POST-SCHOOLING OUTCOMES OF UNIVERSITY GRADUATES: A DATA LINKAGE APPROACH

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I. Introduction

This report presents the results of a descriptive analysis of labour market outcomes of graduates from the University of Ottawa. The project exploits a unique dataset which links university administrative data with tax record data, allowing us to follow individuals from their post-secondary education (PSE) experiences into their post-graduation labour market outcomes. Using the linked dataset we can see how students with different schooling backgrounds do in the labour market; and to do so on a year-by-year basis following graduation for a continuous range of cohorts of graduates, dating as far back as 1998 and as recently as 2010.

The report profiles and compares the earnings of bachelor degree graduates from different faculties on a cohort-by-cohort basis across time. Along with comparing outcomes between different disciplines and cohorts, we compare the earnings of men and women as well as the quintile distribution of earnings in several cohorts.

II. Context

This project provides useful information related to the Government of Ontario's focus on promoting a highly skilled workforce and youth labour market participation by supplying reliable labour market data. The study uses the administrative data of only one post-secondary education (PSE) institution, serving as a pilot project to demonstrate the worth of linking PSE institutional data to tax record data. In doing so, we are able to provide data on labour market outcomes that is more accurate than the small and biased samples on graduates currently carried out by post-secondary education (PSE) institutions themselves and more accurate than using Census data. Using a data linkage strategy, we are able to answer the following questions: Which graduates are doing well in the labour market, and which not so well? How do earnings patterns evolve over the years following graduation, taking into account experience on future earnings? Have earnings patterns changed over time (i.e., across graduating cohorts)?

Those areas of study where graduates have received higher earnings (and increasing over time) presumably represent areas where there is strong demand for the skills obtained by studying those disciplines, and the converse could be inferred for those earning less. This kind of information could help inform a range of policies relating to labour markets and the PSE system, as students are likely to be drawn to areas of high demand (where their skills are presumably

needed) and PSE institutions have incentives to respond with the programs they offer.

Such dynamics – the flow of students into disciplines where labour market demand is high – are a central element of the standard human capital model of skill acquisition and (related) post-schooling outcomes, which leads to human resources going where they will be most productive. However, this can only happen to the degree that there is accurate information on labour market outcomes, which is an area where there currently exist significant shortcomings, including for individual PSE institutions, individual provinces and Canada as a whole. This project aims to provide a new and accurate source of information that will be useful for young people making schooling choices, PSE institutions, employers and education policy makers.

III. Main Findings

This section presents the key findings of the research project.

III.1. Number of Graduates

- The total number of bachelor degree graduates from the University of Ottawa has increased over the 13 year period covered by this study. In 1998, there were 2,300 graduates from bachelor programs included in this study, while in 2010 this number increased to 4,570 graduates.
- The largest year-over-year increase in the number of graduating students occurred in 2007, when around 400 more students graduated relative to the 2006 cohort. This increase is most likely driven by students who were part of the double-cohort of high school graduates from Ontario.

III.2. Earning Patterns

- The mean earnings in the 1st year after graduation for all graduates at the University of Ottawa taken together varied between $41,000 and $47,000 in the period covered by this study.
- Earnings of graduates from different faculties at the University of Ottawa tended to increase in the years following graduation for each of the cohorts examined, although the extent of this increase varied between cohorts and was impacted by the business cycle.
- Graduates of Engineering and Computer Sciences had the highest earnings (at every year after graduation) of all graduating cohorts up to 2001. After 2001, these graduates had

earnings in the 1st year after graduation similar to the University of Ottawa average but tended to earn more for every subsequent year after graduation, ultimately finishing among the highest earners in every cohort examined.

- Business graduates tended to have the highest increases in earnings over time for most of the cohorts examined. These graduates had earnings in the 1st year after graduation similar to those of the University of Ottawa average but registered among the highest earnings in the final year of analysis for each cohort.
- Students that graduated from Health programs tended to have the highest earnings in their 1st year after graduation for all cohorts after 2001, but had the lowest increases in earnings over time.
- Graduates of the Humanities had lower earnings than the University of Ottawa average for all of the cohorts examined.
- Social Science graduates had starting earnings that were similar to those of the Humanities graduates for each cohort examined, however, Social Sciences graduates finished with higher earnings at the end of the period of analysis in most of the cohorts examined.
- Graduates of Mathematics and Natural Sciences had earnings profiles that were roughly similar to those of the Social Sciences graduates for most of the cohorts analysed, with the exception that in a few cohorts Mathematics and Natural Sciences graduates finished with higher earnings than Social Sciences graduates.
- Engineering and Computer Sciences, Mathematics and Natural Sciences, and Business graduates experienced more volatile earnings patterns relative to the other groups, particularly for the earlier cohorts (those finishing before 2003). This variability could be driven, in part, by the relatively smaller sample size (number of students) in these groups but also presumably by changing business conditions such as the dot-com bust. Health, Humanities and Social Sciences graduates had more stable earnings patterns.

III.3. Gender and Quintile Findings

- Before the 2001 cohort, each quintile of Engineering and Computer Sciences graduates had earnings that were higher than the comparable quintile in any other faculty group. For all cohorts after 2001, however, each quintile of these graduates had 1st year earnings

comparable to the University of Ottawa average but finished the period of analysis with higher earnings.

- The top earning 20% of Engineering and Computer Sciences, and Business graduates tended to be the highest earners across all the cohorts examined, with roughly similar earnings.
- The top earning 20% of graduates of the Engineering and Computer Sciences saw 1st year earnings decrease considerably over the period covered by this study. This group saw a consistent decrease in 1st year earnings between the 2000 and 2003 cohorts (fiscal years 2001 and 2004), moving from around $109,000 to around $72,000. Since the 2003 cohort, 1st year mean earnings of the top earning 20% of these graduates have increased only slightly.
- There were large differences in starting earnings between men and women of all faculties examined in the earlier cohorts. For all cohorts before 2003, male graduates were earning around $10,000 more than female graduates in their 1st year after graduation. For all cohorts after 2003 earnings in the 1st year after graduation were roughly similar for men and women. In all cohorts, however, female graduates tended to have increasingly lower earnings than men in the years following graduation for all faculties examined.
- The biggest differences in earnings between men and women tended to be found in the Engineering and Computer Sciences, Business and Social Sciences faculties, where men earned substantially more than women. Of all the faculties examined, female graduates of the Humanities had the smallest difference in earnings compared to men.

IV. Data and Methodology

This section describes the creation of the dataset which links administrative University of Ottawa data with tax data and the steps taken to undertake the final analysis. Addressed below are the creation of the measure of earnings, the sample inclusions and censoring strategy for graduates that do not file taxes and those that return to school, and the construction of the faculty groups.

IV.1. Creation of Linked Dataset

The University of Ottawa's Institutional Research and Planning (IRP) office provided

Statistics Canada with the administrative data on all graduating students from the University of Ottawa between the years 1998 and 2010. These data include specific information on students such as gender and program of study, among others. The University also provided a separate file that included the individual student identifiers required to link students to the tax data (e.g., full name, precise date of birth, and geographical information). At no point were the two files containing student information at Statistics Canada at the same time, further ensuring a high level of student-privacy and confidentiality. Identifiable, individual-level student information was destroyed after the linkage was completed by Statistics Canada and the analysis file does not include any of the above-mentioned student identifiers. Additionally, researchers were not given direct access to micro records and instead worked with an analyst at Statistics Canada.

Statistics Canada's tax record data for this study is available from 1998 to 2011. This tax data represents the adult population very well as the rate of tax filing in Canada is very high. Upper and middle-income Canadians are required to file; whereas lower-income Canadians have strong financial incentives to file as they can recover a part of their income tax and other payroll tax deductions made throughout the year, or receive various tax credits. As a result, over 99 percent of graduating students at the University of Ottawa could be matched to at least one tax year record. The final dataset consists of 82,000 University of Ottawa graduates.

IV.2. Statistics Canada Disclosure Rules

The results below follow Statistics Canada's disclosure rules. These rules state that where observation counts are lower than 15 the results must be suppressed. Furthermore, to protect individual privacy, all counts are rounded to the nearest 10 and final earnings to the nearest $100.

IV.3. Measure of Earnings

To measure labour market outcomes this analysis 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 any declared self-employment income and other employment income. The focus on before tax income ensures that the effects of various tax credits and transfer programs, which would disproportionately affect the after tax earnings of some types of graduates, are not captured. For example, individuals with children could claim a tax credit that would raise their after tax earnings relative to those that do not have children and have the same level of before tax earnings.

In order to track each individual's earnings over time, and to capture the effects of labour market experience on earnings, this analysis will examine earnings on a cohort-by-cohort basis by year after graduation. As an example: for a student who graduated in 1998 (the 1998 cohort), we observe their earnings at one year after graduation, i.e. in fiscal/tax year 1999, and follow them on a yearly basis for as long as we have earnings information. For this earliest cohort, we have earnings information spanning 13 years (until 2011), while for later cohorts we have less information; for example, for the 1999 cohort, we have 12 years of earnings information, for the 2010 cohort, we have only 1 year of earnings information.

As part of the analysis we also examine the change in earnings in the 1st year after graduation between cohorts. This serves as a measure of the labour market value of new entrants into the labour force and allows us to capture the effects of the business cycle on the earnings of recent graduates. In the cases where the analysis is focused on 1st year earnings, as above, the fiscal year following the year of graduation is considered year 1 but the findings are presented on a yearly basis (ie. 1999 through to 2011).

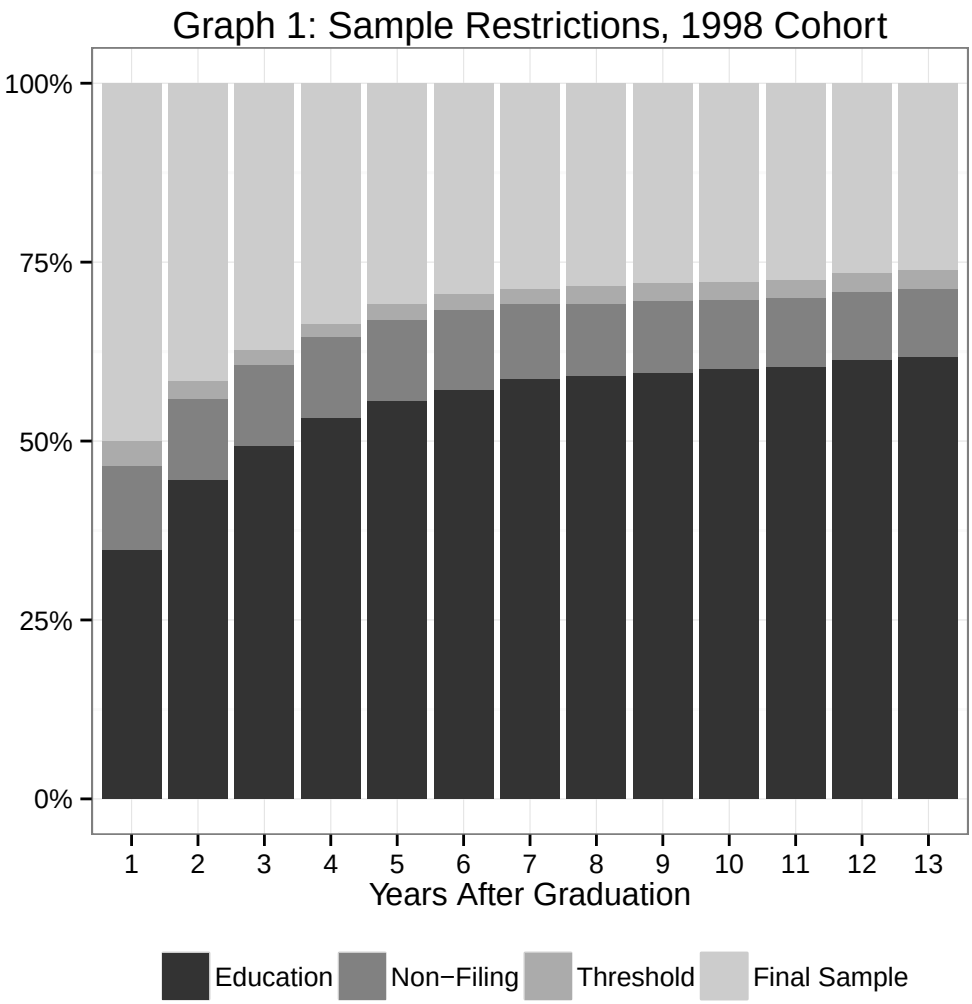
We focus on mean earnings in this report. All earnings are Consumer Price Index (CPI) adjusted to 2011 dollars.

IV.4. Sample Inclusions and Censoring

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

Graph 1 presents the effects of the censoring strategy on the sample of the 1998 cohort of


Graph 1: Sample Restrictions, 1998 Cohort
100%
75%
50%
25%
0%
1
2
3
4
5
6
7
8
9
10
11
12
13
Years After Graduation
Education
Non−Filing
Threshold
Final Sample

graduates (all additional cohorts can be found in the appendix).

In the 1st year after graduation around 35% of graduating students of the 1998 cohort are censored because they were found to be in school (ie. they claimed at least $100 in education deductions in the 1st full year after graduation). For each additional year after graduation, a significantly smaller number of graduates returned to school, but the total proportion grows over time due to the fact that this censoring criterion is cumulative (those that returned to school in the 1st year after graduation are counted in all subsequent years). Around 10% of the sample is censored in the 1st year after graduation because these individuals did not file their taxes in that year. The number of graduates that did not file their taxes remains roughly the same for this cohort for each year after graduation. An even smaller number (around 4%) was censored in every year due to the fact that these individuals earned less than $1,000 in that year. For the 1998 cohort, the total sample size in the 1st year after graduation is around 50% of the total number of graduates in that cohort (around 1,150 graduates in total). By year 13 after graduation, the total sample is reduced to a quarter of the total number of graduating students (around 600).

IV.5. Employment Rates

Due to the relatively small sample size of graduates from each faculty and Statistics Canada disclosure rules, we are unable to generate meaningful employment rates. Employment rates were generated by dividing the number of graduates with earnings in a given year (generally the 1st year after graduation) by the sum of the number of graduates with earnings and the number of graduates with no earnings, for each cohort. For almost all cohorts of graduates in almost every faculty very few graduates were unemployed, generating employment rates that were 100% due to the Statistics Canada rounding requirements. In order to generate meaningful employment rates in the future, we would need a larger sample size by including more post-secondary education (PSE) institutions in the analysis.

IV.6. Definition of Faculty Groups

This analysis is confined to only graduates who obtained a bachelor degree and excludes individuals that graduated with advanced degrees. Bachelor degrees which cannot be entered directly from high school (e.g. education or law) are excluded. Given that we also have information about graduate degree holders from the University of Ottawa, future analyses could be undertaken to examine the outcomes of graduates with advanced degrees.

Using the Classification of Instructional Programs (CIP) codes, the entire bachelor degree holding sample is divided into the following eight faculty groups:

Table 1 - Faculty Groups and matching CIP codes

Faculty Group Name	CIP Codes
Business	52
Health	51
Social Science	42, 44, 45
Mathematics and Natural Sciences	26, 27, 40, 41
Engineering and Computer Sciences	11, 14, 15
Humanities	5, 9, 16, 22, 23, 24, 38, 39, 54, 55
Other	All other not included above
All	All pooled together

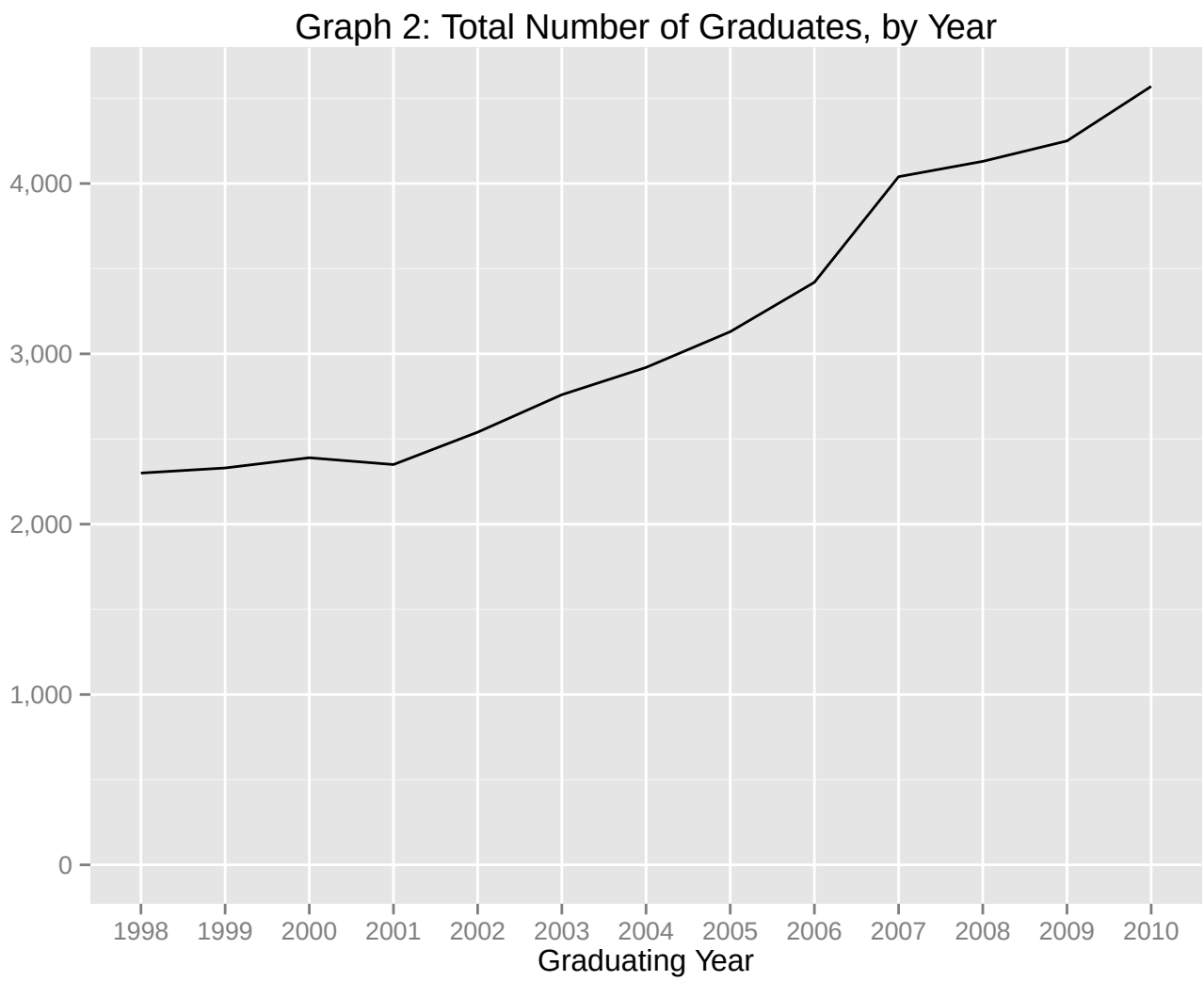
The "All" faculty group examines the labour market outcomes of all graduates included in the analysis and provides us with an institutional (University of Ottawa) average, or sample mean, which we use for comparative purposes.

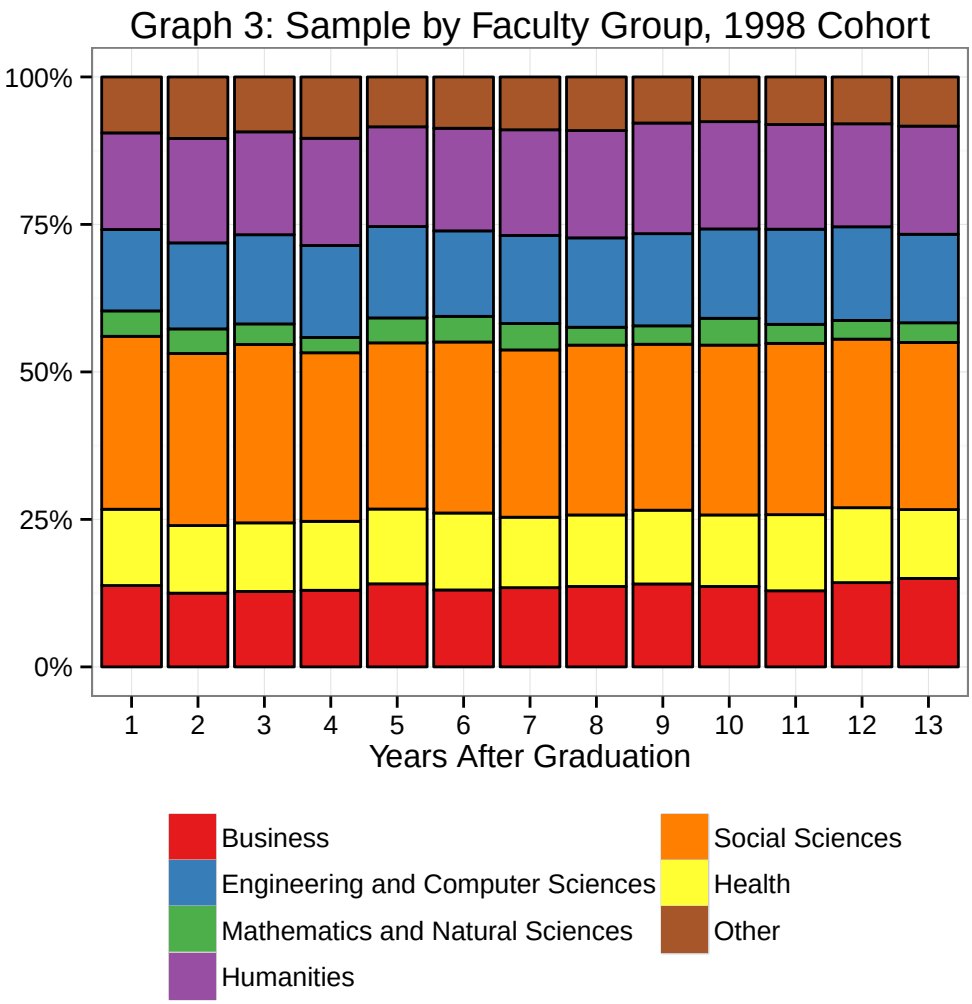
V. Descriptive Statistics

V.1. Number of Graduates

Graph 2 presents the number of students graduating from bachelor degree programs in each year of the period covered by this study. Graph 3 presents the composition of the graduating class of 1998 by faculty group (for the remaining cohorts refer to the appendix).

As Graph 2 demonstrates, the total number of bachelor degree graduates from the University of Ottawa has increased over the 13 year period. The first 4 cohorts registered modest yearly increases in graduates, with the number of graduates in the 2001 cohort actually falling relative to the 2000 cohort. Subsequent cohorts, however, registered yearly increases of around 200 graduates until 2007. The largest year-over-year increase in the number of graduating students occurred with the 2007 cohort, when around 400 more students graduated than in the 2006 cohort. This result is most likely caused by the double-cohort of high school graduates from Ontario, many of whom would have been graduating in 2007.


Graph 2: Total Number of Graduates, by Year
4,000
3,000
2,000
1,000
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Graduating Year


Graph 3: Sample by Faculty Group, 1998 Cohort
100%
75%
50%
25%
0%
1
2
3
4
5
6
7
8
9
10
11
12
13
Years After Graduation
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other

Graph 3 presents the distribution of the 1998 graduating class by faculty group after the censoring of the sample discussed earlier. The largest faculty group is the Social Sciences, representing slightly more than 25% of the entire sample of the graduating class of 1998 for each year after graduation. The next largest group are graduates from Humanities programs, representing close to 20% of the sample. Graduates from Business, Engineering and Computer Sciences, and Health, each represent around 12.5% of the total number of graduates included in the sample. Finally, Other, and Mathematics and Natural Sciences faculty groups had the smallest share of graduates part of the 1998 graduating class.

V.2. Earnings by Cohort

This section examines earnings on a year by year basis following graduation for different cohorts of graduates (defined with respect to the year they finished their studies). As mentioned above, since this analysis uses tax information in fiscal years 1999 and 2011, later cohorts have less complete earnings profiles than earlier cohorts, while the first cohort (1998) has a complete profile of 13 years. We focus on cohorts 1998, 2000, 2004 and 2008 throughout most of this report. The earnings profiles of the remaining cohorts are presented in the appendix.

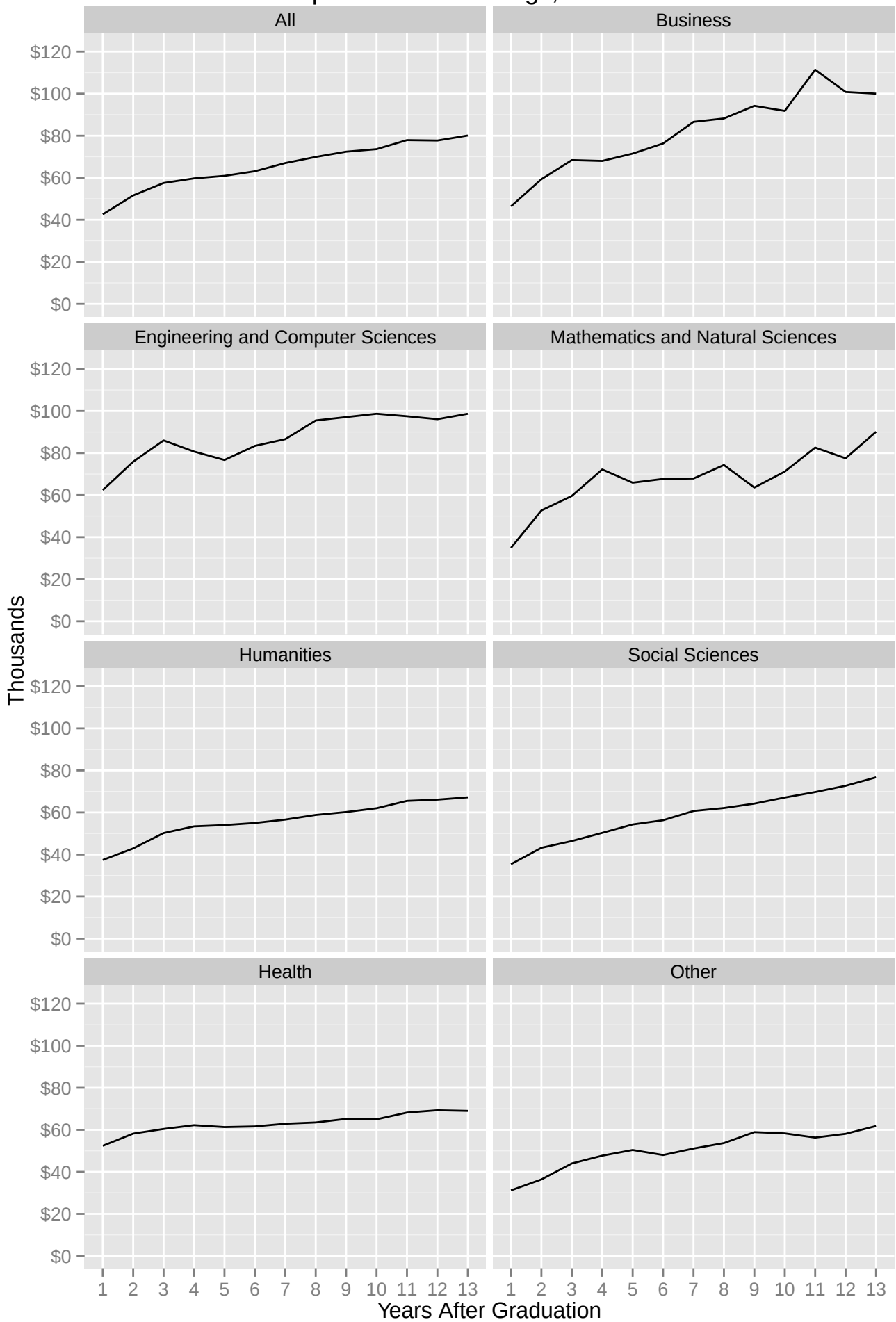
1. 1998 Cohort - A complete profile

Graph 4 presents the earnings profiles of graduates from the 1998 cohort for each of the 8 faculty groups included in the analysis. Year 1 after graduation corresponds to fiscal year 1999, year 2 after graduation corresponds to fiscal year 2000 and so on until year 13 after graduation (fiscal year 2011).

The 1998 cohort of graduates from the University of Ottawa pooled together (All group) entered the labour force with earnings of around $42,000. During the 13 years for which we have data, these graduates saw their earnings increase year-over-year for all but one year (year 12 after graduation), reaching mean earnings of around $80,000 by year 13 after graduation.

On average, graduates from Engineering and Computer Sciences programs had the highest earnings in the 1st year after graduation of all the faculty groups examined in this cohort (around $62,000). These graduates saw rapid increases in their yearly earnings leading up to the bursting of the dot-com bubble in 2001 (year 3 after graduation). The effects of the bust are evident in the substantial decreases in earnings in the 4th and 5th years after graduation (fiscal years 2002 and 2003). Nonetheless, in the 13th year after graduation these graduates are amongst

Graph 4: Mean Earnings, 1998 Cohort



the top earning faculty group examined in this cohort, with mean earnings just below $100,000.

Math and Natural Science graduates of the 1998 cohort follow a similarly volatile earnings profile as that of Engineering and Computer Sciences graduates. Earnings increased rapidly until year 4 after graduation (fiscal year 2002) – perhaps as a result of these graduates entering into sectors similar to those of the Engineering and Computer Sciences graduates – after which they enter a period of volatility with 3 years of earnings decreases registered (in fiscal years 2003, 2007 and 2010). These graduates finished with mean earnings of around $90,000 at 13 years after graduation.

Graduates from Business programs in this cohort experienced the largest net increase in mean earnings for the 13 year period for which we have data. Although these graduates had 1st year earnings roughly equivalent to the sample mean (All group), and much lower than those of the Engineering and Computer Sciences group, Business graduates of the 1998 cohort experienced, on average, much larger earnings increases year-over-year than any other faculty group examined (i.e., the slope of their earnings profile is the steepest). This group registered particularly large year-over-year increases in earnings in the first three years after graduation and in year 11 after graduation (fiscal years 2008 and 2009). The latter increase appears to be driven by the top earning 20% in this faculty group (see Quintiles section). Business graduates of the 1998 cohort finish the 13 year period with earnings close to $100,000.

Health, Humanities and Social Science graduates from the 1998 cohort have roughly similar earnings profiles. Although graduates from Health programs had significantly higher 1st year earnings ($52,000 compared to $35,000 for Social Sciences and $37,000 for Humanities), each of these faculty groups experienced increasing earnings year-over-year with little volatility during the course of the 13 years examined. Although Health graduates started with higher earnings, they finished with earnings similar to those of the Humanities group (around $70,000), while the Social Sciences graduates registered the highest increase over the 13 years, finishing with earnings close to $75,000.

Finally, the Other faculty group, which includes graduates from programs as varied as Fine Arts and Agriculture, had the lowest 1st year earnings (around $30,000) and the lowest earnings at year 13 after graduation (around $60,000) of all the faculty groups.

2. 1998 Cohort – Confidence Intervals

Graph 5 builds on Graph 4 above (mean earnings of the 1998 cohort) but adds the 95% confidence intervals. The shaded area above and below each line represents the upper and the lower confidence limit of the mean, respectively. The variance in confidence limits captures the underlying differences in income distribution, as well as the differing sample sizes among our faculty groups.

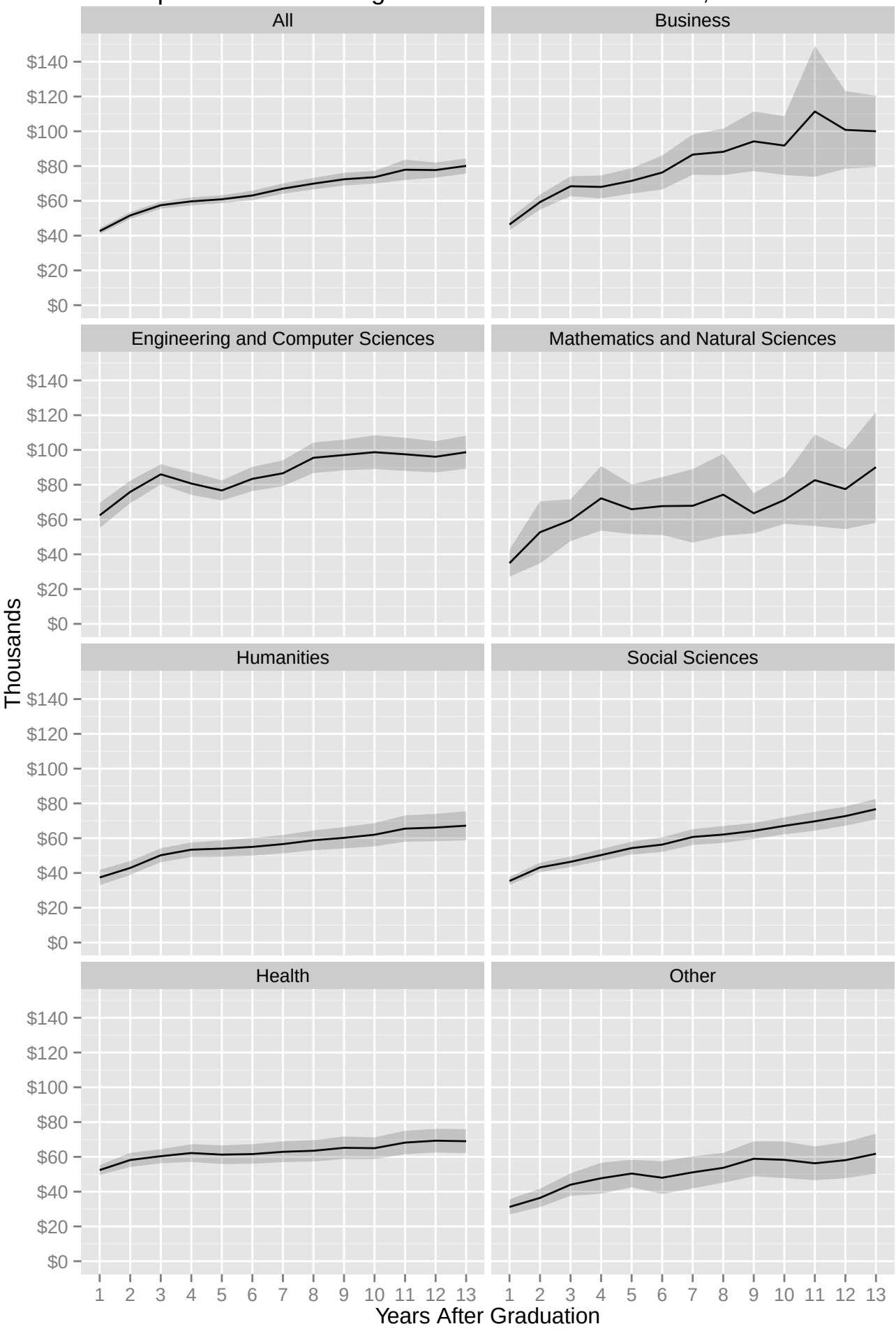
Faculty groups in the 1998 cohort with the largest differences between the upper and lower limits of actual earnings were Mathematics and Natural Sciences, and Business. Business graduates began the 13 year period with a very tight confidence interval, but in the final year of analysis there was a $40,000 difference between the upper and lower limit. This result appears to be primarily driven by the fact that there were large differences in earnings among graduates of this group later on in their careers. The result for the Mathematics and Natural Sciences group is most likely driven by a small sample size, as this is the smallest of all faculty groupings.

Engineering and Computer Sciences, and Other graduates had moderate differences between the upper and lower limits of actual earnings for all the years after graduation (around $7,000). This result is probably driven by a combination of considerable differences in observed earnings for these graduates and the relatively small sample sizes of each group.

Graduates of the Humanities, Social Sciences and Health programs had narrow confidence intervals. As Humanities and Social Sciences are two of the largest faculty groups, the large sample sizes are likely to explain some of the small difference in variance. However, the results also suggest a relatively tight distribution in incomes, and this is especially true among graduates of Health program, who are fewer in number but whose incomes appear to be most evenly distributed (see the Distribution of Earnings section)

Looking at the confidence intervals in this way allows us to solidify some of the initial findings above. For example, the upper limit of actual earnings for the Humanities, and Other groups is lower than the lowest limit for the Business, and Engineering and Computer Sciences groups.

Graph 5: Mean Earnings With Confidence Intervals, 1998 Cohort



3. Cohorts Compared - the 1998 and 2004 Cohorts together

Graph 6 adds the earnings profile of the 2004 cohort on top of those of the 1998 cohort for comparative purposes.

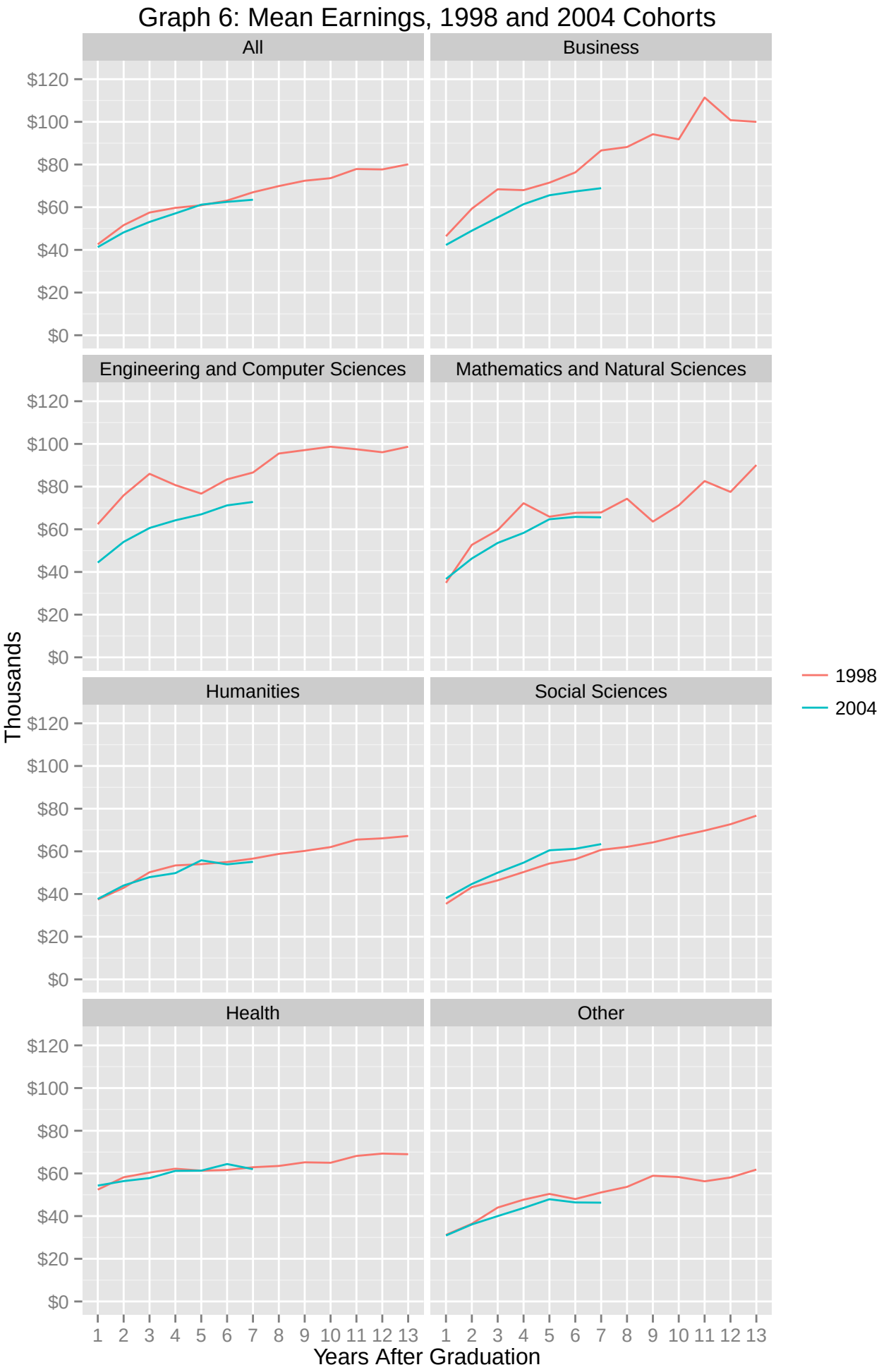
The 2004 cohort of graduates from the University of Ottawa taken together (All group), had 1st year earnings several thousand dollars lower than those of the 1998 cohort. For the first 4 years after graduation, the 2004 cohort earned less than the 1998 cohort at the same point in their careers. Only in year 5 after graduation (fiscal year 2003 for the 1998 cohort and fiscal year 2009 for the 2004 cohort) does the 2004 cohort register higher earnings than the 1998 cohort. For the remaining 2 years for which we have tax data for the 2004 cohort, this group of graduates continues to have lower earnings that the 1998 cohort at the same point in their careers.

The 2004 cohort of graduates from Engineering and Computer Sciences entered the workforce at the trough of the dot-com bust and this is reflected in their substantially lower 1st year earnings. These graduates had mean 1st year earnings of around $45,000, only somewhat higher than the 1st year earnings of the University of Ottawa average for the same cohort (around $42,000). For the remainder of the timeframe for which we have data on the 2004 cohort, graduates of Engineering and Computer Sciences programs saw their earnings increase year-over-year but never reaching the same level of earnings for a given year after graduation as those of the 1998 cohort of graduates of the same faculty group.

The 2004 cohort of graduates from the Mathematics and Natural Sciences group had slightly higher 1st year earnings compared to those of the 1998 cohort from the same faculty group. The later cohort experienced less volatility in earnings over the 7 year period for which we have data, but earned less than the 1998 cohort at every year after graduation.

Business graduates from the 2004 cohort had lower 1st year earnings than Business graduates from the 1998 cohort. The 2004 cohort's earnings, nevertheless, increased year-over-year for the 7 years for which we have tax data. At no point in time are earnings of the 2004 cohort higher than those of the 1998 cohort of Business graduates at the same point in their careers.

Health, Humanities and Social Sciences graduates had similar earnings profiles for each of the two cohorts compared. The 2004 cohort began with slightly higher 1st year earnings than the 1998 cohort in each faculty group, but only in the Social Sciences group was this relationship


Graph 6: Mean Earnings, 1998 and 2004 Cohorts
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
$120
$100
$80
$60
$40
$20
$0
Thousands
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
1998
2004

maintained for the duration of the 7 years for which we have tax data. For both the Humanities and Health faculty groups, earnings between the two cohorts varied only slightly for any given year after graduation.

Finally, the 2004 cohort from the Other faculty group started with earnings similar to those of the 1998 cohort of the same group. At year 2 after graduation, however, and for all subsequent years, the 2004 cohort earned less relative to the 1998 cohort.

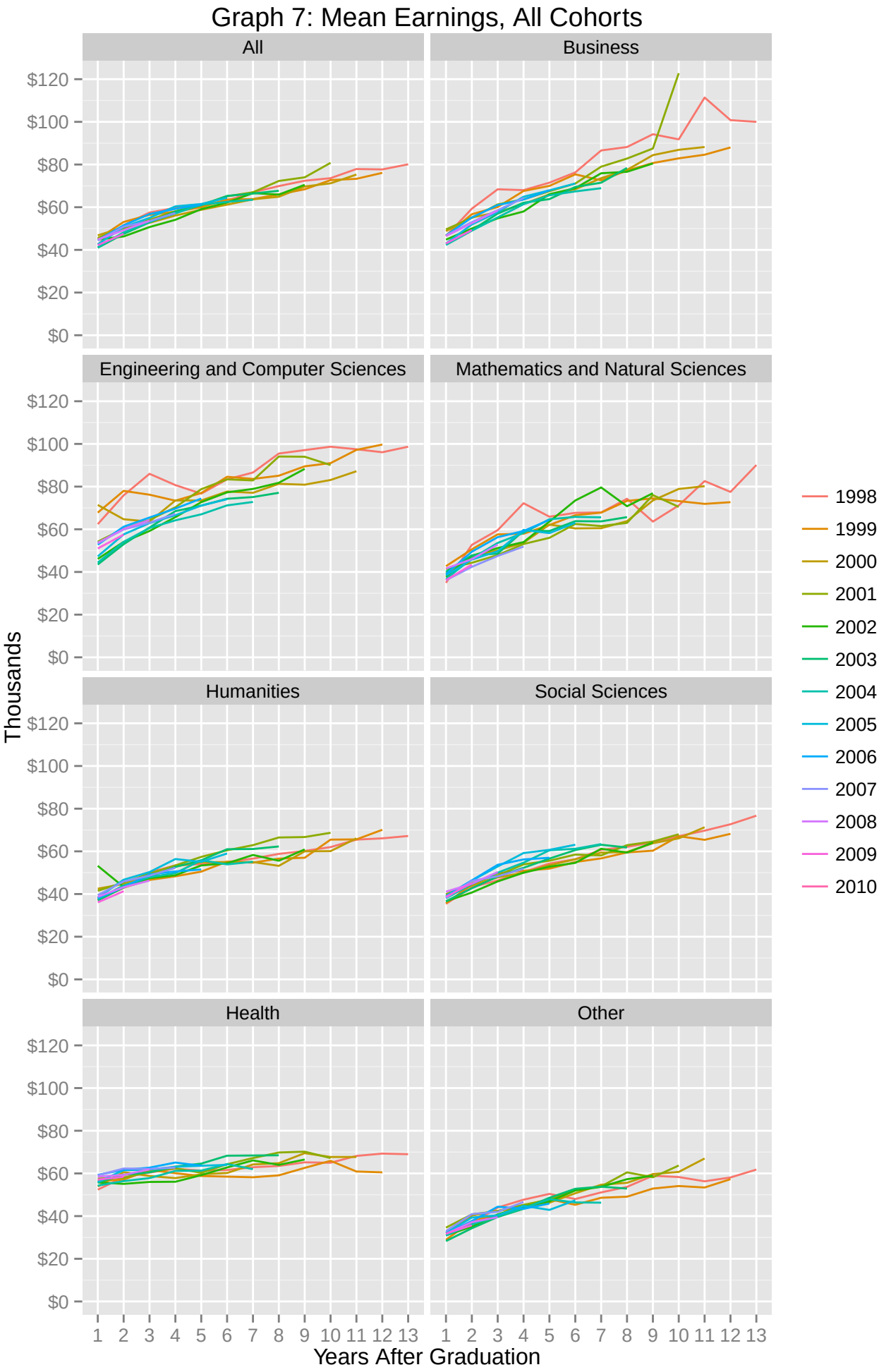
4. All Cohorts Together

Graph 7 groups the earnings profiles of all 13 cohorts together for each faculty group and allows us to see the how the various cohorts compare.

What is most evident at first glance is that there are differences between cohorts in each faculty group and that, in some cases, longer-run earnings patterns tend to reflect starting earnings levels. We also observe that some areas of study have stable earnings profiles while others have variable ones, with some cohorts deviating greatly from others with respect to earnings at a given year after graduation.

The earnings profiles of a majority of the faculty groups are fairly stable, with earnings of the cohorts in these groups deviating only slightly from each other for any year after graduation. Health, Humanities, Social Sciences and Other are the faculty groups with earnings profiles that change least. Although 1st year earnings tend to vary between cohorts for these three faculty groups, this variation is contained within $10,000 for each of the groups (the only exception being the 2002 cohort in the Humanities group).

There is considerably more variability in earnings profiles between the cohorts of graduates from Engineering and Computer Sciences, Mathematics and Natural Sciences and Business. This is particularly evident when looking at the 1st year earnings of the Engineering and Computer Sciences group. The first three cohort (1998, 1999 and 2000) had significantly higher 1st year earnings than all the other cohorts in this faculty group, while also exhibiting much more variability in earnings year-over-year throughout the course of their careers. For Business graduates, the variability appears later in the earnings profiles for each cohort, with the 1998 and 2001 cohorts deviating greatly from the others. Similar to the Business graduates, the earnings profiles of Mathematics and Natural Sciences cohorts exhibit variability in the middle to later years.


Graph 7: Mean Earnings, All Cohorts
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
$120
$100
$80
$60
$40
$20
$0
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

5. Selected Cohorts - 1998, 2000, 2004, 2008

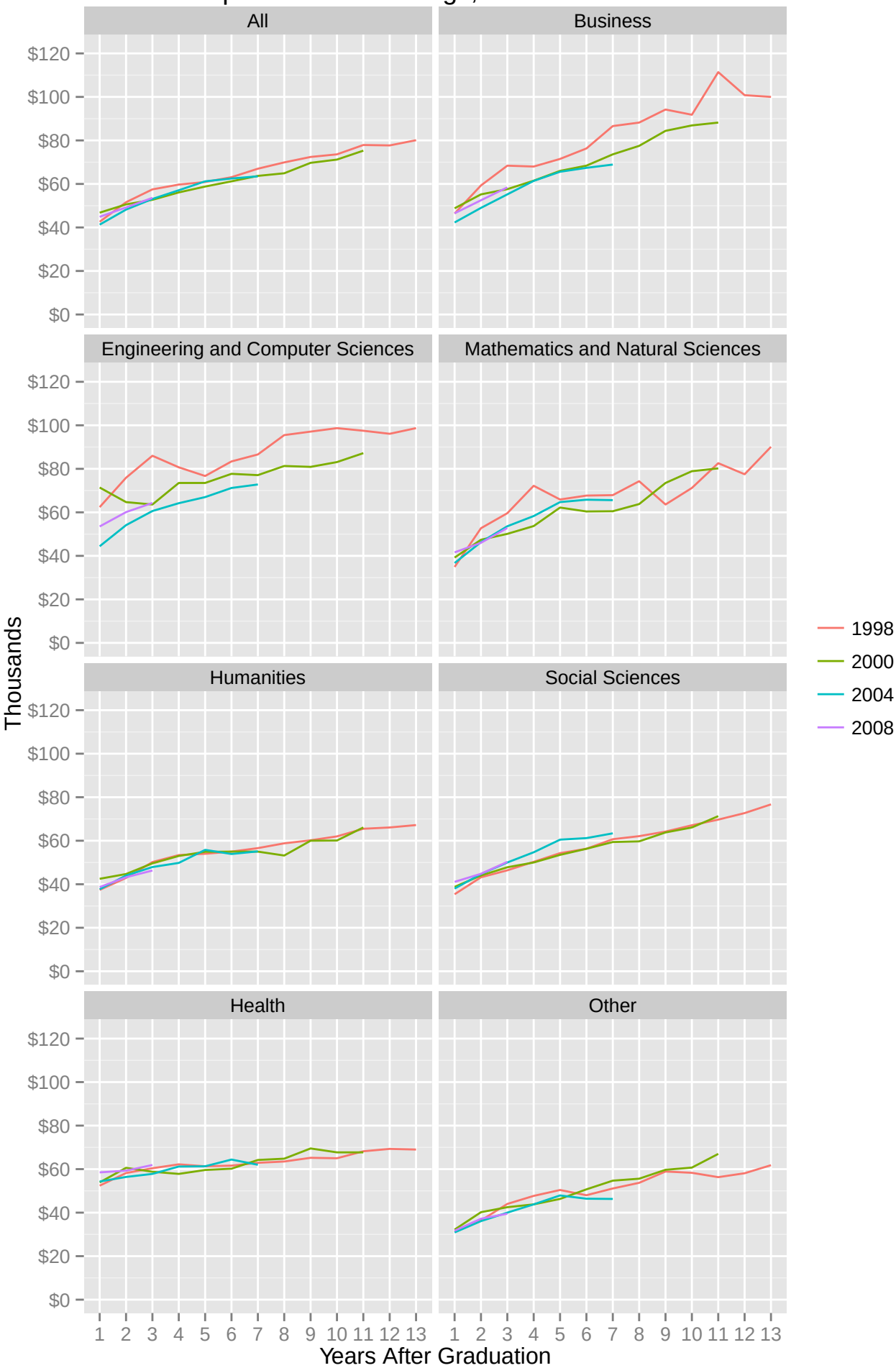
Graph 8 keeps only four cohorts from Graph 7, allowing us to observe the earnings profiles of a sample of representative cohorts. Below, we compare the earnings profiles of graduates from these four cohorts for each faculty group.

All graduates of the 2000 cohort of the University of Ottawa pooled together (All group) had higher 1st year earnings than the 1998, 2004 and 2008 cohorts. At year 3 after graduation, however, and for all subsequent years thereafter, with the exception of year 7, this cohort earned less than the other three cohorts at a given year after graduation. Earnings increase year-over-year for this cohort, including through fiscal years 2008 and 2009 (years 8 and 9 after graduation). Graduates of the 2004 cohort registered the lowest 1st year earnings but experienced steady growth in earnings all the way to the 5th year after graduation (fiscal year 2009), at which point they registered the highest earnings of the selected cohorts. The 2008 cohort had the second-highest 1st year earnings of the four selected cohorts. Their earnings rose over the 3 year period for which we have information, surpassing the earnings of the 2000 and 2004 cohorts at year 3 after graduation but not reaching the same earnings level as the 1998 cohort.

The 2000 cohort of graduates from Engineering and Computer Sciences programs entered the workforce immediately before the dot-com bust. Although the 1st year earnings of graduates in this cohort were the highest of the four selected cohorts, at around $70,000, the earnings steadily decreased for the first 3 years after graduation (until fiscal year 2003). The earnings of this cohort never surpass the earnings of the 1998 cohort of Engineering and Computer Sciences graduates at the same point in their careers. The 2004 cohort of graduates entered the workforce at the trough of the dot-com bust and, as a result, had the lowest 1st year earnings of any of the four cohorts (around $45,000). For the remainder of the period for which we have data, this cohort of Engineering and Computer Sciences graduates saw their earnings increase year-over-year but never surpassing the earnings levels of the other three cohorts. Graduates in the 2008 cohort had 1st year earnings higher than only those of the 2004 cohort. For each of the 3 years for which we have tax information, this cohort registered increasing earnings, surpassing the earnings of the 2000 cohort at year 3 after graduation.

Graduates from the Mathematics and Natural Sciences programs part of the 2000 cohort registered the second highest 1st year earnings of the selected cohorts for this faculty group. From

Graph 8: Mean Earnings, Selected Cohorts



year 3 after graduation to year 8 after graduation this cohort had the lowest earnings. The 2004 cohort registered 1st year earnings slightly higher than those of the 1998 cohort but had lower earnings than the 1998 cohort for all subsequent years. Cohort 2008 had the highest 1st year earnings but had lower earnings than cohorts 1998 and 2004 at each year after graduation for the 2 remaining years for which we have data.

The 2000 cohort of Business graduates had the highest 1st year earnings of the selected Business cohorts. Although this cohort started with the highest earnings, and saw its earnings increase year-over-year, this cohort had lower earnings at every year after graduation than the 1998 cohort. The 2004 cohort started with the lowest 1st year earnings of the four selected Business cohorts and earned less at every year after graduation that the other four. Finally, the 2008 cohort started with 1st year earnings roughly equivalent to those of the 1998 cohort, but did not see the same increases year-over-year for the first 3 years evident in the 1998 cohort's profile. At year 3 after graduation, the 2008 cohort was the second highest earning, behind only the 1998 cohort.

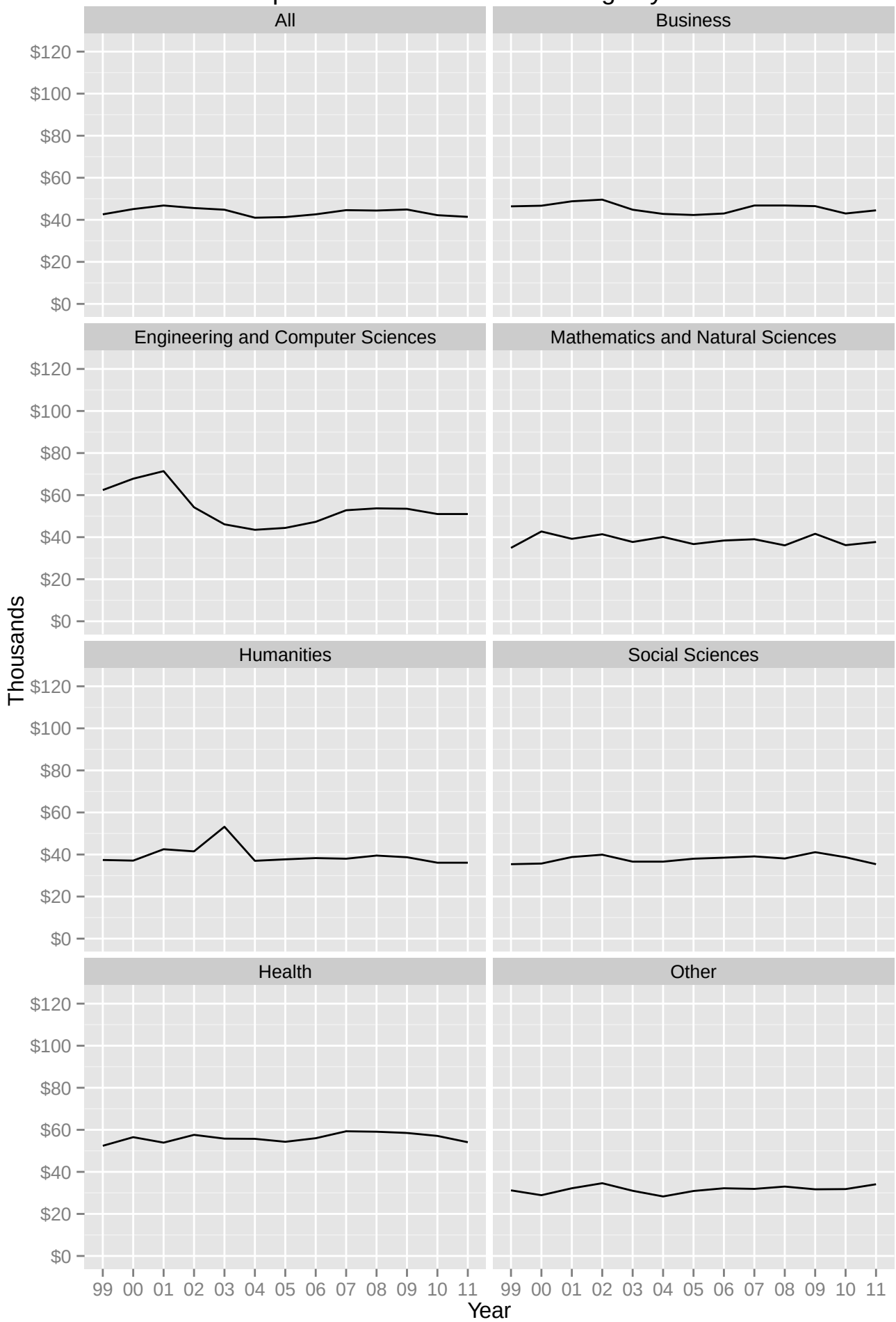
The earnings profiles of the four selected cohorts of graduates of Health programs follow very similar patterns. Later cohorts registered increasingly higher 1st year earnings, with the 2008 cohort earning close to $10,000 more than the 1998 cohort. Unlike the 1998 cohort of Business, Mathematics and Natural Sciences, and Engineering and Computer Sciences graduates, the 1998 cohort of Health graduates does no better than the other three Health cohorts over time.

Similar to the cohorts from the Health faculty group, all the cohorts of Humanities graduates and Social Sciences graduates follow similar patterns with the later cohorts having higher 1st year earnings. The only exception to this being the 2000 cohort in both the Humanities and Social Sciences, where it registered the highest 1st year earnings of all the cohorts (Humanities) and the second highest (Social Sciences). As in the Health faculty group, the 1998 cohort does no better than the other three cohorts in each of the Humanities and Social Sciences faculty groups.

6. First Year Earnings

Graph 9 profiles only the 1st year mean earnings of each cohort from the faculty groups examined, but presents the information by fiscal/tax year. Fiscal year 1999 indicates the 1st year earnings of the 1998 cohort, fiscal year 2000 indicates the 1st year earnings of the 1999 cohort

Graph 9: First Year Mean Earnings by Cohort



and so on until fiscal year 2011, which indicates the 1st year earnings of the 2010 cohort.

As is evident in Graph 9, 1st year mean earnings of all graduates of the University of Ottawa pooled together (All group) have decreased slightly over the period covered by this analysis. The 1998 cohort had 1st year earnings of around $42,500 (fiscal year 1999), which decreased to around $41,000 for the 2010 cohort (fiscal year 2011). The highest 1st year earnings were registered by the 2000 cohort (fiscal year 2001), when 1st year earnings were around $47,000, and the second highest were registered by cohort 2008 (fiscal year 2009).

Graduates from the Engineering and Computer Sciences group had the highest 1st year earnings of all graduates between years 1999 and 2001. During this period, this group had 1st year earnings between $20,000 (in 1999) and $35,000 (in 2001) higher than the university average (All group). In 2001, 1st year earnings for these graduates was more than $70,000. Between years 2001 and 2004, 1st year earnings for Engineering and Computer Sciences graduates decreased by around $30,000, with the 2003 cohort earning close to $43,000 in their 1st year after graduation. 1st year earnings rebounded quickly between years 2004 and 2007, and are followed by a period of slight decreases, perhaps as a result of the recession of 2008. At the end of the 13 year period, 1st year earnings of the 2010 cohort are around $51,000, significantly higher for that year than most other faculty groups examined.

Graduates of Mathematics and Natural Sciences programs had very volatile 1st year earnings over the course of the 13 years covered by this analysis. In 1999, 1st year earnings of this group was around $35,000. 1st year earnings are seen to increase one year, then decrease in the next, for all but one year out of 13. At the end of the time period for which we have data, Math and Natural Sciences graduates had 1st year earnings of around $37,500.

Business graduates in 1999 had 1st year earnings of around $46,000, somewhat higher than the sample mean (All group). The highest 1st year earnings were registered in year 2002 (cohort 2001), where 1st year earnings were just under $50,000. Between 2002 and 2005, these graduates registered decreasing 1st year earnings year-over-year, bottoming out at around $42,500. At the end of the period covered by this analysis, Business graduates from the 2010 cohort registered 1st year earnings just under $45,000.

The Health faculty group had the second highest 1st year earnings in 1999 (around $52,000), second only to the Engineering and Computer Sciences group. During the first 7 years

of the period covered by this analysis (between years 1999 and 2005), 1st year earnings went through a period of volatility. Health graduates registered the highest 1st year earnings in year 2007 (cohort 2006), with earnings just under $60,000. At the end of the 13 year period graduates of Health programs had 1st year earnings close to $55,000. This group is one of the few to have 1st year earnings higher at the end of the period covered by this analysis than at the beginning.

Humanities graduates had 1st year earnings of around $37,500 in 1999. There is a large increase in 1st year earnings between 2002 and 2003, a finding which would require further investigation to fully understand but appears to be driven by a small number of strong earners. At the end of the 13 year period, these graduates have earnings roughly similar to those of the 1998 cohort (around $36,000). Similarly, Social Sciences graduates in 2010 had the same 1st year earnings as those of Social Science graduates in 1998. Highest 1st year earnings of Social Science graduates were observed in 2009, when this group earned around $41,000.

V.3. Distribution of Earnings

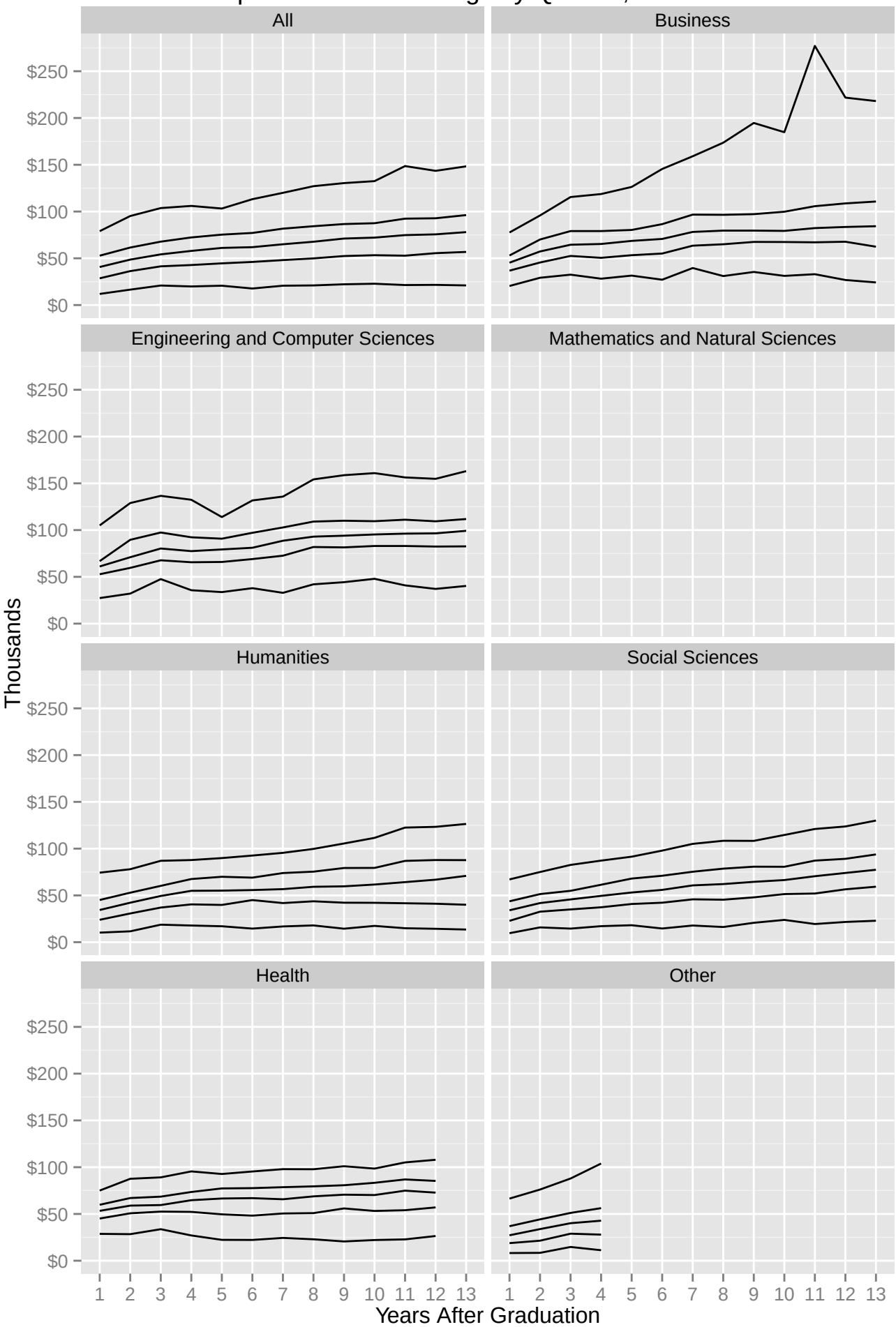
This section examines the distribution of earnings in selected cohorts by quintile. The earnings amounts presented here do not represent quintile thresholds, but means obtained from a sample separated into 5 even-sized earnings groups. Because we are not interested in individual outcomes but rather the aggregate earnings, we allow individuals to move between the quintiles across years.

1. 1998 Cohort - Quintiles

Graph 10 presents the distribution of earnings by quintile for the 1998 cohort of graduates. As we can see, there are significant differences between the lowest and the highest earning quintiles for each of the faculty groups examined in the 1998 cohort and these differences tend to grow over time.

For all University of Ottawa graduates taken together (All group), earnings of the lowest quintile started at around $12,000 in the 1st year after graduation and finished near $21,000 in year 13 after graduation, a difference of $9,000. This quintile's profile is fairly flat during the entire period of this analysis. The highest quintile moved from earning around $79,000 in the 1st year after graduation to close to $150,000 in year 13, an increase of $71,000 over the course of 13 years. The middle three quintiles, each separated from the other by around $12,500 in the 1st

Graph 10: Mean Earnings by Quintile, 1998 Cohort



year after graduation, follow roughly the same pattern with the differences widening slightly between each over time.

Of all the faculty groups examined in the 1998 cohort, Engineering and Computer Sciences graduates had the highest 1st year earnings for each of the top four quintiles. The top earning quintile of this group had 1st year earnings higher than $100,000, and finished the 13 year period with earnings higher than $160,000. The middle three quintiles had 1st year earnings that ranged between $50,000 and $66,000 and each moved to earning between $82,000 and $112,000 at year 13 after graduation. The lowest earning quintile moves from earning $27,000 to around $40,000.

Business graduates registered the largest difference in earnings between the highest and lowest earning quintiles at the end of the 13 year period for which we have data. The lowest earning quintile had 1st year earnings of around $20,000, while the top earning quintile registered 1st year earnings close to $77,000. The top earning quintile of Business graduates experiences the fastest increases in earnings year-over-year of all of the faculty groups examined and finished the 13 year period with earnings of around $218,000. The steep increase in earnings between years 10 and 11 after graduation, followed by an equally steep decrease between years 11 and 12, is puzzling, but likely represents exceptionally strong earnings in only one year among a small number of individuals. The middle three quintiles follow roughly similar overall patterns, with earnings increasing over time for each quintile and the differences between each growing.

The quintiles of graduates from Health programs in the 1998 cohort were more tightly clustered compared to the other faculty groups. The top earning quintile entered the workforce with earnings of around $68,000, while the lowest earning quintile earned $28,000 in the 1st year after graduation. Quintiles 2, 3 and 4 each had 1st year earnings close to $50,000. At the end of the period for which we have data for this cohort, the top earners were earning more than $100,000 while the lowest earners had earnings similar to those they had at year 1 after graduation (around $25,000).

Each quintile from the Humanities faculty group of the 1998 cohort had similar 1st year earnings as the comparable quintile from the Social Sciences group. Top earners from both groups earned around $75,000 in their 1st year after graduation, while the lowest earners earned around $10,000. Quintile 5 from both faculty groups finished the 13 year period with earnings

close to $125,000. The main difference between graduates of the Humanities and those of Social Sciences from this cohort appears to be how the middle 3 quintiles fared over time. Quintiles 2, 3 and 4 of graduates from Social Sciences had higher earnings at year 13 after graduation than did the same quintiles from the Humanities group.

There were insufficient sample sizes in both the Mathematics and Natural Sciences, and Other faculty groups to examine the distribution of earnings for this cohort.

2. 2004 Cohort - Quintiles

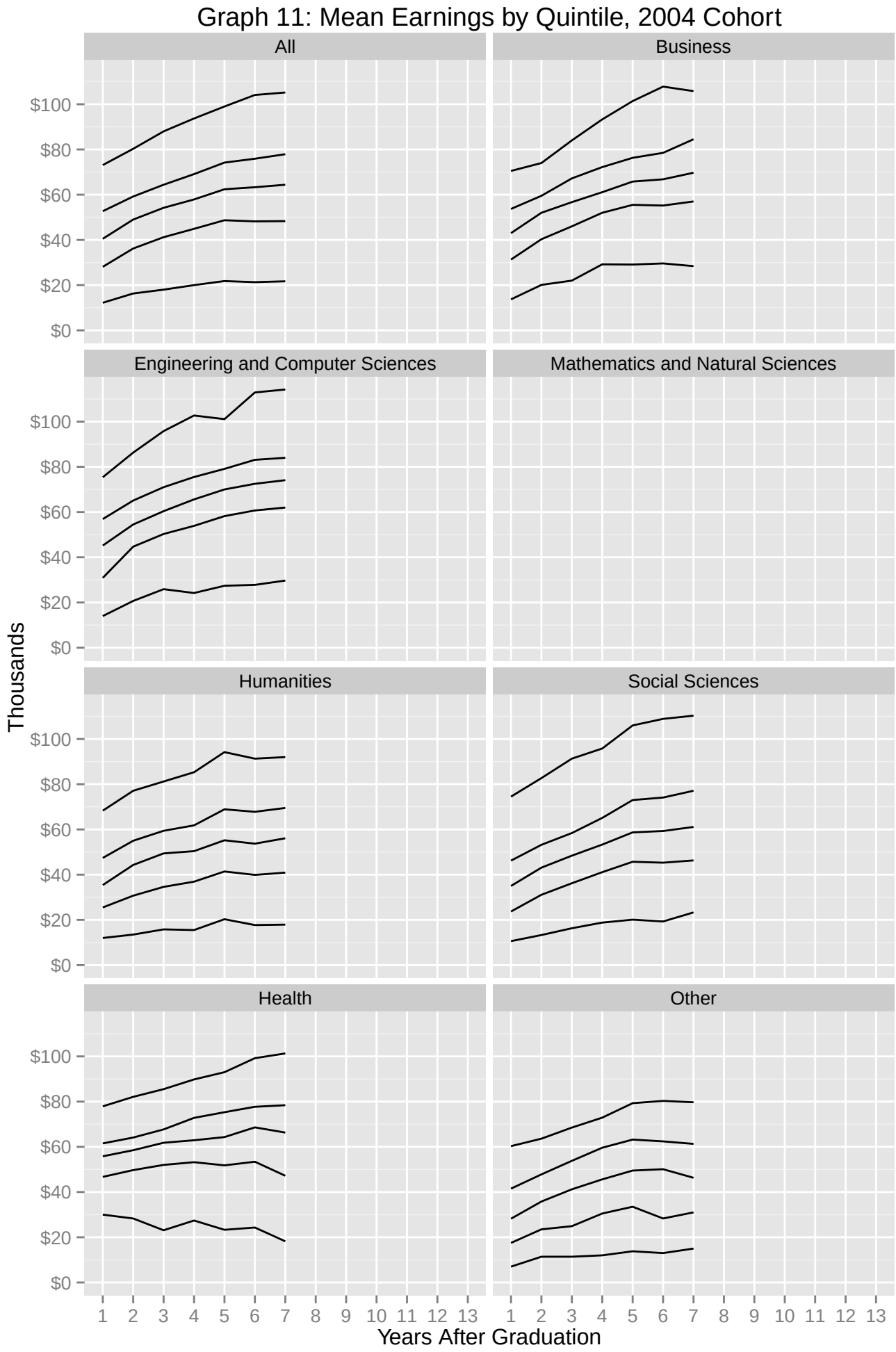
Graph 11 presents the distribution of earnings by quintile for the 2004 cohort of graduates.

The top earning quintile of all University of Ottawa graduates taken together from the 2004 cohort had 1st year earnings of around $75,000, while the lowest earning quintile registered 1st year earnings close to $12,000. Earnings increased year-over-year for each quintile and, after the 7 year period for which we have tax data, the top earning quintile had earnings higher than $100,000 while the lowest earning quintile had earnings of around $20,000.

Graduates of Engineering and Computer Science programs no longer registered the highest earnings relative to other faculties for most quintiles. The highest earning quintile entered the labour force with earnings of $75,000 and continued to register higher earnings for the duration of time for which we have data, finishing the 7 year period with earnings close to $115,000. The lowest earning quintile started with earnings of $14,000 and finished with earnings of $30,000. The middle three quintiles of this faculty group did somewhat better than the middle three quintiles from the sample mean during this 7 year period.

Business graduates of the 2004 cohort had earnings distributions very similar to those of the All group. At year 1 after graduation, the top quintile started with earnings of $70,000 and at year 7 had earnings of around $105,000. The lowest earning quintile moved from earning $13,000 to $28,000 over the 7 year period. The middle three quintiles each did slightly better than the corresponding quintile in the sample mean.

The 2004 cohort of graduates from Health programs had the highest 1st year earnings for each quintile relative to the other faculty groups. The top quintile had 1st year earnings of around $78,000, the 4th quintile had earnings of $62,000, the 3rd registered earnings of $56,000, the 2nd


Graph 11: Mean Earnings by Quintile, 2004 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
$0
$20
$40
$60
$80
$100
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation

earned around $47,000 and the lowest quintile had 1st year earnings of $30,000. After 7 years, the top quintile earned around $100,000. The lowest quintile of earners registered earnings of only $18,000 and the second lowest quintile had earnings of $47,000.

The distribution of earnings of the 2004 cohort of the Humanities and Social Sciences faculty groups were, again, roughly similar. Although each quintile in each group started with similar earnings, the main difference appears to be that each quintile of graduates of the Social Sciences had higher earnings at the end of the 7 year period.

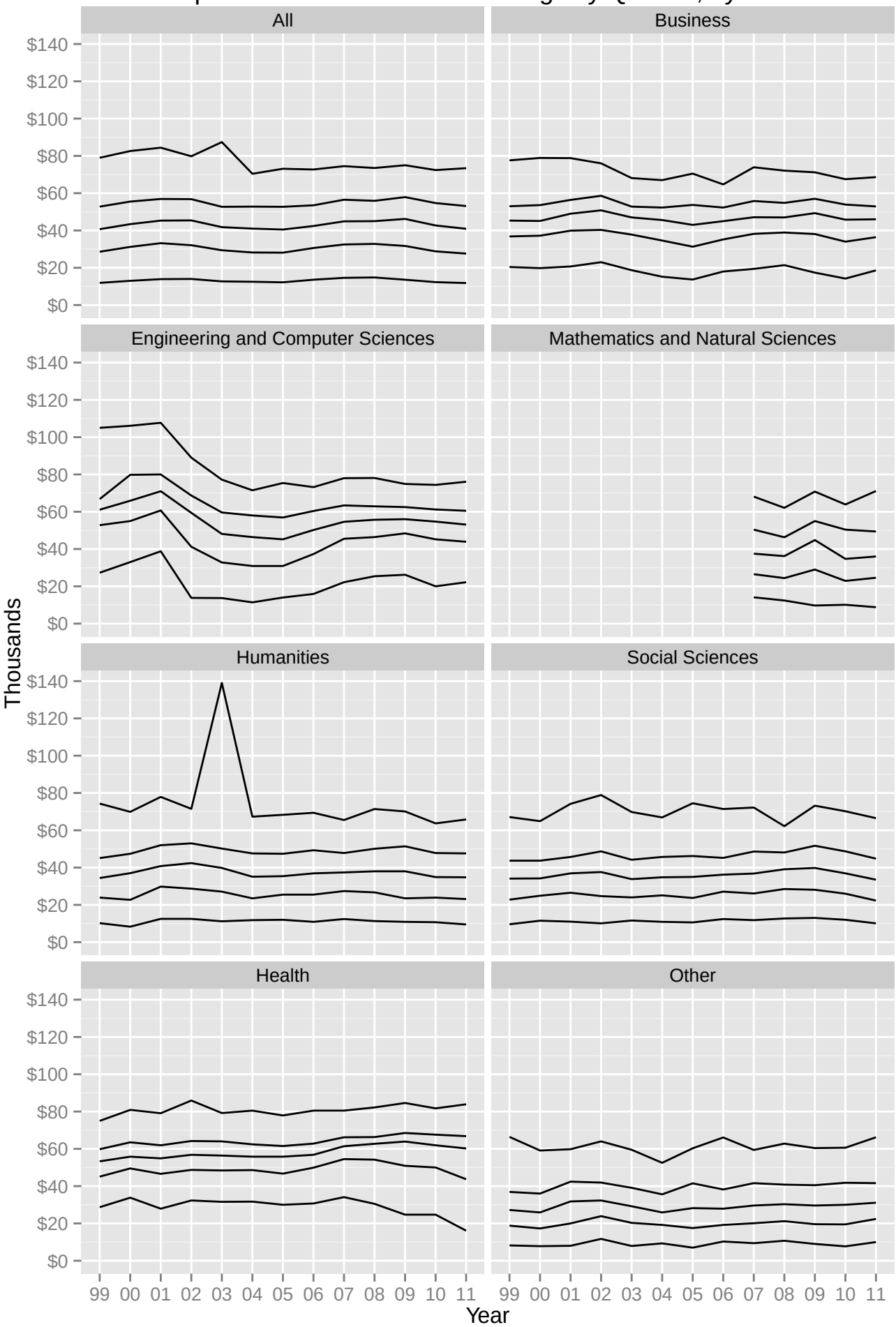
3. First Year Earnings - Quintiles

Graph 12 profiles the 1st year earnings of each of the faculty groups. As with other times when we look at 1st year earnings only, the information is presented by fiscal/tax year.

The distribution of 1st year earnings of all graduates from the University of Ottawa taken together (All group) is fairly stable across time for each quintile. All quintiles, except the top earning group, have roughly similar 1st year earnings in the first and last years of this analysis. Put another way, a graduate from the 2011 cohort earned on average the same in their 1st year as a graduate from the 1998 cohort. Quintile 5 has a large spike in 1st year earnings between years 2002 and 2004, a result driven primarily by the Humanities faculty group. Each of the three middle quintiles are separated from each other by around $10,000 for the entire 13 year period, while quintile 1 is separated from the nearest quintile by around $20,000 and quintile 5 is separated from its nearest quintile by almost $30,000.

The variability of 1st year earnings of graduates from Engineering and Computer Sciences programs is evident in all quintiles. The lowest earning quintile of these graduates had 1st year earnings close to $40,000 leading up to the dot-com bubble burst of 2001. Since then, this group has seen their 1st year earnings fall, varying between $15,000 and $25,000 per year for the remaining 10 years for which we have data. Quintile 2 of Engineering and Computer Sciences graduates followed the same pattern as quintile 1, with 1st year earnings at around $55,000-$60,000 leading up to 2001. Since 2001, this group's 1st year earnings have varied between $30,000-$50,000. Quintiles 3 and 4 follow a pattern similar to the 2nd quintile, but with less variability after 2004. The most impacted by the 2001 bubble was the top earning quintile of Engineering and Computer Sciences graduates. This group saw a large decrease in 1st year earnings between 2001 and 2004. In 2001, the 1st year mean earnings of the top earners was

Graph 12: First Year Mean Earnings by Quintile, by Cohort



around $130,000, and in 2004 this number had fallen to around $75,000. Since 2004, 1st year mean earnings of the fifth quintile have increased only slightly.

With the exception of the top earning quintile, Business graduates tended to have higher 1st year earnings for each quintile than the University average for the 13 years covered by the analysis. The top earning quintile had 1st year earnings close to $80,000 in 1999 and $75,000 in 2011, a decrease similar to that registered by the sample average. From lowest to highest, the middle three quintiles had earnings of $37,000, $45,000 and $54,000 in 1999 and registered roughly the same 1st year earnings in 2011. The lowest earning quintile does better than the University average, but in 2011 registers the same 1st year earnings as it did in 1999 (around $20,000).

The top three quintiles of Health graduates are amongst the few quintiles from any faculty group that register significantly higher 1st year earnings in year 2011 than in 1999. Even in 1999, these three quintiles were amongst the highest earners in their 1st year after graduation, with earnings of around $52,000, $60,000 and $76,000, respectively. After 13 years, the top three quintiles of Health graduates register 1st year earnings of $60,000, $68,000 and $84,000. Interestingly, much of the increase in 1st year earnings occur after 2006. The lowest two quintiles had lower 1st year earnings in 2011 than in 1998, with earnings dropping steadily after 2007.

Graduates from Humanities and Social Sciences had much larger differences in 1st year earnings between the middle three quintiles than graduates from the Health faculty group. The lowest earning quintiles of both Humanities and Social Sciences graduates had earnings of around $10,000, somewhat lower than those of the lowest quintile in the University average. The highest earning quintiles from both groups had 1st year earnings that were around $20,000 higher than the closest quintile, a pattern that continued in the Social Sciences group but not in the Humanities group in 2011.

V.4. Earnings by Gender

This section presents earnings profiles by gender. Breakdowns of cohorts (such as by gender) leads to smaller sample sizes and, therefore, increased suppression of data. This is the case for the Health and Mathematics and Natural Sciences faculty groups, whose sample sizes are highly skewed by gender. As a result, below we present only two complete earnings profiles, that of the 1998 and 2004 cohorts. We also present the 1st year earnings by faculty group. For the

remaining earnings profiles broken down by gender refer to the appendix.

1. 1998 Cohort

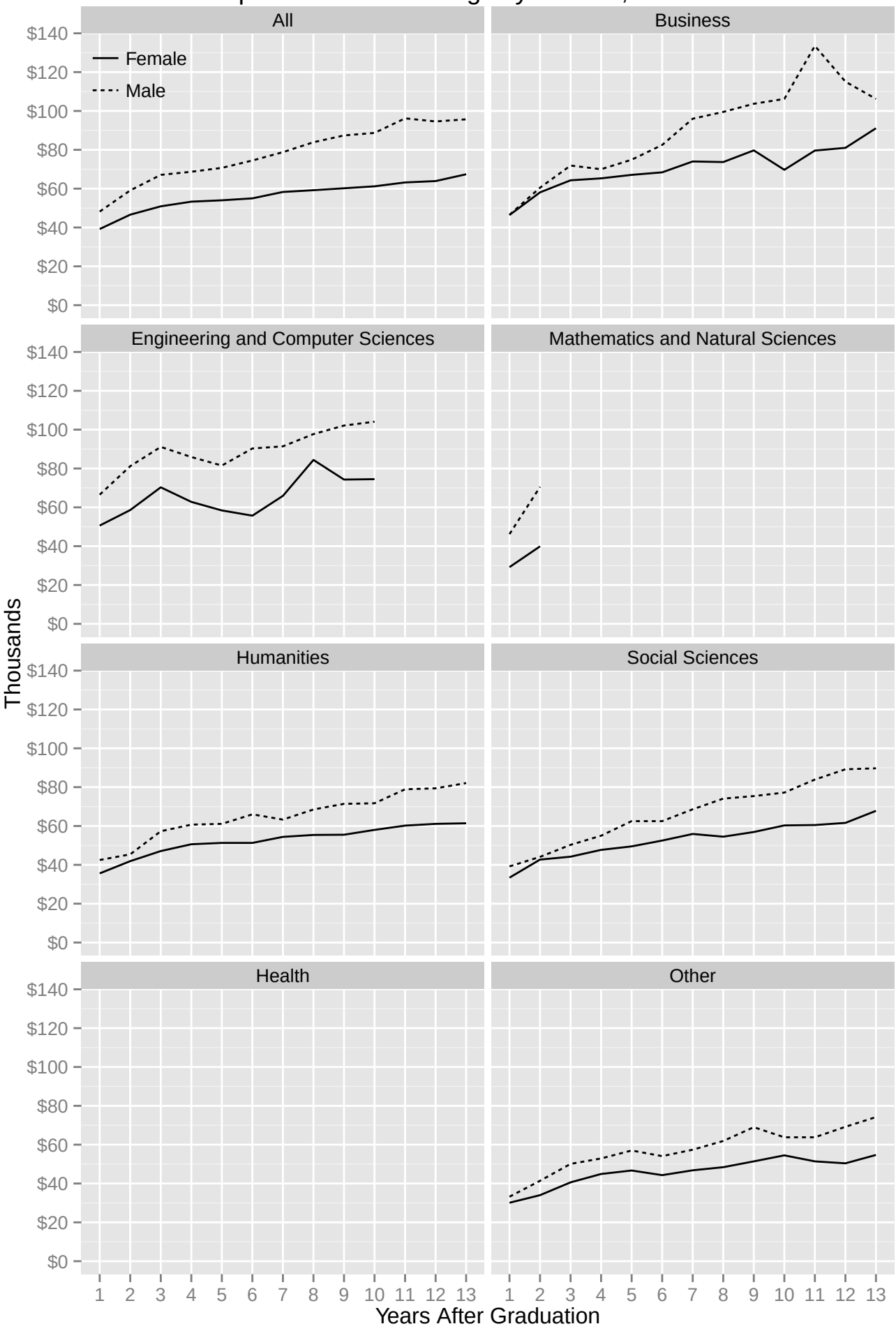
On average, men who graduated from the University of Ottawa in 1998 had higher earnings than female graduates. The earnings gap between men and women widens over time for all graduates taken together (All group) in the 1998 cohort. Although women start with earnings around $10,000 less than men in the 1st year after graduation, this gap widens to more than $20,000 at year 13 after graduation.

A similarly increasing income gap between men's and women's earnings is observed in the 1998 cohort of graduates from Business programs. At year 1 after graduation there is almost no difference in earnings between men and women. However, at 2 years after graduation and all subsequent years thereafter, a gap emerges. By year 13 after graduation men were earning around $17,000 more than women.

The earnings profile of the Engineering and Computer Sciences faculty group is particularly interesting when examined by gender. In the 1st year after graduation there is already an earnings differential, with men earning around $15,000 more than women. While both men and women see earnings increases in the first three years after graduation, women's earnings appear to be more affected by the dot-com bubble: they register a third consecutive decrease in earnings that is not evident in the men's profile in year 6 after graduation. Between years 6 and 8 after graduation (fiscal years 2004-2006), women narrow the gap but still earn around $8,000 less than men in year 8 after graduation. In the final year for which we have tax data, men registered an earnings premium of around $30,000.

Men from the 1998 cohort of graduates from the Humanities and Social Sciences earned more than women for each year after graduation. Much like for the other faculty groups, the earnings differential between men and women in both the Humanities and Social Sciences faculty groups starts small, but also grows over time. At the end of the 13 years, men were earning around $20,000 more than women in each of these faculty groups.

Graph 13: Mean Earnings by Gender, 1998 Cohort



2. 2004 Cohort

Unlike the 1998 cohort, both men and women of the 2004 cohort of graduates from the University of Ottawa (All group) had similar earnings at 1 year after graduation (both earned just over $40,000). Already in the second year after graduation men earned more than women, a pattern that continues and increases for the duration of the 7 years for which we have tax data. At year 7, men were earning around $10,000 more than women.

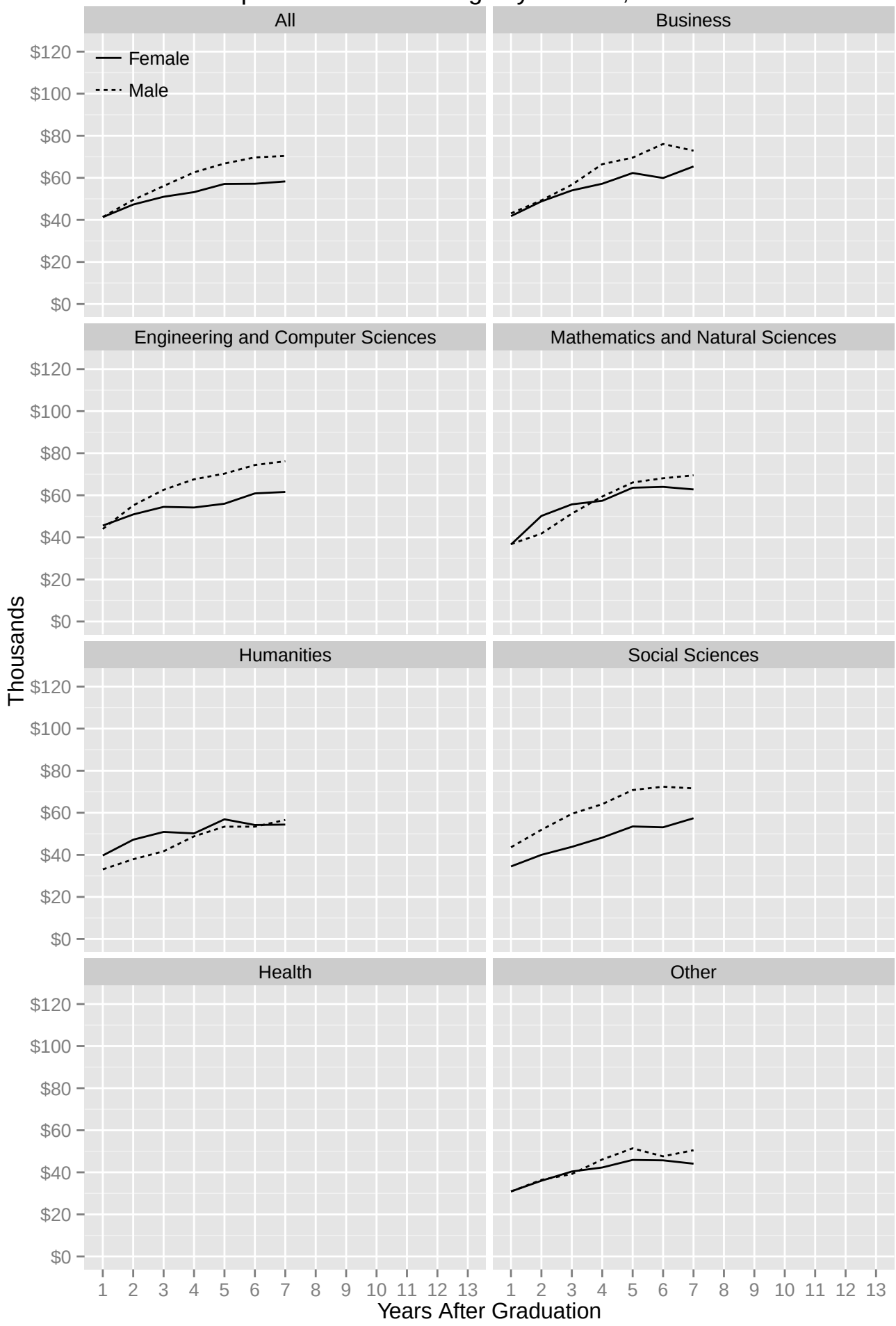
The pattern observed in the All faculty group is also visible in the 2004 cohort of Business graduates. Although men earned more than women in every year, a substantial gap is only observable starting in year 4 after graduation. Men in Business tended to have earnings roughly similar to the men in the All group, while female graduates of Business did substantially better than women in the All group. The difference in earnings at year 7 after graduation between men and women graduates from Business is smaller than the difference in the University of Ottawa average (around $5,000). Female graduates from Business had the highest earnings among women of any faculty group in the final year of analysis.

Female graduates from the Engineering and Computer Sciences faculty group of the 2004 cohort had slightly higher 1st year earnings than male graduates from the same programs. This trend, however, did not continue as men earned more in every year after graduation for which we have data. At the 7th year after graduation, women were earning around $15,000 less than men and had only slightly higher earnings than women from the All group.

Male and female graduates from the Mathematics and Natural Sciences faculty group part of the 2004 cohort had almost identical 1st year earnings. Women had higher earnings in years 2 and 3 after graduation, after which they earned less than men for the remained of the period for which we have data. Although at year 7, female graduates of this faculty group were earning around $8,000 less than men in the same group, these women were the second highest female earners in this cohort, behind only female graduates from Business programs.

There are significant differences in earnings outcomes of male and female graduates from the Social Sciences faculty group. Men had an earnings premium of around $10,000 in the 1st year after graduation and continued to earn more than women for each of the 7 years. Conversely, male and female graduates from the Humanities had very different relative outcomes. Women from the Humanities had higher earnings than men (around $8,000) at year 1

Graph 14: Mean Earnings by Gender, 2004 Cohort



after graduation and continued to have higher earnings for all but the last year for which we have data.

3. First Year Earnings

Graph 15 profiles only the 1st year earnings of men and women in each cohort from the faculty groups examined. Again, we present the information by fiscal/tax year.

In the University of Ottawa average (All group) men had substantially higher earnings (around $10,000 higher) than women in the 1st year after graduation from 1999 to 2004. Since 2004, however, 1st year earnings of men and women have tended to be similar, differing only by a few thousand dollars, with women having higher earnings in some years.

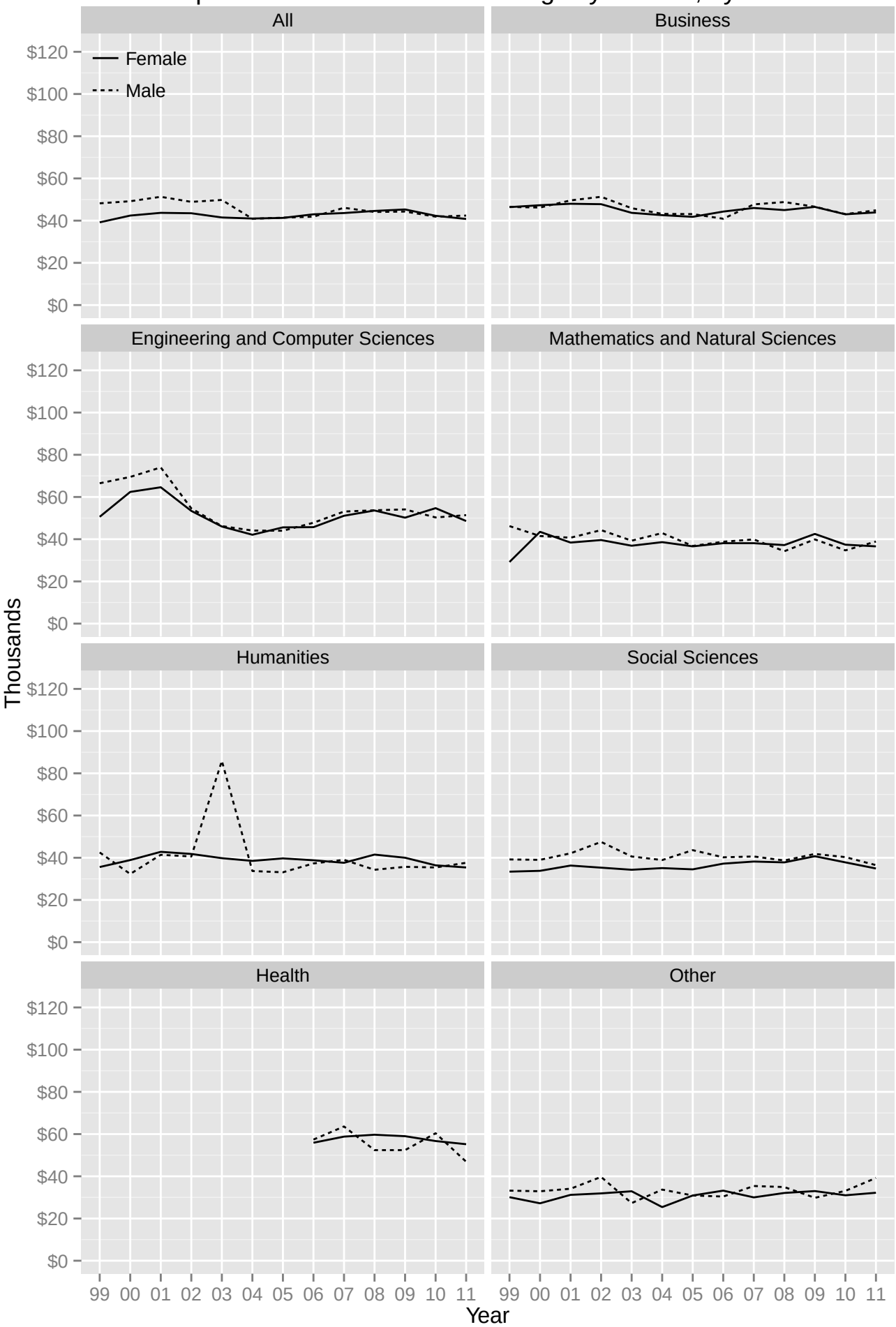
The earnings difference between male and female graduates from the Engineering and Computer Sciences faculty group was large between 1999 and 2001. After the bursting of the dot-com bubble, earnings of men and women equalized, but both dropped substantially. After 2004, 1st year earnings increased for both men and women roughly at the same rate.

Male graduates of Mathematics and Natural Sciences had 1st year earnings that were $15,000 higher than female graduates in 1999. In all subsequent years, and particularly after 2005, men and women who graduated from Mathematics and Natural Sciences programs had similar 1st year earnings.

Social Science graduates saw 1st year earning differences between men and women decrease over time. In 1999, male graduates were earning around $5,000 more than women graduates in their 1st year in the labour force. Although this gap is never eliminated, it narrows over the 13 years for which we have data.

Humanities was the only faculty were female graduates tended to have higher 1st year earnings than men for most of the years covered in this analysis. Notwithstanding a dramatic one year increase registered by male graduates in 2003, a result driven by a few high earning individuals, female graduates earned more in their 1st year after graduation in all but 4 years.

Graph 15: First Year Mean Earnings by Gender, by Cohort



VI. Conclusion

This report presents the results of a descriptive analysis of labour market outcomes of graduates of the University of Ottawa. We explore the earnings of graduates from different faculties on a cohort-by-cohort basis using a unique dataset which links university administrative data held on graduates with tax record data.

The findings demonstrate that the number of students graduating from the University of Ottawa has increased over the 13 year period covered by this study. Those that performed best in the labour market appear to be graduates from Business, Engineering and Computer Sciences, and Health programs. Graduates of the Humanities and the Social Sciences tended to have earnings profiles similar to those of the university average.

Although some disciplines were better compensated relative to others, earnings in these disciplines tend to be more variable, suggesting a greater vulnerability to changes in the business cycle. For example, the dot-com bubble burst had a strongly negative effect on earnings of graduates from the Engineering and Computer Sciences group, while the earnings of other graduates remained more stable throughout the entire period of analysis.

In order to better understand some of the observed effects, and to ensure that these results are not exclusive to the University of Ottawa or to the regional economy, we would need to include more universities from various locations in the analysis. Doing so would give us a larger sample sizes of graduates from programs in which relatively few students enroll. Having a larger sample would allow us to generate meaningful employment rates and have more reliable outcomes of sub-populations, such as women.

With an expanded project of this type several kinds of additional analyses could be undertaken. For example, we could separate out the earnings profiles of specific programs in each faculty. In doing so, we would see if graduates of Economics programs do relatively better than graduates from Sociology programs, both of which are currently in the Social Sciences group. We could also examine the labour market outcomes of graduate students from different disciplines, not only comparing earnings outcomes between graduate students, but also between graduate and undergraduate students.

Various studies looking at student pathways through school, and their impacts on earnings, could also be conducted. Future analyses could, for example, look to see if there are

differences in earnings between students who participated in co-op programs, or for transfer students, versus those who took more traditional pathways through PSE. The co-op option in particular would allow us to observe if there exist labour market benefits after graduation for work experience while in school.

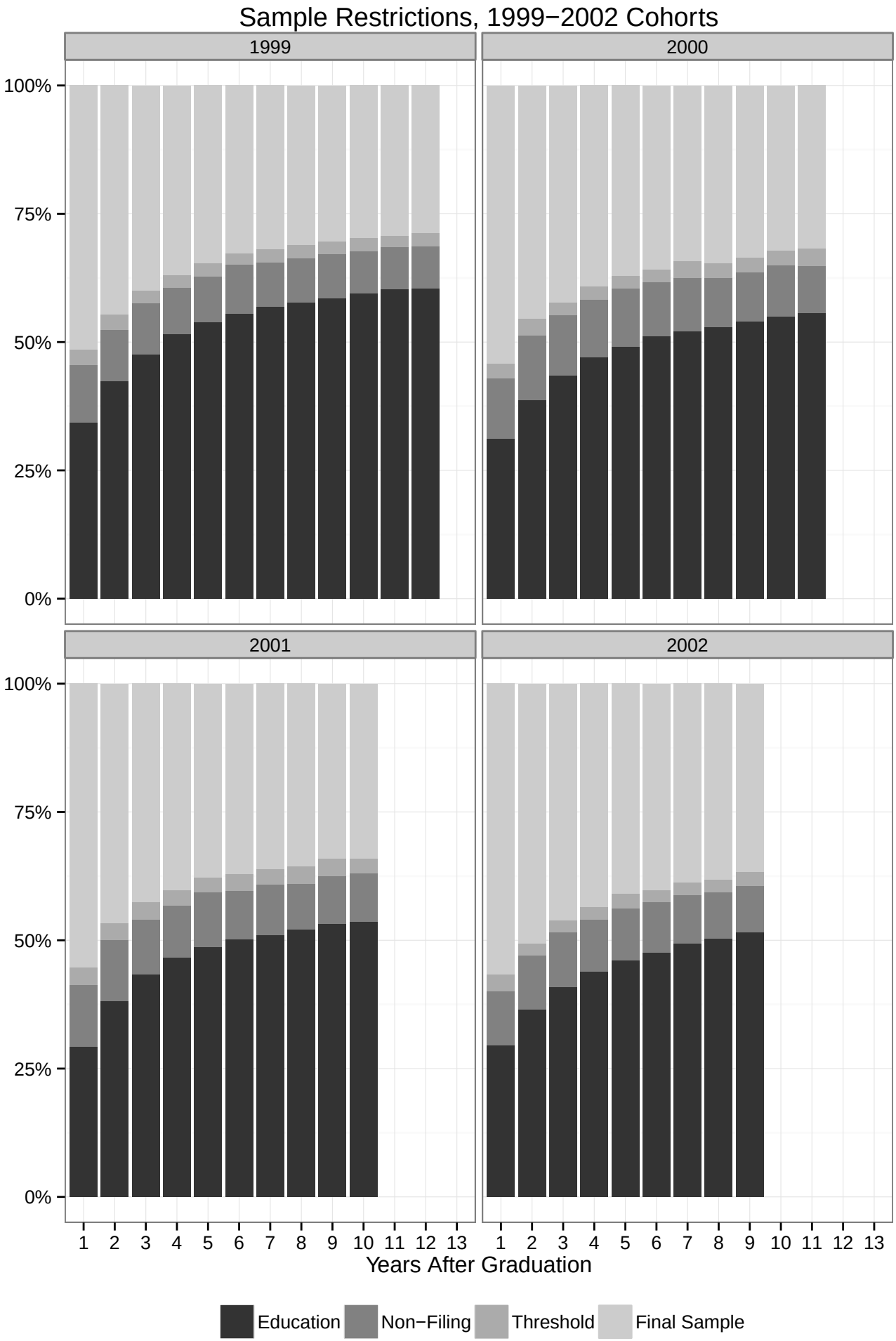
Labour market outcomes of students belonging to different socioeconomic groups could also be conducted with this type of data and this analytical framework. Such studies could examine, for example, the differences in labour market outcomes of international, Aboriginal, and immigrant students, relative to other types of students.

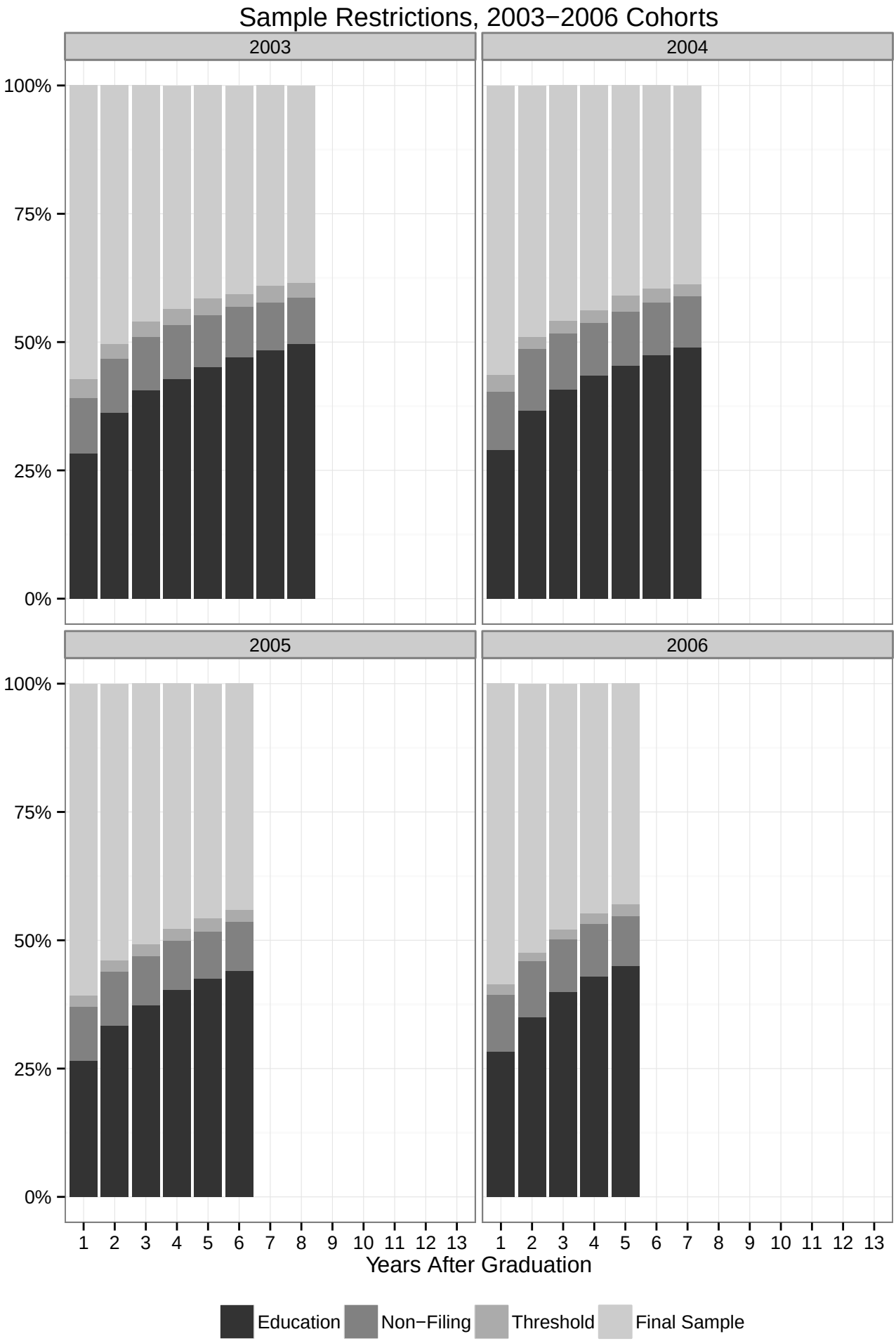
Finally, a variety of studies related to student performance while in PSE are also possible. This could include looking at the effects of academic performance on labour market outcomes. Including grades at entry into PSE (high school grades) would also allow us to further extend any such an analysis.

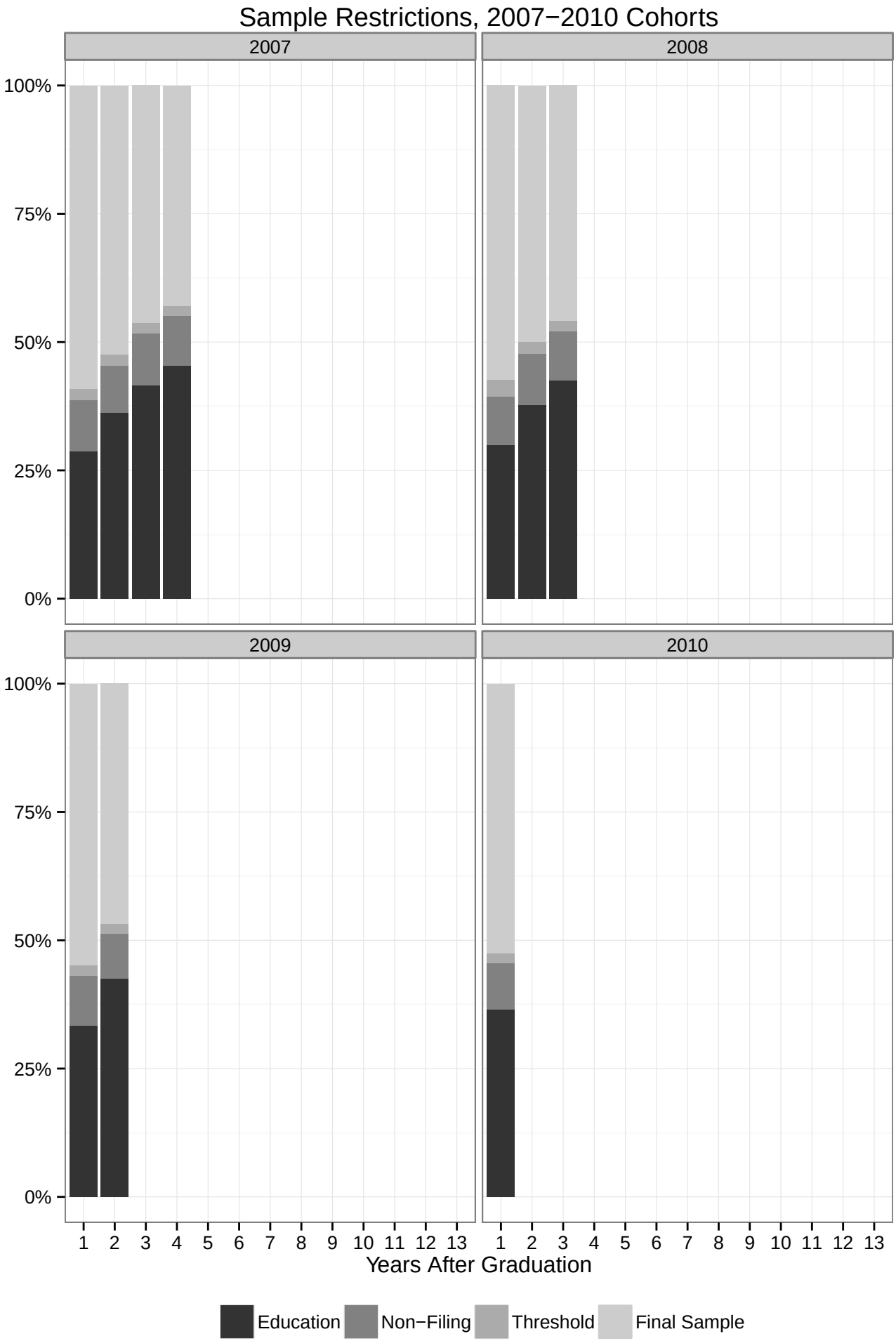
Some of the analyses suggested above could be undertaken, at least on a pilot basis, with the existing data from the University of Ottawa, perhaps with some relatively minor additions to the selection of variables available for analysis. In most cases, however, more institutions would be required to ensure sufficient sample size. Future projects of this type could, in particular, focus on including more PSE institutions from Ontario, giving researchers a more complete picture of the provincial economy, or a more provincially representative sample of the labour market outcomes of graduates from Ontario universities. The analysis could also be extended to include college graduates, which would seem like a natural, and extremely important, extension of the work.

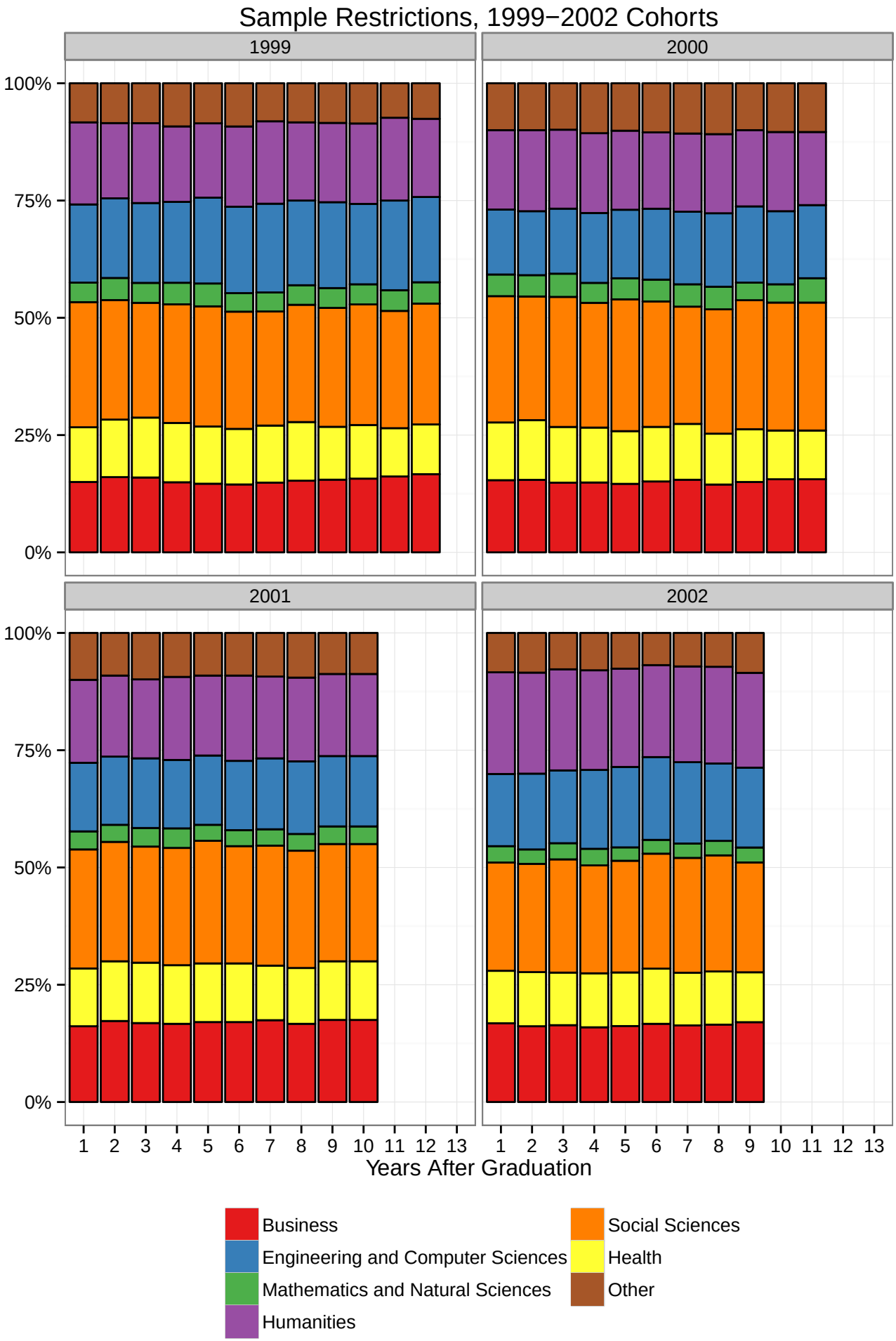
If the work were extended to include PSE institutions from across Canada, wider comparisons could also be made – even as each institution and each complete jurisdiction (e.g., different provinces) would presumably be interested in seeing how their graduates perform, on their own, or in comparison to elsewhere.

VII. Appendix


Sample Restrictions, 1999−2002 Cohorts
1999
2000
2001
2002
100%
75%
50%
25%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
Education
Non−Filing
Threshold
Final Sample


Sample Restrictions, 2003−2006 Cohorts
2003
2004
2005
2006
100%
75%
50%
25%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
Education
Non−Filing
Threshold
Final Sample


Sample Restrictions, 2007−2010 Cohorts
2007
2008
2009
2010
100%
75%
50%
25%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
Education
Non−Filing
Threshold
Final Sample


Sample Restrictions, 1999−2002 Cohorts
1999
2000
2001
2002
100%
75%
50%
25%
0%
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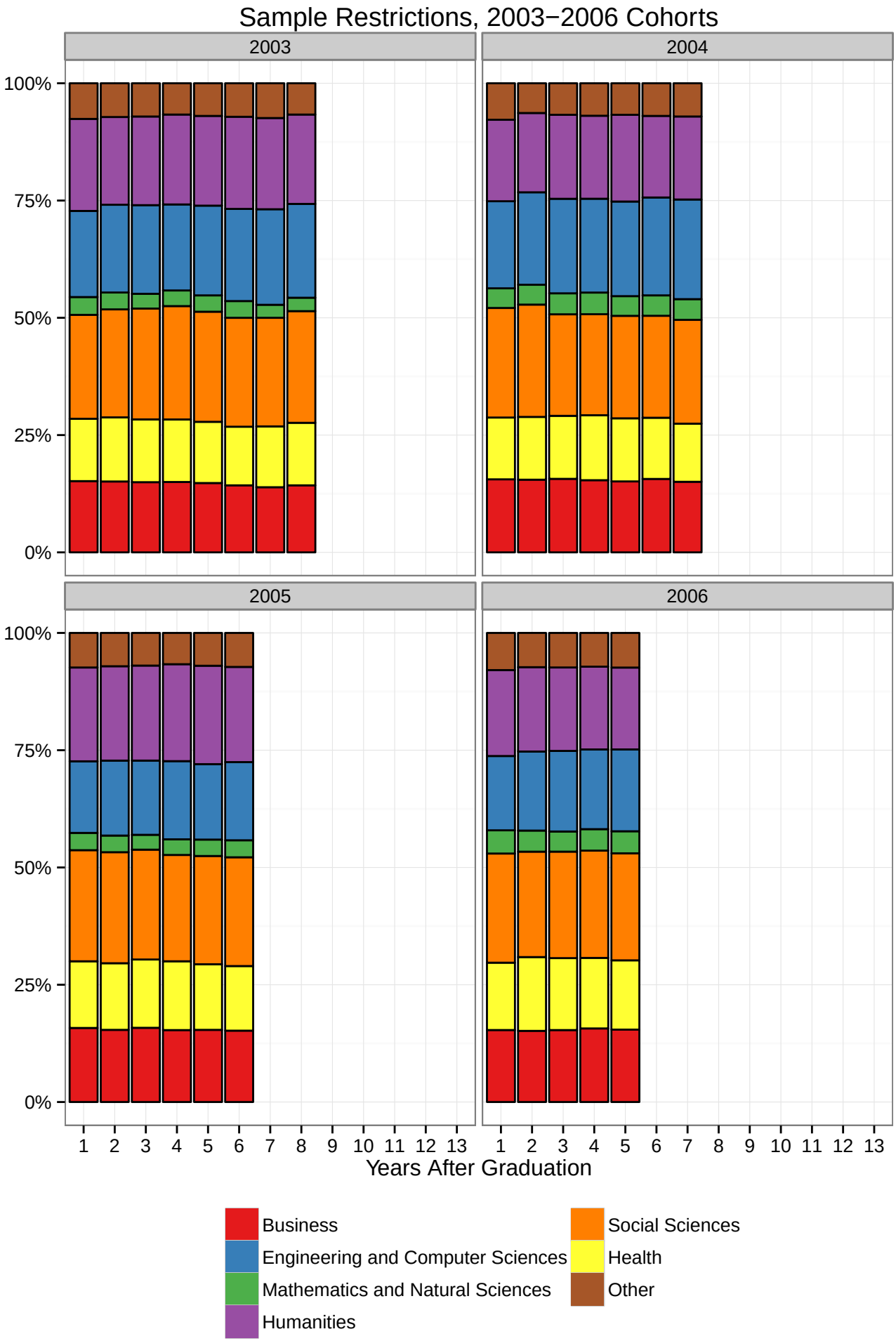
Years After Graduation
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other


Sample Restrictions, 2003−2006 Cohorts
2003
2004
2005
2006
100%
75%
50%
25%
0%
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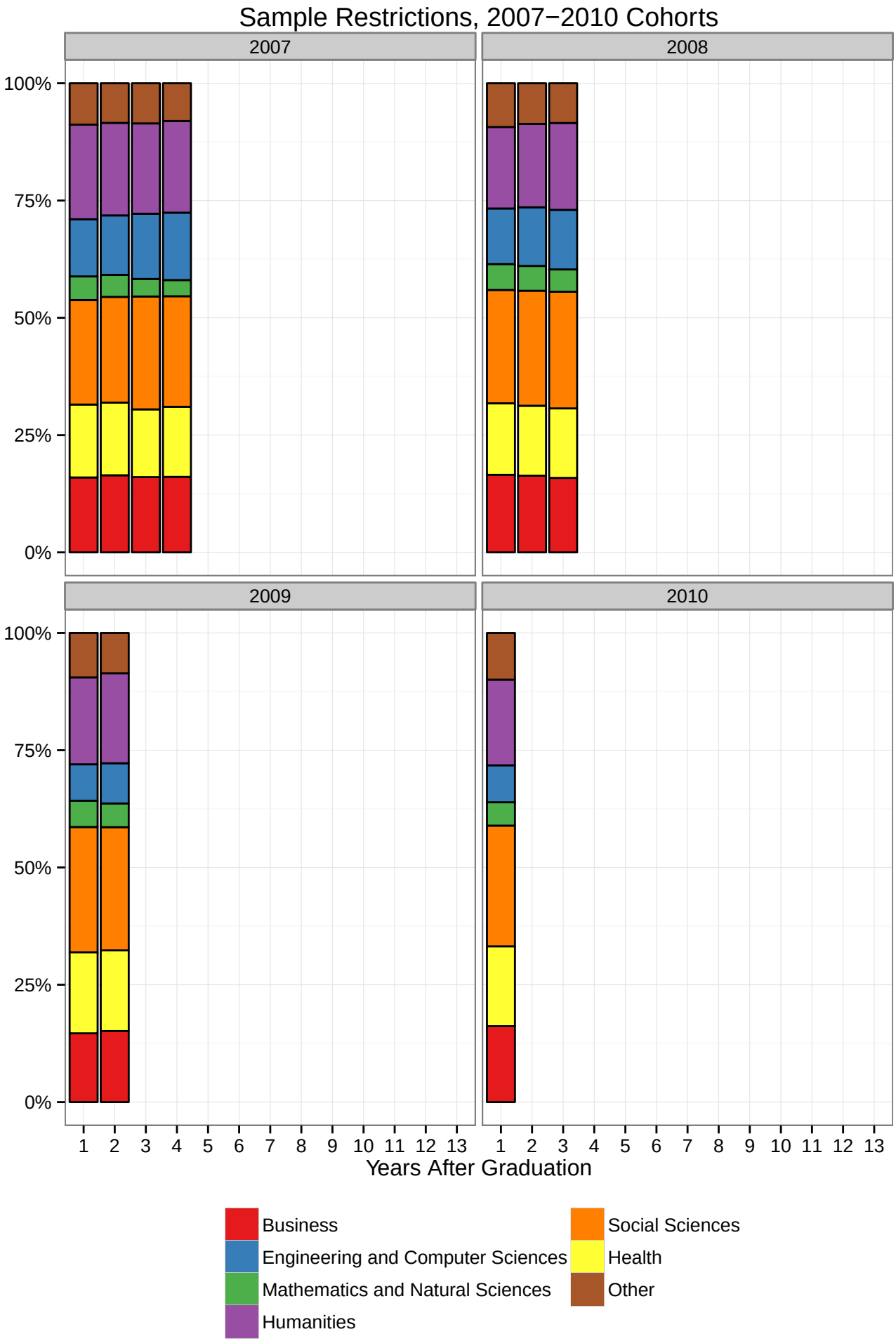
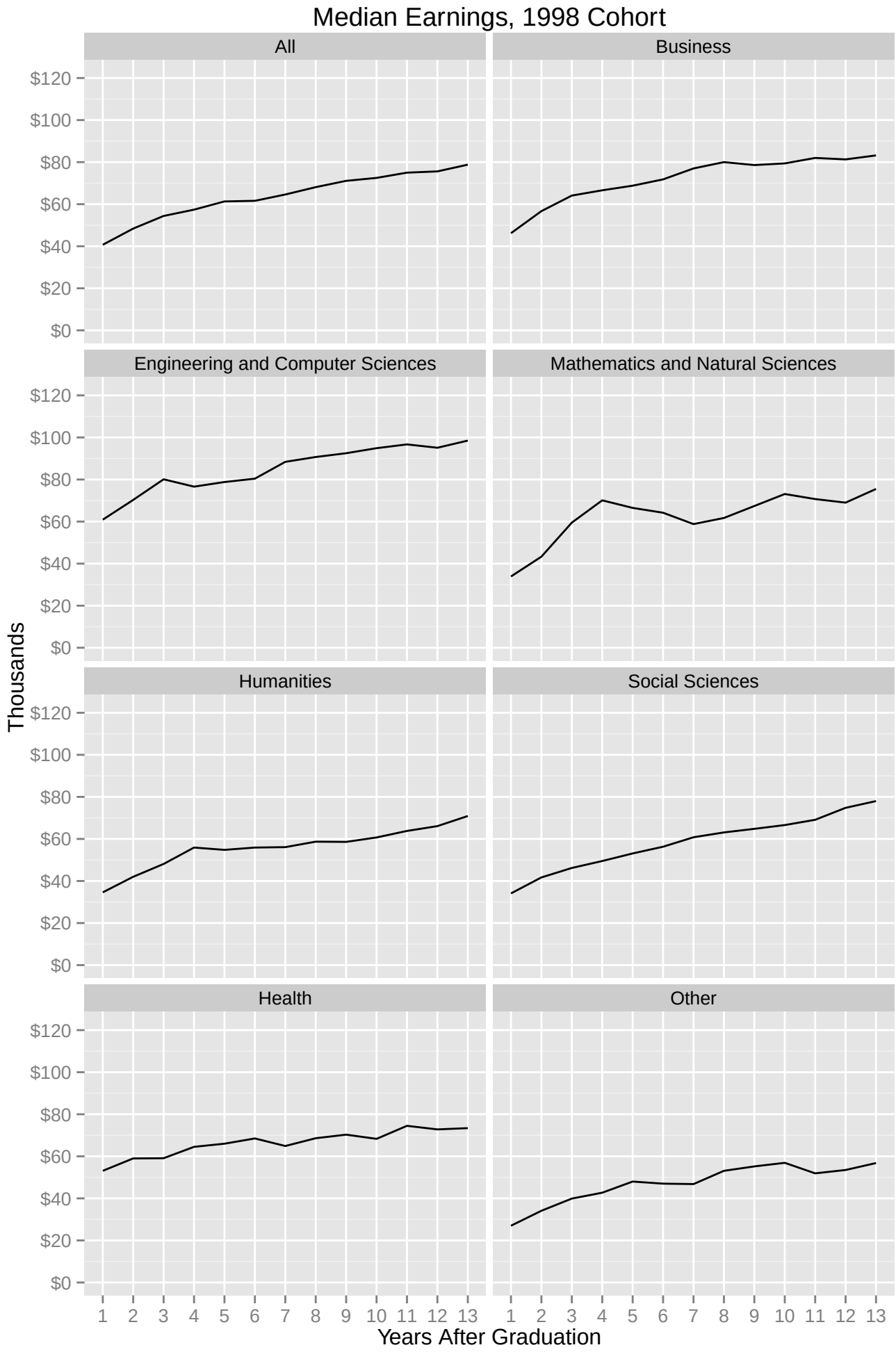
Years After Graduation
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other


Sample Restrictions, 2007−2010 Cohorts
2007
2008
2009
2010
100%
75%
50%
25%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other


Median Earnings, 1998 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
$120
$100
$80
$60
$40
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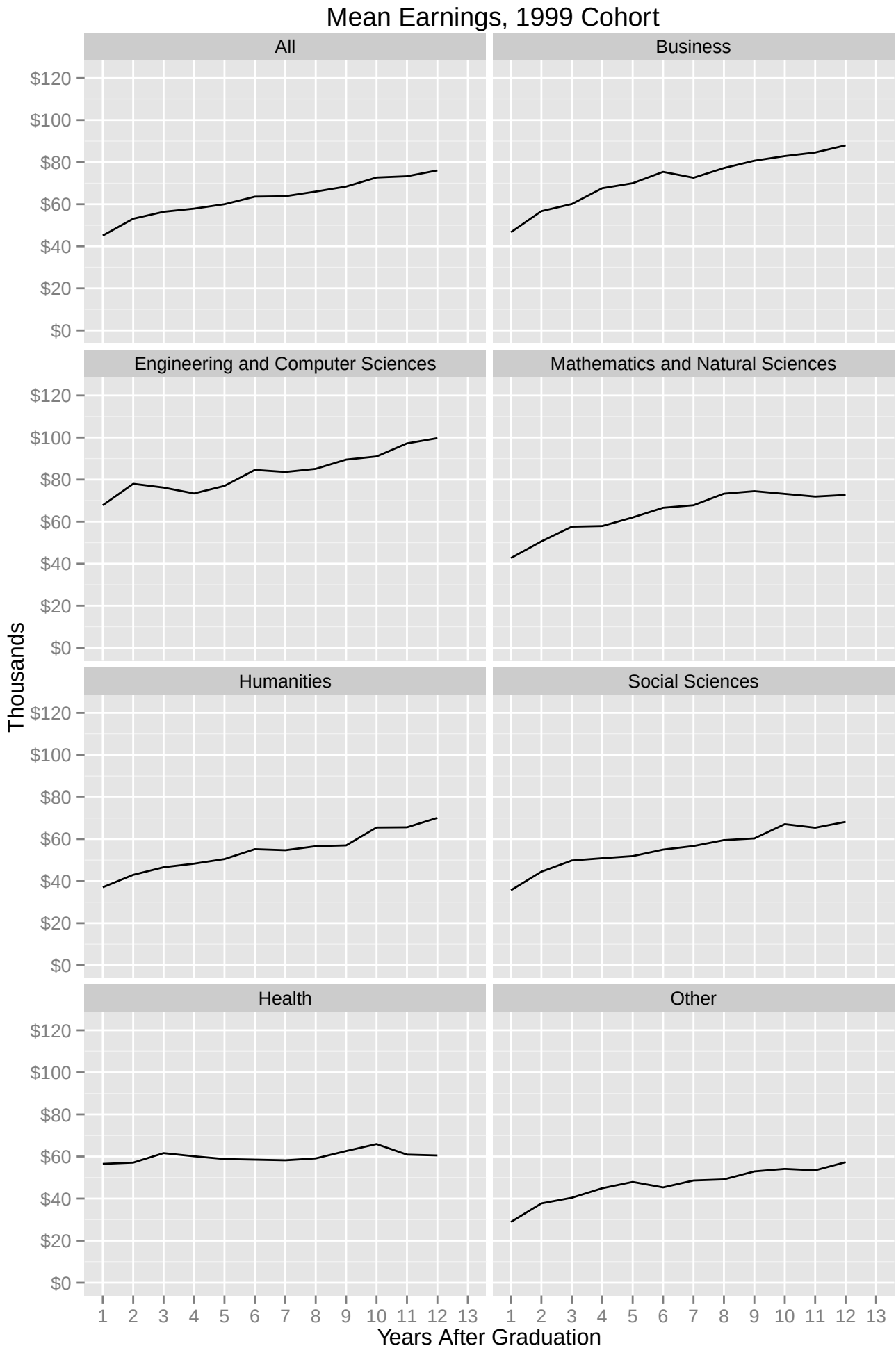
Years After Graduation


Mean Earnings, 1999 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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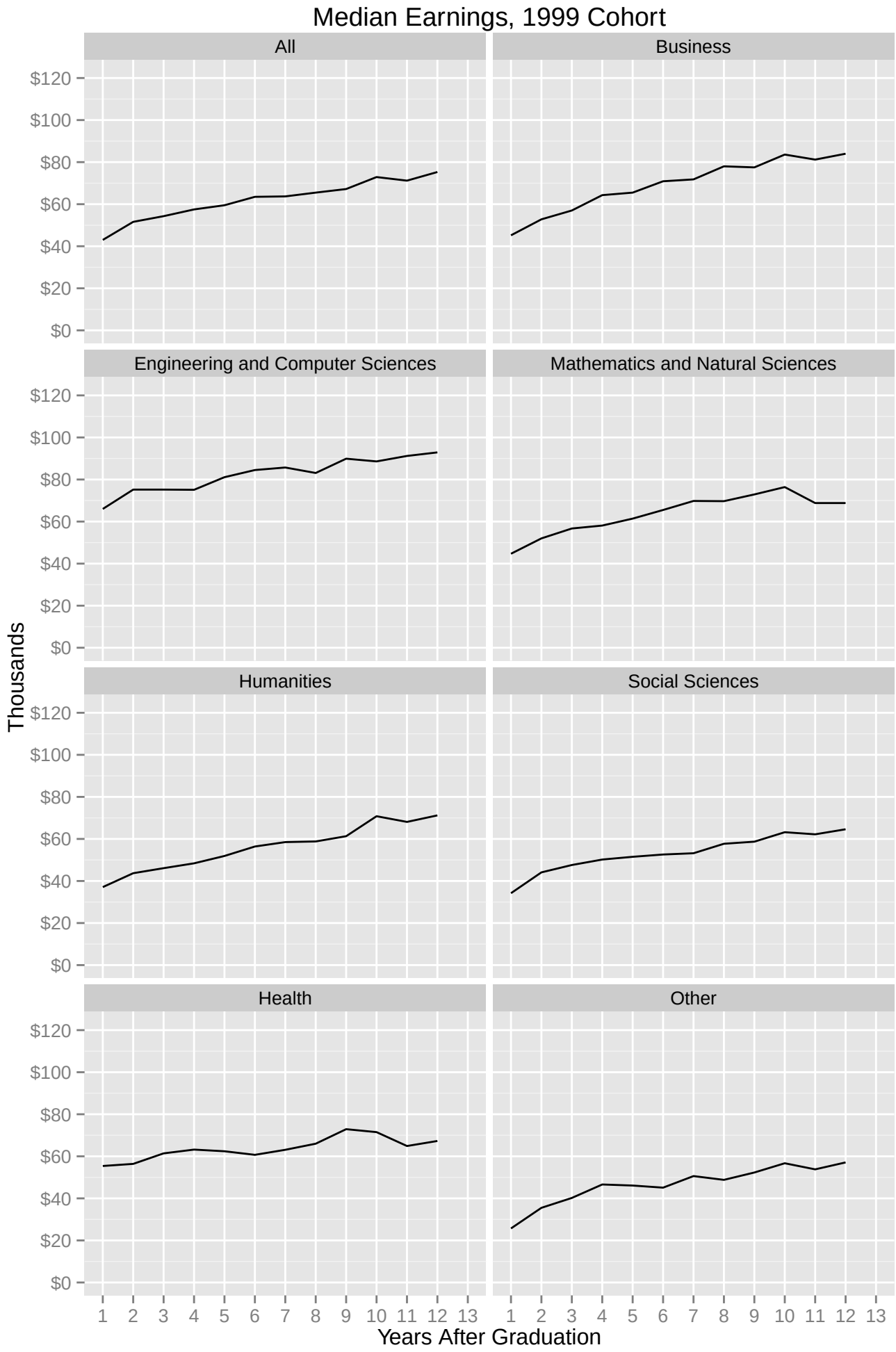
Years After Graduation


Median Earnings, 1999 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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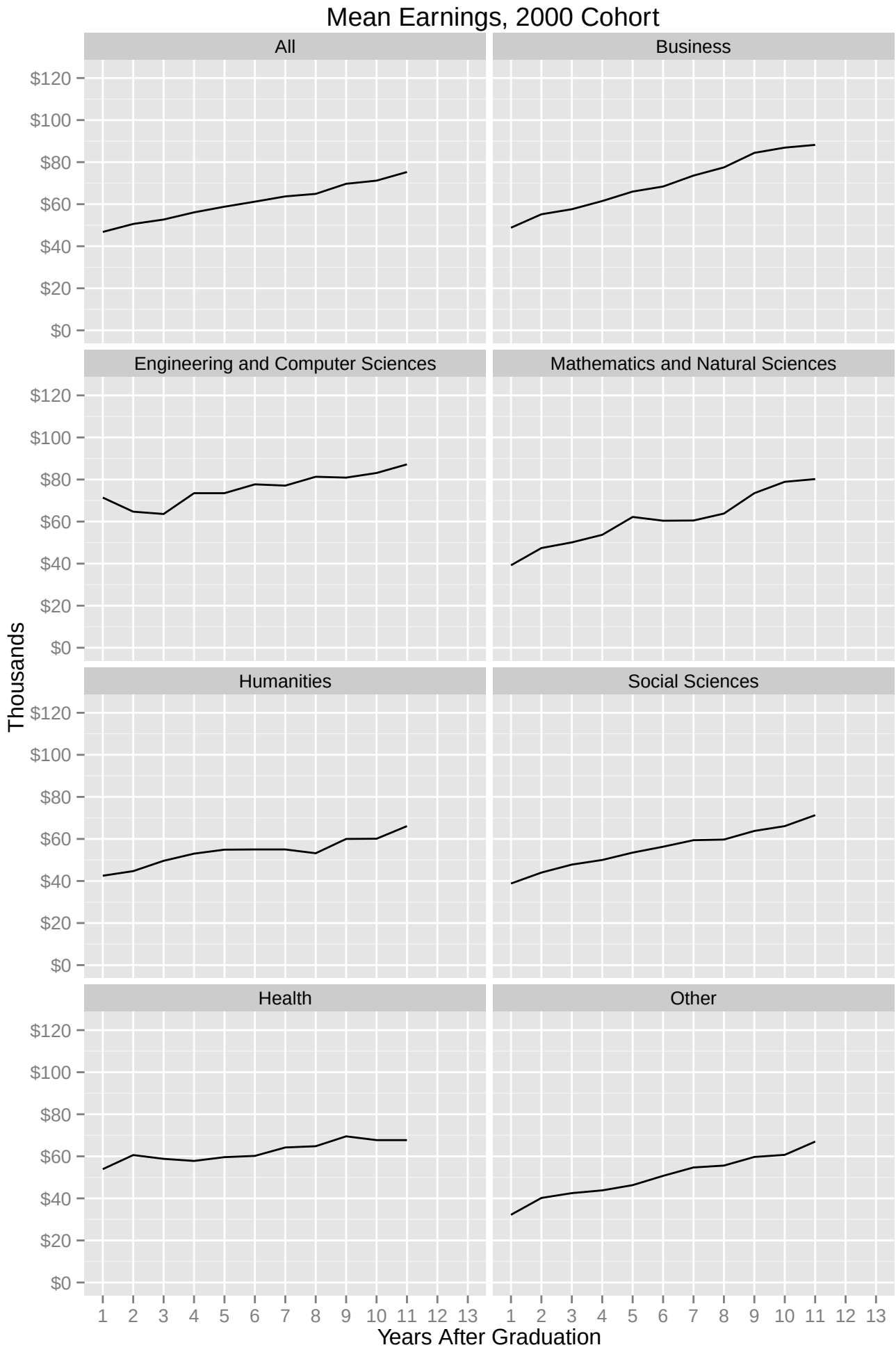
Years After Graduation


Mean Earnings, 2000 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
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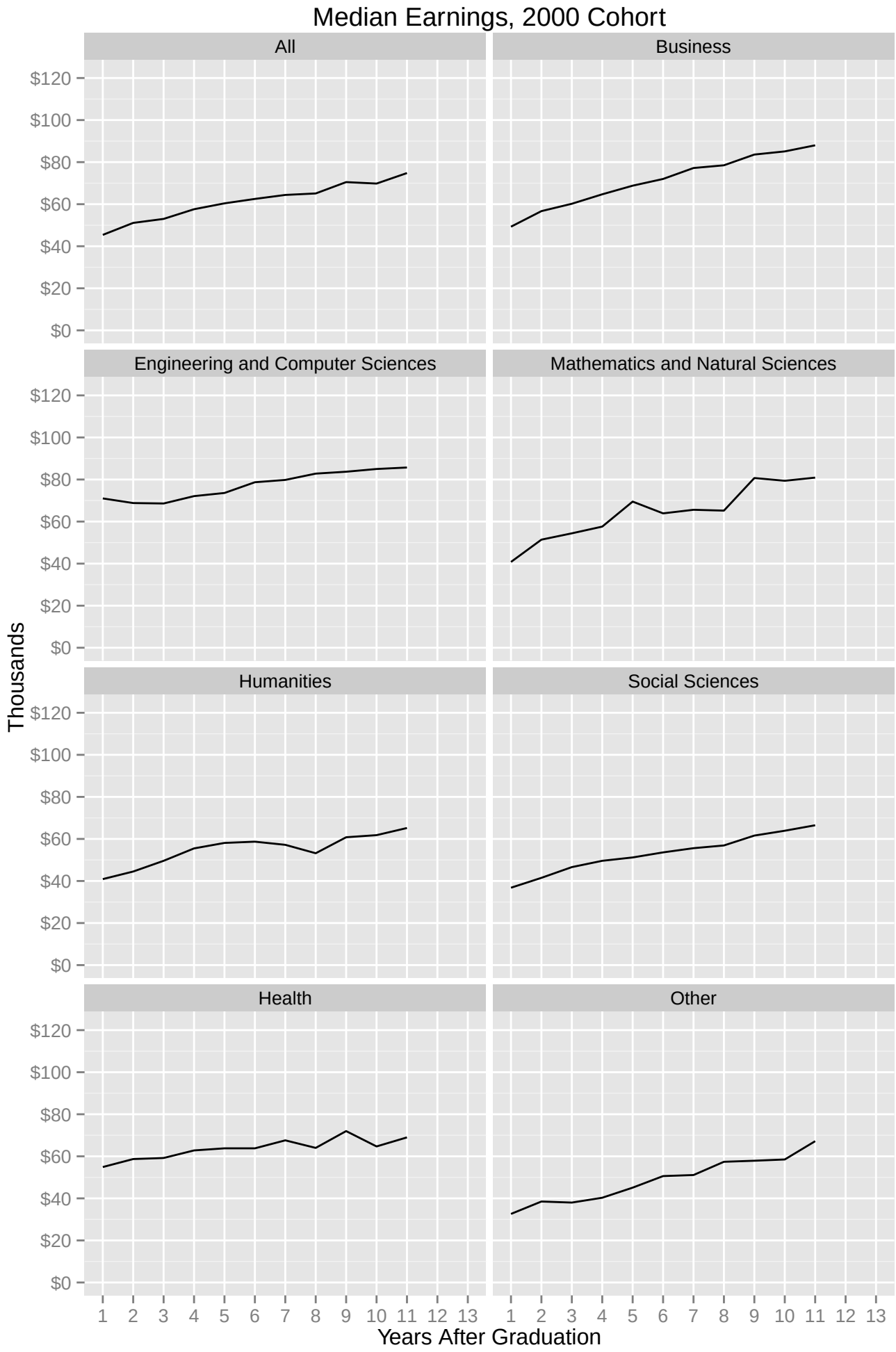
Years After Graduation


Median Earnings, 2000 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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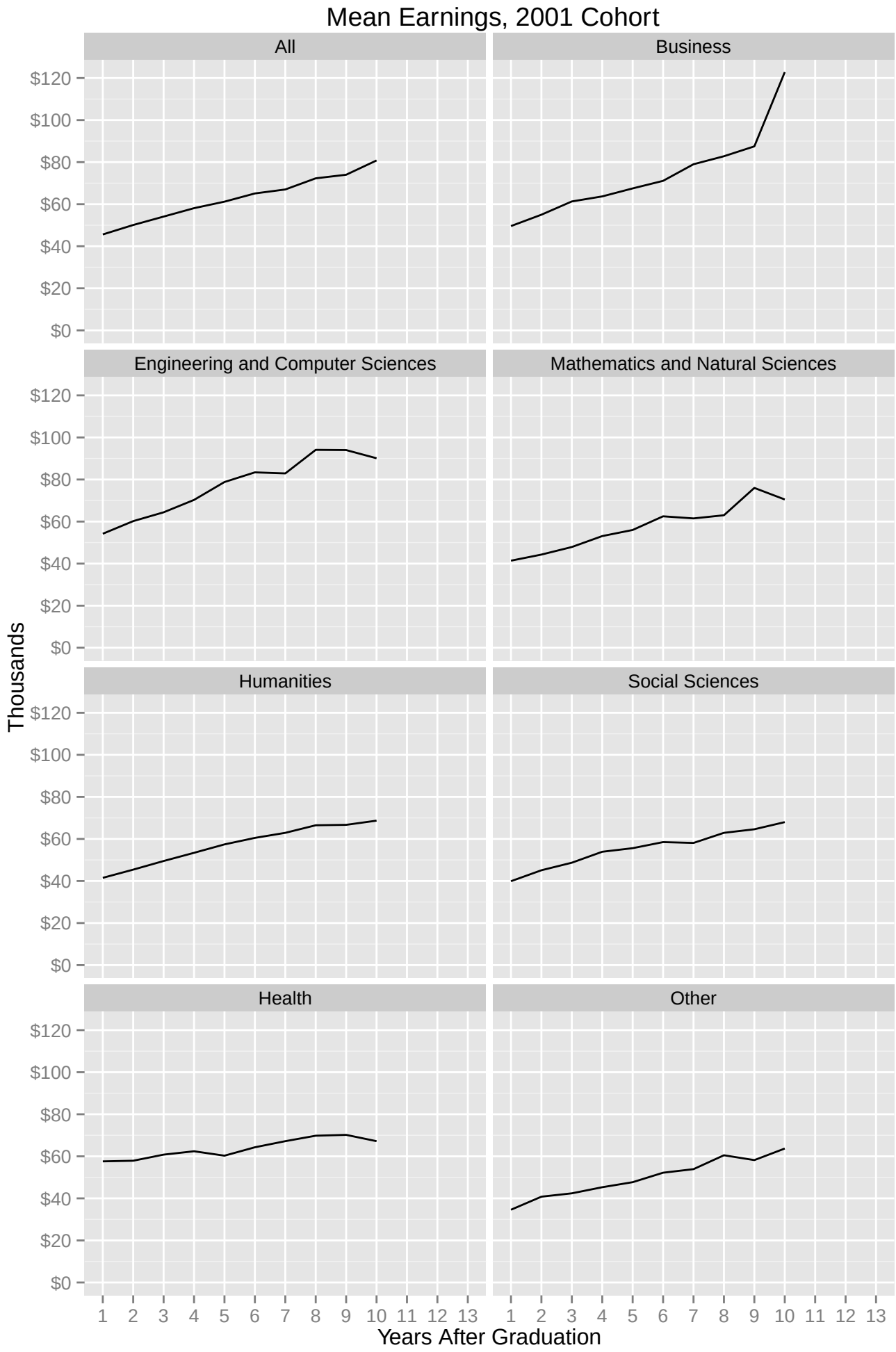
Years After Graduation


Mean Earnings, 2001 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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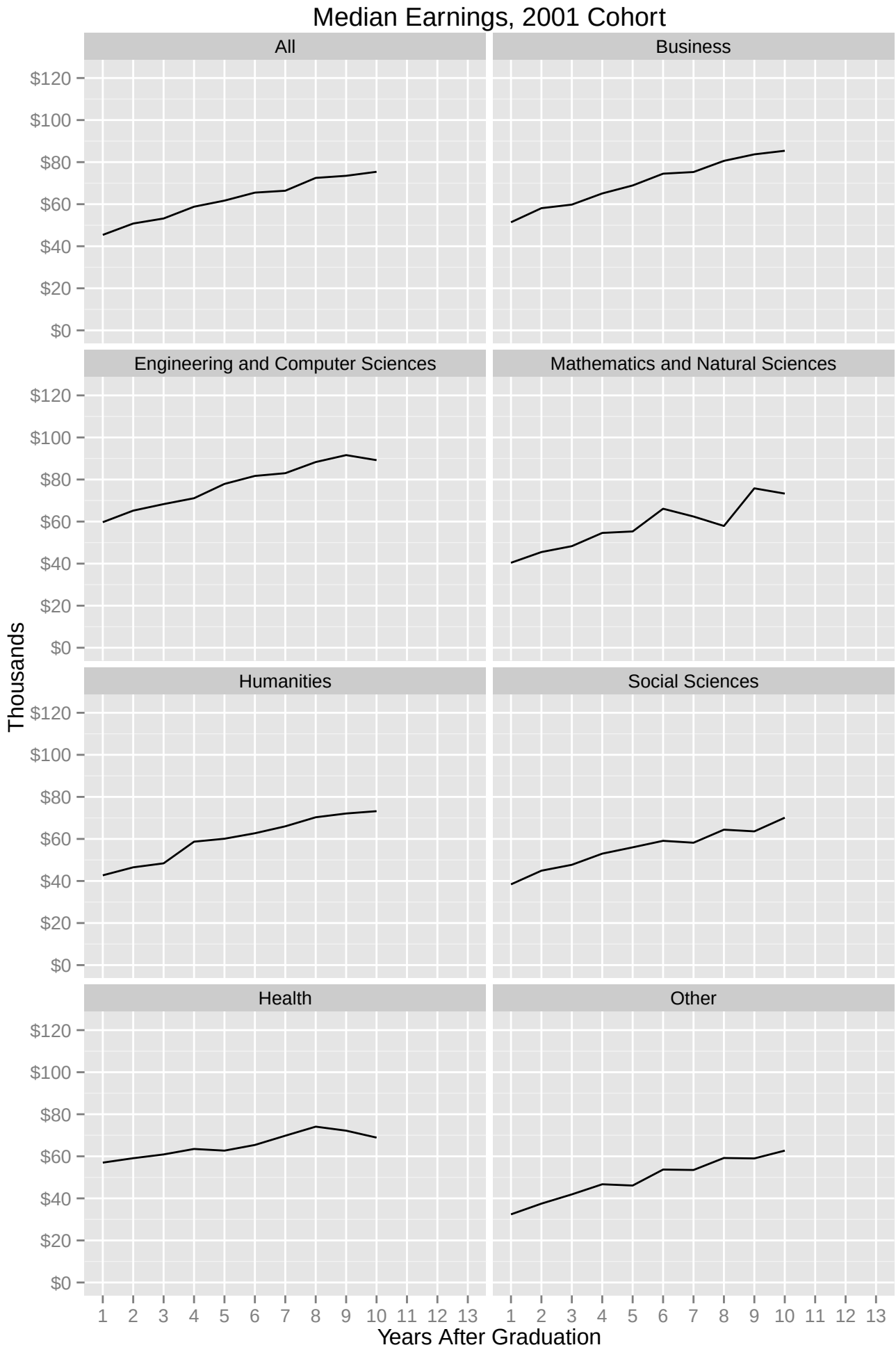
Years After Graduation


Median Earnings, 2001 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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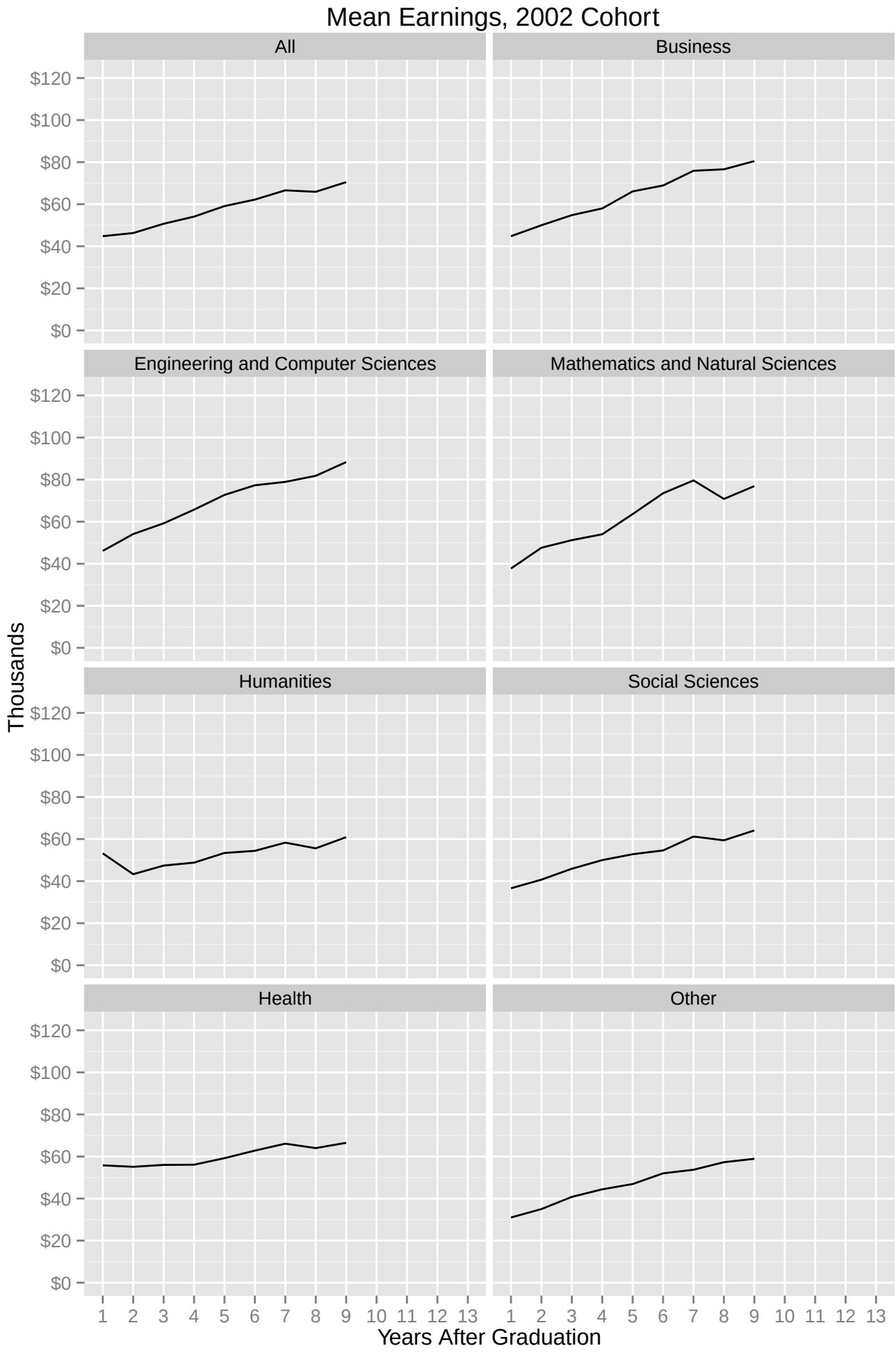
Years After Graduation


Mean Earnings, 2002 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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$80
$60
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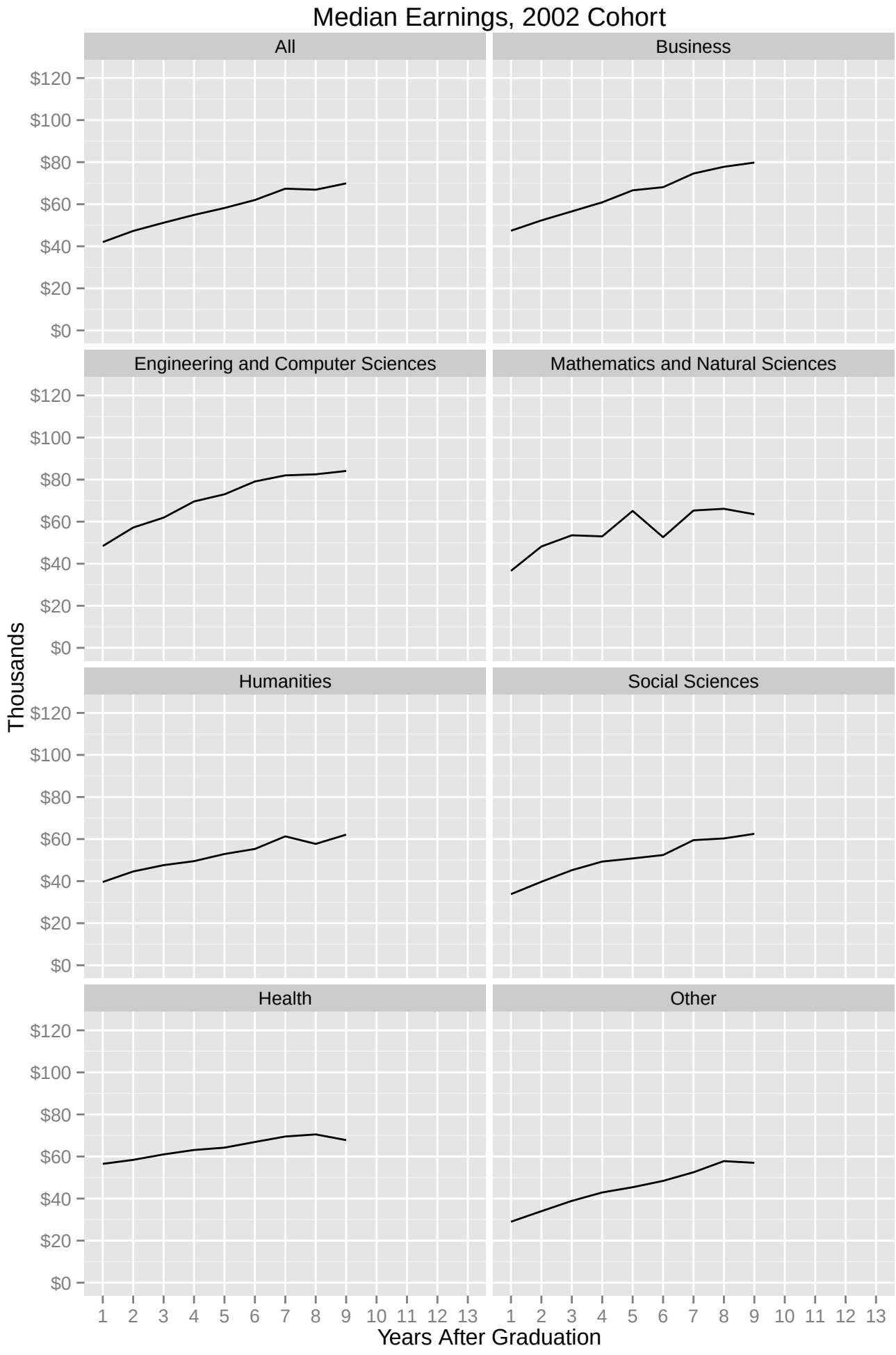
Years After Graduation


Median Earnings, 2002 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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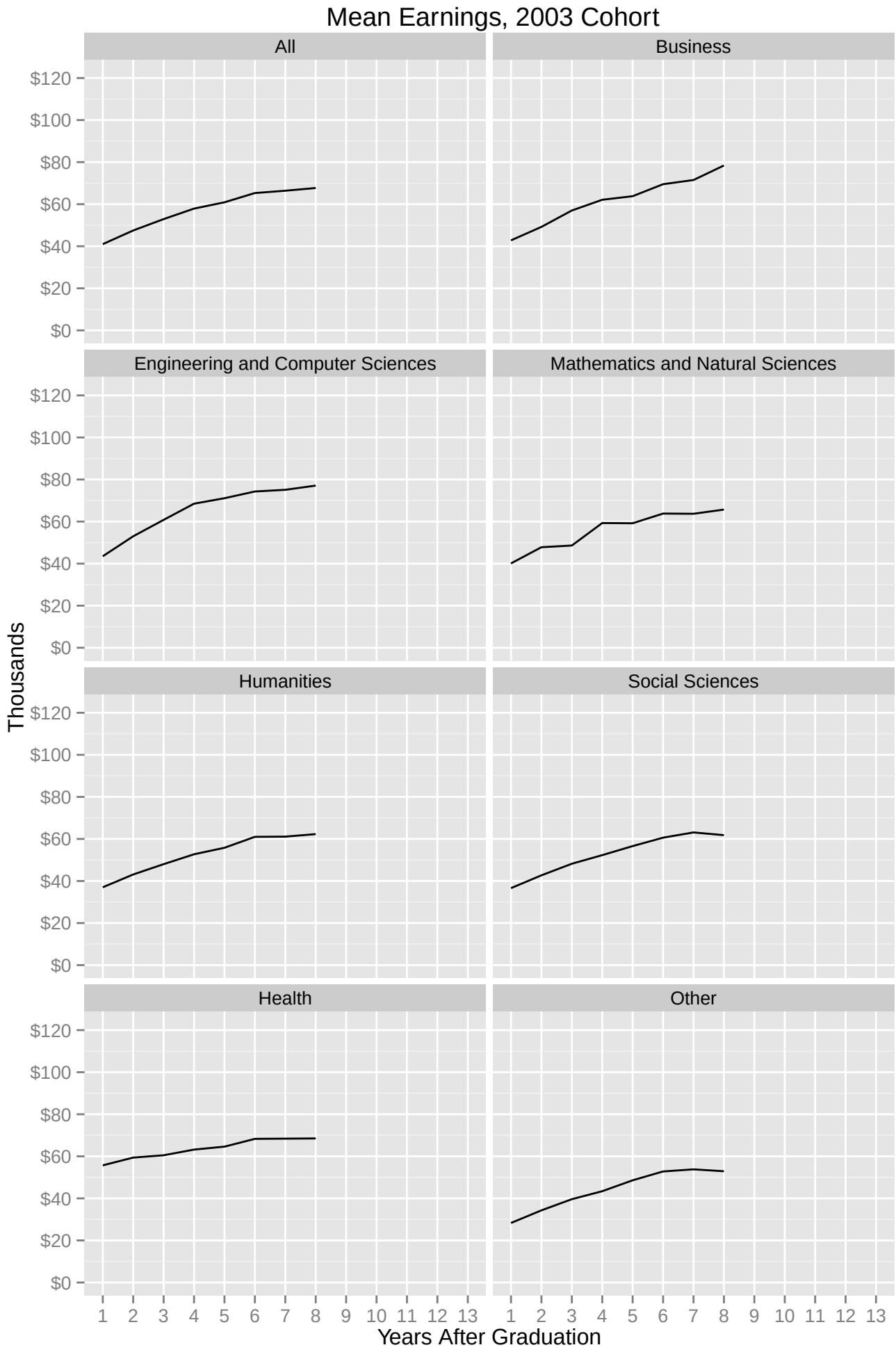
Years After Graduation


Mean Earnings, 2003 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
$120
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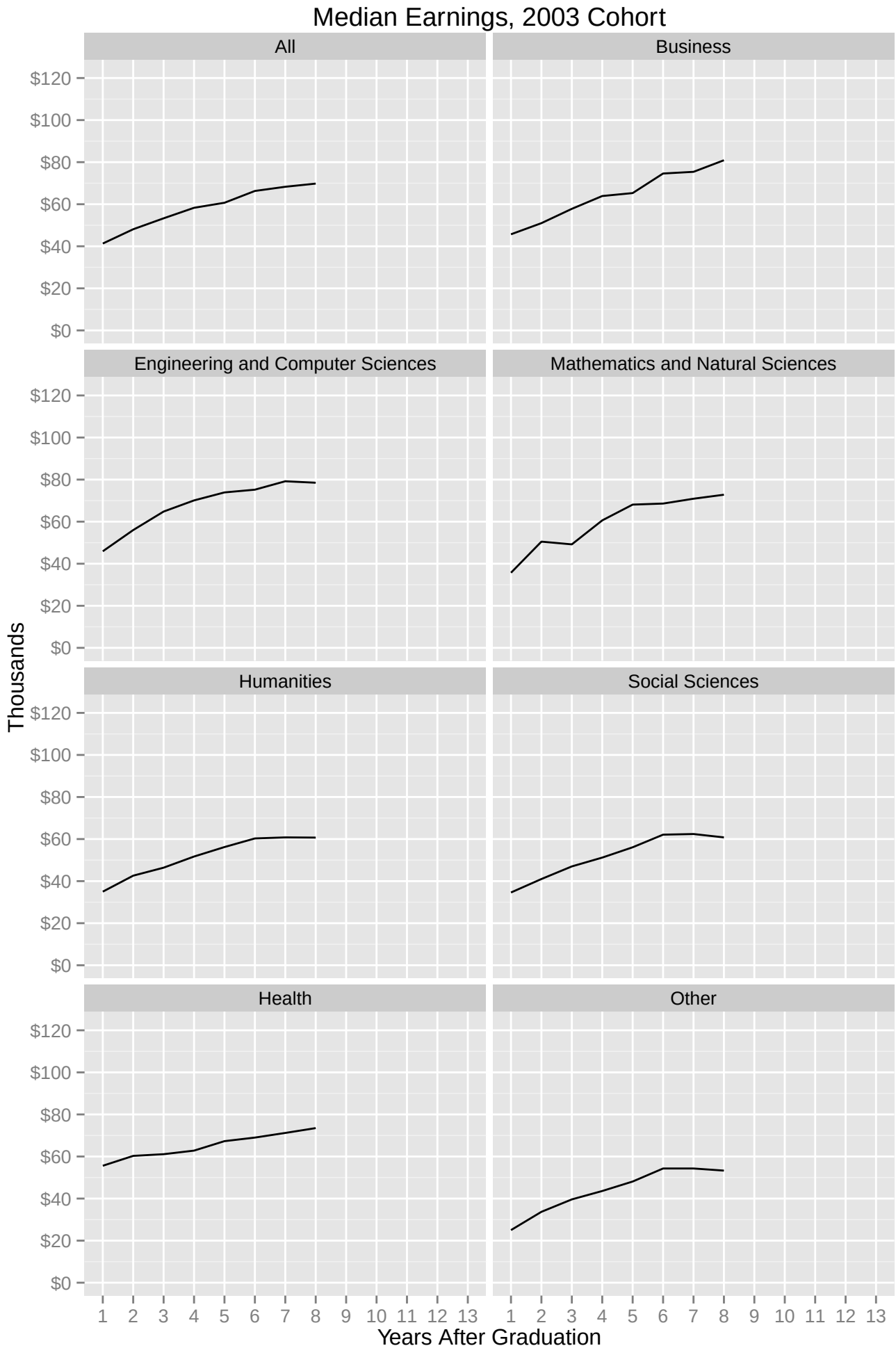
Years After Graduation


Median Earnings, 2003 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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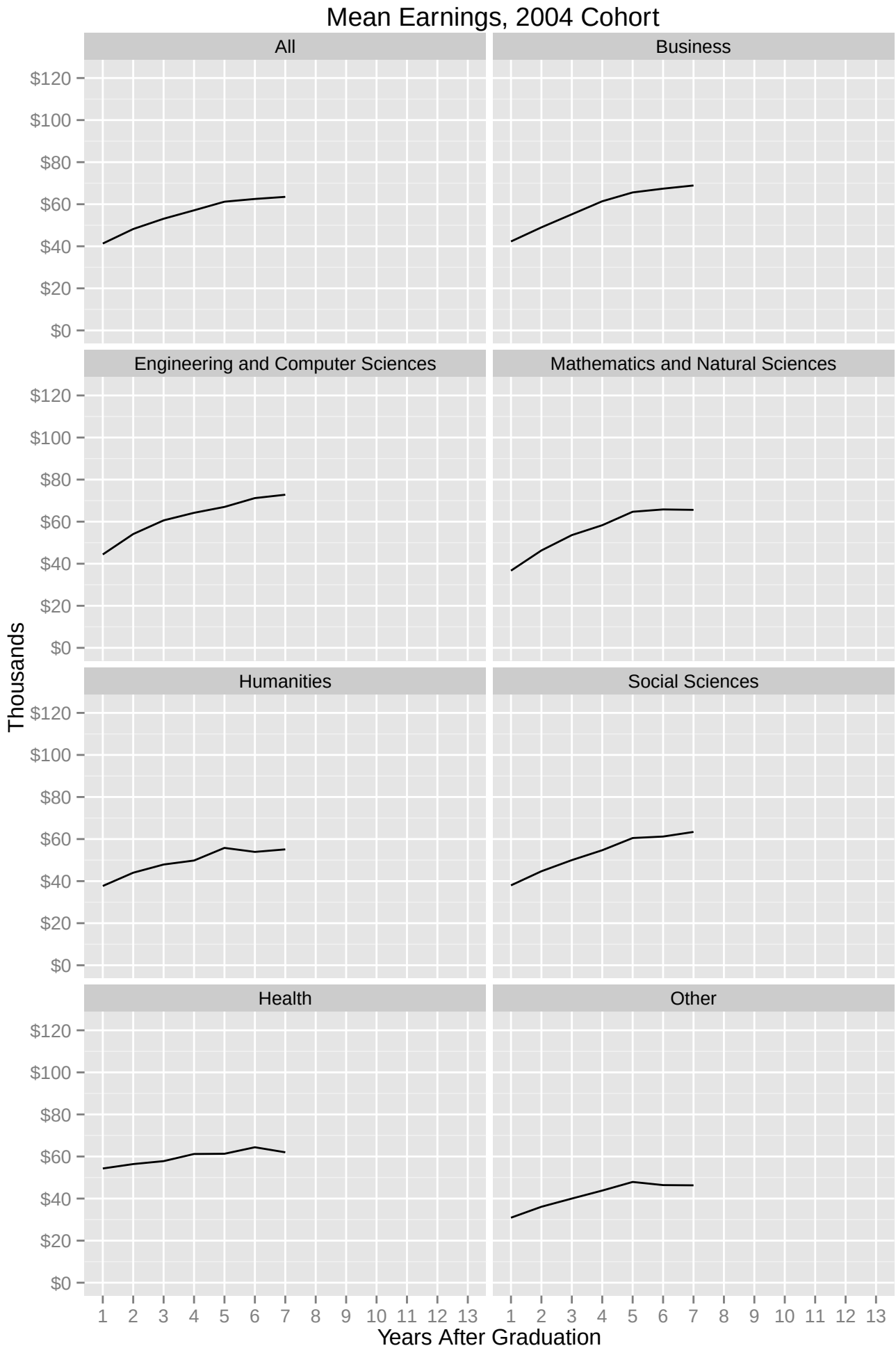
Years After Graduation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All
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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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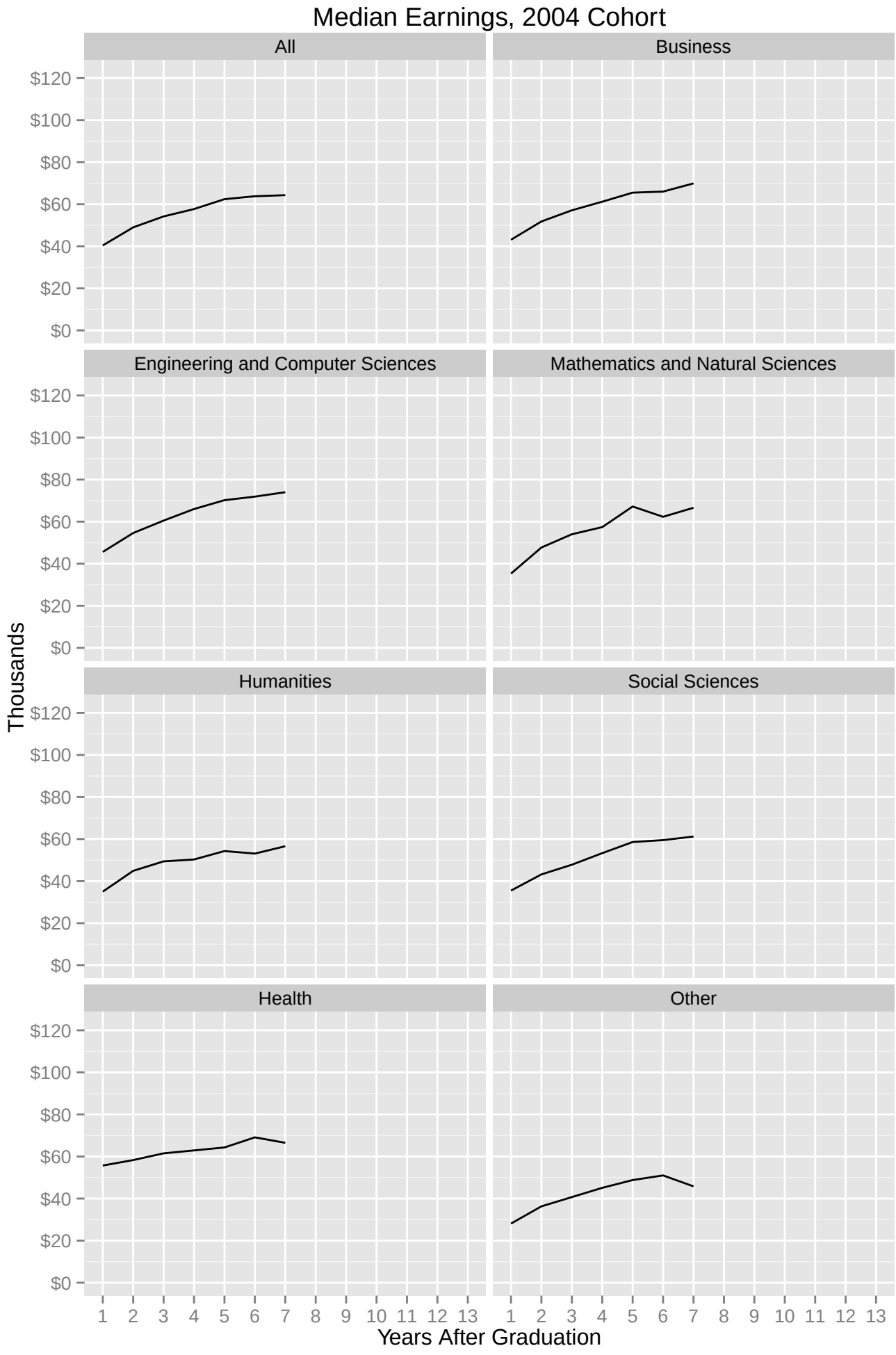
Years After Graduation


Median Earnings, 2004 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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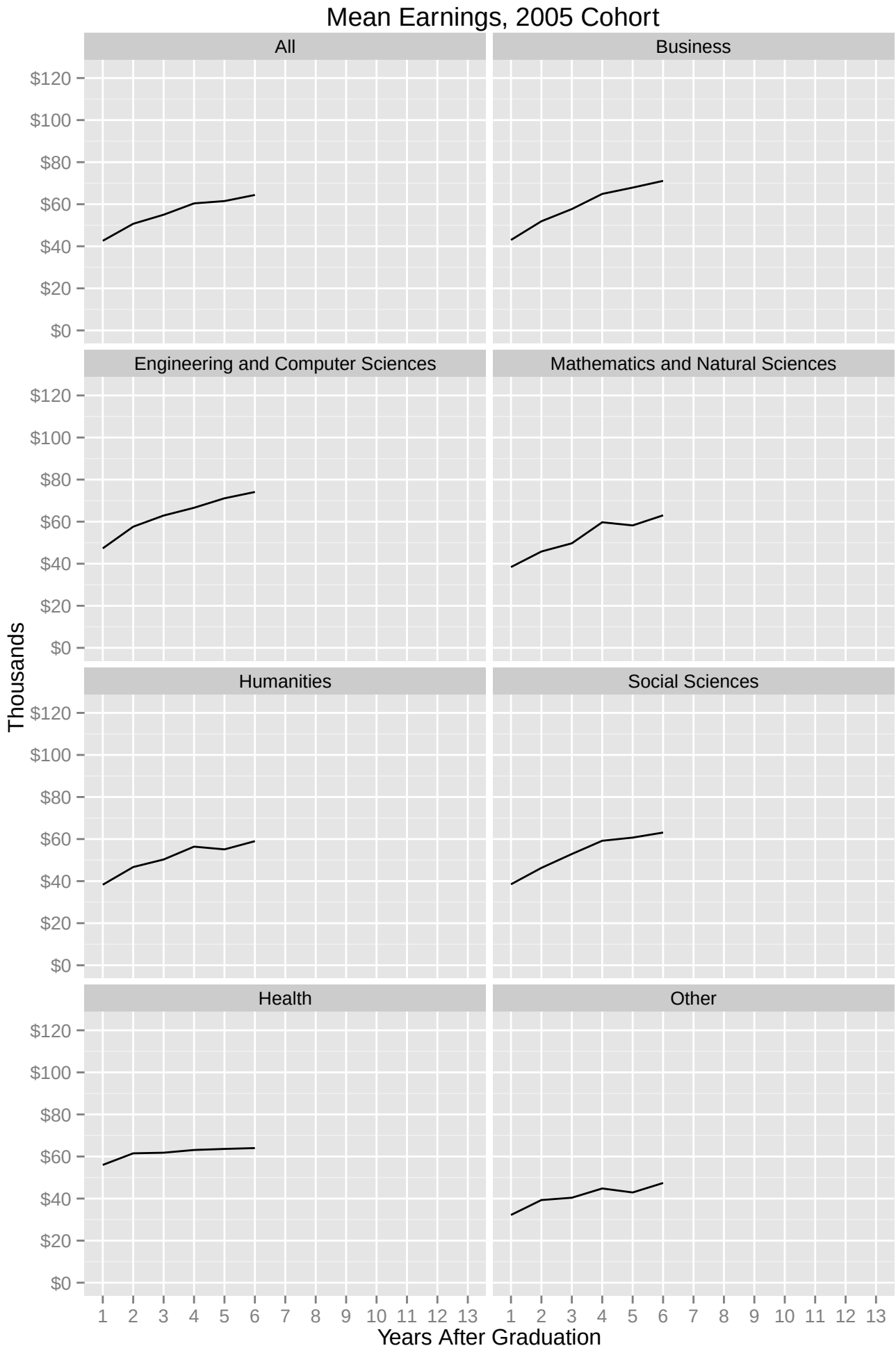
Years After Graduation


Mean Earnings, 2005 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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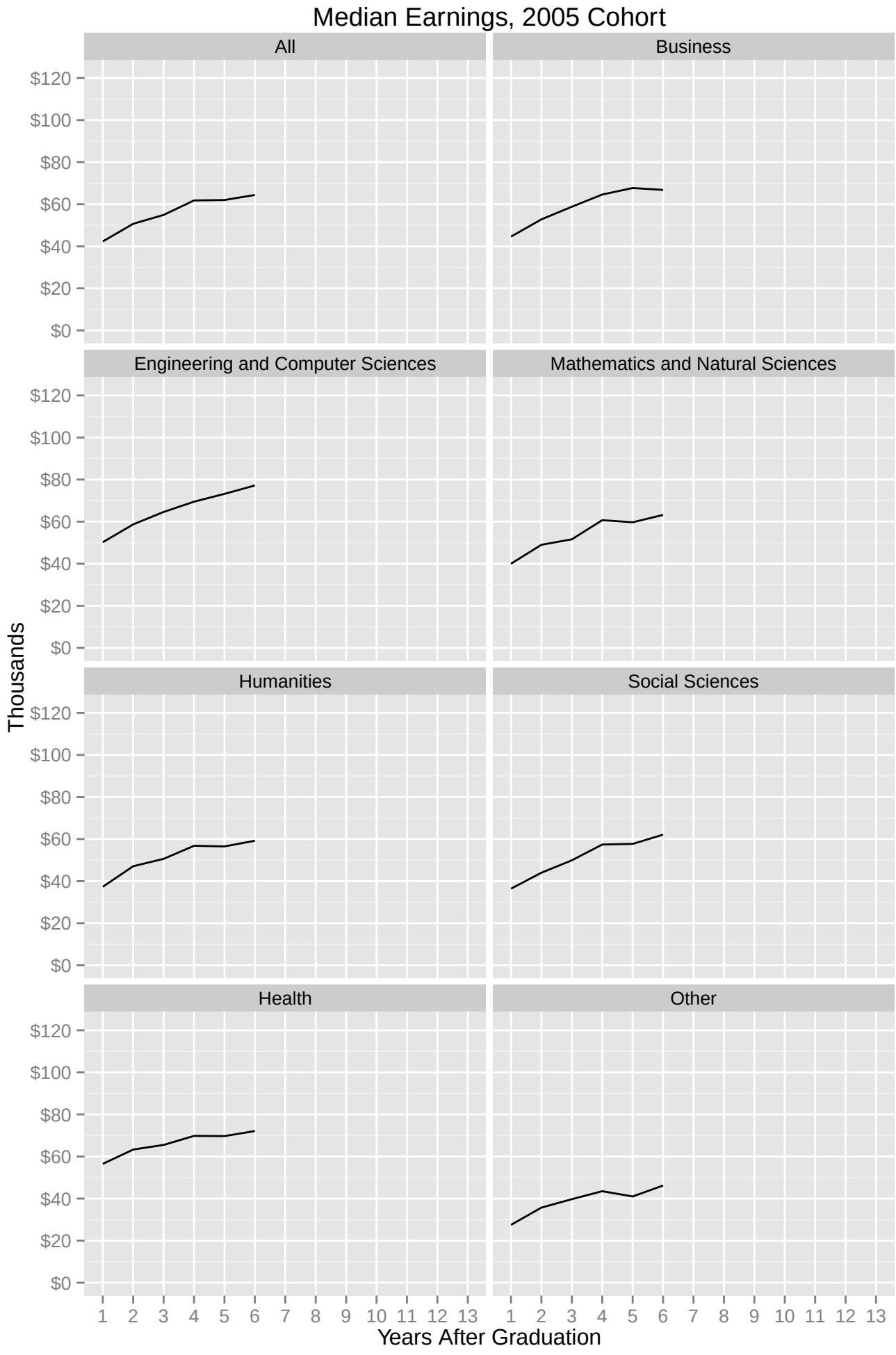
Years After Graduation


Median Earnings, 2005 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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$60
$40
$20
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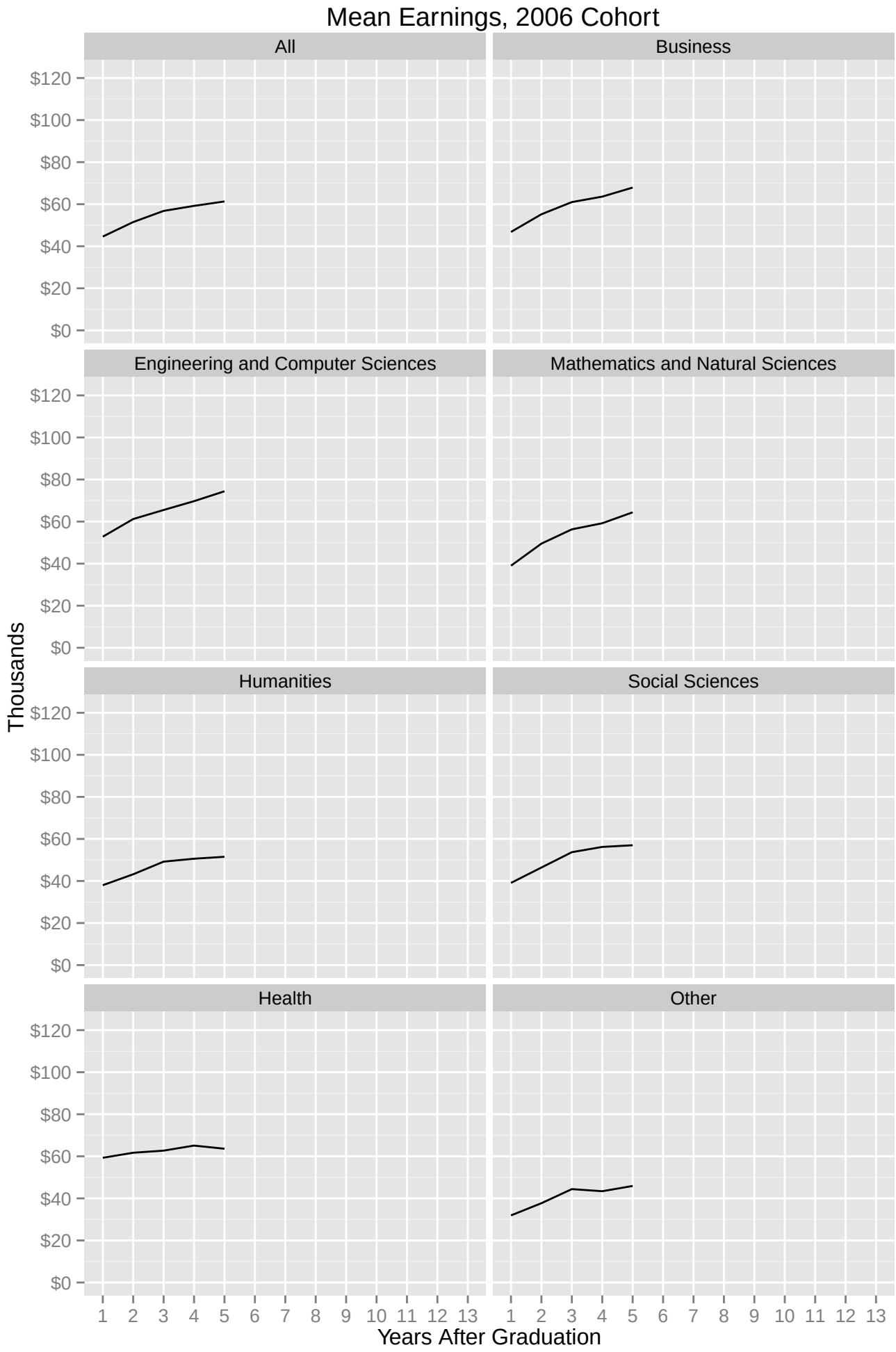
Years After Graduation


Mean Earnings, 2006 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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$60
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$20
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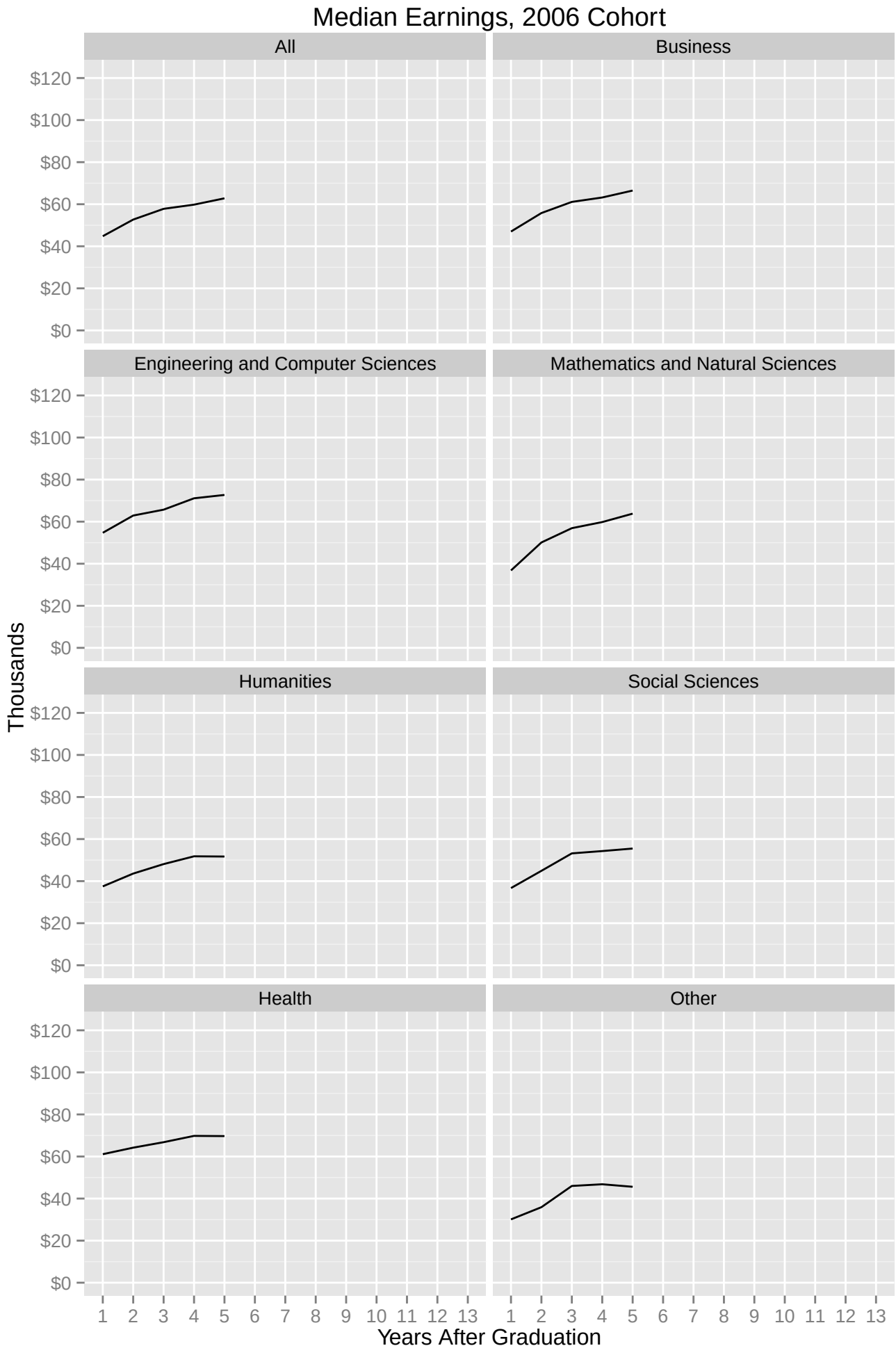
Years After Graduation


Median Earnings, 2006 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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$60
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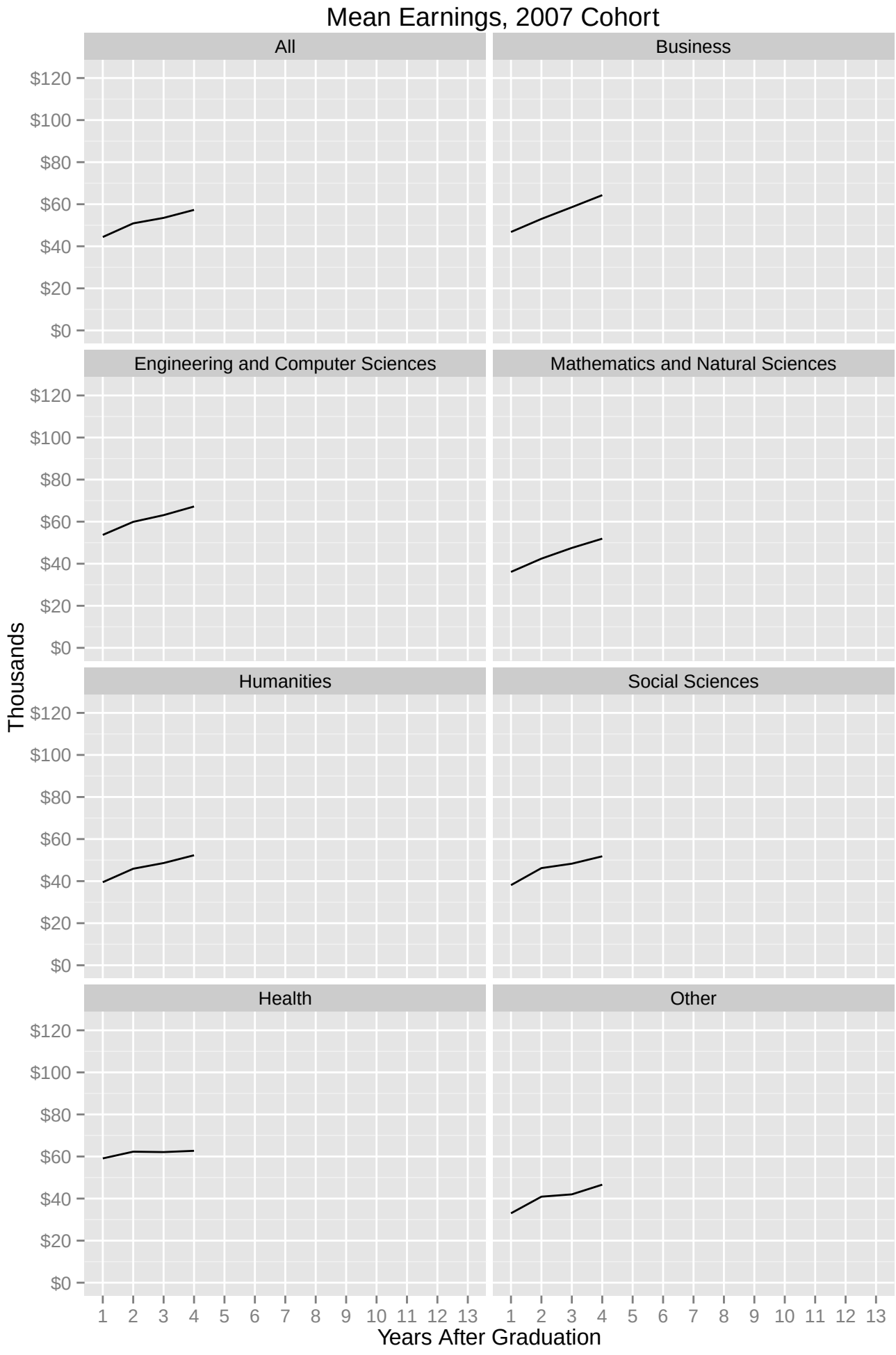
$20
$0
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation


Mean Earnings, 2007 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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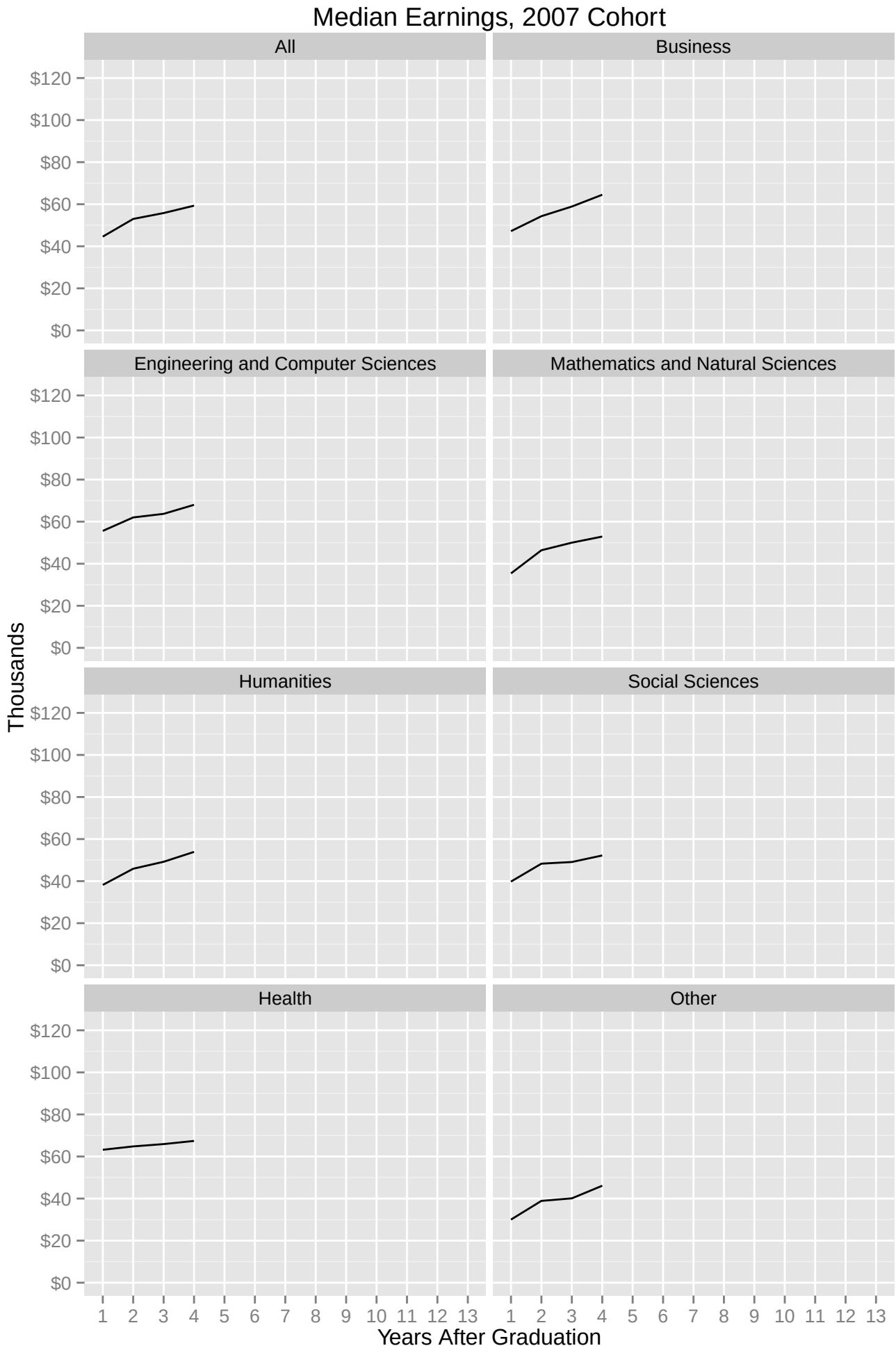
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation


Median Earnings, 2007 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
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$20
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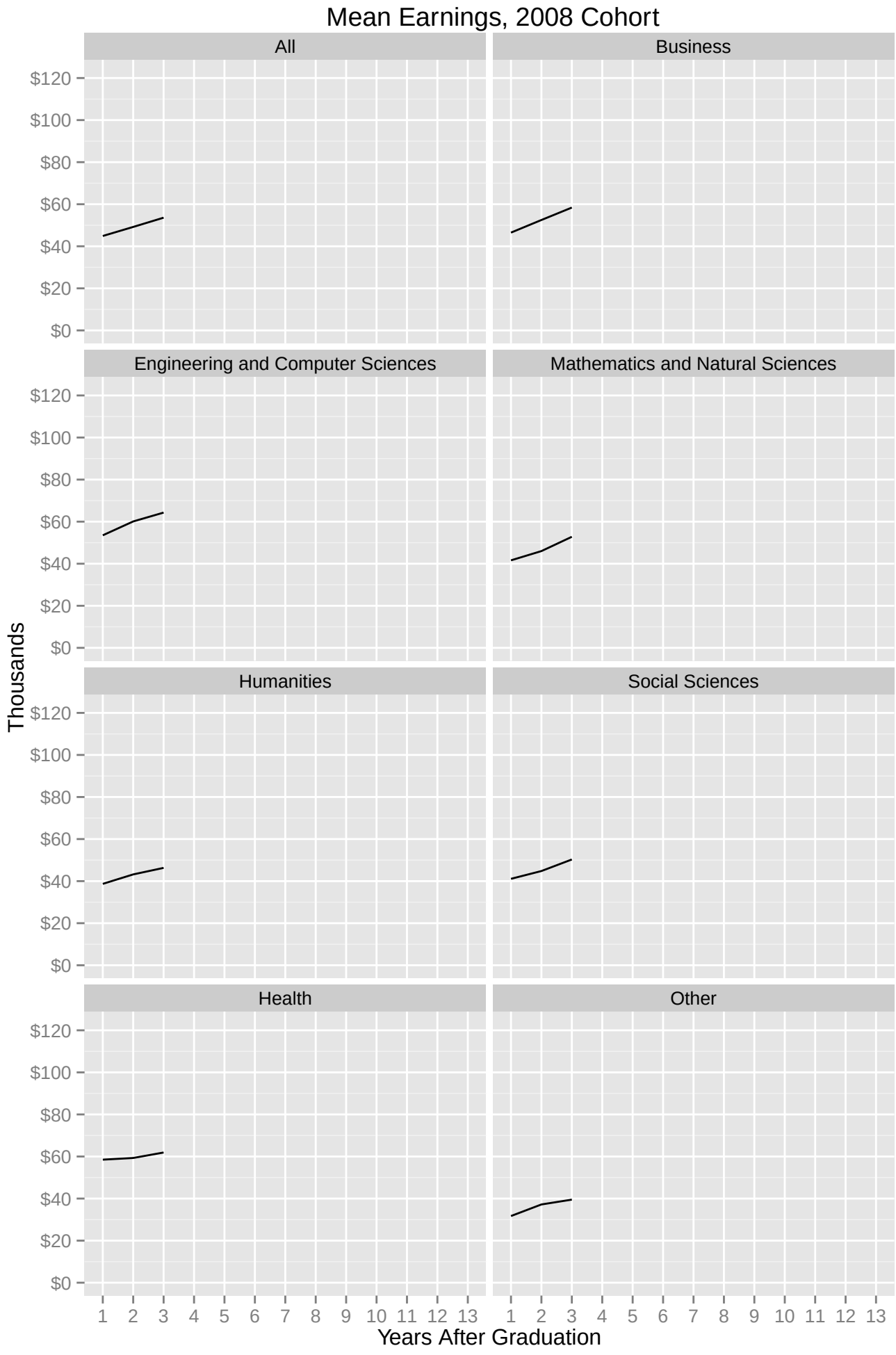
Thousands
1 2 3 4 5 6 7 8 9 10 11 12 13
Years After Graduation


Mean Earnings, 2008 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
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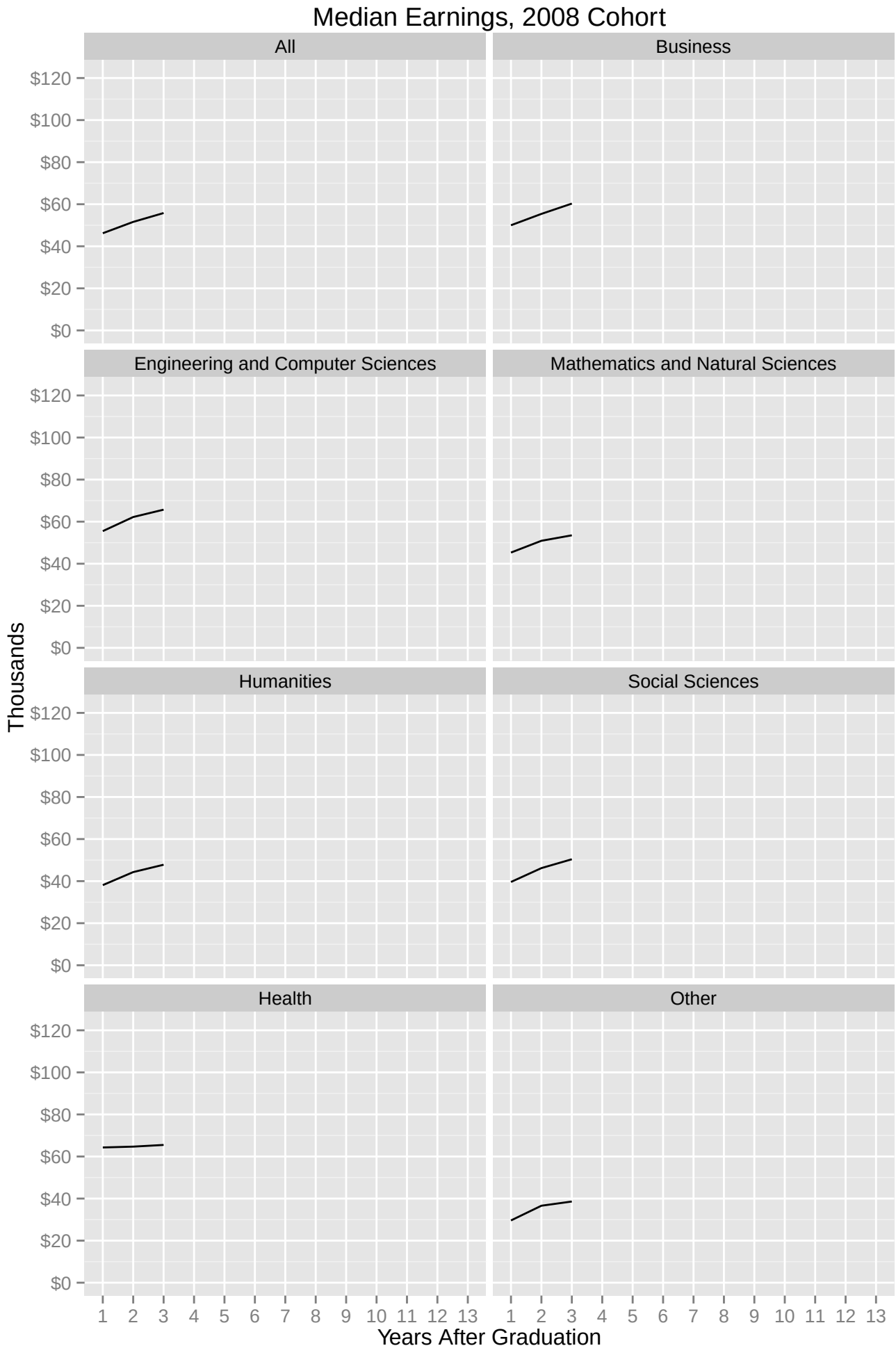
Years After Graduation


Median Earnings, 2008 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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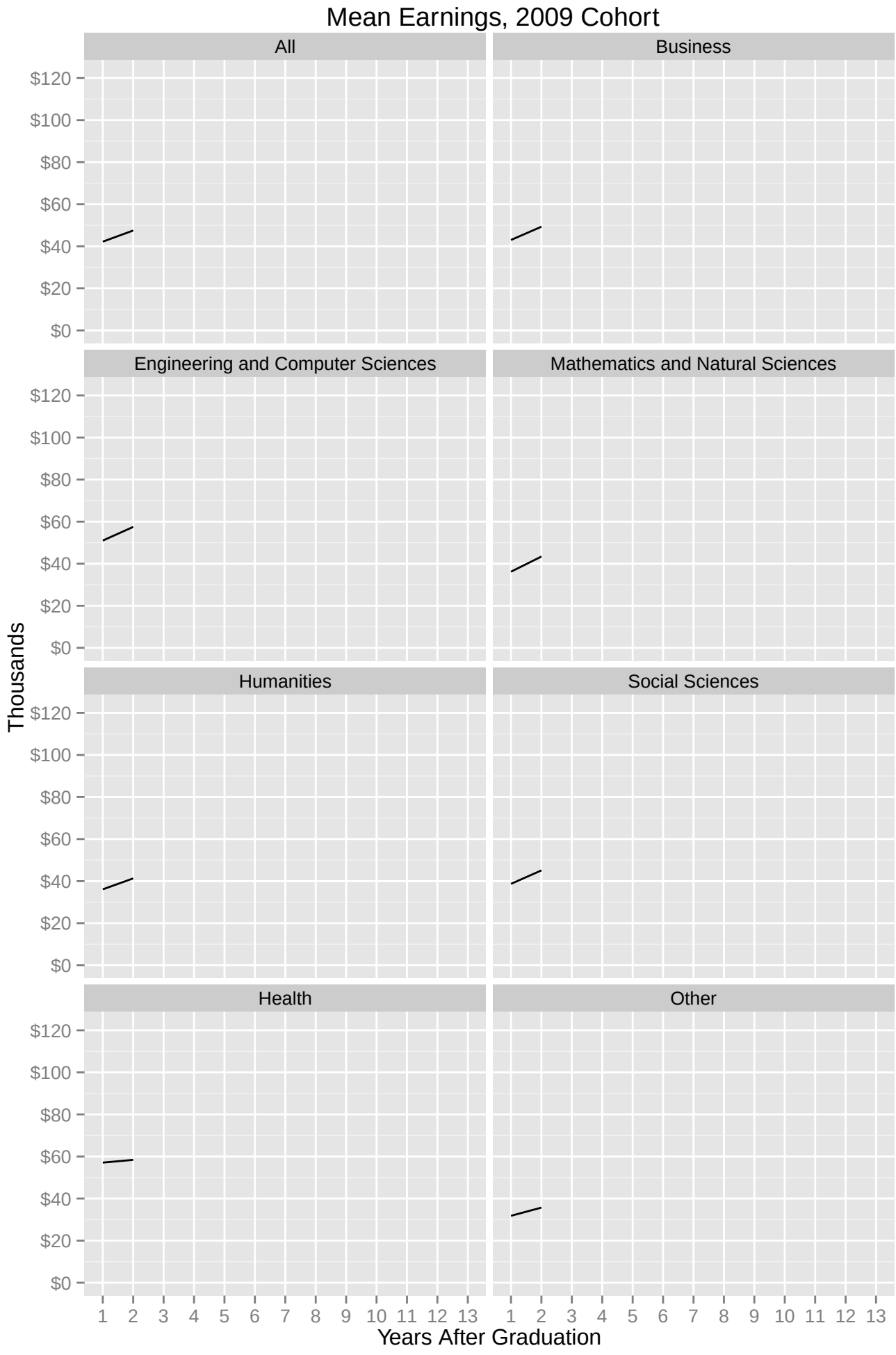
Years After Graduation


Mean Earnings, 2009 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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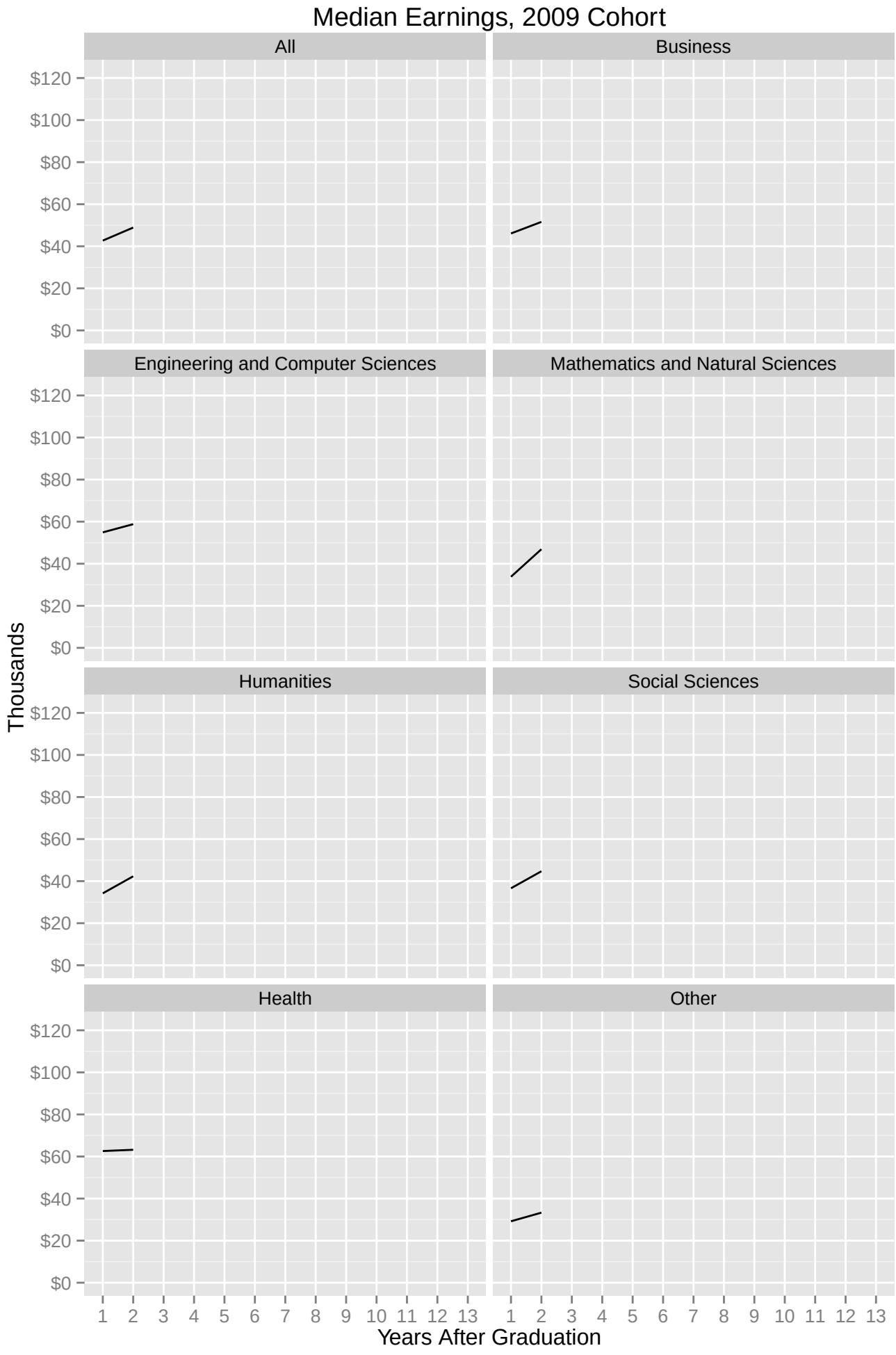
Years After Graduation


Median Earnings, 2009 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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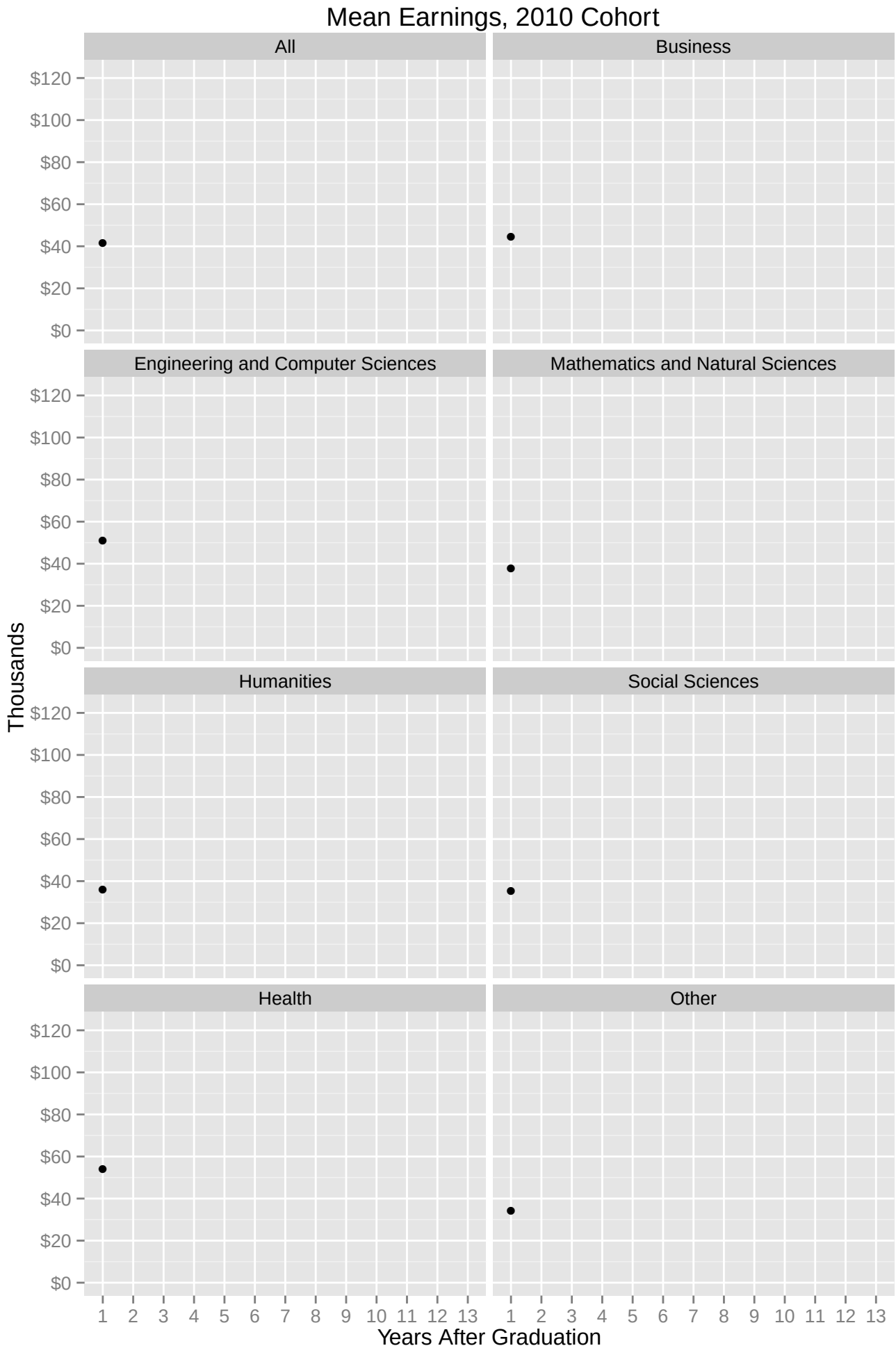
Years After Graduation


Mean Earnings, 2010 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
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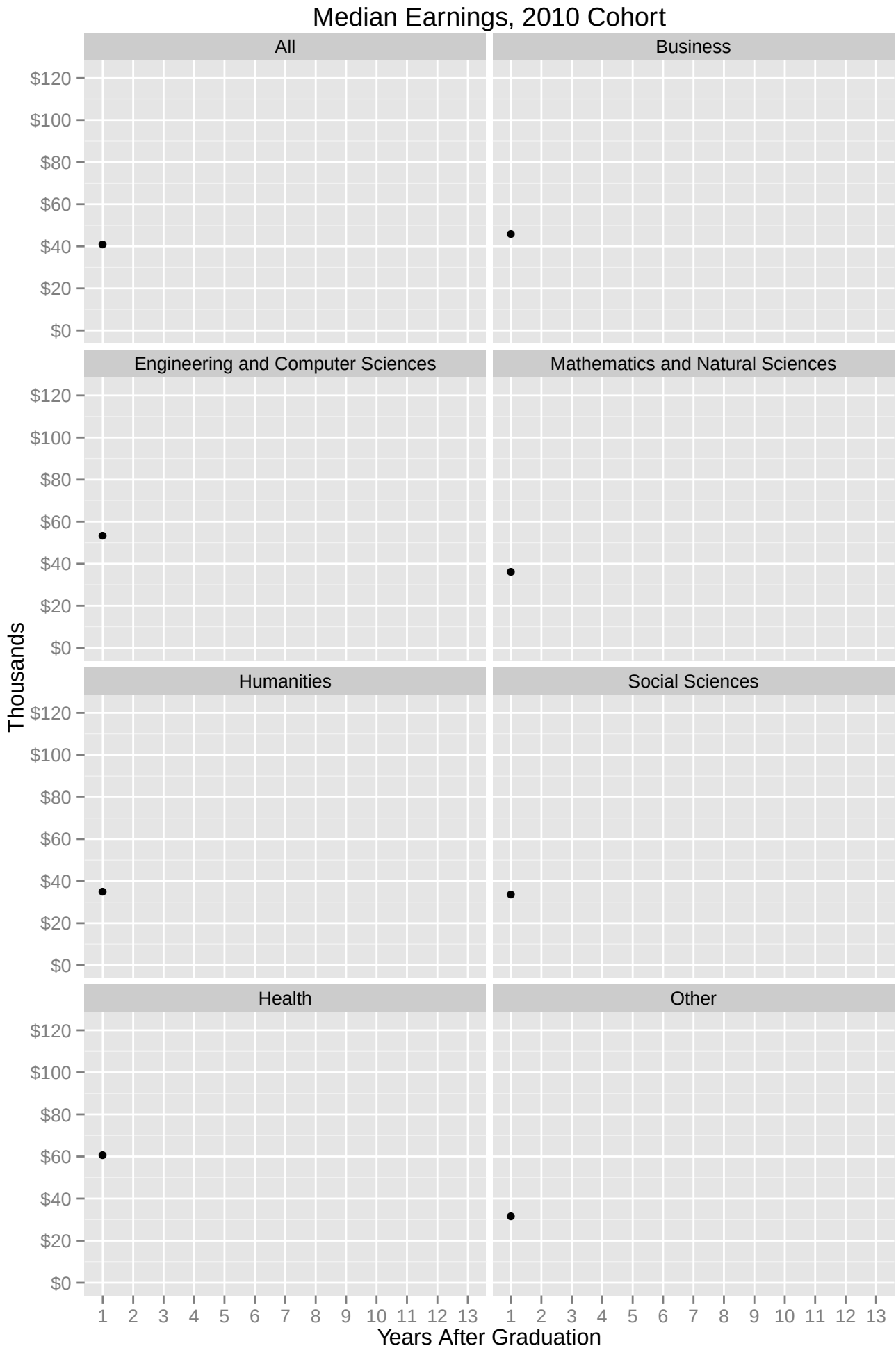
Years After Graduation


Median Earnings, 2010 Cohort
All
Business
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Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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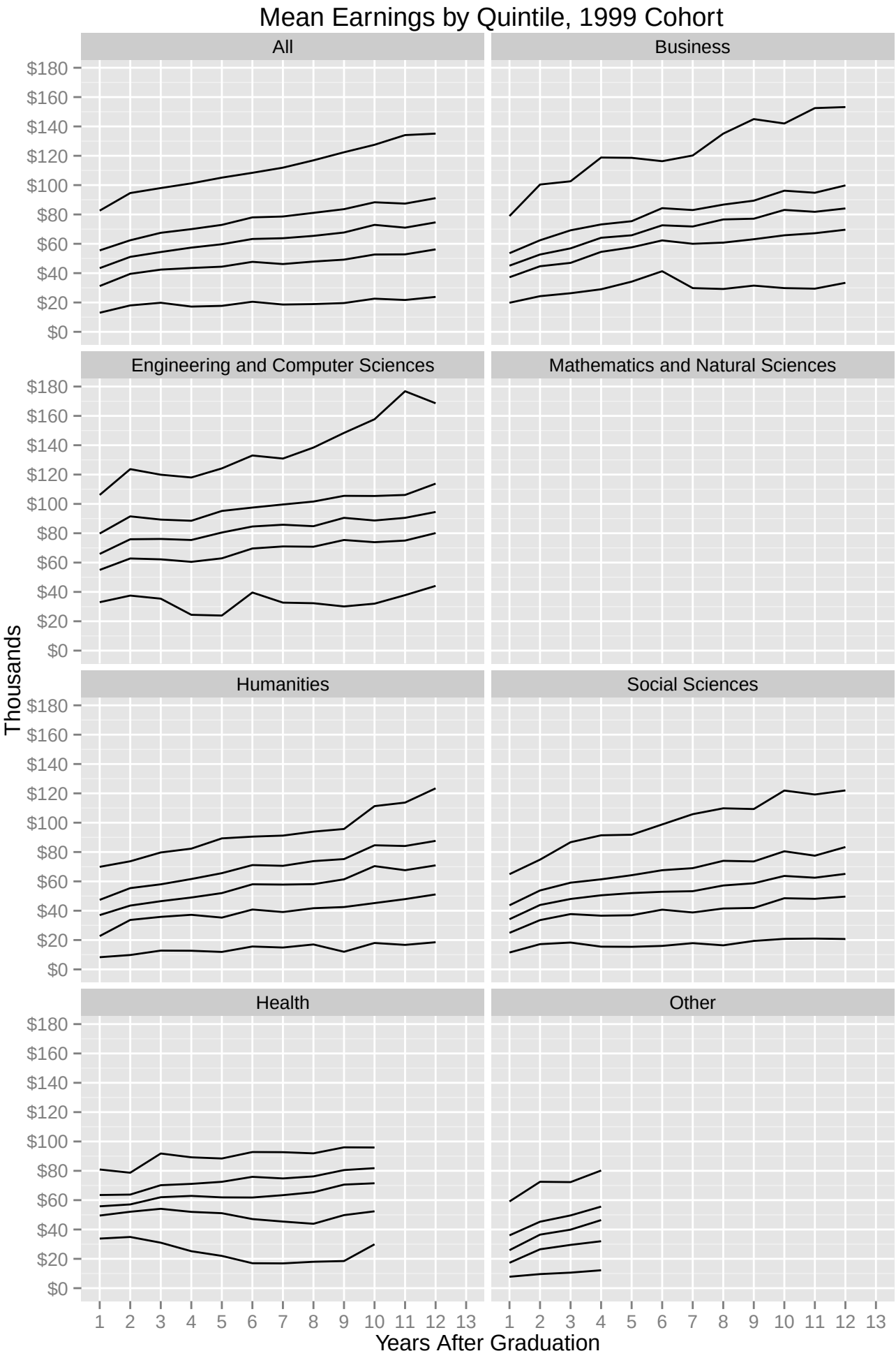
Years After Graduation


Mean Earnings by Quintile, 1999 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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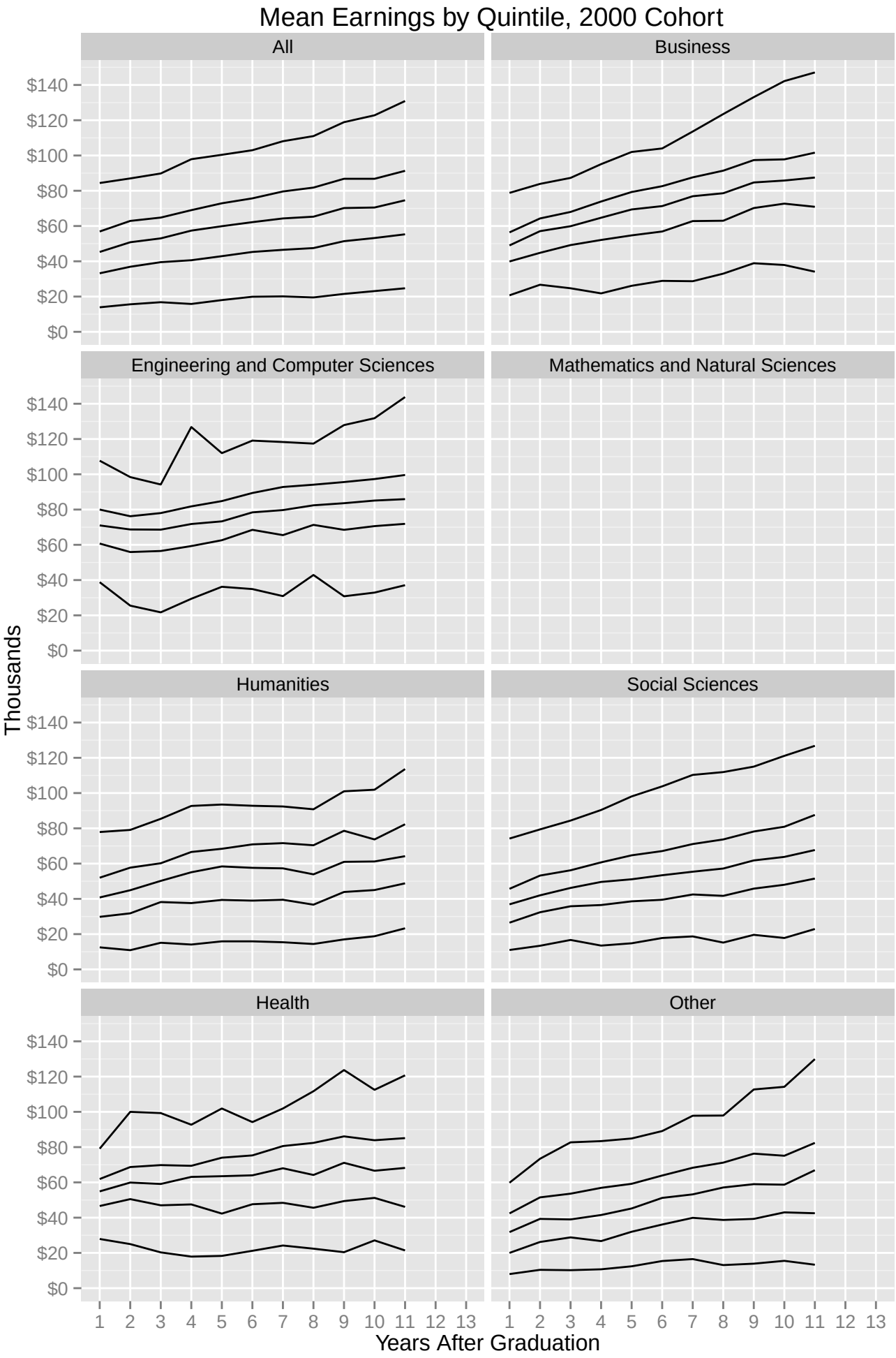
Years After Graduation


Mean Earnings by Quintile, 2000 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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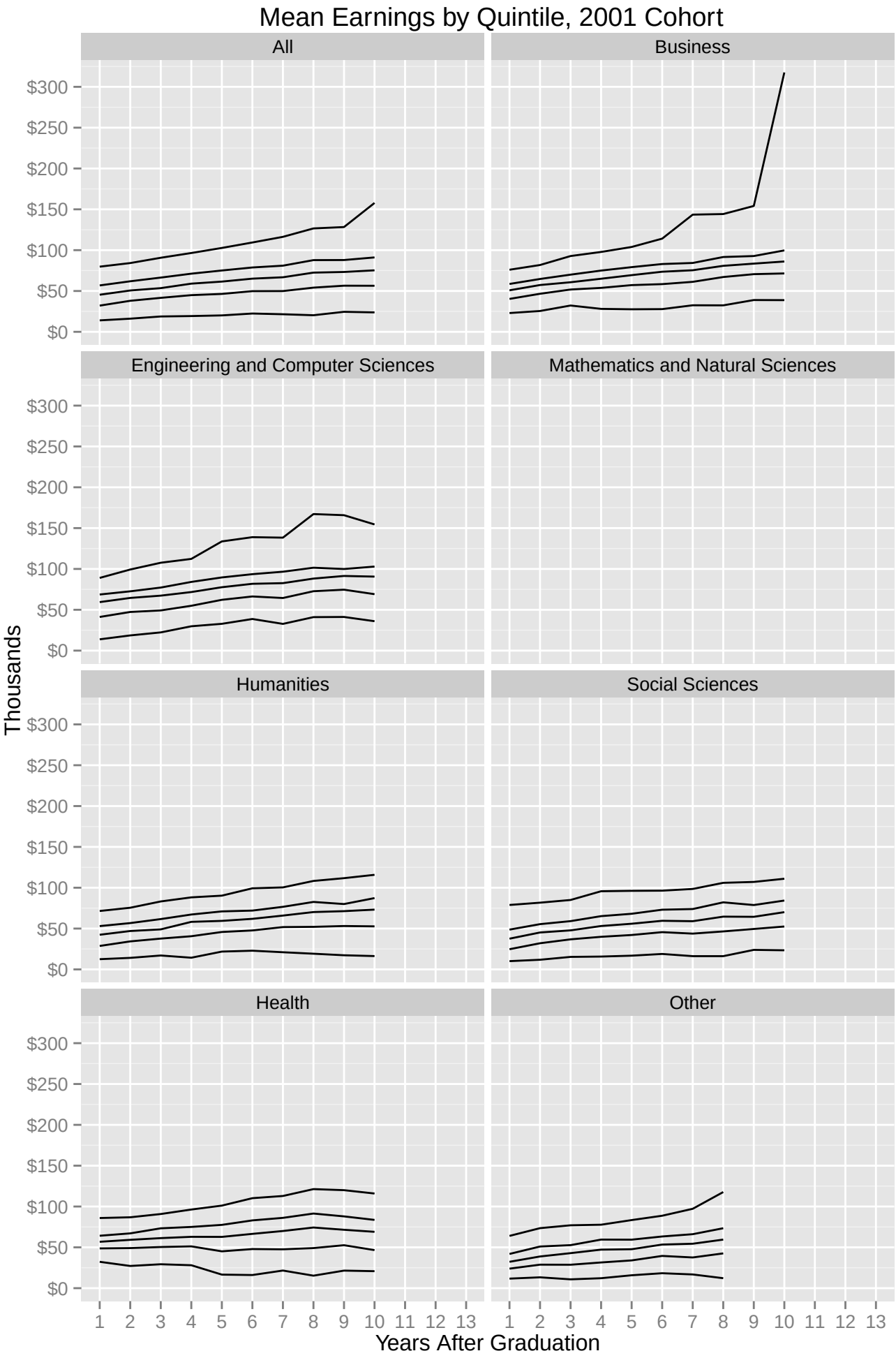
Years After Graduation


Mean Earnings by Quintile, 2001 Cohort
All
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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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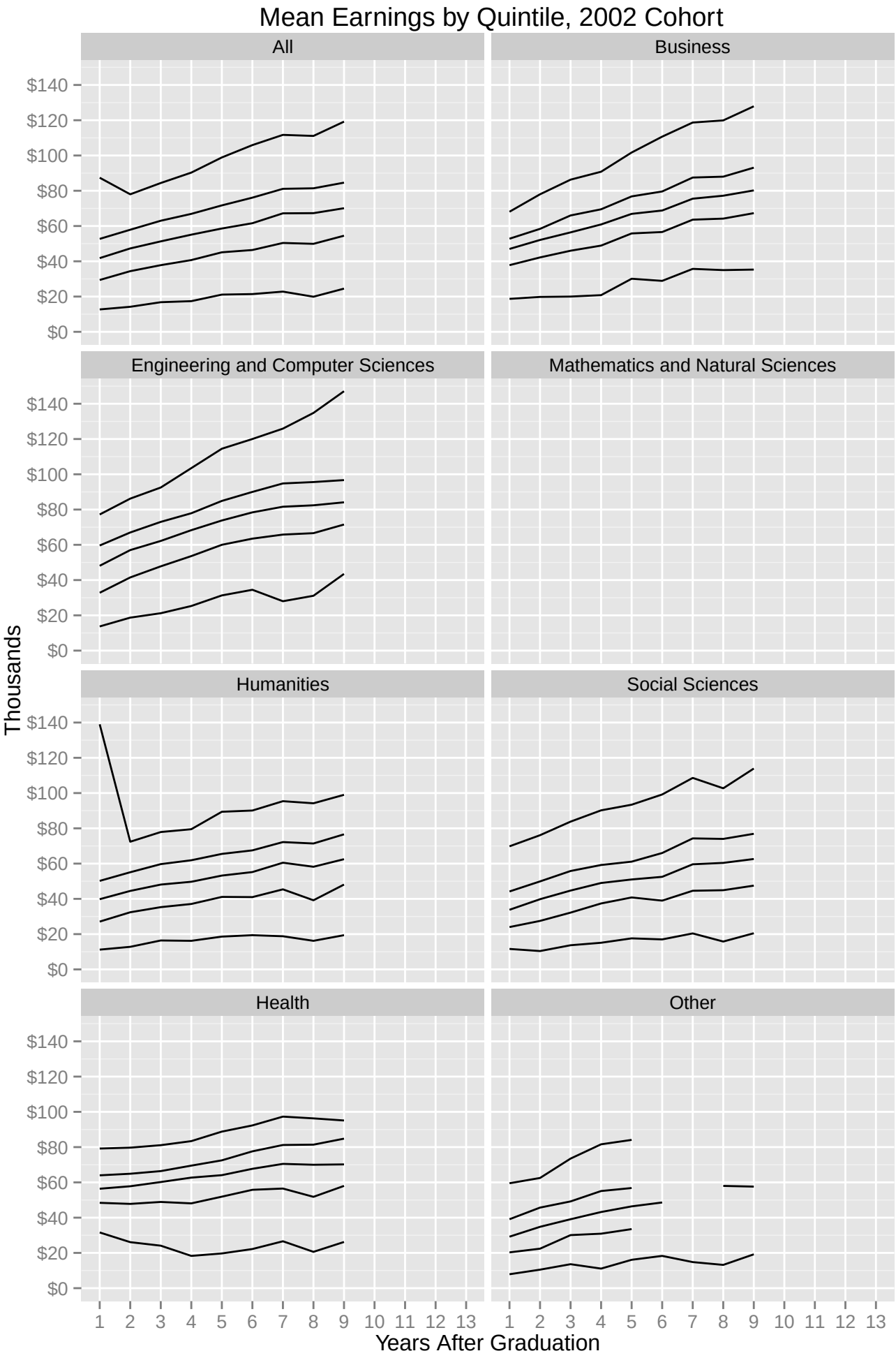
Years After Graduation


Mean Earnings by Quintile, 2002 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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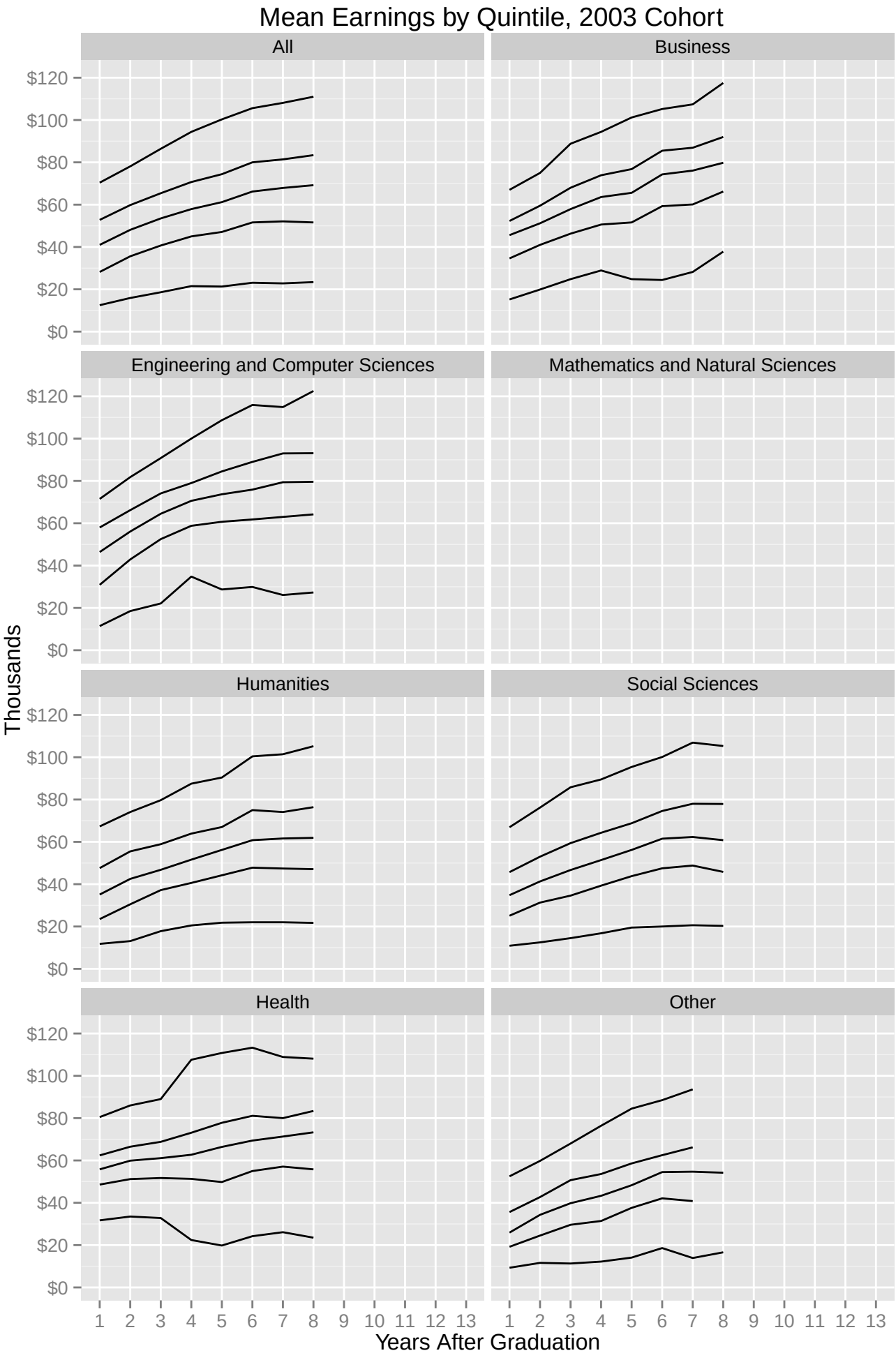
Years After Graduation


Mean Earnings by Quintile, 2003 Cohort
All
Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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$60
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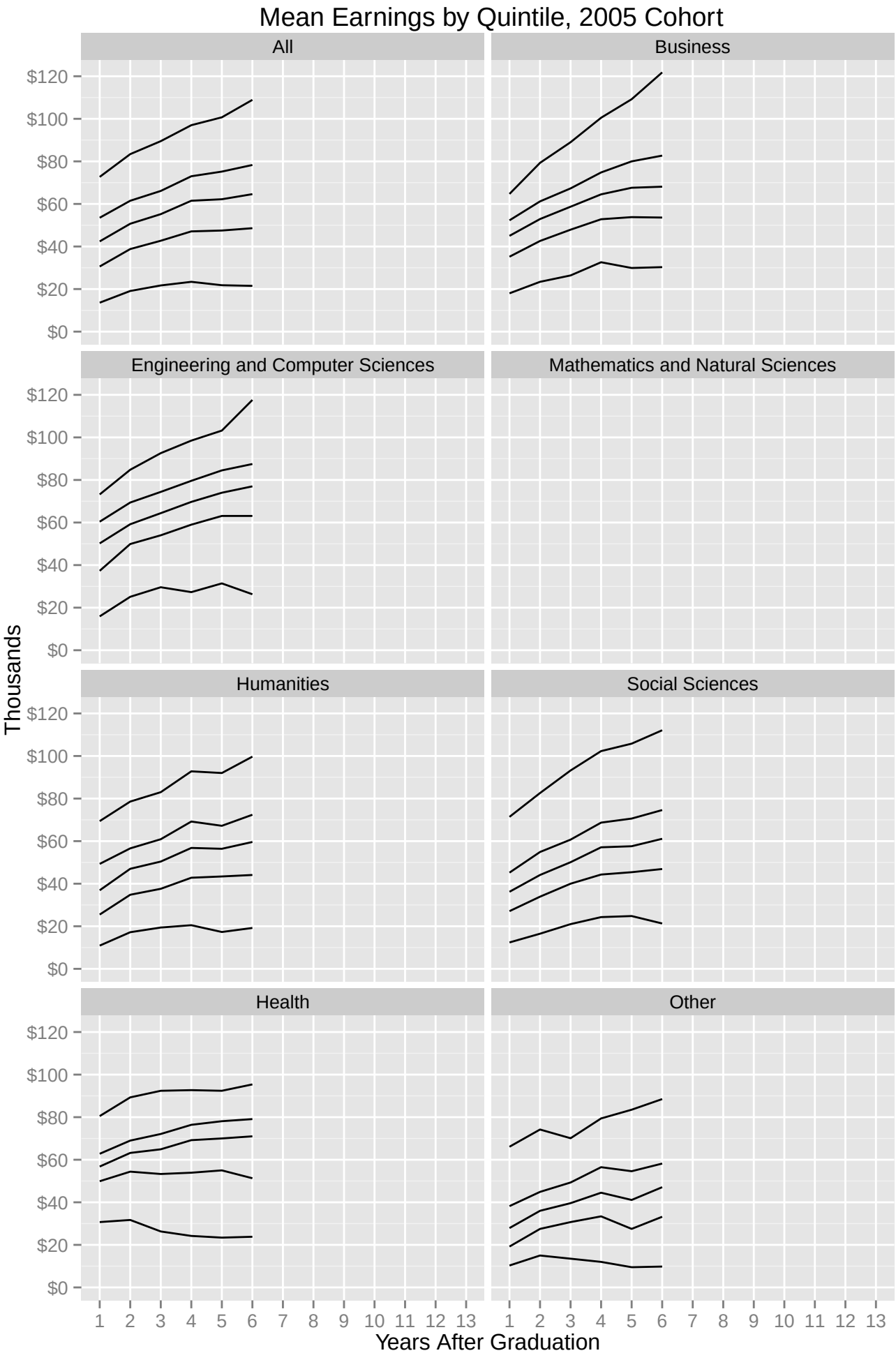
Years After Graduation


Mean Earnings by Quintile, 2005 Cohort
All
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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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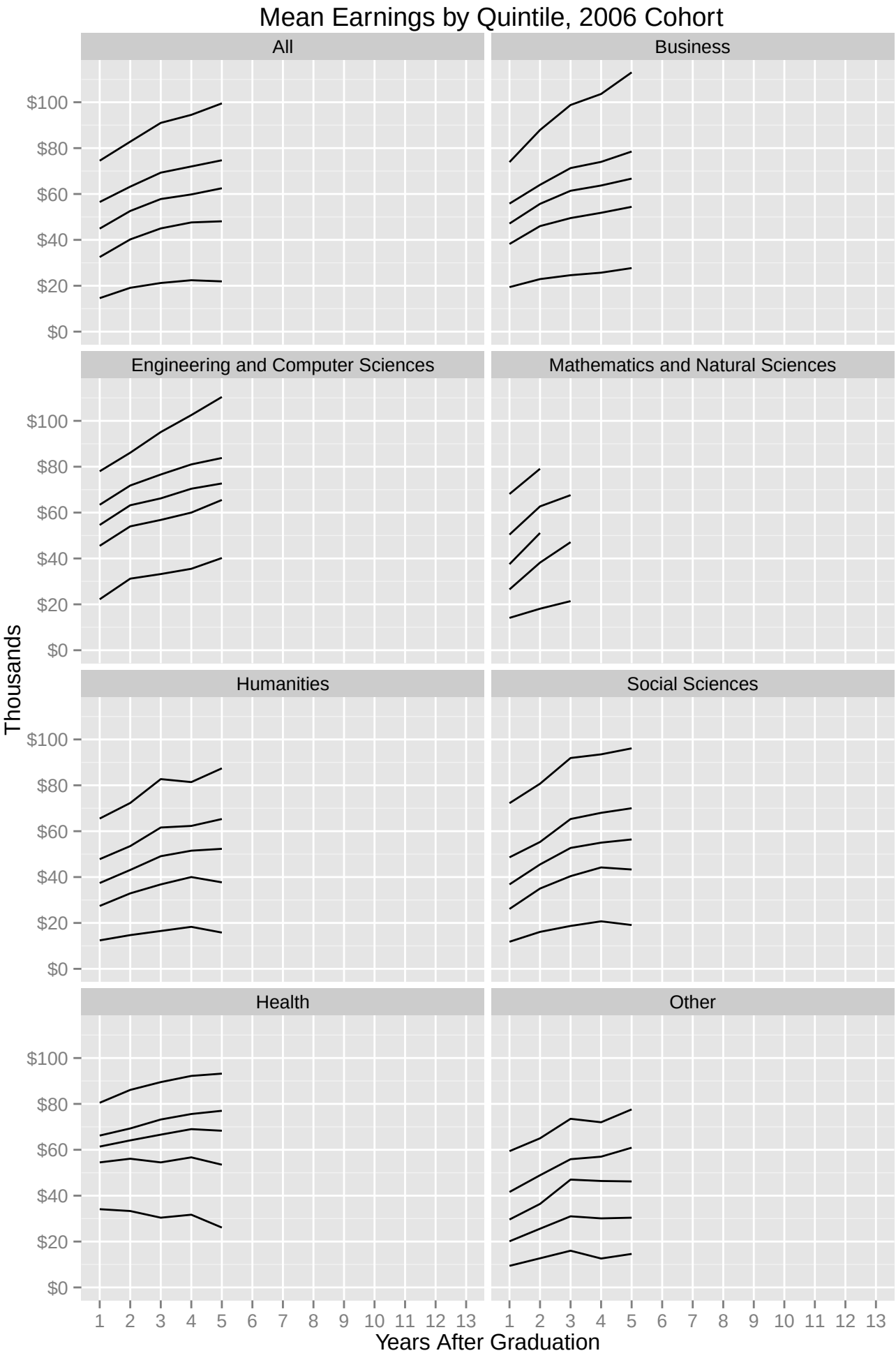
Years After Graduation


Mean Earnings by Quintile, 2006 Cohort
All
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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
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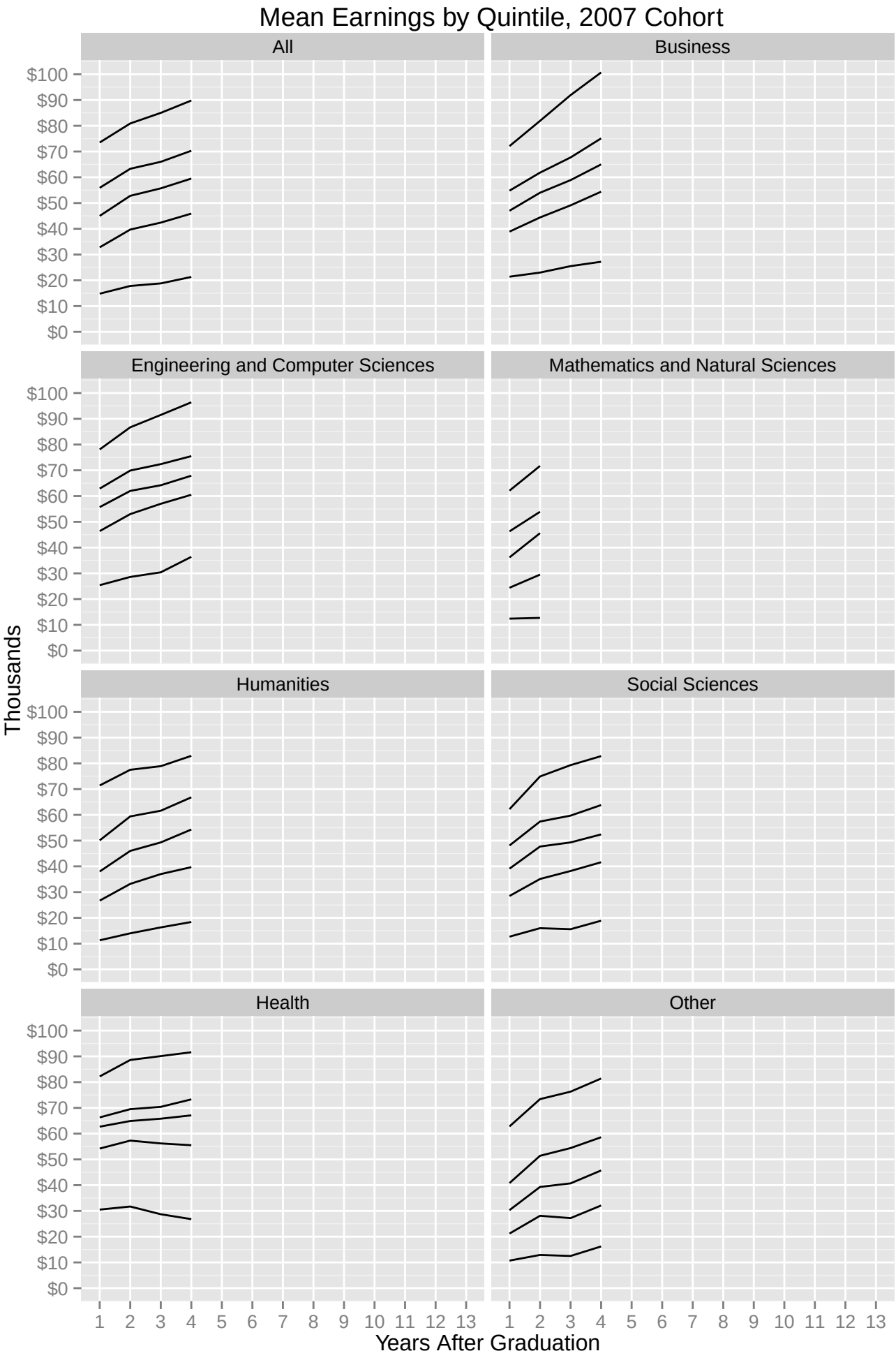
Years After Graduation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Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
Thousands
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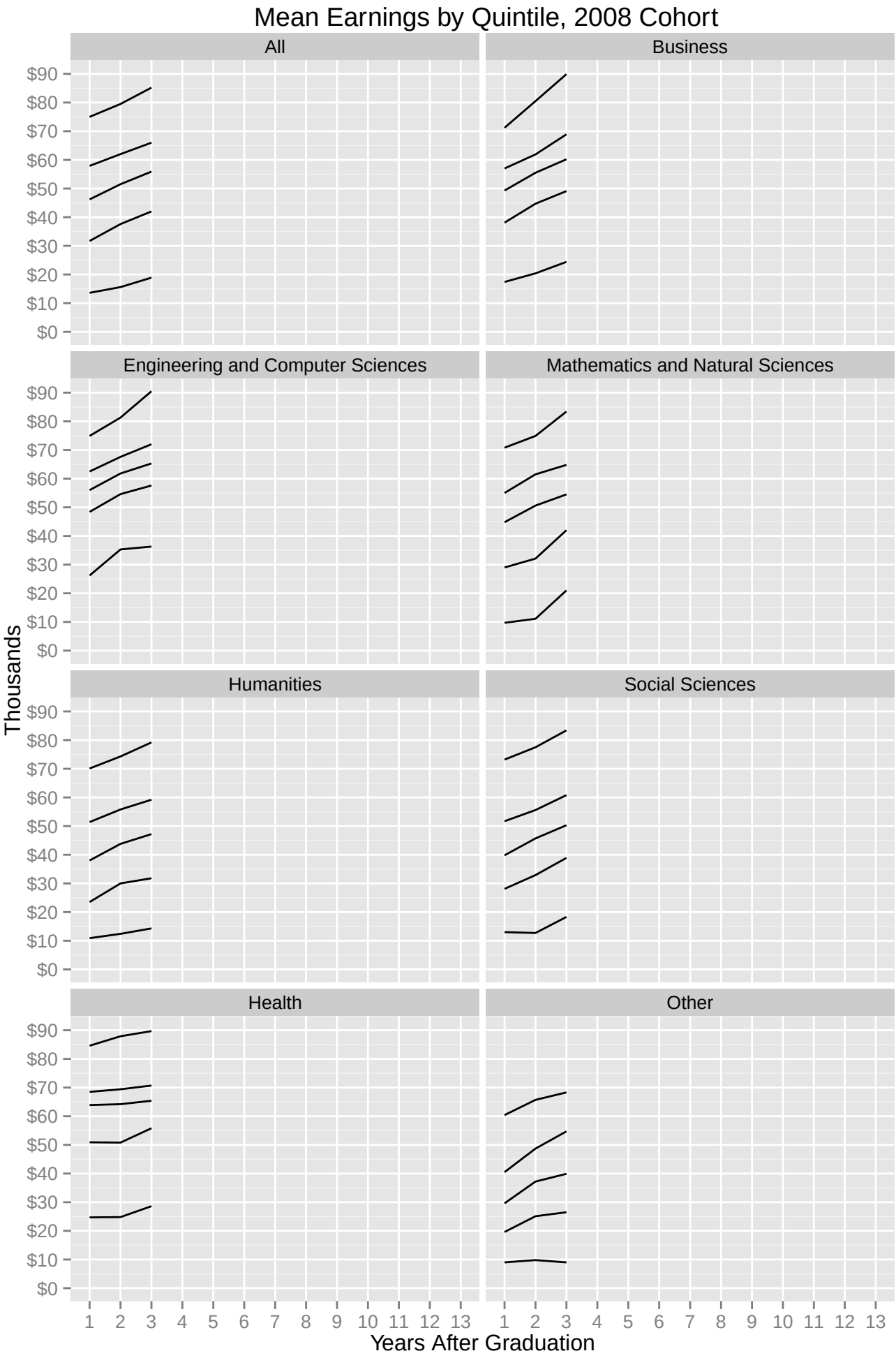
Years After Graduation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Mathematics and Natural Sciences
Humanities
Social Sciences
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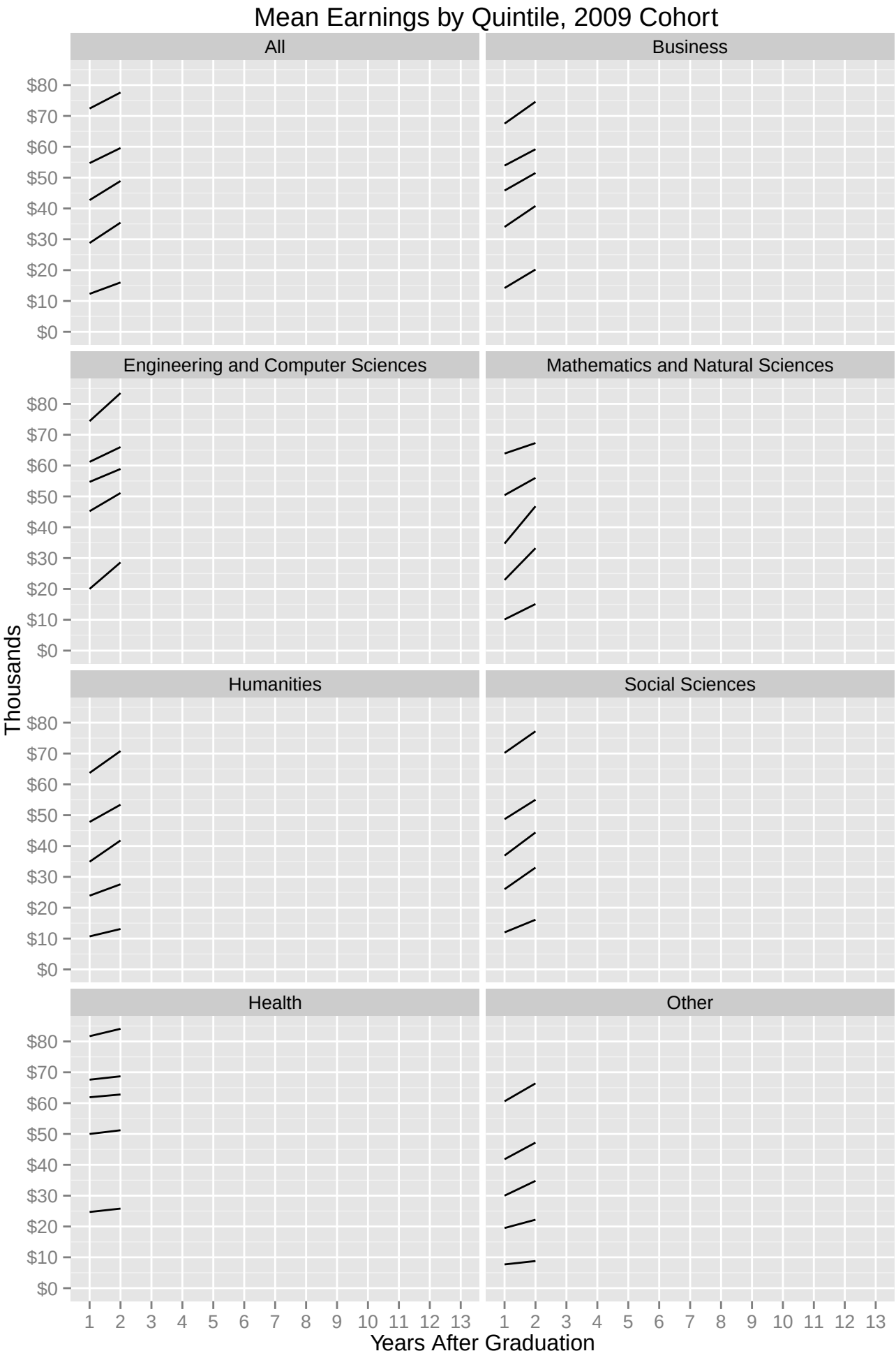
Years After Graduation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Mathematics and Natural Sciences
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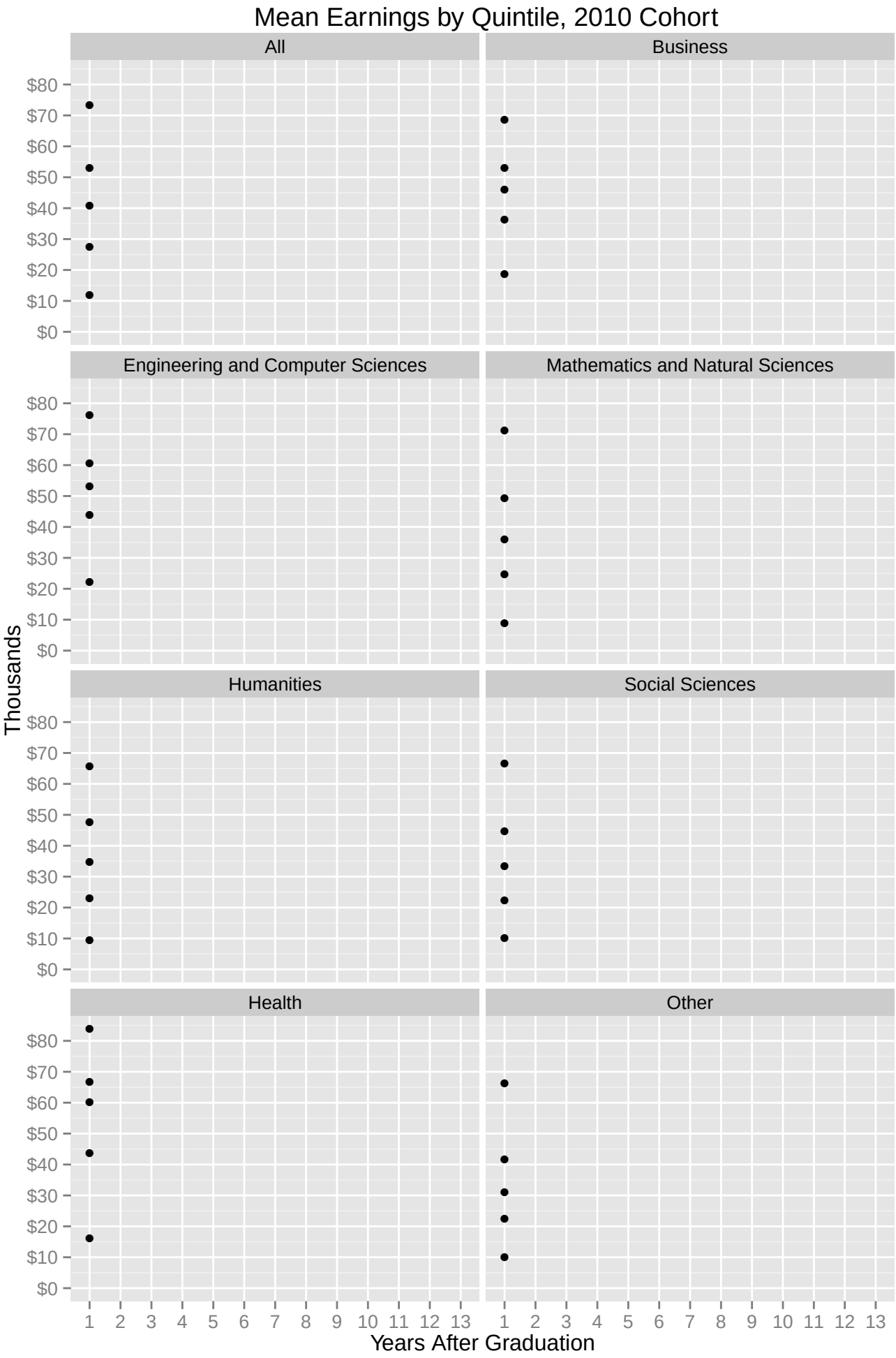
Years After Graduation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Mathematics and Natural Sciences
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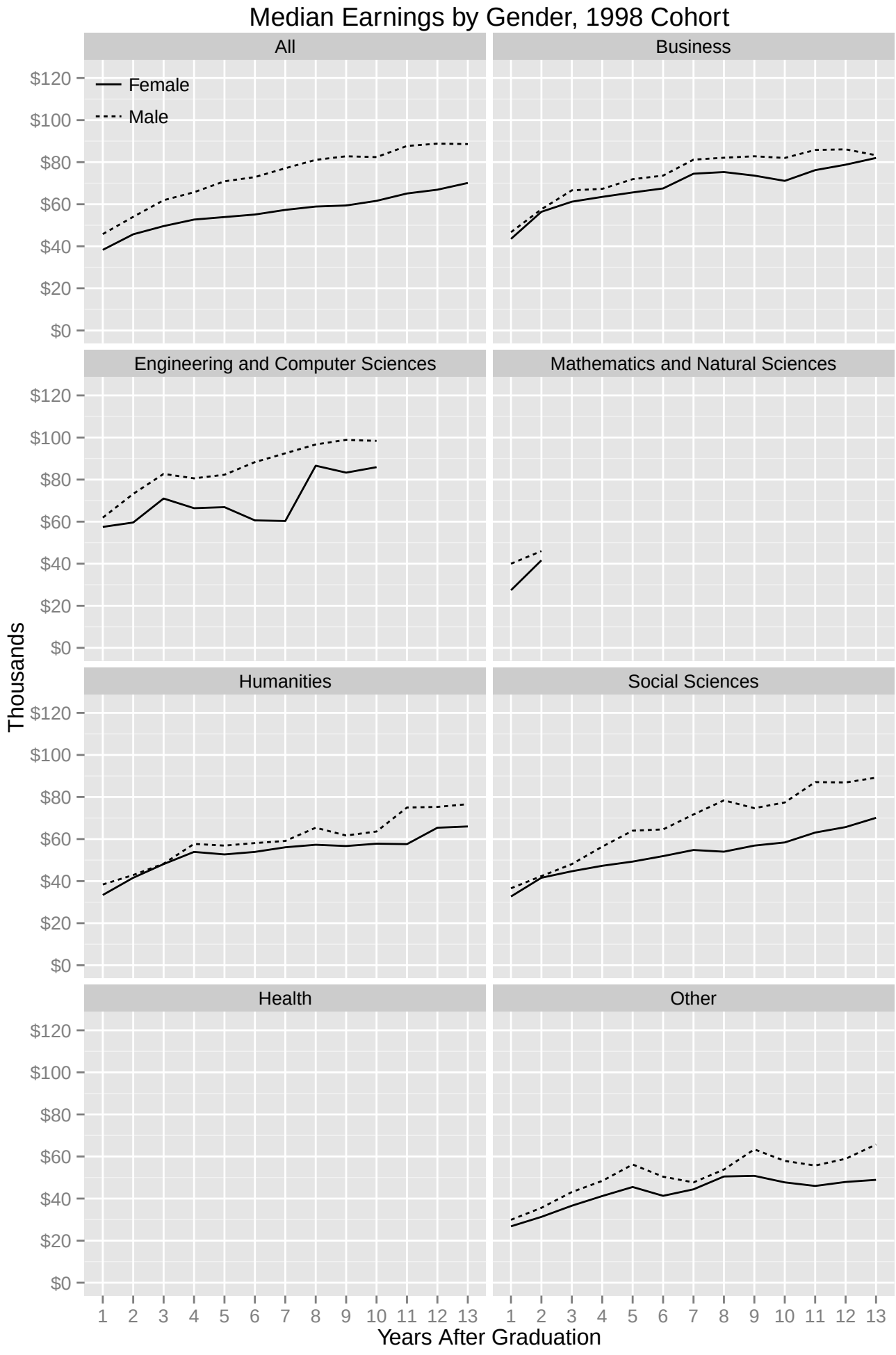
Years After Graduation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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
Health
Other
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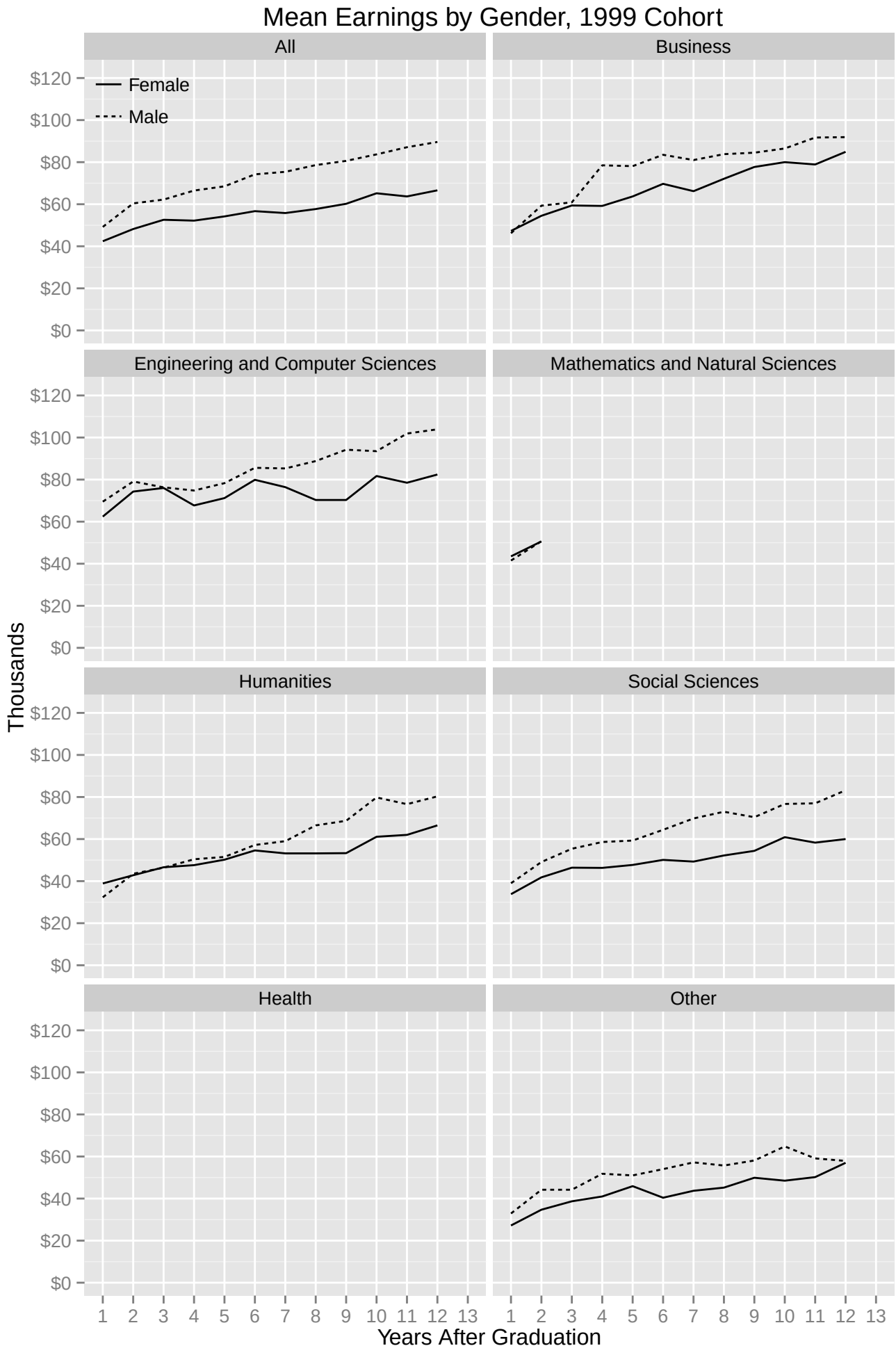
Years After Graduation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Mathematics and Natural Sciences
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Social Sciences
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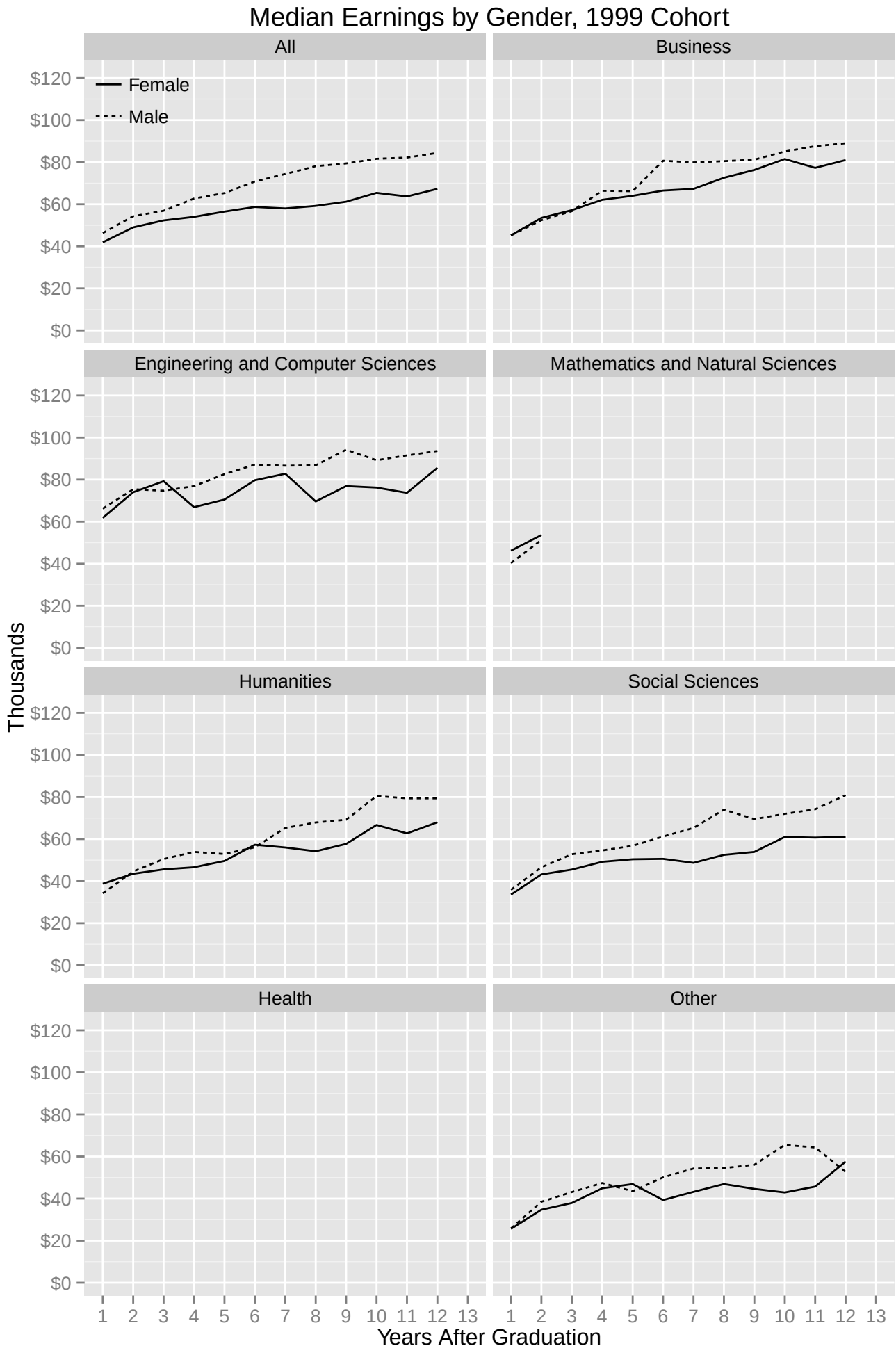
Years After Graduation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Mathematics and Natural Sciences
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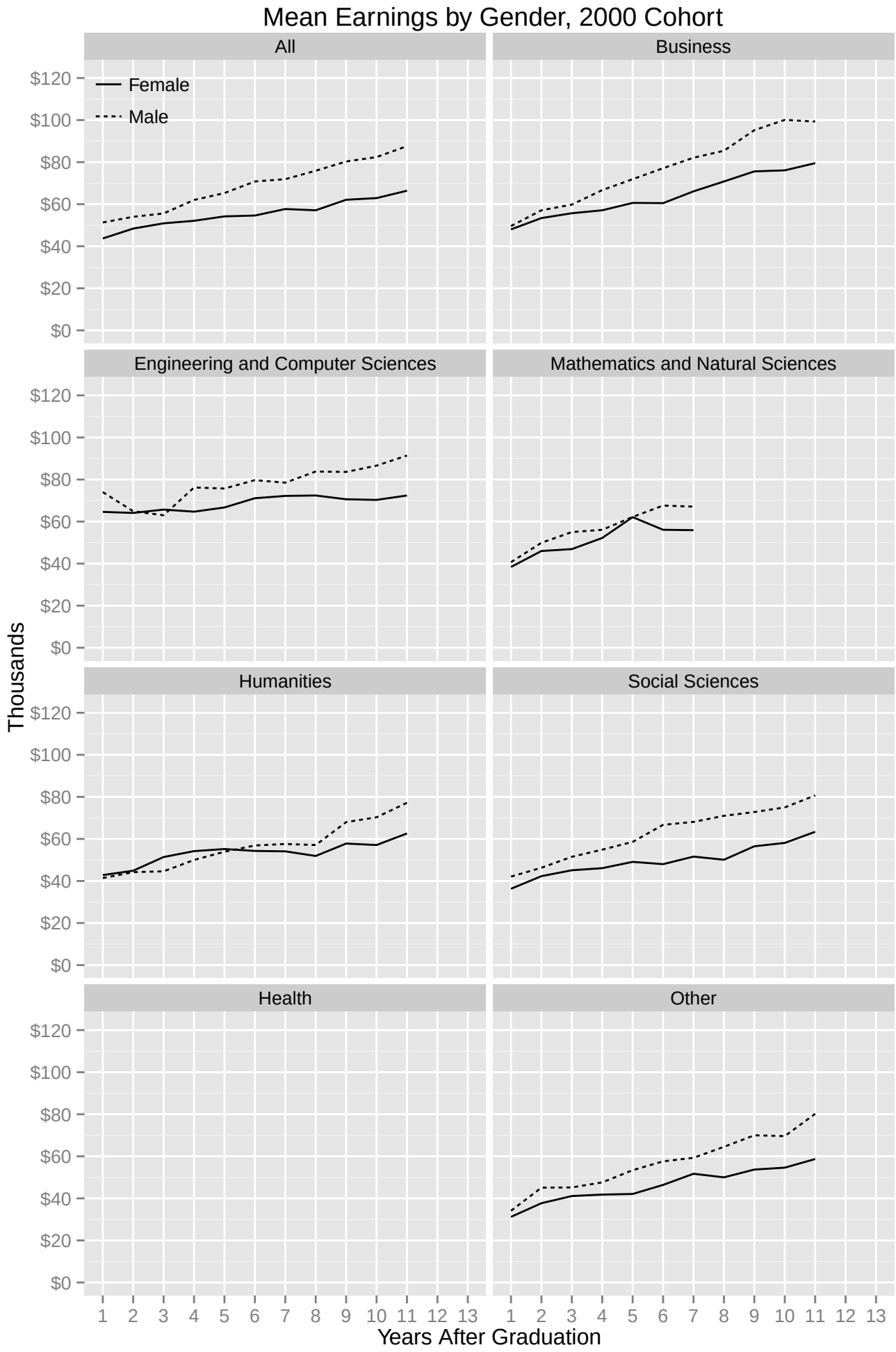
Years After Graduation


Mean Earnings by Gender, 2000 Cohort
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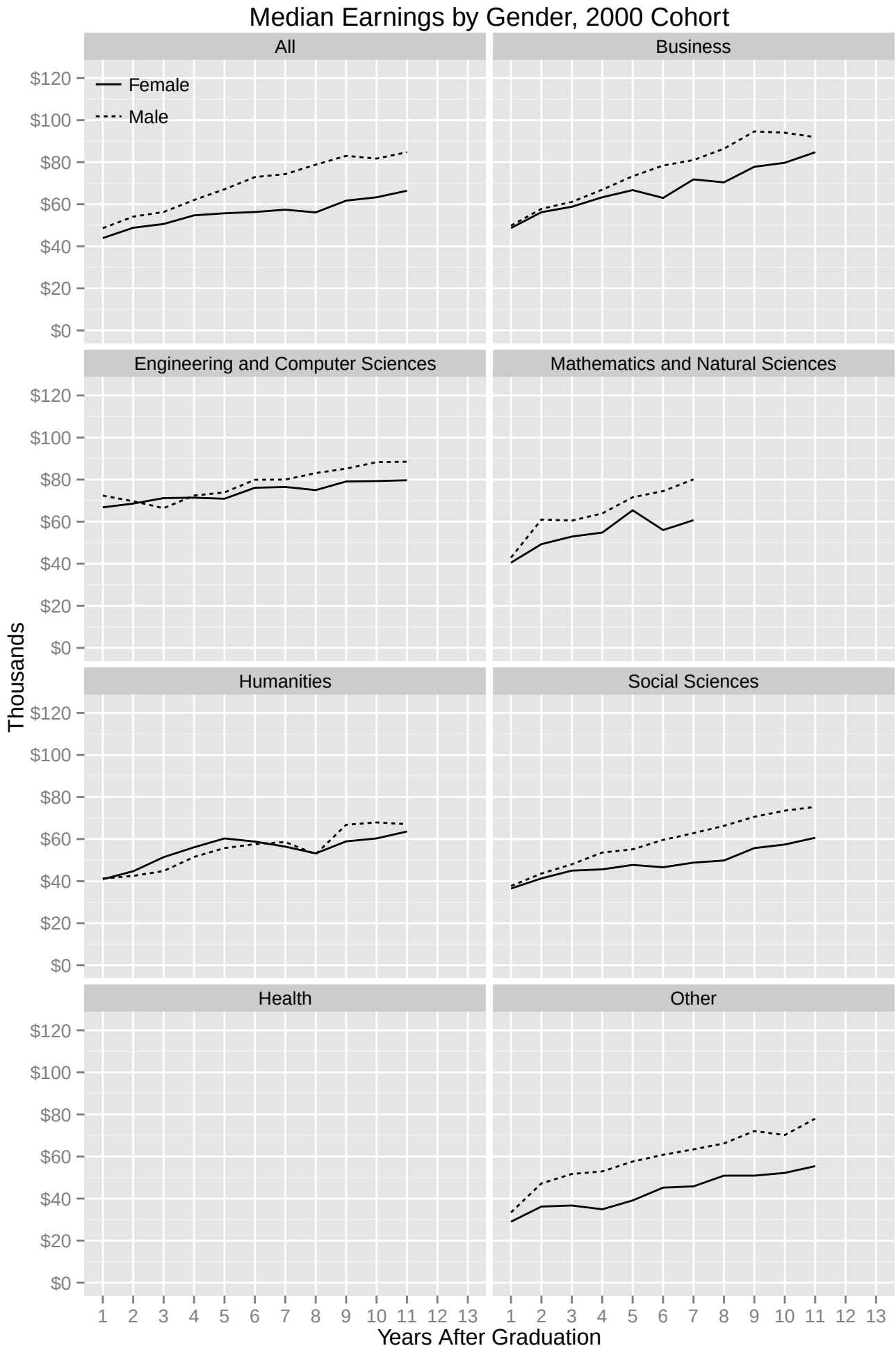
Years After Graduation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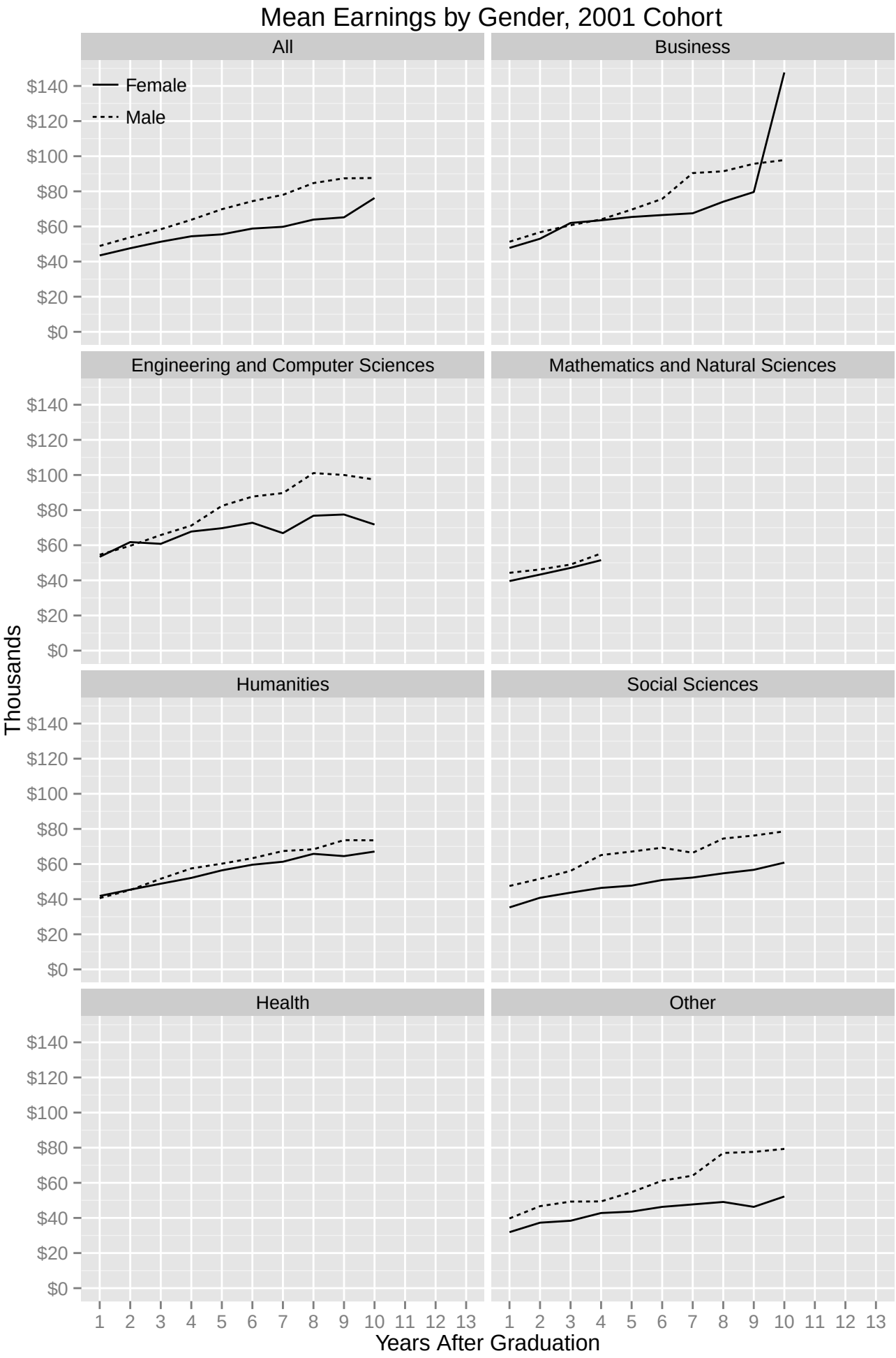
Years After Graduation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Mathematics and Natural Sciences
Humanities
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Health
Other
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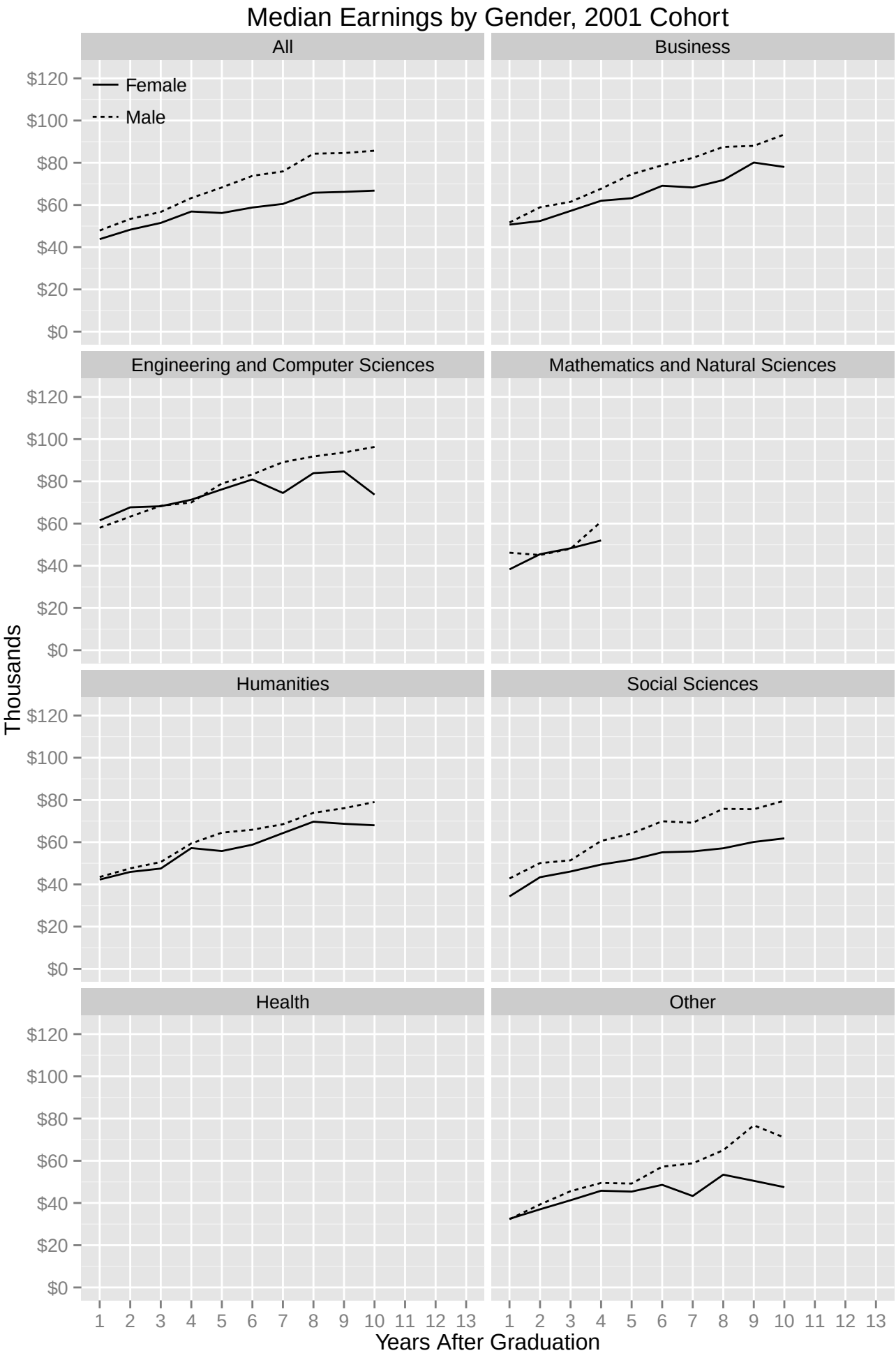
Years After Graduation


Median Earnings by Gender, 2001 Cohort
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Business
Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
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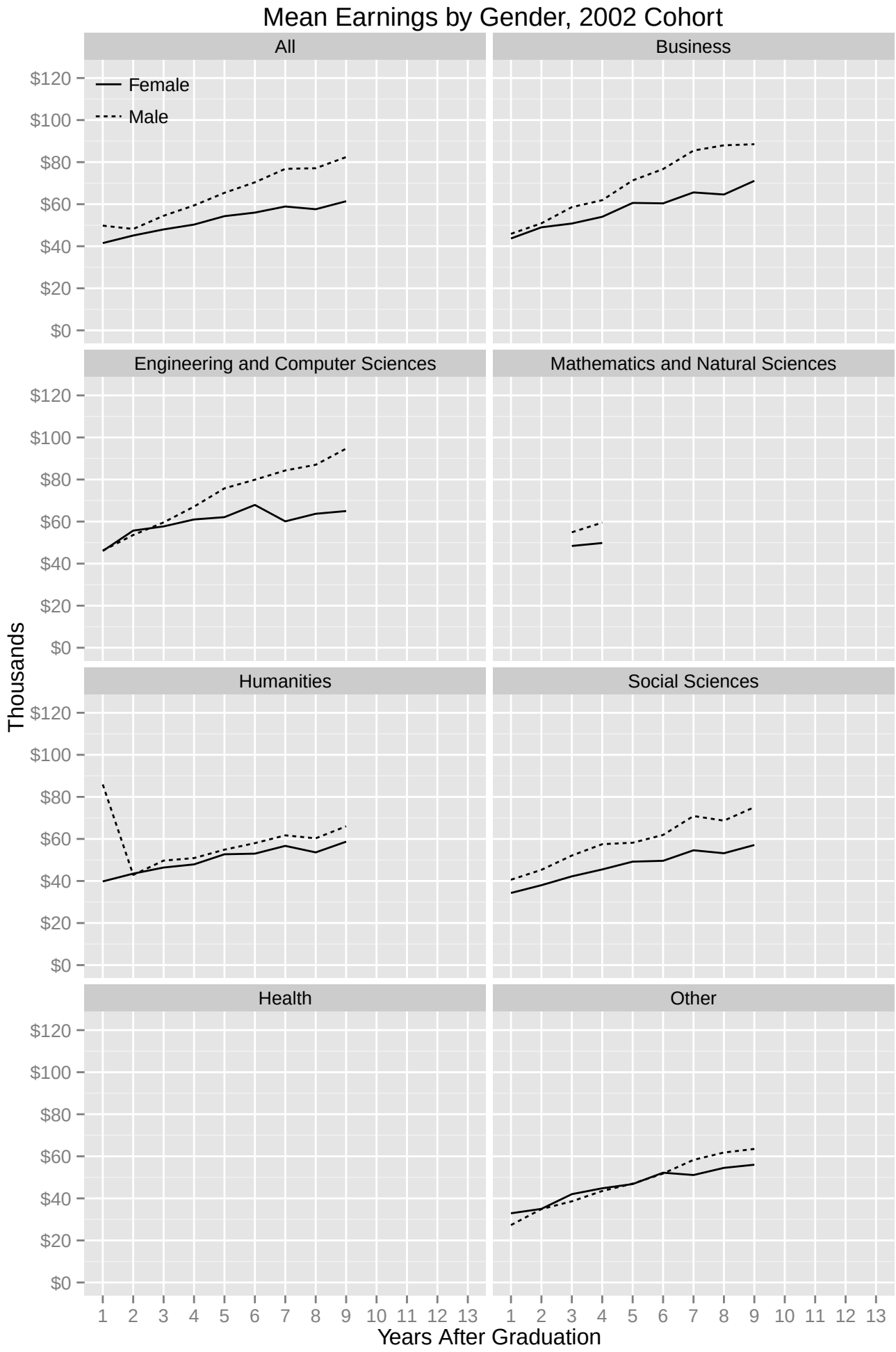
Years After Graduation


Mean Earnings by Gender, 2002 Cohort
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Engineering and Computer Sciences
Mathematics and Natural Sciences
Humanities
Social Sciences
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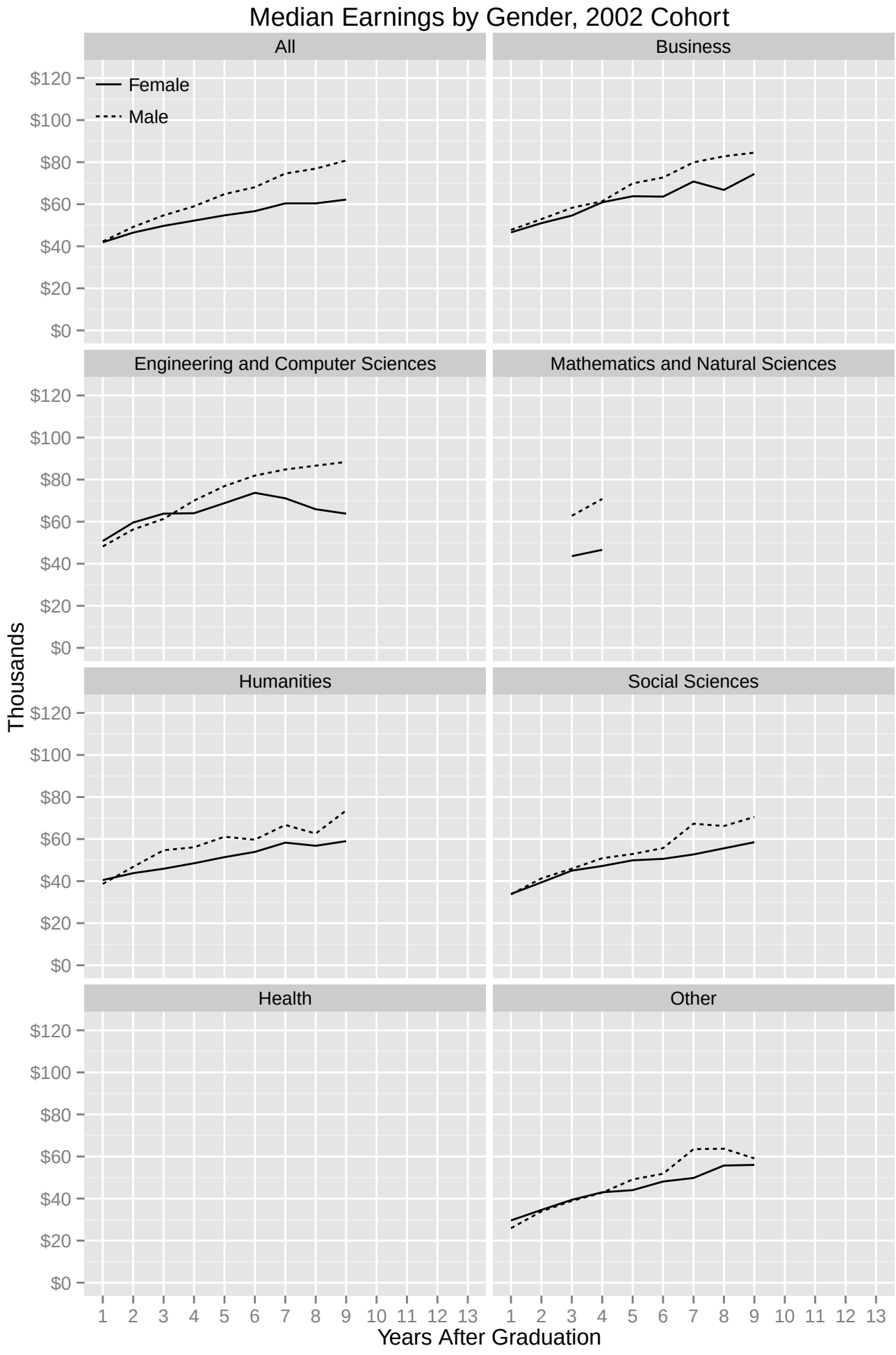
Years After Graduation


Median Earnings by Gender, 2002 Cohort
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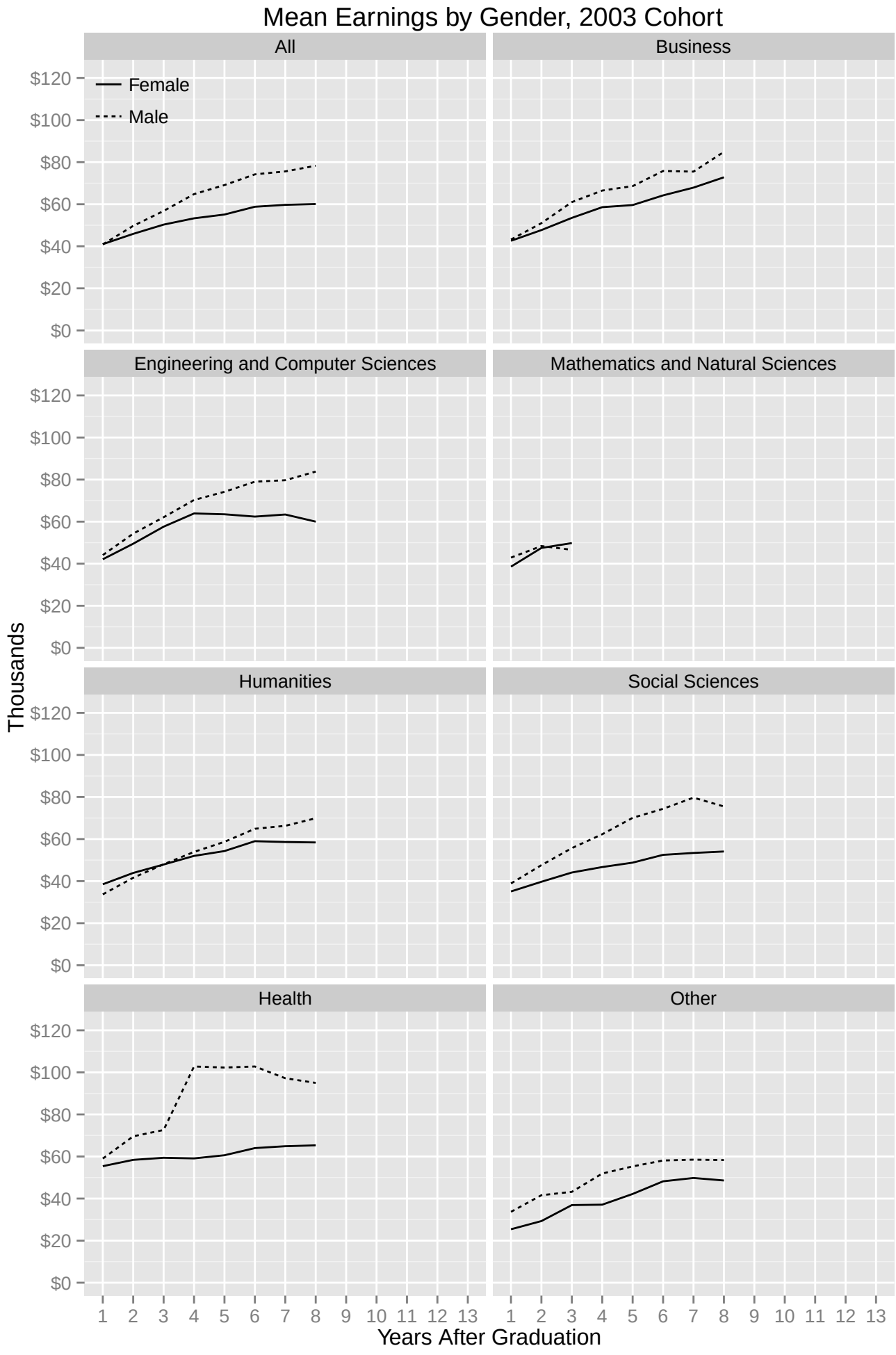
Years After Graduation


Mean Earnings by Gender, 2003 Cohort
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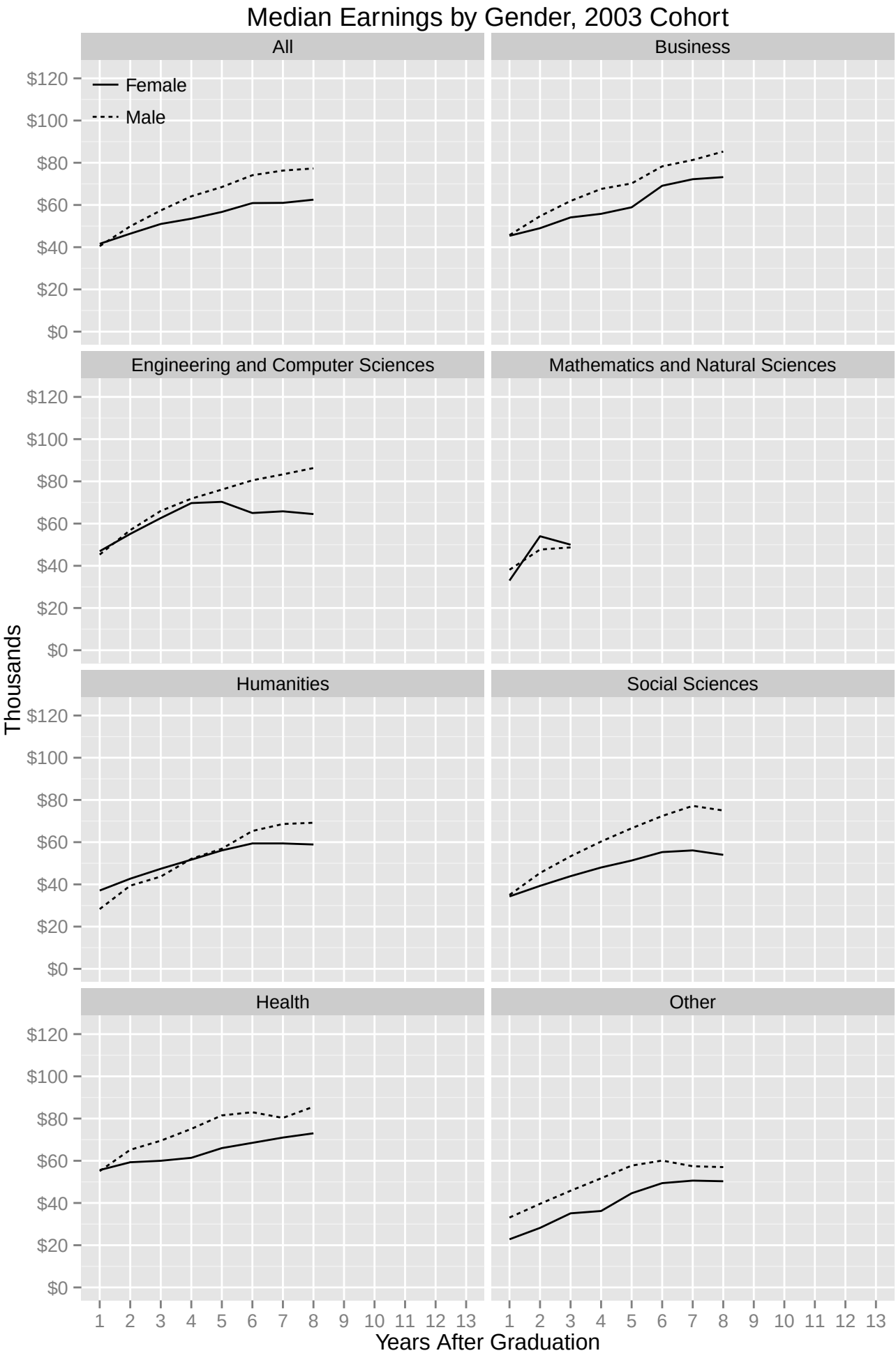
Years After Graduation


Median Earnings by Gender, 2003 Cohort
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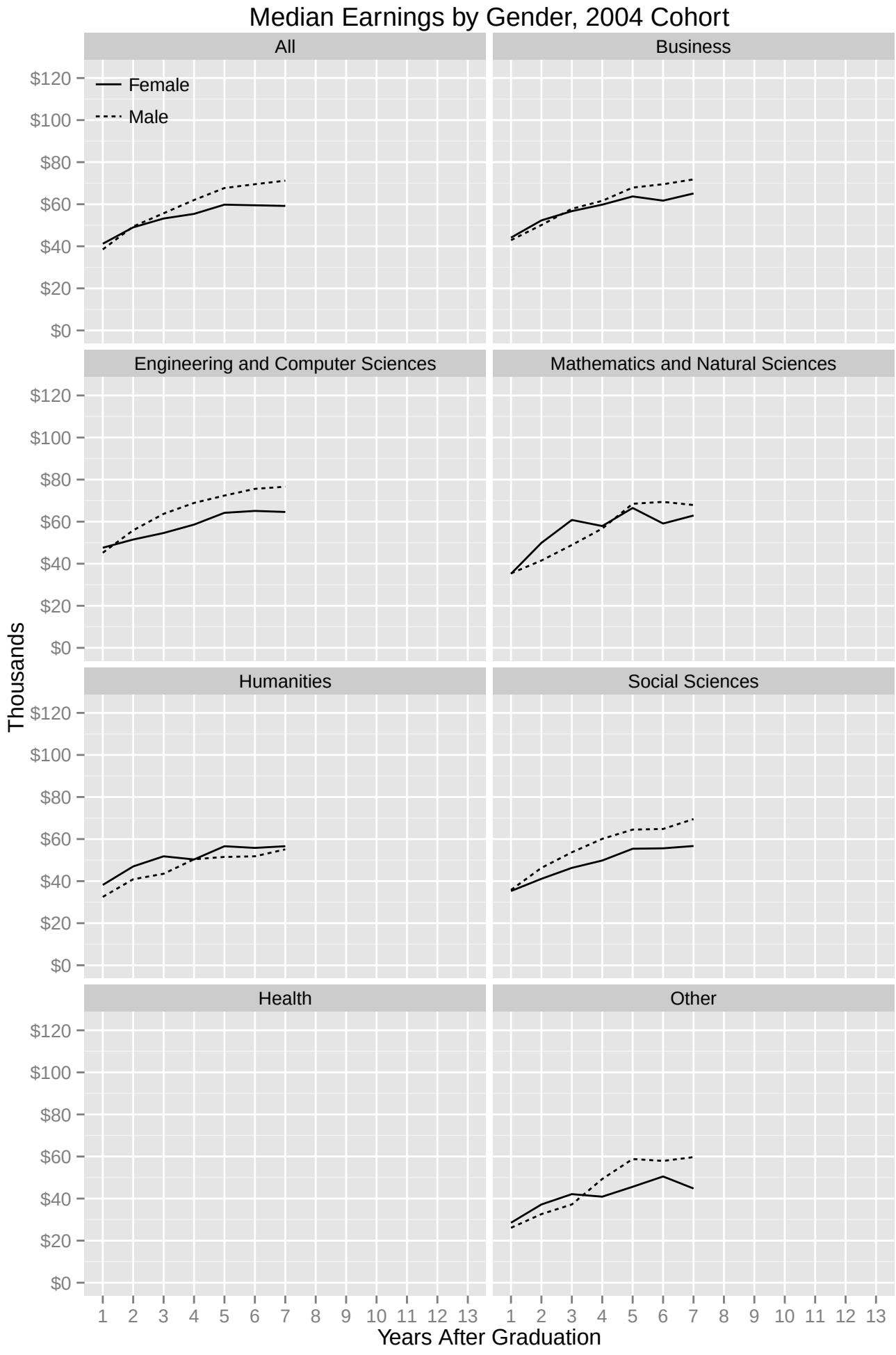
Years After Graduation


Median Earnings by Gender, 2004 Cohort
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Mathematics and Natural Sciences
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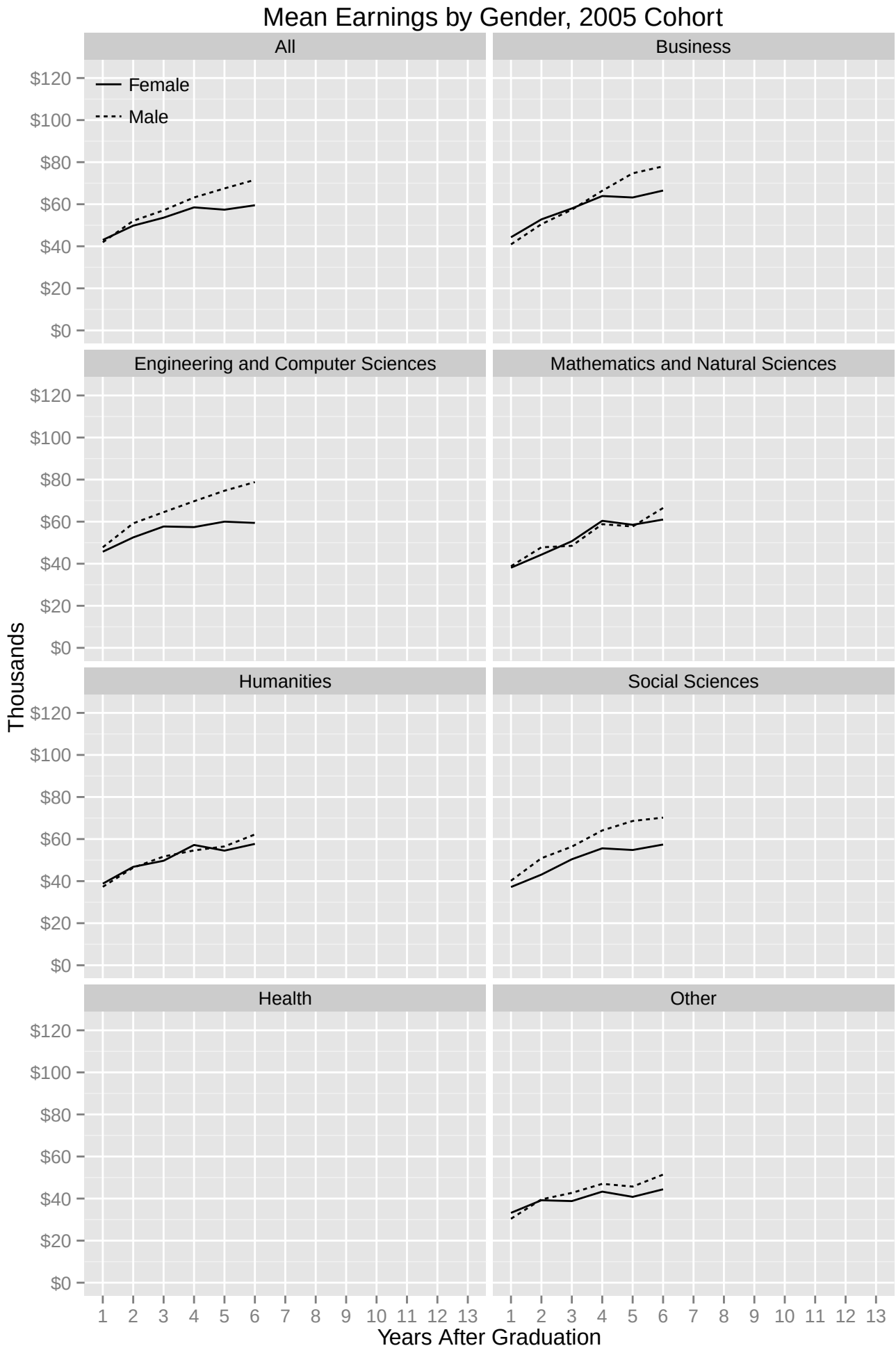
Years After Graduation


Mean Earnings by Gender, 2005 Cohort
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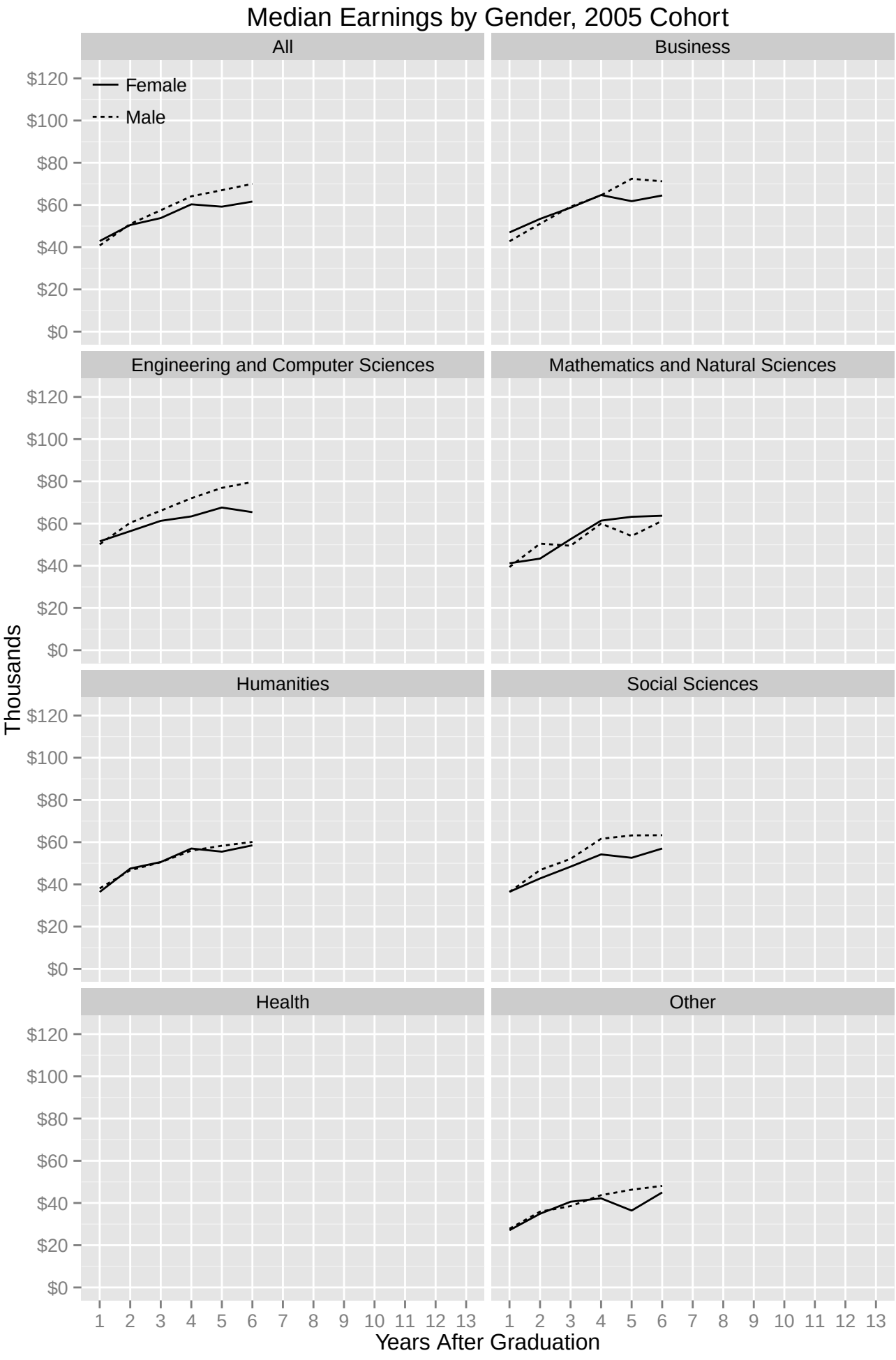
Years After Graduation


Median Earnings by Gender, 2005 Cohort
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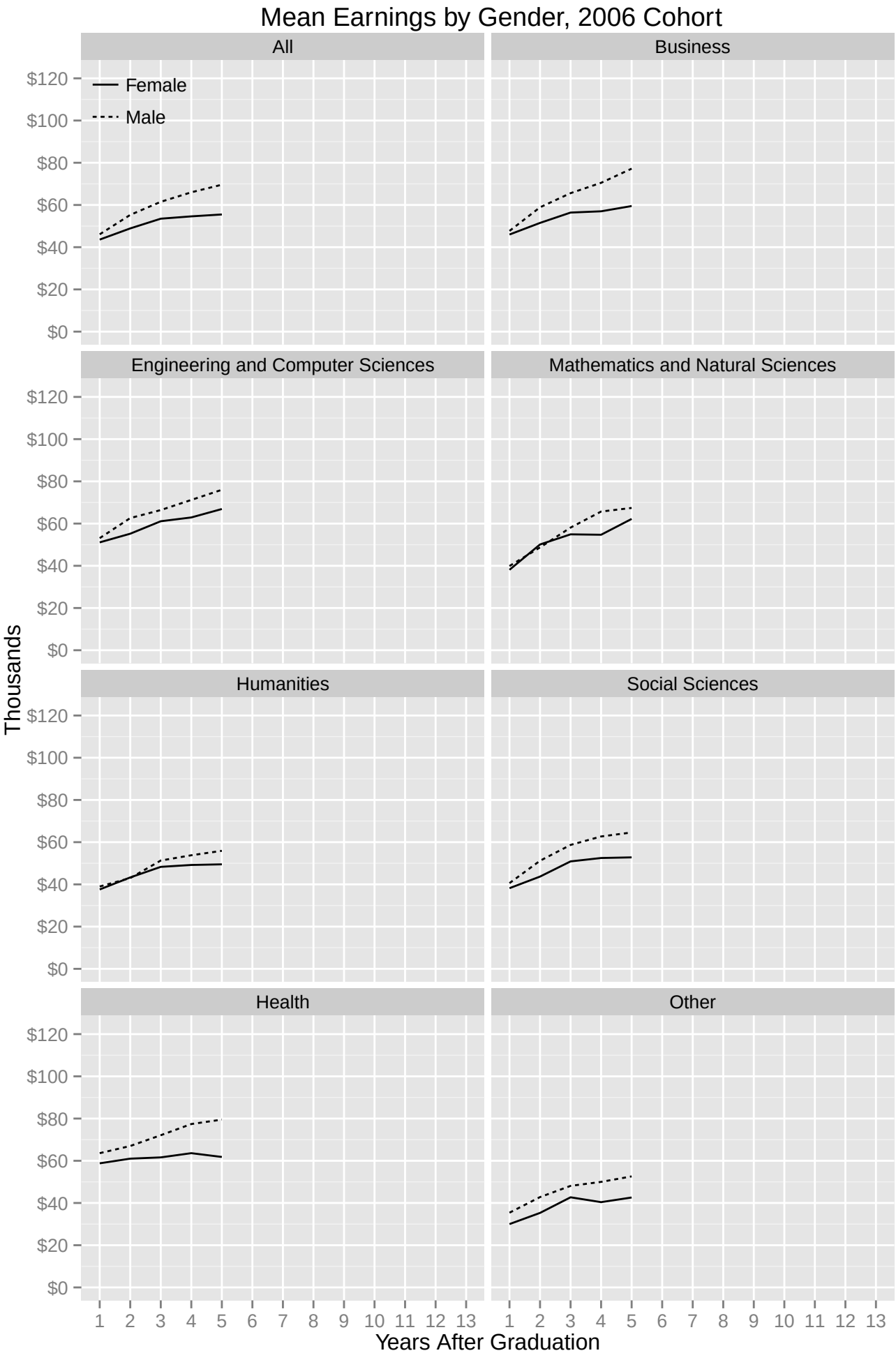
Years After Graduation


Mean Earnings by Gender, 2006 Cohort
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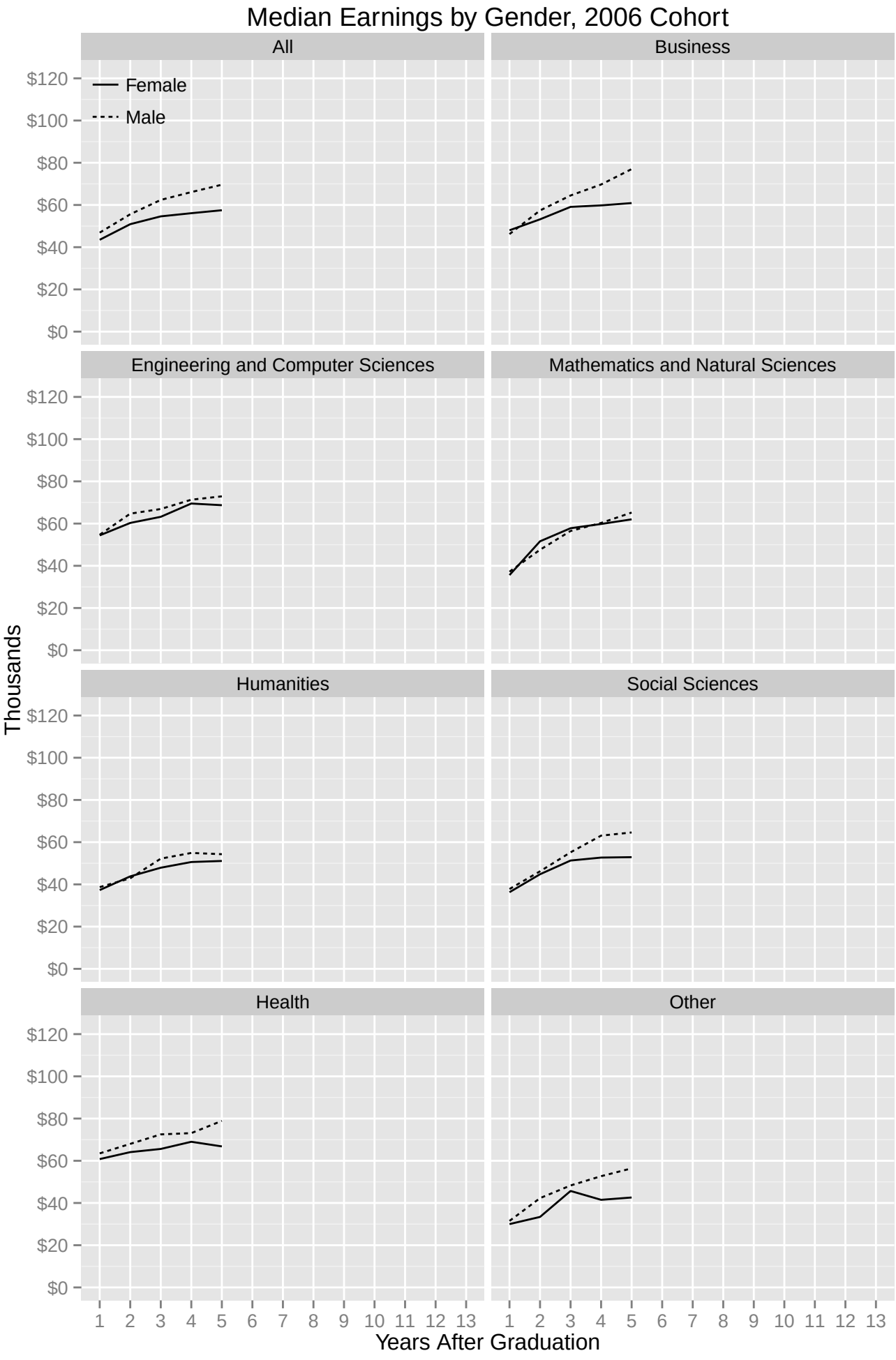
Years After Graduation


Median Earnings by Gender, 2006 Cohort
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Mathematics and Natural Sciences
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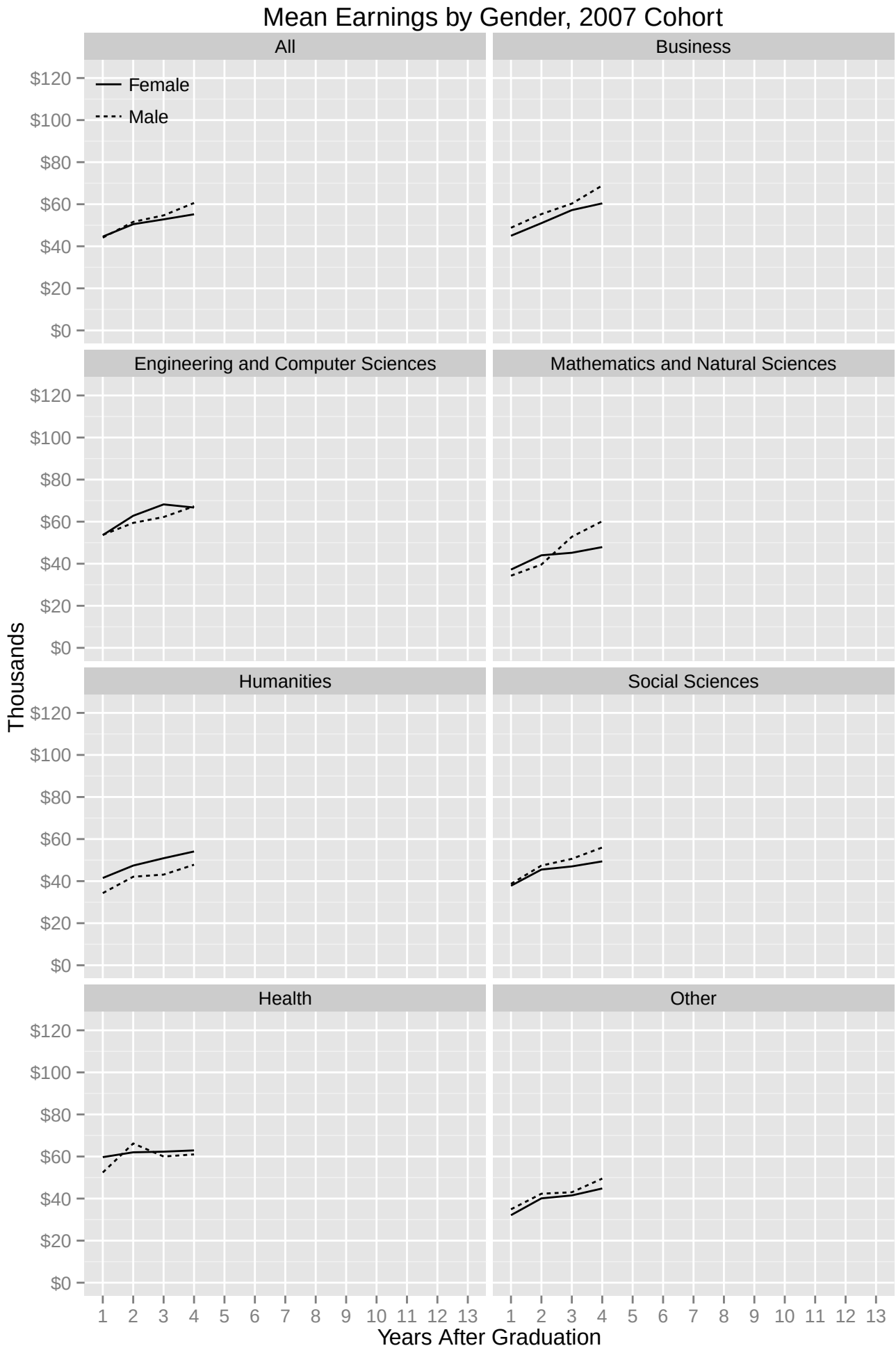
Years After Graduation


Mean Earnings by Gender, 2007 Cohort
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Mathematics and Natural Sciences
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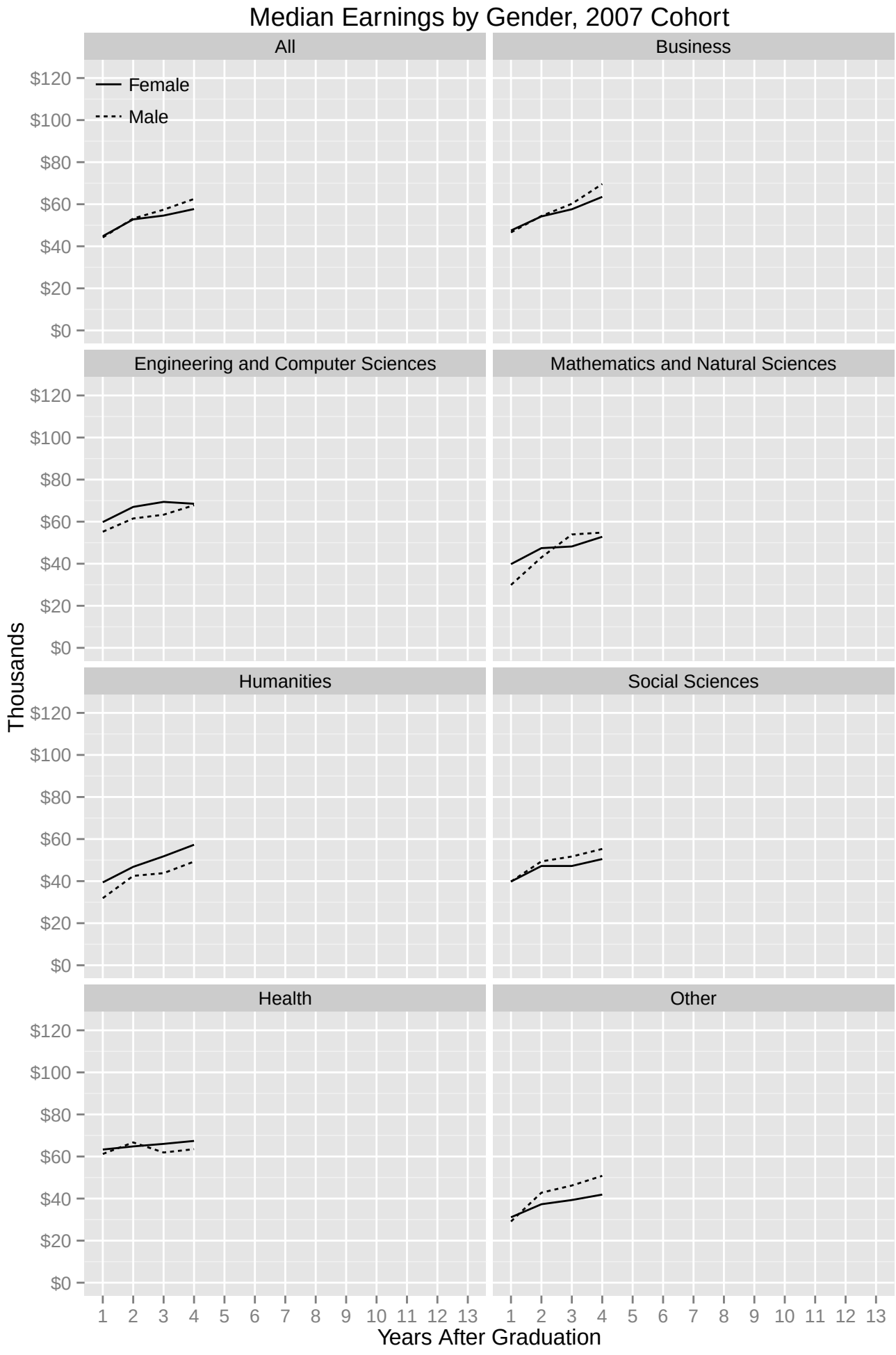
Years After Graduation


Median Earnings by Gender, 2007 Cohort
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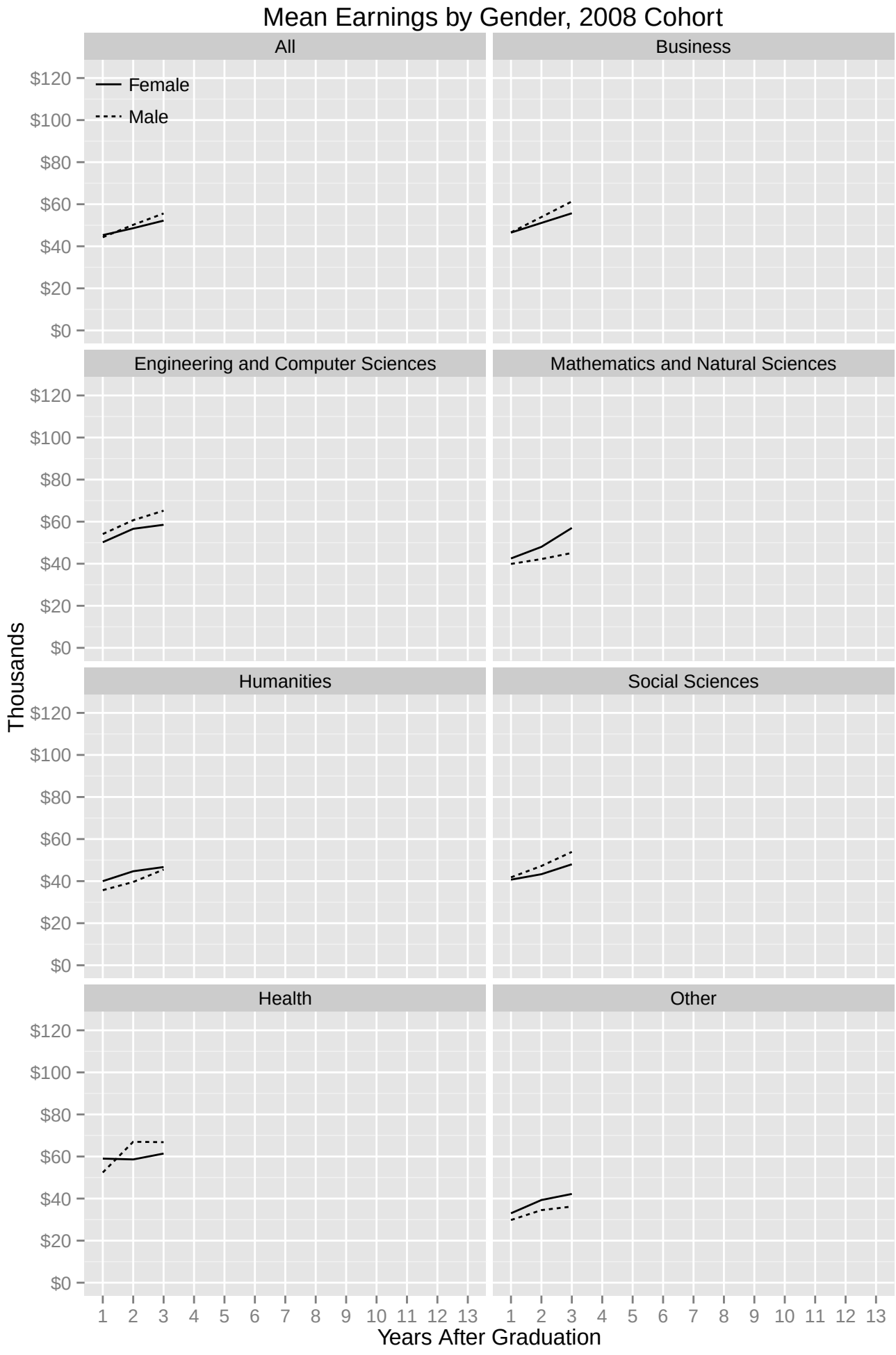
Years After Graduation


Mean Earnings by Gender, 2008 Cohort
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Mathematics and Natural Sciences
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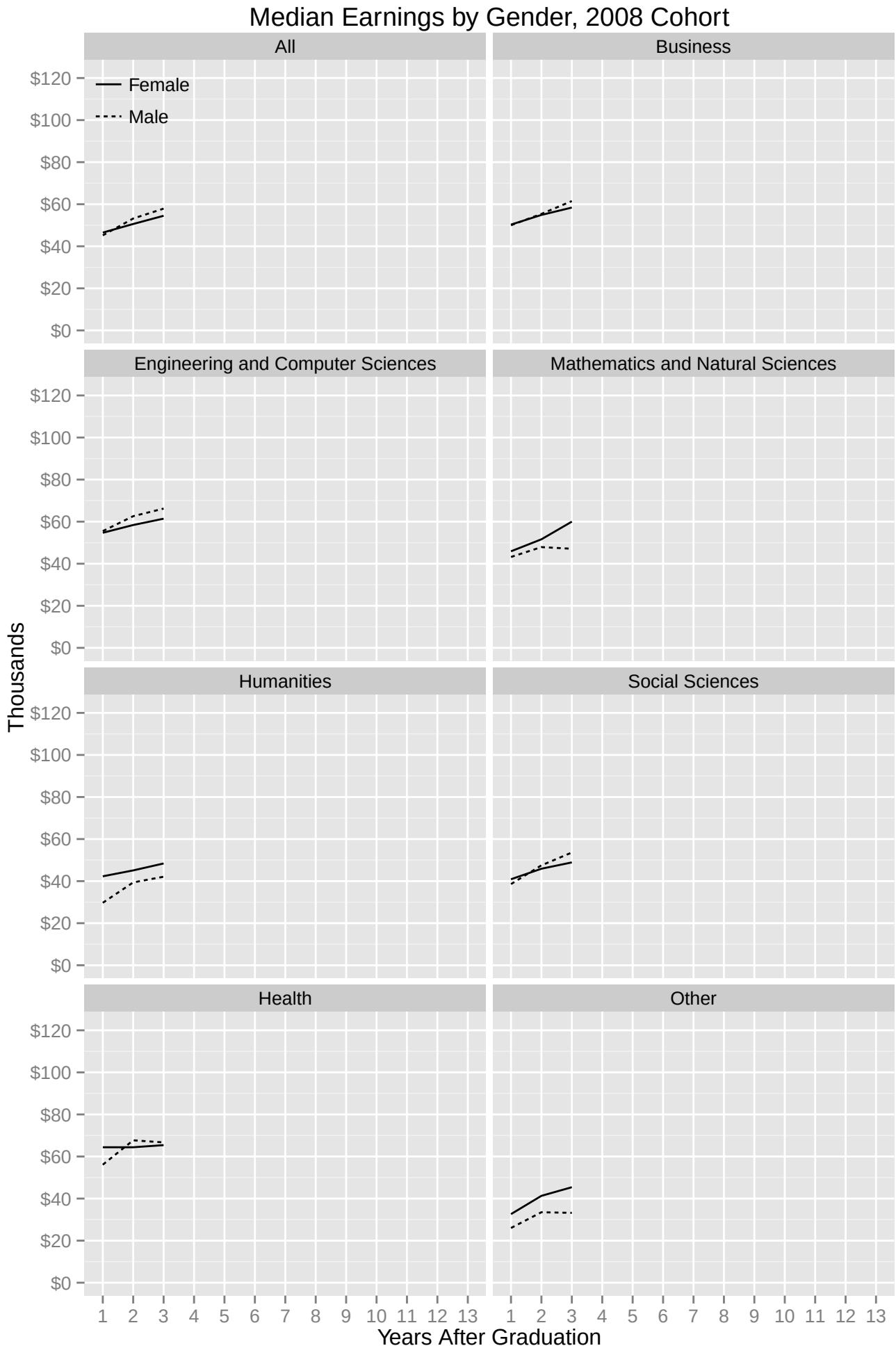
Years After Graduation


Median Earnings by Gender, 2008 Cohort
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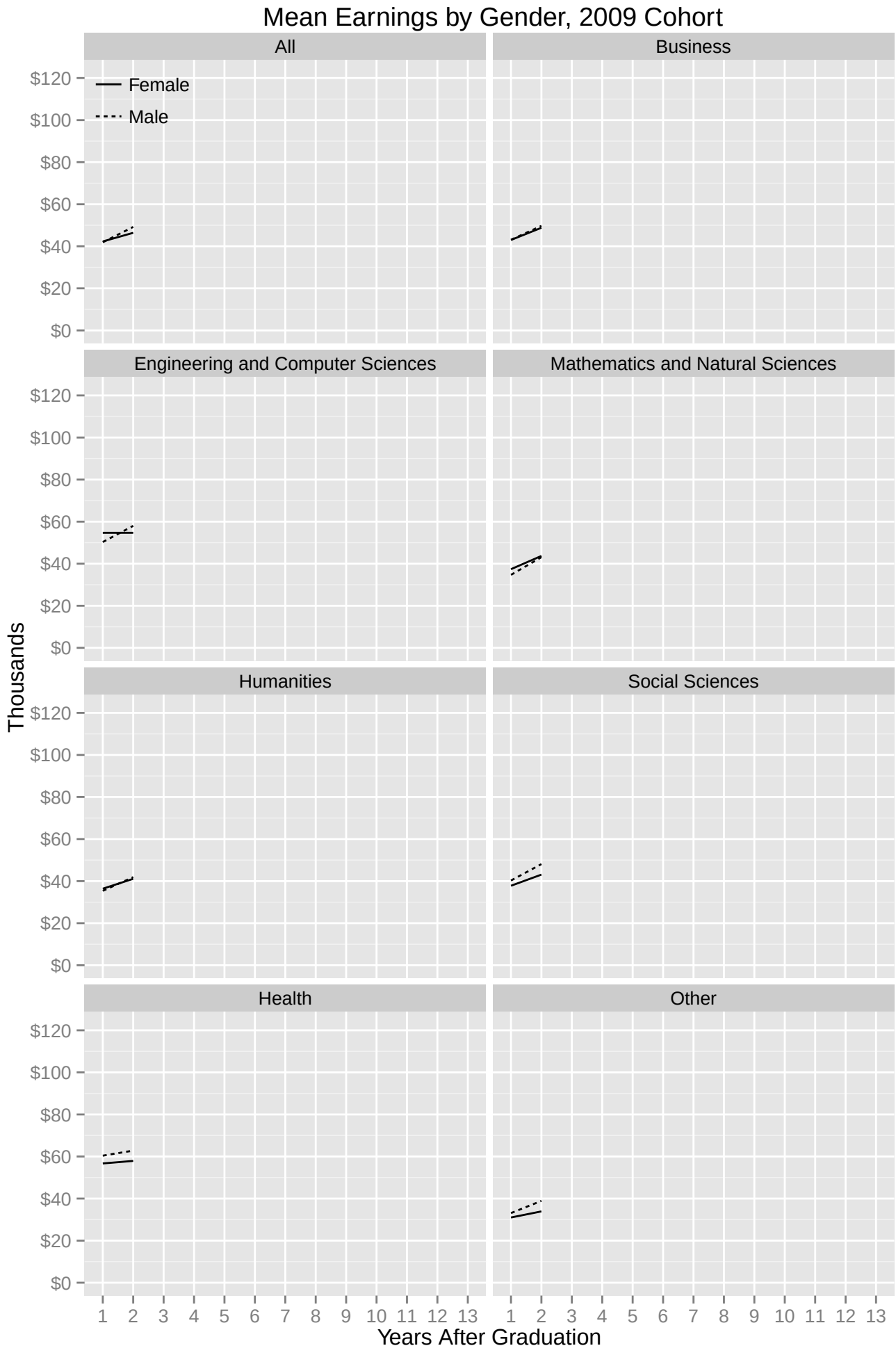
Years After Graduation


Mean Earnings by Gender, 2009 Cohort
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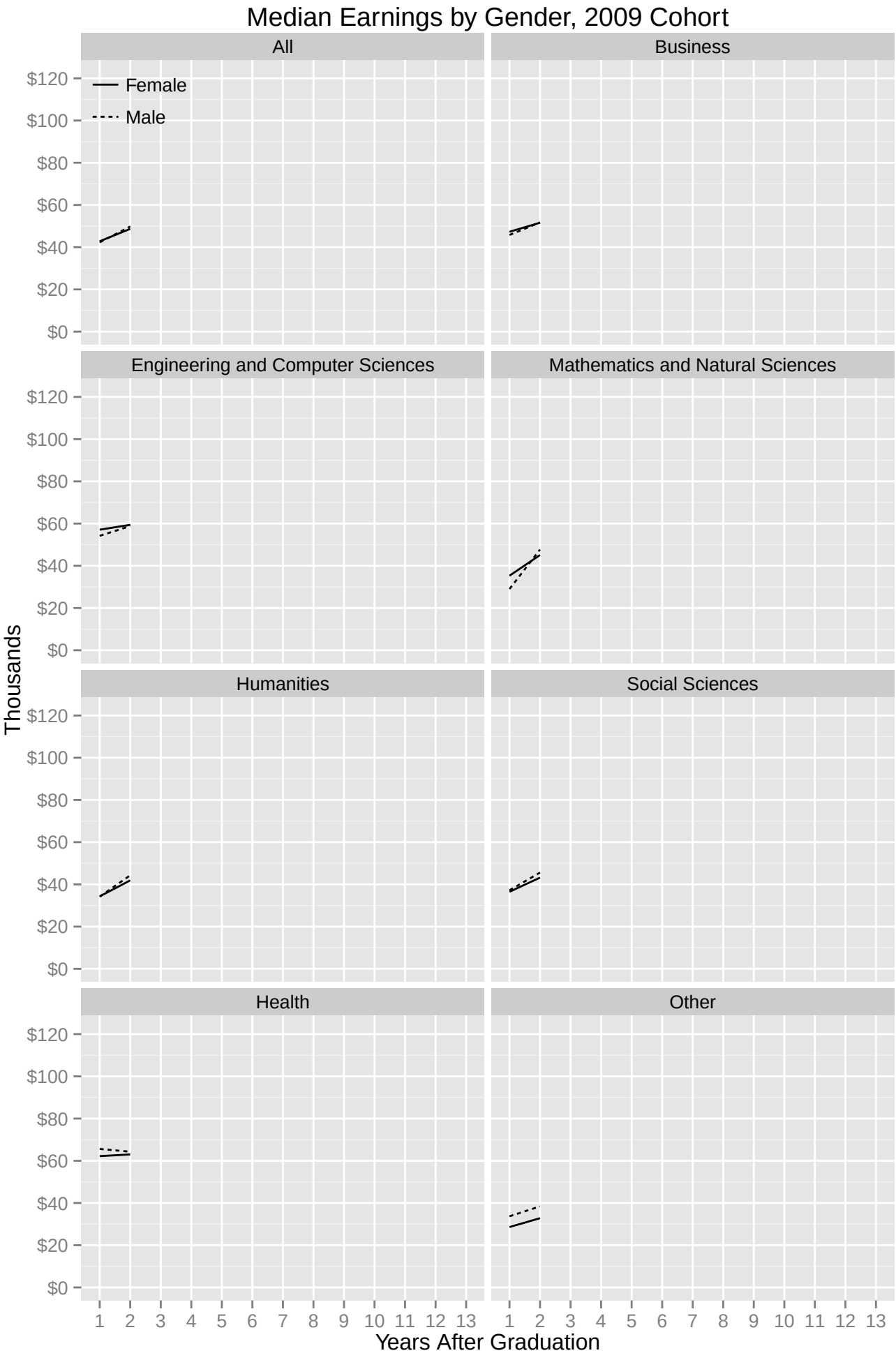
Years After Graduation


Median Earnings by Gender, 2009 Cohort
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Humanities
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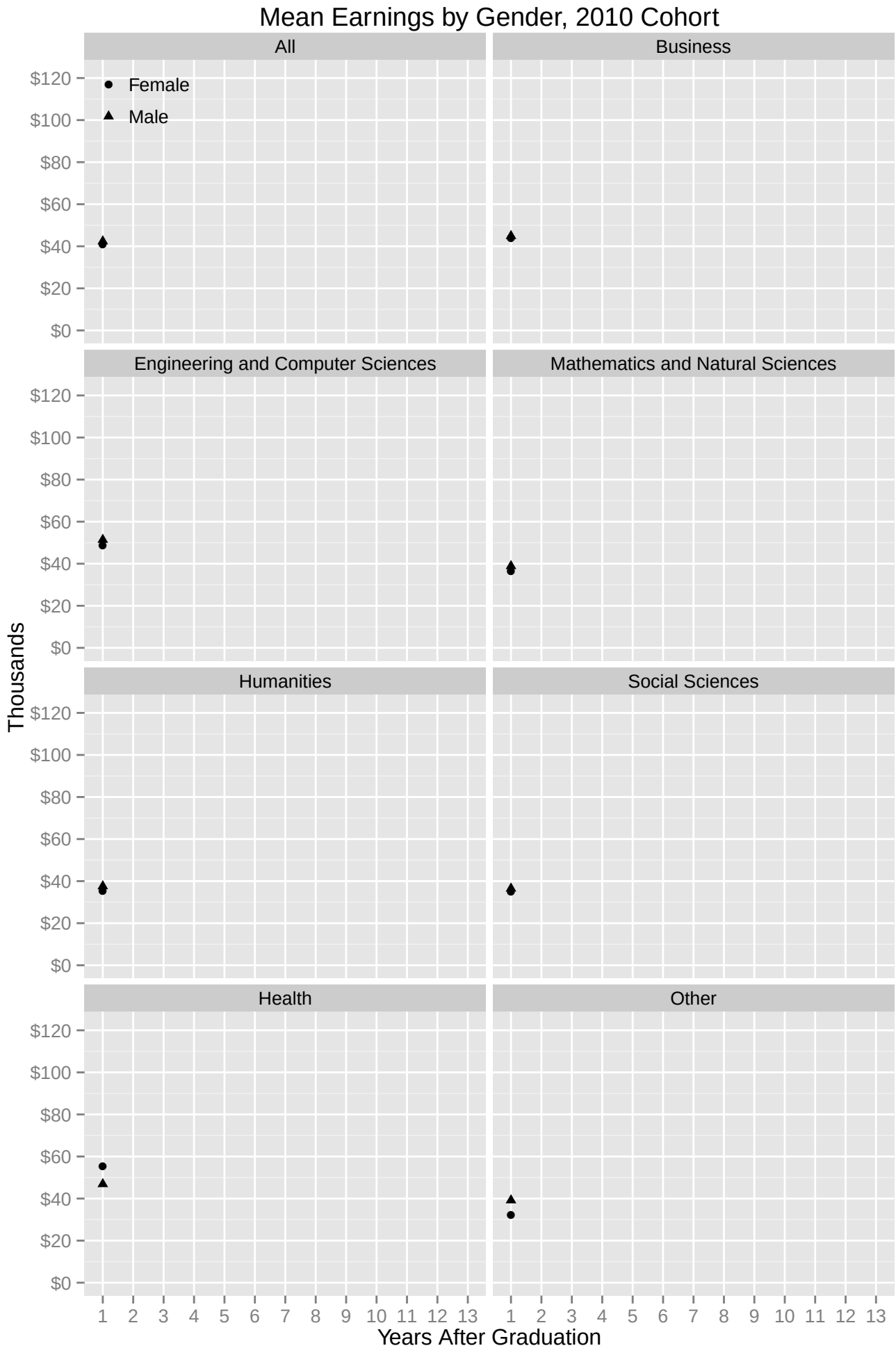
Years After Graduation


Mean Earnings by Gender, 2010 Cohort
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Mathematics and Natural Sciences
Humanities
Social Sciences
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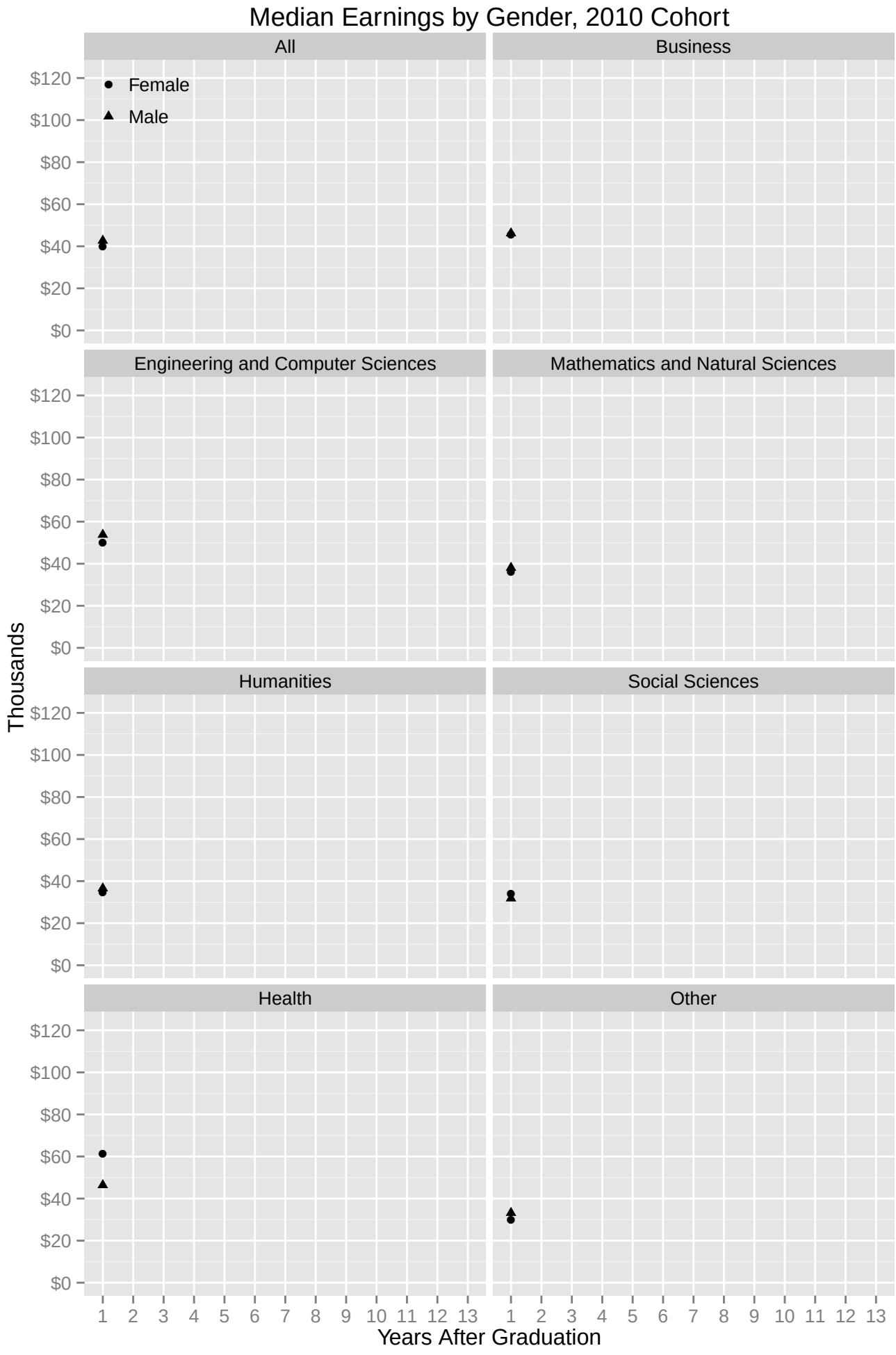
Years After Graduation


Median Earnings by Gender, 2010 Cohort
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Mathematics and Natural Sciences
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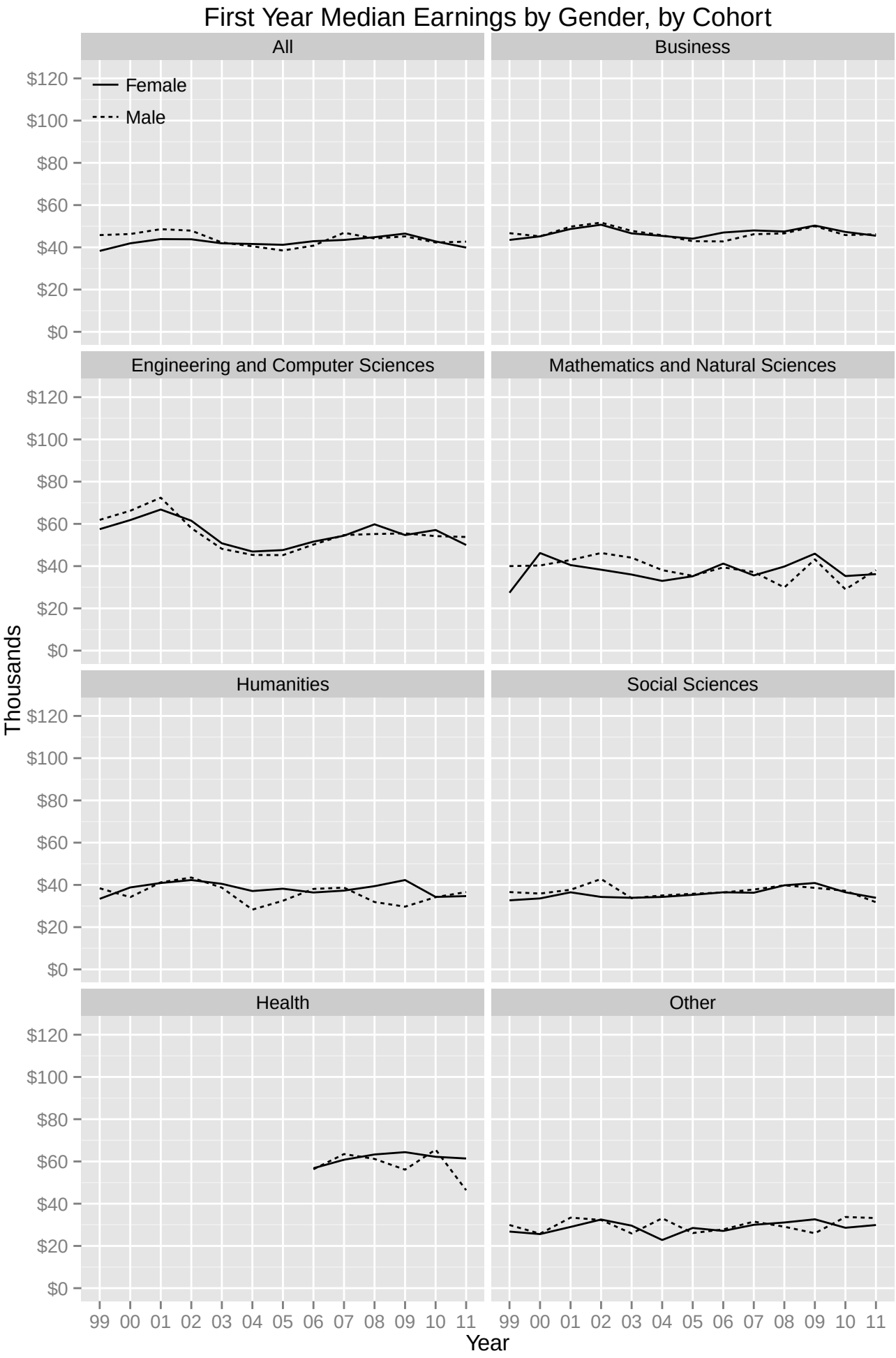
Years After Graduation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Humanities
Social Sciences
Health
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