

Economic Insights

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

by Marc Frenette and Tomasz Handler

Release date: August 24, 2020



Statistics
Canada

Statistique
Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

Email at STATCAN.infostats-infostats.STATCAN@canada.ca

Telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-514-283-9350

Depository Services Program

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "[Standards of service to the public](#)."

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Published by authority of the Minister responsible for Statistics Canada

© Her Majesty the Queen in Right of Canada as represented by the Minister of Industry, 2020

All rights reserved. Use of this publication is governed by the Statistics Canada [Open Licence Agreement](#).

An [HTML version](#) is also available.

Cette publication est aussi disponible en français.

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

Marc Frenette and Tomasz Handler

This study reports on the median earnings of doctoral degree graduates by very detailed field of study five years after graduation (prior to the COVID-19 pandemic), after adjusting for age, institution, and year of graduation. In total, the study covers 29 disciplines for men and 22 disciplines for women. The findings suggest that the top-earning male and female doctoral graduates come from a wide variety of broad disciplines, such as business, health, engineering, social sciences, and education. The fields associated with the lowest pay are generally in the sciences, and more specifically, those related to biological sciences. Unlike the case at the bachelor's and master's degree level, there is little variation in earnings by detailed fields of study within broader program areas, which might reflect the smaller number of disciplines at the doctoral level. Finally, only two of the disciplines examined were female-dominated, but women performed well in both of them.

Introduction

While it is common to report earnings by field of study for broad academic programs, a small number of studies have opted to examine more detailed fields of study (Stark 2007; Frenette and Frank 2016; Frenette and Handler 2020a; Frenette and Handler 2020b). Although this approach creates challenges in presenting and describing the findings, results to date have clearly demonstrated the importance of highlighting the details. In particular, studies have shown that there is considerable variation in earnings by detailed fields of study within the broad program areas that most studies base their estimates. Moreover, reporting on these details may provide useful information to students, who base their academic decisions in part on expected earnings (Gunderson and Krashinsky, 2009).

This study reports median paid earnings of doctoral graduates five years after graduation, adjusted for age, institution, and year of graduation (see Frenette and Handler 2020a for more details on the approach).¹ Briefly, the sample consists of doctoral degree graduates between the years 2010 and 2012 based on the Postsecondary Student Information System (PSIS), who did not return to school in the following five years and did not report any self-employment income five years after graduation. Median earnings are observed five years after graduation (2015 to 2017, prior to the COVID-19 pandemic) based on the T1 Family File (T1FF), and are reported in 2017 constant dollars. Disciplines are identified with the 4 digit, 2011 Classification of Instructional Program (CIP). Only disciplines with at least

1. This is one of three articles examining the earnings of graduates by detailed fields of study. The other articles look at bachelor's graduates (Frenette and Handler 2020a) and master's graduates (Frenette and Handler 2020b). Future work may look at college certificate and diploma graduates, as more data become available. Note that the data used in these studies were collected and the first drafts written prior to the COVID-19 pandemic. How individuals who graduate from specific programs during or after the pandemic will fare in the labour market may not be known for quite some time.

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

50 observations are included in the analysis. Note that individuals with no paid earnings are also included. In total, results are available for 29 (22) fields for men (women).^{2,3,4}

Highest earning doctoral graduates come from wide variety of fields

For both men and women, the fields associated with the highest median earnings five years after graduation (adjusted for age, institution, and year of graduation) are very diverse, representing a wide variety of broad program areas.

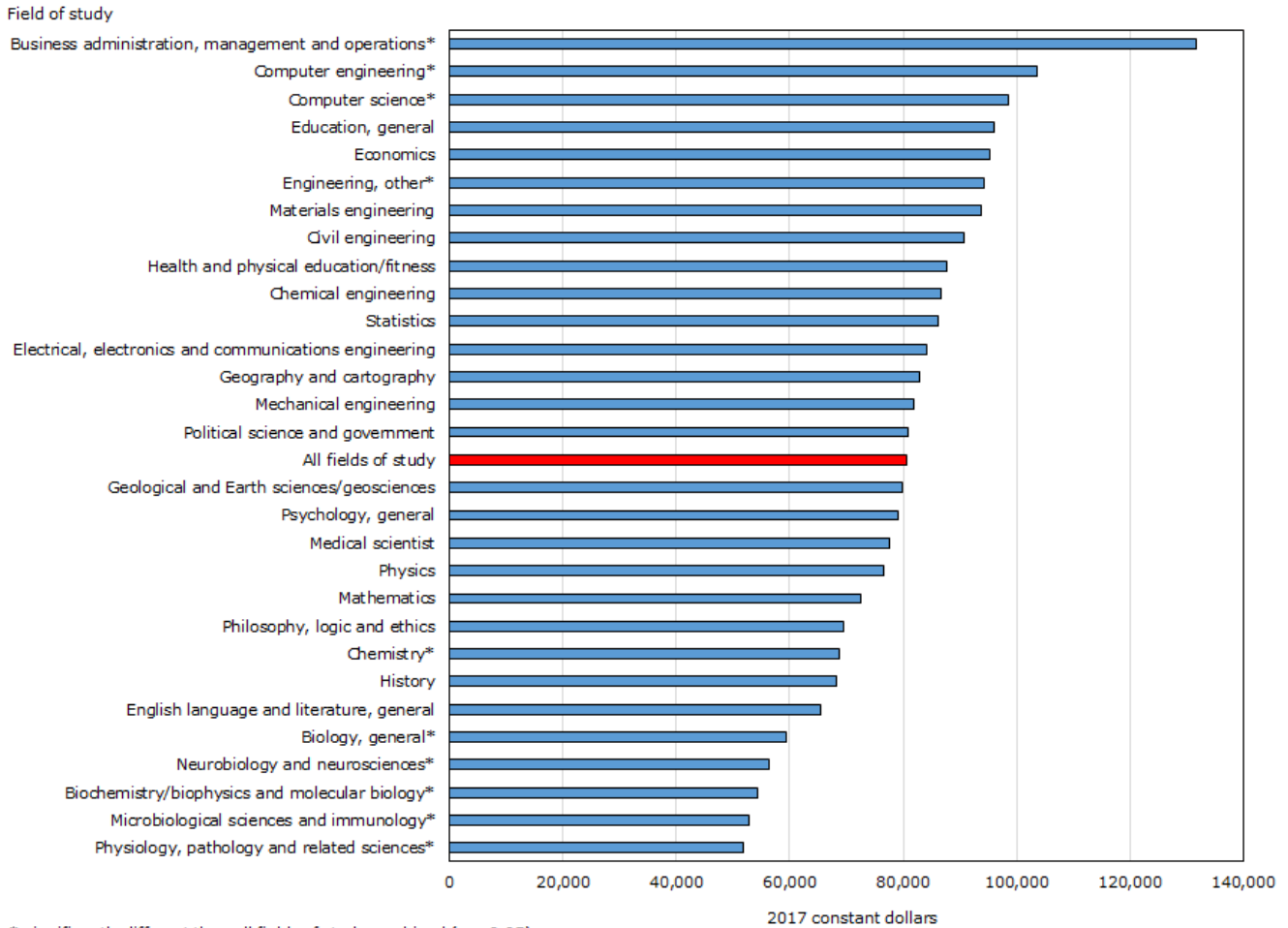
For men, Business administration, management and operations doctoral graduates earned the most, with \$131,549 in median earnings, five years after graduation (Chart 1). This was well above second place Computer engineering graduates (\$103,657), third place Computer science graduates (\$98,484), fourth place Education (general) graduates (\$96,151), and fifth place Economics graduates (\$95,144). Engineering graduates also occupied the 6th, 7th, 8th, 10th, 12th, and 14th spots. The relative success of engineering graduates mirrors their outcomes at the bachelor's degree level (Frenette and Handler, 2020a). However, Frenette and Handler (2020b) found that master's degree graduates from most engineering programs registered median earnings below the level registered for all master's degree graduates.

The diversity of fields represented at the top of doctoral graduate outcomes is worth highlighting. While the top five include some fields often associated with high earnings (e.g. engineering and business), it also includes a social science (Economics) and an education field [Education (general)]. Frenette and Handler (2020a; 2020b) previously reported that Economics graduates earned below the median among all bachelor's and master's degree graduates. Other doctoral graduates of social sciences registered more or less average outcomes, including Geography and cartography and Political science and government graduates (both slightly above the median among all male doctoral graduates), as well as Psychology (general) graduates (slightly below the overall median). Meanwhile, Frenette and Handler (2020a) reported that many education graduates (particularly those related to teacher education) registered typical earnings associated with bachelor's degree graduates. But at the master's level (Frenette and Handler 2020b) and now the doctoral level, education graduates are amongst the top earners.

-
2. Note that the following professional programs were excluded from the analysis since they are typically not offered as a third degree after high school that is focused on graduate level research (like most doctoral degree programs): Law (LLB, JD, CL), Legal research and advanced professional studies (post-LLB/JD), Chiropractic (DC), Dentistry (DDS, DMD), Advanced/graduate dentistry and oral sciences (Cert., MS, MSc, PhD), Medicine (MD), Optometry (OD), Osteopathic medicine/osteopathy (DO), Podiatric medicine/podiatry (DPM), Veterinary medicine (DVM), Dental residency programs, Veterinary residency programs, Medical residency programs—general certificates, Medical residency programs— subspecialty certificates, Podiatric medicine residency programs, and Dental, medical and veterinary residency programs (other).
 3. Disciplines with fewer than 50 observations are included when reporting results for all doctoral degree graduates, which consist of 4,912 men and 4,023 women. The percentage of these graduates in disciplines with fewer than 50 observations is 30.0% for men and 43.6% for women.
 4. Although the statistical significance of the results is reported in this study, it is important to note that there is no sampling in the data used in deriving the results other than the sampling restrictions. In other words, results are based on complete, well-defined populations (e.g. all female graduates of a certain discipline who appeared in the tax data). Statistical significance can be used by readers to make inferences to “super-populations” (e.g. all female graduates of a certain discipline, whether they appeared in tax data or not). However, in doing so, it is important to note that the “sampling” process (appearing in the tax data) was not necessarily random, and no weights have been created to obtain estimates for the larger population.

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

Chart 1
Median earnings of male doctoral degree graduates by field of study (adjusted for age, institution, and graduation year)



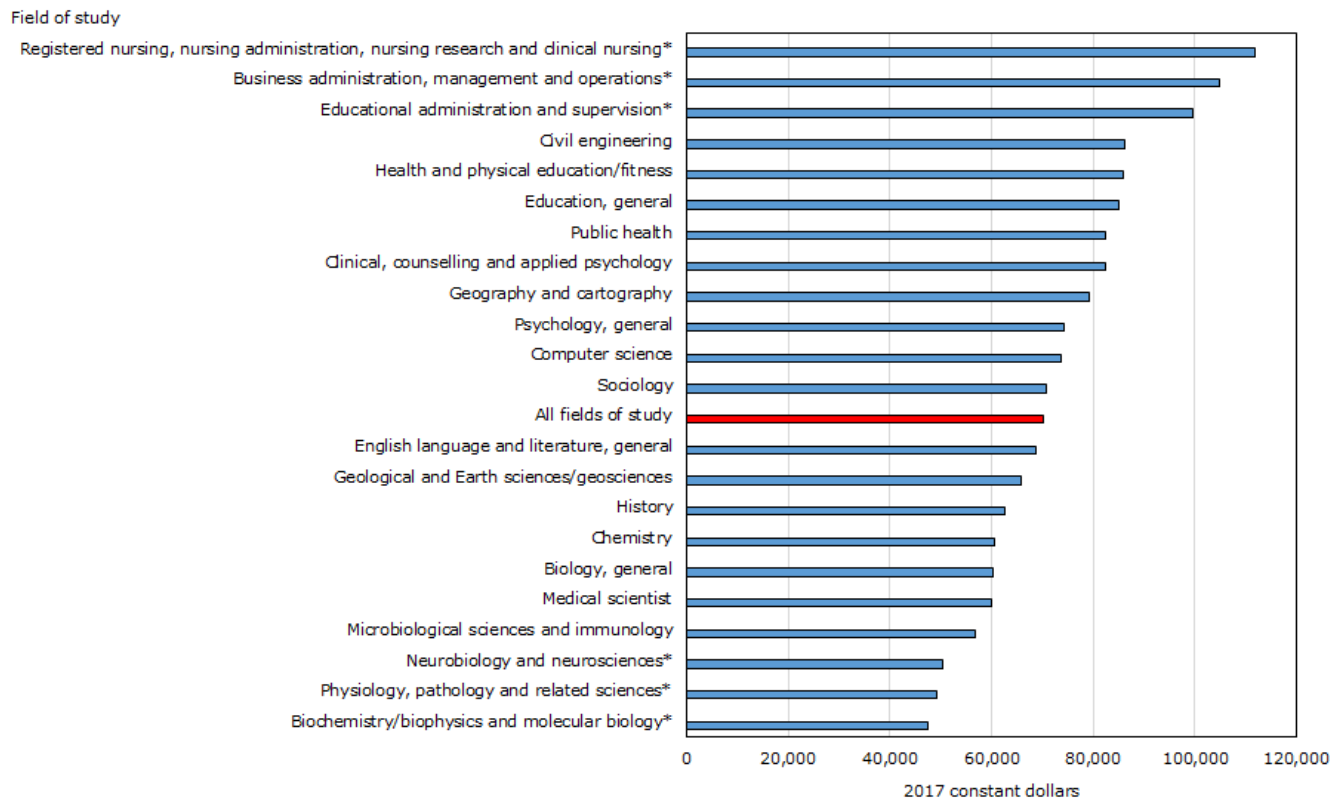
* significantly different than all fields of study combined ($p < 0.05$)

Sources: Statistics Canada, Postsecondary Student Information System (PSIS) and T1 Family File (T1FF).

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

The fields associated with the highest median earnings among female doctoral graduates also represent a wide diversity of program areas (Chart 2). The field associated with the top median earnings in this case is Registered nursing, nursing administration, nursing research and clinical nursing (\$111,796), followed by Business administration, management and operations (\$104,807), Educational administration and supervision (\$99,535), Civil engineering (\$86,285), and Health and Physical education/fitness (\$85,794).⁵ Education (general) graduates also performed well (landing in 6th place), while all social science graduates registered median earnings above the overall median for female doctoral graduates [including Clinical, counselling and applied psychology, Geography and cartography, Psychology (general), and Sociology].

Chart 2
Median earnings of female doctoral degree graduates by field of study (adjusted for age, institution, and graduation year)



* significantly different than all fields of study combined ($p < 0.05$)
Sources: Statistics Canada, Postsecondary Student Information System (PSIS) and T1 Family File (T1FF).

5. There were not enough female Economics graduates in the sample to report findings.

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

Science doctoral graduates earned the least, particularly those related to biology

Most of the fields associated with the lowest pay among male and female doctoral graduates are in the sciences, particularly those related to biology. In fact, many registered median earnings below \$60,000 five years after graduating from their doctoral program.

Among male doctoral graduates, median earnings were lowest among Physiology, pathology and related sciences (\$51,897), Microbiological sciences and immunology (\$52,923), Biochemistry/biophysics and molecular biology (\$54,252), Neurobiology and neurosciences (\$56,235), and Biology (general) with \$59,275. In some instances, these graduates earned only slightly more than their counterparts with a bachelor's degree in the same discipline (Frenette and Handler, 2020a). For example, male bachelor's degree graduates of Microbiological sciences and immunology programs registered \$51,168 in median earnings—less than \$2,000 below their doctoral counterparts. Male bachelor's degree graduates in Biochemistry/biophysics and molecular biology registered \$50,961 in median earnings (about \$3,000 less than their doctoral counterparts).

Male Chemistry, Physics, and Geological and earth sciences/geosciences doctoral graduates also registered median earnings below the median for all male doctoral graduates.

The fields associated with lowest pay among female doctoral graduates included Biochemistry/biophysics and molecular biology (\$47,470), Physiology, pathology and related sciences (\$49,271), Neurobiology and neurosciences (\$50,407), Microbiological sciences and immunology (\$56,829), and Medical scientist (\$60,046).

Female doctoral graduates in other science programs also registered median earnings below the median for all female doctoral graduates, including Biology (general), Chemistry, and Geological and earth sciences/geosciences.

Unlike bachelor's and master's degree graduates, earnings of doctoral graduates generally did not vary much within broad program areas

For the most part, median earnings did not vary considerably within broad program areas. This is in contrast to bachelor's and master's degree graduates (Frenette and Handler 2020a and Frenette and Handler 2020b).

For example, all engineering, business, education, health, and almost all social science graduates registered median earnings above the all graduates median for men and women. Conversely, all science and humanities graduates registered median earnings below the median for all doctoral graduates.

The one exception consisted of disciplines classified under Mathematics, computer and information sciences⁶. For male doctoral graduates, median earnings for this group ranged from \$98,484 (Computer science) to \$72,649 (Mathematics). Statistics graduates registered \$86,247 in median earnings. For women, only Computer science graduates could be examined, and they registered \$73,678 in median earnings.

One possible reason why median earnings generally did not vary much within broad program areas for doctoral graduates is that, compared to bachelor's and master's degree graduates, there were so few fields that could be examined at the doctoral level.

6. This is one of the 13 CIP primary groupings used in many studies.

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

Only two doctoral disciplines are female dominated, but women do well in both

Although most degree graduates are female, this is not the case among doctoral degree holders. In fact, of the total 33 unique disciplines that could be examined for men and women, only two were female-dominated (at least 75% of graduates were female).

One of the female dominated disciplines was Registered nursing, nursing administration, nursing research and clinical nursing, which ranked first among female doctoral graduates, well ahead of male-dominated disciplines such as Civil engineering and Computer science. In fact, female graduates in Registered nursing, nursing administration, nursing research and clinical nursing would rank second among male doctoral graduates, ahead of male Computer engineering and Computer science graduates (two male-dominated disciplines).

The other female dominated discipline was Clinical, counselling and applied psychology, which registered median earnings of \$82,358—good for 8th place overall among female doctoral graduates (and ahead of female Computer science graduates). Female doctoral graduates of Clinical, counselling and applied psychology would place 14th among male doctoral graduates, ahead of male mechanical engineering graduates (another male-dominated discipline).

Conversely, there were only enough women in two male-dominated disciplines to enter the study—Civil engineering and Computer science. While female doctoral graduates of Civil engineering performed well compared to their male counterparts (\$86,285 for women; \$90,667 for men), this was not the case for female Computer science graduates. These graduates registered \$73,678 in median earnings, which was about \$25,000 below the level for their male counterparts (\$98,484). In making these comparisons, it is important to realize that individuals who did not work, or who worked part-time or for part of the year were included in the sample. Since women remain the primary caregivers of children in the home, it is possible that differences in earnings between the sexes reflect differences in time spent in the home.

Conclusion

This study reports on the median earnings of doctoral degree graduates five years after graduation (prior to the COVID-19 pandemic), after adjusting for age, institution, and year of graduation. Results are shown for 29 fields for men and for 22 fields for women. This detailed level of information could be beneficial to students, who must apply to specific academic programs rather than broad groupings of disciplines that are often reported in studies.

The findings suggest that the top-earning male and female doctoral graduates come from a wide variety of broad disciplines, such as business, health, engineering, social sciences, and education. The fields associated with the lowest pay are generally in the sciences, and more specifically, those related to biological sciences. Unlike the case at the bachelor's and master's degree level (Frenette and Handler 2020a and Frenette and Handler 2020b, respectively), there is little variation in earnings by detailed fields of study within broader program areas, which might reflect the smaller number of disciplines at the doctoral level. Finally, only two of the disciplines examined were female-dominated, but women performed well in both of them.

Finally, it is important to note that these results pertained to graduates from the early 2010s and the economic conditions that they faced in the following years. Shifts in sectoral demand are common, and this may result in variable labour market conditions for different cohorts of graduates. Moreover, the COVID-19 pandemic may create new realities for future graduates, either through work re-organization (e.g. telework or automation) or broader shifts in demand (e.g. health care or clean energy).

Which Doctoral Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study

References

Frenette, M. and K. Frank. 2016. Earnings of Postsecondary Graduates by Detailed Fields of Study. Economic Insights, no. 56. Statistics Canada Catalogue no. 11-626-X. Ottawa: Statistics Canada.

Frenette, M. and T. Handler. 2020a. Which Bachelor's Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study. Economic Insights, no. 120. Statistics Canada Catalogue no. 11-626-X. Ottawa: Statistics Canada.

Frenette, M. and T. Handler. 2020b. Which Master's Degree Programs Were Associated with the Highest Pay Prior to the COVID-19 Pandemic? A Focus on Very Detailed Fields of Study. Economic Insights, no. 121. Statistics Canada Catalogue no. 11-626-X. Ottawa: Statistics Canada.

Gunderson, M., and H. Krashinsky. 2009. Do Education Decisions Respond to Returns by Field of Study? Canadian Labour Market and Skills Researcher Network. Working Paper no. 47.

Stark, A. 2007. Which Fields Pay, Which Fields Don't? An Examination of the Returns to University Education in Canada by Detailed Field of Study. Working Paper 2007-03. Ottawa: Department of Finance.