How Student Pathways Affect Labour Market Outcomes:
Evidence from Tax-Linked Administrative Data

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1. Introduction

Post-secondary education (PSE) plays an important role in developing the highly skilled workforce suitable for a modern knowledge-based economy. While direct entry from high school is the most familiar pathway to PSE for many students in Canada, a substantial proportion of students in fact take different paths. For example, Ferguson and Wang (2014) found from the class of 2009-10 of the National Graduate Survey (NGS) that direct entry students accounted for just about half of the Bachelor's degree graduates, and the corresponding figure for College graduates was 28 percent.[1]

Indirect paths are thought to help expand access to PSE for demographic groups that are underrepresented in the PSE system or adult learners retraining themselves for different career paths. Understanding how direct entry and non-direct entry students compare provides valuable policy input helping shape better access and quality of PSE system.

Understanding the link between particular PSE pathways and subsequent schooling and labour market outcomes is a complex challenge. Unlike years of schooling or highest educational attainment, PSE pathway is a multi-dimensional concept and there has been no established unified analytical framework. Pathways represent diverse schooling choices including transfers, multiple PSE credentials, delays to PSE attendance, modes of attendance, or returns to PSE.

In theory, pathways varying along any one of these dimensions are each different PSE experiences, and have potentially different implications for students' outcomes at PSE institutions or in the labour market. Moreover, it goes without saying that PSE pathways are not chosen randomly but by conscious decision making to a large degree. Thus, analysis requires understanding of student background and circumstances that lead to the choice.

In practice, however, analysis of PSE pathway is highly subject to data availability because rich data on students' schooling histories are hard to come by. As a result, depending on data sources, researchers choose some facet of PSE pathway, including transfers, multiple credentials, or delays to PSE entry.

Under these challenges, access to data on both educational histories and labour market outcomes of PSE students greatly enhances the possibility of this research area. An ideal dataset will include not only extensive background information and complete education history, but also post-graduation labour market outcomes. Examples of data sources meeting these data requirements include the Youth in Transition Survey (YITS), the National Graduate Survey (NGS), and the US National Longitudinal Study of Youth.

1 The figure for Bachelor graduates excludes graduates in Quebec.

Alternatively, access to both schooling and post-graduation labour market outcome can be gained by linking PSE institutions' administrative student data to earnings information available in Statistics Canada's tax data.

The Education Policy Research Initiative (EPRI), a national research organization based at the University of Ottawa, recently carried out a research project examining post-graduation outcomes of PSE graduates by constructing and analyzing a dataset linking 14 Canadian PSE institutions' administrative data with tax data held at Statistics Canada. One variable included in the administrative data classifies students by applicant type, such as direct entry from high school or transfer student. Using information on the application types to their PSE programs and post-graduation earnings, EPRI aimed to construct and compare the earnings profiles of students who followed different pathways.

At the same time, the present analysis does not overcome all of the analytical and practical challenges discussed earlier due to data quality issues surrounding the applicant type variable. Therefore, while the empirical analysis undertook here points to a promising avenue for enhancing research on PSE pathways, it is accompanied by discussions on future research.

This report is organized as follows. The next section discusses existing findings relating PSE pathways and post-graduation earnings outcomes. Section 3 discusses the analysis data and methodology, followed by Section 4 presenting findings. Section 5 Concludes. All figures and tables discussed in this report are given in the Annex at the end of the report.

2. Literature and Background

The existing research in PSE pathways is generally grouped into three categories:

- Student background or characteristics associated with given pathways;
- Experiences and outcomes associated with different pathways;
- Post-graduation outcomes associated with different pathways.

Kerr, McCloy, and Liu (2010) provide an extensive review of research related to these themes. Past research on non-direct entry students (transfer students in particular) mainly addresses the first two points, focusing on their PSE success and outcomes, and establishing the demographic properties of these students (Tomkowicz and Bushnik, 2003; Hango, 2011; Ferrer and Menendez, 2009). While the third point is the most relevant to this study, much less is written about it due to its data requirements.

Among findings to date, Dubois (2007) used the NGS to study the post-graduation earnings implications of having previous PSE credentials. She found that for college graduates, having previous credentials was associated with higher earnings than having no previous PSE experience at both two and five years after graduation. For university graduates, in contrast, her descriptive analysis found that only those with a previous university degree had higher earnings than those with no previous PSE experience. However, her regression analysis revealed other types of PSE credentials were also associated with higher earnings than no previous PSE experience at five years after graduation.

Dubois (2007) also carried out a regression analysis that compared post-graduation earnings following indirect PSE pathways and a direct pathway, defined as entry to PSE directly from high school that is full-time without interruption. The regression results for college graduates found that, while taking a break during PSE was associated with higher earnings at the 5 percent statistically significant level compared to the baseline direct PSE pathway at both two and five years since graduation, delaying PSE entry or studying part-time were not. In contrast, only part-time study was associated higher post-graduation earnings than the direct PSE pathway at the 5 percent statistically significant level for university graduates.

Wannell, Pereboom, and Lavllee (2000), using the NGS as well, examined how university graduates with a direct path, defined as those who studied full-time, graduated at age 25 or younger, and had no dependent children, compared to their indirect path counterpart in terms of post-graduation earnings. They found that though the direct-path group was more likely to study in technical fields such as engineering or sciences, they earned less than the indirect path group both two and five years after graduation. They also found that the pay difference between the direct and indirect group was narrower in technical fields than "softer" fields such as arts and humanities.

Using the 2005 graduating cohort of the NGS, Ferrer and Menendez (2009) developed and estimated an empirical model to estimate returns to delaying PSE while controlling for endogeneity of this choice. The estimation results revealed substantial gains from interrupting and later re-entering PSE compared to continually pursuing PSE. Specifically, these gains were estimated to be 18 and 30% at two years after graduation, and 8 and 5% at 5 years after graduation for college and university graduates, respectively.

Hango (2010) used the YITS to study annual earnings associated with different educational pathways at two points in time after graduation (i.e., 1-2 years and 5-6 years since leaving full-time schooling). In this study, she found that PSE graduates with no gap between high school and PSE had higher earnings than those with gaps at both points examined.

3. Data and Methodology

3.1 Analysis Data

This analysis builds on a unique dataset created by linking administrative student data from 14 Canadian PSE institutions to Statistics Canada's tax records from 2005 to 2013.

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] 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 2005 to 2013. The tax data represent 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.[3]

This analysis selects graduates from two Canadian colleges and three Ontario universities which provided a variable identifying students' application type and agreed to participate in this project. This analysis focuses on graduates from either degree or diploma programs that require education credentials no higher than a secondary school diploma as an entry requirement. In other words, first-professional degree, graduate degree, and post-graduate diploma programs are excluded.

In what follows, we discuss the key variables for the analysis in more detail.

Student Pathway Variable

A key step for this study is identification of each student's pathway into their PSE programs recorded in the data. This step largely depends on the applicant type variable in the dataset, which groups graduate observations into the following four categories:

- Direct entry from high school;
- Transfer from another PSE institution;
- After successful completion of different PSE programs;
- Mature student.

[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 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.

3 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 mean and median statistics. Furthermore, earnings figures must be rounded to the nearest $100.

Based on this variable, student are classified into the direct entry (DE) or the non-direct entry (non DE) group, with the first category in the applicant type variable comprising the DE group, and the remaining three categories making up the non DE group.[4]

In addition, the PSE administrative data provide a variable reporting students' graduation year, and the tax data make graduates' year of birth available. Using these two variables, we derive graduates' age at graduation.

Inspection of the distribution of age at graduation among the direct entry category reveals that a sizeable number of graduates finished their PSE programs in their thirties or older. This suggests that the DE group includes students who had gaps between their high school graduation and PSE entry as well as those who do not.

Gaps in schooling activities are an important aspect of student pathways, and therefore it is natural to distinguish this group of students from those without any gap. Unfortunately, the dataset lacks a variable that provides this piece of information precisely. Therefore, we utilize the age at graduation as a proxy. Specifically, graduates were divided into the two groups according to the following cutoff age: 23 for diploma graduates and 24 for degree graduates. An obvious limitation of this classification rule is that age at graduation is a less informative measure of the gap between schooling than age at PSE entry.

To summarize, the three types of PSE pathways we consider are described as:

- Younger DE group;
- Older DE group;
- Non DE group.

Earnings

In this study, earnings equal total before-tax earnings, created as the sum of 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 2014 dollars.

[4] The aggregation of non DE categories is necessary due to small sample size issues.

Other Variables

The dataset provides graduates' fields of study using the Classification of Instructional Program (CIP) code. Based on this variable, each graduate observation is classified into seven and eight fields of study (FOS) for diploma and degree graduates, respectively, with each group given a category name that reflects it. For diploma graduates, these groupings are Arts and Education;

- Business;
- Health;
- Engineering;
- Personal, Protective, and Transportation (PPT) Services;
- Fine Arts;
- Sciences.

For degree graduates, we use the groupings of

- Social Sciences;
- Business;
- Health;
- Engineering;
- Sciences;
- Humanities;
- Mathematics;
- Fine Arts.

For a detailed list of subfields in each field of study group, refer to Tables 1 to 4**.**

In addition, numeric values of graduates' cumulative GPA at graduation are available for degree graduates. However, the cumulative GPA values are reported under different grading scales depending on PSE institutions. To resolve these differences, grades are grouped into three groups, each corresponding to A, B, or C, based on each institution's conversion schemes between numeric and letter grades.[5]

The year-since-graduation (YSG) variable equals 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

[5] A very small fraction of graduates had graduating cumulative GPA corresponding to the letter grade of D and are combined into the C group.

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.

3.2 Analyses of Post-Graduation Earnings

The current analysis of post-graduation earnings consists of two parts. First, we will start with the descriptive analysis of mean earnings of graduates after they leave school. Earnings will be examined on a year-by-year basis following graduation. The differences in earnings based on pathways will be broken down by the following variables: i) graduation cohort, ii) the graduates' gender and iii) fields of study. The results from the descriptive analysis are intended to provide overall pictures of i) how the earnings of graduates with different pathways evolve over time, and iii) whether, and to what degree, these earnings profiles differ across cohort, field of study, and gender.

Second, regression analysis provides an alternative means of descriptive analysis to uncover earnings differences among graduates experiencing different PSE pathways more concisely. The modelling framework in general is expressed by the following regression equation:

$$Earnings = f(Graduating\ Cohort, YSG, Pathyway\ Type, X) + \varepsilon$$

where the dependent variable is annual earnings in a given year since graduation. The regression model relates the dependent variable to a set of explanatory variables that account for an individual's graduating cohort, years since graduation, and pathway type as well as other characteristics. *X* on the right-hand side of the equation represents a set of student characteristics often included in earnings regressions in the literature, such as gender or field of study. The last term on the right-hand side of the regression model, ε, is an error term capturing a part of the dependent variable unexplained by the explanatory variables.

The regression is formulated as a linear regression model that includes a set of dummy variables indicating graduates' cohorts and years since graduation. Furthermore, to capture differences in earnings across different PSE pathway, the model includes two dummy variables indicating whether a graduate belongs to the older and non DE groups, respectively.[6] In addition, terms interacting these dummies with years since graduation are included in the model.

We consider three regression model specifications that differ in terms of student characteristics included in X. The first model, called Model 1, includes only a constant term in X. Model 2 also

[6] Thus, the younger DE group forms a base group.

includes a set of dummy variables indicating graduates' field of study and gender.[7] Moreover, each of these dummy variables is interacted with years since graduation to allow for different earnings growth patterns among fields of study and between genders. Model 3 augments Model 2 by adding a set of dummies indicating graduating grades and their interactions with years since graduation[8].

The objective of this study is to understand the relationship between PSE pathway and earnings. To this end, the coefficients on the pathway type dummy variables capture difference in initial post-graduation earnings. Moreover, the interaction term between these dummy variables and years since graduation captures changes in the relationship between these two variables over years.

We employ the least square method to estimate the regression coefficients. While this estimation method is widely used, least square estimates should not be interpreted as the causal effects of the explanatory variables on the dependent variable 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 provided biased estimates of the causal effects of the explanatory variables on the earnings.

3.3 Comparison of Pre and Post Graduation Earnings

Since the dataset contains tax records from 2005 to 2013, it also allows us to track earnings of graduates before graduation. As a result, for latter graduating cohorts, some earnings records correspond to those earned by graduates before starting their PSE programs. Taking advantage of this data availability, we compare mean earnings profiles before and after PSE programs to see how earning outcomes change across intervening PSE spells.

In practice, however, the dataset does not provide information on which year each graduate entered the PSE programs, forcing us to rely on a proxy for PSE starting dates. To this end, we apply a simple cut-off rule that assumes that it takes four and three years to finish degree and diploma programs, respectively. Under this assumption, the last time each degree graduate in the dataset worked a full year is five years before they graduated. Likewise, the last time each diploma graduate in the dataset worked a full year is assumed to be four years before they graduated. Therefore, we have one year of pre-PSE earnings records for degree graduates in the 2010 cohort and two years of pre-PSE earnings record for diploma graduates in the 2010 cohorts.

[7] The base group among fields of study is Social Sciences for degree graduates, and Arts & Education for diploma graduates. As for gender, male graduates form the base group.

[8] Graduates with the graduating cumulative GPA of B are used as the base group.

For this part of the analysis, we further divide the non DE group into two groups using their median age at graduation as the cut-off point, thus creating younger and older non DE groups. The cut-off values are 25 for diploma graduates, and 26 for degree graduates.

It is fair to suppose that the older groups had established labour market experience ,and therefore the change in earnings of these students around their PSE experiences could be interpreted in a "value added" perspective.

4. Results

4.1 Post-Graduation Earnings

Diploma Graduates

Student Characteristics

The upper panel of Table 5 reports the distributions of the applicant type variable by graduating cohort. Unfortunately, the table suggests that there are data quality issues related to this variable. Specifically, the unknown applicant type category accounted for a disproportionately high proportion of diploma graduate observations among earlier graduating cohorts. For example, the applicant type was unknown for almost all graduates in the 2005 cohort, and 84% of the graduates in the 2006 cohort had the unknown applicant type. In contrast, this figure was more or less stable from the 2008 graduate cohort and on. This suggests that the coding of this variable was not consistent until at least the 2008 cohort.

Moreover, Table 5 shows that there were no diploma graduates classified as transfer students, and a large fraction of graduates with an unknown application type, which likely reflects the difficulty in identifying transfer students based on administrative data at institutions. It might be natural to suppose that transfer students were grouped into the unknown category. However, without extra information establishing that graduates in the unknown category are transfer students, we chose to exclude observations in this category.

Table 6 presents the basic characteristics of diploma graduates by pathway type group in the dataset. Male graduates accounted for nearly 60% of the younger DE group, while female graduates accounted for a similar proportion of the non DE group. The older DE group was more evenly split between male and female graduates, with female graduates having a majority with 52%.

As for the distribution of field of study, Engineering accounted for the largest proportion among the younger DE group, with almost half the group having graduated from this field. Engineering was also the top field among the older DE group, accounting for 41% of the group, and graduates from Business and Health accounted for sizeable proportions as well (17% and 23%, respectively). Among the non DE group, Health accounted for the largest proportion (26%), while Arts & Education, Business, and Engineering each accounted for approximately 20% for the group.

Descriptive Results of Mean Earnings

Figures 1 to 8 report descriptive results for diploma graduates.[9] Recall that the distribution of the applicant type variable underlying the pathway type was unreliable before the 2008 cohort. Therefore we leave out those earlier cohorts from the ensuing discussions.

First, Figure 1 presents the mean earnings profiles by pathway type for all diploma graduates. This figure shows that the older DE group had the highest first-year earnings in any graduating cohort, with their earnings levels ranging from $35,000 to $40,000. In contrast, the younger DE group typically started with a lower earnings level than the older DE group. However, this group experienced higher post-graduation earnings growth than their older counterpart. The non DE group had a similar first year earnings level as the older DE group among the 2008 cohort, but among the other cohorts, they started with lower earnings levels.

Second, Figures 2 and 3 present the mean earnings profiles broken down by gender. As shown in Figure 2, female graduates had similar earnings profiles regardless of their pathway types. In contrast, male graduates exhibited a clearer spread in mean earnings differences among the three pathway types than female graduates. The older DE group in any graduating cohort had higher earnings than the non DE group in all five years since graduation, with the differences staying at roughly the same size over time. The younger DE group also started with lower mean first-year earnings than the older DE group. However, the former group's earnings appeared to catch up with the latter's with faster earnings growth.

Third, Figures 4 to 8 present the mean earnings profiles for selected fields of study.[10] Overall, these figures do not indicate clear systematic patterns in mean earnings differences among the three pathway types. However, it is important to note that quite a few mean earnings figures had to be suppressed due to small sample size issues, making a thorough analysis difficult.

Regression Results

Table 15 presents the regression model estimates for diploma graduates, and Figure 9 graphs earnings differences among the three pathway groups implied by the coefficient estimates. The estimated constant term in Model 1 suggest that the younger DE group has $30,800 first-year earnings on average. According to the coefficient estimate on the dummy variable for the older DE group, the first-year earnings for the older DE group is higher than the younger DE group by $4,900. The estimated coefficient on the interaction term between this dummy variable and year since graduation implies that this difference in annual earnings narrows by $1,600 each year

[9] The same set of results is available in a table format in Tables 7 to 14.

[10] In order to comply with the Statistics Canada's disclosure rules regarding confidential data, results for only the five largest fields of study among diploma graduates are released for this report.

afterward, resulting in the younger DE group's earnings surpassing the older DE group's earnings at 4 years since graduation.

Based on the parameter estimates from Model 2, accounting for gender and field of study does not change the qualitative patterns of the earnings gap between these two groups. The initial earnings gap is estimated at approximately $5,500 and the gap in annual earnings is estimated to decrease by approximately $1,500 each year afterward.

The estimates for Model 1 indicate that the non DE group earns $1,100 less than the younger DE group in the first year since graduation. This gap is estimated to widen by $2,510 each year, amounting to a significant earnings gap several years after graduation.

A different picture of the earnings gap profile emerges between these two groups once their gender and field of study is controlled for. In Model 2, the non DE group earns on average $2,030 more than the younger DE group initially. The difference is estimated to narrow by $960 each year afterward, and the younger DE group is predicted to surpass the non DE group three years after graduation. Overall, the earnings gap between these two groups is quantitatively insignificant over the first five years after graduation, unlike the one implied by Model 1.

Despite the earnings differences implied by the estimated regression model, it is important to note that these earnings differences across different pathway types become quantitatively insignificant as time goes on. More specifically, the coefficient estimate on the dummy variable corresponding to 5 years after graduation indicates that there is $26,300 growth in earnings from the first to fifth years after graduation. This increase in earnings dwarfs changes in the earnings gaps among different pathway types.

Moreover, the earnings gap among different pathway types are relatively minor compared to those among different fields of study. For example, the coefficient estimates on the dummy variable for Engineering and its interaction term with YSG reveal a far more quantitatively significant earnings difference between Engineering and Arts & Education. Specifically, the regression results estimate a $14,100 first year mean earnings difference between these two fields, and the difference will increase by $4,300 each year afterward.

Degree Graduates

Student Characteristics

The lower panel of Table 5 reports the distributions of the applicant type variable by graduating cohort, and it raises data quality issues surrounding this variable. To be more specific, there was a large upswing in the proportion of the category "Direct entry from high school" from the 2005 to 2007 cohorts, increasing from 40% to over 60%. Correspondingly, there was a large decline in the proportion of the unknown applicant category from the 2005 to 2007 cohorts. Furthermore, there was a noticeable jump in the proportion of "Transfer Student" from the 2005 and 2008 graduating cohorts, going from less than 1% to slightly over 3%. These observations suggest that the coding of this variable was not consistent until at least the 2008 cohort.

Moreover, Table 5 shows that unexpectedly small proportions of degree graduates in the data were transfer or mature students. This likely reflects the difficulty in identifying transfer students based on administrative data at institutions.

Table 16 presents the basic characteristics of degree graduates by pathway type in the dataset. It shows that the younger DE and non DE groups had similar gender composition, with female graduates accounting for 56% and 58% of the groups, respectively. In contrast, male graduates accounted for 60% of the older DE group.

As for the distribution of field of study, Social Sciences accounted for the largest proportion among the younger DE group, with nearly a quarter of the group having graduated from this field. Engineering, Business, and Health also accounted for sizeable proportions of the younger DE group at 18%, 17%, and 14%, respectively. Engineering was the top field among the older DE group, accounting for 25%, while Social Sciences and Business accounted for sizeable proportions as well (17% and 23%, respectively). Among the non DE group, Social Sciences accounted for the largest proportion with 36%, and Humanities was the second largest field at 14%. The remaining fields other than Fine Arts each accounted for approximately 10% of the group.

Based on the graduating cumulative GPA, the non DE group had the highest academic achievement of the three pathway type groups, with 39% of the group having graduated with A. 60% of the younger DE group graduated with B, while 24% of them graduated with A. In contrast, the older DE group had 31% of their graduates graduating with C, almost twice the figures for the younger and non DE groups.

Mean Earnings

Figures 10 to 18 report descriptive results for degree graduates.[11] As is the case with diploma graduates, the distribution of the applicant type variable was unreliable before the 2008 cohort. Therefore we focus on results for graduates in the 2008 cohort and later.

Figure 10 presents the mean earnings profiles by pathway type for all degree graduates. Within each graduating cohort, the three pathway type groups had first-year earnings levels in the low- to mid-$40,000. The observed earnings gaps between these groups were at most $3,600 and much lower than this value in many cases. Generally, the three groups experienced similar

[11] The same set of results is available in a table format in Tables 17 to 25.

earnings growth.[12] The figure shows no consistent ordering for earnings level among the three groups that holds across different graduating cohorts.

Figures 11 and 12 present the mean earnings profiles broken down by gender. Both female and male graduates had similar earnings profiles among the three pathway groups except for the male 2008 cohort. Within this cohort, the non DE group experienced much higher earnings growth than the other two groups, resulting in earnings gaps around $24,000. However, this could be an artifact of the small sample size of the non DE group.

Figures 13 to 18 present the mean earnings profiles for six selected fields of study.[13] These figures do not indicate clear systematic patterns in mean earnings differences among the three pathway types. However, as quite a few mean earnings figures had to be suppressed due to small sample size issues, any findings from these figures may not be reliable.

Regression Results

Table 26 presents the regression model estimates for degree graduates, and Figure 19 graphs earnings differences among the three pathway groups implied by the coefficient estimates. The estimates for Model 1 indicate that the older DE group has higher first-year earnings than the younger DE group by $1,320 on average. This earnings gap is estimated to narrow by $230 each year afterward. Therefore, five years after graduation the earnings gap between these two groups is predicted to almost disappear.

Once graduates' fields of study and gender are accounted for by Model 2, the older DE group has a lower first year earnings level than the younger DE group by $620, though this difference is statistically insignificant. The earnings gap is estimated to widen by $780 each year.

Model 3 controls for graduating grades as well as gender and field of study. The parameter estimates from this model indicate that the older DE group has a higher first-year earnings level than the younger DE group by $670 but the difference is statistically insignificant. However, the younger DE group's mean earnings are estimated to surpass those of the older DE group, as it grows by a larger margin (by $870) each year. Overall, the estimated profile of earnings gap is similar to the one from Model 2.

The estimation results for Model 1 indicates that the non DE group's first year earnings is not statistically different from those of the younger DE group, with the former exceeding the latter

[12] Noticeable gaps in earnings level are observed at five years after graduation between the non DE group and the other two groups in the 2008 graduating cohort, $8,300 and $10,400, respectively. However, this could be due to outlier observations in the non DE group as the sample size of this group is modest.

[13] In order to comply with the Statistics Canada's disclosure rules regarding confidential data, results for only the six largest fields of study among degree graduates were released for this report.

by $130. The difference is expected to grow by $920 each year. Once gender and field of study is controlled for, the earnings gap is estimated to start at a substantially higher level ($2,380), but widen at a slower margin ($730) each year afterward.

However, Model 3, which also accounts for graduating grades, estimates a more moderate earnings gap profile between the non and younger DE groups, which starts at $1,140 and widens by $460 each year.

Importantly, these earnings differences across different pathway types become quantitatively insignificant when they are compared with actual post-graduation earnings levels over years after graduation. For example, Model 1 estimates the post-graduation earnings of the younger DE group to grow by $22,430 from the first to fifth years after graduation.

Moreover, earnings gap among different pathway types are relatively minor compared to those among different fields of study. For example, the estimated Model 2 indicates that Business graduates earn $14,100 more than Social Sciences graduates in the first year after graduation, with this gap widening by $1,200 each year afterward.

4.2 Comparison of Pre- and Post-Graduation Earnings

Diploma Graduates

Figure 20 presents the mean earnings profiles surrounding graduates' times in PSE for the 2010, 2011, and 2012 cohorts of diploma graduates. Since these three cohorts exhibited similar earnings profile patterns in this figure, we pool them together and produce mean earnings profiles for the combined group. Figure 21 shows the result.

The older non DE group had the highest pre-PSE earnings, which stayed slightly below $30,000, followed by the older DE group with a gradually increasing mean earnings profile around $20,000. The pre-PSE earnings for the remaining groups were mostly below $10,000.

The younger and older DE groups as well as the younger non DE group had either increasing or flat pre-PSE program earnings profiles. Interestingly, the mean earning of the older non DE group declined during the two year period before starting their PSE program.

The three pathway groups other than the older non DE group experienced substantial jumps in earnings upon graduation, with the most notable case of an approximately $29,000 increase for the younger DE groups. In contrast, for the older non DE group, an increase in earnings upon graduation was much more modest at $4,300. However, this increase followed the decline in mean earnings before starting the spells of PSE, and was followed by a positive earnings growth, thus having important implications for earnings dynamics surrounding PSE. Moreover, the increase in earnings from a year before the PSE spell reached close to $12,000 at three years after graduation, a substantial change amounting to an increase of nearly 42%.

Degree Graduates

Figure 22 presents the mean earnings profiles surrounding graduates' times in PSE for the 2010, 2011, and 2012 graduating cohorts of degree graduates, while Figure 23 shows the mean earnings profile among a student group pooling these three cohorts.

As shown in the figure, while both younger and older DE groups as well as the younger non DE group had similar pre-PSE earnings profiles hovering mostly below $10,000, the older non DE group had much higher pre-PSE earnings around $30,000. This is expected as the older non DE group is likely comprised of those who had made a full transition to the labour market. The increase in labour market earnings is therefore more modest for this group at approximately $13,000, as opposed to around $30,000 or higher for the rest of pathway type groups. Nevertheless the increase is quantitatively substantial as it translates into an earnings increase of nearly 40%.

While all four groups experienced at least mild earnings growth before starting their observed spells of PSE, the post-graduation profiles featured faster growth.

5. Discussion and Concluding Remarks

This project examines how different pathways through PSE are related to labour market outcomes by using information available from institutions on the basis upon which students were admitted to their programs and then linking this information to labour market outcomes obtained from the linked tax files previously constructed by EPRI.

We compared the earnings outcomes of direct entry students with those of students from other application type categories. The direct entry graduates were further divided into two groups based on their age at graduation to partially account for differences in their previous schooling and labour market histories.

While we found differences in first-year earnings and subsequent earnings growth across different pathways, these differences were quantitatively insignificant compared to those found with respect to other graduate characteristics, especially field of study. Moreover, these earnings differences became quantitatively less significant relative to actual earnings levels as earnings generally grew at a robust pace after graduation.

In addition, we took advantage of the unique features of the dataset that allowed us to observed graduates' earnings even before graduation, and compared *pre-schooling earnings* to *post-schooling earnings* across four groups formed by direct-entry status and age at graduation. This comparison produced arguably the most interesting findings as to earnings differences among graduates from different pathways, together with the earnings dynamics of the older non-direct entry graduates.

Notably, while the younger groups had relatively low pre-schooling earnings, as would be expected, the older groups generally had established labour market experience and therefore the change in earnings of these students around their PSE experiences could be interpreted in a

"value added" perspective. Most interestingly, those older students generally demonstrated substantial increases in earnings in their post-schooling years relative to their pre-schooling years: i.e., significant value added from their PSE experiences.

Any comparison of pre-post earnings profiles of PSE graduates who had established pre-PSE labour market profiles could in a similar way be used to answer a range of questions. For example, it would be interesting from a policy perspective to look at the change in earnings (and other related outcomes such as the use of income support programs such as EI and SA as well as employment programs) of those PSE graduates who gain their PSE experiences through sponsored government program such as those offered through EI or SA.

However, it is important to highlight data quality issues underlying these findings. First, the non-direct entry group consisted of heterogeneous groups, thus the earnings comparisons between this group and the direct-entry group mask potentially important earnings differences within this group. Since the applicant type variable had difficulty identifying the application types of all the graduates in the data, we could not examine potential heterogeneities among non-direct entry graduates.

Similarly, the applicant type variable had a large proportion of unknown values in the data. Importantly, if missing values occur non-randomly and are related to student characteristics including their mode of PSE entry, the results may be significantly biased.

Thus, while this project may have demonstrated fruitful approaches by which PSE-tax linked data can be used to examine how PSE pathways are related to both pre- and post-schooling outcomes, more thorough analysis requires higher-quality data on PSE pathways.

Indeed, it would be ideal to have full PSIS-type data for an entire jurisdiction so that specific pathways can be identified by the researcher by tracking students as they move through the entire PSE system. This will include identifying each student in each year at the PSE institution they are attending, then defining a finite set of trajectories through PSE from the almost infinite set of possibilities that such rich – but complex – data could identify, and then linking these to labour market outcomes.

In this way we could learn, for example, how students who start in a program and then switch to another program at another institution without graduating perform in comparison to those who go straight through a single program. Similarly, comparison could be made involving those who first finish a first program and then enter another program perform in comparison with others (perhaps with a break in-between, perhaps not). All such movements could take account of movements across PSE sectors (i.e., college and university).

Therefore, even though pathways through PSE have a highly diverse facets, they could be captured and analyzed in a manageable framework, with a focus on those which are most common and/or are of greatest interest. Such work would be complex and take a serious investment of resources since tracking students through all their PSE experiences is not easily done – while then connecting students who take different pathways through PSE to their labour market outcomes as captured in tax data would add a whole other element requiring different

kinds of expertise. But such work is possible, and the benefits of such a program of research could be substantial.

6. References

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7. Annex

Table 1: 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	Accounting and Computer Science
	52	Business, Management, Marketing and Related Support Services

Table 2: 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
	48	Precision Production
Fine Arts	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
Personal, Protective & Transportation Services	12	Personal and Culinary Services
	28	Military Science, Leadership and Operational Art
	29	Military Technologies and Applied Sciences
	43	Security and Protective Services
	49	Transportation and Materials Moving
Science & Agriculture	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

Table 3: 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
	48	Precision Production
Fine Arts	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 4: 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 5: Distribution of Applicant Type Variable by Graduating Cohort

Diploma Graduates

Graduating Cohort	Direct Entry from HS (%)	Transfer Student (%)	Mature Student* (%)	Unknown (%)
2005	x	x	x	99.4
2006	13.7	0.0	2.1	84.2
2007	29.0	0.0	6.2	64.8
2008	49.3	0.0	21.8	28.8
2009	50.1	0.0	25.2	24.7
2010	49.2	0.0	28.8	22.0
2011	45.9	0.0	31.3	22.7
2012	42.7	0.0	30.2	27.1

Degree Graduates

Graduating Cohort	Direct Entry from HS (%)	Transfer Student (%)	Mature Student* (%)	Unknown (%)
2005	39.4	0.8	0.9	59.0
2006	57.7	1.3	0.7	40.3
2007	63.5	1.9	0.9	33.7
2008	62.9	3.1	1.1	32.8
2009	60.8	3.3	0.9	35.0
2010	60.0	3.2	1.2	35.6
2011	59.0	3.5	1.2	36.3
2012	60.0	3.1	1.2	35.7

* Includes the applicant type “After successful completion of another PSE program”.
x These figures cannot be reported due to the confidentiality rules of Statistics Canada.

Table 6: Distribution of Student Characteristics, Diploma Graduates

	Pathway Type		
Group	Younger DE	Older DE	Non DE
Gender (%)			
Female	41.2	52.3	58.9
Male	58.8	47.7	41.1
All	100.0	100.0	100.0
Field of Study (%)			
Arts & Education	10.3	4.9	19.5
Business	11.5	16.6	18.5
Health	11.9	23.1	26.1
Engineering	49.4	40.6	20.2
PPT Services	11.7	9.5	8.5
Fine Arts	3.6	1.8	4.2
Sciences	1.6	3.4	3.1
All	100.0	100.0	100.0

Figure 1: Mean Earnings of Diploma Graduates by Pathway Type

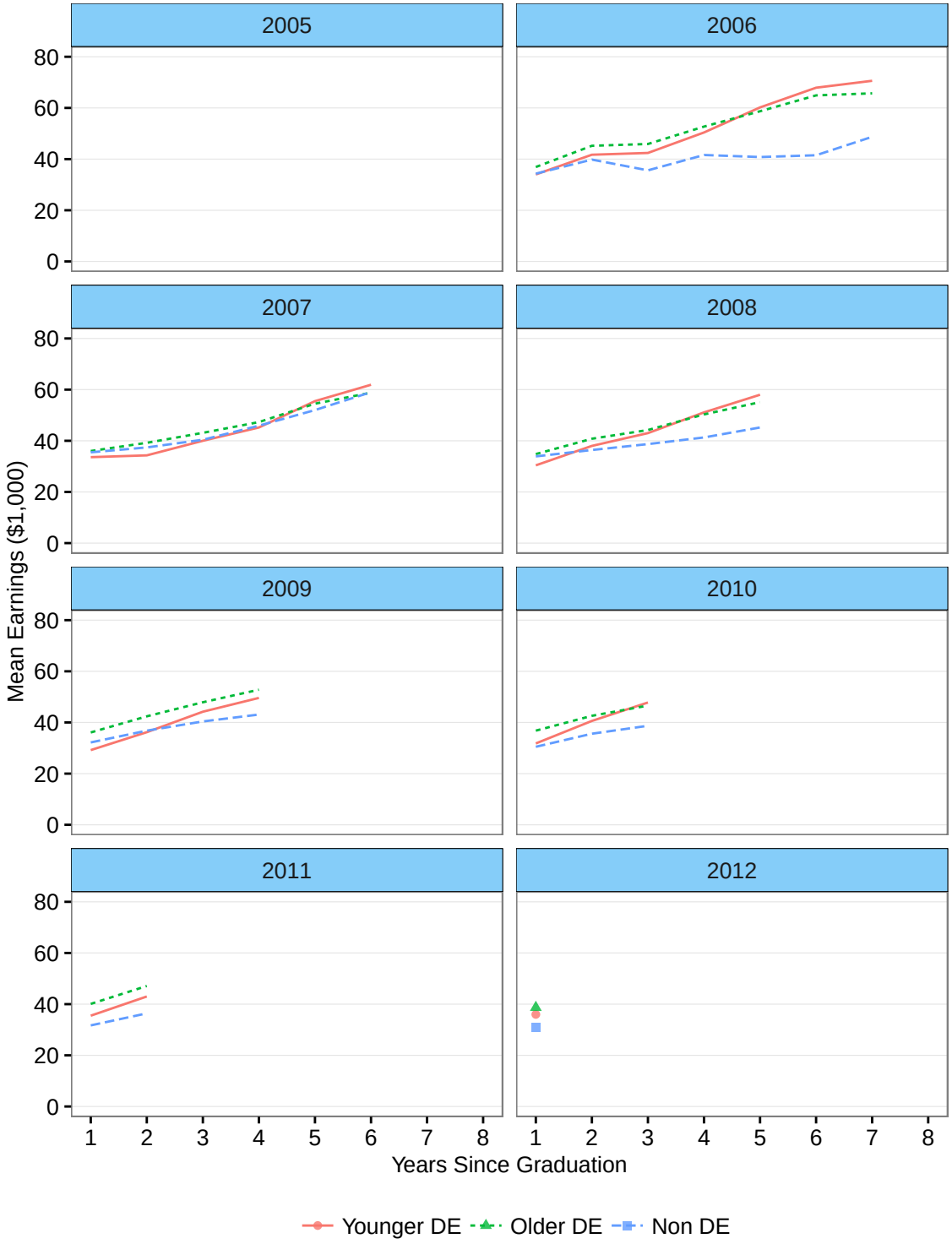

Figure 2: Mean Earnings of Diploma Graduates by Pathway Type, Female

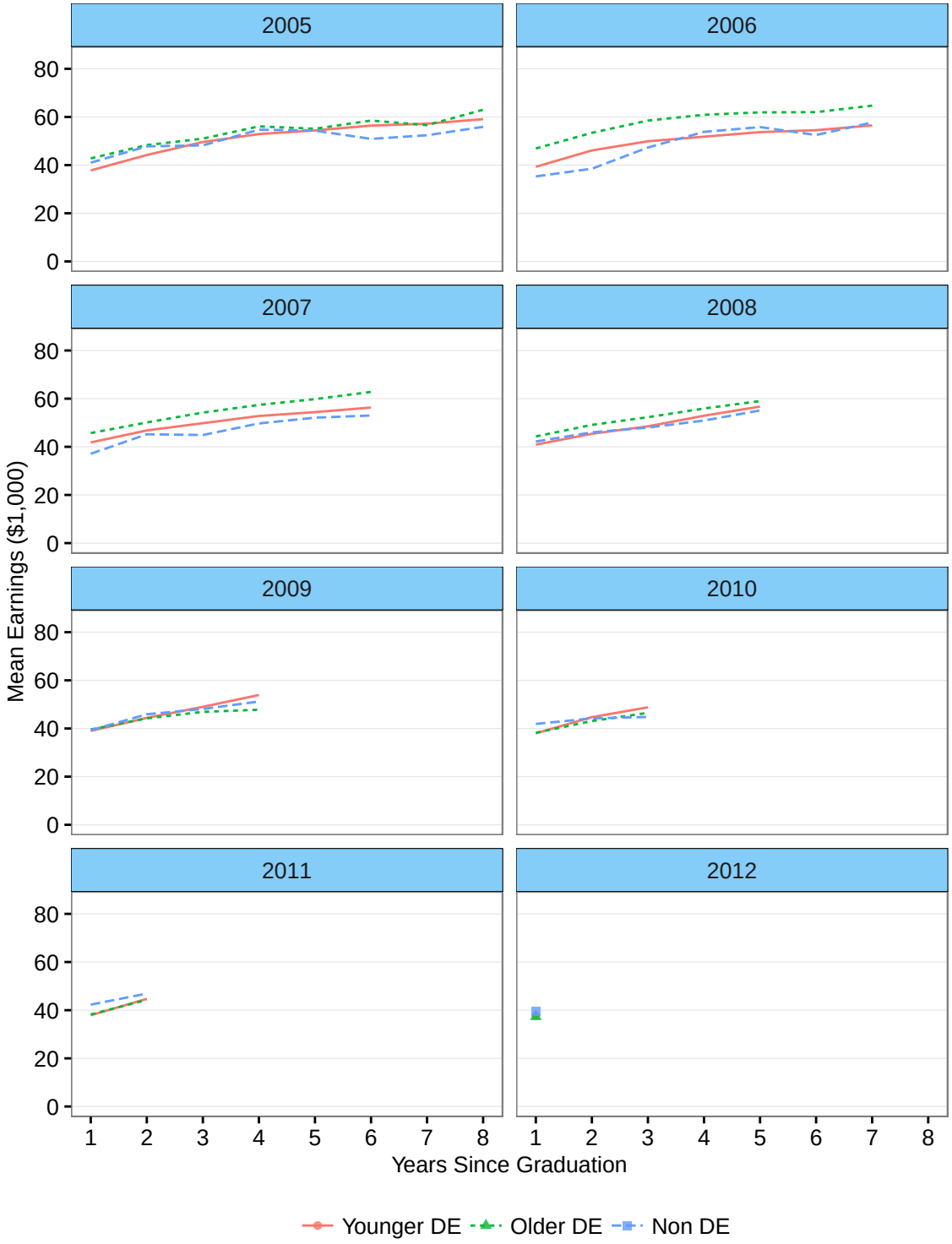

Figure 3: Mean Earnings of Diploma Graduates by Pathway Type, Male

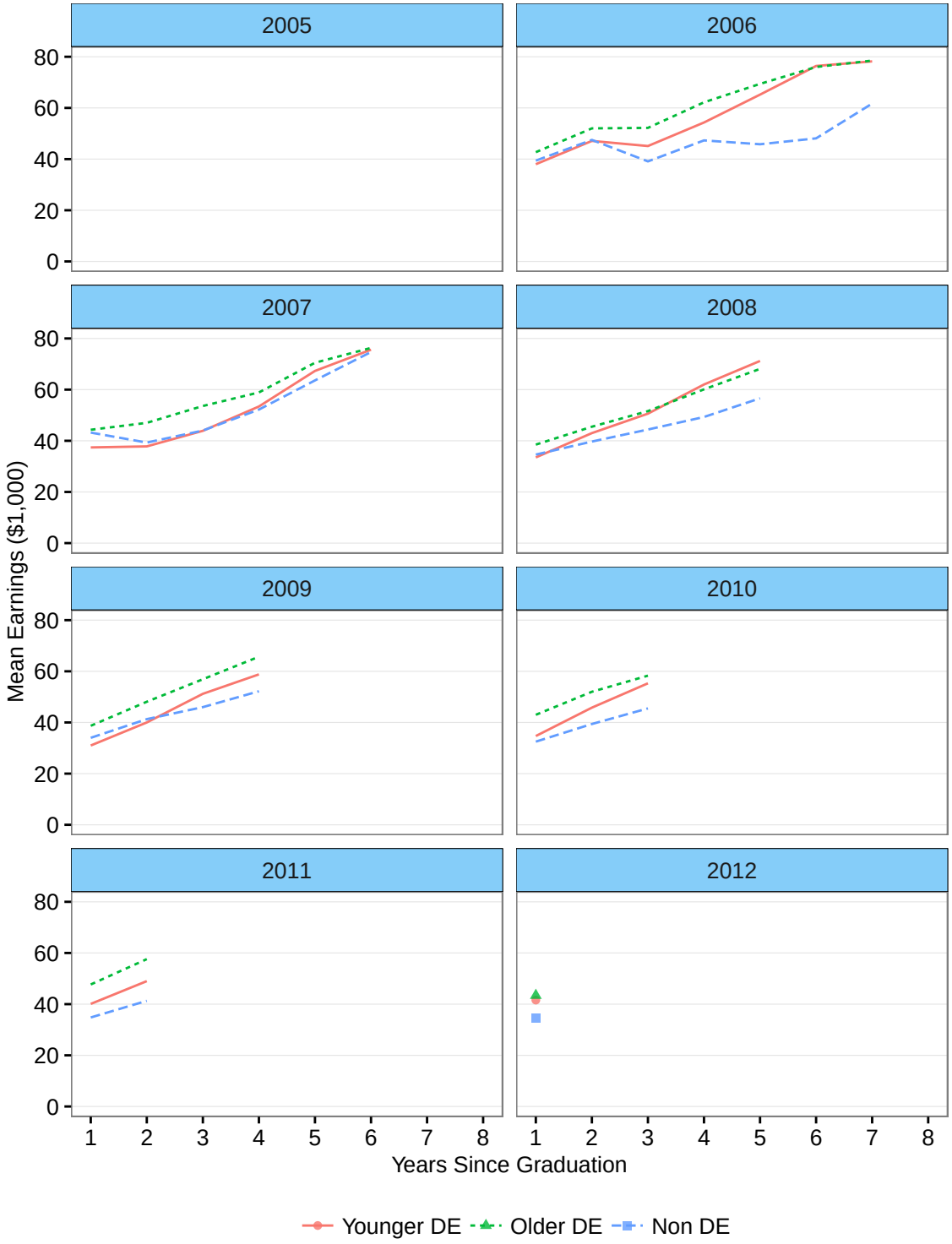

Figure 4: Mean Earnings of Diploma Graduates by Pathway Type, Arts & Education

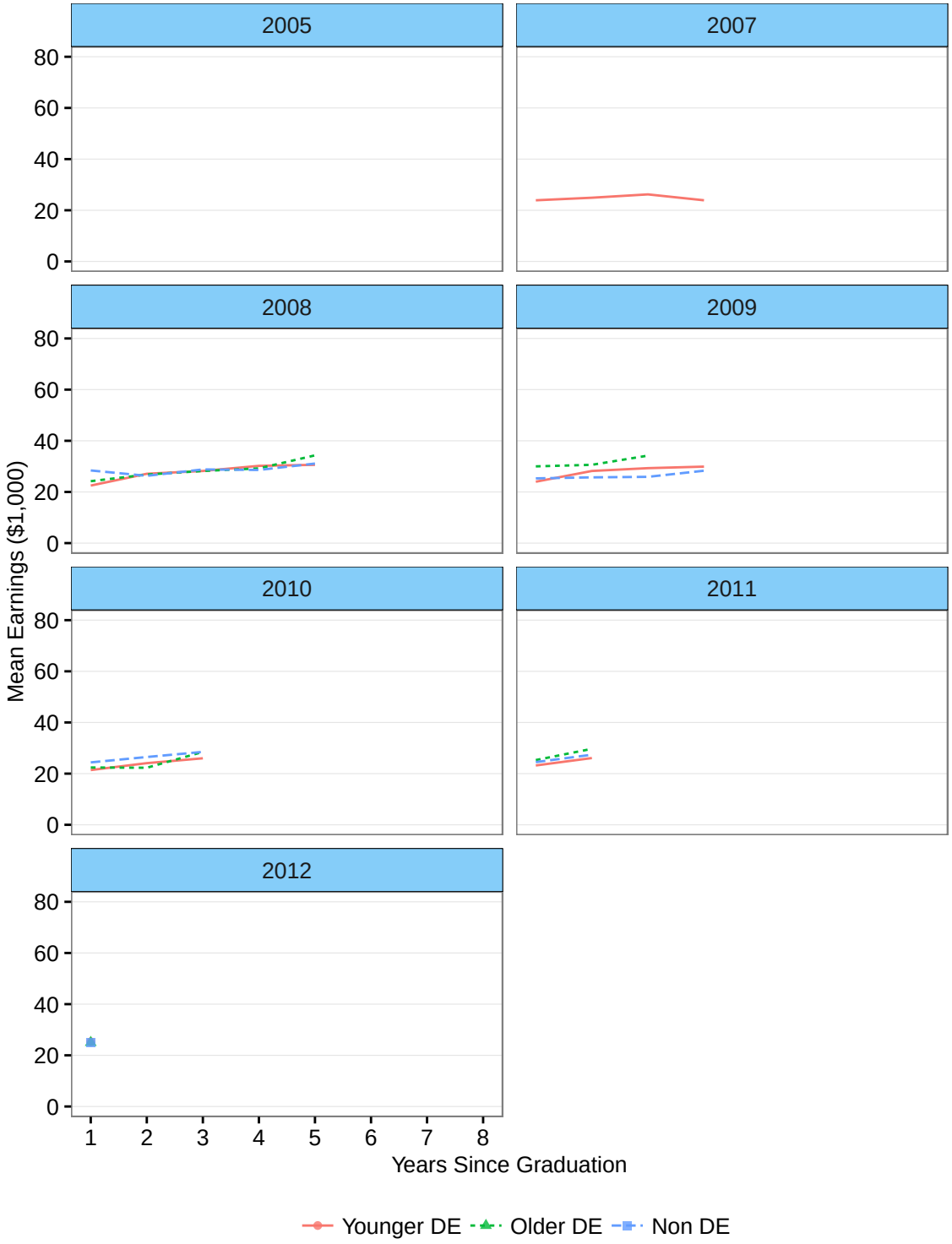

Figure 5: Mean Earnings of Diploma Graduates by Pathway Type, Business

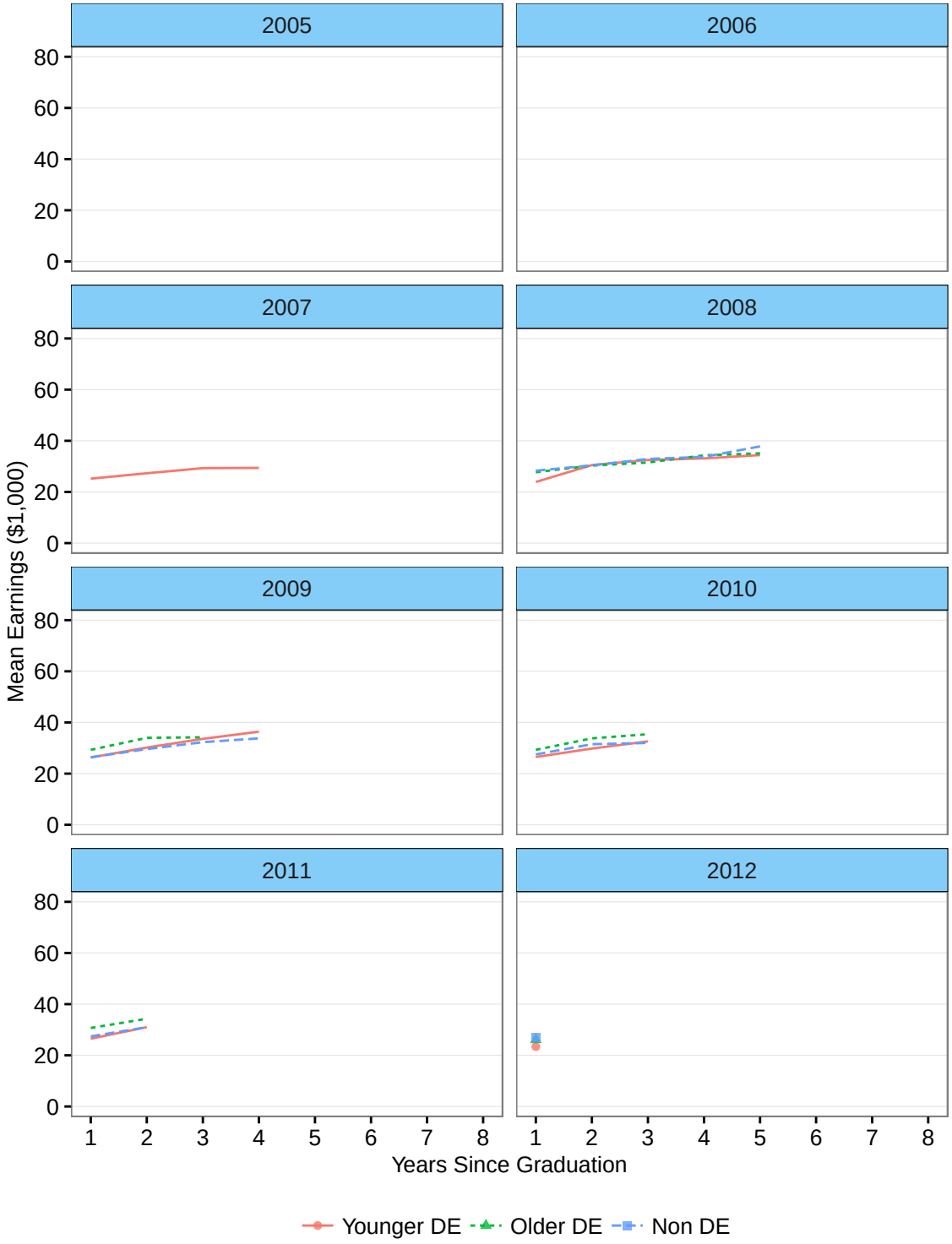

Figure 6: Mean Earnings of Diploma Graduates by Pathway Type, Health

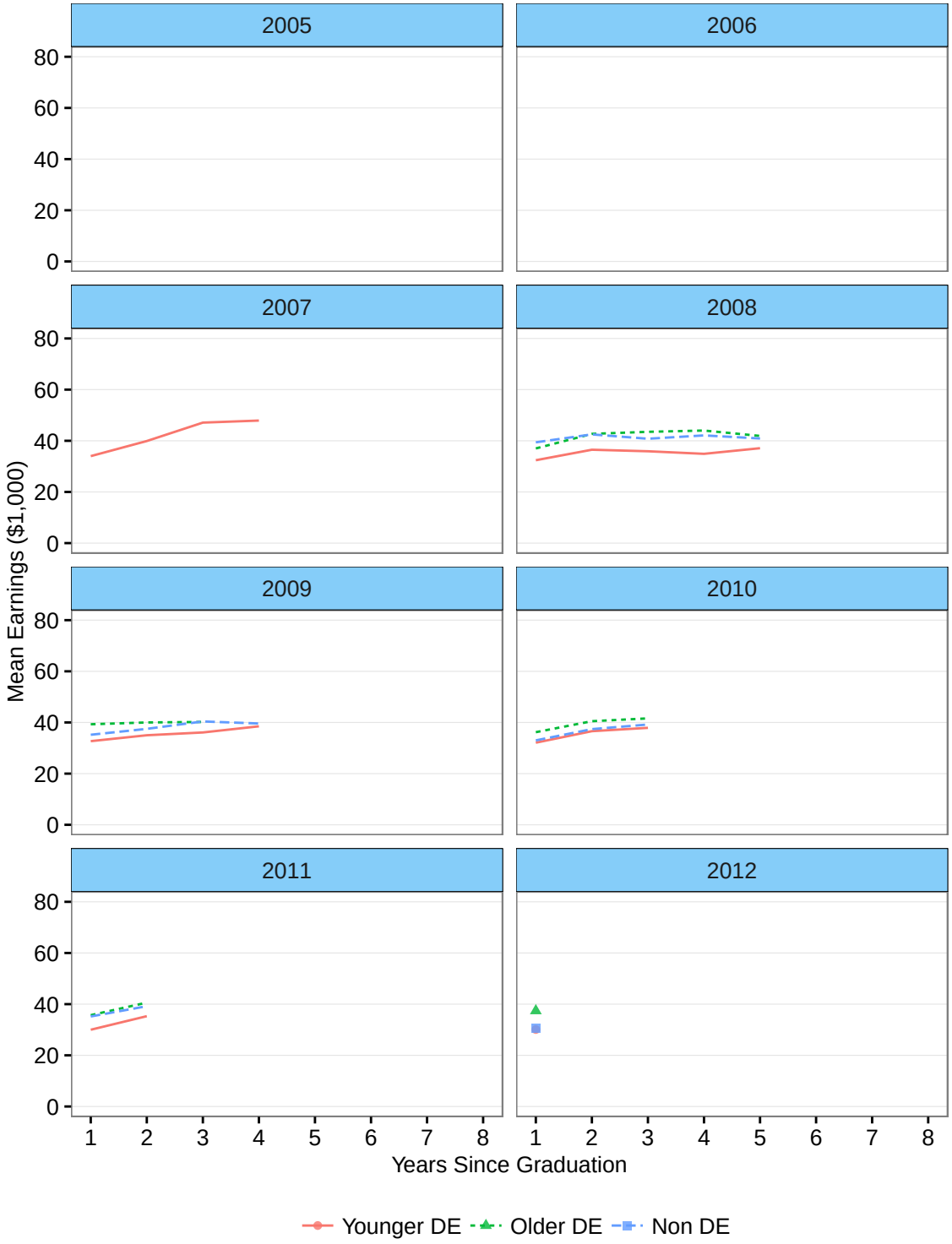

Figure 7: Mean Earnings of Diploma Graduates by Pathway Type, Engineering

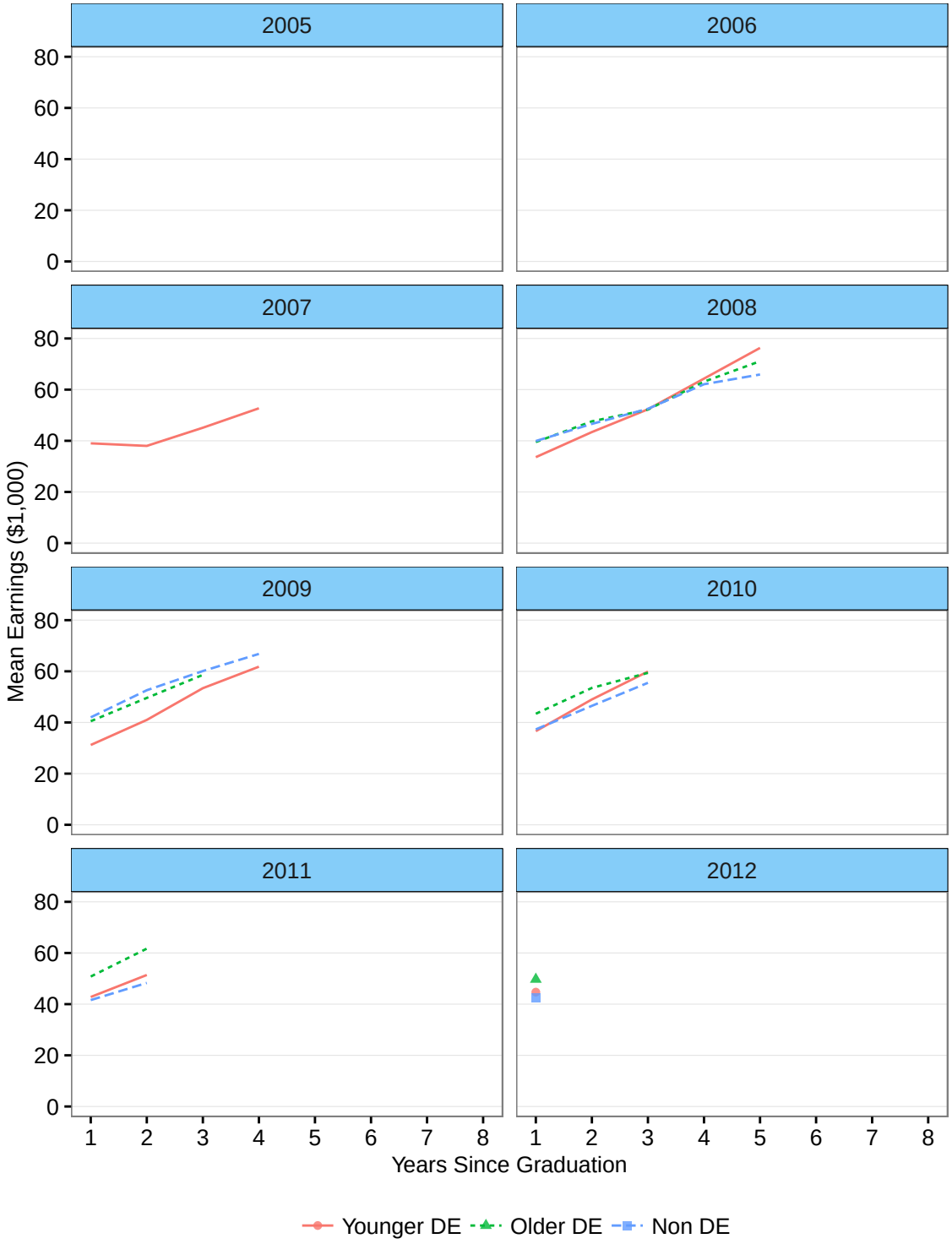

Figure 8: Mean Earnings of Diploma Graduates by Pathway Type, PPT Services

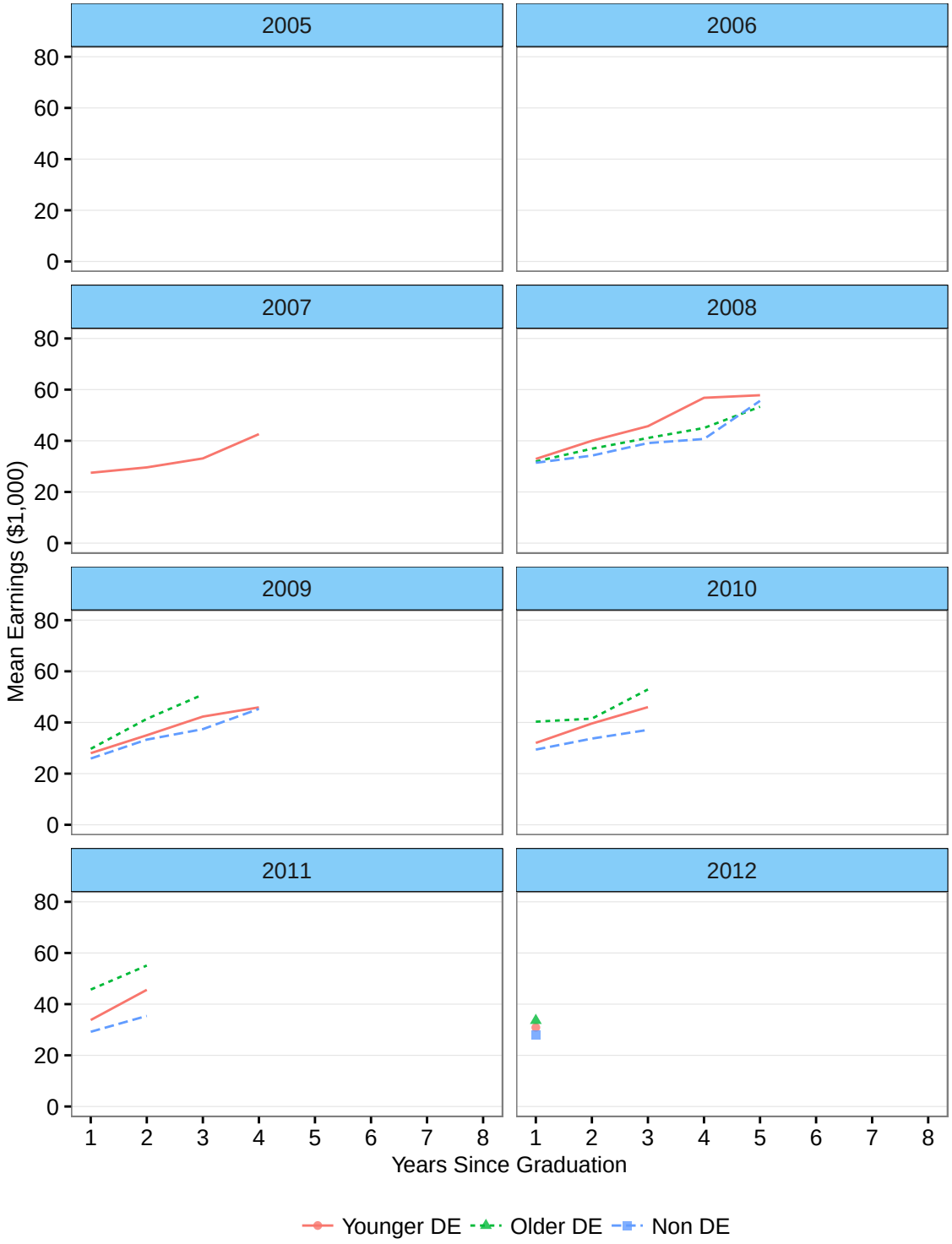

Table 7: Mean Earnings of Diploma Graduates by Pathway Type

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	34.0	41.7	42.4	50.4	60.2	67.9	70.6	
	2007	33.6	34.3	40.0	45.2	55.5	61.9		
	2008	30.4	38.0	43.0	51.1	58.0			
	2009	29.2	36.2	44.2	49.6				
	2010	31.8	40.6	47.8					
	2011	35.5	43.0						
	2012	36.0							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	36.9	45.2	45.9	52.7	58.7	64.9	65.7	
	2007	36.0	39.2	43.1	47.3	54.5	58.8		
	2008	34.8	40.8	44.2	50.3	55.1			
	2009	36.1	42.4	47.9	52.8				
	2010	36.8	42.6	46.6					
	2011	40.1	47.1						
	2012	38.7							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	34.3	39.8	35.6	41.6	40.8	41.5	48.7	
	2007	35.5	37.4	40.4	45.9	52.0	59.0		
	2008	33.9	36.4	38.7	41.3	45.2			
	2009	32.2	36.8	40.4	43.1				
	2010	30.5	35.6	38.7					
	2011	31.7	36.4						
	2012	30.9							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 8: Mean Earnings of Diploma Graduates by Pathway Type, Female

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	21.1	25.9	33.3	38.0	43.5	38.2	41.8	
	2007	27.0	28.1	32.5	29.7	31.6	33.6		
	2008	26.4	31.4	32.9	35.3	38.1			
	2009	26.5	30.5	34.0	36.4				
	2010	27.8	32.8	36.1					
	2011	28.8	33.9						
	2012	27.5							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	24.4	28.8	32.1	31.1	33.5	36.7	36.2	
	2007	26.9	30.5	31.2	34.2	36.7	38.0		
	2008	31.1	35.8	36.3	40.0	40.5			
	2009	33.1	36.0	37.6	37.4				
	2010	32.0	35.2	37.7					
	2011	33.8	38.3						
	2012	34.7							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	25.4	28.9	31.0	33.5	33.8	33.3	31.9	
	2007	30.0	36.1	38.0	41.4	43.0	45.1		
	2008	33.4	34.1	35.0	36.1	37.3			
	2009	30.9	33.4	36.2	36.6				
	2010	29.3	33.2	34.4					
	2011	29.4	32.8						
	2012	28.1							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 9: Mean Earnings of Diploma Graduates by Pathway Type, Male

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	38.0	47.1	45.1	54.3	65.2	76.4	78.2	
	2007	37.4	37.8	43.9	53.4	67.3	75.6		
	2008	33.5	43.0	50.6	62.0	71.2			
	2009	31.0	40.0	51.2	58.8				
	2010	34.7	45.8	55.3					
	2011	40.1	49.0						
	2012	41.6							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	42.7	52.0	52.2	62.2	69.4	76.0	78.5	
	2007	44.3	47.0	53.6	58.9	70.5	76.3		
	2008	38.5	45.5	51.6	60.1	68.1			
	2009	38.7	48.1	56.9	65.7				
	2010	43.0	52.0	58.3					
	2011	47.7	57.6						
	2012	43.4							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	39.4	47.5	39.1	47.3	45.8	48.1	61.7	
	2007	43.2	39.3	44.0	52.2	63.6	74.7		
	2008	34.6	39.7	44.4	49.3	56.6			
	2009	34.0	41.3	46.0	52.2				
	2010	32.5	39.4	45.5					
	2011	34.8	41.3						
	2012	34.6							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 10: Mean Earnings of Diploma Graduates by Pathway Type, Arts & Education

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	23.9	24.9	26.2	23.9	x	x		
	2008	22.5	27.1	28.2	30.2	30.6			
	2009	24.0	28.2	29.3	29.9				
	2010	21.4	24.1	26.0					
	2011	23.2	26.1						
	2012	25.3							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	24.2	26.8	28.2	29.2	34.3			
	2009	30.0	30.6	34.2	x				
	2010	22.4	22.3	28.5					
	2011	25.3	29.7						
	2012	25.0							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	28.4	26.3	28.8	28.6	31.1			
	2009	25.3	25.7	25.9	28.3				
	2010	24.4	26.5	28.5					
	2011	24.5	27.4						
	2012	25.0							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 11: Mean Earnings of Diploma Graduates by Pathway Type, Business

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	25.2	27.3	29.3	29.4	x	x		
	2008	23.9	30.5	32.5	33.1	34.4			
	2009	26.3	30.2	33.6	36.4				
	2010	26.5	29.8	32.6					
	2011	26.5	31.0						
	2012	23.4							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	27.7	30.3	31.5	34.3	35.1			
	2009	29.3	34.0	34.2	x				
	2010	29.3	33.8	35.4					
	2011	30.7	34.3						
	2012	26.1							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	28.3	30.4	32.9	33.7	37.8			
	2009	26.4	29.6	32.3	33.8				
	2010	27.5	31.5	32.0					
	2011	27.4	31.0						
	2012	27.1							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 12: Mean Earnings of Diploma Graduates by Pathway Type, Health

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	34.0	39.9	47.1	47.9	x	x		
	2008	32.4	36.5	35.9	34.9	37.1			
	2009	32.7	35.0	36.1	38.5				
	2010	32.1	36.6	37.9					
	2011	30.0	35.3						
	2012	30.1							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	37.0	42.7	43.5	44.0	41.9			
	2009	39.3	40.0	40.2	x				
	2010	36.2	40.5	41.6					
	2011	35.7	40.6						
	2012	37.4							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	39.4	42.5	40.8	42.1	40.9			
	2009	35.2	37.5	40.4	39.6				
	2010	33.0	37.4	39.2					
	2011	35.2	39.2						
	2012	30.7							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 13: Mean Earnings of Diploma Graduates by Pathway Type, Engineering

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	39.0	38.0	45.1	52.7	x	x		
	2008	33.6	43.4	52.3	64.3	76.3			
	2009	31.2	41.0	53.4	61.8				
	2010	36.6	49.0	59.9					
	2011	42.8	51.4						
	2012	44.7							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	39.5	47.6	52.2	63.1	71.1			
	2009	40.5	49.6	58.6	x				
	2010	43.4	53.5	59.4					
	2011	50.8	61.7						
	2012	49.7							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	39.9	46.6	52.5	62.1	65.9			
	2009	42.0	52.6	60.1	66.8				
	2010	37.3	46.5	55.5					
	2011	41.6	48.3						
	2012	42.4							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 14: Mean Earnings of Diploma Graduates by Pathway Type, PPT Services

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	27.5	29.6	33.1	42.6	x	x		
	2008	32.9	40.0	45.7	56.8	57.8			
	2009	28.0	35.0	42.3	45.9				
	2010	32.0	39.6	46.0					
	2011	33.8	45.6						
	2012	30.9							
Older DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	31.9	36.9	41.1	45.0	53.3			
	2009	29.7	41.4	50.9	x				
	2010	40.3	41.5	52.9					
	2011	45.7	55.1						
	2012	33.6							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	31.4	34.2	39.1	40.7	55.6			
	2009	25.9	33.3	37.4	45.3				
	2010	29.4	33.7	37.1					
	2011	29.2	35.4						
	2012	27.9							

Note: Earnings figures are in thousand 2014 dollars.
x These figures cannot be reported to comply with the confidentiality rules of Statistics Canada.

Table 15: Regression Coefficient Estimates, Diploma Graduates

	Estimates		Std. error	
	Model 1	Model 2	Model 1	Model 2
Old DE	4.91**	5.48**	0.53	0.51
Old DE × YSG	−1.59**	−1.46**	0.31	0.30
Non DE	−1.11*	2.03**	0.50	0.49
Non DE × YSG	−2.51**	−0.96**	0.31	0.30
2009 Cohort	0.53	0.10	0.44	0.41
2010 Cohort	1.33**	1.61**	0.47	0.44
2011 Cohort	3.69**	3.86**	0.52	0.49
2012 Cohort	3.14**	3.30**	0.68	0.64
YSG = 2	7.48**	6.02**	0.43	0.61
YSG = 3	13.60**	10.66**	0.57	1.05
YSG = 4	19.79**	15.27**	0.75	1.54
YSG = 5	26.28**	20.01**	1.02	2.05
Business		2.32**		0.78
Health		9.83**		0.74
Engineering		14.06**		0.80
PPT Services		6.28**		0.93
Fine Arts		−1.49		1.27
Sciences		1.72		1.39
Business × YSG		0.62		0.47
Health × YSG		0.41		0.46
Engineering × YSG		4.31**		0.49
PPT Services × YSG		2.42**		0.56
Fine Arts × YSG		−0.26		0.78
Sciences × YSG		0.12		0.88
Female		−2.35**		0.53
Female × YSG		−2.36**		0.33
Constant	30.77**	22.54**	0.49	0.88

** Significant at 1% level. * Significant at 5 % level.

Figure 9: Implied Earnings Gaps, Diploma Graduates

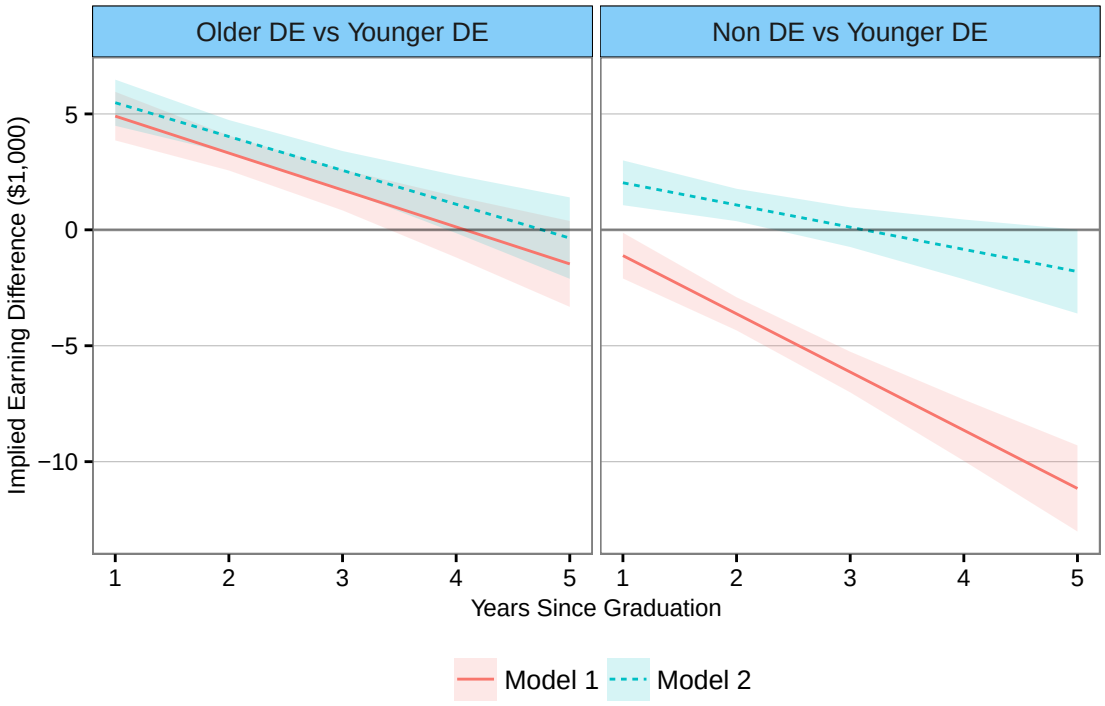

Table 16: Distribution of Student Characteristics, Degree Graduates

	Pathway Type		
Group	Younger DE	Older DE	Non DE
Gender (%)			
Female	56.4	39.7	57.7
Male	43.6	60.3	42.3
All	100.0	100.0	100.0
Field of Study (%)			
Social Sciences	23.7	17.9	36.2
Business	16.7	18.8	9.9
Health	13.9	8.9	9.2
Engineering	18.3	24.6	9.2
Sciences	7.6	8.6	10.6
Humanities	6.6	7.2	13.5
Mathematics	6.3	10.9	9.9
Fine Arts	6.9	3.2	1.4
All	100.0	100.0	100.0
Graduating Grades (%)			
A	24.2	16.4	38.7
B	60.2	52.7	45.1
C	15.6	30.8	16.2
All	100.0	100.0	100.0

Figure 10: Mean Earnings of Degree Graduates by Pathway Type

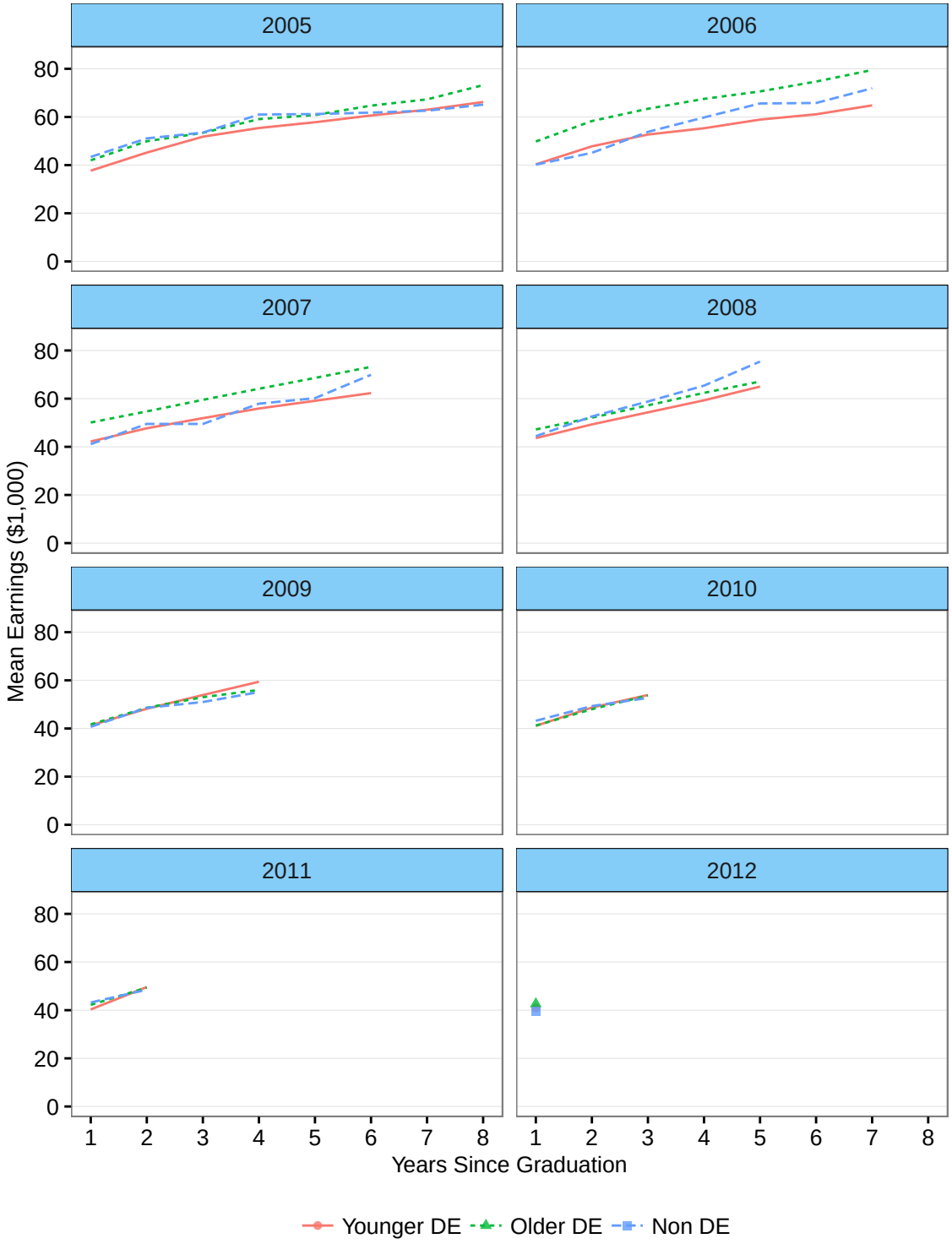

Figure 11: Mean Earnings of Degree Graduates by Pathway Type, Female

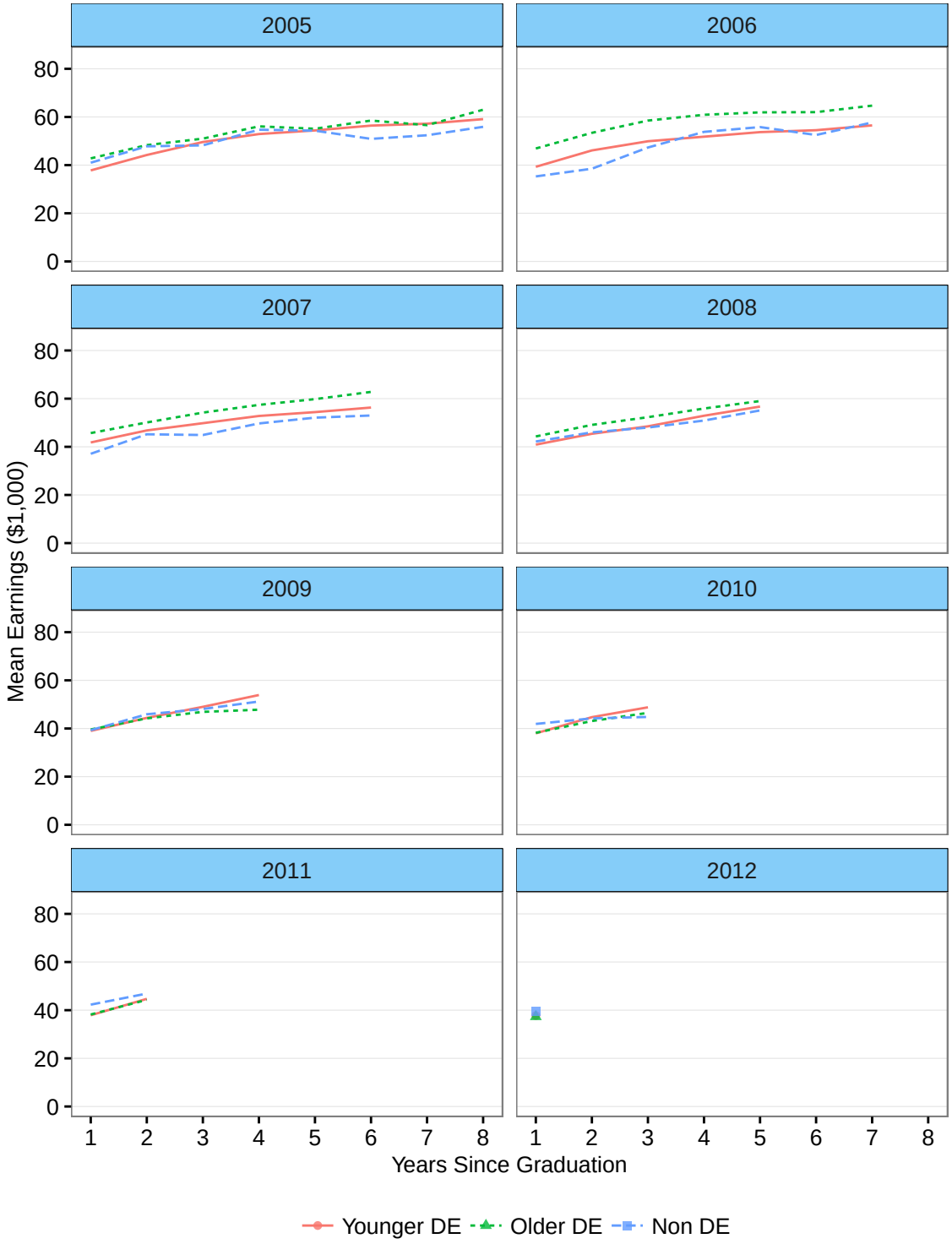

Figure 12: Mean Earnings of Degree Graduates by Pathway Type, Male

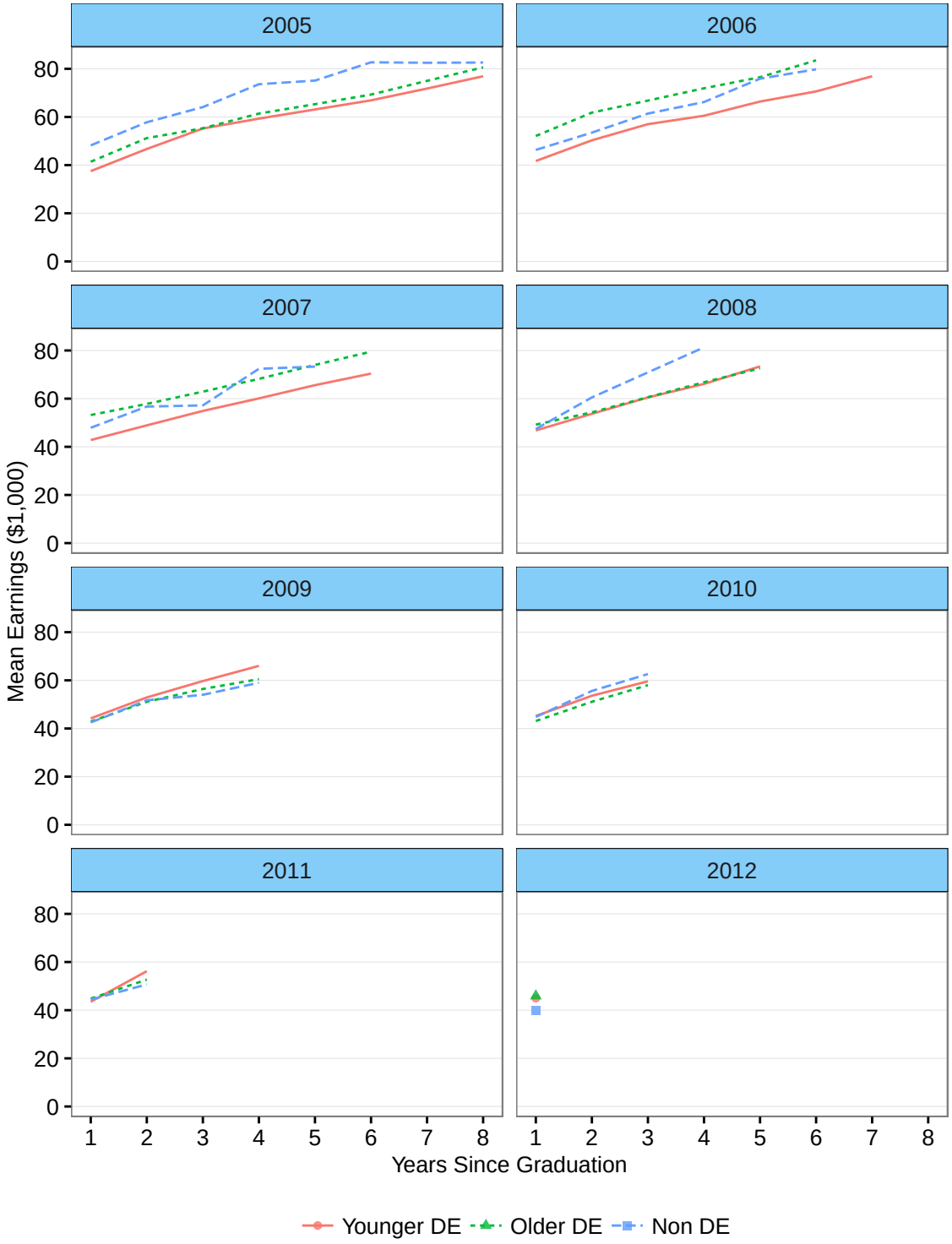

Figure 13: Mean Earnings of Degree Graduates by Pathway Type, Social Sciences

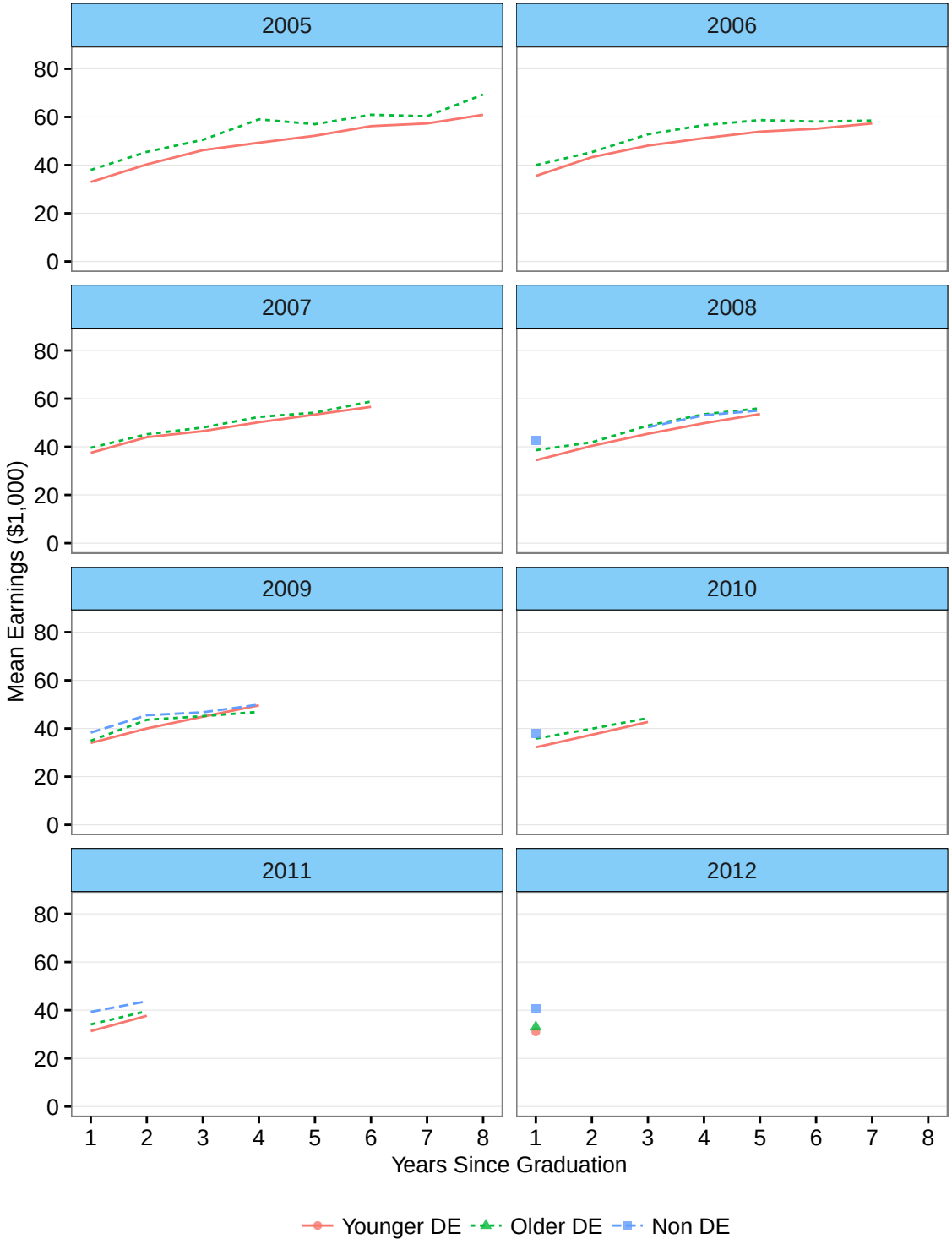

Figure 14: Mean Earnings of Degree Graduates by Pathway Type, Business

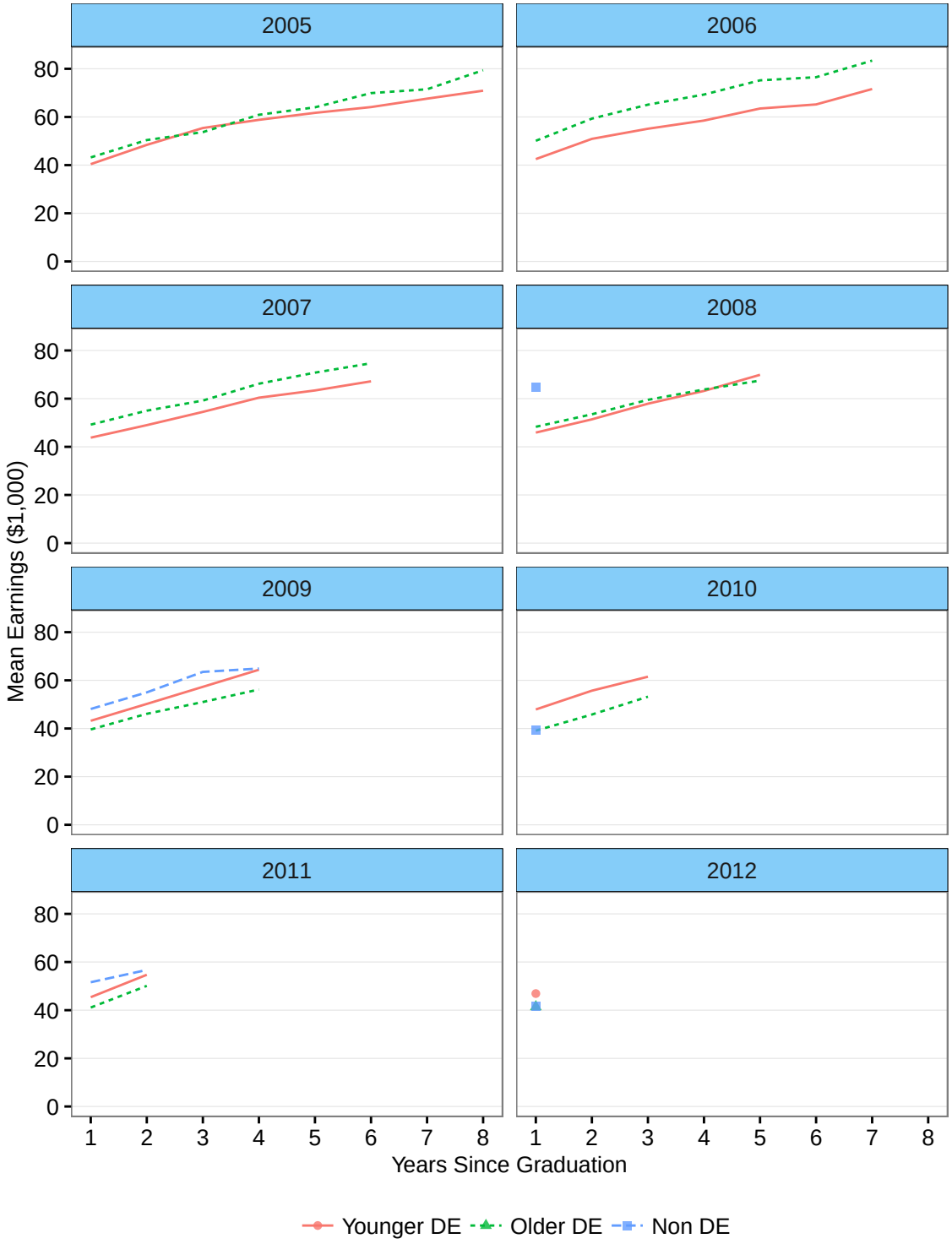

Figure 15: Mean Earnings of Degree Graduates by Pathway Type, Health

Figure 16: Mean Earnings of Degree Graduates by Pathway Type, Engineering

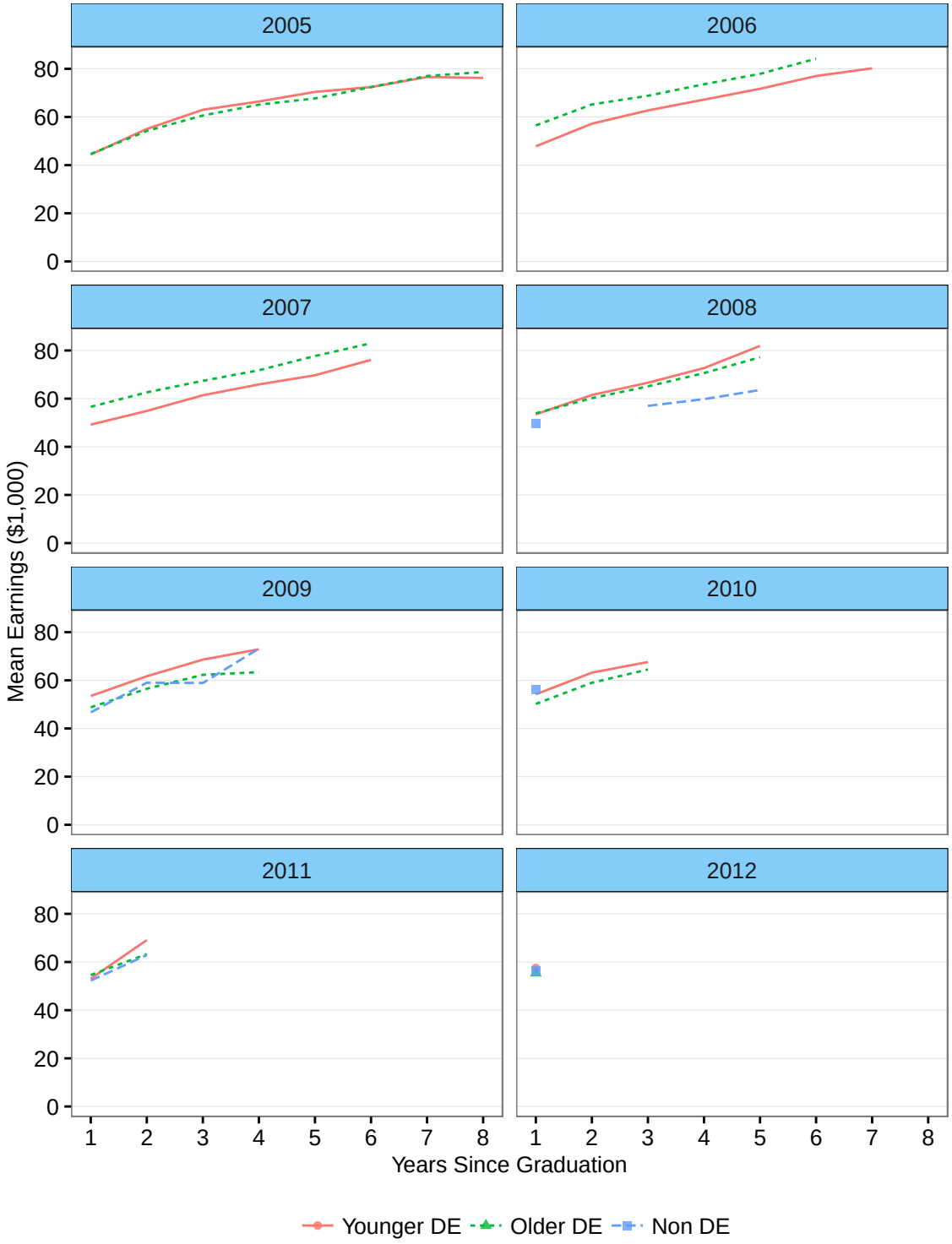

Figure 17: Mean Earnings of Degree Graduates by Pathway Type, Sciences

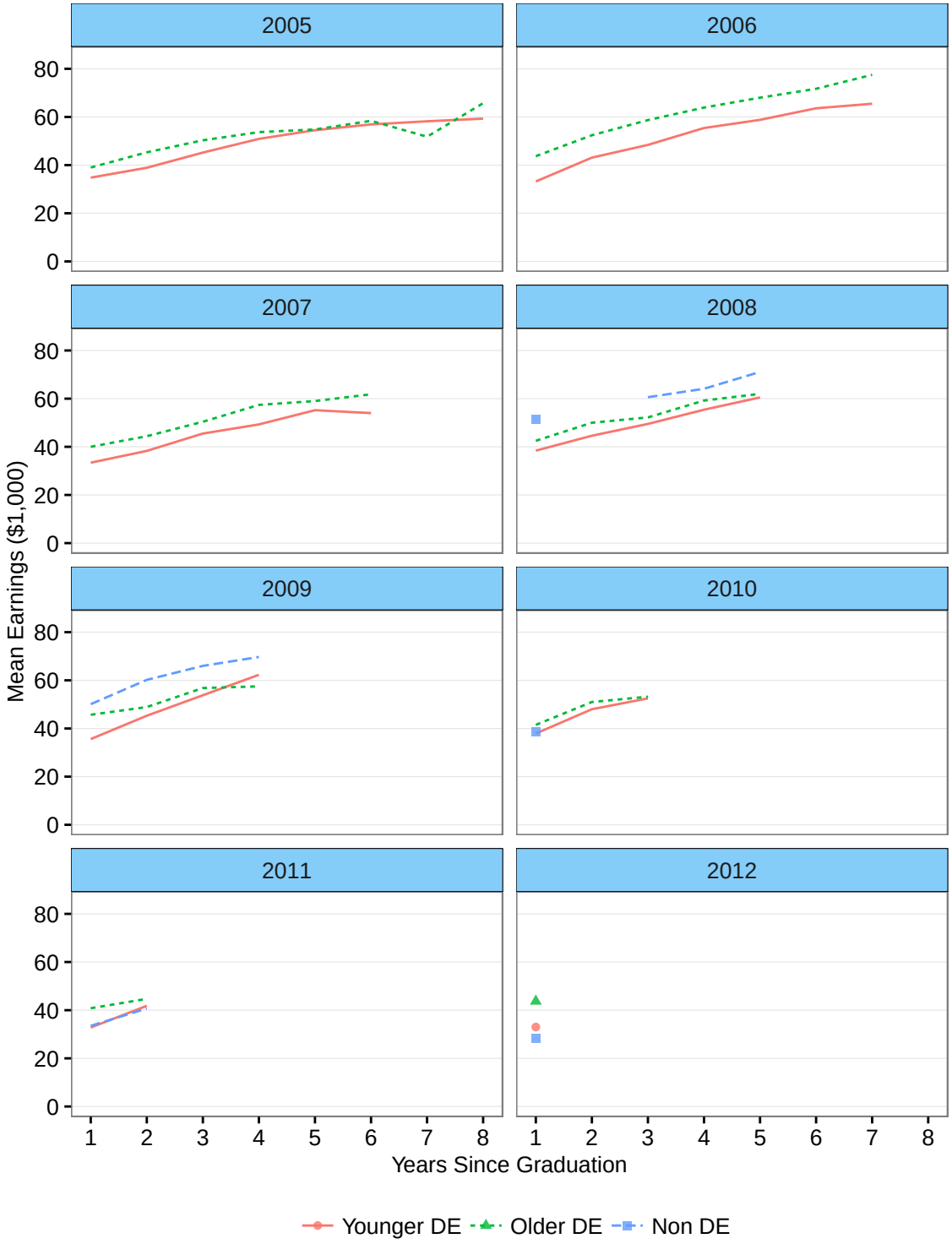

Figure 18: Mean Earnings of Degree Graduates by Pathway Type, Humanities

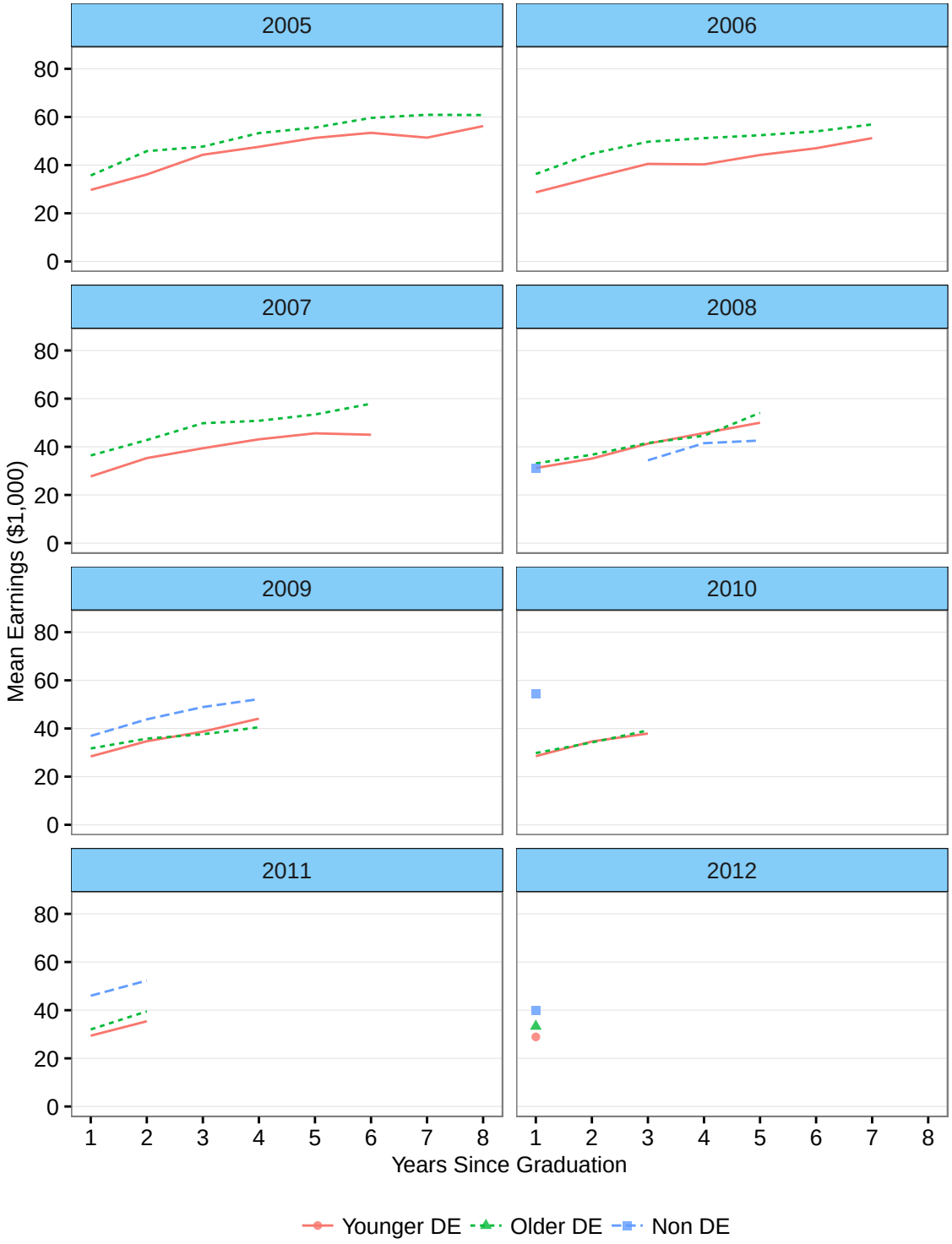

Table 17: Mean Earnings of Degree Graduates by Pathway Type

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	37.7	45.2	51.8	55.4	57.8	60.6	63.0	66.2
	2006	40.3	47.8	52.7	55.3	58.9	61.1	64.8	
	2007	42.2	47.7	51.9	55.9	59.1	62.3		
	2008	43.6	49.3	54.3	59.3	65.0			
	2009	41.3	48.2	53.9	59.4				
	2010	41.1	48.7	53.9					
	2011	40.3	49.6						
	2012	40.9							
Older DE	2005	42.0	49.9	53.4	59.1	60.8	64.7	67.3	73.2
	2006	49.8	58.3	63.4	67.5	70.6	74.7	79.5	
	2007	50.1	54.7	59.5	64.1	68.6	73.2		
	2008	47.2	52.1	57.2	62.4	67.1			
	2009	41.7	48.6	53.0	56.0				
	2010	41.2	48.0	53.7					
	2011	42.2	49.4						
	2012	42.6							
Non DE	2005	43.4	51.1	53.5	61.0	61.2	61.8	62.6	65.1
	2006	40.2	45.1	53.8	59.8	65.6	65.8	71.9	
	2007	41.1	49.5	49.5	57.9	60.2	69.9		
	2008	44.4	52.6	58.8	65.4	75.4			
	2009	40.7	48.6	51.0	55.1				
	2010	43.2	49.3	52.7					
	2011	43.2	48.5						
	2012	39.5							

Note: Earnings figures are in thousand 2014 dollars.

Table 18: Mean Earnings of Degree Graduates by Pathway Type, Female

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	37.8	44.2	49.6	52.9	54.4	56.4	57.2	59.1
	2006	39.3	46.1	49.9	51.8	53.7	54.5	56.5	
	2007	41.8	46.8	49.8	52.8	54.4	56.3		
	2008	40.9	45.4	48.5	52.9	56.7			
	2009	39.0	44.4	49.0	53.9				
	2010	38.0	44.7	48.8					
	2011	37.9	44.7						
	2012	37.8							
Older DE	2005	42.8	48.3	51.0	56.1	55.1	58.5	56.6	63.0
	2006	46.9	53.4	58.5	60.9	61.9	62.0	64.7	
	2007	45.7	50.1	54.2	57.4	59.8	62.8		
	2008	44.3	49.1	52.3	55.9	59.0			
	2009	39.6	44.2	46.9	47.8				
	2010	38.2	43.1	46.5					
	2011	38.2	44.3						
	2012	37.3							
Non DE	2005	41.0	47.8	48.2	54.7	54.3	50.9	52.4	55.9
	2006	35.3	38.5	47.3	53.8	55.8	52.5	57.7	
	2007	37.1	45.2	44.9	49.7	52.1	53.0		
	2008	42.2	46.0	48.0	50.9	55.1			
	2009	39.3	45.9	48.1	51.2				
	2010	41.9	44.2	44.8					
	2011	42.3	46.9						
	2012	39.4							

Note: Earnings figures are in thousand 2014 dollars.

Table 19: Mean Earnings of Degree Graduates by Pathway Type, Male

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	37.5	46.7	55.2	59.3	63.1	66.9	71.8	76.9
	2006	41.7	50.3	57.0	60.5	66.4	70.6	76.9	
	2007	42.8	48.9	54.9	60.1	65.6	70.4		
	2008	46.8	53.7	60.5	66.1	73.4			
	2009	44.2	52.9	59.7	66.0				
	2010	45.2	53.6	59.6					
	2011	43.5	56.2						
	2012	45.0							
Older DE	2005	41.4	51.2	55.3	61.4	65.3	69.3	75.0	80.6
	2006	52.1	61.8	66.8	71.9	76.5	83.5	89.7	
	2007	53.2	57.8	62.9	68.2	74.0	79.5		
	2008	49.2	54.3	60.6	66.8	72.6			
	2009	42.9	51.1	56.4	60.5				
	2010	43.1	51.1	58.0					
	2011	44.8	52.7						
	2012	45.9							
Non DE	2005	48.2	57.8	64.1	73.6	75.1	82.7	82.5	82.6
	2006	46.3	53.5	61.4	66.2	75.9	79.8	86.4	
	2007	47.9	56.7	57.2	72.4	73.3	95.4		
	2008	47.4	60.5	70.9	81.3	97.0			
	2009	42.5	51.7	54.0	59.0				
	2010	44.8	55.6	62.6					
	2011	44.4	50.7						
	2012	39.7							

Note: Earnings figures are in thousand 2014 dollars.

Table 20: Mean Earnings of Degree Graduates by Pathway Type, Social Sciences

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	33.0	40.3	46.2	49.3	52.2	56.2	57.3	60.9
	2006	35.5	43.3	48.1	51.2	53.9	55.1	57.3	
	2007	37.5	44.0	46.5	50.2	53.4	56.6		
	2008	34.4	40.4	45.4	49.8	53.6			
	2009	34.0	40.0	44.9	49.6				
	2010	32.2	37.4	42.7					
	2011	31.3	37.7						
	2012	31.0							
Older DE	2005	38.0	45.5	50.5	59.0	57.0	60.9	60.3	69.3
	2006	40.0	45.4	52.8	56.6	58.7	58.1	58.5	
	2007	39.6	45.2	48.0	52.4	54.2	58.8		
	2008	38.6	41.9	48.8	53.5	56.0			
	2009	34.9	43.6	45.1	46.9				
	2010	35.8	39.9	44.3					
	2011	34.1	39.6						
	2012	33.0							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	42.6	x	48.1	53.1	55.1			
	2009	38.3	45.5	46.7	49.9				
	2010	38.1	x	x					
	2011	39.3	43.7						
	2012	40.5							

Note: Earnings figures are in thousand 2014 dollars.

Table 21: Mean Earnings of Degree Graduates by Pathway Type, Business

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	40.4	48.4	55.4	58.8	61.7	64.1	67.6	70.9
	2006	42.5	50.9	55.1	58.5	63.5	65.2	71.6	
	2007	43.8	49.0	54.5	60.4	63.4	67.2		
	2008	45.9	51.4	57.9	63.2	69.9			
	2009	43.2	50.2	57.3	64.4				
	2010	47.9	55.7	61.5					
	2011	45.4	54.7						
	2012	46.9							
Older DE	2005	43.2	50.4	53.7	60.9	64.0	69.9	71.5	79.4
	2006	50.1	59.3	65.1	69.3	75.2	76.5	83.4	
	2007	49.2	55.0	59.2	66.2	70.8	74.7		
	2008	48.3	53.5	59.5	63.8	67.5			
	2009	39.6	46.1	51.0	56.2				
	2010	39.1	45.8	53.2					
	2011	41.1	50.1						
	2012	41.4							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	64.7	x	116.4	128.8	160.9			
	2009	48.1	55.0	63.5	64.9				
	2010	39.4	x	x					
	2011	51.6	56.7						
	2012	41.6							

Note: Earnings figures are in thousand 2014 dollars.

Table 22: Mean Earnings of Degree Graduates by Pathway Type, Health

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	49.6	57.4	60.8	64.7	62.8	63.3	64.7	65.8
	2006	47.8	53.8	57.9	57.7	58.2	57.0	60.6	
	2007	52.8	57.8	58.9	59.5	60.7	62.3		
	2008	52.9	56.7	59.6	61.6	63.3			
	2009	48.2	52.5	56.4	59.7				
	2010	42.4	48.9	51.8					
	2011	45.0	52.5						
	2012	45.1							
Older DE	2005	49.6	55.4	53.8	51.7	56.5	57.5	61.3	57.3
	2006	48.8	57.0	60.8	61.9	61.9	70.4	67.0	
	2007	49.4	52.9	55.5	53.6	57.7	58.9		
	2008	53.6	57.5	57.8	60.3	65.7			
	2009	47.0	52.1	54.7	58.0				
	2010	39.8	45.3	50.7					
	2011	40.2	45.6						
	2012	40.4							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	42.8	x	49.3	43.0	48.8			
	2009	37.4	42.4	39.2	43.2				
	2010	39.4	x	x					
	2011	35.7	37.5						
	2012	36.4							

Note: Earnings figures are in thousand 2014 dollars.

Table 23: Mean Earnings of Degree Graduates by Pathway Type, Engineering

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	44.4	55.0	63.0	66.4	70.4	72.4	76.6	76.2
	2006	47.8	57.2	62.7	67.2	71.7	77.0	80.2	
	2007	49.2	54.9	61.4	65.9	69.7	76.1		
	2008	53.5	61.5	66.6	72.7	81.9			
	2009	53.5	61.7	68.6	72.9				
	2010	54.2	63.2	67.6					
	2011	53.1	69.1						
	2012	57.5							
Older DE	2005	44.6	54.2	60.6	65.1	67.7	72.4	77.0	78.7
	2006	56.5	65.2	68.8	73.6	77.9	84.2	90.6	
	2007	56.6	62.6	67.4	71.8	77.7	83.0		
	2008	53.9	60.2	65.1	70.6	77.2			
	2009	48.8	56.5	62.3	63.4				
	2010	50.2	59.0	64.5					
	2011	54.6	63.3						
	2012	55.4							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	49.7	x	57.0	59.8	63.6			
	2009	46.7	59.0	58.9	73.2				
	2010	56.2	x	x					
	2011	52.3	62.9						
	2012	56.3							

Note: Earnings figures are in thousand 2014 dollars.

Table 24: Mean Earnings of Degree Graduates by Pathway Type, Sciences

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	34.8	38.9	45.2	50.9	54.5	56.9	58.2	59.3
	2006	33.2	43.1	48.4	55.4	58.8	63.6	65.5	
	2007	33.4	38.3	45.5	49.3	55.2	54.0		
	2008	38.4	44.6	49.5	55.4	60.5			
	2009	35.6	45.3	53.8	62.3				
	2010	37.9	48.0	52.5					
	2011	32.8	41.8						
	2012	33.0							
Older DE	2005	39.0	45.3	50.3	53.7	54.8	58.4	51.8	65.7
	2006	43.7	52.4	58.7	63.9	68.0	71.7	77.5	
	2007	40.0	44.4	50.4	57.4	59.0	61.8		
	2008	42.5	50.0	52.2	59.2	62.0			
	2009	45.7	48.9	56.8	57.5				
	2010	41.5	51.0	53.2					
	2011	40.8	44.7						
	2012	43.7							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	51.3	x	60.6	64.1	71.1			
	2009	50.1	60.2	66.0	69.7				
	2010	38.5	x	x					
	2011	33.5	40.7						
	2012	28.2							

Note: Earnings figures are in thousand 2014 dollars.

Table 25: Mean Earnings of Degree Graduates by Pathway Type, Humanities

		Years since graduation							
	Cohort	1	2	3	4	5	6	7	8
Younger DE	2005	29.7	36.1	44.3	47.6	51.3	53.4	51.4	56.2
	2006	28.7	34.7	40.5	40.3	44.2	47.0	51.2	
	2007	27.7	35.3	39.4	43.1	45.6	45.0		
	2008	31.2	35.1	41.3	45.7	50.0			
	2009	28.4	34.7	38.7	44.1				
	2010	28.5	34.6	37.9					
	2011	29.4	35.4						
	2012	28.9							
Older DE	2005	35.7	45.8	47.7	53.3	55.6	59.6	60.9	60.8
	2006	36.3	44.8	49.7	51.2	52.4	54.0	56.9	
	2007	36.4	42.8	49.8	50.8	53.4	57.9		
	2008	33.1	36.7	41.6	44.6	54.1			
	2009	31.7	35.8	37.6	40.5				
	2010	29.8	34.2	39.2					
	2011	32.0	39.5						
	2012	33.3							
Non DE	2005	x	x	x	x	x	x	x	x
	2006	x	x	x	x	x	x	x	
	2007	x	x	x	x	x	x		
	2008	31.2	x	34.4	41.5	42.6			
	2009	36.9	43.8	48.9	52.2				
	2010	54.5	x	x					
	2011	46.0	52.3						
	2012	39.8							

Note: Earnings figures are in thousand 2014 dollars.

Table 26: Regression Coefficient Estimates, Degree Graduates

	Estimates			Std. error		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Old DE	1.32**	−0.62	0.67	0.38	0.37	0.36
Old DE × YSG	−0.23	−0.78**	−0.87**	0.22	0.21	0.21
Non DE	0.13	2.39**	1.14	0.73	0.70	0.69
Non DE × YSG	0.92*	0.73	0.46	0.44	0.42	0.41
2009 Cohort	−2.65**	−2.10**	−1.84**	0.34	0.33	0.32
2010 Cohort	−2.53**	−2.13**	−2.00**	0.37	0.36	0.35
2011 Cohort	−2.34**	−1.62**	−1.48**	0.42	0.40	0.40
2012 Cohort	−2.69**	−1.64**	−1.71**	0.54	0.51	0.50
YSG = 2	7.11**	8.20**	8.15**	0.34	0.40	0.40
YSG = 3	12.00**	14.15**	14.05**	0.41	0.62	0.63
YSG = 4	16.81**	20.09**	19.90**	0.52	0.87	0.89
YSG = 5	22.43**	26.87**	26.65**	0.70	1.18	1.20
Business		10.92**	10.22**		0.53	0.53
Health		12.14**	11.96**		0.59	0.58
Engineering		20.33**	19.29**		0.54	0.53
Sciences		4.50**	4.50**		0.68	0.67
Humanities		−2.31**	−1.99**		0.70	0.69
Mathematics		15.43**	15.47**		0.69	0.68
Arts		−7.67**	−7.98**		0.78	0.77
Business × YSG		1.20**	0.98**		0.32	0.31
Health × YSG		−0.53	−0.74*		0.36	0.36
Engineering × YSG		−0.24	−0.62*		0.32	0.31
Sciences × YSG		1.25**	1.05*		0.42	0.42
Humanities × YSG		−0.94*	−1.20**		0.42	0.42
Mathematics × YSG		0.33	0.02		0.40	0.40
Arts × YSG		−1.77**	−1.83**		0.46	0.45
Female		−0.35	−1.08**		0.36	0.36
Female × YSG		−2.21**	−2.30**		0.21	0.21
CGPA = A			7.67**			0.40
CGPA = C			−4.47**			0.42
CGPA = A × YSG			2.15**			0.24
CGPA = C × YSG			−0.33			0.25
Constant	43.61**	35.37**	34.84**	0.34	0.52	0.53

** Significant at 1% level. * Significant at 5 % level.

Figure 19: Implied Earnings Gaps, Degree Graduates

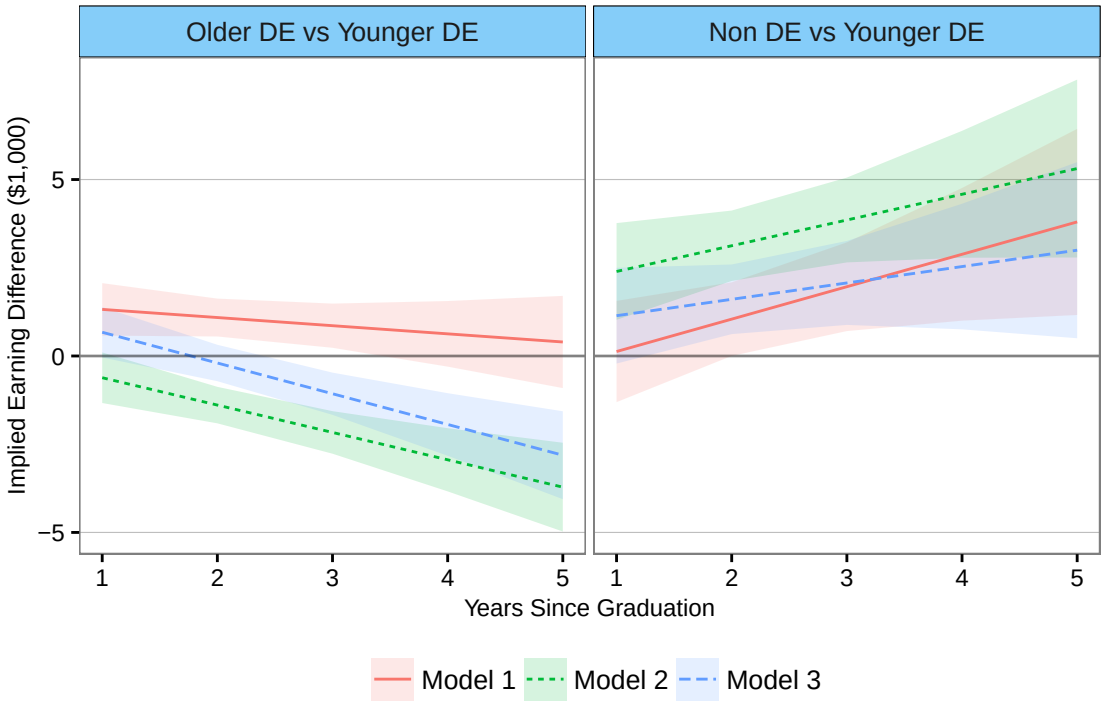

Figure 20: Mean Earnings Surrounding PSE by Graduating Cohort, Diploma Graduates

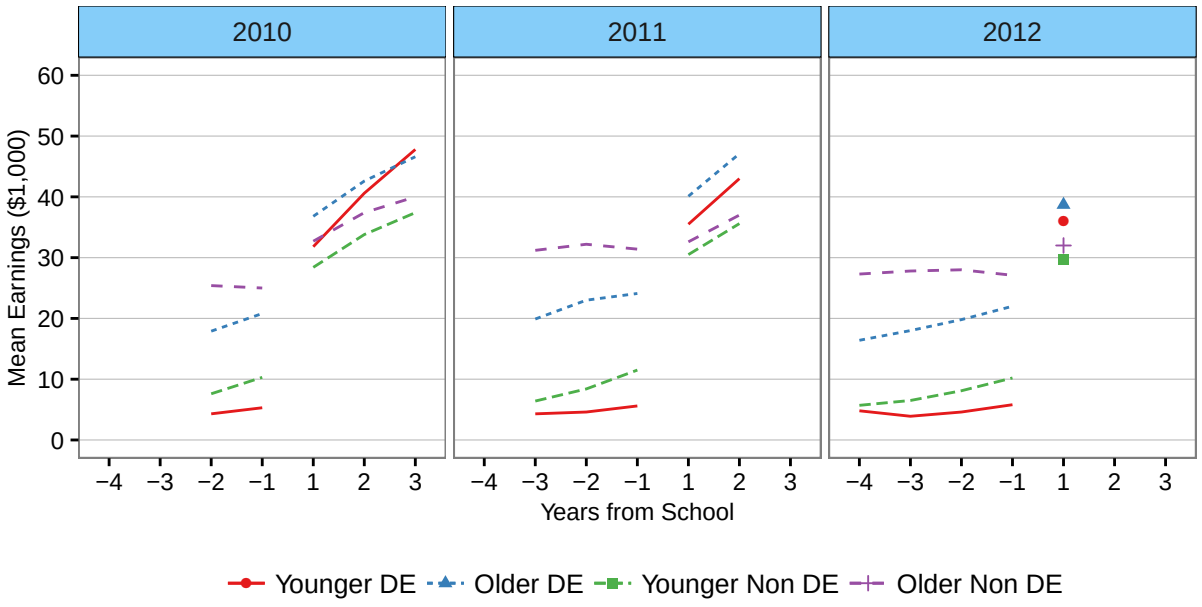

Figure 21: Mean Earnings Surrounding PSE of Diploma Graduates, Pooled

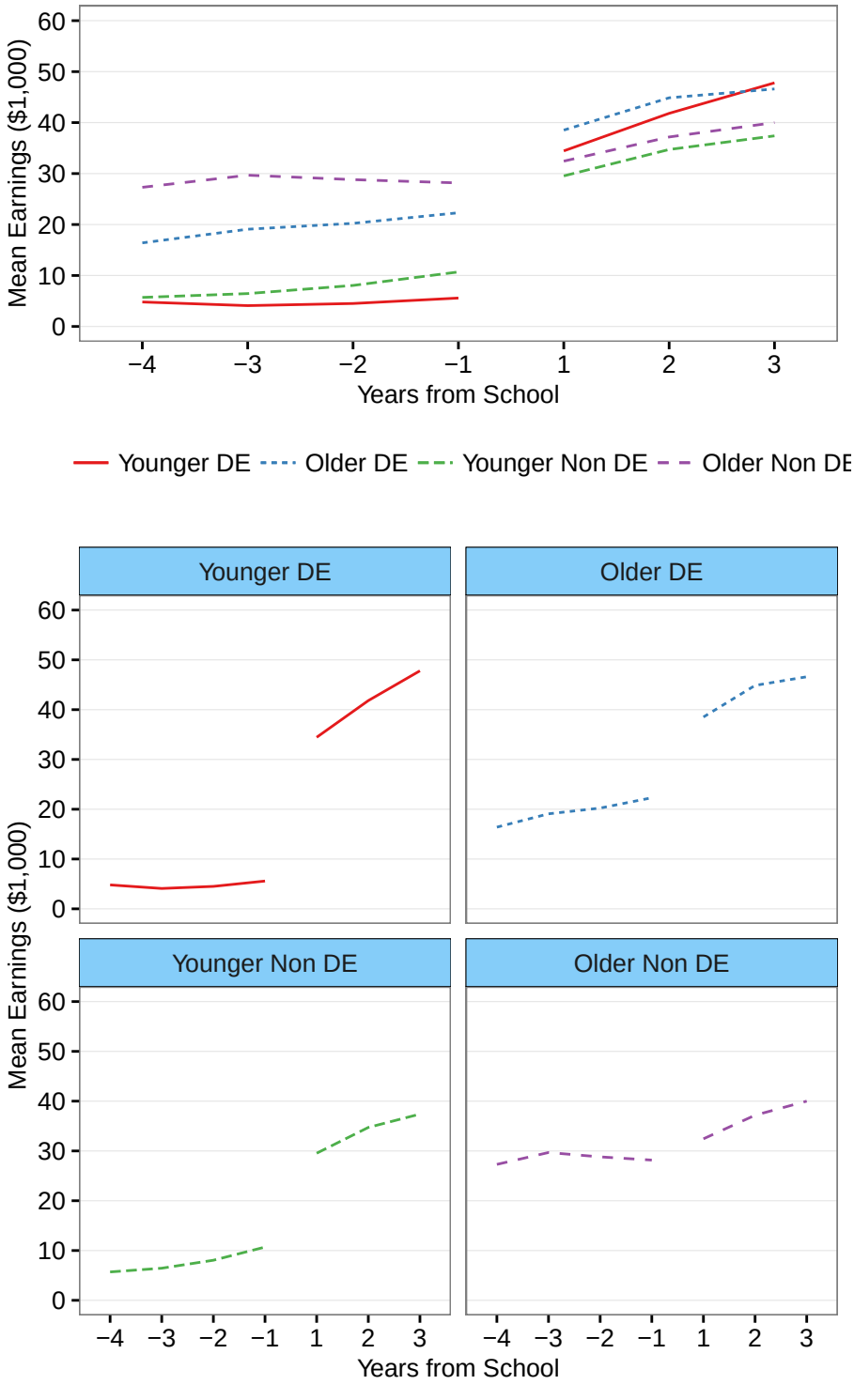

Figure 22: Mean Earnings Surrounding PSE by Graduating Cohort, Degree Graduates

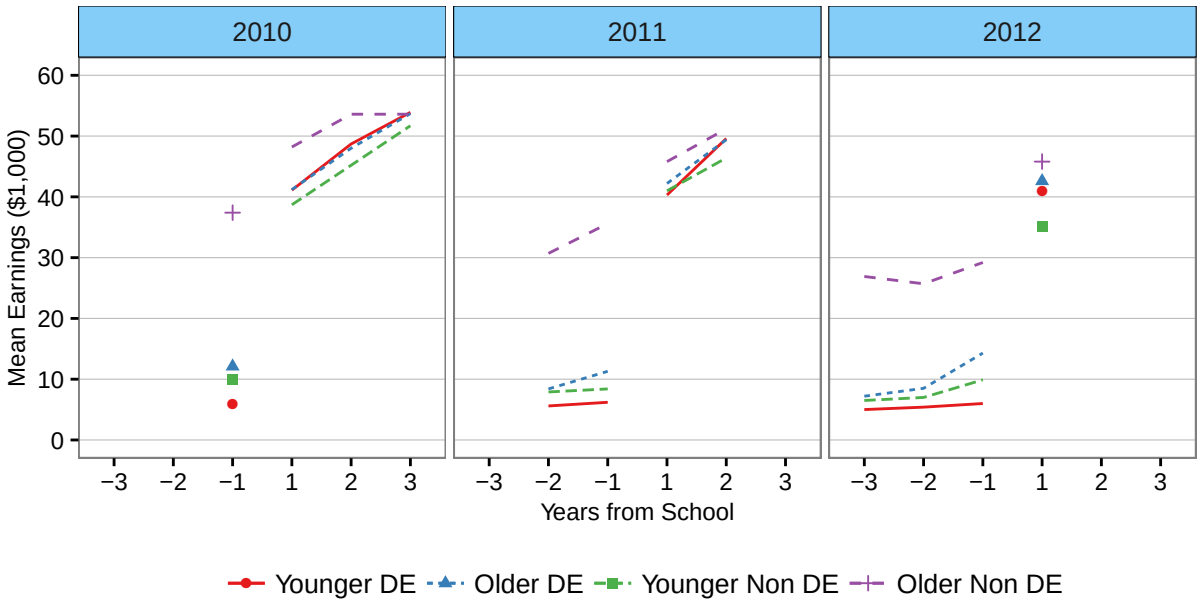

Figure 23: Mean Earnings Surrounding PSE of Degree Graduates, Pooled