# Doctoral studies and international experiences in European research universities, 2011-2020

## An extensive survey and some tentative views of the Cathedral

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March 28, 2022

- Much as undergraduate degrees, probably more, doctoral degrees have a high degree of heterogeneity

    - Doctoral degrees are pursued by candidates with
        - Heterogeneous circumstances (e.g., age)
        - Heterogeneous qualifications (e.g., prior educational credentials and work experiences)
        - Heterogeneous professional, intellectual, and social aspirations (achievement of qualifications to start a research career in higher education or industry, pure intellectual fulfilment, or completion of a degree for professional or social advancement).

- Very substantial part of training in doctoral degrees not organized in coursework there: limited objective measures of performance

## Two surveys

- Universities that participated in the surveys all belong to YERUN
- A brief institutional survey
- A graduates' survey of people who obtained their doctoral degrees between 2011 and 2020
    - 12 universities in 9 European countries: 2,992 responses
    - Characteristics of respondents (e.g., gender, age and citizenship at start of doctoral studies, primary area of study, prior educational credentials and work experience),
    - Doctoral studies (e.g., the source of financial support during their studies, international experiences)
    - First full-time job after graduation (e.g., sector of employment, percentage of time dedicated to research, relation with their doctoral qualifications)
    - Satisfaction with
        - Doctoral studies
        - Subsequent career progress

- Especially centered on documenting international experiences during doctoral studies and their perceived or apparent benefits.
- But because turning the survey data on international experiences into understanding requires detailed contextual information, survey provides an abundance of detailed information that is useful for a general assessment of doctoral studies.

## Existing literature

- 2017 *Career Tracking Survey of Doctorate Holders*: 2,046 responses

- 2019 *Doctoral education in Europe today: approaches and institutional structures*: 311 responses

# Institutional survey

**Table 2.0**
Institutional survey: Universities

| University | Country |
|---|---|
| Antwerp | Belgium |
| Bremen | Germany |
| Brunel | UK |
| Carlos III | Spain |
| Eastern Finland | Finland |
| Essex | UK |
| Maastricht | Netherlands |
| Nova | Portugal |
| Rijeka | Croatia |
| Tor Vergata | Italy |

**Table 2.1**

Institutional survey: Universities, graduates, and international collaborations

| | | *Joint PhD degrees* | | *Cotutelle agreements* | | *Double/Multiple joint doctoral programs* | | *International collaborations based on exchanges* | |
|---|---|---|---|---|---|---|---|---|---|
| **University** | **Graduates** | **Yes/No** | **Number** | **Yes/No** | **Number** | **Yes/No** | **Number** | **Yes/No** | **Number** |
| UC3M | 1248 | Yes | 0 | Yes | 12 | Yes | 7 | Yes | 248 |
| U-B | 3120 | Yes | | Yes | 133 | No | | Yes | |
| U-C | 1937 | Yes | | Yes | 152 | Yes | | Yes | |
| U-D | 3000 | Yes | 28 | No | | Yes | 47 | No | |
| U-E | 2125 | Yes | | Yes | | Yes | | Yes | |
| U-F | 1502 | Yes | 10 | Yes | 12 | No | | Yes | 57 |
| U-G | 1736 | No | | No | | No | | Yes | |
| U-H | 42 | No | | No | | No | | No | |
| U-J | 1963 | | | | | Yes | | | |
| U-K | 2511 | No | | Yes | | No | | Yes | |
| Total | 19184 | | 38 | | 309 | | 54 | | 305 |
| Average | 1918.4 | | 12.7 | | 77.3 | | 27.0 | | 152.5 |

- Limited information universities had about their doctoral graduates
- Apparent diversity across universities

# Graduates' survey

- Total: 2,992
- 45.9% females
- 53.3% males.
- 83.5%, had obtained a master's degree prior to their doctoral studies

**Table 3.3**
Percentages of responses relative to number of graduates reported, by universities

| UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | U-I | U-J | U-K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40.22 | - | 15.13 | 19.36 | 10.47 | 10.4 | 12.45 | 10.6 | 380.95 | - | 0.07 | 0.56 |

**Figure 3.1**
Respondents by year of graduation (percentages)

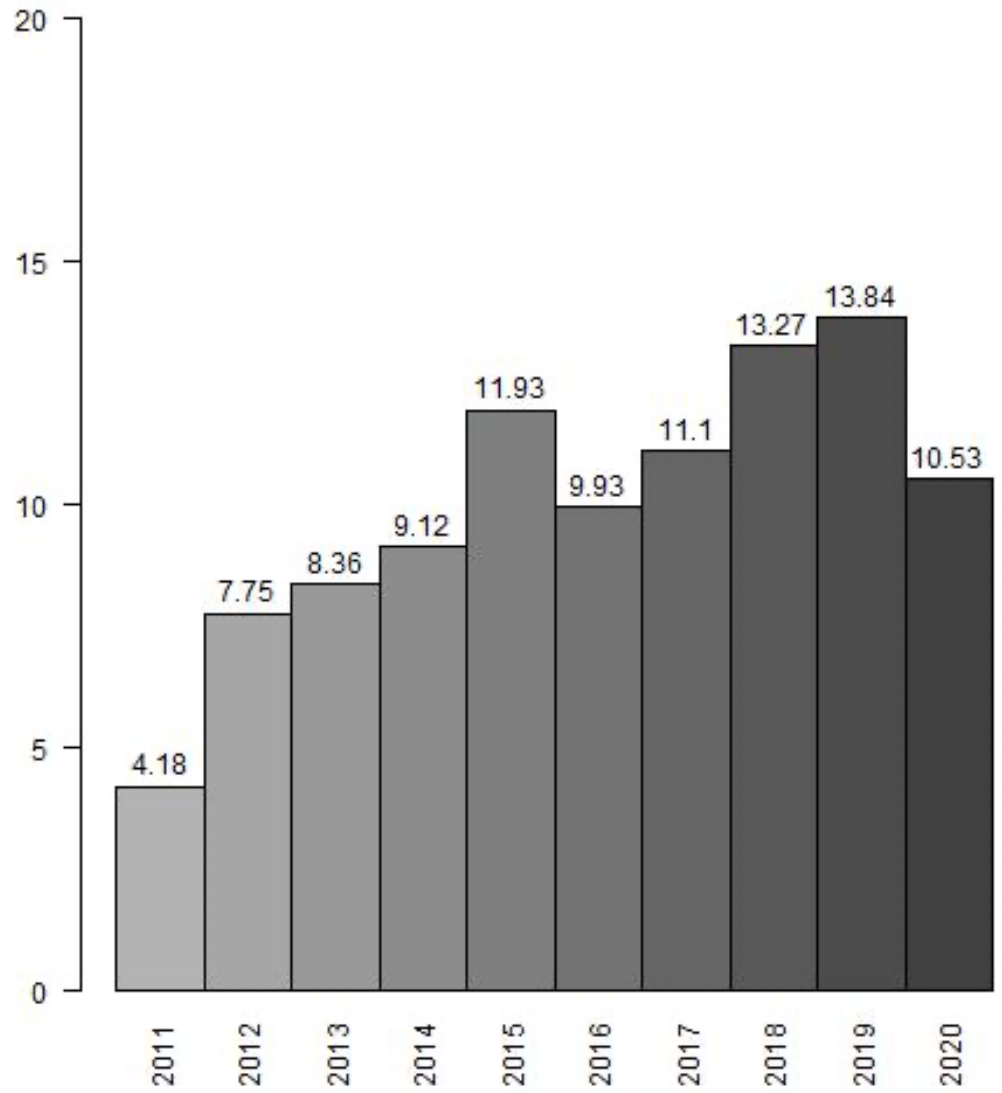

**Table 3.5**

Median age of respondents by primary area of study and university

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 27 | 28 | 27.0 | 27 | 25 | 26.0 | 30.0 | 29.0 | 31.0 | 30.0 | 30.0 |
| Medicine | 30 | | 31.5 | 31 | 26 | 26.0 | 39.5 | 30.0 | 35.0 | 32.0 | 24.0 |
| Engineering and technology | 27 | 27 | 26.0 | 26 | 24 | 23.5 | 25.0 | 35.5 | 31.0 | 26.5 | 28.5 |
| Biology | 25 | 24 | 25.0 | 26 | 25 | 24.0 | 27.0 | 26.5 | 28.5 | 26.0 | 41.0 |
| Economics | 27 | 26 | 40.0 | 26 | 27 | 27.0 | 25.5 | 27.5 | 28.0 | 33.0 | 30.0 |
| Law | 28 | 29 | 30.0 | 27 | 26 | 26.5 | 39.0 | 35.5 | 33.5 | 27.0 | 33.0 |
| Computer science | 28 | 28 | 25.0 | 26 | 23 | 26.0 | 32.5 | 31.0 | 28.0 | 31.0 | 42.0 |
| Physics | 25 | 26 | 25.0 | 26 | 24 | 28.0 | 23.0 | 26.0 | | | 23.0 |
| Other | 28 | 28 | 28.0 | 28 | 26 | 26.0 | 33.0 | 32.0 | 31.0 | 28.0 | 28.0 |

**Table 3.8**
Respondents by field of science and university (numbers)

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | U-I | U-J | U-K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 2,992 | 502 | 472 | 472 | 375 | 314 | 221 | 187 | 184 | 160 | 66 | 25 | 14 |
| Social Sciences | 804 | 180 | 85 | 124 | 81 | 94 | 51 | 33 | 71 | 52 | 18 | 5 | 10 |
| Natural Sciences | 800 | 101 | 218 | 109 | 132 | 35 | 67 | 78 | 33 | 8 | 14 | 4 | 1 |
| Medicine and health | 494 | 0 | 77 | 77 | 73 | 133 | 22 | 35 | 21 | 45 | 3 | 5 | 3 |
| Humanities | 343 | 60 | 64 | 64 | 40 | 6 | 29 | 12 | 32 | 24 | 10 | 2 | 0 |
| Engineering and tech | 339 | 148 | 7 | 77 | 22 | 4 | 22 | 2 | 7 | 29 | 15 | 6 | 0 |
| Other | 212 | 13 | 21 | 21 | 27 | 42 | 30 | 27 | 20 | 2 | 6 | 3 | 0 |

**Table 3.9**
Respondents by field of science and university (percentages)

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | U-I | U-J | U-K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 100.00 | 16.78 | 15.78 | 15.78 | 12.53 | 10.49 | 7.39 | 6.25 | 6.15 | 5.35 | 2.21 | 0.84 | 0.47 |
| Social Sciences | 26.87 | 6.02 | 2.84 | 4.14 | 2.71 | 3.14 | 1.70 | 1.10 | 2.37 | 1.74 | 0.60 | 0.17 | 0.33 |
| Natural Sciences | 26.74 | 3.38 | 7.29 | 3.64 | 4.41 | 1.17 | 2.24 | 2.61 | 1.10 | 0.27 | 0.47 | 0.13 | 0.03 |
| Medicine and health | 16.51 | 0.00 | 2.57 | 2.57 | 2.44 | 4.45 | 0.74 | 1.17 | 0.70 | 1.50 | 0.10 | 0.17 | 0.10 |
| Humanities | 11.46 | 2.01 | 2.14 | 2.14 | 1.34 | 0.20 | 0.97 | 0.40 | 1.07 | 0.80 | 0.33 | 0.07 | 0.00 |
| Engineering and tech | 11.33 | 4.95 | 0.23 | 2.57 | 0.74 | 0.13 | 0.74 | 0.07 | 0.23 | 0.97 | 0.50 | 0.20 | 0.00 |
| Other | 7.09 | 0.43 | 0.70 | 0.70 | 0.90 | 1.40 | 1.00 | 0.90 | 0.67 | 0.07 | 0.20 | 0.10 | 0.00 |

**Table 3.10**

Respondents with at least one year of coursework during doctoral studies by field of science (percentages)

| | |
|---|---|
| Total | 35.33 |
| Social Sciences | 48.01 |
| Natural Sciences | 26.25 |
| Medicine and health | 27.73 |
| Humanities | 36.73 |
| Engineering and tech | 38.94 |
| Other | 31.13 |

**Table 3.11**

Respondents with at least one year of coursework during doctoral studies by university (percentages)

| Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| 35.33 | 51.79 | 29.87 | 38.77 | 16.27 | 11.15 | 71.95 | 23.53 | 29.89 | 60 | 21.9 |

**Table 3.12**

Primary sources of funding by field of science (percentages). "Fellowship" is short for "Fellowship or research assistantship from university where enrolled or outside agencies; teaching assistantship at university where enrolled."

| | Fellowship | Job outside university where enrolled | Support from family, spouse, or partner; personal savings; loans | Other |
|---|---|---|---|---|
| Total | 57.75 | 24.33 | 7.45 | 9.26 |
| Social Sciences | 51.37 | 27.11 | 12.56 | 8.96 |
| Natural Sciences | 78.88 | 8.88 | 3.88 | 8.38 |
| Medicine and health | 40.28 | 38.06 | 9.11 | 12.55 |
| Humanities | 43.44 | 32.07 | 15.45 | 9.04 |
| Engineering and tech | 69.32 | 22.12 | 4.13 | 4.42 |
| Other | 47.64 | 31.13 | 7.08 | 14.15 |

**Table 3.13**

Primary sources of funding by university (percentages). "Fellowship" is short for "Fellowship or research assistantship from university where enrolled or outside agencies; teaching assistantship at university where enrolled."

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fellowship | 57.75 | 63.15 | 57.20 | 57.63 | 77.65 | 52.23 | 58.37 | 51.87 | 36.96 | 35.62 | 60.00 |
| Job outside university where enrolled | 24.33 | 23.11 | 26.48 | 29.24 | 12.81 | 7.83 | 29.41 | 29.95 | 16.30 | 48.75 | 15.24 |
| Support from family, spouse, or partner; personal savings; loans | 7.45 | 8.37 | 9.75 | 8.47 | 3.2 | 5.41 | 9.05 | 4.81 | 22.83 | 11.25 | 12.38 |
| Other | 9.26 | 5.38 | 6.57 | 4.66 | 6.4 | 24.52 | 3.17 | 13.37 | 23.91 | 4.38 | 12.38 |

**Table 3.14**

Respondents satisfied or very satisfied with dimensions of doctoral training by field of science (percentages).

| | Quality of advising and guidance | Intellectual challenge | Placement orientation and assistance | Overall quality |
|---|---|---|---|---|
| Total | 65.61 | 83.42 | 45.15 | 71.09 |
| Social Sciences | 71.64 | 85.82 | 47.89 | 76.37 |
| Natural Sciences | 60.24 | 81.88 | 44.75 | 68.38 |
| Medicine and health | 64.98 | 82.99 | 50.40 | 69.64 |
| Humanities | 63.84 | 79.59 | 33.82 | 66.48 |
| Engineering and tech | 63.42 | 84.37 | 42.18 | 70.50 |
| Other | 70.75 | 85.85 | 47.17 | 73.11 |

**Table 3.15**

Respondents satisfied or very satisfied with dimensions of doctoral training by field of science (percentages).

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quality of advising and guidance | 65.61 | 68.32 | 58.90 | 53.18 | 69.60 | 73.57 | 71.95 | 66.31 | 77.18 | 63.13 | 69.53 |
| Intellectual challenge | 83.42 | 85.86 | 78.17 | 75.42 | 83.73 | 91.40 | 85.97 | 84.49 | 91.31 | 78.74 | 92.38 |
| Placement orientation and assistance | 45.15 | 41.83 | 37.08 | 29.02 | 54.67 | 58.28 | 58.37 | 48.66 | 48.37 | 56.25 | 40.00 |
| Overall quality | 71.09 | 76.09 | 65.89 | 58.69 | 73.60 | 79.94 | 76.02 | 69.52 | 79.89 | 66.87 | 74.28 |

**Table 3.16**

Respondents who carried out international experiences (percentages)

| Joint PhD | Co-tutelle | International coop. | Exchange stays: 6 or less | Exchange stays: more than 6 | Non exchange stays: 6 or less | Non exchange stays: 6 or more | Conferences |
|---|---|---|---|---|---|---|---|
| 3.44 | 3.88 | 14.61 | 11.7 | 3.91 | 25.03 | 8.86 | 74.7 |

**Table 3.19**

Respondents who considered international experiences as important or very important for research, training, and subsequent employment and/or research opportunities (percentages)

| | Research | Training | Opportunities |
|---|---|---|---|
| Total | 72.04 | 69.05 | 54.16 |
| Joint PhD | 71.84 | 63.11 | 62.14 |
| Cotutelle | 87.07 | 73.28 | 62.07 |
| International coop. | 67.73 | 68.19 | 52.63 |
| Exchange stays: 6 or less | 76.29 | 74.57 | 61.71 |
| Exchange stays: more than 6 | 76.92 | 66.67 | 62.39 |
| Non exchange stays: 6 or less | 73.7 | 68.49 | 53.4 |
| Non exchange stays: 6 or more | 83.02 | 78.11 | 72.08 |
| Conferences | 69.35 | 67.65 | 50.2 |

**Table 3.20**

Respondents who rated activities promoting international experiences good or very good, by university (percentages)

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Information | 35.96 | 39.04 | 34.74 | 28.39 | 41.60 | 38.86 | 37.10 | 29.95 | 41.85 | 39.37 | 24.76 |
| Opportunities | 40.07 | 41.24 | 37.92 | 32.20 | 52.53 | 45.22 | 35.74 | 35.83 | 45.65 | 35.00 | 34.28 |
| Administrative support | 30.85 | 35.46 | 28.18 | 26.06 | 40.53 | 31.85 | 21.26 | 27.27 | 36.41 | 31.25 | 22.86 |
| Financial support | 30.72 | 30.08 | 31.57 | 24.58 | 48.53 | 35.99 | 23.07 | 29.94 | 26.63 | 19.37 | 20.00 |

**Table 3.21**

Respondents whose first full-time job after graduation was obtained during or after doctoral studies, by field of science (percentages)

| | |
|---|---|
| Total | 59.49 |
| Social Sciences | 59.48 |
| Natural Sciences | 81.68 |
| Medicine and health | 52.80 |
| Humanities | 54.41 |
| Engineering and tech | 69.44 |
| Other | 60.82 |

**Table 3.22**

Respondents whose first full-time job after graduation was obtained during or after doctoral studies, by university (percentages)

| Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| 59.49 | 68.57 | 66.82 | 63.64 | 76.57 | 74.74 | 58.97 | 56.74 | 59.75 | 26.45 | 77.32 |

**Table 3.29**

Respondents who were satisfied or very satisfied first full-time job after graduation, by field of science (percentages)

| | Job security | Opportunities for promotion | Salary/compensation | Intellectual challenge | Overall |
|---|---|---|---|---|---|
| Total | 63.70 | 46.34 | 56.15 | 73.00 | 66.91 |
| Social Sciences | 65.24 | 47.26 | 59.75 | 74.17 | 69.23 |
| Natural Sciences | 59.49 | 42.78 | 52.94 | 75.67 | 65.51 |
| Medicine and health | 71.55 | 53.44 | 60.56 | 75.65 | 72.20 |
| Humanities | 60.30 | 41.18 | 52.20 | 61.76 | 59.92 |
| Engineering and tech | 63.27 | 49.69 | 55.24 | 72.53 | 66.97 |
| Other | 60.82 | 41.24 | 51.54 | 68.56 | 60.62 |

**Table 3.30**

Respondents who were satisfied or very satisfied first full-time job after graduation, by university (percentages)

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Job security | 63.70 | 60.12 | 56.88 | 67.81 | 70.85 | 67.58 | 55.39 | 64.61 | 69.18 | 66.45 | 57.73 |
| Opportunities for promotion | 46.34 | 53.16 | 42.89 | 38.33 | 46.57 | 51.88 | 31.80 | 50.00 | 51.58 | 58.07 | 39.17 |
| Salary/ compensation | 56.15 | 57.59 | 52.85 | 47.91 | 68.86 | 66.21 | 39.49 | 56.17 | 61.63 | 50.32 | 55.67 |
| Intellectual challenge | 73.00 | 74.05 | 72.28 | 69.78 | 74.86 | 81.23 | 69.23 | 83.14 | 69.81 | 61.94 | 64.95 |
| Overall | 66.91 | 68.71 | 65.64 | 62.90 | 74.86 | 73.72 | 51.80 | 73.04 | 68.55 | 59.35 | 59.79 |

**Table 3.31**

Respondents who agreed or strongly agreed with statements, by field of science (percentages)

| | I was well prepared for first job | My doctorate enabled me to progress towards career aspirations |
|---|---|---|
| Total | 71.46 | 69.85 |
| Social Sciences | 73.63 | 71.52 |
| Natural Sciences | 73.62 | 72.38 |
| Medicine and health | 67.21 | 70.65 |
| Humanities | 62.97 | 60.64 |
| Engineering and tech | 75.52 | 71.68 |
| Other | 72.17 | 64.15 |

**Table 3.32**

Respondents who agreed or strongly agreed with statements, by university (percentages)

| | Total | UC3M | U-A | U-B | U-C | U-D | U-E | U-F | U-G | U-H | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I was well prepared for first job | 71.46 | 76.10 | 73.73 | 63.77 | 73.33 | 76.43 | 67.87 | 75.94 | 67.39 | 66.25 | 66.67 |
| My doctorate enabled me to progress towards career aspirations | 69.85 | 77.89 | 67.58 | 59.53 | 71.20 | 74.84 | 60.63 | 72.73 | 72.83 | 75.00 | 69.52 |

*Discussion*

- Venturing an evaluation of the aggregate results of the survey: hard with no proper external reference for validation.

- Most of the measures of satisfaction are
    - Subjective (very good may mean different things to different respondents)
    - Ordinal (the gap between good and very good may be different for different respondents)

- Responses depend on respondents' expectations
    - May depend on individual or geographical characteristics (for instance local labor market outlooks)
    - May be unreasonable because of lack of an informed and sufficiently broad viewpoint.

- Reasons to use the descriptive analysis to form conjectures, not to rush to conclusions.

# Analysis

- Make sense of the long-run measure of professional satisfaction:
  - Extent to which respondents felt that doctoral studies allowed them to progress towards their career aspirations.
    - *CareerAspirations*
      - 1 when respondents answer that they "agree" or "strongly agree" with the sentence "My doctorate has enabled me to progress towards my career aspirations"
      - 0 otherwise

- Probit regression of *CareerAspirations* with the following regressors:
  - *Male*
  - *Coursework*:
  - *Fellowship*: Primary source of financial support for the respondent was "Fellowship or research assistantship from university where enrolled or outside agencies; teaching assistantship at university where enrolled"
  - *Age* at start of doctoral studies;
  - *Year* of graduation;
  - Dummy variables for universities
  - Dummy variables for fields of science

**Table 4.4**

Probit regression of *CareerAspirations*; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | 0.6569 | 0.1439 | 4.564 | 5.019e-06 | *** |
| *Male* | 0.1973 | 0.05062 | 3.897 | 9.724e-05 | *** |
| *Coursework* | 0.1657 | 0.05653 | 2.931 | 0.003376 | ** |
| *Fellowship* | 0.1455 | 0.05722 | 2.544 | 0.01097 | * |
| *Age* | -0.5572 | 0.2233 | -2.496 | 0.01257 | * |
| *Year* | -0.07066 | 0.0858 | -0.8235 | 0.4102 | |
| *U-C* | -0.1578 | 0.1248 | -1.265 | 0.206 | |
| *U-F* | -0.02432 | 0.1424 | -0.1708 | 0.8644 | |
| *U-D* | 0.008528 | 0.1301 | 0.06553 | 0.9478 | |
| *U-E* | -0.4229 | 0.1371 | -3.085 | 0.002038 | ** |
| *OtherUniversities* | -0.1405 | 0.1645 | -0.8539 | 0.3932 | |
| *U-H* | 0.003894 | 0.1499 | 0.02598 | 0.9793 | |
| *U-B* | -0.4579 | 0.1177 | -3.891 | 9.967e-05 | *** |
| *U-A* | -0.2261 | 0.1196 | -1.891 | 0.05869 | |
| *UC3M* | 0.03021 | 0.1219 | 0.2477 | 0.8043 | |
| *Engineering and tech* | -0.06284 | 0.09185 | -0.6842 | 0.4938 | |
| *Humanities* | -0.2109 | 0.08515 | -2.477 | 0.01325 | * |
| *Medicine and health* | 0.03915 | 0.0798 | 0.4906 | 0.6237 | |
| *Natural Sciences* | 0.01494 | 0.07312 | 0.2043 | 0.8381 | |
| *OtherFields* | -0.1197 | 0.104 | -1.152 | 0.2495 | |

**Table 4.5**

Probit regression of *CareerAspirations*; Respondents with a "new job" after graduation

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | 0.6402 | 0.2094 | 3.057 | 0.002234 | * * |
| *Male* | 0.1482 | 0.0671 | 2.208 | 0.02723 | * |
| *Coursework* | 0.2388 | 0.078 | 3.062 | 0.0022 | * * |
| *Fellowship* | 0.1709 | 0.08019 | 2.131 | 0.03308 | * |
| *Age* | -0.02634 | 0.4542 | -0.05799 | 0.9538 | |
| *Year* | -0.1049 | 0.1138 | -0.9223 | 0.3564 | |
| *U-C* | -0.2829 | 0.1725 | -1.64 | 0.101 | |
| *U-F* | -0.09928 | 0.2036 | -0.4875 | 0.6259 | |
| *U-D* | -0.07507 | 0.1782 | -0.4212 | 0.6736 | |
| *U-E* | -0.4846 | 0.1983 | -2.443 | 0.01455 | * |
| *OtherUniversities* | -0.2539 | 0.2138 | -1.188 | 0.235 | |
| *U-H* | 0.1187 | 0.2784 | 0.4264 | 0.6699 | |
| *U-B* | -0.5263 | 0.1693 | -3.108 | 0.001884 | * * |
| *U-A* | -0.2151 | 0.1715 | -1.254 | 0.2098 | |
| *UC3M* | -0.08435 | 0.1722 | -0.4897 | 0.6243 | |
| *Engineering and tech* | -0.05134 | 0.1206 | -0.4258 | 0.6702 | |
| *Humanities* | -0.1965 | 0.1284 | -1.53 | 0.126 | |
| *Medicine and health* | 0.1223 | 0.1161 | 1.054 | 0.292 | |
| *Natural Sciences* | 0.000612 | 0.09444 | 0.00648 | 0.9948 | |
| *OtherFields* | -0.2405 | 0.141 | -1.706 | 0.08804 | |

**Table 4.6**

Probit regression of *CareerAspirations*; Respondents with the "same job" after graduation; Year of graduation: 2011-2020

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | 0.7215 | 0.2599 | 2.776 | 0.005496 | ** |
| *Male* | 0.1865 | 0.09197 | 2.027 | 0.04262 | * |
| *Coursework* | 0.01272 | 0.09719 | 0.1309 | 0.8959 | |
| *Fellowship* | 0.2565 | 0.1079 | 2.378 | 0.01738 | * |
| *Age* | -0.5728 | 0.3645 | -1.572 | 0.1161 | |
| *Year* | 0.001695 | 0.1599 | 0.0106 | 0.9915 | |
| *U-C* | 0.07435 | 0.2409 | 0.3086 | 0.7576 | |
| *U-F* | -0.01864 | 0.2397 | -0.07774 | 0.938 | |
| *U-D* | 0.1288 | 0.25 | 0.5151 | 0.6065 | |
| *U-E* | -0.4218 | 0.238 | -1.773 | 0.0763 | |
| *OtherUniversities* | -0.08455 | 0.3387 | -0.2496 | 0.8029 | |
| *U-H* | -0.06237 | 0.2253 | -0.2769 | 0.7819 | |
| *U-B* | -0.511 | 0.208 | -2.456 | 0.01404 | * |
| *U-A* | -0.3402 | 0.2148 | -1.583 | 0.1133 | |
| *UC3M* | 0.09613 | 0.2185 | 0.4399 | 0.66 | |
| *Engineering and tech* | -0.1065 | 0.1619 | -0.6579 | 0.5106 | |
| *Humanities* | -0.07992 | 0.1439 | -0.5554 | 0.5786 | |
| *Medicine and health* | -0.04202 | 0.1249 | -0.3363 | 0.7366 | |
| *Natural Sciences* | 0.2531 | 0.1561 | 1.621 | 0.105 | |
| *OtherFields* | -0.05634 | 0.1767 | -0.3188 | 0.7499 | |

- Intercept for te probit regression with respondents with "new jobs"
  - Lower than the one for all respondents,
    - In turn lower than the one for respondents with the "same job".
    -

*The impact of international activities*

*AnyStay*: 1 if a respondent did any international stay, 0 otherwise

**Table 4.26**

Probit regression of *CareerAspirations*; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | 0.6565 | 0.1423 | 4.613 | 3.967e-06 | * * * |
| *Male* | 0.197 | 0.0537 | 3.668 | 0.0002449 | * * * |
| *Coursework* | 0.1475 | 0.05961 | 2.474 | 0.01336 | * |
| *Fellowship* | 0.1107 | 0.06148 | 1.801 | 0.07173 | |
| *Age* | -0.4911 | 0.2165 | -2.269 | 0.0233 | * |
| *Year* | -0.1112 | 0.08839 | -1.258 | 0.2086 | |
| *U-C* | -0.2272 | 0.1309 | -1.736 | 0.08255 | |
| *U-F* | -0.07831 | 0.1479 | -0.5295 | 0.5965 | |
| *U-D* | -0.09587 | 0.1354 | -0.7083 | 0.4788 | |
| *U-E* | -0.4822 | 0.1456 | -3.312 | 0.0009249 | * * * |
| *OtherUniversities* | -0.2553 | 0.1718 | -1.485 | 0.1374 | |
| *U-H* | -0.09295 | 0.1575 | -0.5903 | 0.555 | |
| *U-B* | -0.5312 | 0.1234 | -4.305 | 1.669e-05 | * * * |
| *U-A* | -0.3133 | 0.1264 | -2.478 | 0.0132 | * |
| *UC3M* | -0.03706 | 0.1279 | -0.2897 | 0.7721 | |
| *Engineering and tech* | -0.09348 | 0.09636 | -0.9701 | 0.332 | |
| *Humanities* | -0.2611 | 0.09109 | -2.867 | 0.004148 | * * |
| *Medicine and health* | 0.0202 | 0.08493 | 0.2378 | 0.812 | |
| *Natural Sciences* | -0.01217 | 0.07764 | -0.1568 | 0.8754 | |
| *OtherFields* | -0.1108 | 0.1097 | -1.01 | 0.3126 | |
| *AnyStay* | 0.203 | 0.05502 | 3.69 | 0.0002241 | * * * |

- Probit regression of *CareerAspirations* with same regressors as in benchmark model augmented with
  - *Co-tutelle*: 1 if a respondent did a Co-tutelle 0 otherwise
    - Coefficient on *Co-tutelle* positive but not significant.

*ASOpp* 1 if the respondent rated any of the international stays as 4 or 5, and 0 otherwise;

*CTOpp* 1 if the respondent rated the Co-tutelle as 4 or 5, and 0 otherwise.

**Table 4.28**

Probit regression of *CareerAspirations*; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | 0.6523 | 0.1426 | 4.575 | 4.752e-06 | * * * |
| *Male* | 0.1963 | 0.0538 | 3.649 | 0.0002637 | * * * |
| *Coursework* | 0.1424 | 0.05988 | 2.378 | 0.0174 | * |
| *Fellowship* | 0.1106 | 0.06164 | 1.794 | 0.07287 | |
| *Age* | -0.4733 | 0.217 | -2.18 | 0.02922 | * |
| *Year* | -0.1156 | 0.08858 | -1.305 | 0.1918 | |
| *U-C* | -0.234 | 0.1313 | -1.782 | 0.07481 | |
| *U-F* | -0.07293 | 0.148 | -0.4929 | 0.6221 | |
| *U-D* | -0.09855 | 0.1355 | -0.7274 | 0.467 | |
| *U-E* | -0.4714 | 0.1461 | -3.227 | 0.00125 | * * |
| *OtherUniversities* | -0.2631 | 0.1719 | -1.53 | 0.126 | |
| *U-H* | -0.08892 | 0.1576 | -0.5644 | 0.5725 | |
| *U-B* | -0.5272 | 0.1236 | -4.266 | 1.991e-05 | * * * |
| *U-A* | -0.3069 | 0.1266 | -2.424 | 0.01533 | * |
| *UC3M* | -0.02836 | 0.1281 | -0.2215 | 0.8247 | |
| *Engineering and tech* | -0.08624 | 0.09654 | -0.8933 | 0.3717 | |
| *Humanities* | -0.2647 | 0.09142 | -2.896 | 0.00378 | * * |
| *Medicine and health* | 0.02758 | 0.08504 | 0.3243 | 0.7457 | |
| *Natural Sciences* | -0.0126 | 0.07779 | -0.162 | 0.8713 | |
| *OtherFields* | -0.1119 | 0.1098 | -1.019 | 0.3081 | |
| *AnyStay* | 0.2019 | 0.05539 | 3.645 | 0.0002673 | * * * |
| *AnyStay*ASOpp* | 4.136 | 57.94 | 0.07139 | 0.9431 | |
| *Co-tutelle* | -0.4917 | 0.1979 | -2.485 | 0.01297 | * |
| *Co-tutelle*CTOpp* | 0.9708 | 0.2727 | 3.56 | 0.0003708 | * * * |

**Table 4.29**

Probit regression of *Satisfaction* with Co-tutelle; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | -2.791 | 0.4556 | -6.126 | 9.026e-10 | * * * |
| *Male* | -0.0915 | 0.1184 | -0.7727 | 0.4397 | |
| *Fellowship* | 0.1694 | 0.1325 | 1.279 | 0.2011 | |
| *U-C* | 0.6095 | 0.3122 | 1.952 | 0.0509 | |
| *U-F* | -0.2632 | 0.458 | -0.5746 | 0.5655 | |
| *U-D* | 0.245 | 0.3396 | 0.7216 | 0.4705 | |
| *U-E* | 0.3935 | 0.3467 | 1.135 | 0.2564 | |
| *OtherUniversities* | 0.4002 | 0.4082 | 0.9803 | 0.3269 | |
| *U-H* | 0.1942 | 0.411 | 0.4726 | 0.6365 | |
| *U-B* | 0.3202 | 0.3202 | 0.9999 | 0.3174 | |
| *U-A* | 0.3408 | 0.3235 | 1.054 | 0.292 | |
| *UC3M* | -0.09823 | 0.331 | -0.2968 | 0.7666 | |
| *Biology* | -0.1592 | 0.4067 | -0.3913 | 0.6955 | |
| *Business* | -0.2329 | 0.5274 | -0.4416 | 0.6588 | |
| *Chemistry* | 0.2451 | 0.4229 | 0.5796 | 0.5622 | |
| *Economics* | -0.1357 | 0.4276 | -0.3175 | 0.7509 | |
| *Education* | -0.2938 | 0.5492 | -0.535 | 0.5926 | |
| *Engineering and tech* | -0.02889 | 0.411 | -0.07028 | 0.944 | |
| *Law* | 0.6291 | 0.3956 | 1.59 | 0.1118 | |
| *Medicine* | -0.2171 | 0.4009 | -0.5415 | 0.5881 | |
| *OtherPrimaryAreas* | 0.1856 | 0.3615 | 0.5134 | 0.6076 | |
| *Physics* | 0.1383 | 0.4065 | 0.3403 | 0.7336 | |
| *Psychology* | -3.669 | 96.53 | -0.03801 | 0.9697 | |
| *Sociology* | -0.147 | 0.5488 | -0.2678 | 0.7889 | |
| *Information* | 0.1246 | 0.1557 | 0.8 | 0.4237 | |
| *Opportunities* | 0.5406 | 0.17 | 3.181 | 0.001469 | * * |
| *Administrative* | 0.1571 | 0.1578 | 0.9958 | 0.3193 | |
| *Financial* | -0.007179 | 0.1513 | -0.04743 | 0.9622 | |

**Table 4.30**

Probit regression of *Satisfaction* with Exchange based international stay of 6 months or less; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | -2.115 | 0.2892 | -7.315 | 2.573e-13 | * * * |
| *Male* | -0.1405 | 0.08279 | -1.697 | 0.08965 | |
| *Fellowship* | 0.4247 | 0.09368 | 4.533 | 5.804e-06 | * * * |
| *U-C* | 0.09802 | 0.2147 | 0.4565 | 0.648 | |
| *U-F* | 0.04698 | 0.2539 | 0.185 | 0.8532 | |
| *U-D* | -0.03252 | 0.2286 | -0.1422 | 0.8869 | |
| *U-E* | -0.1585 | 0.2611 | -0.6072 | 0.5437 | |
| *OtherUniversities* | -0.4311 | 0.3706 | -1.163 | 0.2447 | |
| *U-H* | 0.6231 | 0.2406 | 2.59 | 0.009606 | * * |
| *U-B* | 0.1105 | 0.2162 | 0.5111 | 0.6093 | |
| *U-A* | 0.5574 | 0.2045 | 2.726 | 0.00641 | * * |
| *UC3M* | 0.5385 | 0.1999 | 2.694 | 0.007055 | * * |
| *Biology* | -0.2822 | 0.2674 | -1.056 | 0.2912 | |
| *Business* | -0.3489 | 0.3157 | -1.105 | 0.2692 | |
| *Chemistry* | 0.00289 | 0.2944 | 0.009817 | 0.9922 | |
| *Economics* | -0.5579 | 0.2892 | -1.929 | 0.0537 | |
| *Education* | -0.6347 | 0.4022 | -1.578 | 0.1145 | |
| *Engineering and tech* | -0.2755 | 0.2616 | -1.053 | 0.2922 | |
| *Law* | -0.1645 | 0.2775 | -0.5926 | 0.5534 | |
| *Medicine* | -0.2629 | 0.2603 | -1.01 | 0.3124 | |
| *OtherPrimaryAreas* | -0.02754 | 0.2357 | -0.1168 | 0.907 | |
| *Physics* | -0.5599 | 0.2959 | -1.892 | 0.05847 | |
| *Psychology* | -0.04222 | 0.3156 | -0.1338 | 0.8936 | |
| *Sociology* | 0.2517 | 0.3269 | 0.7702 | 0.4412 | |
| *Information* | 0.06767 | 0.1115 | 0.6069 | 0.5439 | |
| *Opportunities* | 0.3905 | 0.1179 | 3.312 | 0.0009279 | * * * |
| *Administrative* | 0.2532 | 0.1125 | 2.252 | 0.02433 | * |
| *Financial* | 0.0577 | 0.1067 | 0.5406 | 0.5888 | |

**Table 4.31**

Probit regression of *Satisfaction* with Exchange based international stay of more than 6 months; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | -6.59 | 179.9 | -0.03663 | 0.9708 | |
| *Male* | 0.1307 | 0.1188 | 1.1 | 0.2714 | |
| *Fellowship* | 0.2344 | 0.1356 | 1.728 | 0.08391 | |
| *U-C* | 3.956 | 179.9 | 0.02199 | 0.9825 | |
| *U-F* | 3.394 | 179.9 | 0.01887 | 0.9849 | |
| *U-D* | 3.758 | 179.9 | 0.02089 | 0.9833 | |
| *U-E* | 4.165 | 179.9 | 0.02315 | 0.9815 | |
| *OtherUniversities* | -0.07037 | 299.6 | -0.0002348 | 0.9998 | |
| *U-H* | 3.615 | 179.9 | 0.02009 | 0.984 | |
| *U-B* | 4.152 | 179.9 | 0.02308 | 0.9816 | |
| *U-A* | 3.988 | 179.9 | 0.02217 | 0.9823 | |
| *UC3M* | 4.165 | 179.9 | 0.02316 | 0.9815 | |
| *Biology* | 0.1772 | 0.4815 | 0.368 | 0.7129 | |
| *Business* | -0.3107 | 0.6252 | -0.497 | 0.6192 | |
| *Chemistry* | -0.03834 | 0.5494 | -0.06979 | 0.9444 | |
| *Economics* | 0.2658 | 0.4856 | 0.5475 | 0.5841 | |
| *Education* | 0.7268 | 0.5082 | 1.43 | 0.1527 | |
| *Engineering and tech* | -0.1113 | 0.4879 | -0.2282 | 0.8195 | |
| *Law* | 0.2816 | 0.4892 | 0.5756 | 0.5649 | |
| *Medicine* | 0.1197 | 0.4794 | 0.2498 | 0.8028 | |
| *OtherPrimaryAreas* | 0.0934 | 0.4592 | 0.2034 | 0.8388 | |
| *Physics* | 0.2653 | 0.4905 | 0.5408 | 0.5886 | |
| *Psychology* | -3.783 | 236 | -0.01603 | 0.9872 | |
| *Sociology* | 0.1229 | 0.6176 | 0.199 | 0.8423 | |
| *Information* | 0.1028 | 0.1536 | 0.6688 | 0.5036 | |
| *Opportunities* | 0.3728 | 0.1655 | 2.253 | 0.02425 | * |
| *Administrative* | -0.04301 | 0.156 | -0.2758 | 0.7827 | |
| *Financial* | 0.2106 | 0.1489 | 1.415 | 0.1572 | |

**Table 4.32**

Probit regression of *Satisfaction* with Non-Exchange based international stay of 6 months or less; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | -2.028 | 0.2928 | -6.929 | 4.247e-12 | * * * |
| *Male* | -0.1453 | 0.06729 | -2.16 | 0.03081 | * |
| *Fellowship* | 0.3138 | 0.07385 | 4.249 | 2.148e-05 | * * * |
| *U-C* | -0.1554 | 0.1718 | -0.9043 | 0.3658 | |
| *U-F* | -0.1187 | 0.1978 | -0.6003 | 0.5483 | |
| *U-D* | 0.1619 | 0.1688 | 0.959 | 0.3376 | |
| *U-E* | -0.08412 | 0.191 | -0.4404 | 0.6596 | |
| *OtherUniversities* | -0.05253 | 0.2277 | -0.2307 | 0.8176 | |
| *U-H* | 0.03093 | 0.2103 | 0.147 | 0.8831 | |
| *U-B* | -0.1091 | 0.168 | -0.6495 | 0.516 | |
| *U-A* | 0.1899 | 0.1631 | 1.164 | 0.2443 | |
| *UC3M* | 0.4324 | 0.1566 | 2.761 | 0.005765 | * * |
| *Biology* | 0.4171 | 0.2829 | 1.474 | 0.1404 | |
| *Business* | 0.1292 | 0.3207 | 0.4028 | 0.6871 | |
| *Chemistry* | 0.6737 | 0.307 | 2.194 | 0.02823 | * |
| *Economics* | 0.3182 | 0.2901 | 1.097 | 0.2728 | |
| *Education* | 0.3324 | 0.3344 | 0.9941 | 0.3202 | |
| *Engineering and tech* | 0.5918 | 0.2781 | 2.128 | 0.03338 | * |
| *Law* | 0.391 | 0.2918 | 1.34 | 0.1803 | |
| *Medicine* | 0.2308 | 0.2817 | 0.8194 | 0.4126 | |
| *OtherPrimaryAreas* | 0.4598 | 0.2657 | 1.73 | 0.08354 | |
| *Physics* | 0.6382 | 0.2918 | 2.187 | 0.02873 | * |
| *Psychology* | 0.5389 | 0.3117 | 1.729 | 0.08378 | |
| *Sociology* | 0.4857 | 0.3353 | 1.448 | 0.1475 | |
| *Information* | 0.112 | 0.0908 | 1.234 | 0.2174 | |
| *Opportunities* | 0.3263 | 0.09492 | 3.438 | 0.0005862 | * * * |
| *Administrative* | 0.03324 | 0.09374 | 0.3546 | 0.7229 | |
| *Financial* | 0.1357 | 0.08799 | 1.542 | 0.1231 | |

**Table 4.33**

Probit regression of *Satisfaction* with Non-Exchange based international stay of more than 6 months; All respondents

| | Estimate | Std. Error | z value | Pr(>\|z\|) | |
|---|---|---|---|---|---|
| *(Intercept)* | -2.128 | 0.3576 | -5.951 | 2.659e-09 | * * * |
| *Male* | -0.0467 | 0.08284 | -0.5637 | 0.573 | |
| *Fellowship* | 0.1503 | 0.09074 | 1.656 | 0.09772 | |
| *U-C* | -0.395 | 0.2136 | -1.849 | 0.06441 | |
| *U-F* | -0.24 | 0.2445 | -0.9814 | 0.3264 | |
| *U-D* | -0.1392 | 0.2056 | -0.6768 | 0.4985 | |
| *U-E* | 0.131 | 0.2153 | 0.6084 | 0.5429 | |
| *OtherUniversities* | -0.2322 | 0.3035 | -0.765 | 0.4442 | |
| *U-H* | -0.942 | 0.3889 | -2.422 | 0.01543 | * |
| *U-B* | 0.03527 | 0.1924 | 0.1833 | 0.8546 | |
| *U-A* | 0.1049 | 0.1936 | 0.5417 | 0.588 | |
| *UC3M* | 0.1861 | 0.1857 | 1.002 | 0.3162 | |
| *Biology* | 0.14 | 0.354 | 0.3954 | 0.6925 | |
| *Business* | -0.04047 | 0.4059 | -0.09969 | 0.9206 | |
| *Chemistry* | 0.05237 | 0.4061 | 0.1289 | 0.8974 | |
| *Economics* | 0.4585 | 0.3559 | 1.288 | 0.1976 | |
| *Education* | -0.1893 | 0.4579 | -0.4135 | 0.6792 | |
| *Engineering and tech* | 0.2361 | 0.3491 | 0.6764 | 0.4988 | |
| *Law* | 0.5564 | 0.352 | 1.581 | 0.1139 | |
| *Medicine* | 0.4668 | 0.3435 | 1.359 | 0.1742 | |
| *OtherPrimaryAreas* | 0.2355 | 0.3308 | 0.7121 | 0.4764 | |
| *Physics* | 0.3702 | 0.3633 | 1.019 | 0.3082 | |
| *Psychology* | 0.08972 | 0.41 | 0.2189 | 0.8268 | |
| *Sociology* | 0.1602 | 0.4263 | 0.3757 | 0.7071 | |
| *Information* | 0.05761 | 0.111 | 0.5188 | 0.6039 | |
| *Opportunities* | 0.4586 | 0.1164 | 3.94 | 8.161e-05 | * * * |
| *Administrative* | 0.06046 | 0.1137 | 0.5318 | 0.5949 | |
| *Financial* | 0.06656 | 0.1075 | 0.6189 | 0.536 | |

- Remarks
  - Respondents more likely to rate opportunities as good or very good (40.07%), than financial, administrative support, or information (30.72% and 30.85%, 35.96%),
  - Higher percentage of respondents satisfied with opportunities for international experiences
    - May be argued to mean that information and financial and administrative support for international experience are lacking
    - But the analysis of determinants of satisfaction with international stays suggests that
      - satisfaction depends more on the opportunities for international stays that doctoral students have available.

# Discussion

- Analysis indicates that satisfaction with doctoral studies has a lot to do with motivations and aspirations
  - May lead to higher satisfaction levels for people who sought a doctoral degree more as an instrument for social or professional promotion than for the attainment of research skills
- An important aspect of the analysis:
  - Rather than simply asking the graduates' opinions on the likely impact of international experiences on their career outcomes,
  - Attempted to aggregate individual opinions and organize them with the rest of information to determine the extent to which international experiences are likely to really impact career outcomes,
    - Possibly in ways in which individual respondents could not envision.

- Largely informal international stays
  - A very significant driver of extent to which respondents are satisfied with the way in which their doctoral studies enabled them to progress towards career aspirations.
  - But the importance respondents believe that stays have had on their subsequent research and employment opportunities does not matter.
- More formal collaborations, Co-tutelle agreements
  - Useful only when those who did them thought they were

- Bottom-up better than top-down?
  - This does not mean of course that there is no scope for formal agreements sponsored by universities' administrations
  - But suggests that it may be important to offer a broad range of opportunities and sufficient flexibility to adjust to the research needs of doctoral students

- An important limitation by design
  - Survey collects information on experiences of graduates, i.e., people who enrolled in doctoral programs and completed them,
  - Provides no information on the experiences of those who started doctoral studies but did not complete them.