M and γ_T for the middle and top third groups, respectively. For example, a positive value of γ_M implies that earnings for the middle third group grows faster than the bottom third group.

Quantitatively, δ_M and δ_T multiplied by 100 approximate the initial earnings differences in percentage terms from the bottom third group to the middle and top grade groups, respectively. Similarly, γ_M multiplied by 100 reflects the change in earnings difference in percentage terms between the middle and low third grade groups with one additional year. The coefficient γ_T is interpreted similarly for the earnings difference between the high and low third grade groups.

The model implies that the log earnings difference between the middle and bottom third grade group is $\delta_M + \gamma_M(t - 1)$ after t years since graduation, on average. Similarly, the difference in log earnings between the top and bottom grade groups is $\delta_T + \gamma_T(t - 1)$ after t years since graduation.

In equation (1), log earnings grow linearly over time, i.e., by β for the bottom third grade group each year, and $\beta + \gamma_M$ and $\beta + \gamma_T$ for the middle and top third grade groups each

year, respectively. This feature may be too restrictive to fit earnings data well. To allow for potential non-linearity between log earnings and years since graduation, we model the common growth component more flexibly, as shown in the following regression model:

$$y_{it} = \alpha + \sum_{k=2006}^{2012} \alpha_k C_i^k + \sum_{s=2}^8 \beta_s YSG_{it}^s + G_i^M [\delta_M + \gamma_M(t-1)] + G_i^T [\delta_T + \gamma_T(t-1)] + \varepsilon_{it}. \quad (2)$$

C_i^k denotes a binary variable equaling 1 if individual i is a graduate in year k . YSG_{it}^s denotes a binary variable equaling 1 if individual i 's years since graduation in year t equals s , and 0 otherwise. In equation (2), initial post-graduation earnings may differ among different cohorts, with each α_k capturing differences in log earnings of the year k cohort relative to the 2005 cohort. In addition, with β_s capturing earnings growth from the first year to s years since graduation, equation (2) models annual earnings growth flexibly.

The equation can be further extended by allowing different graduation cohorts to have different earnings growth profiles as in the following specification:

$$y_{it} = \alpha + \sum_{k=2006}^{2012} \alpha_k C_i^k YSG_{it}^1 + \sum_{k=2005}^{2011} \sum_{s=2}^{2013-k} \beta_s^k C_i^k YSG_{it}^s + G_i^M [\delta_M + \gamma_M(t-1)] + G_i^T [\delta_T + \gamma_T(t-1)] + \varepsilon_{it}. \quad (3)$$

To facilitate the discussion, we call the model specification given in equation (2) the Baseline specification, and the one given in equation (3) the flexible YSG specification.

We employ the least square method to estimate the model parameters. While this estimation method is widely used, the least square estimates should not be interpreted as the causal effect without further conditions. In particular, if the error term contains a factor that is correlated with any of the explanatory variables, the least square estimator results in biased estimates of the causal effects of the explanatory variables on the earnings.

As revealed in the earlier descriptive analysis, the observed earnings profiles differed across gender and FOS groups. To account for these differences we estimate the parameters separately by credential type, field of study, and gender.

4.2 Degree Program Graduates

The key parameters in the regression model are δ_M , δ_H , γ_M , and γ_T , which reflect the differences in log earnings across the three grade groups. Table 4.1 presents the least square estimates for these four coefficients for both Baseline and Flexible YSG specifications.⁶

The first two columns identify relevant student groups, the next four columns present the coefficient estimates for the Baseline specification, and the last four columns present those for the flexible YSG specification. The two model specifications produce very close estimation results.

The estimate for δ_M is positive for all student groups except male Humanities graduates, and male and female Fine Arts graduates. These positive estimates are as low as 0.026 for the male Social Sciences graduates, and as high as 0.279 for the female Math & Computer Sciences graduates.

The coefficient estimates for δ_T are also positive for most of the student groups, and larger than the estimates for δ_M , revealing positive relationships between the grade and initial post-graduation earnings.

For the male and female Fine Arts graduates, both δ_T and δ_M are estimated to be negative, with δ_T larger in magnitude than δ_M . These estimates indicate an inverse relationship between grades and earnings. Moreover, the estimate for δ_T is negative for the male Sciences & Agriculture graduates. Although it is not statistically significant, this estimate is in contrast to 0.07 estimated for δ_M .

The estimates for γ_M and γ_T are statistically insignificant for many student groups. These values are also quantitatively small relative to the corresponding estimates for δ_M and δ_T , suggesting that the initial earnings gaps among the three grade groups are fairly stable over time for many groups.

The estimates are quantitatively significant in some cases, e.g. γ_M and γ_T for the female Health graduates, γ_T for the male Sciences & Agriculture graduates, and γ_M for the female Fine Arts graduates. These values have the opposite sign to the initial earnings gap implied by δ_M or δ_T . For example, for the female Health graduates, the estimates for δ_T and γ_T together indicate that the estimated 13 percent gap of initial post-graduation earnings between

6. See Tables A.5 to A.10 in the Appendix for the rest of the estimation results.

Table 4.1: Key Parameter Estimates – Degree Program Graduates

FOS	Gender	Baseline Specification				Flexible YSG Specification			
		δ_M	δ_T	γ_M	γ_T	δ_M	δ_T	γ_M	γ_T
Social Sciences	Male	.026 (.017)	.074 [†] (.019)	.002 (.006)	.012 (.007)	.026 (.017)	.075 [†] (.019)	.002 (.006)	.012 (.007)
	Female	.097 [†] (.012)	.183 [†] (.013)	-.002 (.004)	-.002 (.005)	.097 [†] (.012)	.183 [†] (.013)	-.002 (.004)	-.002 (.005)
Business	Male	.095 [†] (.013)	.227 [†] (.013)	-.002 (.005)	-.005 (.005)	.095 [†] (.013)	.227 [†] (.013)	-.002 (.005)	-.005 (.005)
	Female	.084 [†] (.013)	.221 [†] (.014)	.012* (.005)	.012* (.005)	.083 [†] (.013)	.221 [†] (.014)	.012* (.005)	.013* (.005)
Health	Male	.123 [†] (.026)	.232 [†] (.028)	.005 (.010)	-.006 (.011)	.122 [†] (.026)	.232 [†] (.028)	.006 (.010)	-.005 (.011)
	Female	.110 [†] (.010)	.132 [†] (.010)	-.022 [†] (.004)	-.022 [†] (.004)	.110 [†] (.010)	.132 [†] (.010)	-.022 [†] (.004)	-.023 [†] (.004)
Engineering	Male	.101 [†] (.010)	.156 [†] (.011)	-.008* (.004)	-.008* (.004)	.101 [†] (.010)	.156 [†] (.011)	-.008* (.004)	-.008* (.004)
	Female	.107 [†] (.022)	.175 [†] (.023)	.009 (.008)	-.001 (.008)	.107 [†] (.022)	.175 [†] (.023)	.009 (.008)	-.001 (.008)
Sciences & Agriculture	Male	.070 [†] (.024)	-.020 (.030)	.012 (.009)	.031 [†] (.012)	.070 [†] (.024)	-.020 (.030)	.012 (.009)	.031 [†] (.012)
	Female	.075 [†] (.022)	.141 [†] (.025)	-.004 (.008)	.010 (.010)	.075 [†] (.022)	.141 [†] (.025)	-.004 (.008)	.010 (.010)
Humanities	Male	-.028 (.032)	.046 (.036)	.014 (.012)	-.001 (.013)	-.027 (.032)	.048 (.036)	.014 (.012)	-.002 (.013)
	Female	.046* (.023)	.092 [†] (.025)	.006 (.009)	.029 [†] (.009)	.046* (.023)	.092 [†] (.025)	.007 (.009)	.028 [†] (.009)
Mathematics & Computer Science	Male	.167 [†] (.018)	.274 [†] (.020)	-.000 (.006)	-.004 (.007)	.167 [†] (.018)	.274 [†] (.020)	-.000 (.006)	-.004 (.007)
	Female	.279 [†] (.036)	.397 [†] (.038)	.001 (.013)	-.016 (.013)	.281 [†] (.036)	.397 [†] (.038)	.000 (.013)	-.016 (.014)
Fine Arts	Male	-.046 (.038)	-.094* (.039)	.010 (.014)	.021 (.015)	-.045 (.038)	-.094* (.039)	.010 (.014)	.021 (.015)
	Female	-.070 [†] (.026)	-.102 [†] (.027)	.028 [†] (.010)	.003 (.010)	-.069 [†] (.026)	-.101 [†] (.027)	.027 [†] (.010)	.002 (.010)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

the bottom and top third grade groups decrease by 2.2 percent each year, closing the initial earning gap quite quickly.

As noted earlier, the regression model implies that the expressions $\delta_M + \gamma_M(t - 1)$ and $\delta_T + \gamma_T(t - 1)$ reflect the earnings gaps from the bottom third grade group to the top and middle third grade groups, respectively, in t years since graduation. Figures 4.1 and 4.2 present the values implied by the estimation results, with their confidence intervals.

Figure 4.1 shows that there are clear positive grade-earnings relationships for the male degree graduates in Social Sciences, Business, Engineering, and Mathematics & Computer Science. The earnings gaps among the three grade groups widen over time in Social Sciences. The earnings gaps gradually decrease over time in Business, Engineering and Math & Computer Science.

Figure 4.2 displays positive grade-earnings relationships for the female degree graduates in Social Sciences, Business, Sciences & Agriculture, and Humanities. The figure presents a positive grade-earnings relationship in Math & Computer Science immediately after graduation. However, this does not persist over time, with a downward pattern in the earnings gap from the bottom third to the top and middle third grade groups.

4.3 Diploma Program Graduates

Table 4.2 presents the key coefficient estimates for the diploma program graduates.⁷ As is the case with the degree program graduates, both Baseline and Flexible YSG specifications result in very similar estimation results.

The estimates for δ_M are positive for all student groups except for the Engineering students. These positive values range from 0.034 for the male Fine Arts graduates to 0.207 for the female Sciences and Agriculture graduates, and most are statistically significant, at least at the five percent level. For these subsamples, the estimates for δ_T are positive, and greater than the corresponding estimates for δ_M , thus revealing that PSE grades and initial post-graduation earnings are positively related.

By contrast, these same two parameters are estimated to be negative for both male and female Engineering graduates. The estimate for δ_M for the male graduates implies approximately 16 percent lower earnings for the middle third grade group compared to the bottom

7. See Tables A.11 to A.16 in the Appendix for the remainder of the estimation results.

Figure 4.1: Implied Relative Earnings Differences—Male Degree Graduates

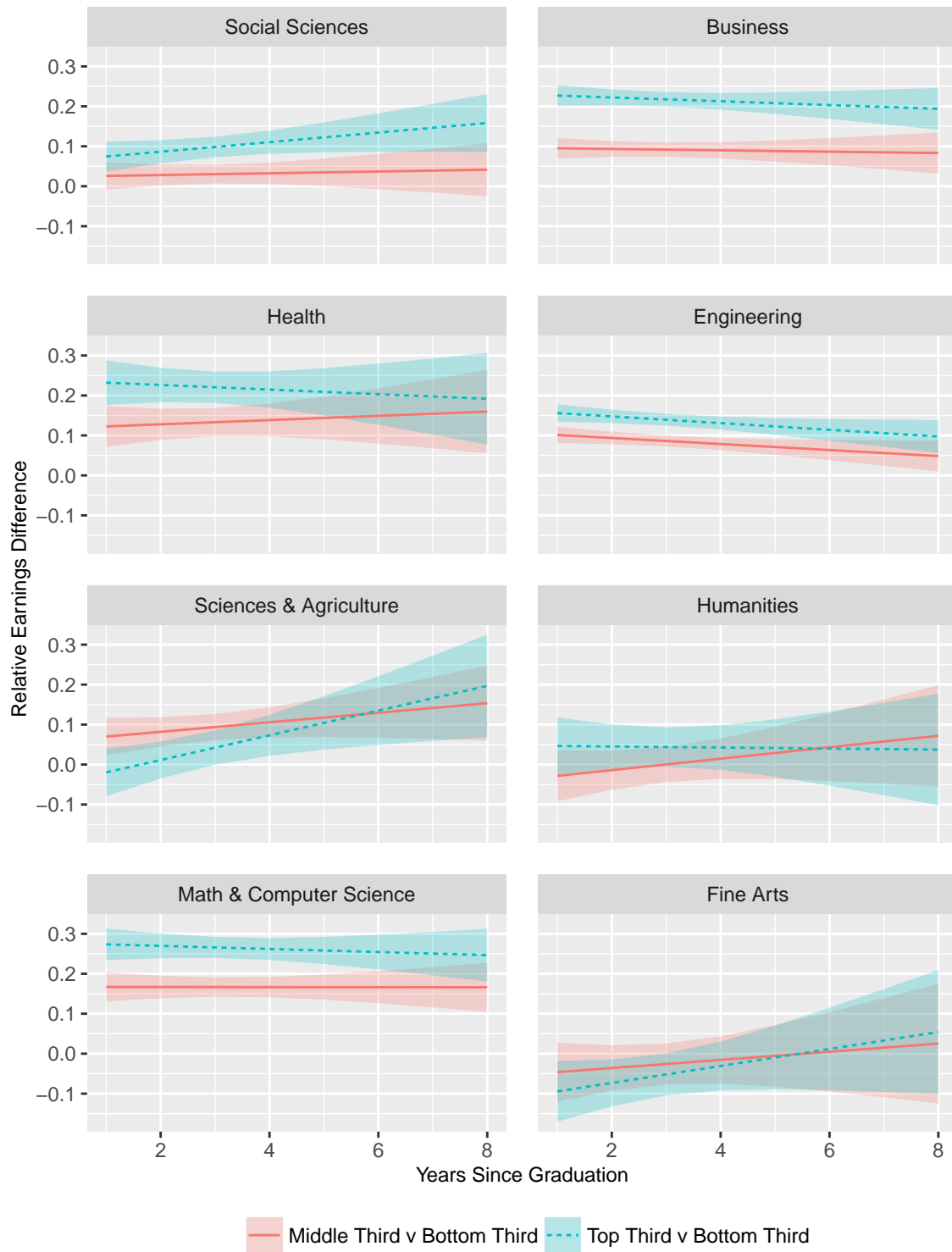


Figure 4.2: Implied Relative Earnings Differences—Female Degree Graduates

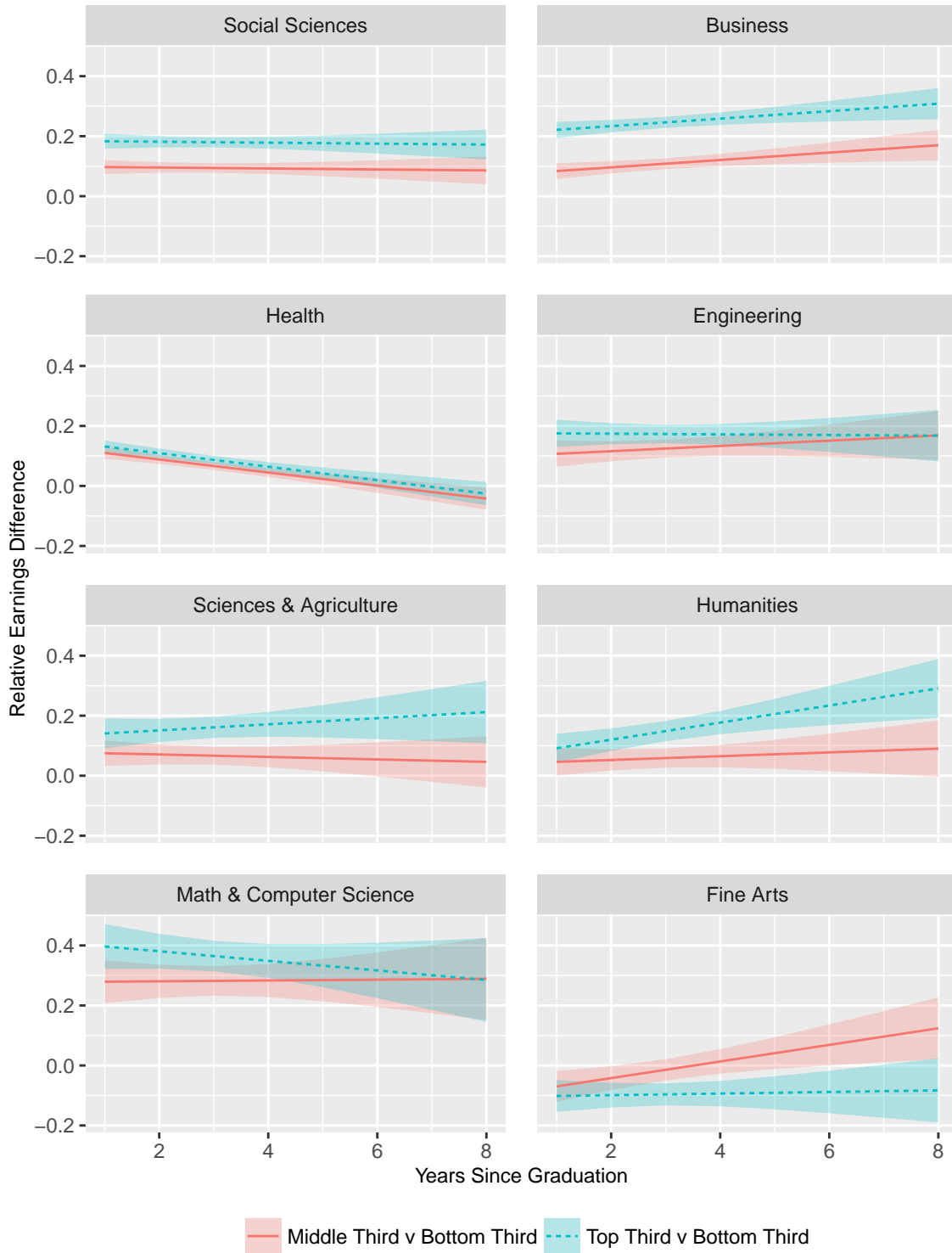


Table 4.2: Key Parameter Estimates – Diploma Program Graduates

FOS	Gender	Baseline Specification				Flexible YSG Specification			
		δ_M	δ_T	γ_M	γ_T	δ_M	δ_T	γ_M	γ_T
Engineering	Male	-.163 [†] (.013)	-.041 [†] (.013)	.020 [†] (.005)	-.004 (.005)	-.164 [†] (.013)	-.041 [†] (.013)	.020 [†] (.005)	-.004 (.005)
	Female	-.009 (.037)	-.075* (.037)	.021 (.013)	.035 [†] (.013)	-.009 (.037)	-.075* (.037)	.021 (.013)	.034* (.013)
Business	Male	.046* (.021)	.148 [†] (.021)	-.001 (.008)	-.009 (.008)	.047* (.021)	.149 [†] (.021)	-.001 (.008)	-.009 (.008)
	Female	.045 [†] (.017)	.119 [†] (.017)	.011 (.006)	.005 (.006)	.045 [†] (.017)	.119 [†] (.017)	.011 (.006)	.005 (.006)
Arts & Education	Male	.143 [†] (.030)	.354 [†] (.030)	-.016 (.011)	-.012 (.011)	.143 [†] (.030)	.354 [†] (.030)	-.017 (.011)	-.012 (.011)
	Female	.095 [†] (.015)	.224 [†] (.015)	-.008 (.006)	-.016 [†] (.005)	.095 [†] (.015)	.224 [†] (.015)	-.008 (.006)	-.016 [†] (.005)
Health	Male	.119 [†] (.032)	.404 [†] (.033)	.019 (.012)	-.022 (.012)	.117 [†] (.032)	.402 [†] (.033)	.020 (.012)	-.022 (.012)
	Female	.088 [†] (.020)	.193 [†] (.020)	-.008 (.007)	-.013 (.007)	.088 [†] (.020)	.192 [†] (.020)	-.007 (.007)	-.013 (.007)
PPT Services	Male	.143 [†] (.023)	.386 [†] (.023)	.005 (.008)	-.017* (.009)	.143 [†] (.023)	.386 [†] (.023)	.005 (.009)	-.017 (.009)
	Female	.044 (.031)	.185 [†] (.032)	.025* (.012)	.018 (.012)	.043 (.031)	.183 [†] (.032)	.025* (.012)	.018 (.012)
Fine Arts	Male	.034 (.038)	.187 [†] (.038)	-.017 (.014)	-.055 [†] (.014)	.035 (.038)	.186 [†] (.038)	-.017 (.014)	-.055 [†] (.014)
	Female	.075* (.029)	.226 [†] (.029)	-.025* (.011)	-.015 (.011)	.073* (.029)	.226 [†] (.029)	-.024* (.011)	-.015 (.011)
Sciences & Agriculture	Male	.174 [†] (.056)	.210 [†] (.061)	-.050* (.020)	-.066 [†] (.022)	.175 [†] (.056)	.211 [†] (.062)	-.050* (.020)	-.066 [†] (.022)
	Female	.207 [†] (.058)	.358 [†] (.058)	.002 (.020)	-.007 (.020)	.205 [†] (.059)	.359 [†] (.059)	.002 (.020)	-.008 (.020)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

third grade group. The initial post-graduation earnings gap between the top and bottom third groups is estimated to be approximately 4 percent. For the female engineering graduates, the coefficient estimates reveal an inverse grade-earnings relationship for the initial post-graduation earnings, with approximately 1 and 8 percent differences for the middle and high grade groups compared to the low grade group, respectively.

The estimates for γ_M and γ_T are neither statistically significant nor quantitatively large compared to δ_M and δ_T for both male and female graduates in Business and Health, indicating that the grade-earnings relationship is stable over time for these student groups. In contrast, the estimates for γ_M and γ_T for the male Sciences and Agriculture graduates as well as the estimate for γ_T for the male Fine Arts graduates is quantitatively significant at -0.50 , -0.66 , and -0.55 , respectively, indicating that the grade-earnings relationships change significantly over time for these student groups.

Figures 4.3 and 4.4 present the log earnings differences among the three grade groups implied by the estimation results for the male and female diploma graduates, respectively.

While these figures show that there is a positive grade-earnings relationship in initial earnings for many student groups, they present a wide range of patterns of log earnings differences over time among the grade groups both qualitatively and quantitatively.

For example, the top and middle third grade groups of the male Arts & Education graduates initially had higher earnings than the bottom third grade groups by 35 and 14 percent, respectively, with both of these differences gradually decreasing over time. Although the corresponding log earnings differences for the male Health graduates started at similar levels, the middle third grade group caught up with the top third group with a faster earnings growth.

The male Business graduates and the female Arts & Education and Health graduates had similar downward patterns of earnings differences over time as that of the male Arts and Education graduates. However, these groups' earnings gaps among the three grade groups are quantitatively more modest.

Furthermore, only the female PPT Services graduates had an increasing earnings gap between the bottom third grade groups and the other two grade groups, with a 20 percent earnings gap between top and bottom third groups growing to 30 percent, and a 5 percent earnings gap between the middle and bottom third groups growing to 20 percent over eight

Figure 4.3: Implied Relative Earnings Differences—Male Diploma Graduates

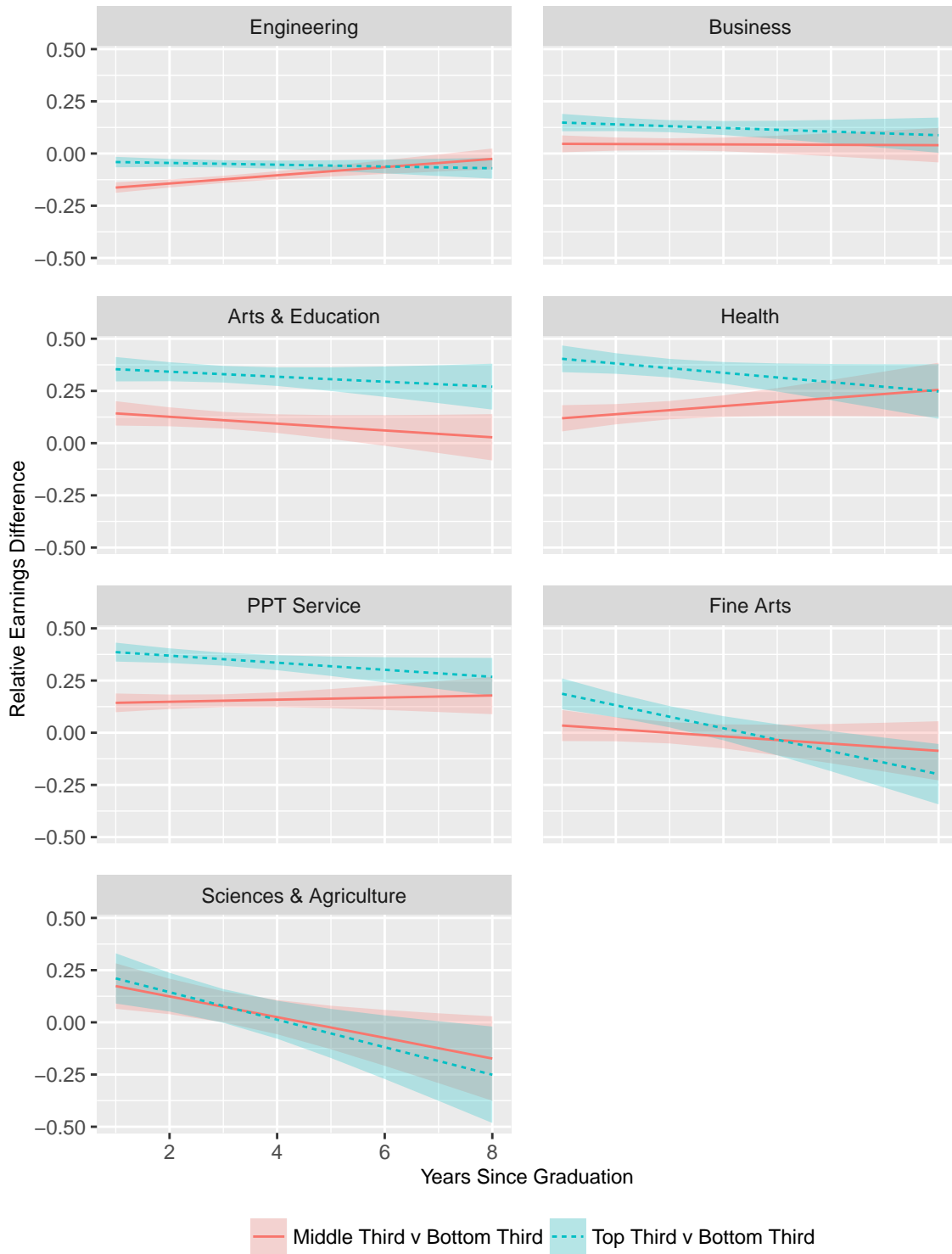
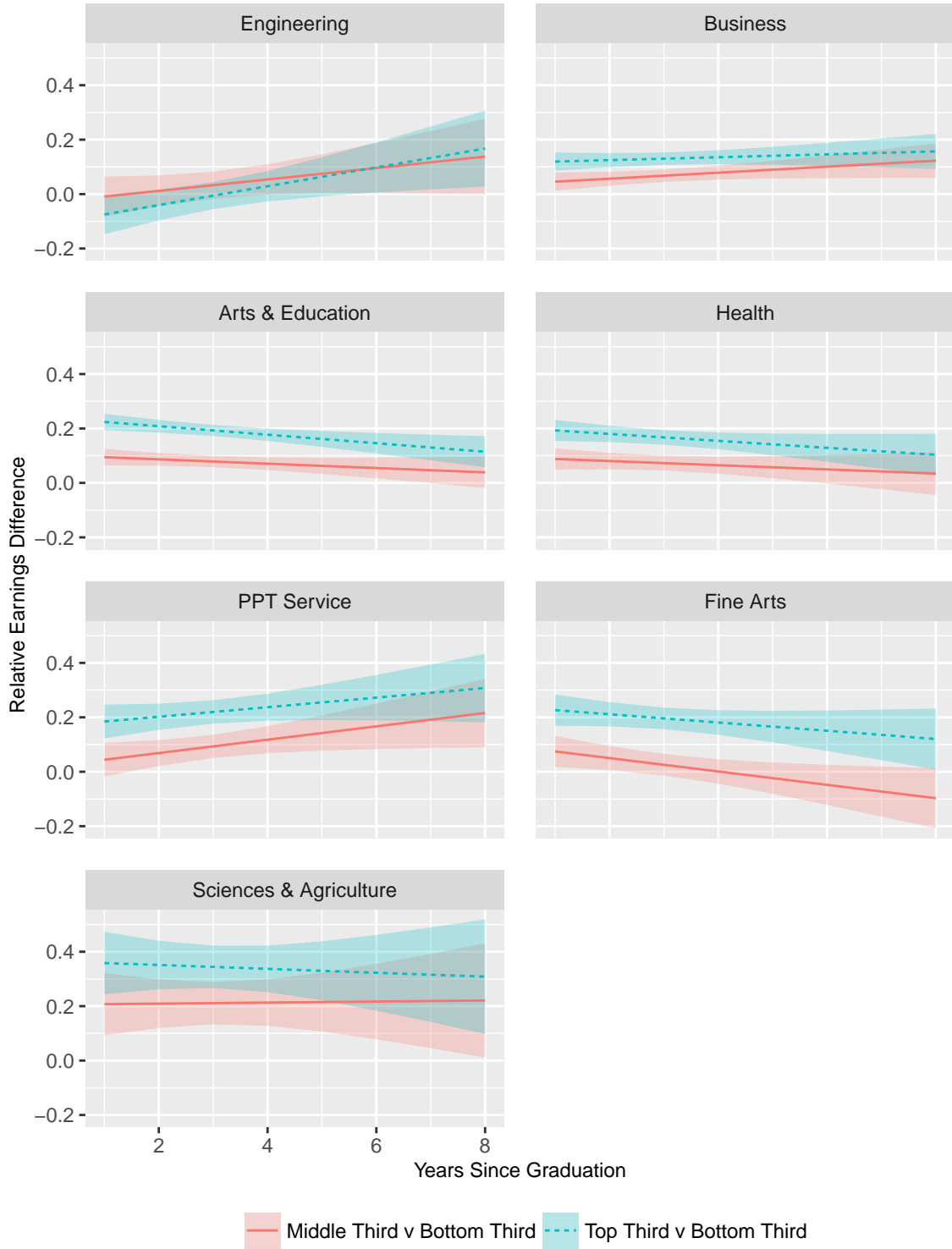


Figure 4.4: Implied Relative Earnings Differences—Female Diploma Graduates



years since graduation.

4.4 Analysis by Institution Location

Lastly, we carry out the same regression analysis separately for degree program graduates from the Ontario institutions and those from the non-Ontario institutions to obtain evidence specific to Ontario.⁸ As is the case with the other estimation results, the two model specifications yielded very similar parameter estimates for the Ontario degree program sample. Therefore, this section focuses on the Baseline model.

Table 4.3 presents the key parameter estimates.⁹ Between the Ontario and non-Ontario degree program graduates, the most salient difference is found for δ_T for the male Sciences and Agriculture graduates. While the estimate for the Ontario program graduates is 0.199, the value for the non-Ontario program graduates is -0.118 , revealing opposite initial post-graduation earnings gaps between the low and high grade groups. For the Ontario program graduates, the coefficient estimates indicate the initial earnings gap between the top and bottom third grade groups is stable over time as γ_T is estimated to be just -0.007 . For the non Ontario program graduates, in contrast, the earnings gap between these two groups is short-lived as the estimate for γ_T indicates that the earnings gap is estimated to narrow by 5.8 percent each year after graduation.

Figures 4.5 to 4.6 present log earnings differences among the three grade groups implied by the estimation results for the male Ontario and non-Ontario degree graduates, respectively. Different patterns in log earnings differences emerge between the Ontario and non-Ontario graduates in Social Sciences, Health, Engineering, Sciences & Agriculture, and Mathematics & Computer Science. Therefore, the implications based on both Ontario and non-Ontario graduate samples discussed earlier may need to be qualified.

In particular, the estimation results indicate that the middle and top third grade groups among the Ontario graduates in Sciences & Agriculture have a similar positive earnings gap to the bottom third groups. This pattern differs from the findings obtained earlier with the combined sample that the earnings of the top third group eventually overtook the earnings of the middle grade group, after starting at a statistically non-significant level.

8. Due to the composition of our data source, the sample of non-Ontario diploma graduates is based on one institution's administrative data. As a result, we do not carry out the same analysis for diploma graduates so as not to release any results specific to one individual institution.

9. See Tables A.17 to A.20 in Appendix for the remainder of the estimation results.

Table 4.3: Key Parameter Estimates by Institution Location

FOS	Gender	Ontario				Non-Ontario			
		δ_M	δ_T	γ_M	γ_T	δ_M	δ_T	γ_M	γ_T
Social Sciences	Male	.020 (.030)	.105 [†] (.031)	.021 (.011)	.021 (.012)	.032 (.021)	.063 [†] (.024)	-.006 (.008)	.009 (.009)
	Female	.087 [†] (.018)	.211 [†] (.019)	-.009 (.007)	-.018* (.007)	.107 [†] (.015)	.174 [†] (.017)	.004 (.006)	.011 (.006)
Business	Male	.104 [†] (.018)	.276 [†] (.018)	-.001 (.007)	-.006 (.007)	.086 [†] (.019)	.167 [†] (.020)	-.001 (.007)	.002 (.007)
	Female	.117 [†] (.019)	.246 [†] (.019)	.004 (.007)	.008 (.007)	.054 [†] (.019)	.203 [†] (.019)	.019 [†] (.007)	.018 [†] (.007)
Health	Male	.163 [†] (.044)	.333 [†] (.047)	-.014 (.018)	-.032 (.019)	.102 [†] (.031)	.178 [†] (.035)	.015 (.011)	.010 (.013)
	Female	.190 [†] (.017)	.265 [†] (.017)	-.029 [†] (.006)	-.037 [†] (.007)	.074 [†] (.012)	.068 [†] (.013)	-.018 [†] (.004)	-.017 [†] (.004)
Engineering	Male	.087 [†] (.015)	.144 [†] (.016)	-.007 (.005)	.001 (.006)	.118 [†] (.013)	.169 [†] (.015)	-.009 (.005)	-.020 [†] (.005)
	Female	.052 (.029)	.079 [†] (.029)	.012 (.010)	.022* (.011)	.161 [†] (.032)	.345 [†] (.034)	.003 (.011)	-.041 [†] (.012)
Sciences & Agriculture	Male	.154 [†] (.044)	.199 [†] (.049)	.002 (.016)	-.007 (.019)	.051 (.029)	-.118 [†] (.039)	.016 (.011)	.058 [†] (.016)
	Female	.121 [†] (.043)	.326 [†] (.045)	-.004 (.016)	-.015 (.017)	.072 [†] (.025)	.065* (.032)	-.007 (.009)	.019 (.012)
Humanities	Male	-.016 (.066)	.148* (.069)	.028 (.025)	-.007 (.025)	-.039 (.036)	-.003 (.042)	.007 (.013)	.002 (.015)
	Female	.061 (.043)	.152 [†] (.044)	-.026 (.017)	.010 (.017)	.040 (.028)	.061* (.030)	.019 (.010)	.037 [†] (.011)
Mathematics & Computer Science	Male	.188 [†] (.022)	.314 [†] (.024)	-.001 (.007)	-.007 (.008)	.104 [†] (.034)	.136 [†] (.038)	.004 (.011)	.008 (.012)
	Female	.292 [†] (.042)	.464 [†] (.043)	-.002 (.015)	-.014 (.015)	.242 [†] (.072)	.123 (.081)	.009 (.025)	-.008 (.027)
Fine Arts	Male	-.061 (.045)	-.109* (.045)	.002 (.017)	.012 (.017)	-.009 (.069)	-.095 (.075)	.035 (.026)	.051 (.029)
	Female	-.071* (.031)	-.139 [†] (.032)	.026* (.011)	.017 (.012)	-.077 (.049)	-.027 (.052)	.025 (.019)	-.037 (.019)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Figure 4.5: Implied Relative Earnings Differences—Male Ontario Degree Graduates

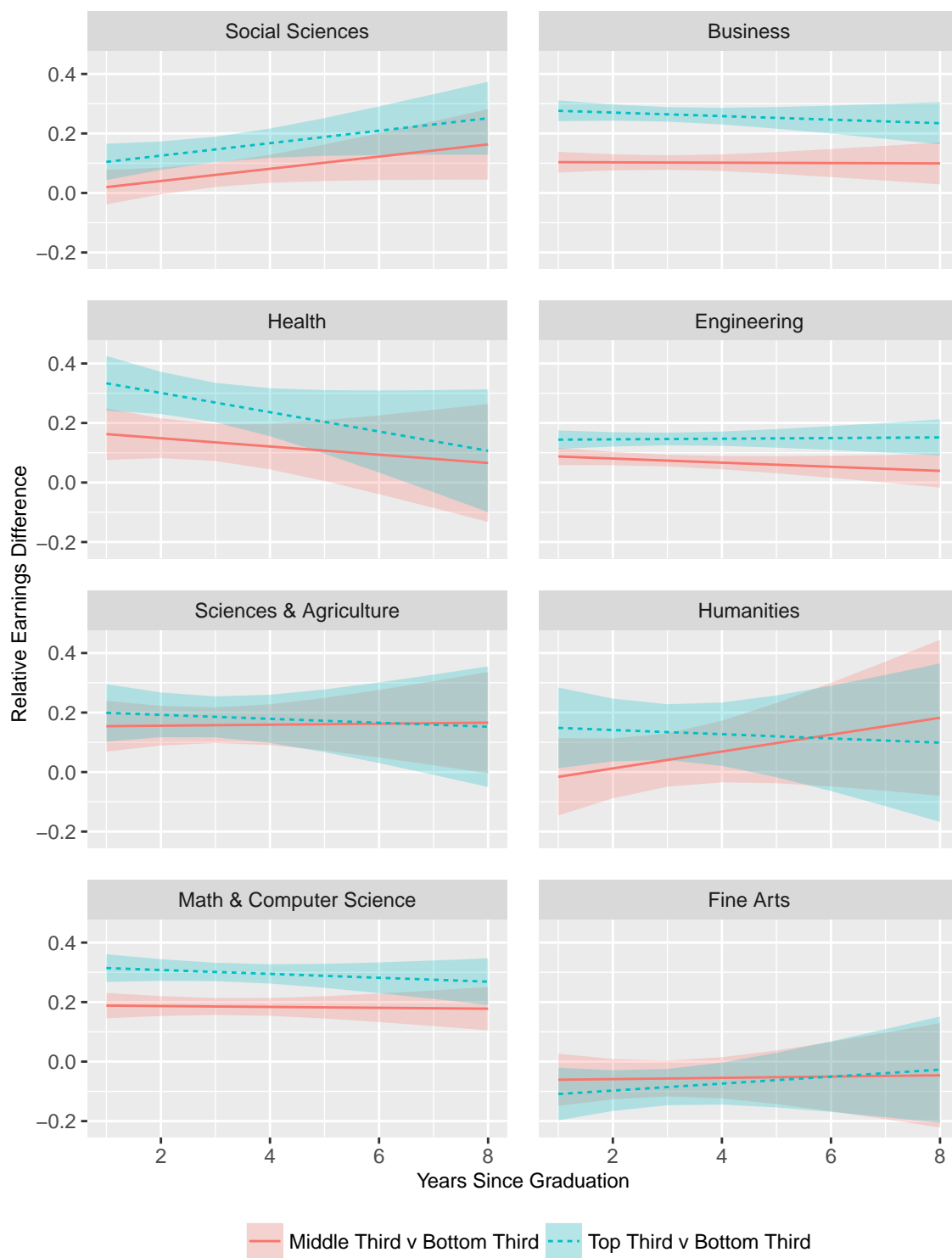
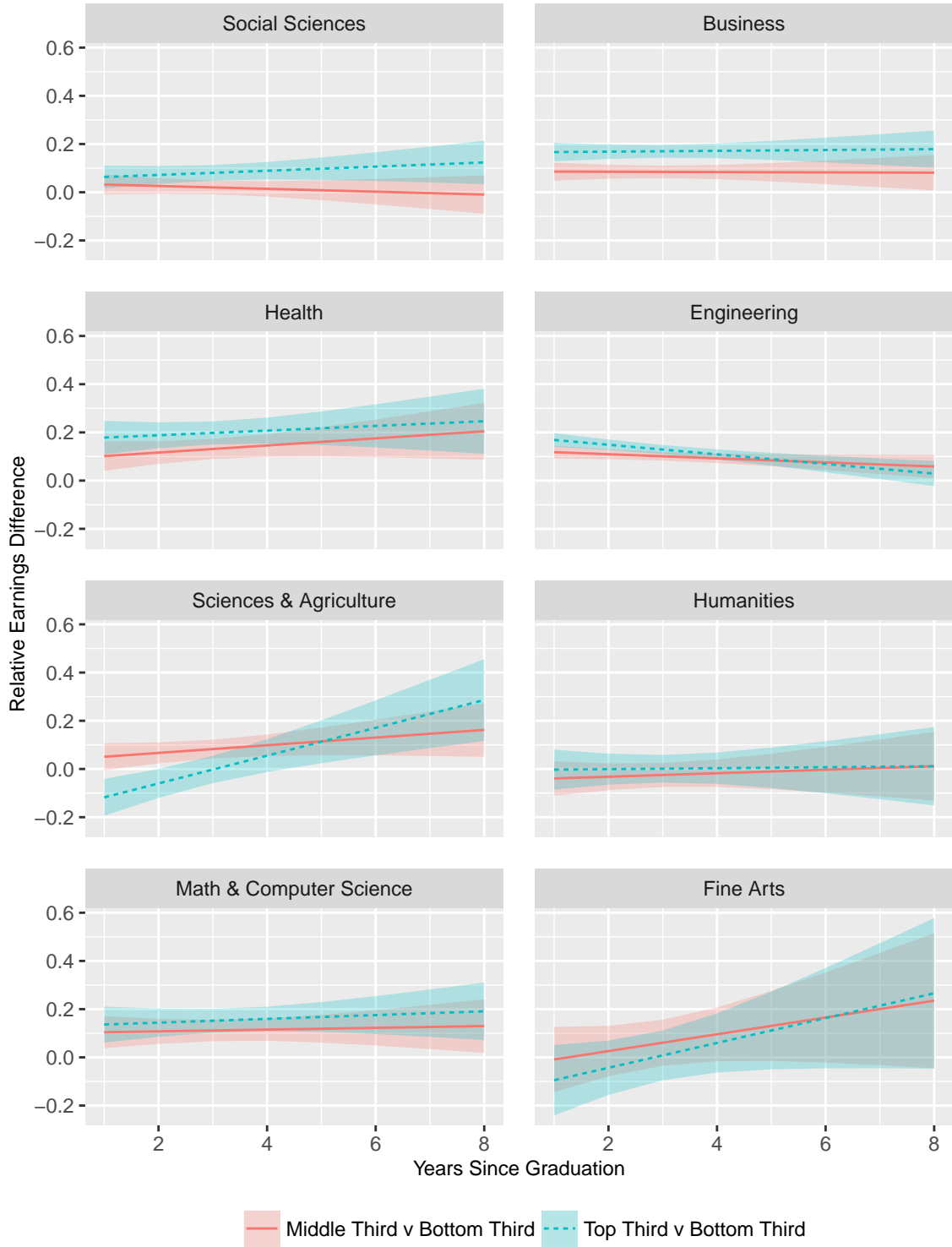


Figure 4.6: Implied Relative Earnings Differences—Male Non-Ontario Degree Graduates



Figures 4.7 to 4.8 present the same set of graphs for the female Ontario and non-Ontario degree graduates, respectively. Although very different patterns emerge between the female Ontario and Non-Ontario graduates in Engineering, Sciences & Agriculture, and Mathematics & Computer Science, the results obtained earlier with these two groups in general resemble those presented in Figure 4.7. An exception is the middle third grade group in Humanities, however, as the earnings premium for this group relative to the bottom third group decreases to a negative level over time.

Figure 4.7: Implied Relative Earnings Differences—Female Ontario Degree Graduates

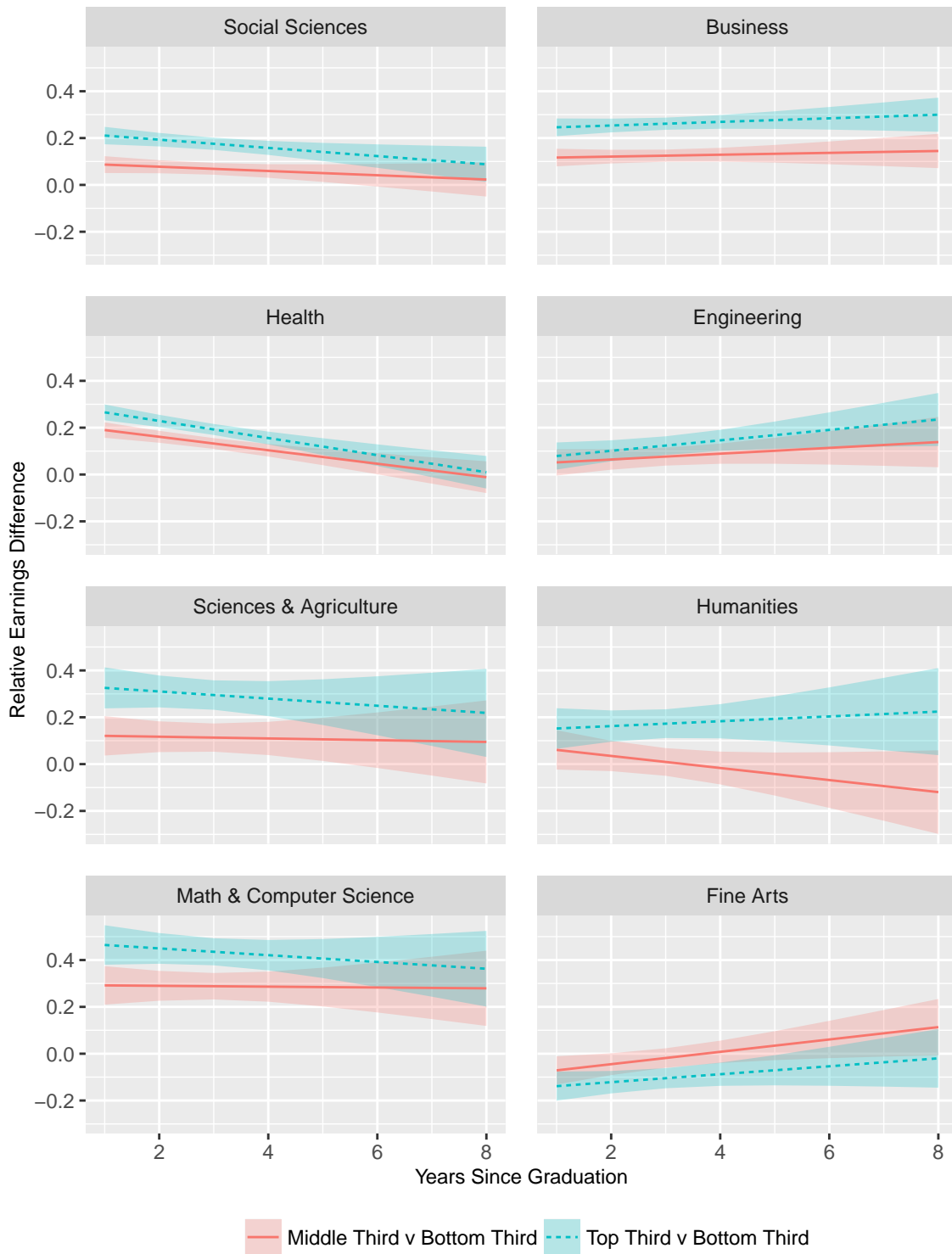
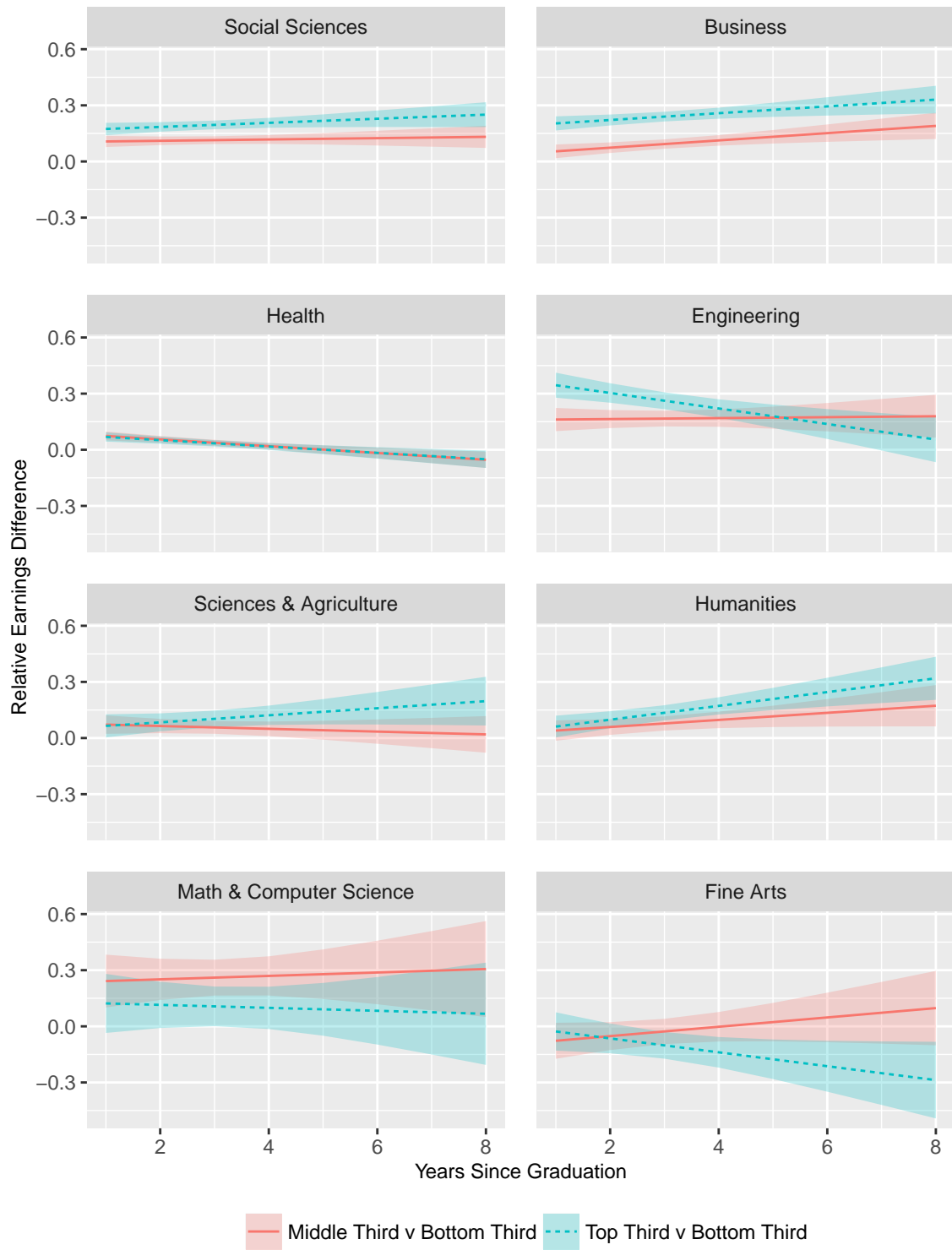


Figure 4.8: Implied Relative Earnings Differences—Female Non-Ontario Degree Graduates



5 Discussion and Concluding Remarks

Using a unique dataset created by linking eight PSE institutions' administrative data to tax data held at Statistics Canada, this study provides the first Canadian evidence for the relationship between a student's academic performance and his/her labour market earnings. By combining different information sources this way, the study was able to examine this link across a wide range of student and program characteristics over time.

The results from both descriptive and regression analyses revealed that there was a positive relationship between PSE grades and post-graduation earnings for a number of student groups, especially in early post-graduation years. However, the grade-earnings relationship was highly heterogeneous among different student groups. For some graduates, the positive relationship remained fairly stable early in their careers. These include men with bachelor's degrees in Business, Mathematics & Computer Sciences, women with bachelor's degrees in Social Sciences, and men with college diplomas in Arts & Education. Earnings differences among the three grade groups of high, middle, and low narrowed for other student groups such as men with bachelor's degrees in Engineering and the women with diplomas in Arts & Education. Conversely, earnings grew larger over time for other graduates such as women with bachelor's degrees in Business. For some student groups such as those with bachelor's degrees in Fine Arts, better PSE grades did not translate into better post-graduation earnings.

Like any other study, this study has some limitations. Firstly, the quantitative relationship between PSE grades and labour market earnings obtained in the regression analysis cannot be interpreted as the causal effect of PSE grades on earnings without making further assumptions. Grades likely capture many attributes beyond academic ability. These can include time-management, self-discipline, academic support and interest in learning, among other things. Thus, accounting for richer student and PSE program characteristics, which future research can focus on, will be an important next step to examine the robustness of our results.

Secondly, the grade variable used for the analysis may mask large heterogeneity. Because of different grading standards, students in each grade group at a particular PSE institution may not consistently be comparable to their counterparts at a different PSE institution. Without standardized grading schemes, comparing grades across different PSE institutions is subject to errors.

Lastly, the results did not account for the censoring of earnings records from students' decisions to pursue further studies, in particular at graduate and professional levels. Naturally there is a strong link between graduate enrolment and PSE grades. Thus, the results may be subject to a self-selection bias.

The findings in this report raise several research questions that can have important policy implications for PSE institutions and the labour market. Firstly, it is important to understand what grades capture. If grades truly reflect academic ability along with a certain academic experiences and some productive personality attributes or habits that are rewarded in the labour market, it may be advisable to invest in effective student success initiatives and provide resources in PSE (or even at the K-12 level) that help improve academic performance, create those useful academic experience, and build the attributes or habits that help graduate success in the labour market. Put simply, future research can help inform policy by determining the factors that help graduates succeed in the labour market.

Given the range of labour market outcomes, it is also important to understand what drives these diverse observations in order to provide some guidance for future PSE and labour market policy. For example, it is important to understand if and how the structure of the labour market in each field affects earnings of students with different grades. Rigid labour market structure may treat all graduates equally regardless of academic mastery while more flexible labour market structures allow for earnings to better reflect ability and skills. Furthermore, skills gained at the PSE levels in some fields may be more relevant to the labour market than skills gained in other fields. As a result, academic mastery (i.e., as captured by grades) may matter more for those fields. Thus, determining what drives the underlying earnings patterns for graduates with different grades is important.

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Appendix: Supplementary Tables and Figures

Table A.1: Field of Study Groups for Degree Programs

Degree Groupings	CIP Code	Series/Subseries Name
Business	30.16	Accounting and Computer Science
	52	Business, Management, Marketing and Related Support Services
Engineering	04	Architecture and Related Services
	14	Engineering
	15	Engineering Technologies and Engineering-Related Fields
	30.12	Historic Preservation and Conservation
	46	Construction Trades
	47	Mechanic and Repair Technologies/Technicians
Fine Arts	48	Precision Production
	10	Communication Technologies/Technicians and Support Services
	50	Visual and Performing Arts
Health	31	Parks, Recreation, Leisure and Fitness Studies
	51	Health Professions and Related Programs
	60	Dental, Medical and Veterinary Residency Programs
Humanities	16	Aboriginal and Foreign Languages, Literatures and Linguistics
	23	English Language and Literature/Letters
	24	Liberal Arts and Sciences, General Studies and Humanities
	30.13	Medieval and Renaissance Studies
	30.21	Holocaust and Related Studies
	30.22	Classical and Ancient Studies
	30.29	Maritime Studies
	38	Philosophy and Religious Studies
	39	Theology and Religious Vocations
	54	History
55	French Language and Literature/Letters	

Table A.2: Field of Study Groups for Degree Programs (Continued)

Degree Groupings	CIP Code	Series/Subseries Name
Mathematics & Computer Science	11	Computer and Information Sciences and Support Services
	25	Library Science
	27	Mathematics and Statistics
	30.06	Systems Science and Theory
	30.08	Mathematics and Computer Science
	30.30	Computational Science
Sciences & Agriculture	01	Agriculture, Agriculture Operations and Related Sciences
	03	Natural Resources and Conservation
	26	Biological and Biomedical Sciences
	30.01	Biological and Physical Sciences
	30.18	Natural Sciences
	30.19	Nutrition Sciences
	30.24	Neuroscience
	30.27	Human Biology
	30.32	Marine Sciences
	40	Physical Sciences
41	Science Technologies/Technicians	
Social Sciences	5	Area, Ethnic, Cultural, Gender and Group Studies
	9	Communication, Journalism and Related Programs
	19	Family and Consumer Sciences/Human Sciences
	22	Legal Professions and Studies
	30.05	Peace Studies and Conflict Resolution
	30.10	Biopsychology
	30.11	Gerontology
	30.14	Museology/Museum Studies
	30.15	Science, Technology and Society
	30.17	Behavioural Sciences
	30.2	International/Global Studies
	30.23	Intercultural/Multicultural and Diversity Studies
	30.25	Cognitive Science
	30.26	Cultural Studies/Critical Theory and Analysis
	30.28	Dispute Resolution
	30.31	Human Computer Interaction
	30.33	Sustainability Studies
	42	Psychology
	44	Public Administration and Social Service Professions
	45	Social Sciences

Table A.3: Field of Study Groups for Diploma Programs

Degree Groupings	CIP Code	Series/Subseries Name
Arts & Education	05	Area, Ethnic, Cultural, Gender and Group Studies
	09	Communication, Journalism and Related Programs
	13	Education
	16	Aboriginal and Foreign Languages, Literatures and Linguistics
	19	Family and Consumer Sciences/Human Sciences
	22	Legal Professions and Studies
	23	English Language and Literature/Letters
	24	Liberal Arts and Sciences, General Studies and Humanities
	30.05	Peace Studies and Conflict Resolution
	30.1	Biopsychology
	30.11	Gerontology
	30.13	Medieval and Renaissance Studies
	30.14	Museology/Museum Studies
	30.15	Science, Technology and Society
	30.17	Behavioural Sciences
	30.20	International/Global Studies
	30.21	Holocaust and Related Studies
	30.22	Classical and Ancient Studies
	30.23	Intercultural/Multicultural and Diversity Studies
	30.25	Cognitive Science
	30.26	Cultural Studies/Critical Theory and Analysis
	30.28	Dispute Resolution
	30.29	Maritime Studies
	30.31	Human Computer Interaction
	30.33	Sustainability Studies
	38	Philosophy and Religious Studies
	39	Theology and Religious Vocations
	42	Psychology
	44	Public Administration and Social Service Professions
	45	Social Sciences
	54	History
	55	French Language and Literature/Letters
	Business	30.16
52		Business, Management, Marketing and Related Support Services

Table A.4: Field of Study Groups for Diploma Programs (Continued)

Degree Groupings	CIP Code	Series/Subseries Name
Engineering	04	Architecture and Related Services
	11	Computer and Information Sciences and Support Services
	14	Engineering
	15	Engineering Technologies and Engineering-Related Fields
	30.06	Systems Science and Theory
	30.08	Mathematics and Computer Science
	30.12	Historic Preservation and Conservation
	30.30	Computational Science
	46	Construction Trades
	47	Mechanic and Repair Technologies/Technicians
Fine Arts	48	Precision Production
	10	Communication Technologies/Technicians and Support Services
Health	50	Visual and Performing Arts
	31	Parks, Recreation, Leisure and Fitness Studies
	51	Health Professions and Related Programs
Personal, Protective & Transportation Services	60	Dental, Medical and Veterinary Residency Programs
	12	Personal and Culinary Services
	28	Military Science, Leadership and Operational Art
	29	Military Technologies and Applied Sciences
	43	Security and Protective Services
Science & Agriculture	49	Transportation and Materials Moving
	01	Agriculture, Agriculture Operations and Related Sciences
	03	Natural Resources and Conservation
	25	Library Science
	26	Biological and Biomedical Sciences
	27	Mathematics and Statistics
	30.01	Biological and Physical Sciences
	30.18	Natural Sciences
	30.19	Nutrition Sciences
	30.24	Neuroscience
	30.27	Human Biology
	30.32	Marine Sciences
	40	Physical Sciences
41	Science Technologies/Technicians	

Figure A.1: Average Earnings of Male Social Sciences Degree Graduates

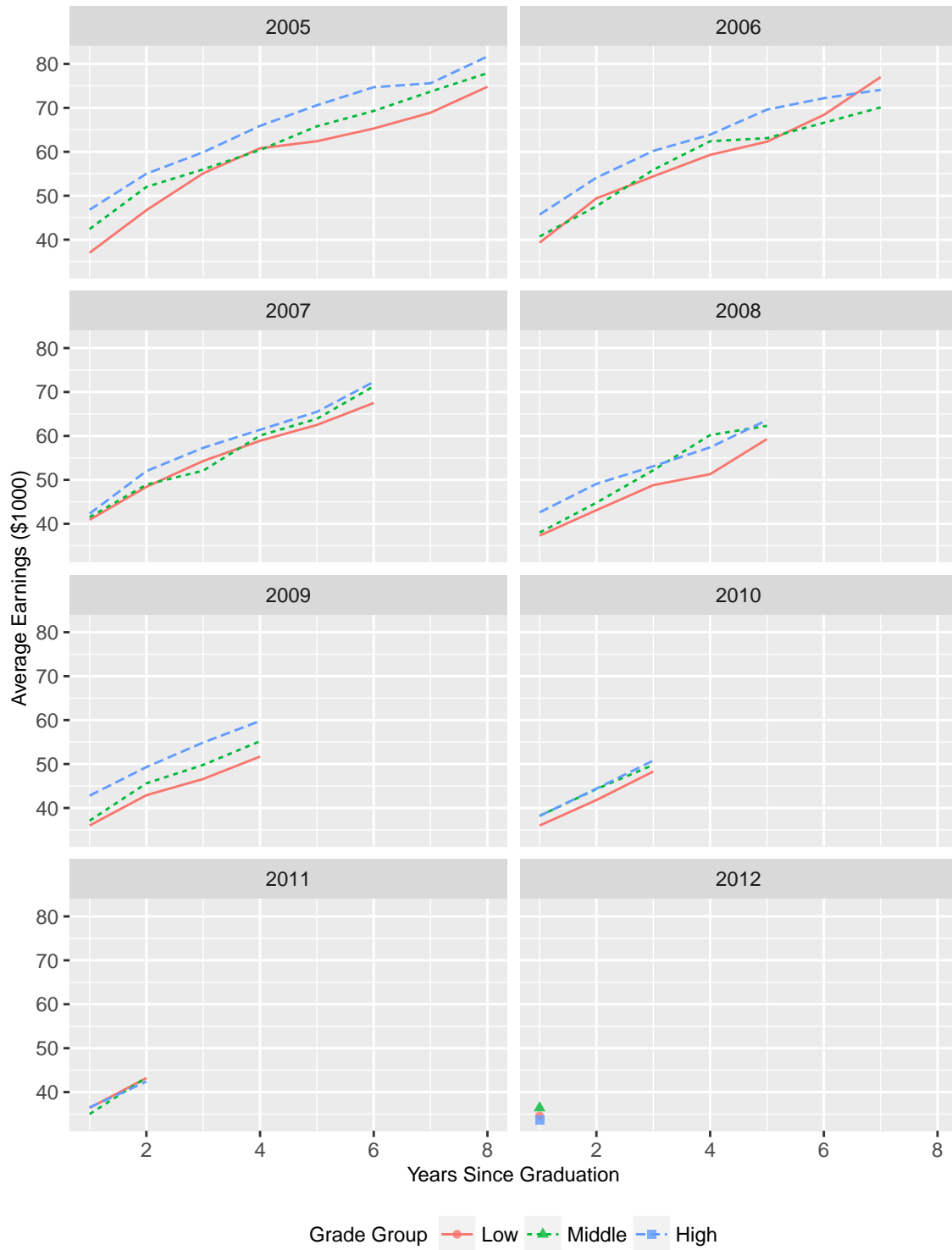


Figure A.2: Average Earnings of Female Social Sciences Degree Graduates

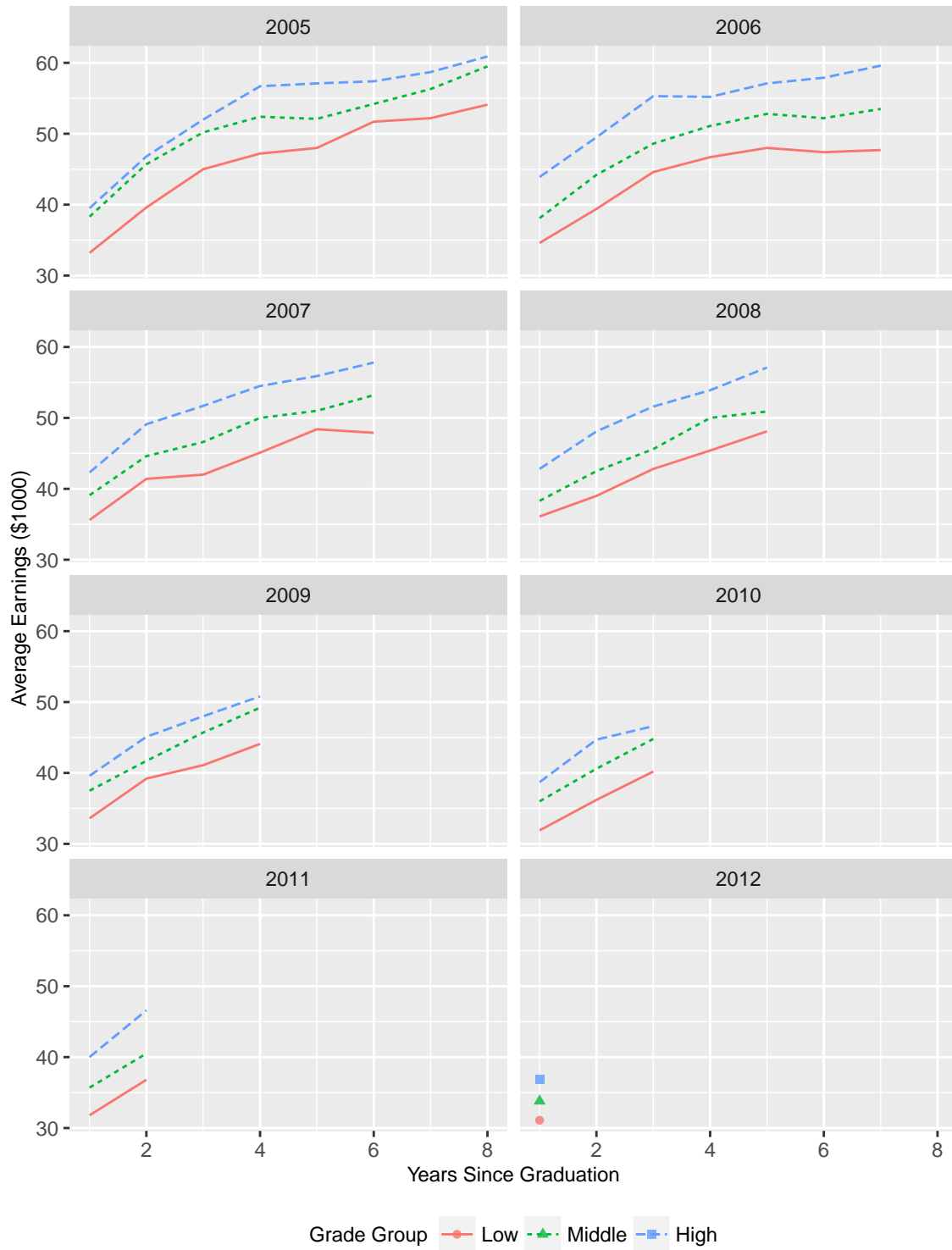


Figure A.3: Average Earnings of Male Business Degree Graduates

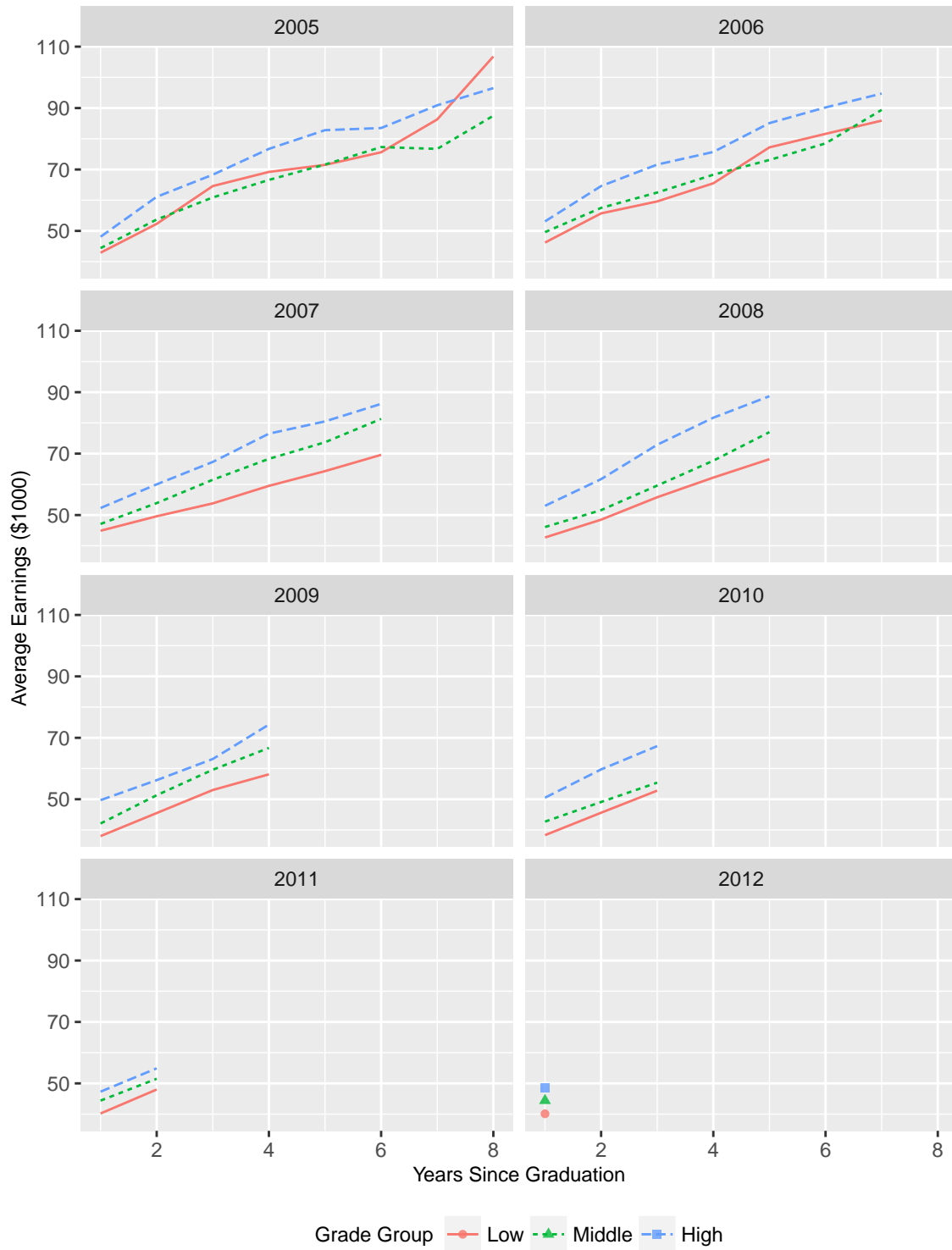


Figure A.4: Average Earnings of Female Business Degree Graduates

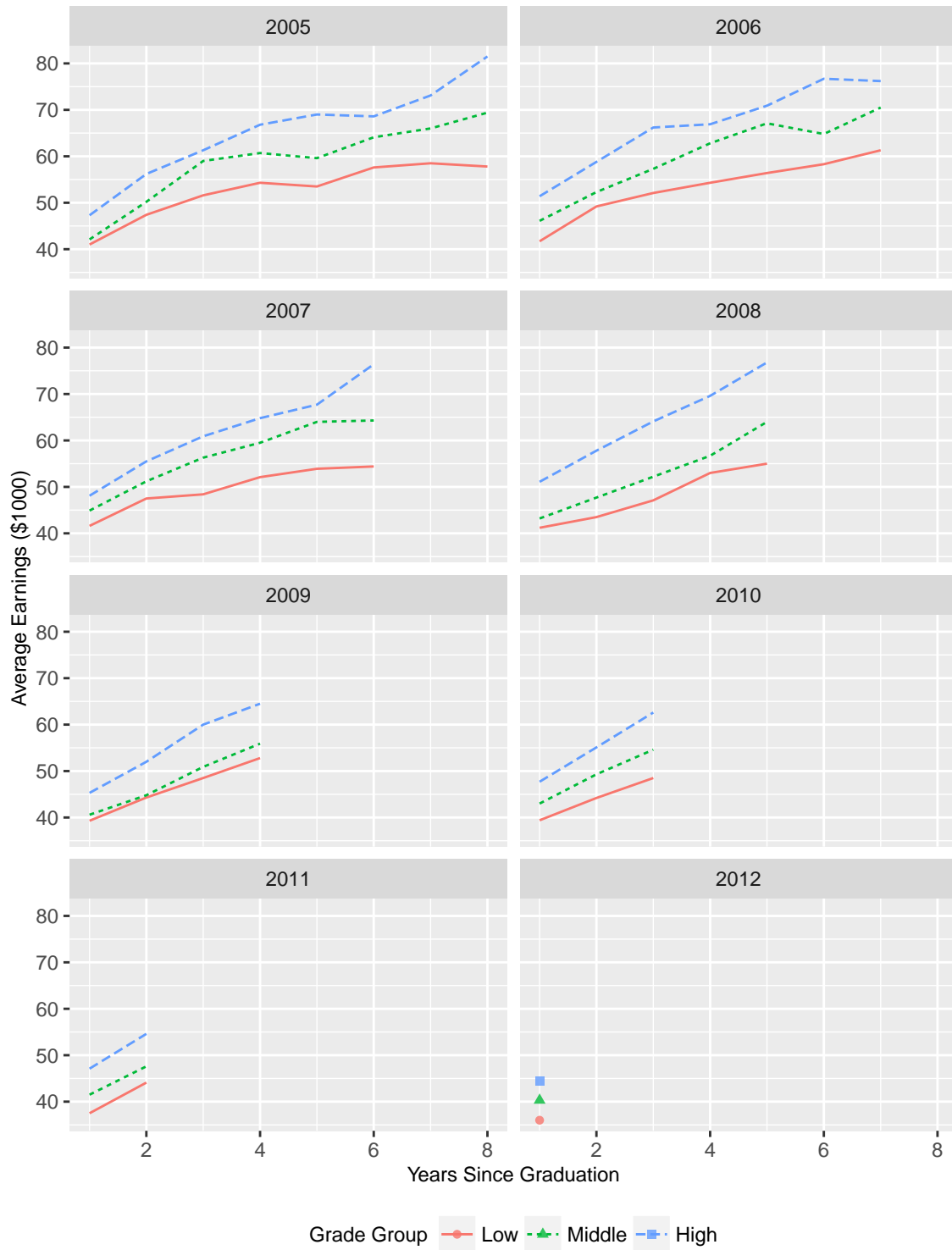


Figure A.5: Average Earnings of Male Health Degree Graduates

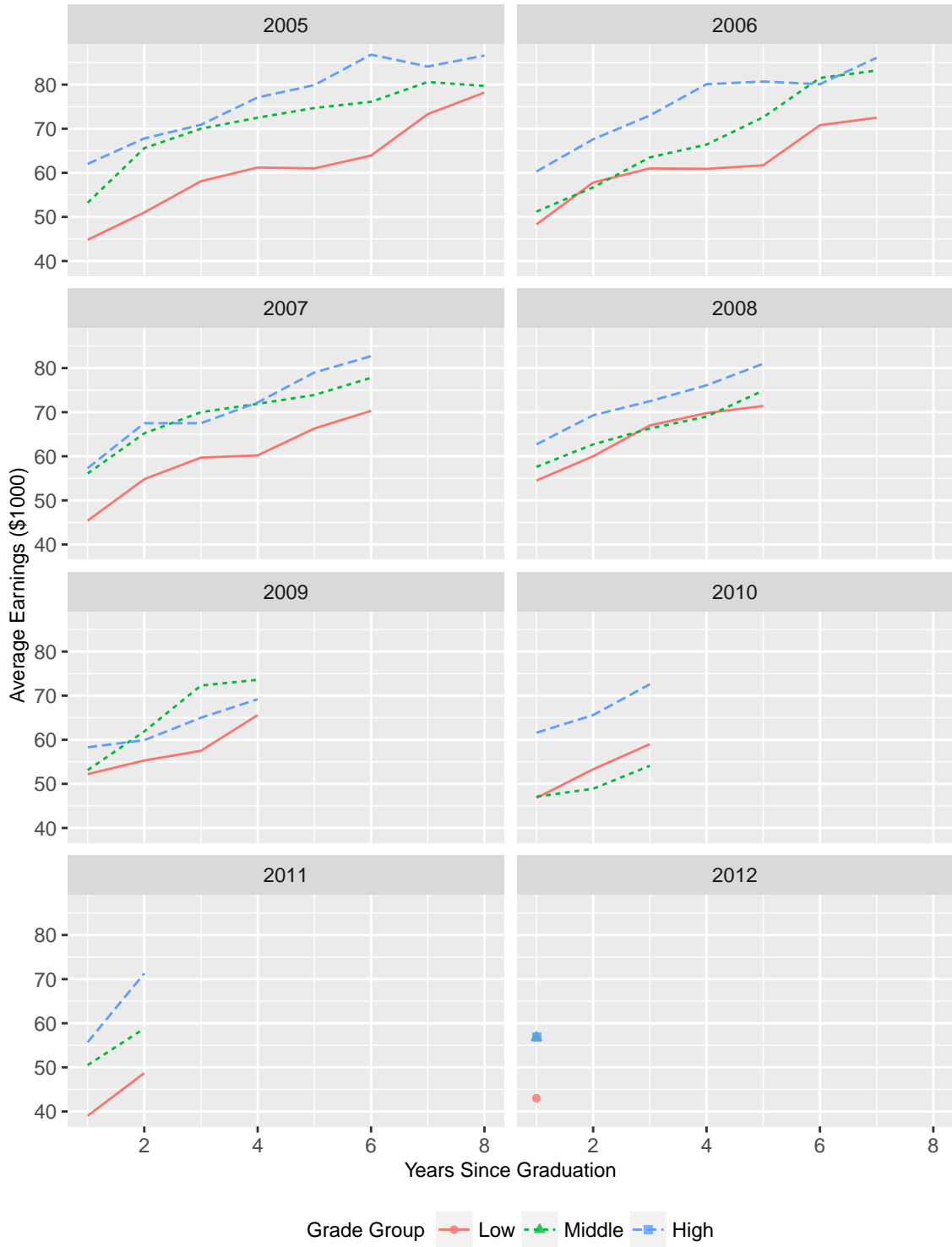


Figure A.6: Average Earnings of Female Health Degree Graduates

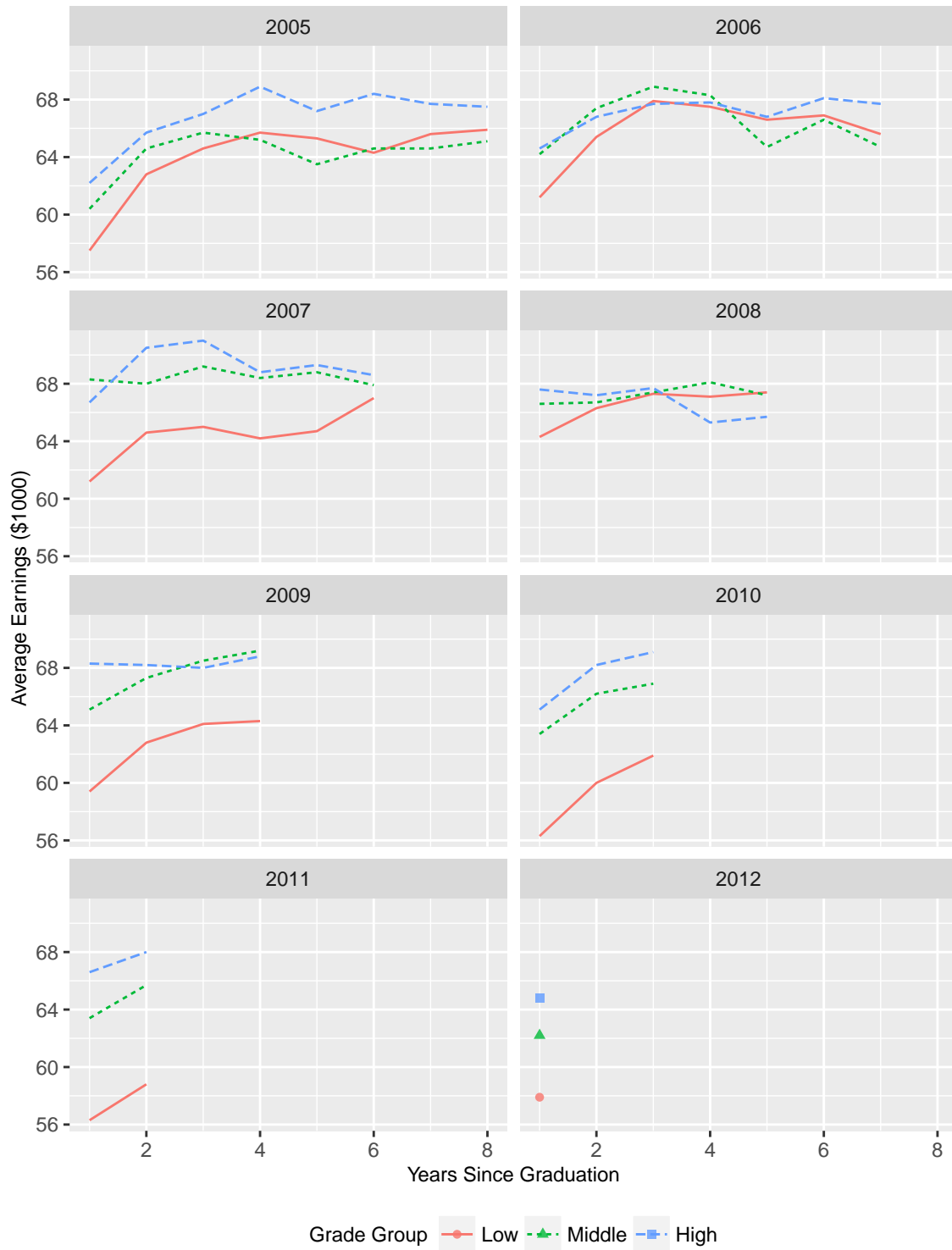


Figure A.7: Average Earnings of Male Engineering Degree Graduates

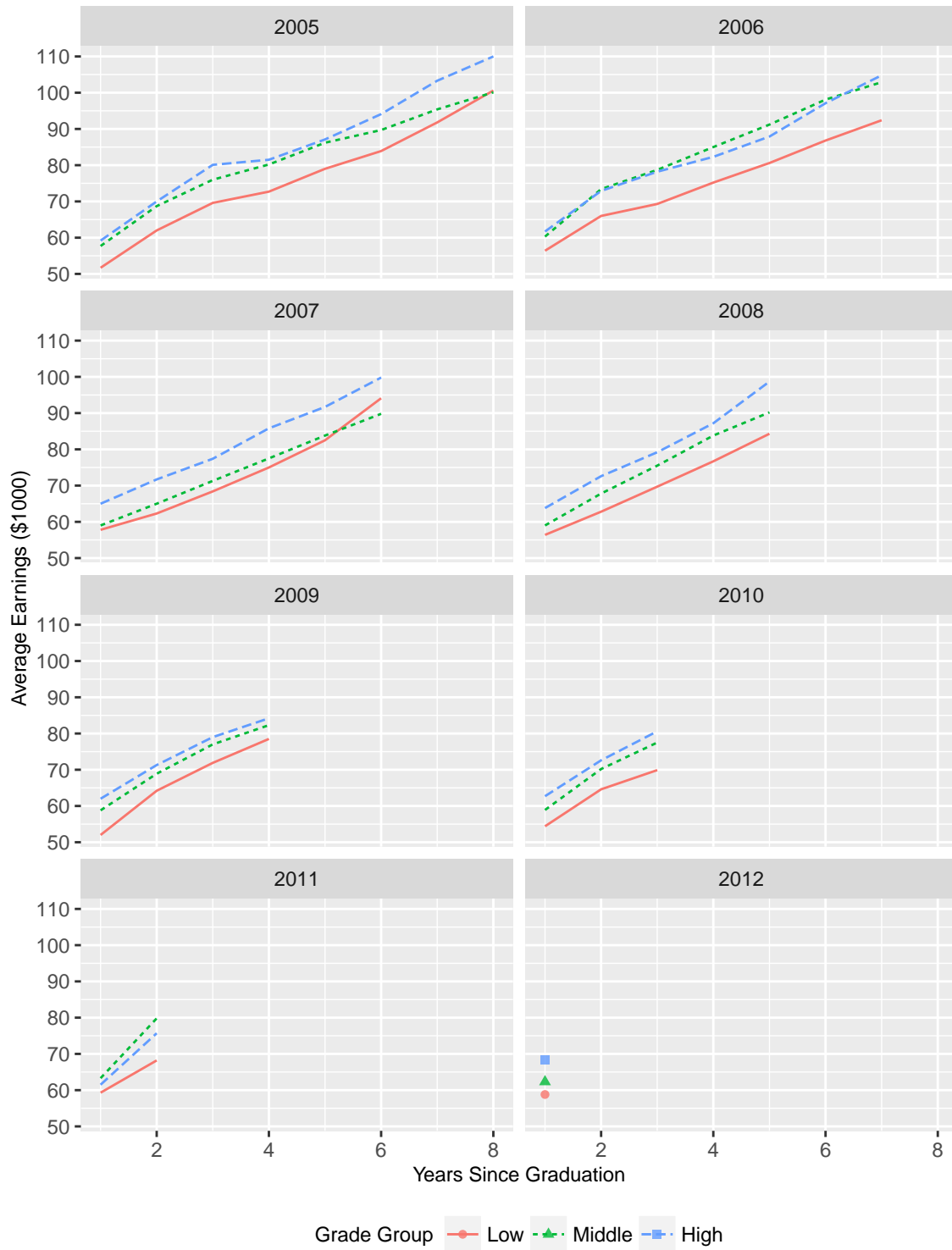


Figure A.8: Average Earnings of Female Engineering Degree Graduates



Figure A.9: Average Earnings of Male Sciences & Agriculture Degree Graduates

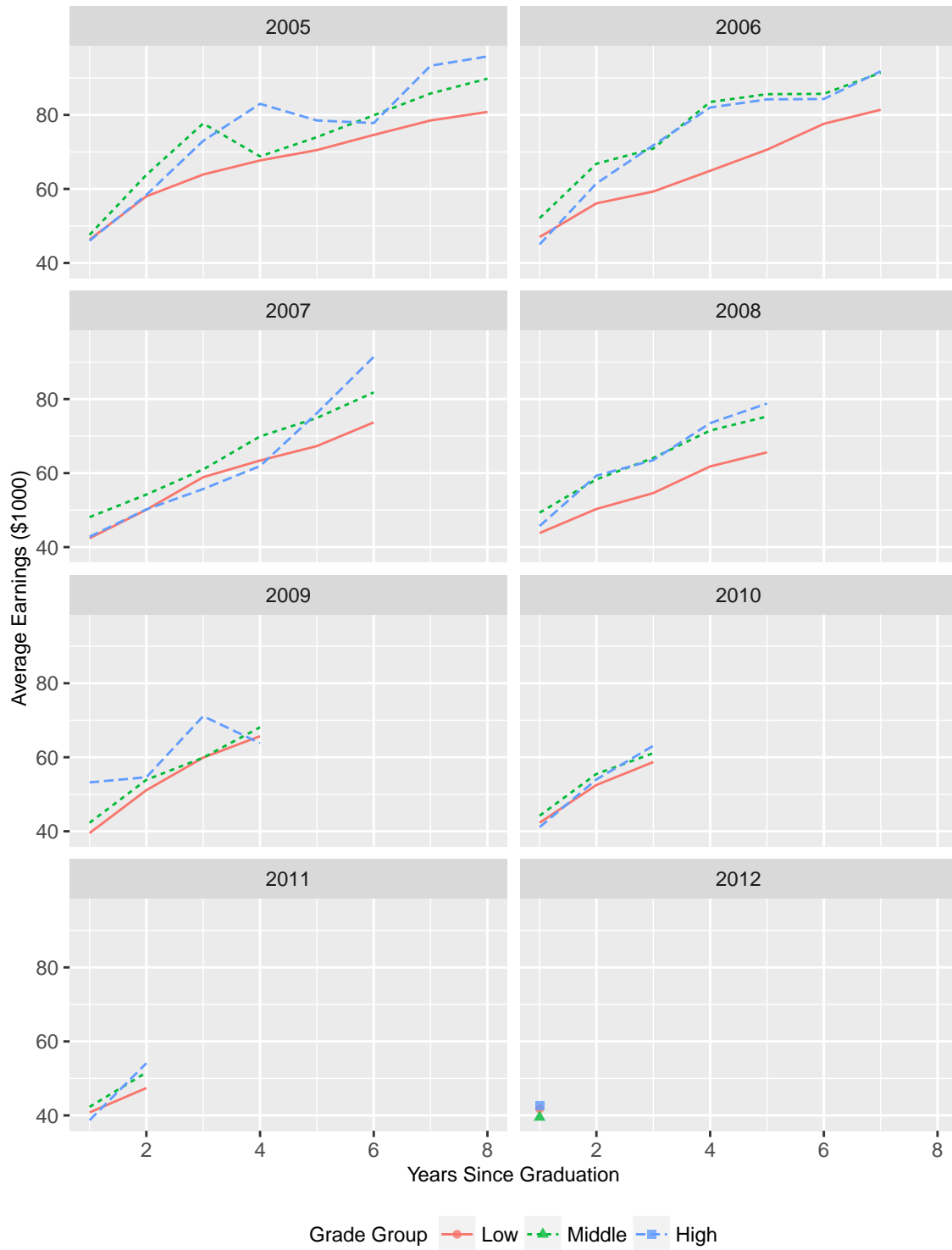


Figure A.10: Average Earnings of Female Sciences & Agriculture Degree Graduates

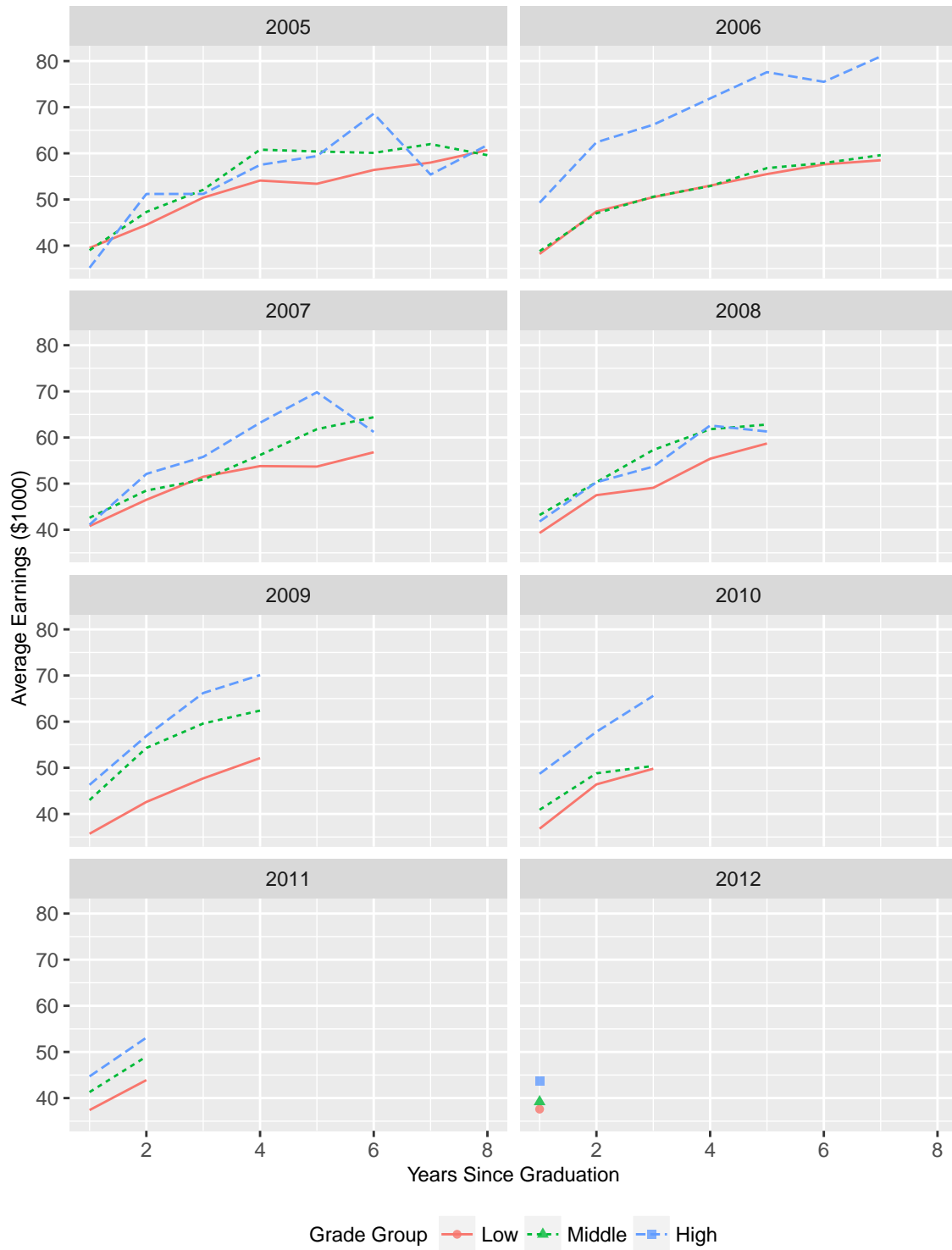


Figure A.11: Average Earnings of Male Humanities Degree Graduates

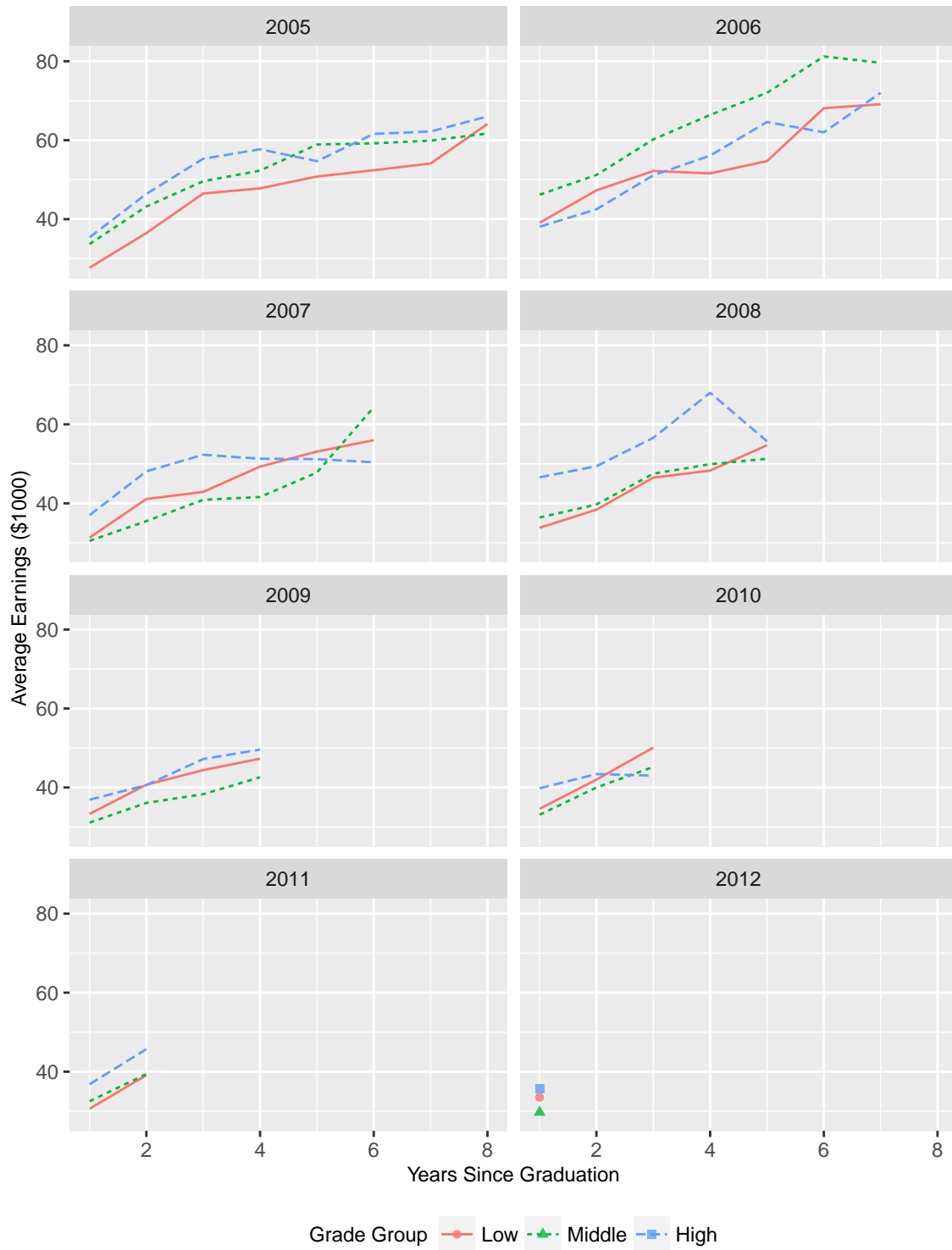


Figure A.12: Average Earnings of Female Humanities Degree Graduates

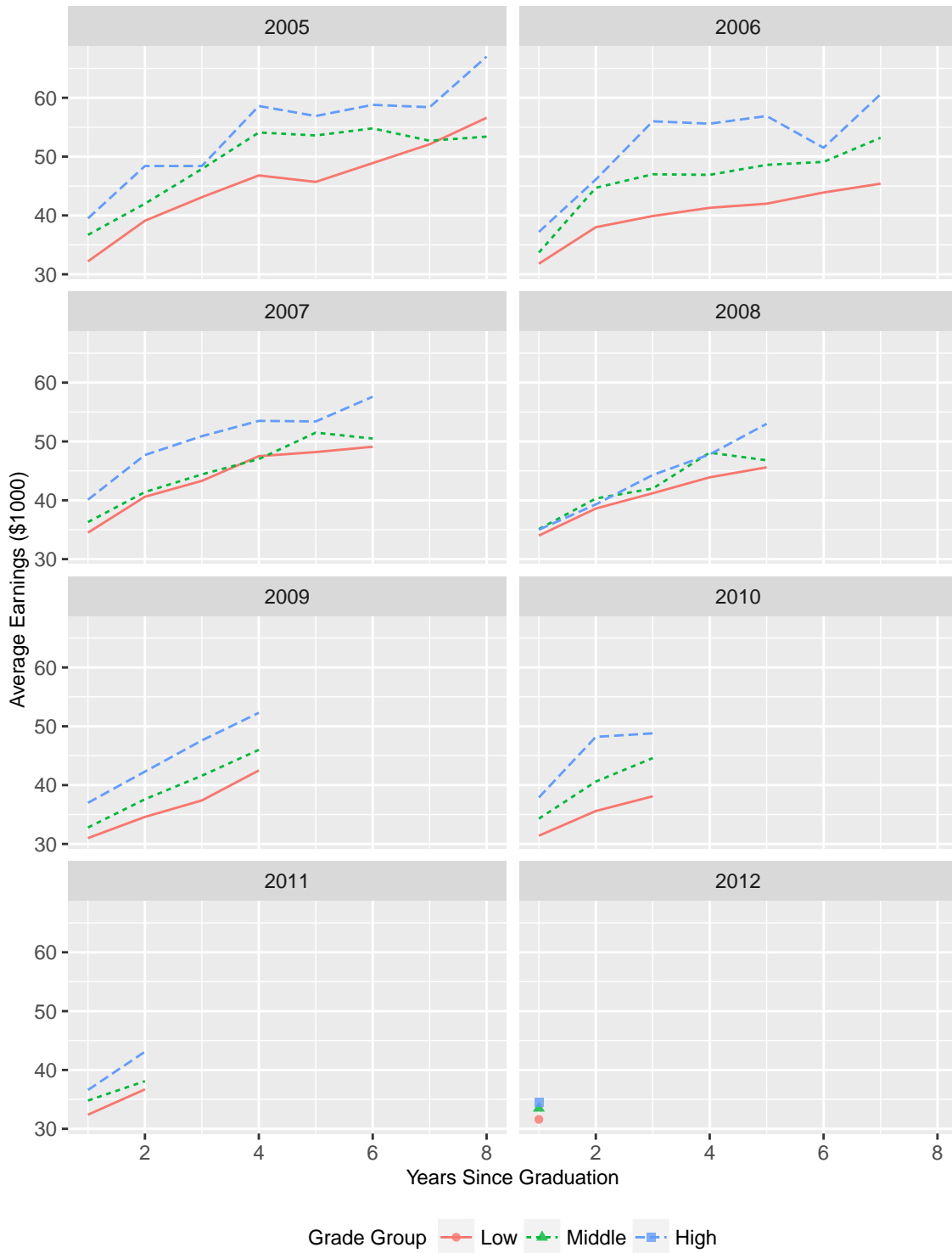


Figure A.13: Average Earnings of Male Math & Computer Science Degree Graduates

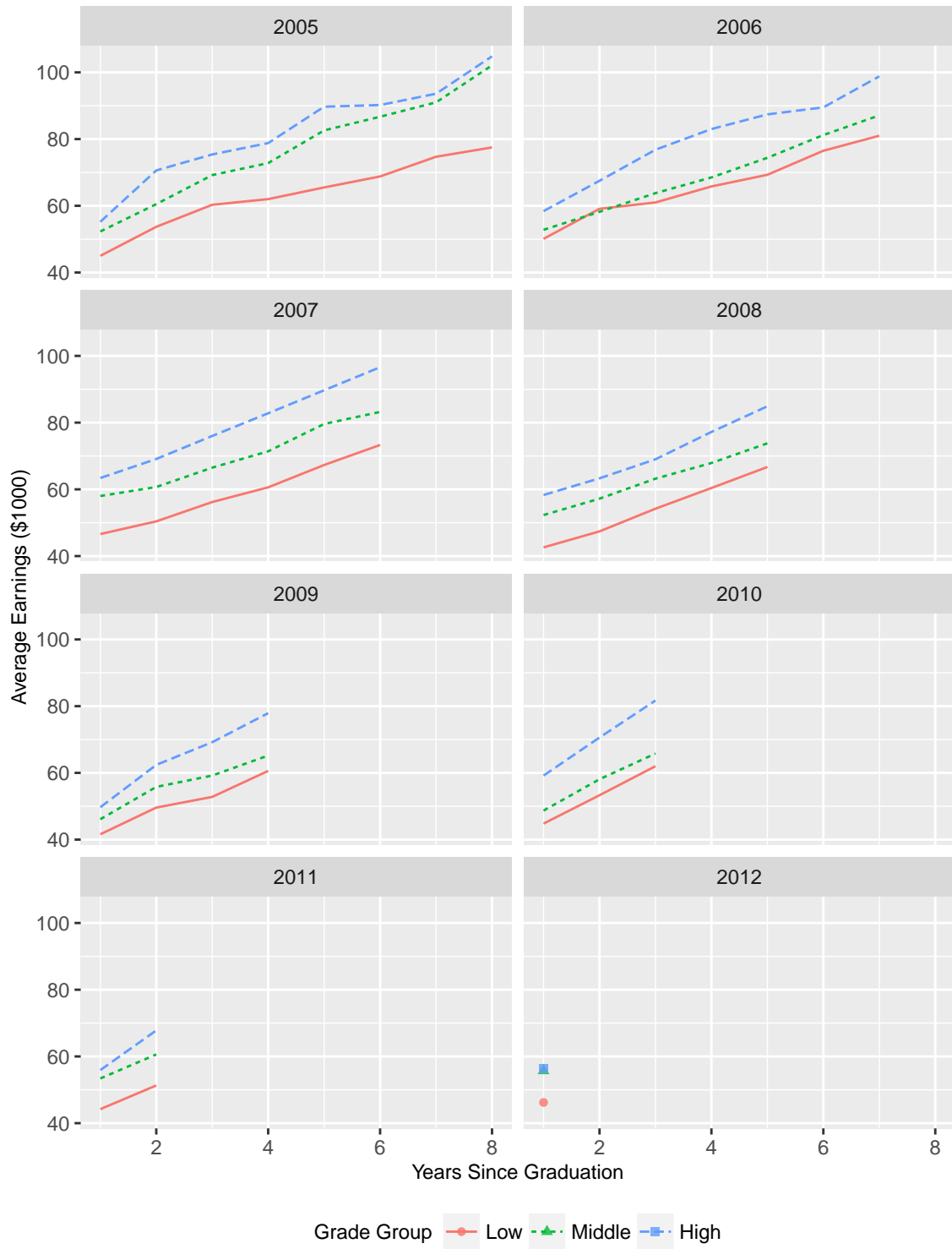


Figure A.14: Average Earnings of Female Math & Computer Science Degree Graduates

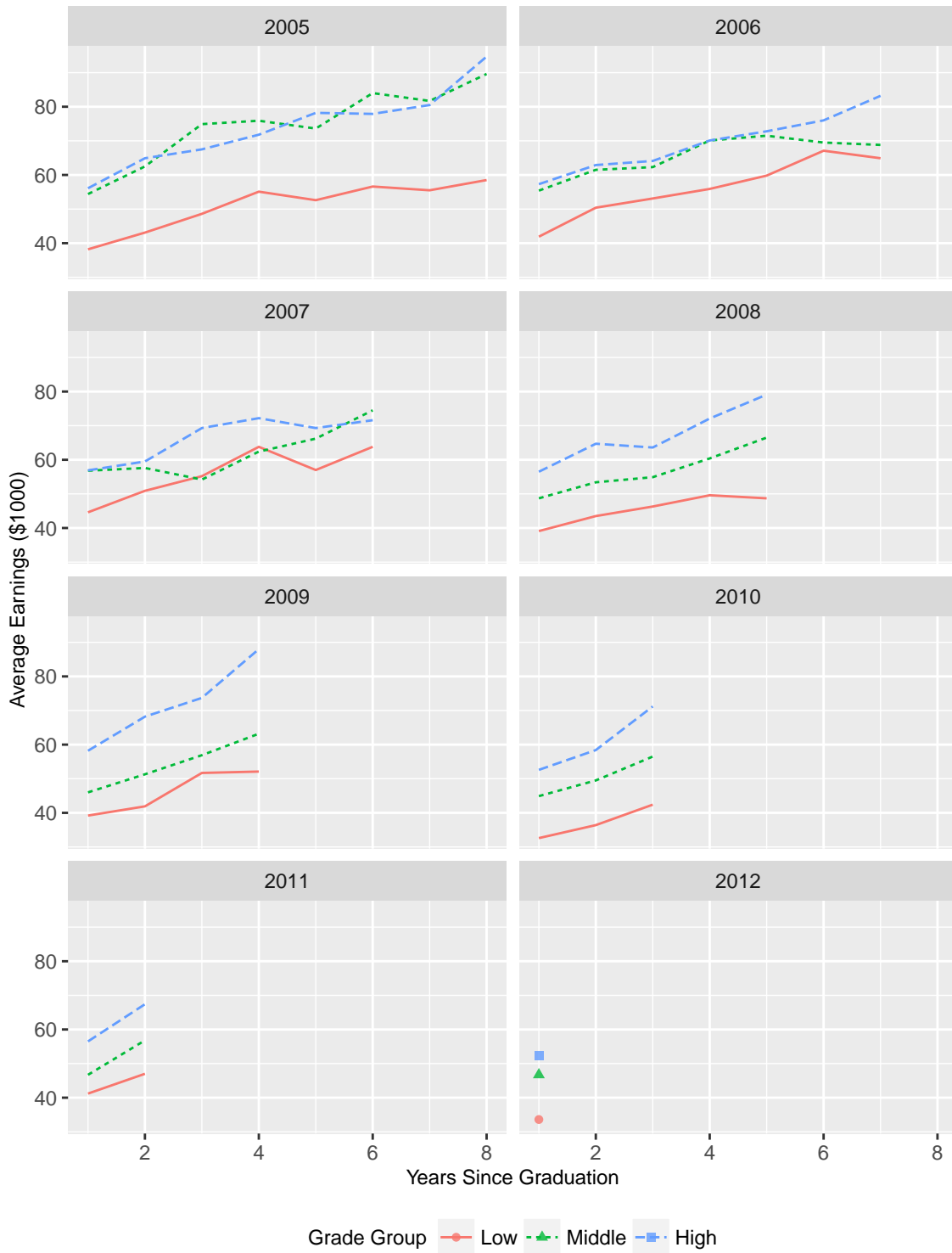


Figure A.15: Average Earnings of Male Fine Arts Degree Graduates

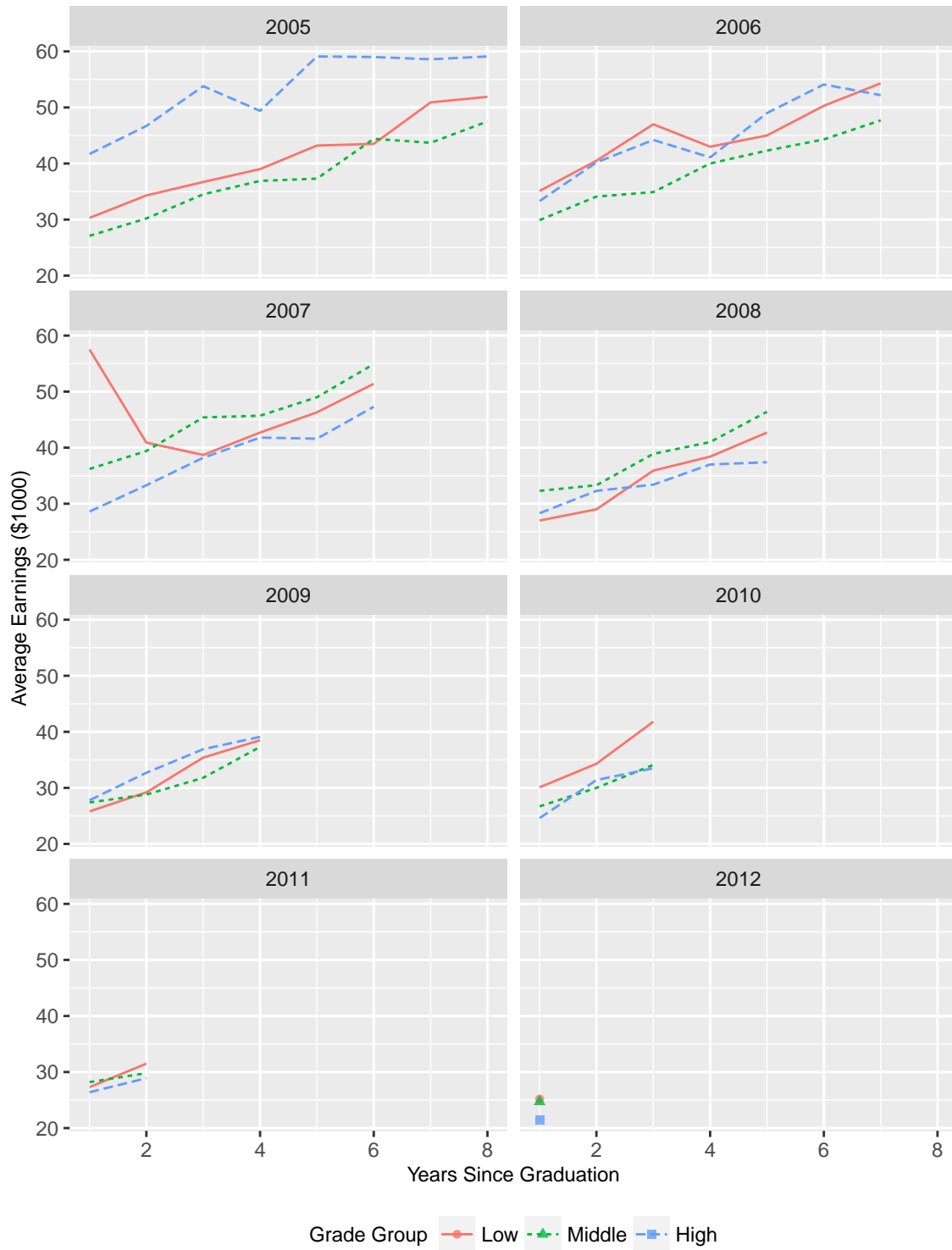


Figure A.16: Average Earnings of Female Fine Arts Degree Graduates

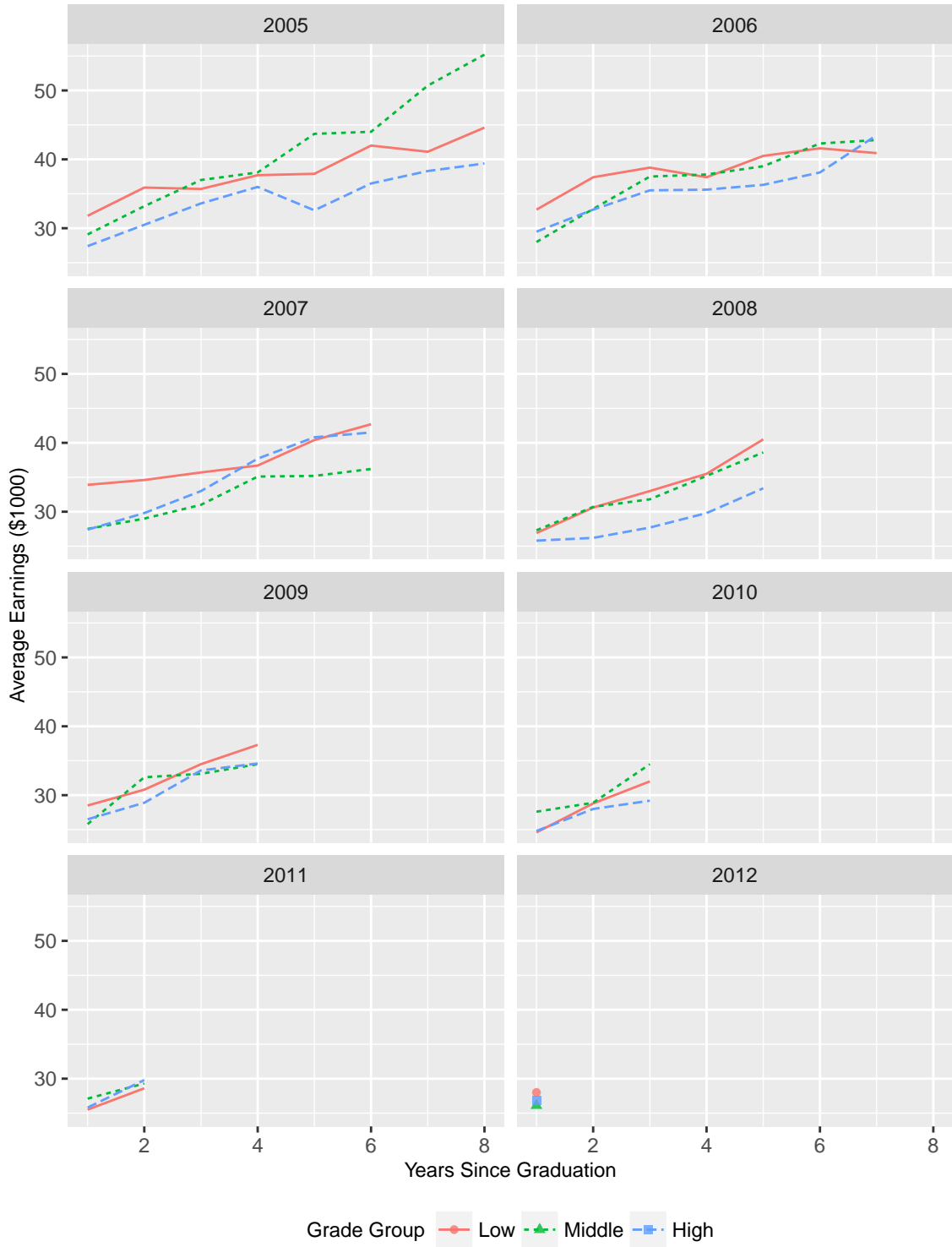


Figure A.17: Average Earnings of Male Engineering Diploma Graduates

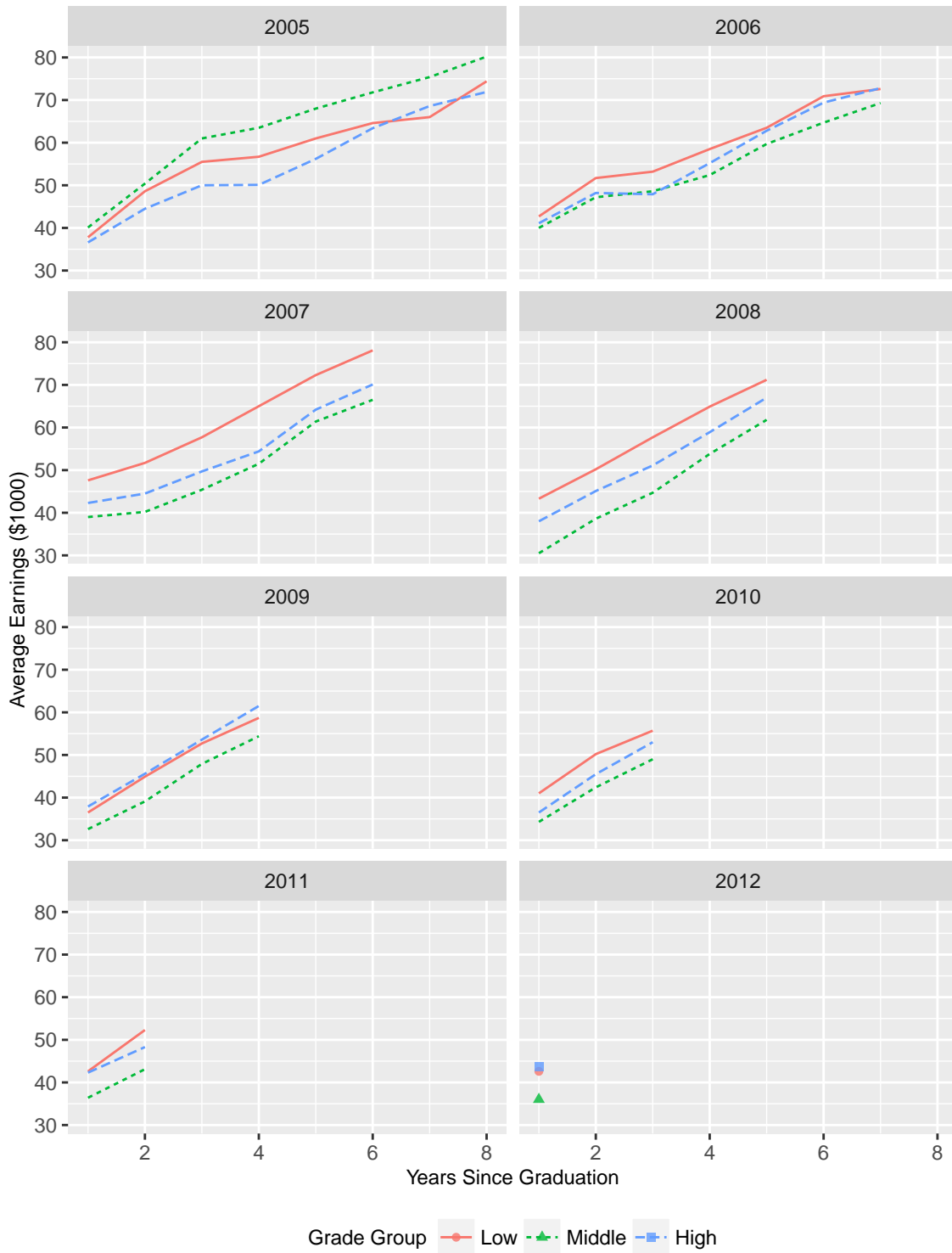


Figure A.18: Average Earnings of Female Engineering Diploma Graduates

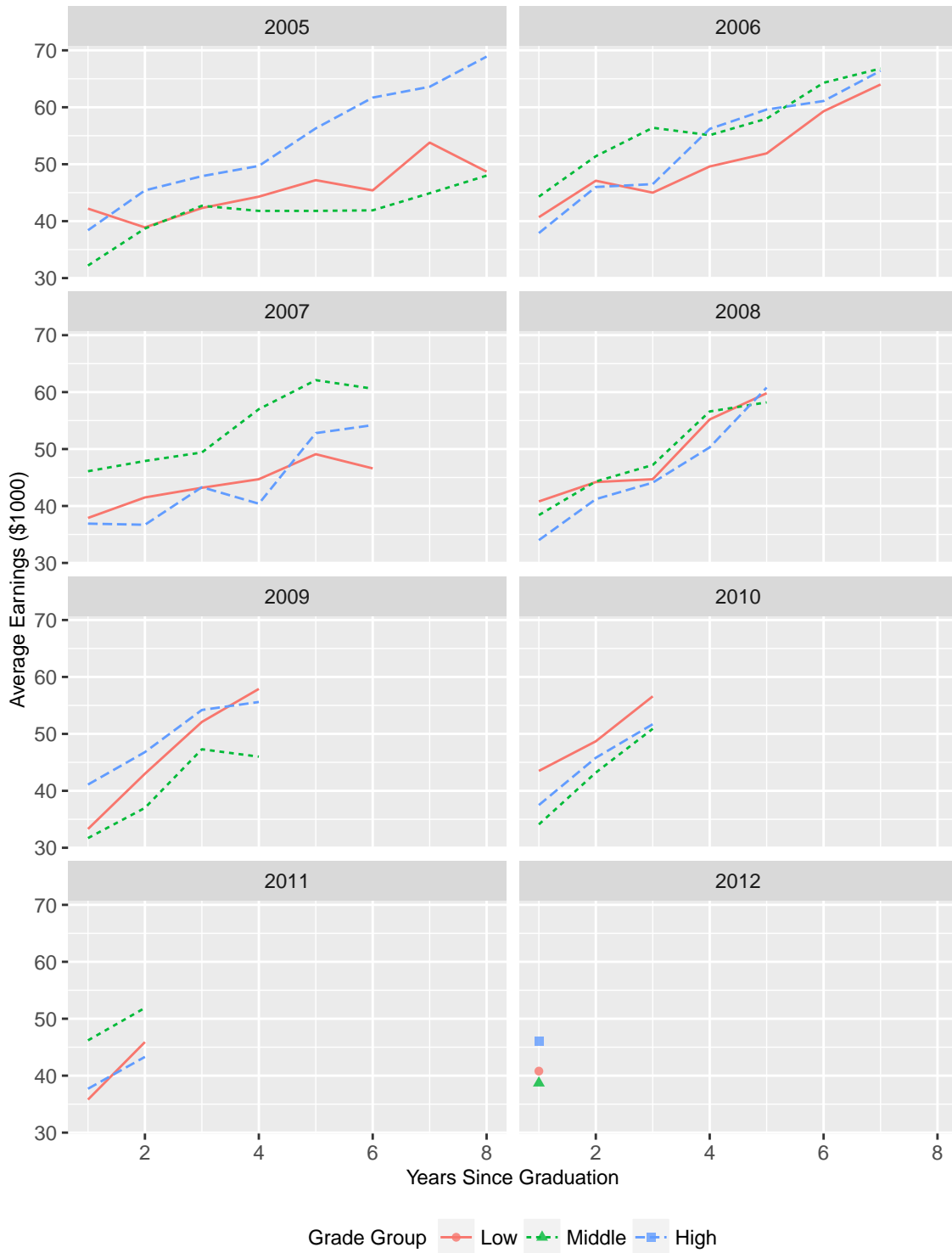


Figure A.19: Average Earnings of Male Business Diploma Graduates

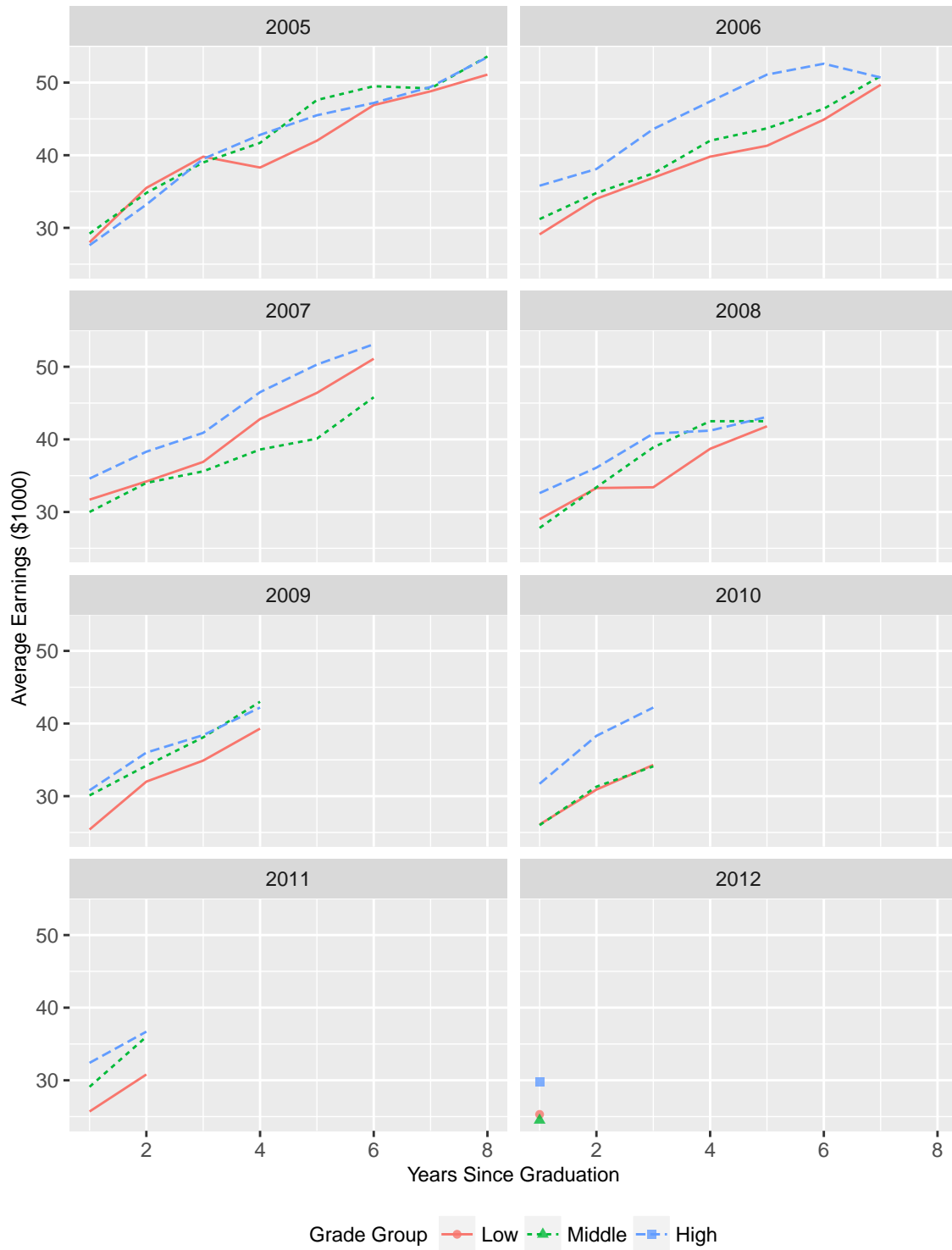


Figure A.20: Average Earnings of Female Business Diploma Graduates

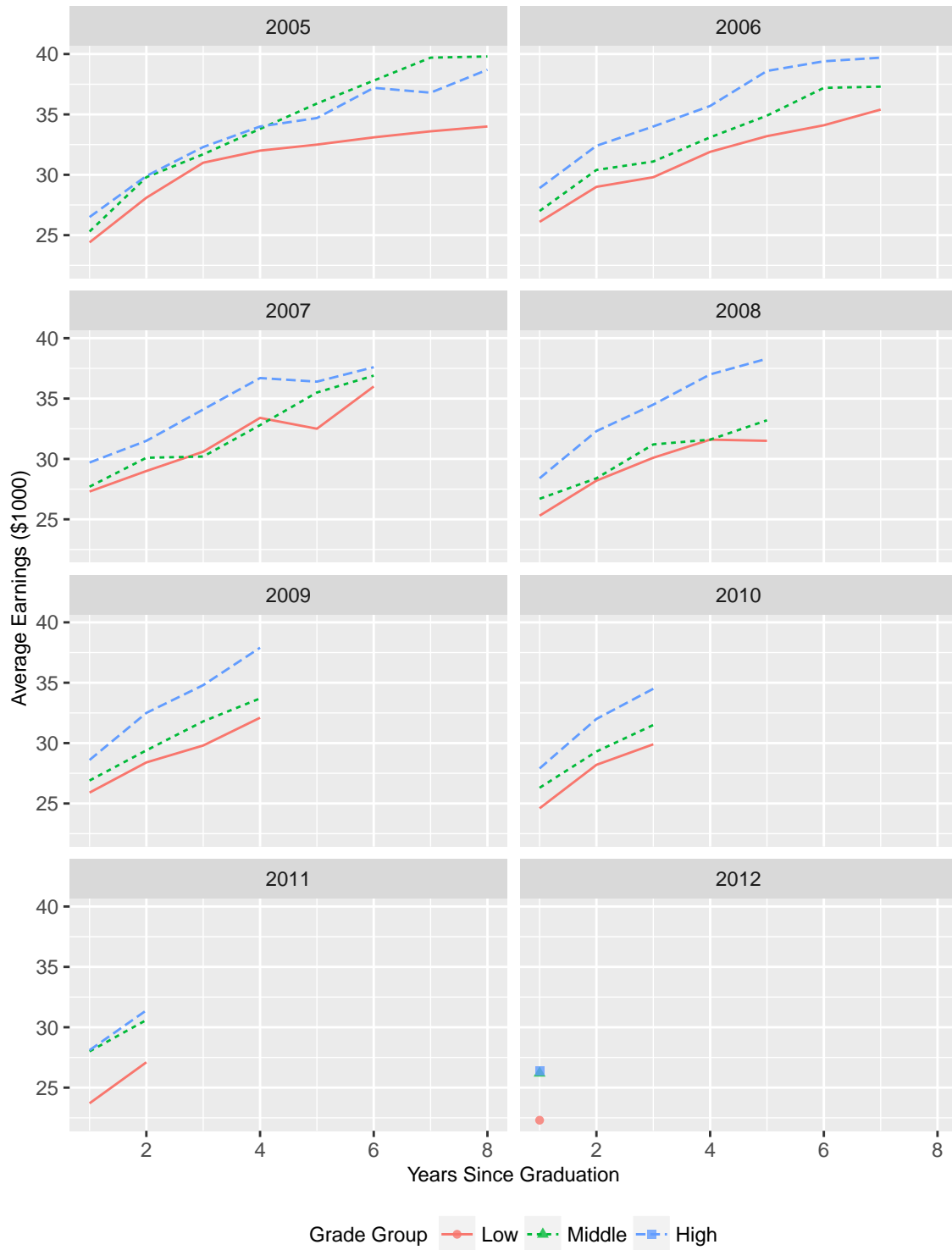


Figure A.21: Average Earnings of Male Arts & Education Diploma Graduates

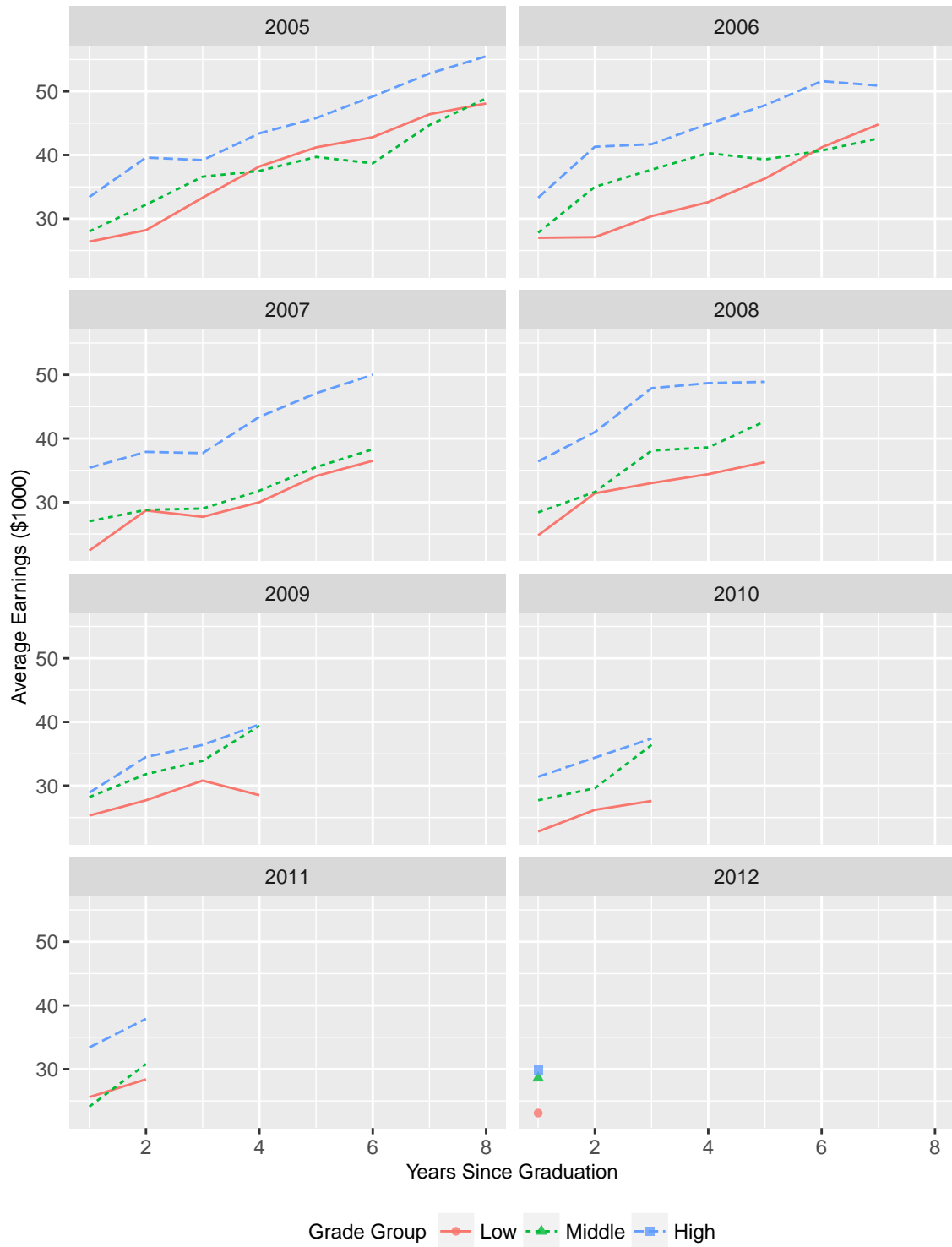


Figure A.22: Average Earnings of Female Arts & Education Diploma Graduates

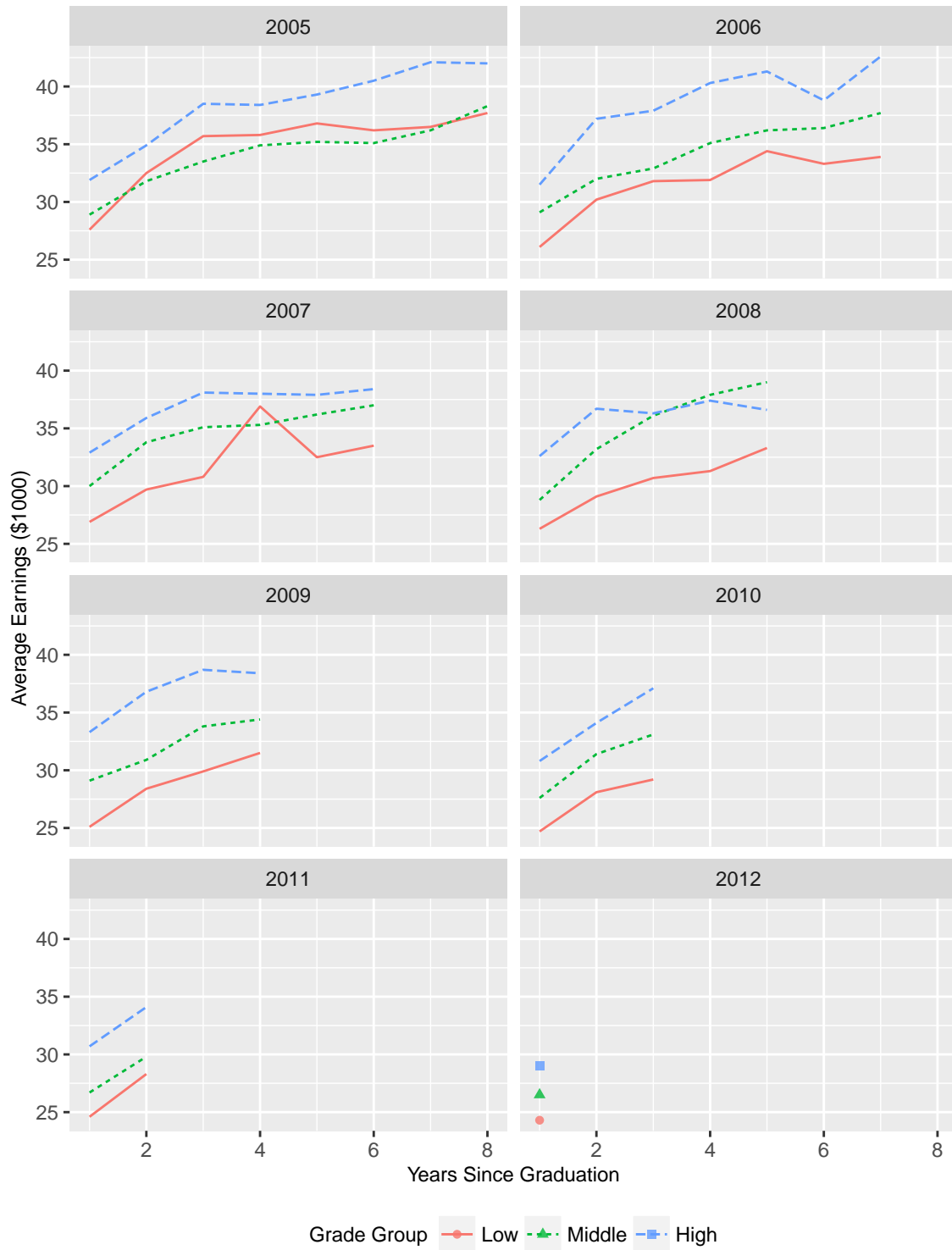


Figure A.23: Average Earnings of Male Health Diploma Graduates

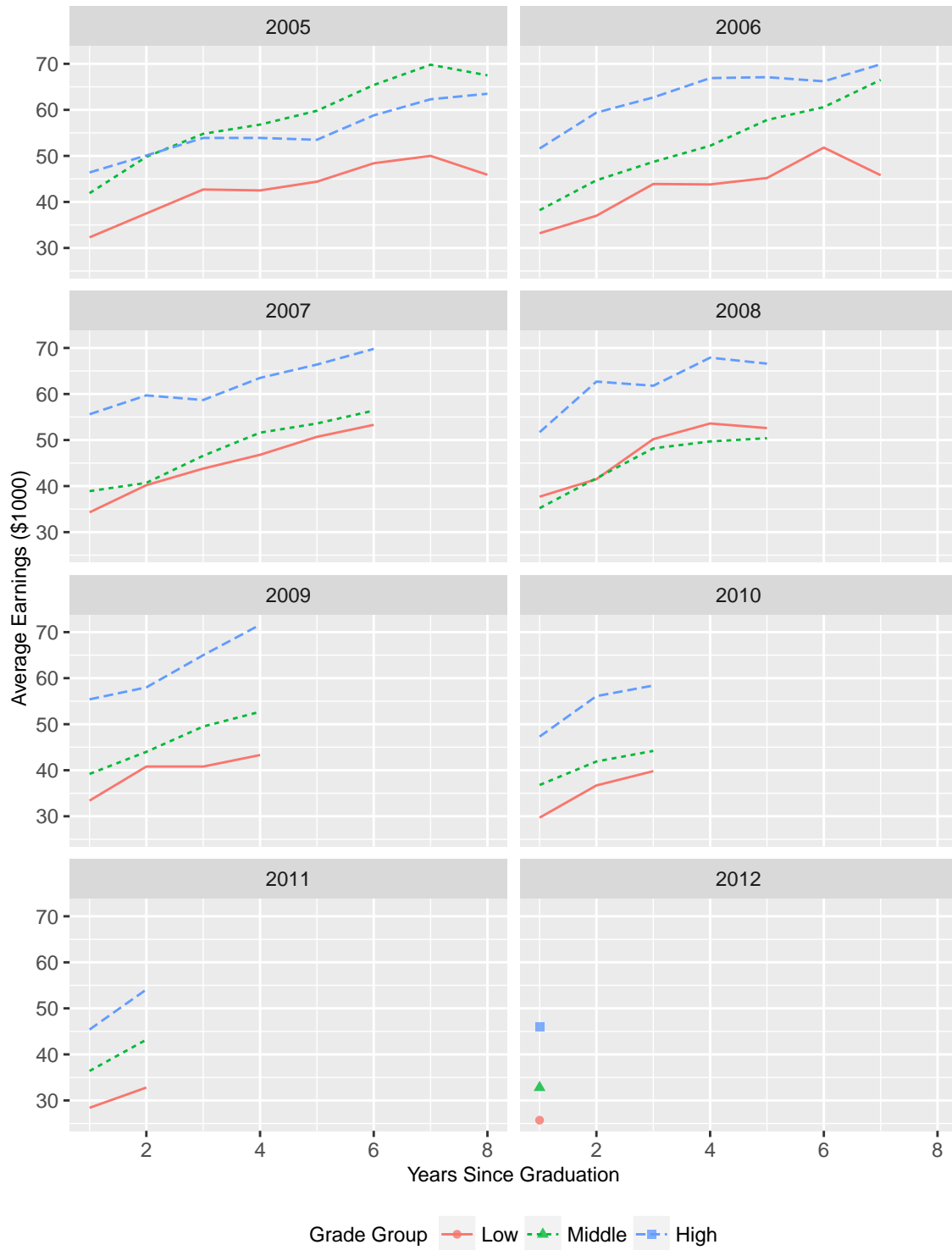


Figure A.24: Average Earnings of Female Health Diploma Graduates



Figure A.25: Average Earnings of Male PPT Services Diploma Graduates

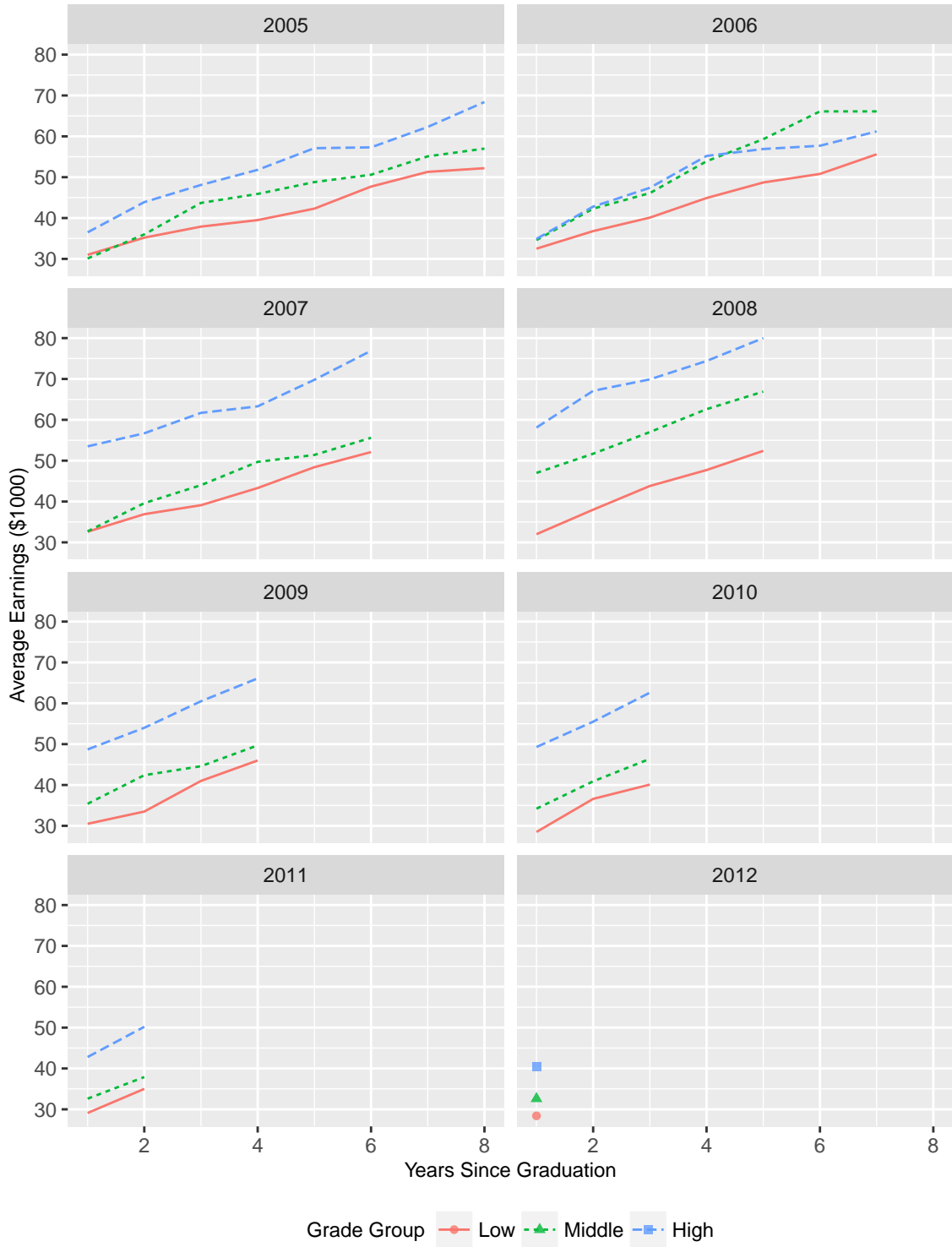


Figure A.26: Average Earnings of Female PPT Services Diploma Graduates

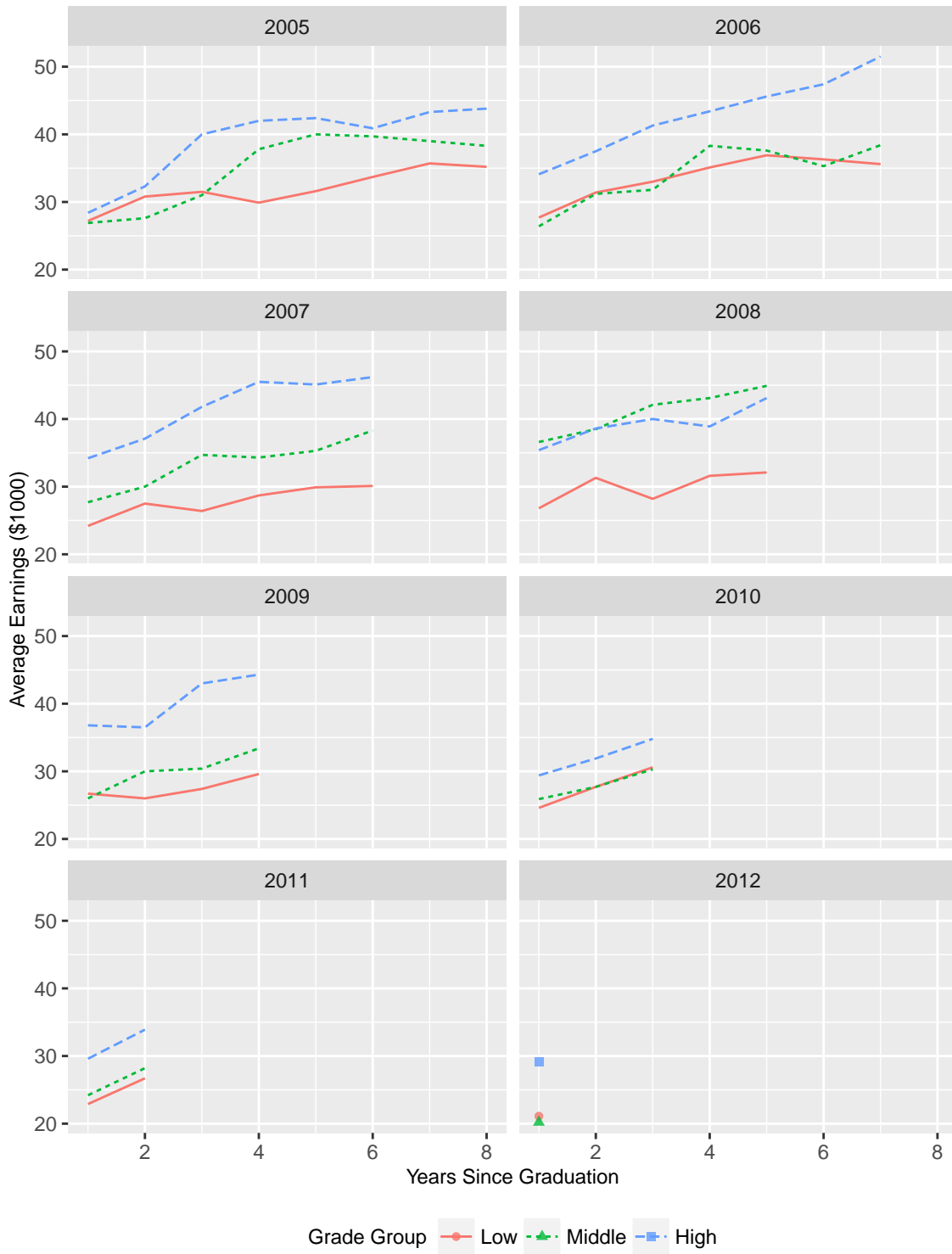


Figure A.27: Average Earnings of Male Fine Arts Diploma Graduates

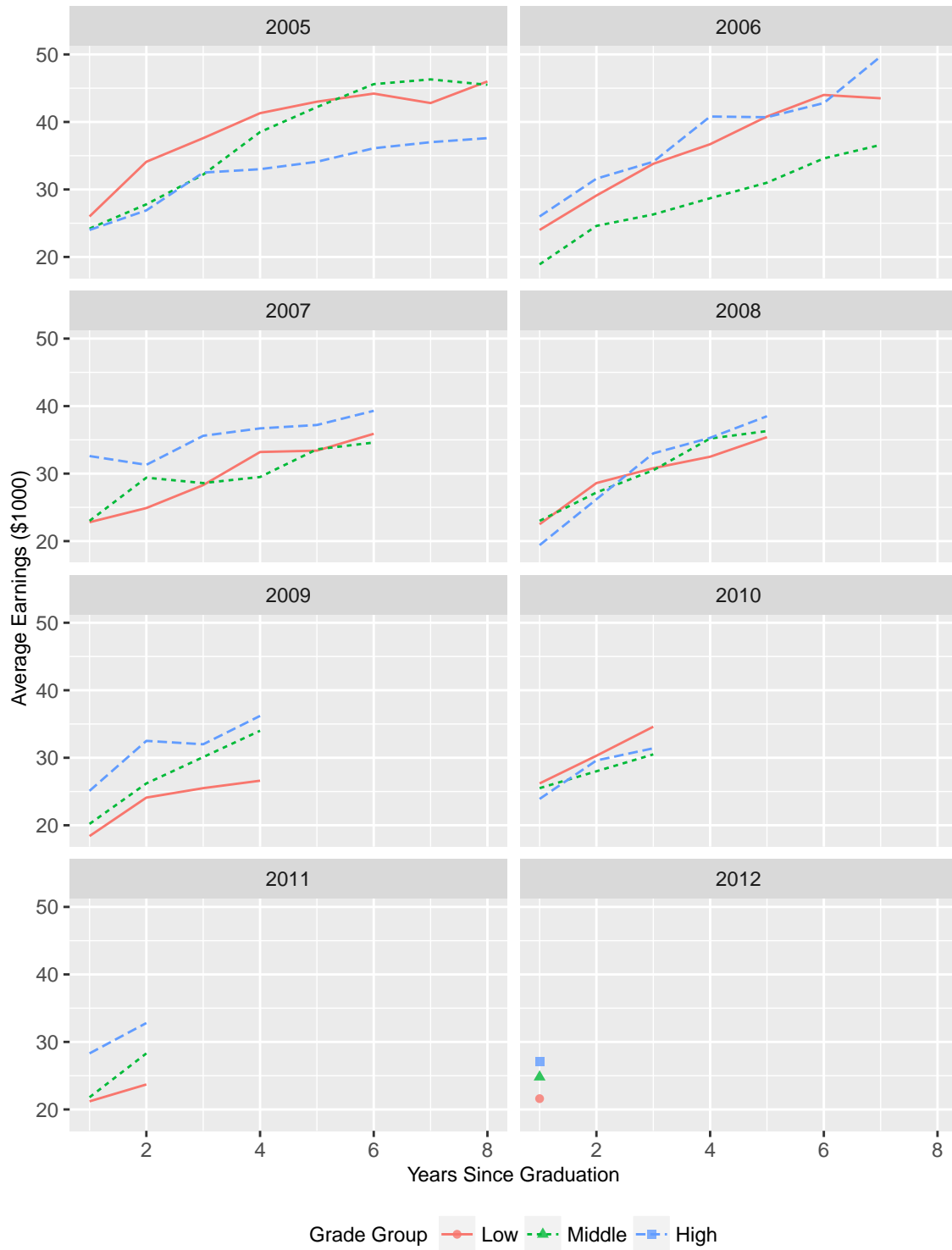


Figure A.28: Average Earnings of Female Fine Arts Diploma Graduates

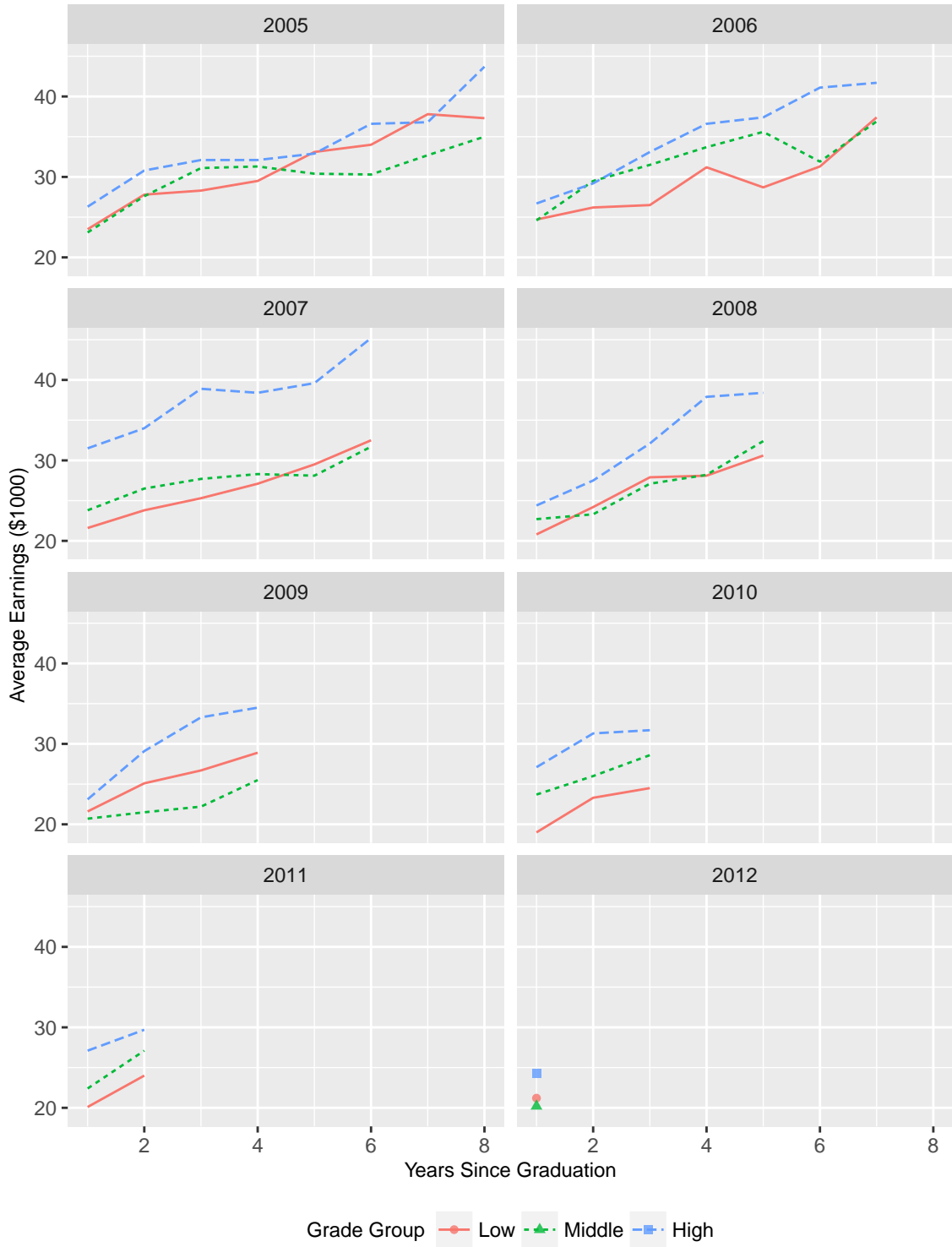


Table A.5: Baseline Model Parameter Estimates – Degree Graduates

	Social sciences		Business		Health		Engineering	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.403 [†]	10.287 [†]	10.462 [†]	10.465 [†]	10.599 [†]	10.844 [†]	10.733 [†]	10.665 [†]
	(.019)	(.013)	(.014)	(.014)	(.029)	(.011)	(.011)	(.023)
α_{06}	-.015	.009	.074 [†]	.041 [†]	-.005	.023*	.038 [†]	.049*
	(.018)	(.012)	(.013)	(.013)	(.029)	(.010)	(.010)	(.021)
α_{07}	-.038*	-.005	.031*	-.011	.001	.048 [†]	.011	.053*
	(.018)	(.012)	(.014)	(.013)	(.028)	(.010)	(.010)	(.021)
α_{08}	-.093 [†]	-.019	.016	-.016	.045	.043 [†]	.030 [†]	-.031
	(.019)	(.013)	(.014)	(.014)	(.029)	(.010)	(.011)	(.023)
α_{09}	-.115 [†]	-.065 [†]	-.055 [†]	-.075 [†]	-.022	.015	.012	-.052*
	(.020)	(.014)	(.015)	(.015)	(.031)	(.011)	(.012)	(.025)
α_{10}	-.147 [†]	-.115 [†]	-.065 [†]	-.026	-.128 [†]	-.033 [†]	.019	-.029
	(.022)	(.015)	(.016)	(.016)	(.033)	(.012)	(.013)	(.027)
α_{11}	-.148 [†]	-.108 [†]	-.072 [†]	-.070 [†]	-.133 [†]	-.037 [†]	.076 [†]	.087 [†]
	(.024)	(.016)	(.018)	(.018)	(.037)	(.014)	(.014)	(.030)
α_{12}	-.194 [†]	-.155 [†]	-.063 [†]	-.127 [†]	-.111*	-.043*	.063 [†]	.013
	(.030)	(.020)	(.022)	(.022)	(.046)	(.018)	(.019)	(.039)
β_2	.195 [†]	.150 [†]	.167 [†]	.132 [†]	.159 [†]	.053 [†]	.179 [†]	.153 [†]
	(.016)	(.010)	(.011)	(.012)	(.023)	(.009)	(.009)	(.019)
β_3	.319 [†]	.225 [†]	.290 [†]	.203 [†]	.247 [†]	.069 [†]	.276 [†]	.217 [†]
	(.018)	(.012)	(.013)	(.014)	(.027)	(.010)	(.011)	(.022)
β_4	.408 [†]	.286 [†]	.380 [†]	.248 [†]	.310 [†]	.055 [†]	.344 [†]	.246 [†]
	(.021)	(.014)	(.016)	(.016)	(.032)	(.012)	(.012)	(.026)
β_5	.483 [†]	.315 [†]	.455 [†]	.269 [†]	.353 [†]	.040 [†]	.431 [†]	.253 [†]
	(.025)	(.017)	(.019)	(.019)	(.037)	(.014)	(.014)	(.030)
β_6	.528 [†]	.295 [†]	.506 [†]	.266 [†]	.427 [†]	.056 [†]	.487 [†]	.287 [†]
	(.029)	(.020)	(.022)	(.022)	(.045)	(.016)	(.017)	(.036)
β_7	.580 [†]	.298 [†]	.551 [†]	.278 [†]	.450 [†]	.047*	.550 [†]	.269 [†]
	(.036)	(.025)	(.027)	(.027)	(.056)	(.019)	(.020)	(.043)
β_8	.643 [†]	.355 [†]	.621 [†]	.286 [†]	.495 [†]	.081 [†]	.606 [†]	.244 [†]
	(.047)	(.032)	(.036)	(.035)	(.075)	(.026)	(.027)	(.056)
δ_M	.026	.097 [†]	.095 [†]	.084 [†]	.123 [†]	.110 [†]	.101 [†]	.107 [†]
	(.017)	(.012)	(.013)	(.013)	(.026)	(.010)	(.010)	(.022)
δ_T	.074 [†]	.183 [†]	.227 [†]	.221 [†]	.232 [†]	.132 [†]	.156 [†]	.175 [†]
	(.019)	(.013)	(.013)	(.014)	(.028)	(.010)	(.011)	(.023)
γ_M	.002	-.002	-.002	.012*	.005	-.022 [†]	-.008*	.009
	(.006)	(.004)	(.005)	(.005)	(.010)	(.004)	(.004)	(.008)
γ_T	.012	-.002	-.005	.012*	-.006	-.022 [†]	-.008*	-.001
	(.007)	(.005)	(.005)	(.005)	(.011)	(.004)	(.004)	(.008)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.6: Baseline Model Parameter Estimates – Degree Graduates (Continued)

	Sciences & Agri		Humanities		Math & Comp Sci		Fine Arts	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.502 [†]	10.315 [†]	10.146 [†]	10.233 [†]	10.568 [†]	10.500 [†]	10.093 [†]	10.111 [†]
	(.027)	(.025)	(.036)	(.025)	(.018)	(.038)	(.041)	(.028)
α_{06}	.077 [†]	.043	.183 [†]	-.063 [†]	.026	.003	.134 [†]	.078 [†]
	(.026)	(.023)	(.034)	(.024)	(.016)	(.032)	(.041)	(.027)
α_{07}	-.058*	.031	-.039	-.027	.014	-.027	.102 [†]	-.012
	(.027)	(.024)	(.034)	(.024)	(.017)	(.035)	(.039)	(.027)
α_{08}	-.029	.012	.003	-.090 [†]	-.075 [†]	-.108 [†]	-.008	-.075 [†]
	(.028)	(.025)	(.037)	(.025)	(.019)	(.036)	(.040)	(.028)
α_{09}	-.086 [†]	.039	-.060	-.120 [†]	-.135 [†]	-.077	-.065	-.041
	(.030)	(.027)	(.040)	(.027)	(.021)	(.043)	(.042)	(.029)
α_{10}	-.088 [†]	.023	.046	-.083 [†]	-.035	-.284 [†]	-.059	-.094 [†]
	(.031)	(.029)	(.041)	(.029)	(.024)	(.049)	(.045)	(.032)
α_{11}	-.179 [†]	-.006	-.023	-.074*	-.039	-.089	-.090	-.094 [†]
	(.036)	(.031)	(.046)	(.033)	(.027)	(.049)	(.050)	(.035)
α_{12}	-.176 [†]	-.018	.006	-.106*	-.016	-.234 [†]	-.233 [†]	-.038
	(.043)	(.039)	(.060)	(.042)	(.035)	(.066)	(.066)	(.044)
β_2	.217 [†]	.225 [†]	.216 [†]	.169 [†]	.165 [†]	.115 [†]	.106 [†]	.093 [†]
	(.022)	(.020)	(.029)	(.021)	(.017)	(.032)	(.033)	(.023)
β_3	.341 [†]	.291 [†]	.350 [†]	.247 [†]	.269 [†]	.191 [†]	.208 [†]	.170 [†]
	(.026)	(.023)	(.034)	(.024)	(.019)	(.037)	(.039)	(.027)
β_4	.415 [†]	.376 [†]	.405 [†]	.339 [†]	.329 [†]	.260 [†]	.247 [†]	.175 [†]
	(.030)	(.027)	(.040)	(.028)	(.021)	(.044)	(.045)	(.032)
β_5	.464 [†]	.379 [†]	.474 [†]	.323 [†]	.423 [†]	.252 [†]	.295 [†]	.218 [†]
	(.034)	(.032)	(.046)	(.034)	(.024)	(.051)	(.054)	(.037)
β_6	.519 [†]	.359 [†]	.580 [†]	.305 [†]	.479 [†]	.309 [†]	.354 [†]	.215 [†]
	(.040)	(.038)	(.054)	(.040)	(.028)	(.061)	(.064)	(.044)
β_7	.551 [†]	.381 [†]	.627 [†]	.338 [†]	.532 [†]	.317 [†]	.394 [†]	.221 [†]
	(.049)	(.046)	(.066)	(.049)	(.033)	(.073)	(.080)	(.054)
β_8	.578 [†]	.348 [†]	.670 [†]	.430 [†]	.570 [†]	.450 [†]	.467 [†]	.321 [†]
	(.068)	(.063)	(.090)	(.066)	(.042)	(.097)	(.102)	(.072)
δ_M	.070 [†]	.075 [†]	-.028	.046*	.167 [†]	.279 [†]	-.046	-.070 [†]
	(.024)	(.022)	(.032)	(.023)	(.018)	(.036)	(.038)	(.026)
δ_T	-.020	.141 [†]	.046	.092 [†]	.274 [†]	.397 [†]	-.094*	-.102 [†]
	(.030)	(.025)	(.036)	(.025)	(.020)	(.038)	(.039)	(.027)
γ_M	.012	-.004	.014	.006	-.000	.001	.010	.028 [†]
	(.009)	(.008)	(.012)	(.009)	(.006)	(.013)	(.014)	(.010)
γ_T	.031 [†]	.010	-.001	.029 [†]	-.004	-.016	.021	.003
	(.012)	(.010)	(.013)	(.009)	(.007)	(.013)	(.015)	(.010)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.7: Flexible YSG Model Parameter Estimates – Degree Graduates

	Social sciences		Business		Health		Engineering	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.349 [†]	10.236 [†]	10.437 [†]	10.456 [†]	10.604 [†]	10.819 [†]	10.708 [†]	10.664 [†]
	(.030)	(.021)	(.024)	(.022)	(.049)	(.017)	(.018)	(.037)
α_{06}	.036	.078 [†]	.103 [†]	.055	-.005	.048*	.066 [†]	.098*
	(.041)	(.028)	(.031)	(.030)	(.065)	(.023)	(.024)	(.049)
α_{07}	.050	.062*	.101 [†]	.014	-.027	.081 [†]	.098 [†]	.069
	(.040)	(.026)	(.030)	(.029)	(.061)	(.022)	(.024)	(.048)
α_{08}	-.039	.043	.036	.012	.068	.099 [†]	.066 [†]	-.063
	(.040)	(.027)	(.030)	(.029)	(.060)	(.022)	(.024)	(.048)
α_{09}	-.057	-.004	-.053	-.066*	-.016	.038	.002	-.041
	(.040)	(.027)	(.030)	(.030)	(.061)	(.022)	(.024)	(.050)
α_{10}	-.090*	-.061*	-.043	-.028	-.106	-.024	.032	-.042
	(.040)	(.026)	(.030)	(.029)	(.061)	(.022)	(.024)	(.050)
α_{11}	-.081*	-.065*	-.042	-.073 [†]	-.192 [†]	-.017	.091 [†]	.063
	(.039)	(.026)	(.029)	(.028)	(.061)	(.023)	(.024)	(.049)
α_{12}	-.139 [†]	-.104 [†]	-.038	-.117 [†]	-.117	-.019	.087 [†]	.013
	(.038)	(.026)	(.029)	(.028)	(.060)	(.023)	(.024)	(.048)
β_2^{05}	.263 [†]	.208 [†]	.217 [†]	.150 [†]	.163*	.079 [†]	.219 [†]	.143 [†]
	(.043)	(.029)	(.033)	(.031)	(.069)	(.024)	(.025)	(.050)
β_2^{06}	.255 [†]	.207 [†]	.299 [†]	.193 [†]	.139*	.091 [†]	.267 [†]	.206 [†]
	(.043)	(.029)	(.032)	(.031)	(.068)	(.023)	(.025)	(.051)
β_2^{07}	.229 [†]	.211 [†]	.220 [†]	.149 [†]	.167 [†]	.128 [†]	.182 [†]	.178 [†]
	(.041)	(.028)	(.031)	(.030)	(.063)	(.023)	(.025)	(.049)
β_2^{08}	.135 [†]	.162 [†]	.176 [†]	.100 [†]	.208 [†]	.121 [†]	.212 [†]	.133 [†]
	(.041)	(.028)	(.031)	(.030)	(.063)	(.023)	(.024)	(.051)
β_2^{09}	.150 [†]	.133 [†]	.135 [†]	.047	.091	.090 [†]	.217 [†]	.087
	(.041)	(.028)	(.031)	(.031)	(.063)	(.023)	(.025)	(.051)
β_2^{10}	.078	.082 [†]	.126 [†]	.107 [†]	-.018	.050*	.228 [†]	.138 [†]
	(.042)	(.028)	(.031)	(.030)	(.064)	(.023)	(.024)	(.051)
β_2^{11}	.088*	.104 [†]	.116 [†]	.085 [†]	.082	.045	.289 [†]	.268 [†]
	(.040)	(.027)	(.030)	(.029)	(.064)	(.023)	(.024)	(.050)
β_3^{05}	.395 [†]	.316 [†]	.336 [†]	.220 [†]	.264 [†]	.085 [†]	.333 [†]	.246 [†]
	(.044)	(.030)	(.034)	(.032)	(.071)	(.025)	(.026)	(.052)
β_3^{06}	.362 [†]	.312 [†]	.379 [†]	.268 [†]	.228 [†]	.123 [†]	.327 [†]	.240 [†]
	(.045)	(.030)	(.033)	(.032)	(.071)	(.024)	(.026)	(.053)
β_3^{07}	.303 [†]	.243 [†]	.320 [†]	.188 [†]	.247 [†]	.151 [†]	.274 [†]	.284 [†]
	(.042)	(.029)	(.033)	(.031)	(.066)	(.024)	(.025)	(.052)
β_3^{08}	.285 [†]	.244 [†]	.329 [†]	.156 [†]	.266 [†]	.129 [†]	.317 [†]	.162 [†]
	(.043)	(.029)	(.032)	(.032)	(.065)	(.024)	(.025)	(.052)
β_3^{09}	.242 [†]	.192 [†]	.273 [†]	.151 [†]	.212 [†]	.097 [†]	.343 [†]	.170 [†]
	(.043)	(.029)	(.032)	(.032)	(.065)	(.024)	(.025)	(.053)
β_3^{10}	.251 [†]	.164 [†]	.258 [†]	.211 [†]	.125	.073 [†]	.327 [†]	.190 [†]
	(.043)	(.029)	(.032)	(.031)	(.066)	(.024)	(.025)	(.053)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.8: Flexible YSG Model Parameter Estimates – Degree Graduates (Continued)

	Social sciences		Business		Health		Engineering	
	Male	Female	Male	Female	Male	Female	Male	Female
β_4^{05}	.493 [†]	.345 [†]	.397 [†]	.283 [†]	.320 [†]	.099 [†]	.362 [†]	.272 [†]
	(.046)	(.031)	(.035)	(.033)	(.075)	(.025)	(.027)	(.054)
β_4^{06}	.455 [†]	.337 [†]	.446 [†]	.277 [†]	.290 [†]	.122 [†]	.407 [†]	.286 [†]
	(.047)	(.032)	(.035)	(.034)	(.074)	(.025)	(.027)	(.056)
β_4^{07}	.405 [†]	.311 [†]	.434 [†]	.219 [†]	.290 [†]	.096 [†]	.370 [†]	.289 [†]
	(.044)	(.030)	(.034)	(.032)	(.067)	(.025)	(.026)	(.053)
β_4^{08}	.362 [†]	.333 [†]	.441 [†]	.256 [†]	.315 [†]	.101 [†]	.407 [†]	.212 [†]
	(.044)	(.030)	(.033)	(.033)	(.068)	(.024)	(.026)	(.053)
β_4^{09}	.340 [†]	.281 [†]	.370 [†]	.193 [†]	.325 [†]	.111 [†]	.390 [†]	.191 [†]
	(.045)	(.030)	(.033)	(.033)	(.067)	(.024)	(.026)	(.055)
β_5^{05}	.543 [†]	.353 [†]	.478 [†]	.240 [†]	.335 [†]	.077 [†]	.451 [†]	.239 [†]
	(.047)	(.032)	(.037)	(.035)	(.076)	(.026)	(.028)	(.056)
β_5^{06}	.500 [†]	.371 [†]	.555 [†]	.324 [†]	.331 [†]	.083 [†]	.472 [†]	.251 [†]
	(.048)	(.033)	(.036)	(.035)	(.076)	(.026)	(.027)	(.058)
β_5^{07}	.483 [†]	.366 [†]	.485 [†]	.262 [†]	.360 [†]	.120 [†]	.471 [†]	.299 [†]
	(.045)	(.031)	(.035)	(.034)	(.070)	(.025)	(.027)	(.055)
β_5^{08}	.476 [†]	.360 [†]	.527 [†]	.302 [†]	.395 [†]	.094 [†]	.504 [†]	.292 [†]
	(.046)	(.031)	(.035)	(.034)	(.070)	(.025)	(.026)	(.056)
β_6^{05}	.586 [†]	.348 [†]	.539 [†]	.276 [†]	.387 [†]	.072 [†]	.500 [†]	.289 [†]
	(.049)	(.033)	(.038)	(.036)	(.078)	(.027)	(.029)	(.059)
β_6^{06}	.554 [†]	.342 [†]	.598 [†]	.307 [†]	.431 [†]	.109 [†]	.553 [†]	.310 [†]
	(.049)	(.034)	(.037)	(.036)	(.079)	(.027)	(.028)	(.060)
β_6^{07}	.552 [†]	.352 [†]	.565 [†]	.272 [†]	.437 [†]	.132 [†]	.530 [†]	.360 [†]
	(.047)	(.032)	(.036)	(.035)	(.073)	(.027)	(.028)	(.057)
β_7^{05}	.633 [†]	.377 [†]	.562 [†]	.294 [†]	.425 [†]	.088 [†]	.575 [†]	.232 [†]
	(.051)	(.035)	(.040)	(.038)	(.081)	(.028)	(.030)	(.060)
β_7^{06}	.622 [†]	.329 [†]	.664 [†]	.323 [†]	.457 [†]	.080 [†]	.612 [†]	.360 [†]
	(.051)	(.035)	(.039)	(.038)	(.081)	(.028)	(.029)	(.063)
β_8^{05}	.698 [†]	.406 [†]	.647 [†]	.295 [†]	.488 [†]	.105 [†]	.631 [†]	.244 [†]
	(.052)	(.036)	(.041)	(.039)	(.084)	(.029)	(.030)	(.062)
δ_M	.026	.097 [†]	.095 [†]	.083 [†]	.122 [†]	.110 [†]	.101 [†]	.107 [†]
	(.017)	(.012)	(.013)	(.013)	(.026)	(.010)	(.010)	(.022)
δ_T	.075 [†]	.183 [†]	.227 [†]	.221 [†]	.232 [†]	.132 [†]	.156 [†]	.175 [†]
	(.019)	(.013)	(.013)	(.014)	(.028)	(.010)	(.011)	(.023)
γ_M	.002	-.002	-.002	.012*	.006	-.022 [†]	-.008*	.009
	(.006)	(.004)	(.005)	(.005)	(.010)	(.004)	(.004)	(.008)
γ_T	.012	-.002	-.005	.013*	-.005	-.023 [†]	-.008*	-.001
	(.007)	(.005)	(.005)	(.005)	(.011)	(.004)	(.004)	(.008)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.9: Flexible YSG Model Parameter Estimates – Degree Graduates (Continued)

	Sciences & Agri		Humanities		Math & Comp Sci		Fine Arts	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.462 [†]	10.325 [†]	10.029 [†]	10.185 [†]	10.534 [†]	10.466 [†]	10.093 [†]	10.099 [†]
	(.045)	(.041)	(.060)	(.041)	(.028)	(.056)	(.066)	(.046)
α_{06}	.122*	.042	.341 [†]	-.035	.094*	.060	.140	.067
	(.060)	(.053)	(.078)	(.054)	(.037)	(.071)	(.091)	(.062)
α_{07}	.018	.048	.077	.049	.137 [†]	.066	.143	.055
	(.059)	(.052)	(.074)	(.051)	(.039)	(.075)	(.085)	(.059)
α_{08}	.059	-.005	.157*	-.037	-.035	-.065	-.024	-.059
	(.058)	(.052)	(.077)	(.052)	(.040)	(.074)	(.085)	(.059)
α_{09}	-.083	-.017	.085	-.051	-.153 [†]	-.069	-.062	-.052
	(.059)	(.053)	(.079)	(.052)	(.042)	(.082)	(.083)	(.058)
α_{10}	-.072	.005	.175*	-.050	-.054	-.289 [†]	-.098	-.085
	(.058)	(.052)	(.075)	(.052)	(.042)	(.085)	(.084)	(.059)
α_{11}	-.139*	-.008	.072	-.003	-.018	-.080	-.083	-.086
	(.058)	(.051)	(.075)	(.052)	(.042)	(.076)	(.083)	(.058)
α_{12}	-.137*	-.028	.122	-.057	.017	-.202 [†]	-.233 [†]	-.027
	(.057)	(.051)	(.076)	(.053)	(.041)	(.077)	(.084)	(.057)
β_2^{05}	.289 [†]	.199 [†]	.371 [†]	.196 [†]	.219 [†]	.130	.140	.134*
	(.065)	(.058)	(.085)	(.057)	(.037)	(.076)	(.091)	(.063)
β_2^{06}	.358 [†]	.298 [†]	.488 [†]	.176 [†]	.236 [†]	.145	.276 [†]	.231 [†]
	(.063)	(.055)	(.081)	(.058)	(.038)	(.075)	(.097)	(.064)
β_2^{07}	.125*	.237 [†]	.311 [†]	.200 [†]	.164 [†]	.114	.207*	.066
	(.061)	(.055)	(.078)	(.054)	(.040)	(.079)	(.088)	(.061)
β_2^{08}	.240 [†]	.213 [†]	.251 [†]	.133*	.080	.100	.053	.029
	(.061)	(.055)	(.080)	(.054)	(.041)	(.078)	(.087)	(.062)
β_2^{09}	.167 [†]	.234 [†]	.301 [†]	.069	.101*	.032	.022	.041
	(.061)	(.056)	(.082)	(.055)	(.043)	(.085)	(.085)	(.060)
β_2^{10}	.185 [†]	.259 [†]	.385 [†]	.180 [†]	.173 [†]	-.174*	.065	-.004
	(.060)	(.055)	(.079)	(.055)	(.043)	(.089)	(.085)	(.061)
β_2^{11}	.076	.197 [†]	.334 [†]	.118*	.172 [†]	.085	.007	.016
	(.060)	(.054)	(.078)	(.055)	(.043)	(.079)	(.084)	(.060)
β_3^{05}	.438 [†]	.289 [†]	.568 [†]	.304 [†]	.336 [†]	.242 [†]	.174	.172 [†]
	(.067)	(.060)	(.088)	(.060)	(.038)	(.080)	(.096)	(.066)
β_3^{06}	.466 [†]	.294 [†]	.660 [†]	.292 [†]	.303 [†]	.133	.390 [†]	.310 [†]
	(.066)	(.058)	(.084)	(.061)	(.040)	(.081)	(.104)	(.067)
β_3^{07}	.276 [†]	.318 [†]	.397 [†]	.274 [†]	.265 [†]	.209*	.275 [†]	.125
	(.064)	(.057)	(.082)	(.057)	(.041)	(.083)	(.092)	(.064)
β_3^{08}	.295 [†]	.258 [†]	.483 [†]	.171 [†]	.216 [†]	.079	.211*	.053
	(.063)	(.056)	(.082)	(.057)	(.042)	(.080)	(.089)	(.063)
β_3^{09}	.328 [†]	.391 [†]	.359 [†]	.179 [†]	.177 [†]	.214*	.136	.185 [†]
	(.063)	(.058)	(.086)	(.057)	(.044)	(.090)	(.088)	(.062)
β_3^{10}	.305 [†]	.290 [†]	.488 [†]	.187 [†]	.318 [†]	.031	.175*	.107
	(.062)	(.057)	(.081)	(.057)	(.045)	(.093)	(.088)	(.064)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.10: Flexible YSG Model Parameter Estimates – Degree Graduates (Continued)

	Sciences & Agri		Humanities		Math & Comp Sci		Fine Arts	
	Male	Female	Male	Female	Male	Female	Male	Female
β_4^{05}	.437 [†]	.387 [†]	.565 [†]	.432 [†]	.342 [†]	.308 [†]	.217*	.195 [†]
	(.069)	(.063)	(.091)	(.063)	(.040)	(.085)	(.099)	(.069)
β_4^{06}	.540 [†]	.365 [†]	.664 [†]	.297 [†]	.396 [†]	.280 [†]	.349 [†]	.251 [†]
	(.068)	(.060)	(.089)	(.064)	(.041)	(.085)	(.106)	(.069)
β_4^{07}	.404 [†]	.377 [†]	.466 [†]	.346 [†]	.358 [†]	.295 [†]	.336 [†]	.178 [†]
	(.067)	(.059)	(.084)	(.059)	(.043)	(.086)	(.096)	(.066)
β_4^{08}	.405 [†]	.409 [†]	.562 [†]	.293 [†]	.318 [†]	.155	.267 [†]	.101
	(.065)	(.059)	(.085)	(.060)	(.044)	(.084)	(.092)	(.065)
β_4^{09}	.390 [†]	.420 [†]	.439 [†]	.271 [†]	.238 [†]	.224*	.207*	.159*
	(.065)	(.061)	(.089)	(.059)	(.046)	(.094)	(.092)	(.065)
β_5^{05}	.470 [†]	.362 [†]	.607 [†]	.384 [†]	.463 [†]	.340 [†]	.305 [†]	.200 [†]
	(.072)	(.065)	(.093)	(.065)	(.041)	(.090)	(.106)	(.072)
β_5^{06}	.590 [†]	.396 [†]	.733 [†]	.292 [†]	.450 [†]	.342 [†]	.390 [†]	.268 [†]
	(.069)	(.062)	(.090)	(.066)	(.042)	(.089)	(.109)	(.072)
β_5^{07}	.466 [†]	.384 [†]	.578 [†]	.319 [†]	.481 [†]	.166	.382 [†]	.204 [†]
	(.068)	(.062)	(.086)	(.061)	(.044)	(.089)	(.099)	(.069)
β_5^{08}	.469 [†]	.417 [†]	.588 [†]	.314 [†]	.404 [†]	.165	.317 [†]	.229 [†]
	(.067)	(.061)	(.088)	(.062)	(.045)	(.089)	(.094)	(.068)
β_6^{05}	.531 [†]	.351 [†]	.683 [†]	.398 [†]	.507 [†]	.329 [†]	.341 [†]	.220 [†]
	(.074)	(.067)	(.095)	(.067)	(.043)	(.095)	(.106)	(.075)
β_6^{06}	.588 [†]	.398 [†]	.892 [†]	.271 [†]	.535 [†]	.387 [†]	.488 [†]	.290 [†]
	(.070)	(.064)	(.093)	(.068)	(.044)	(.094)	(.113)	(.074)
β_6^{07}	.569 [†]	.372 [†]	.660 [†]	.308 [†]	.539 [†]	.290 [†]	.467 [†]	.235 [†]
	(.070)	(.063)	(.089)	(.064)	(.046)	(.094)	(.102)	(.073)
β_7^{05}	.620 [†]	.344 [†]	.706 [†]	.386 [†]	.568 [†]	.352 [†]	.424 [†]	.255 [†]
	(.076)	(.069)	(.098)	(.070)	(.044)	(.100)	(.110)	(.078)
β_7^{06}	.641 [†]	.436 [†]	.962 [†]	.325 [†]	.591 [†]	.355 [†]	.492 [†]	.293 [†]
	(.072)	(.066)	(.096)	(.070)	(.045)	(.098)	(.118)	(.076)
β_8^{05}	.617 [†]	.338 [†]	.788 [†]	.479 [†]	.604 [†]	.486 [†]	.467 [†]	.334 [†]
	(.077)	(.071)	(.102)	(.073)	(.047)	(.107)	(.114)	(.080)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.11: Baseline Model Parameter Estimates – Diploma Graduates

	Engineering		Business		Arts & Education		Health	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.440 [†]	10.237 [†]	10.055 [†]	9.961 [†]	9.909 [†]	10.040 [†]	10.196 [†]	10.357 [†]
	(0.014)	(0.041)	(0.023)	(0.018)	(0.031)	(0.016)	(0.036)	(0.021)
α_{06}	-.001	.182 [†]	.037	.022	.025	-.040 [†]	.045	-.043*
	(.013)	(.035)	(.021)	(.016)	(.027)	(.014)	(.034)	(.020)
α_{07}	.016	.055	.028	.024	-.038	-.018	.063	-.009
	(.013)	(.039)	(.022)	(.017)	(.029)	(.015)	(.033)	(.020)
α_{08}	-.036 [†]	.098*	-.020	.002	.103 [†]	-.038*	.083*	-.030
	(.014)	(.039)	(.024)	(.018)	(.031)	(.016)	(.035)	(.020)
α_{09}	-.047 [†]	.054	-.045	.021	-.055	-.059 [†]	.057	-.074 [†]
	(.014)	(.040)	(.025)	(.019)	(.033)	(.017)	(.038)	(.022)
α_{10}	-.016	.124 [†]	-.050	-.001	-.101 [†]	-.083 [†]	-.032	-.130 [†]
	(.015)	(.045)	(.025)	(.021)	(.034)	(.018)	(.040)	(.024)
α_{11}	.030	.181 [†]	-.051	-.010	-.072	-.111 [†]	-.063	-.120 [†]
	(.017)	(.049)	(.027)	(.023)	(.038)	(.020)	(.043)	(.027)
α_{12}	.046*	.192 [†]	-.119 [†]	-.084 [†]	-.054	-.146 [†]	-.112*	-.170 [†]
	(.021)	(.063)	(.033)	(.029)	(.047)	(.025)	(.052)	(.033)
β_2	.173 [†]	.119 [†]	.159 [†]	.089 [†]	.160 [†]	.133 [†]	.129 [†]	.079 [†]
	(.011)	(.032)	(.018)	(.015)	(.026)	(.013)	(.028)	(.017)
β_3	.295 [†]	.212 [†]	.246 [†]	.136 [†]	.247 [†]	.185 [†]	.236 [†]	.111 [†]
	(.013)	(.037)	(.022)	(.017)	(.030)	(.015)	(.033)	(.020)
β_4	.387 [†]	.252 [†]	.348 [†]	.185 [†]	.317 [†]	.195 [†]	.303 [†]	.118 [†]
	(.015)	(.044)	(.026)	(.020)	(.036)	(.018)	(.039)	(.024)
β_5	.487 [†]	.291 [†]	.402 [†]	.187 [†]	.390 [†]	.221 [†]	.340 [†]	.113 [†]
	(.018)	(.052)	(.030)	(.023)	(.042)	(.021)	(.046)	(.028)
β_6	.555 [†]	.263 [†]	.497 [†]	.242 [†]	.453 [†]	.209 [†]	.408 [†]	.125 [†]
	(.022)	(.061)	(.035)	(.027)	(.049)	(.025)	(.055)	(.033)
β_7	.569 [†]	.341 [†]	.500 [†]	.236 [†]	.561 [†]	.248 [†]	.455 [†]	.143 [†]
	(.027)	(.073)	(.043)	(.033)	(.059)	(.030)	(.070)	(.041)
β_8	.612 [†]	.319 [†]	.600 [†]	.220 [†]	.664 [†]	.254 [†]	.388 [†]	.176 [†]
	(.037)	(.098)	(.059)	(.045)	(.076)	(.039)	(.093)	(.054)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.12: Baseline Model Parameter Estimates – Diploma Graduates (Continued)

	PPT Services		Fine Arts		Sciences & Agri	
	Male	Female	Male	Female	Male	Female
α	10.068 [†]	9.993 [†]	9.814 [†]	9.851 [†]	10.002 [†]	9.906 [†]
	(0.026)	(0.036)	(0.041)	(0.030)	(0.063)	(0.061)
α_{06}	.037	.039	-.028	.027	-.103	-.047
	(.024)	(.033)	(.037)	(.027)	(.055)	(.050)
α_{07}	.062*	-.050	-.067	-.037	.057	.044
	(.025)	(.034)	(.039)	(.029)	(.058)	(.061)
α_{08}	.174 [†]	.031	-.064	-.074*	-.131*	.083
	(.026)	(.036)	(.041)	(.030)	(.060)	(.059)
α_{09}	.043	-.042	-.109*	-.096 [†]	.080	-.085
	(.027)	(.037)	(.043)	(.033)	(.063)	(.059)
α_{10}	.051	-.100*	.000	-.070*	.068	-.085
	(.029)	(.039)	(.044)	(.033)	(.074)	(.073)
α_{11}	-.034	-.131 [†]	-.044	-.056	.155*	.023
	(.031)	(.042)	(.047)	(.036)	(.074)	(.076)
α_{12}	-.028	-.222 [†]	.017	-.133 [†]	.132	.007
	(.039)	(.051)	(.060)	(.046)	(.092)	(.093)
β_2	.160 [†]	.073 [†]	.228 [†]	.133 [†]	.195 [†]	.118*
	(.020)	(.027)	(.033)	(.025)	(.050)	(.051)
β_3	.269 [†]	.106 [†]	.352 [†]	.207 [†]	.254 [†]	.147*
	(.023)	(.032)	(.039)	(.030)	(.059)	(.058)
β_4	.370 [†]	.155 [†]	.482 [†]	.255 [†]	.350 [†]	.265 [†]
	(.027)	(.038)	(.045)	(.035)	(.068)	(.067)
β_5	.441 [†]	.179 [†]	.540 [†]	.281 [†]	.380 [†]	.279 [†]
	(.032)	(.045)	(.053)	(.041)	(.079)	(.081)
β_6	.509 [†]	.154 [†]	.612 [†]	.339 [†]	.442 [†]	.321 [†]
	(.039)	(.053)	(.062)	(.049)	(.093)	(.095)
β_7	.566 [†]	.173 [†]	.692 [†]	.400 [†]	.632 [†]	.293 [†]
	(.047)	(.065)	(.074)	(.058)	(.113)	(.109)
β_8	.640 [†]	.104	.716 [†]	.443 [†]	.777 [†]	.281*
	(.066)	(.090)	(.097)	(.074)	(.148)	(.141)

Notes: standard errors in parentheses; * significant at 5%;
[†] significant at 1%

Table A.13: Flexible YSG Model Parameter Estimates – Diploma Graduates

	Engineering		Business		Arts & Education		Health	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.426 [†]	10.365 [†]	10.010 [†]	9.915 [†]	9.900 [†]	10.032 [†]	10.229 [†]	10.340 [†]
	(.024)	(.069)	(.040)	(.029)	(.050)	(.027)	(.061)	(.034)
α_{06}	.083 [†]	.069	.132 [†]	.085*	.044	-.032	.040	.005
	(.031)	(.085)	(.051)	(.038)	(.066)	(.034)	(.080)	(.045)
α_{07}	.122 [†]	.012	.111*	.110 [†]	.022	.021	.068	-.029
	(.030)	(.089)	(.051)	(.038)	(.066)	(.034)	(.075)	(.044)
α_{08}	-.083 [†]	-.066	.030	.052	.066	-.048	-.012	.009
	(.030)	(.086)	(.051)	(.039)	(.067)	(.035)	(.075)	(.043)
α_{09}	-.077 [†]	-.155	-.013	.066	-.064	-.041	.029	-.031
	(.029)	(.084)	(.051)	(.038)	(.066)	(.035)	(.077)	(.043)
α_{10}	-.041	-.047	-.016	.021	-.077	-.085*	-.089	-.140 [†]
	(.029)	(.086)	(.049)	(.038)	(.064)	(.034)	(.075)	(.043)
α_{11}	.054	.043	-.028	.038	-.068	-.107 [†]	-.089	-.105*
	(.029)	(.084)	(.047)	(.038)	(.063)	(.033)	(.073)	(.044)
α_{12}	.059*	.064	-.074	-.038	-.045	-.138 [†]	-.144*	-.154 [†]
	(.029)	(.084)	(.046)	(.037)	(.061)	(.033)	(.071)	(.043)
β_2^{05}	.235 [†]	-.017	.204 [†]	.137 [†]	.174 [†]	.126 [†]	.110	.087
	(.034)	(.094)	(.055)	(.041)	(.068)	(.036)	(.084)	(.047)
β_2^{06}	.252 [†]	.209*	.232 [†]	.168 [†]	.206 [†]	.113 [†]	.127	.094*
	(.032)	(.087)	(.052)	(.039)	(.069)	(.035)	(.083)	(.047)
β_2^{07}	.152 [†]	.029	.200 [†]	.153 [†]	.159*	.121 [†]	.143	.043
	(.031)	(.092)	(.052)	(.039)	(.069)	(.035)	(.077)	(.046)
β_2^{08}	.124 [†]	.080	.185 [†]	.135 [†]	.260 [†]	.128 [†]	.153*	.051
	(.031)	(.089)	(.053)	(.040)	(.068)	(.036)	(.077)	(.045)
β_2^{09}	.118 [†]	.031	.163 [†]	.143 [†]	.126	.067	.157*	.021
	(.030)	(.086)	(.053)	(.039)	(.069)	(.035)	(.078)	(.045)
β_2^{10}	.191 [†]	.115	.157 [†]	.145 [†]	.029	.050	.115	-.012
	(.030)	(.089)	(.050)	(.040)	(.065)	(.035)	(.077)	(.045)
β_2^{11}	.205 [†]	.183*	.177 [†]	.123 [†]	.104	.035	.027	-.022
	(.029)	(.085)	(.048)	(.038)	(.064)	(.034)	(.075)	(.046)
β_3^{05}	.375 [†]	.058	.340 [†]	.211 [†]	.274 [†]	.223 [†]	.257 [†]	.130 [†]
	(.035)	(.096)	(.057)	(.042)	(.069)	(.037)	(.088)	(.049)
β_3^{06}	.237 [†]	.258 [†]	.316 [†]	.171 [†]	.273 [†]	.119 [†]	.259 [†]	.075
	(.033)	(.089)	(.054)	(.040)	(.071)	(.036)	(.086)	(.048)
β_3^{07}	.269 [†]	.099	.278 [†]	.180 [†]	.127	.172 [†]	.218 [†]	.121*
	(.032)	(.095)	(.054)	(.040)	(.070)	(.037)	(.079)	(.048)
β_3^{08}	.274 [†]	.107	.277 [†]	.206 [†]	.415 [†]	.154 [†]	.349 [†]	.096*
	(.031)	(.091)	(.055)	(.041)	(.071)	(.037)	(.080)	(.046)
β_3^{09}	.297 [†]	.219*	.243 [†]	.204 [†]	.200 [†]	.124 [†]	.229 [†]	.050
	(.031)	(.089)	(.054)	(.040)	(.071)	(.037)	(.081)	(.047)
β_3^{10}	.315 [†]	.262 [†]	.252 [†]	.200 [†]	.181 [†]	.131 [†]	.148	.007
	(.031)	(.092)	(.051)	(.041)	(.067)	(.036)	(.080)	(.046)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.14: Flexible YSG Model Parameter Estimates – Diploma Graduates (Continued)

	Engineering		Business		Arts & Education		Health	
	Male	Female	Male	Female	Male	Female	Male	Female
β_4^{05}	.377 [†]	.066	.365 [†]	.228 [†]	.326 [†]	.212 [†]	.212*	.187 [†]
	(.036)	(.099)	(.059)	(.043)	(.073)	(.039)	(.091)	(.051)
β_4^{06}	.348 [†]	.289 [†]	.417 [†]	.241 [†]	.354 [†]	.158 [†]	.275 [†]	.046
	(.034)	(.092)	(.055)	(.041)	(.073)	(.038)	(.091)	(.051)
β_4^{07}	.379 [†]	.151	.424 [†]	.270 [†]	.274 [†]	.179 [†]	.342 [†]	.160 [†]
	(.033)	(.098)	(.056)	(.041)	(.072)	(.038)	(.083)	(.050)
β_4^{08}	.409 [†]	.275 [†]	.392 [†]	.214 [†]	.430 [†]	.152 [†]	.388 [†]	.101*
	(.032)	(.094)	(.057)	(.043)	(.074)	(.038)	(.084)	(.048)
β_4^{09}	.397 [†]	.215*	.365 [†]	.267 [†]	.286 [†]	.161 [†]	.352 [†]	.030
	(.032)	(.092)	(.056)	(.042)	(.073)	(.038)	(.083)	(.048)
β_5^{05}	.451 [†]	.106	.487 [†]	.238 [†]	.379 [†]	.228 [†]	.221*	.098
	(.037)	(.101)	(.061)	(.045)	(.075)	(.040)	(.094)	(.053)
β_5^{06}	.448 [†]	.292 [†]	.487 [†]	.286 [†]	.415 [†]	.206 [†]	.348 [†]	.087
	(.035)	(.096)	(.057)	(.043)	(.075)	(.039)	(.093)	(.053)
β_5^{07}	.533 [†]	.238*	.472 [†]	.229 [†]	.379 [†]	.183 [†]	.409 [†]	.163 [†]
	(.034)	(.101)	(.057)	(.042)	(.074)	(.039)	(.085)	(.053)
β_5^{08}	.524 [†]	.357 [†]	.397 [†]	.229 [†]	.517 [†]	.203 [†]	.408 [†]	.089
	(.033)	(.098)	(.058)	(.044)	(.076)	(.039)	(.085)	(.050)
β_6^{05}	.534 [†]	.151	.535 [†]	.296 [†]	.432 [†]	.217 [†]	.393 [†]	.176 [†]
	(.038)	(.104)	(.064)	(.047)	(.078)	(.042)	(.099)	(.056)
β_6^{06}	.575 [†]	.335 [†]	.550 [†]	.306 [†]	.515 [†]	.176 [†]	.437 [†]	.028
	(.036)	(.099)	(.058)	(.045)	(.078)	(.041)	(.097)	(.055)
β_6^{07}	.603 [†]	.157	.607 [†]	.309 [†]	.429 [†]	.201 [†]	.414 [†]	.169 [†]
	(.035)	(.105)	(.059)	(.044)	(.078)	(.041)	(.088)	(.054)
β_7^{05}	.574 [†]	.204	.550 [†]	.306 [†]	.611 [†]	.242 [†]	.427 [†]	.130*
	(.040)	(.109)	(.066)	(.048)	(.083)	(.043)	(.103)	(.058)
β_7^{06}	.588 [†]	.405 [†]	.581 [†]	.284 [†]	.555 [†]	.229 [†]	.460 [†]	.144*
	(.037)	(.103)	(.061)	(.046)	(.081)	(.043)	(.100)	(.057)
β_8^{05}	.626 [†]	.193	.646 [†]	.266 [†]	.673 [†]	.263 [†]	.353 [†]	.191 [†]
	(.042)	(.113)	(.067)	(.050)	(.086)	(.045)	(.105)	(.061)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.15: Flexible YSG Model Parameter Estimates – Diploma Graduates (Continued)

	PPT Services		Fine Arts		Sciences & Agri	
	Male	Female	Male	Female	Male	Female
α	10.074 [†]	9.994 [†]	9.795 [†]	9.842 [†]	10.027 [†]	9.829 [†]
	(.047)	(.064)	(.068)	(.046)	(.102)	(.094)
α_{06}	.047	.005	-.010	.053	-.122	.111
	(.058)	(.081)	(.091)	(.063)	(.131)	(.119)
α_{07}	.102	-.030	.091	.010	.153	.129
	(.057)	(.080)	(.092)	(.064)	(.134)	(.134)
α_{08}	.156 [†]	.040	-.124	-.119	-.188	.242
	(.057)	(.079)	(.089)	(.064)	(.132)	(.131)
α_{09}	.023	.010	-.153	-.083	.050	-.049
	(.057)	(.077)	(.088)	(.066)	(.130)	(.120)
α_{10}	.007	-.090	.066	-.049	-.083	-.035
	(.056)	(.075)	(.084)	(.060)	(.137)	(.136)
α_{11}	-.034	-.179*	-.032	-.054	.123	.081
	(.055)	(.074)	(.080)	(.058)	(.124)	(.123)
α_{12}	-.034	-.221 [†]	.037	-.124*	.105	.085
	(.055)	(.073)	(.081)	(.058)	(.122)	(.118)
β_2^{05}	.159*	.020	.242 [†]	.210 [†]	.202	.193
	(.064)	(.089)	(.094)	(.064)	(.138)	(.127)
β_2^{06}	.171 [†]	.096	.230*	.134*	.123	.196
	(.060)	(.082)	(.093)	(.066)	(.133)	(.124)
β_2^{07}	.224 [†]	.048	.142	.121	.197	.233
	(.059)	(.081)	(.094)	(.067)	(.135)	(.140)
β_2^{08}	.337 [†]	.130	.197*	.001	.066	.264*
	(.058)	(.082)	(.091)	(.066)	(.136)	(.132)
β_2^{09}	.171 [†]	.013	.184*	.020	.153	.080
	(.058)	(.078)	(.090)	(.068)	(.131)	(.125)
β_2^{10}	.233 [†]	-.071	.215*	.088	.251	.085
	(.057)	(.078)	(.086)	(.062)	(.142)	(.137)
β_2^{11}	.114*	-.003	.213 [†]	.094	.330 [†]	.242
	(.056)	(.076)	(.082)	(.060)	(.127)	(.126)
β_3^{05}	.288 [†]	.110	.383 [†]	.270 [†]	.353*	.235
	(.067)	(.091)	(.096)	(.065)	(.145)	(.129)
β_3^{06}	.279 [†]	.121	.303 [†]	.209 [†]	.103	.075
	(.061)	(.084)	(.095)	(.069)	(.137)	(.127)
β_3^{07}	.287 [†]	.052	.284 [†]	.182 [†]	.125	.238
	(.061)	(.083)	(.096)	(.070)	(.139)	(.151)
β_3^{08}	.442 [†]	.150	.358 [†]	.162*	.042	.323*
	(.060)	(.083)	(.094)	(.070)	(.137)	(.134)
β_3^{09}	.321 [†]	.034	.282 [†]	.107	.331*	.206
	(.060)	(.080)	(.092)	(.069)	(.134)	(.129)
β_3^{10}	.332 [†]	.041	.354 [†]	.113	.423 [†]	.198
	(.059)	(.079)	(.088)	(.064)	(.144)	(.141)

Notes: standard errors in parentheses; * significant at 5%;

† significant at 1%

Table A.16: Flexible YSG Model Parameter Estimates – Diploma Graduates (Continued)

	PPT Services		Fine Arts		Sciences & Agri	
	Male	Female	Male	Female	Male	Female
β_4^{05}	.323 [†]	.181	.525 [†]	.235 [†]	.263	.452 [†]
	(.069)	(.093)	(.099)	(.068)	(.150)	(.135)
β_4^{06}	.431 [†]	.237 [†]	.451 [†]	.320 [†]	.266	.242
	(.063)	(.087)	(.097)	(.073)	(.144)	(.133)
β_4^{07}	.397 [†]	.119	.422 [†]	.172*	.296*	.363*
	(.062)	(.085)	(.098)	(.072)	(.143)	(.152)
β_4^{08}	.533 [†]	.128	.445 [†]	.213 [†]	.190	.361 [†]
	(.061)	(.086)	(.097)	(.072)	(.141)	(.140)
β_4^{09}	.438 [†]	.098	.399 [†]	.206 [†]	.494 [†]	.278*
	(.061)	(.083)	(.096)	(.073)	(.140)	(.134)
β_5^{05}	.430 [†]	.220*	.562 [†]	.249 [†]	.218	.326*
	(.071)	(.096)	(.101)	(.071)	(.154)	(.140)
β_5^{06}	.500 [†]	.242 [†]	.515 [†]	.305 [†]	.191	.382 [†]
	(.064)	(.089)	(.099)	(.075)	(.146)	(.140)
β_5^{07}	.469 [†]	.076	.480 [†]	.195 [†]	.520 [†]	.377*
	(.064)	(.087)	(.100)	(.075)	(.148)	(.162)
β_5^{08}	.614 [†]	.210*	.525 [†]	.330 [†]	.293*	.414 [†]
	(.062)	(.088)	(.100)	(.075)	(.146)	(.146)
β_6^{05}	.484 [†]	.144	.651 [†]	.316 [†]	.452 [†]	.434 [†]
	(.072)	(.098)	(.104)	(.075)	(.156)	(.146)
β_6^{06}	.523 [†]	.214*	.655 [†]	.370 [†]	.238	.261
	(.066)	(.092)	(.102)	(.080)	(.152)	(.146)
β_6^{07}	.592 [†]	.089	.489 [†]	.349 [†]	.525 [†]	.550 [†]
	(.066)	(.090)	(.105)	(.078)	(.154)	(.176)
β_7^{05}	.587 [†]	.169	.683 [†]	.366 [†]	.559 [†]	.344*
	(.075)	(.101)	(.109)	(.079)	(.162)	(.151)
β_7^{06}	.580 [†]	.213*	.711 [†]	.484 [†]	.549 [†]	.354*
	(.068)	(.095)	(.106)	(.082)	(.161)	(.153)
β_8^{05}	.633 [†]	.101	.735 [†]	.449 [†]	.752 [†]	.359*
	(.077)	(.105)	(.112)	(.082)	(.169)	(.159)

Notes: standard errors in parentheses; * significant at 5%;

† significant at 1%

Table A.17: Baseline Model Parameter Estimates – Ontario Degree Graduates

	Social sciences		Business		Health		Engineering	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.401 [†]	10.270 [†]	10.379 [†]	10.412 [†]	10.469 [†]	10.763 [†]	10.649 [†]	10.692 [†]
	(.033)	(.020)	(.020)	(.020)	(.054)	(.019)	(.016)	(.030)
α_{06}	.007	.006	.083 [†]	.045*	.000	.012	.025	-.015
	(.031)	(.019)	(.018)	(.018)	(.055)	(.018)	(.015)	(.028)
α_{07}	-.055	-.082 [†]	.062 [†]	-.018	.041	.007	.002	-.049
	(.031)	(.019)	(.018)	(.018)	(.052)	(.018)	(.015)	(.027)
α_{08}	-.167 [†]	-.073 [†]	.073 [†]	-.005	.129*	.007	-.000	-.169 [†]
	(.033)	(.020)	(.019)	(.020)	(.053)	(.018)	(.016)	(.029)
α_{09}	-.188 [†]	-.130 [†]	-.028	-.080 [†]	-.067	-.045*	-.011	-.176 [†]
	(.034)	(.021)	(.020)	(.021)	(.056)	(.019)	(.017)	(.032)
α_{10}	-.207 [†]	-.198 [†]	-.060 [†]	-.031	-.205 [†]	-.116 [†]	-.028	-.195 [†]
	(.037)	(.022)	(.021)	(.023)	(.058)	(.021)	(.018)	(.036)
α_{11}	-.214 [†]	-.198 [†]	-.028	-.061*	-.199 [†]	-.131 [†]	.025	-.081*
	(.039)	(.025)	(.023)	(.025)	(.065)	(.023)	(.020)	(.040)
α_{12}	-.270 [†]	-.214 [†]	-.031	-.127 [†]	-.169*	-.189 [†]	.004	-.211 [†]
	(.049)	(.031)	(.029)	(.030)	(.075)	(.030)	(.027)	(.051)
β_2	.165 [†]	.170 [†]	.163 [†]	.131 [†]	.196 [†]	.121 [†]	.176 [†]	.141 [†]
	(.026)	(.016)	(.015)	(.017)	(.039)	(.015)	(.013)	(.025)
β_3	.287 [†]	.247 [†]	.282 [†]	.185 [†]	.289 [†]	.171 [†]	.271 [†]	.187 [†]
	(.031)	(.019)	(.018)	(.020)	(.047)	(.017)	(.015)	(.029)
β_4	.314 [†]	.307 [†]	.346 [†]	.222 [†]	.357 [†]	.185 [†]	.323 [†]	.204 [†]
	(.037)	(.022)	(.022)	(.023)	(.056)	(.020)	(.018)	(.033)
β_5	.387 [†]	.357 [†]	.413 [†]	.256 [†]	.404 [†]	.220 [†]	.401 [†]	.223 [†]
	(.044)	(.027)	(.026)	(.027)	(.067)	(.024)	(.021)	(.039)
β_6	.432 [†]	.339 [†]	.466 [†]	.263 [†]	.458 [†]	.246 [†]	.457 [†]	.238 [†]
	(.052)	(.032)	(.031)	(.032)	(.083)	(.029)	(.025)	(.046)
β_7	.487 [†]	.315 [†]	.518 [†]	.279 [†]	.575 [†]	.258 [†]	.506 [†]	.200 [†]
	(.063)	(.039)	(.038)	(.039)	(.107)	(.036)	(.030)	(.057)
β_8	.571 [†]	.389 [†]	.592 [†]	.306 [†]	.721 [†]	.304 [†]	.521 [†]	.194 [†]
	(.083)	(.049)	(.050)	(.050)	(.150)	(.048)	(.039)	(.072)
δ_M	.020	.087 [†]	.104 [†]	.117 [†]	.163 [†]	.190 [†]	.087 [†]	.052
	(.030)	(.018)	(.018)	(.019)	(.044)	(.017)	(.015)	(.029)
δ_T	.105 [†]	.211 [†]	.276 [†]	.246 [†]	.333 [†]	.265 [†]	.144 [†]	.079 [†]
	(.031)	(.019)	(.018)	(.019)	(.047)	(.017)	(.016)	(.029)
γ_M	.021	-.009	-.001	.004	-.014	-.029 [†]	-.007	.012
	(.011)	(.007)	(.007)	(.007)	(.018)	(.006)	(.005)	(.010)
γ_T	.021	-.018*	-.006	.008	-.032	-.037 [†]	.001	.022*
	(.012)	(.007)	(.007)	(.007)	(.019)	(.007)	(.006)	(.011)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.18: Baseline Model Parameter Estimates – Ontario Degree Graduates (Continued)

	Sciences & Agri		Humanities		Math & Comp Sci		Fine Arts	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.321 [†]	10.286 [†]	10.034 [†]	10.217 [†]	10.570 [†]	10.540 [†]	10.144 [†]	10.136 [†]
	(.049)	(.049)	(.076)	(.048)	(.022)	(.044)	(.049)	(.034)
α_{06}	.127 [†]	.020	.281 [†]	-.011	.010	-.014	.196 [†]	.088 [†]
	(.046)	(.045)	(.071)	(.048)	(.018)	(.038)	(.048)	(.031)
α_{07}	-.105*	-.042	.147*	-.051	-.007	-.101*	.147 [†]	-.007
	(.049)	(.048)	(.070)	(.044)	(.021)	(.040)	(.046)	(.032)
α_{08}	.019	-.040	.159*	-.149 [†]	-.082 [†]	-.150 [†]	-.000	-.064
	(.052)	(.049)	(.075)	(.046)	(.021)	(.041)	(.047)	(.033)
α_{09}	-.119*	.011	-.169*	-.117*	-.149 [†]	-.116*	-.112*	-.026
	(.052)	(.055)	(.083)	(.050)	(.025)	(.050)	(.049)	(.034)
α_{10}	-.172 [†]	-.028	.031	-.100	-.024	-.353 [†]	-.113*	-.110 [†]
	(.055)	(.055)	(.082)	(.055)	(.028)	(.055)	(.052)	(.037)
α_{11}	-.173 [†]	-.175 [†]	.127	-.061	-.056	-.151 [†]	-.170 [†]	-.075
	(.060)	(.059)	(.091)	(.061)	(.032)	(.055)	(.059)	(.042)
α_{12}	-.143	-.223 [†]	.099	-.095	-.030	-.320 [†]	-.240 [†]	-.034
	(.074)	(.069)	(.121)	(.075)	(.042)	(.072)	(.077)	(.050)
β_2	.223 [†]	.185 [†]	.212 [†]	.195 [†]	.169 [†]	.112 [†]	.113 [†]	.111 [†]
	(.040)	(.038)	(.058)	(.037)	(.020)	(.036)	(.039)	(.027)
β_3	.357 [†]	.246 [†]	.358 [†]	.285 [†]	.265 [†]	.213 [†]	.235 [†]	.183 [†]
	(.047)	(.046)	(.068)	(.044)	(.022)	(.043)	(.045)	(.032)
β_4	.476 [†]	.389 [†]	.438 [†]	.369 [†]	.332 [†]	.289 [†]	.256 [†]	.180 [†]
	(.056)	(.055)	(.081)	(.052)	(.025)	(.050)	(.053)	(.037)
β_5	.513 [†]	.391 [†]	.473 [†]	.396 [†]	.428 [†]	.238 [†]	.318 [†]	.247 [†]
	(.065)	(.065)	(.093)	(.062)	(.029)	(.058)	(.064)	(.044)
β_6	.540 [†]	.404 [†]	.531 [†]	.388 [†]	.486 [†]	.306 [†]	.387 [†]	.219 [†]
	(.075)	(.078)	(.111)	(.075)	(.033)	(.070)	(.076)	(.053)
β_7	.614 [†]	.447 [†]	.599 [†]	.415 [†]	.524 [†]	.268 [†]	.390 [†]	.231 [†]
	(.090)	(.096)	(.135)	(.097)	(.039)	(.086)	(.093)	(.064)
β_8	.669 [†]	.508 [†]	.593 [†]	.510 [†]	.568 [†]	.417 [†]	.474 [†]	.392 [†]
	(.123)	(.131)	(.183)	(.130)	(.050)	(.115)	(.120)	(.084)
δ_M	.154 [†]	.121 [†]	-.016	.061	.188 [†]	.292 [†]	-.061	-.071*
	(.044)	(.043)	(.066)	(.043)	(.022)	(.042)	(.045)	(.031)
δ_T	.199 [†]	.326 [†]	.148*	.152 [†]	.314 [†]	.464 [†]	-.109*	-.139 [†]
	(.049)	(.045)	(.069)	(.044)	(.024)	(.043)	(.045)	(.032)
γ_M	.002	-.004	.028	-.026	-.001	-.002	.002	.026*
	(.016)	(.016)	(.025)	(.017)	(.007)	(.015)	(.017)	(.011)
γ_T	-.007	-.015	-.007	.010	-.007	-.014	.012	.017
	(.019)	(.017)	(.025)	(.017)	(.008)	(.015)	(.017)	(.012)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.19: Baseline Model Parameter Estimates – Non-Ontario Degree Graduates

	Social sciences		Business		Health		Engineering	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.399 [†] (0.023)	10.294 [†] (0.017)	10.560 [†] (0.021)	10.520 [†] (0.020)	10.662 [†] (0.034)	10.888 [†] (0.013)	10.832 [†] (0.014)	10.642 [†] (0.034)
α_{06}	-.025 (.022)	.010 (.016)	.056 [†] (.019)	.032 (.018)	-.001 (.032)	.024* (.011)	.048 [†] (.013)	.120 [†] (.029)
α_{07}	-.027 (.022)	.049 [†] (.016)	.006 (.020)	-.007 (.018)	-.006 (.032)	.063 [†] (.012)	.035 [†] (.013)	.252 [†] (.032)
α_{08}	-.051* (.023)	.022 (.017)	-.052* (.020)	-.034 (.019)	.009 (.034)	.053 [†] (.013)	.062 [†] (.014)	.192 [†] (.033)
α_{09}	-.068 [†] (.025)	-.018 (.018)	-.086 [†] (.022)	-.073 [†] (.021)	.031 (.036)	.038 [†] (.013)	.046 [†] (.015)	.124 [†] (.036)
α_{10}	-.103 [†] (.028)	-.048* (.019)	-.055* (.024)	-.024 (.023)	-.027 (.040)	.001 (.015)	.105 [†] (.017)	.177 [†] (.038)
α_{11}	-.096 [†] (.030)	-.033 (.022)	-.116 [†] (.026)	-.083 [†] (.025)	-.048 (.045)	.012 (.017)	.153 [†] (.019)	.290 [†] (.043)
α_{12}	-.138 [†] (.038)	-.106 [†] (.027)	-.085 [†] (.033)	-.116 [†] (.034)	-.015 (.057)	.027 (.022)	.138 [†] (.024)	.335 [†] (.057)
β_2	.214 [†] (.019)	.136 [†] (.014)	.172 [†] (.017)	.134 [†] (.016)	.133 [†] (.028)	.019 (.011)	.177 [†] (.012)	.160 [†] (.028)
β_3	.335 [†] (.022)	.210 [†] (.016)	.298 [†] (.020)	.226 [†] (.019)	.218 [†] (.032)	.020 (.012)	.274 [†] (.014)	.242 [†] (.033)
β_4	.457 [†] (.026)	.274 [†] (.019)	.423 [†] (.023)	.280 [†] (.022)	.279 [†] (.037)	-.006 (.014)	.356 [†] (.016)	.292 [†] (.038)
β_5	.529 [†] (.030)	.287 [†] (.022)	.506 [†] (.027)	.286 [†] (.026)	.321 [†] (.044)	-.039* (.016)	.451 [†] (.018)	.275 [†] (.044)
β_6	.574 [†] (.035)	.265 [†] (.026)	.551 [†] (.032)	.273 [†] (.031)	.401 [†] (.051)	-.025 (.019)	.508 [†] (.022)	.343 [†] (.052)
β_7	.626 [†] (.043)	.288 [†] (.032)	.584 [†] (.039)	.282 [†] (.038)	.381 [†] (.063)	-.040 (.023)	.585 [†] (.026)	.358 [†] (.061)
β_8	.675 [†] (.056)	.335 [†] (.043)	.649 [†] (.052)	.265 [†] (.049)	.390 [†] (.083)	-.010 (.030)	.681 [†] (.034)	.317 [†] (.080)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%

Table A.20: Baseline Model Parameter Estimates – Non-Ontario Degree Graduates (Continued)

	Sciences & Agri		Humanities		Math & Comp Sci		Fine Arts	
	Male	Female	Male	Female	Male	Female	Male	Female
α	10.572 [†]	10.314 [†]	10.194 [†]	10.241 [†]	10.572 [†]	10.411 [†]	10.013 [†]	10.073 [†]
	(.032)	(.028)	(.040)	(.030)	(.033)	(.074)	(.073)	(.052)
α_{06}	.051	.047	.142 [†]	-.080 [†]	.067*	.062	-.063	.058
	(.032)	(.027)	(.038)	(.028)	(.028)	(.061)	(.076)	(.050)
α_{07}	-.040	.056*	-.126 [†]	-.013	.067*	.175*	-.022	-.014
	(.032)	(.028)	(.038)	(.029)	(.030)	(.069)	(.071)	(.050)
α_{08}	-.062	.032	-.064	-.061*	-.089*	-.040	-.060	-.101
	(.033)	(.029)	(.041)	(.031)	(.038)	(.071)	(.075)	(.053)
α_{09}	-.070	.047	-.014	-.119 [†]	-.109 [†]	.005	.034	-.117*
	(.036)	(.031)	(.045)	(.032)	(.039)	(.081)	(.079)	(.060)
α_{10}	-.046	.042	.060	-.075*	-.085	-.114	.056	-.066
	(.038)	(.033)	(.047)	(.034)	(.044)	(.106)	(.090)	(.064)
α_{11}	-.171 [†]	.069	-.092	-.080*	-.010	.055	.078	-.132*
	(.044)	(.037)	(.053)	(.039)	(.051)	(.102)	(.093)	(.065)
α_{12}	-.187 [†]	.091	-.035	-.112*	.012	.027	-.279*	-.069
	(.053)	(.048)	(.068)	(.051)	(.065)	(.153)	(.129)	(.088)
β_2	.215 [†]	.242 [†]	.218 [†]	.158 [†]	.150 [†]	.126	.082	.048
	(.027)	(.023)	(.033)	(.025)	(.031)	(.064)	(.060)	(.043)
β_3	.335 [†]	.312 [†]	.347 [†]	.232 [†]	.277 [†]	.136	.105	.135 [†]
	(.030)	(.027)	(.039)	(.029)	(.035)	(.074)	(.072)	(.051)
β_4	.389 [†]	.379 [†]	.390 [†]	.328 [†]	.319 [†]	.178*	.183*	.158 [†]
	(.035)	(.032)	(.045)	(.034)	(.039)	(.085)	(.084)	(.059)
β_5	.445 [†]	.384 [†]	.473 [†]	.292 [†]	.407 [†]	.294 [†]	.197*	.154*
	(.040)	(.037)	(.052)	(.040)	(.044)	(.100)	(.099)	(.068)
β_6	.518 [†]	.354 [†]	.602 [†]	.273 [†]	.456 [†]	.328 [†]	.209	.197*
	(.048)	(.043)	(.060)	(.047)	(.050)	(.119)	(.119)	(.081)
β_7	.531 [†]	.371 [†]	.641 [†]	.310 [†]	.553 [†]	.437 [†]	.334*	.190
	(.059)	(.053)	(.075)	(.057)	(.059)	(.138)	(.154)	(.099)
β_8	.539 [†]	.308 [†]	.712 [†]	.401 [†]	.567 [†]	.506 [†]	.398*	.165
	(.080)	(.072)	(.101)	(.076)	(.074)	(.177)	(.188)	(.136)
δ_M	.051	.072 [†]	-.039	.040	.104 [†]	.242 [†]	-.009	-.077
	(.029)	(.025)	(.036)	(.028)	(.034)	(.072)	(.069)	(.049)
δ_T	-.118 [†]	.065*	-.003	.061*	.136 [†]	.123	-.095	-.027
	(.039)	(.032)	(.042)	(.030)	(.038)	(.081)	(.075)	(.052)
γ_M	.016	-.007	.007	.019	.004	.009	.035	.025
	(.011)	(.009)	(.013)	(.010)	(.011)	(.025)	(.026)	(.019)
γ_T	.058 [†]	.019	.002	.037 [†]	.008	-.008	.051	-.037
	(.016)	(.012)	(.015)	(.011)	(.012)	(.027)	(.029)	(.019)

Notes: standard errors in parentheses; * significant at 5%; † significant at 1%