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The effects of human and other forms of capital on migration:

Evidence from administrative data on university graduates in China

Marc K. Chan
University of Melbourne

Guohua Zeng
Jiangxi University of Science and Technology

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Research questions addressed

- This paper uses a unique administrative data set of the population of university graduates (2017-18) of an inland province in China (Jiangxi) to...

1. Estimate reduced-form and multi-dimensional models of location choice / migration decisions,
 - Who get what kinds of jobs and where?
2. Compare the relative importance of family capital, general human capital, school-specific capital, and geographical capital in shaping these decisions,
3. Provide counterfactual simulations and policy scenarios that can facilitate the retention of graduates and reduce the extent of "brain drain" to other provinces.

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Relationship with the existing literature

- The migration literature has focused on international / cross-border migration (e.g., US-Mexico migration) and less so on internal migration.
- There is a large amount of existing work on rural-urban migration among low-skilled workers in developing countries
- Less is known regarding the migration decisions of high-skilled workers...
 - Movements between rural and urban areas,
 - General location preferences given a set of family capital, general human capital, school-specific capital, and geographical capital endowments

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Some challenges in the literature

- Individuals' existing locations are potentially endogenous (sorting), e.g., better families move to better locations and may stay there.
 - This issue is very difficult to address.
- China's registration system (*Hukou*) restricts movement to locations (especially large cities) other than the prefecture/county of birth.
 - This mitigates the issue at least until college entrance.
- There are few existing estimates from admin data. Our estimates from 2017-18 show that, between time of birth and college entrance exam,
 - **1.4%** of college graduates had moved between provinces (33 locations).
 - **3.4%** of college graduates had moved between prefectures (~350 locations).
- The first job upon college graduation is arguably the most important lifetime opportunity for the individual to migrate.
 - Colleges keep students' registration files and transfer them upon students' graduation.

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Movements upon college graduation, Jiangxi Province

Location of first job...	Within-province student (N=114,374)	Out-of-province student (N=54,253)
In province of origin	59.5%	45.5%
In college province	same	20.4% (+11,067)
None of the above	40.5% (-46,321)	34.1%
In prefecture of origin	34.6%	31.2%
In college prefecture	33.4%	16.5%
None of the above	32.0%	52.3%

- Movements between provinces/prefectures are substantial.
- There is a substantial net outflow from Jiangxi province.

Data notes: college graduates from Jiangxi province in 2017-18 who found a job and were present in both admin and survey data.

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Origin

Destination

Net flow

Source: Jiangxi province admin data, 2017-18, N=317,841 college graduates

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Data

- Population of students who graduated from a college in Jiangxi province in 2018 (317,841 students from 98 colleges).
- Key information from the admin data include...
 - Student's college, degree type, major, employment status, location of origin and location of first job (county level across the nation), employer's type (government, etc.), political status, family poverty status, and key demographics.
- All college graduates are asked to fill out a survey. The survey is administered by the provincial government.
 - Key information include various job characteristics (salary, benefits, etc.), class rank in quintile, experience in college (committee work, etc.), parental education, and parental employer type.
- The matched data contains 206,438 students.
 - 12.4% of graduates are unemployed, as opposed to 13.1% in the population.

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Reduced form model

- Use a linear model to predict the following outcomes ...
 - Whether unemployed
 - Whether to pursue further study
 - Among the employed,
 - Salary
 - Employer type (government, other public institution, state-owned enterprise, private enterprise)
 - Whether the individual returns to the prefecture of origin
 - Whether the individual returns to the province of origin
- The control variables include...
 - Student's prefecture of origin fixed effect (-34)
 - Movement across province before college entrance
 - Movement across prefecture before college entrance
 - Born in an "urban" county
 - Located in an "urban" county just prior to college entrance
 - Degree type (associate, bachelor, postgraduate)
 - College fixed effect (-90)
 - Major fixed effect (-50)
 - Class rank (5 quintiles)
 - Committee work at various levels (class, school, college, party, chairmanship)
 - Age relative to standard cohort (+3 to -1 year, as well as calendar quarter of birth)
 - Gender
 - Ethnicity (5)
 - Political status (CPC member, CPC pre-member, CPC youth league, other)
 - Family poverty status
 - Highest parental education (none, junior hs, hs, associate, bachelor, postgraduate)
 - Whether both parents have the same education level
 - Parental employer type (government, college/research, general education, health, state-owned enterprise, private enterprise, general community, other)

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Results, 5 outcomes (part 1)

	Unemployed=1	FurtherStudy=1	Employer, workers	Returns to home, prefecture=1	Home province not in home prefecture=1
Class rank quintile (base: lowest)					
2nd	-0.004 (0.004)	0.010 (0.002)	0.007 (0.005)	-0.009 (0.005)	-0.033 (0.005)
3rd	-0.006 (0.004)	0.021 (0.002)	0.008 (0.005)	-0.015 (0.005)	-0.006 (0.005)
4th	-0.011 (0.004)	0.034 (0.002)	0.014 (0.005)	-0.023 (0.005)	-0.010 (0.005)
5th (highest)	-0.017 (0.004)	0.082 (0.002)	0.035 (0.005)	-0.041 (0.005)	-0.004 (0.005)
Committee work (base: none)					
Class	0.009 (0.002)	-0.001 (0.001)	0.024 (0.002)	0.003 (0.002)	0.001 (0.002)
Department/School	-0.007 (0.003)	-0.005 (0.002)	0.041 (0.003)	-0.017 (0.004)	-0.002 (0.004)
College	-0.007 (0.004)	-0.007 (0.003)	0.045 (0.005)	-0.023 (0.005)	-0.010 (0.005)
CPC youth branch	-0.003 (0.004)	-0.008 (0.003)	0.052 (0.005)	-0.010 (0.005)	0.001 (0.005)
Looks at committee	-0.003 (0.005)	0.000 (0.004)	0.039 (0.007)	-0.011 (0.007)	0.012 (0.007)
Political status (base: none)					
CPC youth league	-0.005 (0.003)	0.002 (0.001)	-0.010 (0.004)	-0.010 (0.004)	0.010 (0.004)
CPC pre-member	-0.022 (0.005)	0.108 (0.006)	-0.001 (0.008)	-0.002 (0.009)	0.022 (0.008)
CPC member	-0.031 (0.005)	0.107 (0.007)	0.005 (0.009)	0.015 (0.009)	0.008 (0.009)
Degree type (base: Associate)					
Bachelor	-0.007 (0.003)	0.040 (0.002)	0.119 (0.004)	-0.078 (0.004)	0.078 (0.004)
Postgraduate	-0.041 (0.005)	-0.109 (0.005)	0.155 (0.006)	-0.071 (0.006)	0.104 (0.006)

- The higher the class rank, the less likely to return to the original prefecture.
- Committee work is associated with higher salary.
- Political status is NOT associated with salary but instead employment and further study.
- Higher-degree graduates appear to move to the capitals of home province.

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Results, 5 outcomes (part 2)

	Unemployed=1	FurtherStudy=1	Employer, workers	Returns to home, prefecture=1	Home province not in home prefecture=1
Male	0.010 (0.002)	0.000 (0.001)	0.097 (0.002)	-0.063 (0.002)	0.099 (0.002)
Highest parental education (base: junior HS)					
Junior HS	0.007 (0.005)	-0.001 (0.001)	0.079 (0.008)	0.002 (0.007)	0.000 (0.007)
HS	0.003 (0.005)	-0.002 (0.001)	0.072 (0.008)	0.004 (0.007)	-0.001 (0.007)
Associate	-0.005 (0.006)	0.013 (0.004)	0.062 (0.009)	0.007 (0.008)	-0.011 (0.008)
Bachelor	-0.006 (0.006)	0.018 (0.004)	0.083 (0.009)	0.091 (0.009)	-0.017 (0.008)
Postgraduate	-0.016 (0.010)	0.042 (0.008)	0.176 (0.018)	0.049 (0.015)	0.034 (0.014)
Both parents same education	0.002 (0.002)	0.000 (0.001)	0.039 (0.003)	0.005 (0.003)	0.003 (0.003)
Parental employer type (base: other)					
Government	-0.003 (0.004)	0.015 (0.001)	-0.001 (0.006)	0.122 (0.005)	-0.027 (0.005)
Primary/High school	0.008 (0.009)	0.013 (0.004)	-0.014 (0.007)	0.047 (0.007)	-0.004 (0.006)
Medical institution	-0.007 (0.005)	0.017 (0.005)	-0.003 (0.008)	0.047 (0.009)	-0.006 (0.007)
State-owned enterprise	-0.007 (0.007)	0.013 (0.002)	0.013 (0.004)	0.051 (0.005)	0.009 (0.004)
Private enterprise	-0.002 (0.002)	0.000 (0.001)	0.038 (0.002)	0.001 (0.002)	-0.013 (0.002)
Research college	-0.001 (0.006)	0.015 (0.005)	0.005 (0.009)	-0.006 (0.005)	0.023 (0.008)
Community employer	-0.001 (0.002)	0.011 (0.002)	0.020 (0.003)	-0.029 (0.003)	0.001 (0.003)
Family in poverty file	-0.042 (0.002)	-0.001 (0.002)	-0.007 (0.003)	-0.033 (0.003)	0.018 (0.003)

- After controlling for all major characteristics that may proxy for skills that are "measurable" by employers, gender and parental background still seem to matter.
- Males tend to earn higher salary and are less likely to return to home.
- Parental education is strongly associated with salary AND return to home.
- Parental employer type, esp. government, is associated with return to home.
- Students whose family is in poverty are more likely to be employed, and less likely to return to home.

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Results, 5 outcomes (part 3)

	Unemployed=1	FurtherStudy=1	Employer, workers	Returns to home, prefecture=1	Home province not in home prefecture=1
Age relative to standard cohort (base: -1 year)					
-3 to 3 years (oldest)	-0.007 (0.004)	-0.035 (0.003)	0.057 (0.006)	-0.020 (0.006)	0.007 (0.006)
+2 years	-0.003 (0.003)	-0.020 (0.002)	0.039 (0.004)	-0.013 (0.004)	0.012 (0.004)
+1 year	-0.000 (0.003)	-0.012 (0.002)	0.025 (0.003)	-0.018 (0.004)	0.006 (0.003)
0 year	0.003 (0.003)	-0.012 (0.002)	0.007 (0.003)	-0.016 (0.003)	0.007 (0.003)
Calendar birth quarter (base: 1Q (oldest))					
Q1	0.001 (0.002)	0.007 (0.001)	-0.008 (0.003)	0.006 (0.003)	-0.001 (0.003)
Q2	0.001 (0.002)	0.006 (0.001)	-0.008 (0.003)	0.012 (0.003)	-0.004 (0.003)
Q3 (youngest)	0.002 (0.002)	0.010 (0.001)	-0.009 (0.003)	0.014 (0.003)	-0.003 (0.003)
Born in urban county	-0.006 (0.005)	0.013 (0.002)	-0.026 (0.004)	0.005 (0.005)	-0.016 (0.004)
In urban county before entrance	0.003 (0.002)	0.005 (0.001)	-0.007 (0.003)	0.008 (0.003)	-0.025 (0.003)
Moved province before entrance	0.001 (0.008)	0.015 (0.007)	0.013 (0.012)	-0.048 (0.013)	-0.083 (0.016)
Moved prefecture before entrance	0.000 (0.005)	0.000 (0.004)	0.000 (0.007)	-0.002 (0.008)	0.063 (0.008)
Observations	206428	206428	131469	168627	168627
Parameters	5.2	5.2	5.29	5.29	5.29
R ²	0.024	0.1685	0.2466	0.24	0.0897

- Somewhat surprisingly, age (both year and quarter) relative to standard cohort matter a lot. Older students are more likely to be employed, less likely to study further, have higher salary, and less likely to go home.
- Students who were born in an urban county are more likely to be employed and more likely to go home. However, the salary level is lower.
- Movement before college entrance is associated with movement after college graduation.

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Results, employer type (part 1)

	Party & Government=1	Other public institutions=1	State-owned enterprise=1	Private enterprise=1
Male	-0.001 (0.001)	-0.019 (0.002)	0.023 (0.001)	-0.006 (0.002)
Highest parental education (base: junior HS)				
Junior HS	0.004 (0.002)	0.002 (0.005)	0.000 (0.004)	-0.004 (0.006)
HS	0.007 (0.002)	0.000 (0.005)	-0.003 (0.004)	-0.004 (0.006)
Associate	0.009 (0.002)	0.010 (0.005)	0.007 (0.005)	-0.028 (0.007)
Bachelor	0.011 (0.003)	0.017 (0.006)	0.006 (0.005)	-0.036 (0.008)
Postgraduate	0.003 (0.005)	0.012 (0.010)	-0.009 (0.009)	0.000 (0.013)
Both parents same education	-0.002 (0.001)	-0.003 (0.002)	-0.004 (0.002)	0.010 (0.003)
Parental employer type (base: other)				
Government	0.037 (0.003)	0.025 (0.004)	-0.007 (0.004)	-0.058 (0.006)
Primary/High school	0.002 (0.002)	0.049 (0.005)	0.002 (0.004)	-0.052 (0.007)
Medical institution	-0.004 (0.003)	0.043 (0.007)	-0.016 (0.004)	-0.026 (0.004)
State-owned enterprise	-0.002 (0.001)	-0.011 (0.003)	0.078 (0.003)	-0.063 (0.008)
Private enterprise	-0.004 (0.001)	-0.017 (0.001)	-0.013 (0.001)	0.036 (0.002)
Research college	0.005 (0.003)	0.006 (0.006)	0.003 (0.005)	-0.013 (0.008)
Community employer	-0.002 (0.001)	0.000 (0.002)	-0.001 (0.002)	0.001 (0.003)
Family in poverty file	-0.001 (0.001)	-0.001 (0.002)	-0.001 (0.002)	0.003 (0.003)

- Summary statistics: party/government (1.4%), other public institutions (13.8%), state-owned enterprise (7.3%), private enterprise (76.9%)
- Very strong association between parent's employer type and graduate's employer type.
 - Other factors: gender, parental education.

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Results, employer type (part 2)

	Party & Government=1	Other public institutions=	State-owned-enterprise=1	Private enterprise=1
Class rank quintile (base: lowest)				
2nd	-0.001 (0.002)	0.002 (0.003)	0.010 (0.003)	-0.011 (0.005)
3rd	-0.001 (0.001)	0.005 (0.003)	0.011 (0.003)	-0.016 (0.004)
4th	-0.001 (0.001)	0.009 (0.003)	0.016 (0.003)	-0.024 (0.004)
5th (highest)	0.000 (0.001)	0.011 (0.003)	0.020 (0.003)	-0.033 (0.004)
Committee work (base: none)				
Class	0.002 (0.001)	0.005 (0.001)	0.004 (0.001)	-0.010 (0.002)
Department/School	0.002 (0.001)	0.003 (0.002)	0.008 (0.002)	-0.006 (0.003)
College	0.001 (0.002)	0.004 (0.003)	0.005 (0.003)	-0.007 (0.005)
CPC youth branch	0.001 (0.002)	0.006 (0.003)	0.004 (0.003)	-0.009 (0.005)
Leader in committee	0.003 (0.002)	0.010 (0.005)	-0.002 (0.005)	-0.010 (0.007)
Political status (base: none)				
CPC youth league	0.000 (0.001)	0.009 (0.002)	0.006 (0.002)	-0.017 (0.003)
CPC pre-member	0.010 (0.003)	0.014 (0.006)	0.006 (0.006)	-0.076 (0.009)
CPC member	0.025 (0.004)	0.034 (0.007)	0.008 (0.007)	-0.077 (0.009)

- The "better" students are more likely to go to public institutions and state-owned enterprises.

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Results, employer type (part 3)

	Party & Government=1	Other public institutions=	State-owned-enterprise=1	Private enterprise=1
Age relative to standard cohort (base: -1 years)				
≥+3 years (oldest)	0.011 (0.002)	0.005 (0.004)	-0.010 (0.003)	-0.006 (0.005)
+2 years	-0.002 (0.001)	-0.006 (0.003)	-0.006 (0.002)	0.017 (0.004)
+1 year	-0.003 (0.001)	-0.003 (0.002)	-0.003 (0.002)	0.010 (0.003)
0 year	-0.002 (0.001)	-0.002 (0.002)	-0.002 (0.002)	0.006 (0.003)
Calendar birth quarter (base: Q4 (oldest))				
Q1	0.000 (0.001)	-0.003 (0.002)	0.000 (0.002)	0.002 (0.002)
Q2	0.000 (0.001)	-0.001 (0.002)	0.001 (0.002)	0.000 (0.003)
Q3 (youngest)	0.000 (0.001)	0.000 (0.002)	0.002 (0.002)	-0.003 (0.002)
Degree type (base: Associate)				
Bachelor	0.000 (0.001)	-0.021 (0.003)	0.056 (0.002)	-0.025 (0.003)
Postgraduate	0.002 (0.003)	0.136 (0.008)	0.091 (0.008)	-0.217 (0.010)
Born in "urban" county				
In urban county before entrance	-0.002 (0.001)	-0.009 (0.002)	0.004 (0.002)	0.005 (0.003)
Moved province before entrance	0.000 (0.003)	0.004 (0.007)	-0.012 (0.008)	0.008 (0.011)
Moved prefecture before entrance	-0.007 (0.002)	-0.002 (0.005)	0.005 (0.005)	0.003 (0.007)
Observations				
	168627	168627	168627	168627
Parameters				
	529	529	529	529
R2				
	0.143	0.4447	0.2084	0.3151

- Graduates with a rural background tend to be employed by the party/government and other public institutions.
- Movements prior to college entrance is negatively associated with employment by the party/government.

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Multinomial location choice model

- Location choice is usually not binary. It is hard to interpret RF estimates in some of the "middle" cases.
 - e.g., The top students go somewhere else, while the middle students go to the provincial capital.
- Location-specific factors, such as distance from home and economic gradient, are important. It is very difficult to interpret these estimates in an RF model.
 - They were at least partly subsumed by origin FE (~340) and school FE (~90).
- A natural approach is to estimate a multinomial location choice model.
- The choice set is very large if we take every location seriously (341 prefectures). However, most locations are almost irrelevant.

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Multinomial location choice model

- We circumvent the choice dimension issue by customizing the choice set of each individual in relation to his/her origin and college location. This is a non-trivial task.
 - Individuals come from any of the 341 prefectures and study in one of the 11 prefectures. Theoretically, there are 341*11=3751 cases.
 - In the data, there are 3212 cases.
- We construct 8 to 12 choices depending on the case. The condensed model reduces the complexity of the problem and provides guidance to how the RF estimates should be interpreted.
- Still, we need to map the location-specific factors of all potential locations in each of the 3212 cases.
 - E.g., Distance from home prefecture. Maximum possible combinations ~ 341*341/2=58,140.

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Illustration of choice sets

Case and prefecture	Location of home province	Location of school in target province	# choice	Choice within home province	Choice within school province	Choice within other provinces
1 Jiangxi (capital)	capital	capital	8	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
2 Shanghai	capital	capital	9	home (capital)	school (capital), other	home_region, GD, JS, ZJ, other
3 Beijing, Tianjin	capital	capital	9	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
4 Jiangsu (capital)	capital	capital	9	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
5 Zhejiang (capital)	capital	capital	9	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
6 Guangdong (capital)	capital	capital	9	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
7 The rest (capital)	capital	capital	10	home (capital), other	school (capital), other	home_region, GD, SH, JS, ZJ, other
8 Jiangxi (non-capital)	capital	capital	9	home, capital, other	-	home_region, GD, SH, JS, ZJ, other
9 Jiangsu (non-capital)	capital	capital	10	home, capital, other	school (capital), other	home_region, GD, SH, JS, ZJ, other
10 Zhejiang (non-capital)	capital	capital	10	home, capital, other	school (capital), other	home_region, GD, SH, JS, ZJ, other
11 Guangdong (non-capital)	capital	capital	10	home, capital, other	school (capital), other	home_region, GD, SH, JS, ZJ, other
12 The rest (non-capital)	capital	capital	11	home, capital, other	school (capital), other	home_region, GD, SH, JS, ZJ, other
13 Jiangxi (capital)	Non-capital	Non-capital	8	home (capital), school, other	-	home_region, GD, SH, JS, ZJ, other
14 Shanghai	Non-capital	Non-capital	9	home (capital)	school, capital, other	home_region, GD, JS, ZJ, other
15 Beijing, Tianjin	Non-capital	Non-capital	10	home (capital), other	school, capital, other	home_region, GD, SH, JS, ZJ, other
16 Jiangsu (capital)	Non-capital	Non-capital	10	home (capital), other	school, capital, other	home_region, GD, SH, JS, ZJ, other
17 Zhejiang (capital)	Non-capital	Non-capital	10	home (capital), other	school, capital, other	home_region, GD, SH, JS, ZJ, other
18 Guangdong (capital)	Non-capital	Non-capital	10	home (capital), other	school, capital, other	home_region, GD, SH, JS, ZJ, other
19 The rest (capital)	Non-capital	Non-capital	11	home (capital), other	school, capital, other	home_region, GD, SH, JS, ZJ, other
20 Jiangxi (non-capital)	Non-capital	Non-capital	10	home (school), capital, other	-	home_region, GD, SH, JS, ZJ, other
21 Jiangsu (non-capital)	Non-capital	Non-capital	11	home, capital, other	school, capital, other	home_region, GD, SH, JS, ZJ, other
22 Zhejiang (non-capital)	Non-capital	Non-capital	11	home, capital, other	school, capital, other	home_region, GD, SH, JS, ZJ, other
23 Guangdong (non-capital)	Non-capital	Non-capital	11	home, capital, other	school, capital, other	home_region, GD, SH, JS, ZJ, other
24 The rest (non-capital)	Non-capital	Non-capital	12	home, capital, other	school, capital, other	home_region, GD, SH, JS, ZJ, other
25 Jiangxi (non-capital)	Non-capital	Non-capital	10	home, capital, school, other	-	home_region, GD, SH, JS, ZJ, other

- The 3212 cases belong to 25 different types of choice sets.
- Four different types of choice sets for within-province students.

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Intercept-only model as an illustration: Utility function

$$u_{ijk} = (\alpha_h + \alpha_{hh}pf_hh_{ijk} + \alpha_{hp}pf_hc_{ijk})pv_h_{ij} + (\alpha_s + \alpha_{sh}pf_sh_{ijk} + \alpha_{sp}pf_sc_{ijk})pv_s_{ij} + \alpha_{hr}rg_h_{ijk} + \sum_{l=1}^4 \alpha_{rl}rg_l_{ijk} + \epsilon_{ijk}$$

- Individual i and choice (jk).
- Alternative-specific intercepts are denoted by α and indicator variables.
 - For example, $pv_h=1$ if the alternative implies that the individual works in the home province.
 - $pf_hh=1$ if the alternative implies that the individual works in the home prefecture in the home province.
 - $pf_hc=1$ if the alternative implies that the individual works in the capital in the home province.
 - $pv_s=1$ if alternative implies that the individual works in the school province.
 - ...
 - rg_* represent alternatives in which the individual works outside the home and school provinces.

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Model with covariates: utility function

$$u_{ijk} = (\alpha_k + \alpha_{kk}pf_{.jh_{ijk}} + \alpha_{ks}pf_{.jhc_{ijk}})pv_{.jij} + (\alpha_s + \alpha_{ss}pf_{.sh_{ijk}} + \alpha_{sc}pf_{.sc_{ijk}})pv_{.sij} + \alpha_{rs}rg_{.jij} + \sum_{l=1}^4 \alpha_{rl}rg_{.ljk} + \alpha_{shsc} \times pf_{.sc_{ijk}} \times pf_{.sh_{ijk}} \times pv_{.sij} + x_{.hom}_i(\alpha_{sh}^{hom} + \alpha_{sh}^{sc}pf_{.jh_{ijk}})pv_{.jij} + x_{.gen}_i(\alpha_{sh}^{gen} + \alpha_{sh}^{sc}pf_{.jh_{ijk}} + \alpha_{sc}^{gen}pf_{.jhc_{ijk}})pv_{.jij} + x_{.gen}_i(\alpha_{sh}^{gen} + \alpha_{sh}^{sc}pf_{.sh_{ijk}} + \alpha_{sc}^{gen}pf_{.sc_{ijk}})pv_{.sij} + x_{.gen}_i(\alpha_{sh}^{gen}rg_{.jij} + \alpha_{sc}^{gen} \sum_{l=1}^4 rg_{.ljk}) + x_{.sch}_i(\alpha_{sh}^{sch} + \alpha_{sh}^{sc}pf_{.sh_{ijk}} + \alpha_{sc}^{sch}pf_{.sc_{ijk}})pv_{.sij} + x_{.sch}_i(\alpha_{sh}^{sch} \sum_{l=1}^4 rg_{.ljk}) + x_{.loc}_{ijk} \beta^{loc} + \epsilon_{ijk}$$

- $x_{.hom}_i$, $x_{.gen}_i$ and $x_{.sch}_i$ are individual-specific factors that do not vary across location.
- $x_{.loc}_{ijk}$ are location-specific factors. They are the same only for individuals that have the same prefecture of origin and same college location.

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Some preliminary results

- For illustration, we consider local students who came from a non-capital prefecture in Jiangxi province and studied in a non-capital prefecture in Jiangxi province.
 - ~30,000 students. They constitute one-fourth of within-province students.
 - There are 10 non-capital prefectures in Jiangxi province. Hence there are $10 \times 10 = 100$ possible origin-school location combinations.
 - The variation in location-specific factors depend on these combinations.
- 10 location choices in the choice set. This includes...
 - home prefecture in home province,
 - capital in home province,
 - school prefecture in home province,
 - any other prefectures in home province,
 - 6 out-of-province location choices.
- We estimate a conditional logit model.

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Multinomial choice model results (part 1)

	Coef. home province	Coef. home prefecture in home province	Coef. capital in home province	Coef. school prefecture in home province	Other coefficients
Location-specific factors:					
Distance from home prefecture (100km)	-0.095	(0.006)			
Distance from school prefecture (100km)	-0.048	(0.006)			
High speed train density to home prefecture (trains per day / total pops in home and destination *1000)	0.005	(0.001)			
High speed train density to school prefecture (trains per day / total pops in school and destination *1000)	0.004	(0.001)			
Labor wage of workers in prefecture	0.546	(0.249)			
Intercept	-2.274	(0.245)	1.693	(0.278)	0.562
Male	-0.316	(0.068)	-0.741	(0.071)	0.114
Postgraduate Parental education	-0.138	(0.142)	1.054	(0.141)	0.374
Family in poverty file	-0.116	(0.093)	-0.225	(0.098)	-0.019

- Two dimensions of inter-prefecture distance: home-destination; school-destination.
 - Both are negatively associated with choosing the location.
- We use the high speed train network to construct inter-prefecture density of trains.
 - Both measures are positively associated with choosing the location.
- Individuals are more likely to move to locations that have a higher average wage of workers in the prefecture.
 - Next step: add measures of location amenities such as hospital density, etc.

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Multinomial choice model results (part 1)

	Coef. home province	Coef. home prefecture in home province	Coef. capital in home province	Coef. school prefecture in home province	Other coefficients
Location-specific factors:					
Distance from home prefecture (100km)	-0.095	(0.006)			
Distance from school prefecture (100km)	-0.048	(0.006)			
High speed train density to home prefecture (trains per day / total pops in home and destination *1000)	0.005	(0.001)			
High speed train density to school prefecture (trains per day / total pops in school and destination *1000)	0.004	(0.001)			
Labor wage of workers in prefecture	0.546	(0.249)			
Intercept	-2.274	(0.245)	1.693	(0.278)	0.562
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Postgraduate Parental education	-0.138	(0.142)	1.054	(0.141)	0.374
Family in poverty file	-0.116	(0.093)	-0.225	(0.098)	-0.019

- Individual-specific factors that do not vary across location:
 - Males are less likely to return to home prefecture, more likely to move to provincial capital and more likely to move to other provinces.
 - Individuals with very high parental education are more likely to go to home prefecture, provincial capital and school prefecture. They are less likely to go to other provinces.
 - Individuals whose family are in poverty are less likely to go to home prefecture.

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Multinomial choice model results (part 2)

	Coef. home province	Coef. home prefecture in home province	Coef. capital in home province	Coef. school prefecture in home province	Other coefficients
Class rank is in highest quartile	-0.205	(0.074)	-0.056	(0.077)	0.159
Degree type is Bachelor	0.222	(0.106)	-0.382	(0.106)	0.025
School offers bachelor degree	0.582	(0.108)	0.625	(0.119)	-0.792
Top 10 university in province	0.106	(0.156)	0.691	(0.165)	-0.471
Associate prof to student ratio	0.190	(0.093)	-0.068	(0.093)	-0.113
Born in urban county	0.060	(0.119)	0.426	(0.120)	0.009
Moved province before entrance	-1.303	(0.640)	0.814	(0.602)	0.628
Moved prefecture before entrance	0.690	(0.243)	-1.090	(0.267)	-0.315
Other variables - variables:					
Other provinces in same region of home province					-1.091
Guangdong province					0.337
Shanghai province					-0.279
Jiangsu province					-0.387
Zhejiang province					0.613
Observations	26000	Individuals	26,000		
Parameters	58	Log-likelihood	-51633		
Pseudo R ²	0.138				

- Individuals with high class rank are likely to go to provincial capital, school prefecture and other provinces.
- Graduates from higher ranked universities are more likely to go to home prefecture or school prefecture. They are less likely to go to the provincial capital.
- Individuals born in an urban county are more likely to go to home prefecture.
- Individuals who moved province/prefecture are less likely to go to their "home" province/prefecture.

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Conclusions

- We used a unique administrative data set of the population of university graduates (~310,000) in Jiangxi province to estimate various models of location choice.
 - We examined who get what kinds of jobs, and where do they get them.
- Factors that matter: class rank, committee work,