

Arbeitsmarkteinstieg und räumliche Mobilität von Hochschulabsolvent*innen

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KURZFASSUNG

In Wissensgesellschaften ist der Bedarf an Bildung und qualifiziertem Humankapital hoch, ihre ökonomische Relevanz für Wachstum und Entwicklung sowie die Bedeutung für das Individuum sind unbestritten. Aus dem Fachkräftemangel und der gleichzeitigen Zunahme der Anforderungen der beruflichen Tätigkeiten entsteht eine Bildungsexpansion, um die so entstandene Nachfrage zu bedienen; die Aktivierung der dadurch erhöhten Potenziale des qualifizierten Humankapitals ist dabei jedoch an die Umsetzung seiner spezialisierten Fähigkeiten und Wissen im Arbeitsmarkt gebunden. Dabei greifen die gesellschaftlichen und individuellen, monetären Bildungsrenditen erst bei erfolgreichem Arbeitsmarkteinstieg. Entsprechend ist es Aufgabe unter anderem der Hochschulabsolvent*innenforschung, die komplexen Bedingungen, denen die Eintrittsphase in das Arbeitsleben unterliegt, sowohl aus individueller, gesellschaftlicher als auch arbeitsmarktökonomischer Perspektive zu beleuchten.

Diese Dissertation beschäftigt sich entsprechend mit zwei Forschungszielen: einerseits, die empirischen Herausforderungen bisheriger Studien mit einem neuartigen, unikalen Datensatz zu adressieren. Andererseits, drei im Zusammenwirken bis dato wenig beobachtete Faktoren des Arbeitsmarkteintritts (Arbeitserfahrung, Mobilitätsverhalten, Studienfach) in die Analysen sowie in theoretische Forschungsansätze zu integrieren. Hierdurch kann ein vertieftes Verständnis der Übergangsphase zwischen Hochschulabschluss und Arbeitsmarkteinstieg gewonnen werden, wie es bisher in diesem Kontext nicht vorliegt.

Durch die Verknüpfung von administrativen Daten Studierender mehrerer deutscher Hochschulen mit Erwerbsbiographien der Sozialversicherungen auf Individualebene ist es gelungen, ein Hochschulabsolvent*innenpanel zu erstellen, mit dessen Hilfe die Erfolgsfaktoren des Arbeitsmarkteintritts und des frühen Karriereverlaufs detailliert und differenziert analysiert werden. Zentrale Ergebnisse zeigen, dass bereits vorhandene Erfahrungen auf dem Arbeitsmarkt und Mobilitätsverhalten bedeutsame Wirkung auf Parameter des Arbeitsmarkteintrittes – wie räumliche Verortung, Länge der Übergangsphase zwischen Hochschule und Arbeitsmarkt, Entgelt, Adäquanz der Beschäftigung etc. – haben. Die Stärke und die Effektrichtung hängen allerdings deutlich von der Art, Spezifität, Ort und Zeit der Arbeitserfahrungen ab.

Die konzeptionelle Kategorisierung der Beziehungen von Studienfach und assoziiertem Arbeitsmarkt ermöglicht, die signifikanten Effekte, die das Studienfach auf die Arbeitsmarktperformance hat, zu erkennen. Im hier erstmals vorgenommenen systematischen Vergleich des Arbeitsmarkteintritts von Absolvent*innen der Geographie, Wirtschaftswissenschaften und Informatik gelingt es, die Unterschiede genau zu quantifizieren und Wirkungsfaktoren zu identifizieren. Hierbei wird deutlich, dass die Herausforderungen, denen Geograph*innen im Arbeitsmarkt gegenüberstehen, kein Alleinstellungsmerkmal des Faches sind, sondern struktureller Natur bei Fächern mit indirekten, multidimensionalen Verbindungen zu ihrem jeweiligen Arbeitsmarkt.

Die durch diese Dissertation gewonnenen Erkenntnisse helfen, die Ausgestaltung und die Mechanismen hinter dem Arbeitsmarkteinstieg von Hochschulabsolvent*innen besser zu verstehen. Sie bietet damit Erkenntnisse für praktische Implikationen bei der Gestaltung von individuellen Bildungsinvestitionen, der Fachkräfterekrutierung und bei hochschulpolitischen Entscheidungen sowohl für (potenzielle) Studierende als auch Akteur*innen aus Hochschule, Wirtschaft und Regionalpolitik.

Schlagworte: Arbeitsmarkteinstieg; Hochschulabsolvent*innen; Mobilität; Arbeitserfahrung; Verweildaueranalysen; Geographie

ABSTRACT

There is a growing demand for (higher) education and qualified human capital in knowledge-based economies, with human capital being crucial for economic growth and regional development. The scarcity of skilled workers and the simultaneous increase in the requirements of jobs lead to educational expansion. However, the exploitation of human capital is tied to the application of its respective skills and knowledge in the labor market. The societal and individual financial returns to education also only take effect upon successful entry into the labor market. Accordingly, it is the task of research in higher education, among others, to illuminate the transition phase into the labor market from individual, societal and economical perspectives. Against this background, this dissertation has two research goals. Firstly, it aims to address the empirical challenges that previous studies face by developing a novel and unique dataset. Secondly, the dissertation aims to incorporate the hitherto neglected interplay of three factors of labor market entry (work experience, field of study and mobility) into both empirical models and theoretical frameworks.

Matching administrative student data from several German universities with employment biographies from social security records at the individual level enabled the creation of a panel data set of graduates. Using this panel, the labor market entry as well as early career paths and their respective success factors are analyzed in depth. Key findings suggest that labor market experiences and mobility patterns have significant effects on labor market entry variables such as the geographical location, the duration of the transition from university to employment, wages and the adequacy of employment. However, strength and direction of these effects depend on the type, specificity, location and timing of work experiences. In this dissertation, a conceptual categorization of the relation between fields of study and their associated labor markets allows the identification of important effects of the field of study on labor market performances. In more detail, the labor market entry of graduates from different fields, i.e. geography, business, computer sciences, is systematically compared, and differences as well as their predictors are quantified. Results suggest that geographers perform worse than their business and computer science peers do. However, this is not a problem of geographers per se but rather due to the indirect and multidimensional links between some fields of study and their respective labor markets.

The insights gained through this dissertation help to better understand the mechanisms underlying the labor market entry of graduates, leading to practical implications in several domains such as the planning of educational trajectories by individuals, the improvement of skilled labor recruitment strategies by firms, and the decision-making in regional policy.

Keywords: labor market entry; graduates; mobility; work experience; duration analysis; geography

DANKSAGUNG

„Das Gute des vernunftbegabten Lebewesens ist die Gemeinschaft“

MARC AUREL (121-180 n. Chr.); Selbstbetrachtungen, (5)16

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VERZEICHNIS DER ABKÜRZUNGEN

| | |
|--------|---|
| BA | Bundesagentur für Arbeit |
| BBSR | Bundesinstitut für Bau-, Stadt- und Raumforschung |
| BMAS | Bundesministerium für Arbeit und Soziales |
| DZHW | Deutsches Zentrum für Hochschul- und Wissenschaftsforschung |
| FDZ | Forschungsdatenzentrum |
| HZB | Hochschulzugangsberechtigung |
| IAB | Institut für Arbeitsmarkt- und Berufsforschung |
| IEB | Integrierte Erwerbsbiographie |
| KOAB | Kooperationsprojekt Absolventenstudien |
| ME | Marginal Employment |
| NEPS | National Educational Panel Study, <i>Nationales Bildungspanel</i> |
| OECD | Organisation for Economic Co-operation and Development, <i>Organisation für wirtschaftliche Zusammenarbeit und Entwicklung</i> |
| PIAAC | Programme for the International Assessment of Adult Competencies, <i>Internationale Studie zur Untersuchung von Alltagsfertigkeiten Erwachsener</i> |
| RE | Regular Employment |
| SGB-II | Sozialgesetzbuch 2 |

KAPITEL 1

Einleitung

1.1 Motivation und Forschungsziele

Die Beziehung zwischen Gesellschaft und Bildung ist einem stetigen Wandel unterworfen. Ihre Bedeutung auch. Der gegenwärtige Wandel in den industrialisierten Ländern von Dienstleistungs- zu Wissensgesellschaften verstärkt die Bedeutung von Wissen und führt in der Regel zur Bildungsexpansion (Dotti et al., 2013). Tiefgreifende Reformen, wie die in den europäischen Ländern vollzogene Bologna-Reform, unterstützen diesen Prozess und sind mitverantwortlich für eine Reihe deutlicher Veränderungen in der Hochschullandschaft. Die Tendenz, von der dem Humboldt'schen Bildungsideal entsprechenden zur arbeitsmarktnahen Ausbildung von Absolvent*innen zu entwickeln, als Beitrag für Gesellschaft und Wirtschaft, hat konsequenterweise nicht nur gravierende Folgen für die internen Strukturen und Wesen von Universitäten, sondern auch ganz praktische Implikationen für Studierende und ihren Übergang in den Arbeitsmarkt (Stewart, 2020). Dies zeigt sich in zweierlei Hinsicht: Erstens führt die Zunahme des Anforderungsniveaus der vermehrt nachgefragten Tätigkeiten zur Erhöhung des individuellen Investitionsdruckes in Bildung (BMAS, 2017). Zweitens resultiert der steigende Fachkräftemangel – verschärft auch durch den demographischen Wandel – in einem erhöhten Bedarf an hochqualifizierten Arbeitskräften (Dräger, 2009). Folglich steigen die Studierendenzahlen sowohl in Deutschland als auch international in den letzten 20 Jahren kontinuierlich an (Statistisches Bundesamt 2020; OECD, 2020a). Der Bedarf an Hochqualifizierten ist unbestritten, folglich auch die Notwendigkeit, die Eintrittsphase ins Arbeitsleben aus multiplen Perspektiven zu beleuchten. Hierbei geht es zunächst um die Sicht der (späteren) Hochqualifizierten selbst. Die Entscheidung für eine tertiäre Ausbildung und die damit einhergehende Bildungsinvestition ist mit Kosten und gewissen Risiken durch Informationsdefizite verbunden. Abbruch des Studiums durch Fehleinschätzung der Studieninhalte und/oder -anforderungen oder auch fehlende Anschlussverwendung auf dem Arbeitsmarkt zählen neben vielen anderen Faktoren zu diesen Defiziten. Um diese minimieren zu können, widmet sich ein Teil der Hochschul(absolvent*innen)forschung – zu welcher diese Dissertation zuzuordnen ist – der Erkenntnisgewinnung zu Fragen des Arbeitsmarkteintritts von hochqualifizierten Menschen und dessen (Miss-)Erfolgsfaktoren. Aus der Sicht werdender Absolvent*innen, also potenzieller und tatsächlicher Studierender, sind Erkenntnisse aus

diesem Forschungsfeld existenziell, da sie diese als fundierte Grundlage für Entscheidungen für weitere Bildungsinvestitionen, wie den Beginn eines Hochschulstudiums oder Schwerpunktsetzungen im Studium, heranziehen können. Die Verbesserung der eigenen Beschäftigungsfähigkeit schon während des Studiums zählt darüber hinaus zu den effektivsten Wegen, den Übergang in den Arbeitsmarkt optimal vorzubereiten (Rodenstock, 2009).

In wissensbasierten Ökonomien obliegt die Wissensproduktion durch Forschung und Ausbildung in überwiegendem Maße den Hochschulen. Gleichzeitig stehen diese in zunehmendem Wettbewerb zueinander und Wettbewerbsaspekte rücken in den Mittelpunkt der Hochschulstrategieentwicklung. Durch die in Deutschland vorliegende Finanzierung durch öffentliche Gelder unterliegen die Hochschulen ferner einem verstärkten Legitimationsdruck (Dräger, 2009). Somit sind Erkenntnisse über die Arbeitsmarktfähigkeit der Studierenden auch aus Hochschulsicht ein entscheidender Baustein für die Argumentation weiterer Entwicklungs- und Finanzierungsoptionen. International schlägt sich dieser Trend in *performance*-basierten Finanzierungen nieder. Bis zu 40% an zusätzlichen Mitteln können beispielsweise in Australien durch überdurchschnittliche Beschäftigungszahlen der Absolvent*innen von Hochschulen generiert werden (Stewart, 2020). Hochschulen, die detaillierte Informationen über die Beschäftigungszahlen ihrer Absolvent*innen vorweisen können, nutzen diese, um Vorteile im Wettbewerb um Studierende, wissenschaftlichen Nachwuchs und Drittmittel zu erlangen. Nicht nur durch die Bologna-Reform sind tiefgreifende Veränderungen der einzelnen Studiengänge und ihrer Curricula vonstattengegangen. Durch die Veränderung der Anforderungen an die Hochschulen als Motor der globalen Wissensökonomie wurden Studieninhalte vermehrt an die Anforderungen des Arbeitsmarktes angepasst, was die Erfolge der Absolvent*innen auf dem Arbeitsmarkt zu einem relevanten Hochschulevaluationskriterium hat werden lassen.

Die Notwendigkeit von Wissen und gut ausgebildetem Humankapital für das wirtschaftliche Wachstum und die Regionalentwicklung ist in der Wissenschaft unbestritten (Abel & Deitz, 2012). Hochschulen und Hochschulabsolvent*innen kommt hierbei, wie dargelegt, eine Schlüsselrolle zu. Nicht nur auf der Nachfrageseite spielen beide Akteure eine regionalökonomische Rolle (Bredl et al., 2014), sondern zunehmend auch durch Chancen wie dem regionalen Wissenstransfer. Nur bei erfolgreicher Integration der Absolvent*innen in der Hochschulregion kann sich das ökonomische Potenzial eben dort entfalten (Venhorst et al., 2010). Neben Faktoren wie der Absorptionskapazität des regionalen Arbeitsmarktes kommt der Frage nach dem Mobilitätsverhalten der Absolvent*innen in der transitiven Phase zwischen Hochschule und Arbeitsmarkt eine entscheidende Bedeutung zu (Gareis et al., 2018). Durch die

maßgebliche Hochschulfinanzierung der Länder stellt ein(e) Absolvent*in mit Arbeitsmarkteinstieg in einem anderen Bundesland/Staat einen wirtschaftlichen Verlust dar, da der Investitionsrückfluss durch gezahlte Steuern in einer anderen Region realisiert wird. Das Halten und Integrieren der ausgebildeten Absolvent*innen und das Gewinnen von neuen Hochqualifizierten ist ein wirksames Instrument der Regionalpolitik und stellt gerade wirtschaftlich schwächere oder kleinere Hochschulregionen vor Herausforderungen (Abreu et al., 2014). Die Rechtfertigung für die Verwendung öffentlicher Gelder steht bei politischen Akteur*innen im Vordergrund. Darüber hinaus stellt die Bereitstellung ausreichender finanzieller Ressourcen für Lehre, Forschung und notwendige Entscheidungsfreiheiten der Hochschulen die zentrale Aufgabe der Politik in diesem Bereich dar (Rodenstock, 2009).

Auf der Suche nach Fachkräften und gut qualifizierten Mitarbeitenden, beschäftigen sich vor allem Unternehmen aus wissensintensiven Branchen mit der räumlichen Verteilung von Hochschulabsolvent*innen. Die Anwerbung von hochqualifiziertem Humankapital wird durch die Existenz einer Hochschule in der Region vereinfacht, da Migrationskosten von potenziellen Beschäftigten aus anderen Regionen entfallen oder zumindest verringert werden. Auch bei Standortentscheidungen sind die regionale Ausstattung von Fachkräften und die Ausbildungsmöglichkeiten von potenziellen Beschäftigten ein gewichtiger Faktor. Das Nutzen der Potenziale von Wissensspillovern und Hochschul-Industrie-Kooperationen funktioniert maßgeblich über das Medium Absolvent*in. Privatwirtschaftliche Unternehmen haben demnach als vierte Zielgruppe, neben (potenziellen) Studierenden, Hochschulen und Akteur*innen aus Hochschul- und Regionalpolitik (u.a. Leitner, 2009), ein Interesse an den Erkenntnissen der Absolvent*innenforschung.

Die Fachwissenschaft hat im Forschungsfeld der Hochschul(absolvent*innen)forschung mannigfaltige Ergebnisse und Erkenntnisse generiert und so dazu beigetragen, den Sachverhalt weiter einordnen zu können. Jedoch ist dieser Prozess keinesfalls abgeschlossen und bietet Raum für weitere Forschungsvorhaben (siehe Kapitel 1.1.1 und 1.1.2).

Die unterschiedlichen Interessensgruppen mit ihren jeweiligen Sichtweisen auf den Untersuchungsgegenstand eint das Streben nach weiteren Erkenntnissen über die individuellen Erwerbsbiographien von Hochqualifizierten nach ihrem Hochschulabschluss. Die Frage nach Ausgestaltung und Einflussfaktoren in der transitiven Phase steht daher im Zentrum dieser Forschungsarbeit.

Entsprechend beschäftigt sie sich mit dem übergeordneten **Forschungsthema** der

*„Einflüsse auf den Arbeitsmarkteinstieg und die räumliche Mobilität von Hochschulabsolvent*innen nach ihrem Abschluss.“*

Die Arbeit ist wie folgt organisiert: Kapitel 1 führt zunächst zum Forschungsgegenstand dieser Dissertation und legt die Motivation und Zielgruppen dar. Des Weiteren wird aufgeführt, wie sich die Hochschulabsolvent*innenforschung generell und im speziellen mit dem Thema Mobilität und Arbeitsmarkteinstieg auseinandersetzt, welche Forschungslücken sich hierbei herausstellen und entsprechende Forschungsziele und -fragen ableiten lassen. Ferner wird drittens der theoretische Rahmen gespannt und der potenzielle Beitrag hierfür durch diese Arbeit aufgezeigt. Darüber hinaus wird demonstriert, wie die unikale Datenbasis durch Verknüpfung von verschiedenen administrativen Informationsquellen erstellt, bearbeitet und welche Methoden angewendet wurden, um die Forschungsziele zu erreichen. Abschließend wird der übergeordnete konzeptionelle Forschungsrahmen für die kohäsiven Artikel dieser Dissertation dargelegt.

Kapitel 2 bis 4 haben Forschungsartikelcharakter und spiegeln die im Zuge des Forschungsprozesses generierten Fortschritte und Erkenntnisse wider. Hierbei wird zunächst (Artikel 1) der Fokus auf das Mobilitätsverhalten der Absolvent*innen bei ihrem Arbeitsmarkteintritt gelegt. Dieser Artikel hilft dabei zu verstehen, welchen Einfluss Arbeitserfahrung vor und während des Studiums neben anderen Faktoren auf die räumliche Mobilität haben. Unterschieden wird hierbei zusätzlich zwischen dem Ort und der Art der verschiedenen Beschäftigungen. Kapitel 3 (Artikel 2) zielt auf die Erforschung der Einflüsse auf die Länge der transitiven Phase zwischen Abschluss und Arbeitsmarkt ab. Die Wirkung von räumlicher Mobilität(erfahrung) und unterschiedlichen Arbeitserfahrungen wird hierbei identifiziert und herausgearbeitet. Die konkrete Beziehung zwischen Studiengang und assoziiertem Arbeitsmarkt steht im Mittelpunkt von Kapitel 4 (Artikel 3). In einem systematischen Vergleich dreier Studiengänge, wird unter Einnahme der Perspektive der Geographie die Arbeitsmarktperformance der Absolvent*innen beleuchtet und kontrastiert. Hierbei gelingt es, Entgelt- und Vollzeitlücken zu quantifizieren und einzuordnen.

In Kapitel 5 erfolgt die abschließende Zusammenfassung der Forschungsergebnisse und -beiträge und die sich hieraus ableitenden Implikationen. Neben der kritischen Einordnung und Limitationen der Arbeit werden Empfehlungen und Ideen für die weitere Forschung im Bereich der Hochschulabsolvent*innenforschung entwickelt.

1.1.1 (Hochschul-)absolvent*innenforschung

Die wissenschaftliche Hochschulforschung ist ein junges Forschungsfeld, welches im wissenschaftlichen Kontext noch relativ schwach institutionalisiert ist und entsprechend keine alleinstehende Forschungsdisziplin darstellt (Metz-Göckel, 2008). Die wissenschaftlich zu bearbeitenden Probleme liegen im Regelfall nicht innerhalb einer, sondern an den Grenzen mehrerer Disziplinen (Pasternack, 2006). Die Anfänge der deutschen empirischen Hochschulforschung liegen in den 1960er Jahren, als im Zuge von Bildungsexpansion und tiefgreifenden Reformmaßnahmen auch deren Wirksamkeit überprüft und analysiert werden musste. Sie zeichnet sich durch eine hohe Interdisziplinarität aus, wobei sie sich primär über ihren Forschungsgegenstand integriert und sich hierbei methodisch und theoretisch an den beteiligten Quellendisziplinen bedient (Pasternack, 2006). Sie befindet sich dabei im Spannungsfeld zwischen „der wissenschaftsimmanenten Notwendigkeit zur ‚zweckfreien Grundlagenforschung‘“ (Winter, 2014) und dem gleichzeitigen Anspruch „systematisches Wissen so zu entwickeln und aufzubereiten, dass es für praktisches Gestaltungshandeln relevant ist“ (Teichler, 2008) – also im permanenten Spagat zwischen Forschung und Praxis. Nach Wolter (2011) charakterisiert die Hochschulforschung vor allem ihre Anwendungsorientierung, wobei viele empirische Untersuchungen in diesem Forschungsfeld nicht primär das Anliegen haben, theoretische Konzepte und Hypothesen entwickeln und prüfen zu wollen, sondern vielmehr auf ihre pragmatische Problemstellung ausgerichtet sind.

Die im Forschungsfeld der Hochschulforschung involvierten Disziplinen sind ebenso mannigfaltig wie die behandelten Themenschwerpunkte. Teichler (2008) attestiert unter anderem den Disziplinen Soziologie, Wirtschafts- und Rechtswissenschaften, Sozialwissenschaften, Psychologie und Erziehungswissenschaften einen maßgeblichen Anteil an der Hochschulforschung. Er stellt fest, dass diese Disziplinen selbst einen unterschiedlichen Umgang mit dem Sachgebiet der Hochschulforschung aufweisen. Dies macht sich insbesondere in dem Grad des interdisziplinären Problembewusstseins bemerkbar. In der den Wirtschaftswissenschaften angelehnten Hochschulforschung ist ein Zugang mit „klassischen“ wirtschaftswissenschaftlichen Methoden und Theorien eher anzutreffen, als beispielsweise in der Soziologie, die eine größere Akzeptanz für theoretische und methodische Verknüpfungen zwischen Ansätzen aus unterschiedlichen Disziplinen aufweist. Entsprechende fachsystematische Unterteilung wird dem interdisziplinären, stark problemorientierten Charakter der Hochschulforschung nur ungenügend gerecht. Wolter (2011) schlägt deshalb eine nach Strukturen und Prozessen, Funktionen und Aufgaben des Hochschulsystems differenzierte

Unterscheidung der in der Hochschulforschung relevanten Themenfelder vor: Neben *Bildungsbeteiligungs- und Studierendenforschung* (über den Zugang zu Hochschulbildung, Studienverläufe, studentische Mobilität, soziale Lage der Studierenden), *Professionsforschung* (über wissenschaftlichen Nachwuchs, Karrierewege, Promotionsforschung), *Institutionen- und Hochschulentwicklungsforschung* (über Hochschulexpansion und Folgen, Regionalisierung der Hochschulentwicklung, horizontale und vertikale Differenzierung), *Forschung zu Hochschulplanung, Organisation und Steuerung des Hochschulsystems und Hochschulpolitik* und *Wissenschaftsforschung / Funktionalitätsforschung der Wissenschaft* wird noch die *Absolvent*innen- und Berufsforschung* als Themenfeld der Hochschulforschung benannt. Letzteres beschäftigt sich – wie diese Arbeit – mit Fragen zum Verhältnis von Hochschule und Beruf. Hierbei stehen die Übergänge in den Beruf, Berufsverläufe, „outcomes“ des Studiums, Praxis- und Berufsrelevanz des Studiums oder auch die internen und externen Erträge von Hochschulbildung im Vordergrund. Im Zuge von Qualitätssicherung, Studienreformen und Profilierung von Hochschulen gewinnt dieses Themenfeld vermehrt an Bedeutung (ebd.).

Die Absolvent*innenforschung – als Teil der Hochschulforschung – unterliegt entsprechend ähnlichen Verhältnissen in Bezug auf disziplinäre Zugehörigkeiten. Als interdisziplinäres Forschungsfeld bewegt auch sie sich an und über den Grenzen unterschiedlicher Disziplinen, die jeweils aus „ihrer Sicht“ über den Forschungsgegenstand motiviert einen pragmatischen und problemorientierten Beitrag leisten. Diese Dissertation versucht aus der Perspektive der Geographie heraus eben dies zu bewerkstelligen.

Inhaltliche Schwerpunkte der Absolvent*innenforschung sind mannigfaltig. Je nach beteiligter Disziplin geht es um die Betrachtung von sozio-demographischen, hochschulbezogenen, sozialen und wirtschaftlichen Einflussfaktoren auf den Karriere- und Lebensweg der Absolvierenden nach dem Abschluss. Unterschiedlichste Ansätze reichen von der Analyse des Einflusses des Studienfachs (z.B. Núñez & Livanos, 2010; Grave & Goerlitz, 2012), Hochschulort (z.B. Dotti et al., 2013; Ciriaci, 2014), Geschlecht (z.B. Comunian et al., 2017), Bildungshintergrund der Eltern (Eliasson et al., 2020) bis Leistungen im Studium (z.B. Venhorst et al., 2010; Salas-Velasco, 2012) oder Ausgestaltung der Curricula (z.B. Mason et al., 2009) auf die transitive Phase der Absolvent*innen. Die meisten der disziplininhärenten Forschungsfragen der beteiligten Fachrichtungen werden hierbei auf das Forschungssubjekt - die Hochschulabsolvent*innen - übertragen.

Untersuchungen in der Absolvent*innenforschung finden auf allen Maßstabsebenen statt. Neben international vergleichenden Studien, gibt es nationale, regionale und lokale Arbeiten. Hierunter fallen für Deutschland beispielsweise Krabel & Flöther (2014) [Kooperationsprojekt Absolventenstudien], für Länderstudien Falk & Kratz (2009) [Bayrisches Absolventenpanel] oder Analysen für einzelne Hochschulen (z.B. Wolf & Niebuhr, 2013). Ferner führen Hochschulen bzw. Institute interne Absolvent*innenbefragungen durch (u.a. Hennemann & Liefner, 2010). Nationale und lokale Datensätze bilden hierbei mehrheitlich die Grundlage für diese Arbeiten. Eine Ausnahme mit international vergleichbaren Daten ist das CHEERS-Projekt (Careers after Higher Education: An European Research Survey) (z.B. Salas-Velasco, 2007). Die zentrale Herausforderung bei länderübergreifenden Studien ist die einheitliche Datenerfassung. Nationale Bildungssysteme – die teilweise, wie in Deutschland, regionale Besonderheiten aufweisen – sind trotz Vergleichbarkeitsbemühungen sehr differenziert.

Die überwältigende Mehrheit an Daten dieser Studien werden über Absolvent*innenbefragungen generiert. Hierdurch sind zum einen statische Analysen möglich, die die Situation der Absolvent*innen zu einem fixen Zeitpunkt widerspiegeln und zum anderen dynamische Analysen, wenn Absolvent*innen zu mehreren Zeitpunkten befragt werden. Wiederholte Befragungen der gleichen Stichprobe an Untersuchungssubjekten über eine gewisse Zeit, generieren multiple Beobachtungen jedes Individuums und damit sogenannte Längsschnitt- oder Paneldaten (Hsiao, 2014). Hierdurch kann für die Stichprobe eine höhere Informationsdichte gewonnen und die Analyse um die Zeitkomponente erweitert werden. Paneldatenbanken, die u.a. auch für die Bildungsforschung genutzt werden sind beispielsweise das German Socio-Economic Panel (z.B. Busch & Weigert, 2010), das DZHW-Absolventenpanel (Haak & Rasner, 2009¹), der British Household Panel Survey (z.B. Andrews et al., 2011), oder der kanadische National Graduates Survey (Betts et al., 2013). Unabhängig der zeitlichen Struktur der Daten bringen mit Befragungen generierte Informationen auch empirische Herausforderungen mit sich. Neben den relativ hohen Erhebungskosten bei Befragungen, spielen potenzielle Selektionsfehler eine Rolle. Die Sampleauswahl und die verschiedenen hohen Rücklaufquoten können die Ergebnisse verzerren. Weitere Störgrößen sind (un-)bewusste Falschangaben der Befragten. Diese können durch Erinnerungslücken ebenso entstehen, wie durch Antwortverhalten der sozialen Erwünschtheit. Gerade bei sensiblen Themen wie Entgelt, Zeiten der Arbeitslosigkeit und/oder Jobsuche besteht die Gefahr von ungenauen und fehlerhaften Angaben (Kolek, 2012). Eine Alternative stellt die Verwendung

¹ damals noch HIS-Absolventenpanel.

administrativer Daten dar, die diesen Herausforderungen begegnet und weitere Vorteile mit sich bringt (siehe Kapitel 1.3).

Diese Arbeit widmet sich dem Arbeitsmarkteinstieg und der Mobilität der Absolvent*innen. Beides sind hochdynamische Prozesse, deren Parameter sich im Laufe der Zeit stark verändern können. Um den oben genannten empirischen Herausforderungen zu begegnen und darüber hinaus die Forschungsfragen inhaltlich fundiert beantworten zu können, setzt sich diese Arbeit zunächst das

Forschungsziel 1: Aufbau einer Datenbasis mit Panelstruktur, gespeist mit administrativen Individualdaten von Absolvent*innen mehrerer Hochschulen, tagesgenauen Informationen über einen Zeitraum von mindestens 4 Jahren nach Abschluss und einem angemessenen Set an räumlichen, regionalen, soziodemographischen, studiums- und arbeitsmarktbezogenen Variablen.

1.1.2 Mobilität und Arbeitsmarkteinstieg

Die Relevanz von Bildung und Humankapital für Entwicklung und Wachstum ist in den vorstehenden Kapiteln bereits angerissen worden. Die Effekte des Humankapitalbestandes einer Region auf Wachstum, Produktivität, Entgelt und Innovationen sind an die Geographie gebunden und können nur lokal wirken. Hochqualifizierten Menschen und ihrer Präsenz am Ort kommt entsprechend eine tragende Rolle zu. Gleichzeitig gelten Hochschulabsolvent*innen – mit ihrem neu erworbenen Wissen und Fähigkeiten – als überproportional mobile Personengruppe (Corcoran & Faggian, 2017). In der Hochschulforschung spielt Mobilität² außerdem insofern eine große Rolle, als Studierende vor, während und nach dem Studium erhöhten Mobilitätsanreizen unterliegen: von der Wahl des Hochschulstandortes, über räumliche Mobilität zwischen Bachelor- und Masterstudiengängen oder internationalen Austauschprogrammen, bis zur Mobilität nach dem Studium und während des Arbeitsmarkteinstiegs (u.a. Gareis, 2019). Bezüglich des Arbeitsmarkteinstiegs besteht bei allen Zielgruppen (Kapitel 1) ein Interesse an einem möglichst reibungslosen Übergang der Absolvent*innen in den Arbeitsmarkt. Mobilität und Arbeitsmarkteinstieg sind in der Absolvent*innenforschung daher eng miteinander verzahnt.

Aus regionalpolitischer Sicht scheint es nachvollziehbar, dass eine hohe Priorisierung in das Halten der ausgebildeten Hochqualifizierten erfolgt, um nicht dem Vorwurf der

² Anm.: im englischen wird in diesem Kontext auch das Wort „migration“ verwendet, wohingegen in der deutschen Literatur meistens von „Mobilität“ die Rede ist, auch um Verwechslungen mit grenzüberschreitender Migration zu vermeiden.

Ressourcenfehlallokationen zu unterliegen. Aus Sicht der Absolvent*innen ergeben sich hingegen vielfältige Gründe für oder gegen eine Mobilitätsentscheidung nach dem Abschluss. Neben individuellen und studiumsbezogenen Faktoren, stehen regionale Faktoren wie realisierbares Entgelt, Lebenshaltungskosten und vor allem Verfügbarkeit adäquater Jobs im Vordergrund (Buenstorf et al., 2016). Robuste Erkenntnisse existieren bei Zusammenhängen zwischen der Mobilitätsentscheidung und individuellen Faktoren wie Geschlecht und Alter. Auch studiumsbezogene Einflussfaktoren wie Studiendauer, Studienfach und Abschlussnote sind häufig belegt (u.a. Corcoran & Faggian, 2017; Venhorst et al., 2010). Die Bandbreite an regionalen Einflussfaktoren auf die Mobilitätsentscheidung, von Arbeitslosigkeit und Wachstum in den Herkunfts- und Zielregionen (Venhorst et al., 2011) bis lokale Annehmlichkeiten in der Lebensqualität (*amenities*) (Buch et al., 2017), ist groß. Die Arbeitserfahrung verzeichnet in diesem Kontext bis dato weniger Aufmerksamkeit. Erstaunlich ist dies insbesondere, da die meisten Studierenden während ihres Studiums bereits Arbeitserfahrungen gesammelt und entsprechende Kontakte in den Arbeitsmarkt haben knüpfen können (DaVanzo, 1983; Lörz & Krawietz, 2011). Existierende Studien beschäftigen sich mit Arbeitserfahrungen als Einflussfaktor auf die Mobilitätsentscheidung auf allgemeiner Ebene. Krabel und Flöther (2014) sowie Haussen und Uebelmesser (2017) zeigen, dass der durch Arbeitserfahrung entstandene lokale Kontakt zu Arbeitsgebenden die Entscheidung beeinflusst. Haapanen und Karhunen (2017) finden Hinweise auf einen negativen Zusammenhang und führen dies auf gewonnene lokale Arbeitserfahrungen zurück, welche als Mobilitätshemmnis dienen können. An einem Einfluss von Arbeitserfahrung auf die Mobilitätsentscheidung besteht daher kein Zweifel, allerdings fehlt es bis dato an Studien, die den *Ort* der Arbeitserfahrungen mit in Betracht ziehen. Gerade vor dem Hintergrund des Sozialkapital-Ansatzes nach Granovetter (1973), der die Wichtigkeit von etablierten Kontakten zu (fest lokal verortet) Arbeitsgebenden für den Arbeitsmarkteinstieg betont, stellt sich hier weiterer Forschungsbedarf heraus. Ferner gibt es keine Studien, die in diesem Kontext darüber hinaus nach Art, Zeitpunkt und Tätigkeitsspezifität der Arbeitserfahrungen differenzieren.

Der Arbeitsmarkteinstieg ist eine komplexe Phase nach dem Abschluss, welcher eine starke Bedeutung zukommt. Entsprechend viele Studien wurden hierzu angefertigt. Bildungsexpansionen mit gestiegenen Bewerbungszahlen und vermehrt asymmetrischen Erwerbsverläufen konfrontieren die Hochschulabsolvent*innen nach ihrem Studium (Bennett et al., 2020; Stewart, 2020). Davon unbeachtet gelten ein rascher Übergang und ein adäquater Einstieg in den Arbeitsmarkt als „erfolgreich“. Zu langes Verbleiben in der Arbeitslosigkeit oder eine nicht-adäquate Beschäftigung können langfristige Folgen auf die Karriere der

Absolvent*innen haben (Waldorf & Yun, 2016; Pozzoli, 2009). Eine Möglichkeit, diese transitive Phase zu untersuchen, ergibt sich in der Anwendung von „Verweildauer-Analysen“, welche die Länge der Übergangszeit und deren Einflussfaktoren analysieren. Bestehende Studien arbeiten auch hier die Bedeutung von individuellen, studiumsbezogenen und Arbeitsmarktfaktoren für den schnellen Übergang in den Arbeitsmarkt heraus (z.B. Sciulli & Signorelli, 2011; Pozzoli, 2009; Böpple, 2010; Biggeri et al., 2001). Allerdings wird der Einfluss von Mobilitäts- und Arbeitserfahrungen in dem Kontext nur sporadisch untersucht. Hier zeichnet sich der Forschungsstand durch ambivalente Ergebnisse aus (Faggian et al., 2007; Caliendo et al., 2019; Haak & Rasner, 2009; Barros et al., 2011). Eine stärkere Ausdifferenzierung der Mobilität nach Mobilitätstypen³ bzw. der Arbeitserfahrung nach Art, Zeitpunkt und Spezifität kann weiteren Erkenntnisgewinn sicherstellen.

Aber nicht nur die Dauer der transitiven Phase wird als Bewertungskriterium des Arbeitsmarkteinstiegs herangezogen. Häufig verwendete Indikatoren sind ferner das realisierte Entgelt oder die Beschäftigungsadäquanz. Beide Parameter stellen, bei entsprechender Ausgestaltung, einen Rückfluss der von den Absolvent*innen getätigten Bildungsinvestitionen sicher und unterliegen verschiedenen Einflussfaktoren. Einen wesentlichen Einfluss auf vor allem das Entgelt hat das Studienfach mit den jeweils assoziierten Arbeitsmärkten. Allerdings verwischt u.a. durch eine starke Ausdifferenzierung der Studienfächer oder auch neue Wissens- und Fähigkeitsanforderungen die Beziehung zwischen Studienfach und Arbeitsmarkt (Tura, 2020). Noch nie mit einem konkreten Berufsbild verknüpft, zeigt sich auch das Fach der Geographie mit diesen Entwicklungen wiederholt konfrontiert (Pírog, 2018; 2014a). Bisherige Studien untersuchten die Geographie in diesem Kontext entweder in aggregierten Studienfeldern (z.B. „Naturwissenschaften“) oder betrachteten die Geographie singulär, was eine Einordnung der tatsächlichen Unterschiede im Vergleich zu anderen Fächern erschwert. Eine empirisch fundierte Quantifizierung der Unterschiede beim Arbeitsmarkteinstieg und der systematische Vergleich zwischen Geographieabsolvent*innen und Absolvent*innen anderer Studiengänge leisten einen erheblichen Beitrag zur Versachlichung der Diskussionen und bieten Grundlage für weitere Forschungsansätze.

³ beispielsweise auch in diesem Kontext verwendet von Jewell & Faggian (2014) oder Kazakis & Faggian (2017).

Um ihren Teil dazu beizutragen, die Mobilität und den Arbeitsmarkteinstieg von Hochschulabsolvent*innen weiter zu analysieren und oben aufgezeigte Forschungslücken zu schließen, stellt sich diese Dissertation ferner das **Forschungsziel 2**: Die Beantwortung der folgenden drei inhaltlichen **Forschungsfragen**:

- F1:** „Welche Faktoren der Arbeitserfahrung haben Einfluss auf die Mobilitätsentscheidung der Hochschulabsolvent*innen beim Arbeitsmarkteinstieg?“
- F2:** „Wie beeinflussen Arbeits- und Mobilitätserfahrungen die Dauer der Transition der Hochschulabsolvent*innen in den Arbeitsmarkt?“
- F3:** „Wie groß sind die Unterschiede von Entgelt und Vollzeitbeschäftigung zwischen Absolvent*innen der Geographie auf der einen und Wirtschaftswissenschafts- und Informatikabsolvent*innen auf der anderen Seite? Welche Faktoren außer dem Studienfach beeinflussen diese Entwicklungen?“

1.2 Theoretischer Zugang

Durch ihren disziplinübergreifenden, interdisziplinären Charakter zeichnet sich die Hochschulforschung „[...]mithin dadurch aus, dass sie Theorie- und Methodenentwicklungen ihrer Quellen- und Schnittstellendisziplinen systematisch auf gegenstandsbezogene Verwendbarkeit hin auswertet und ggf. in das eigene Theorie- und Methodenarsenal inkorporiert“ (Pasternack, 2006). Entsprechend werden im folgenden Abschnitt die verwendeten theoretischen Ansätze kurz behandelt und dargelegt, wie diese zur Konzeptionierung der vorliegenden Arbeit dienen.

Die inhaltliche Verflechtung von räumlicher Mobilität und Arbeitsmarkteinstieg von Hochqualifizierten ist auch in den in diesem Forschungsfeld verwendeten theoretischen Ansätzen erkennbar. Der grundlegende Mechanismus dahinter ist im Humankapital-Ansatz (Becker, 1962) verankert. Hierbei wird davon ausgegangen, dass Investitionen in das eigene Humankapital durch Bildung sowohl für das Individuum als auch für Regionen der Schlüssel für Entwicklung sind. Für die Einzelperson kann dies zu höheren Löhnen und besseren Karrierechancen führen. Ein großer Grundstock an gut ausgebildetem Humankapital führt in den entsprechenden Regionen zu erhöhter Produktivität, Innovationen und folgend zu mehr wirtschaftlichem Wachstum. Obwohl die Investition in das eigene Humankapital als grundsätzlich wichtig und positiv angesehen wird, variieren die Rückflüsse stark nach

individuellen, regionalen und zeitlichen Gesichtspunkten (Faggian et al., 2017). Ferner sind die Investitionsentscheidungen bis zur tatsächlichen Monetisierung von Unsicherheit geprägt, da sich die Situation (z.B. auf dem Arbeitsmarkt) bis zur Realisierung der maximalen Erträge am Ausbildungsende ändern kann. Hier lenkt Sjaastad (1962) den Fokus auf eine erweiternde, räumliche Komponente des Ansatzes und beschreibt räumliche Mobilität als Alternative bei der Erreichung des individuellen maximierten Bildungsertrages: entweder erfolgt der (adäquate) Arbeitsmarkteinstieg am Ausbildungsstandort oder die Absolvent*innen wandern in eine andere Region ab. Hochqualifizierte erwartet hierbei eine Kombination aus verhältnismäßig geringen Mobilitätskosten und hohen Erträgen, weshalb eine verstärkte Mobilitätsneigung dieser Personengruppe festzustellen ist (Faggian et al., 2007). Diese räumliche Komponente des Humankapitals lässt sich vergleichend-statisch oder dynamisch untersuchen. Ersteres wäre bei der Betrachtung von Humankapitalproduktion oder -anwerbung und adäquatem Arbeitsmarkteinstieg (Kapitel 3 & 4) in einer Region der Fall. Letzteres betrachtet in diesem Kontext die Interaktion zwischen Regionen, beispielsweise bei der Absolvent*innenmobilität (Kapitel 2).

Hochqualifizierte Menschen können also von Mobilität profitieren, da sie die Chance auf eine Beschäftigung, die den Ansprüchen entspricht, steigert und durch ein entsprechend höheres Entgelt die Mobilitätskosten kompensiert (Faggian et al., 2017). Mobilitätsneigungen können sich aber über die Zeit verändern. Huff und Clark (1978) sehen dies als dynamischen Prozess, der von zwei entgegengesetzt wirkenden Kräften beeinflusst wird. Zum einen mobilitätshemmende Faktoren (cumulative inertia) und zum anderen Umstände, die eine Mobilitätsneigung verstärken (residential stress). Die individuelle Neigung wird von diesen beiden Kräften beeinflusst und kann über die Zeit variieren – je nachdem, welche Zugkraft (gegenwärtig) stärker ist.

Der Arbeitsmarkteinstieg, als eine Triebfeder der Mobilitätsneigung der Hochschulabsolvent*innen, wird selbst von einer Vielzahl an Faktoren beeinflusst. DaVanzo (1983) weist in diesem Kontext auf die Funktionsweise von regional-spezifischen Arbeitsmarktkennnissen hin, die beispielsweise durch vorherige Arbeitserfahrung gesammelt werden konnten. Der so erfolgte Zugang zu für die Jobsuche relevanten Informationen über vorhandene Kontakte zu Arbeitgebenden ist im Sozialkapital-Ansatz von Granovetter (1973) beschrieben und hat evidenten Einfluss auf die Mobilitätsentscheidung von Hochschulabsolvent*innen (Krabel & Flöther, 2014). Unterschiede sind hierbei bei der Art und

dem Ort der gesammelten Arbeitserfahrung zu erwarten, welche bis dato noch nicht ausreichend untersucht wurden (siehe Kapitel 2).

Theoretische Ansätze zum Arbeitsmarkteintritt folgen unterschiedlichen Argumentationssträngen. Die Signaltheorie geht beispielsweise davon aus, dass der Auswahlprozess einer Arbeitskraft grundsätzlich unter unvollständiger Informationslage verläuft. Spence (1973) vermutet, dass Arbeitgebende individuelle Merkmale, Bildungserfolge und praktische Fähigkeiten und Erfahrungen als Signale verwenden, um die möglichen Unterschiede zwischen den Bewerbenden in Bezug auf ihre vermeintliche Produktivität hin herauszufinden. Diese Signale sind sehr unterschiedlich und ihre Relevanz kann von Fall zu Fall variieren. Um zu überprüfen, ob diese Signale auch Einfluss auf Parameter des Arbeitsmarkteintritts (Dauer, Adäquanz, Entgelt) haben, sind die Regressionsmodelle der Kapitel 3 und 4 mit entsprechenden Variablensets ausgestattet. Der Erfolg beim Arbeitsmarkteintritt hängt nach Thurow (1975) davon ab, wie gut die mitgebrachten Fähigkeiten und Wissen der Bewerbenden auf den Job passen. Nach seinen Überlegungen sortieren Arbeitgebende Bewerbende in einer hypothetischen „Arbeitskräfteschlange“ nach möglichst niedrigen Einarbeitungskosten. Thurow liefert keine Indikatoren für diese Kosten, weshalb Glebbeek et al. (1989) vorschlagen, das absolvierte Studienfach zur Bewertung der potenziellen Produktivität eines Individuums zu verwenden, um als Entscheidungsgrundlage für Arbeitgebende zu fungieren. In dem training cost model werden Studiengänge nach beruflicher Spezifität und Selektivität unterschieden. Studiengänge mit hoher Spezifität reduzieren die Einarbeitungskosten und erhöhen die Passgenauigkeit zwischen Fähigkeiten der Absolvent*innen und Anforderungen der Tätigkeit. Die Selektivität eines Studiengangs dient als Proxy für die Motivation und andere kognitive Charakteristika der Absolvent*innen (Klein, 2011).

Die imperfekte Informationslage, aus Sicht potenzieller Arbeitnehmender, nimmt die job search Theorie als Ausgangspunkt. Mortensen (1970) argumentiert hier, entgegen des neoklassischen labor supply model, dass der Suchprozess nach einer passenden Tätigkeit ein dynamischer und sequenzieller Prozess ist, bei dem Individuen unter Unsicherheiten und unvollständigen Informationen entscheiden müssen, wann er gestoppt wird. Friktionelle Arbeitslosigkeit kann somit in den Ansatz integriert werden (Faggian, 2014). Hierdurch eignet sich dieser für die Analyse der Länge der transitiven Phase der Hochschulabsolvent*innen (Kapitel 3) als theoretischer Rahmen. Van der Klaauw und van Vuuren (2010) legen dar, dass die Länge bestimmt wird durch die Jobangebotsrate und die Entgeltvorstellungen der Absolvent*innen.

Beide hängen mit dem von Absolvent*innen betriebenen Aufwand für das Studium und dem Aufwand für die Jobsuche zusammen. Der Einfluss von Arbeitstätigkeit während des Studiums auf die beiden Faktoren und damit auf die Länge der transitiven Phase wurde noch nicht ergiebig analysiert und stellt in dem Kontext eine Forschungslücke dar. Beide Ausprägungen sind denkbar: Verlängerung der Übergangsphase, da Zeit während des Studiums für Arbeit aufgewendet wurde und entsprechend weniger Zeit für Studium und Jobsuche blieb, oder auch Verkürzung der Übergangsphase, da die gewonnenen Erfahrungen und Kontakte in den Arbeitsmarkt die Informationsbeschaffung bei der Jobsuche vereinfachen.

1.3 Datengrundlage und Methodologie

Der Bedarf an Erkenntnisgewinnung in der (Hochschul-)absolventen*innenforschung ist, wie oben dargelegt, für verschiedene Interessensgruppen von hoher Relevanz. Amtliche Statistiken konzentrieren sich in diesem Kontext auf Zahlen zu Studienbeginnenden, Studierenden und Absolvent*innen, beinhalten aber wenig Informationen zu (Bildungs-)verläufen. Die hierfür notwendige Datengrundlage beschränkt sich – aus angesprochenen Gründen – im nationalen und auch internationalen Kontext meist auf umfragebasierte Erhebungsmethoden. Die Vorteile sind evident: themenspezifische Tiefenanalyse, hohe Anpassungsmöglichkeiten bei der Befragung und das Abbilden schwer quantifizierbarer Faktoren (persönliche Einschätzungen, Meinungen, Empfindungen etc.) zählen dazu. Unzählige hochschulspezifische Absolvent*innenbefragungen ermöglichen lokale, singuläre Erkenntnisse, die allerdings nur bedingt komparative Analysen zulassen. Hochschulübergreifende Projekte, wie beispielsweise das KOAB, greifen diese Problematik auf und verknüpfen in einer breit angelegten, großmaßstäbigen Befragung mehrere Themenkomplexe und führen die Befragung in über 60 deutschen Hochschulen durch (Buenstorf et al., 2016). Weitere nationale Lösungen gibt es in vielen industrialisierten Ländern.⁴ PIAAC der OECD oder auch der EU Labor Force Survey sind transnationale, thematisch nicht ausschließlich auf Hochschulabsolvent*innen fokussierte Projekte, die in ihrem Ansatz die Bildungsbiographien von (jungen) Erwachsenen abbilden und die Einflussfaktoren der Humankapitalakkumulation ihrer Untersuchungssubjekte nachzeichnen. Unabhängig der Maßstabsebene können mit der Erhebungsmethode dieser Projekte empirische Herausforderungen einhergehen. Neben den in Kapitel 1.1.1 aufgezeigten methodeninhärenten Herausforderungen bestehen die meisten Absolvent*innenstudien aus Zeitpunktbetrachtungen. Absolvent*innen werden nach einer bestimmten Zeit kontaktiert und

⁴ Beispielsweise in Niederlande (u.a. Venhorst & Cörvers, 2018), Kanada (u.a. Finnie, 2004), Schweden (Ahlin et al., 2014), Italien (u.a. Biggeri et al., 2001).

zu diversen Themen befragt. Somit sind dynamische Betrachtungen von Entwicklungen oder Verläufen schwer möglich. Panel-Datensätze bieten hierbei eine sinnvolle aber methodisch aufwendigere Verfahrensweise. Das wiederholte Befragen der gleichen Untersuchungssubjekte zu verschiedenen Zeiträumen ermöglicht die Analyse von Entwicklungsschritten. Das nationale Bildungspanel ist ein Beispiel im Bereich der Bildungsforschung (NEPS, 2020). Eine Herausforderung bei befragungsgenerierten Paneldaten stellt die Panelmortalität dar, also das verschieden begründete Ausscheiden von Befragungsteilnehmenden aus den Befragungen. Natürliche Gründe wie der Tod oder Krankheit können ebenso vorkommen, wie das Ausscheiden aus Gründen, die in der Verantwortung der Befragten liegen (Verlust der Teilnahmemotivation, Vergessen der Befragung, Umzug, etc.). Dies kann zu systematischen Verzerrungen führen.

1.3.1 Datenquellen

Zur Beantwortung der Forschungsfragen dieser Dissertation wird ein Datensatz benötigt, der die oben genannten Probleme minimiert bzw. ansatzbedingt nicht aufweist. Durch die Verwendung von administrativen Daten mit Panel-Struktur wird diese Voraussetzung im Rahmen dieser Dissertation geschaffen. Zur Realisierung einer solchen Datenbasis ist die Verknüpfung von unterschiedlichen administrativen Datenquellen geboten. Dies erfolgte durch die Verknüpfung von Hochschuldaten mit Daten u.a. der Sozialversicherung auf Individualebene. Besagtes ist in Deutschland an sehr hohe rechtliche Hürden gebunden. Hier sind – zum Schutz der personenbezogenen Daten – die Datenbestände konsequent voneinander getrennt. Im Gegensatz zu skandinavischen Ländern, in denen jede Person eine Personenkennziffer hat, die in jedem Datenbestand verzeichnet ist, gibt es dies hierzulande nicht (Schnell, 2013). Erst ausgiebige Datenschutzprüfungen auf Hochschul-, Landes- und Bundesebene ermöglichten sowohl die Bereitstellung seitens der Hochschulen wie auch die Verknüpfung der zwei Datenbausteine für die einzelnen Hochschuldatensätze: Einerseits die hochschulinternen Informationen aus den Studiensekretariaten und Prüfungsämtern bzw. -verwaltungssystemen und andererseits die Erwerbsverläufe der Absolvent*innen, die in den Integrierten Erwerbsbiographien (im Folgenden: IEB) des Instituts für Arbeitsmarkt- und Berufsforschung (im Folgenden: IAB) enthalten sind. In den Hochschulen werden detaillierte Angaben zu den Studierenden bereits bei ihrer Einschreibung erfasst, ferner im weiteren Studienverlauf (z.B. Prüfungsleistungen) bis hin zum Abschluss des Studiums und der Exmatrikulation. Darüber hinaus gehören zu den hochschulinternen Daten beispielsweise neben Individualinformationen auch die Angaben zur vorherigen Schulbildung (z.B. Note und Ort der

Hochschulzugangsberechtigung) und dem Studium (Studiengang, Abschlussnote, Datum von Immatrikulation, Exmatrikulation, letzten Prüfung, etc.). Die IEB werden am Forschungsdatenzentrum des IAB generiert und enthalten auf Individualebene tagesgenaue Informationen zu Tätigkeiten und -niveaus, Arbeitslosigkeiten, Entgelten, Qualität der Beschäftigungen etc. Als Quellen hierfür dienen die Meldungen an die Sozialversicherungen, die BA-Geschäftsprozesse und Daten der SGB-II-Träger (Dorner et al., 2011). Somit beinhalten die IEB Informationen unter anderem zu sozialversicherungspflichtig Beschäftigten, Arbeitslosen und Menschen in Umschulungs- und Teilnahmemaßnahmen. Rund 80% der Personen im erwerbsfähigen Alter sind in den IEB aufgeführt (vom Berge et al., 2013b). Durch die Entstehungsnatur der Daten über das amtliche Meldeverfahren sind Personen in Beamtenverhältnissen, durchgängig Selbstständige, Menschen in beispielsweise Familienphasen und Personen mit Wohnsitz im Ausland nicht enthalten.

Schematisch erfolgte zunächst die hochschulinterne Zusammenstellung der entsprechenden Daten zu einem Rohdatensatz, der anschließend unter Wahrung höchster Datenschutzansprüche und -verfahren an das FDZ des IAB übertragen wurde. Die Methode zur Verknüpfung dieser Daten mit den IEB erfolgt mittels *record linkage*.⁵ Dieses Verfahren ermöglicht die Verknüpfung von Angaben aus den Berichtssystemen der Hochschulen mit Registerdaten zu einer neuen Datenbasis, dem Hochschulpanel. Im gesamten Projektverlauf wurden Absolvent*innendaten aus den Berichtssystemen von sechs Hochschulen mit den IEB mit Hilfe der persönlichen Identifikationen Vor-, Nachname, Geschlecht und Geburtsdatum verknüpft. Das *matching* war im Durchschnitt für etwa 85% der Absolvent*innen erfolgreich. Folglich enthalten die sechs Hochschulpanels nahezu die vollständige Population der Absolvent*innen sowie ihrer Erwerbsverläufe. Obwohl das *record-linkage* in der Forschung in steigendem Maße eingesetzt wird (Schnell, 2013), sind bislang kaum Verknüpfungen zwischen administrativen Absolvent*innendaten und Erwerbsbiographien durchgeführt worden.⁶ Ausnahme bietet hier beispielsweise Britton et al. (2015), die vergleichbare *record-linkages* für Angaben zu Hochschulabsolvent*innen mit Einkommensregisterdaten in Großbritannien vorgenommen haben.

Erste Forschungsarbeiten mit den einzelnen Hochschulpanels wurden für die Hochschule Saarbrücken (Hell et al., 2011) und die Universität in Kiel (Wolf & Niebuhr, 2013) erstellt. Im

⁵ In der statistischen Literatur werden die verschiedenen Optionen zur Verknüpfung unterschiedlicher Datenbanken *record-linkage* genannt (Schnell, 2013).

⁶ In der Vergangenheit wurden vielfach personenbezogene Informationen aus Befragungen mit erwerbsbiographischen Daten verknüpft. Voraussetzend ist hierfür die individuelle Zustimmung der Befragten.

weiteren Verlauf des Projektes kam es zu Datennachlieferungen aktueller Abschlussjahrgänge, um die Analysen auf eine aktuellere und breitere Basis zu stellen. Die Erwerbsbiographien, die immer bis zu einem bestimmten Stichtag bereitgestellt und jährlich aktualisiert werden, wurden im weiteren Verlauf auch am aktuellen Rand geliefert. Den Grundstock des späteren Hochschulabsolvent*innenpanels stellten also die einzelnen Hochschuldatensätze dar. Weitere Hochschulen erweiterten den Datenfundus: Universität des Saarlandes (u.a. Kaul et al., 2016), Hochschule Kiel (Homolkova et al., 2016), Universität Regensburg (Möller & Rust, 2017). Die einzelnen Datensätze zeichneten sich durch eine hohe Heterogenität in Bezug auf Datenumfang und Datenaufbereitung aus. So erfassten beispielsweise nicht alle Hochschulen für den Untersuchungszeitraum der Abschlussjahrgänge die Note der Hochschulzugangsberechtigung oder codierten (sofern die Daten digital vorlagen) die Studiengänge nach unterschiedlichen Systemen.

1.3.2 Hochschulabsolvent*innenpanel

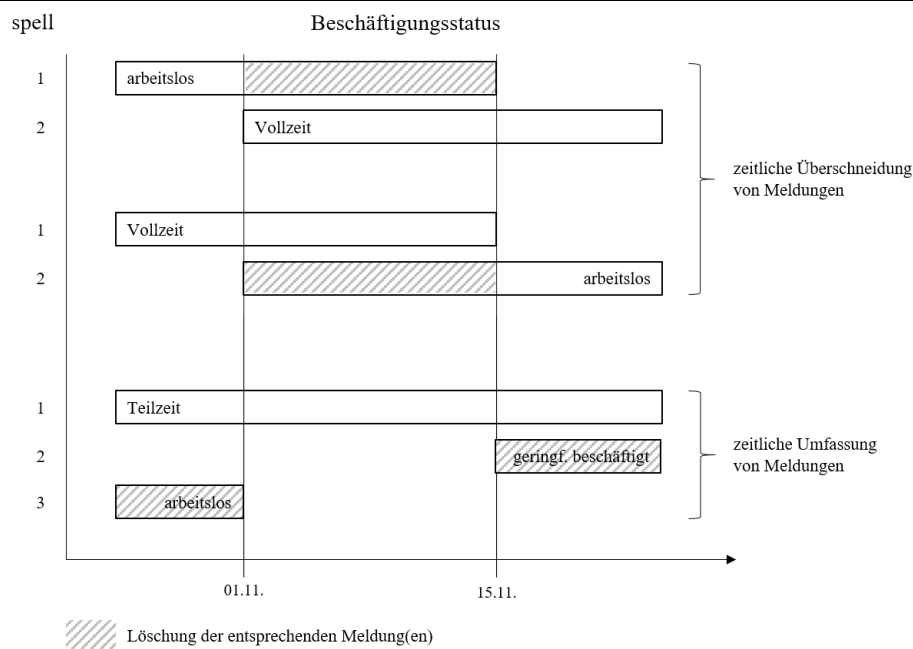
Im Zuge der Erstellung eines *einheitlichen* Hochschulabsolvent*innenpanels als Datenbasis für Analysen dieser Dissertation waren, wegen mangelnder Vergleichbarkeit, diverse Homogenisierungsschritte an den einzelnen unispezifischen Hochschulpanels notwendig. Auch weitere im Zuge des Forschungsfokus notwendige Variablen wurden eingepflegt und angepasst. Neben der Vereinheitlichung von Schreibweisen und Codierung einzelner Merkmale (Studiengänge, Abschlüsse etc.) wurden umfangreichere Anpassungen durchgeführt. Die räumlichen Forschungsfragen dieser Dissertation nach Mobilität benötigten beispielsweise angepasste Angaben der Raumvariablen. Im Untersuchungszeitraum fanden diverse Kreisreformen in Deutschland statt, sodass im Rahmen der Erstellung des Hochschulabsolvent*innenpanels der Gebietsstand vom 31.12.2016 durch Umcodierung rückgeschlüsselt wurde und somit einheitliche Raumangaben gewährleistet waren. Zur Verdeutlichung ein Beispiel: eine Person, die ihre Hochschulzugangsberechtigung im Sommer 2006 in der kreisfreien Stadt Greifswald erlangt und nach dem Studium in der gleichen Stadt 2012 einen Job annimmt, hat als Arbeitsort den Landkreis Südvorpommern verzeichnet, da die Stadt Greifswald mittlerweile in diesen eingegliedert wurde. Um eine so verzerrte Mobilitätsdarstellung zu vermeiden, wurden die Kreise nachträglich auf den neuen Gebietsstand umcodiert. Während der Kreisreformen kam es zu Eingliederungen, Umbenennungen, Auflösungen, Neubildungen und Vergrößerungen von Landkreisen, vor allem in den neuen Bundesländern. Da einige Gemeinden neuen Kreisen zugeordnet wurden, erfolgte die Umschlüsselung teilweise auf Gemeindeebene. Durch den vereinheitlichten

Gebietsstand wurden in Zusammenarbeit mit dem BBSR Variablen ergänzt, die Entfernungen zwischen den geometrischen Zentroiden der Kreise in Luftliniendistanz in Kilometer, Straßenkilometer und Fahrtzeit angeben. Somit war die Möglichkeit geschaffen, Mobilitätsverhalten der Absolvent*innen zu analysieren.

An den Einzeldatensätzen der Hochschulen wurden weitere Vereinheitlichungsschritte unternommen. Über den Zeitraum der untersuchten Abschlussjahrgänge veränderten sich Studiengänge und Prüfungsordnungen. Damit einhergehend fanden unterschiedliche Notenskalen Anwendung. Dezimalnoten waren ebenso in den Daten enthalten, wie Notenpunkte mit 0-15 sowie 0-20 Punkten. Durch Umrechnungstabellen in den jeweiligen Prüfungsordnungen wurden alle Noten – sofern notwendig – in Dezimalnoten umgewandelt und somit vergleichbar gemacht. Doppelqualifikationen und/oder ein Zweitstudium ein und derselben Person im Untersuchungszeitraum an einer der Hochschulen wurde Rechnung getragen, indem sowohl der letzte und der höchste Abschluss in separaten Variablen abgebildet wurde. Falls noch weitere Abschlüsse in den Prüfungsamtsdaten verzeichnet waren, fanden diese keine Berücksichtigung. Allerdings war in allen Fällen der letzte Abschluss auch der höchste, der an der Hochschule im Untersuchungszeitraum erreicht wurde.

Auch an den Erwerbsbiographien waren zur Beantwortung der Forschungsfragen zu Mobilität und Arbeitsmarkteinstieg Datenanpassungen notwendig. In der Panelstruktur der Daten ist jede Meldung in einem spell aufgeführt. Hierbei kann es zu Überschneidungen kommen. Um dies nachträglich zu korrigieren, wurden bei zeitlichen Überschneidungen oder bei Umfassungen die „statusniedrigere“ Meldung gelöscht (siehe Fig. 1, S. 19). Bei statusgleichen Meldungen zum gleichen Zeitpunkt, fanden die Meldungen mit dem geringeren Entgelt keine Verwendung. Von weiterreichender Bedeutung für die Beantwortung der Forschungsfragen war die Identifikation der ersten Beschäftigung/Meldung nach Abschluss. Dazu wurde als t_0 das Datum des letzten Eintrages im Prüfungsamt herangezogen. Die alternative Möglichkeit des Exmatrikulationsdatums fand keine Anwendung, da dieses Datum Verzerrungspotenzial bietet. Einerseits werden an manchen Hochschulen Zwangsexmatrikulationen nach Abschluss nur zum April und Oktober eines Jahres durchgeführt, zum anderen bleiben Absolvent*innen nach Abschluss vermehrt eingeschrieben, um die Immatrikulationsvorteile bei der Krankenversicherung, des Semestertickets etc. in der Übergangszeit nutzen zu können. Der day-count für die Dauer des Arbeitsmarkteinstiegs (Kapitel 3 und 4) oder bis zum Eintritt des Mobilitätsereignisses (Kapitel 2) startet daher mit dem Tag der letzten Prüfung bzw. der Abgabe der Abschlussarbeit.

Fig. 1: Spell-Bereinigung (schematisch): Umgang mit doppelten Meldungen, drei mögliche Szenarien



Eigener Entwurf

In dieser Dissertation wurde als Untersuchungsebene für die Analyse des Arbeitsmarkteinstiegs und der Mobilität die funktionalen Raumordnungsregionen (96 Regionen, Stand 2020) gewählt. Raumordnungsregionen inkludieren verschiedene funktionale Verknüpfungen und beinhalten so mehr als nur die administrative Zugehörigkeit. Mit Hilfe dieser Einteilung des Untersuchungsraumes wurden die Mobilitätsereignisse festgelegt (Kapitel 2 und 3). Zirkuläre Entfernungsgrenzmarker schienen für diesen speziellen Forschungszweck nicht vorteilhaft, da als Entfernungsmesspunkte die Zentroidkoordinaten der Kreise verwendet werden müssten und damit eine radiale Messung im Raum um den Zentroid wenig intuitiv zu verstehen ist. Alle notwendigen Variablen wurden von verschiedenen Ausgangsebenen⁷ auf die Ebene der Raumordnungsregionen umcodiert. Um die Mobilität in der Phase des Arbeitsmarkteinstiegs abzubilden, wurde der Arbeitsort als Raumangabe herangezogen. Mobilität vor dem Studium ergab sich durch die (möglicherweise) erfolgte Raumänderung vom Ort der HZB zum Hochschulort. Um an bestehende Forschung nahtlos anknüpfen zu können, wurde mit Hilfe dieser beiden Variablen die den Kapiteln 2 und 3 unterliegenden Mobilitätstypen nach Faggian et al. 2007 (siehe u.a. Abb. 4) herausgebildet.

Für die umfassende Analyse des Arbeitsmarkteinstiegs der Hochschulabsolvent*innen sind in dem Untersuchungsdatensatz unterschiedlichste Variablen enthalten. So auch der tagesgenaue Arbeitsmarktstatus der Absolvent*innen. Sobald eine Meldung/spell erscheint, ist dieser

⁷ So waren beispielsweise die Orte der Hochschulzugangsberechtigung mit KFZ-Kennzeichen codiert.

gleichzeitig verzeichnet. Hierbei werden Beschäftigungsverhältnisse wie Voll- und Teilzeit (unter 30 Stunden Arbeitszeit/Woche) unterschieden. Geringfügige Beschäftigung bedeutet ein max. monatliches Entgelt von 450€, der Status „Ausbildung“ und „arbeitslos“ sind evident. Arbeitserfahrungen vor und während des Studiums spielen eine zentrale Rolle in dieser Arbeit. Nicht nur die praktischen Erfahrungen und das Erlernen von Fähigkeiten und Wissen, sondern auch damit einhergehende soziale Netze und Branchenkenntnisse können den Arbeitsmarkteinstieg beeinflussen. Um dies messbar zu machen, wurde ein Day-count implementiert, der die gesammelte Arbeitserfahrung in Tagen aufsummiert und abbildet, sowohl vor als auch während des Studiums.

Eine wesentliche Komponente und häufig verwendeter Indikator für einen (erfolgreichen) Arbeitsmarkteinstieg und Karriereverlauf ist das erzielte Entgelt. In dem vorliegenden Hochschulabsolvent*innenpanel wurden die in den IEB enthaltenen Bruttotagesentgelte jedes spells zum Basisjahr 2010 deflationiert und imputiert. Die Deflationierung sorgt für eine Vergleichbarkeit der Entgelte über den gesamten Untersuchungszeitraum und die Lohnimputation wirkt den rechtszensierten Entgeltangaben entgegen. Entgeltangaben oberhalb der Beitragsbemessungsgrenze(n) werden standardmäßig „abgeschnitten“ und mit der Zahl der jeweils gültigen Grenze vermerkt. Somit ist die Anwendung eines Verfahrens nötig, dass die Verteilung rechts der Grenze schätzt und entsprechend vermerkt (Gartner, 2005).

Neben den grundsätzlichen Anpassungen am Gesamtdatensatz, wurden die Sub-Sample der Kapitel 2-4 teilweise unterschiedlich zugeschnitten und folgen dem individuellem Forschungsdesign der jeweiligen Teilkapitel. So werden in Kapitel 4 beispielsweise nur die Absolvent*innen der Studiengänge Geographie, Wirtschaftswissenschaften und Informatik betrachtet und diese werden nicht in allen Hochschulen im Gesamtdatensatz angeboten, was zu einer reduzierten Fallzahl führt. Die detaillierten Informationen zum jeweiligen Zuschnitt sind in den Kapiteln 2.4, 3.3.2 und 4.3 enthalten.

1.3.3 Methodik

In den thematischen Schwerpunkten der Kapitel 2-4 bedient sich die Arbeit verschiedener empirischer Strategien. Deskriptive Methoden dienen hierbei zunächst dem Verschaffen eines groben Überblicks, wobei erweiterte analytische Methoden anschließend den verschärften, inhaltlichen Blick ermöglichen. Regressionen – als Standard-Methoden der empirischen Forschung – zielen auf die Suche nach Einflussfaktoren auf beobachtete, abhängige Variablen ab. Die Erfassung der Form des Zusammenhangs zwischen Regressant und Regressor steht hierbei im Vordergrund (de Lange & Nipper, 2018). Diese Eigenschaft wird sich in Kapitel 4

bei der Analyse der Einflussfaktoren der Entgelthöhe bei Arbeitsmarkteinstieg zunutze gemacht. Diese erfolgt über eine multiple lineare Regression nach dem klassischen OLS-Schätzverfahren (z.B. Kohler & Kreuter, 2017). Nicht-lineare, logistische Regressionen, ebenfalls Kapitel 4, erweitern das Analysespektrum um die Frage, ob ein Ereignis überhaupt eintritt oder nicht. Im einfachsten Falle stellt sich die Frage nach Einflussfaktoren auf die Eintrittswahrscheinlichkeit eines Komplementärereignisses (Backhaus et al., 2011). Durch den binären Charakter der abhängigen Variable, eignet sich dieses Verfahren für die Analyse des Erfolgsparameters „Vollzeitstelle“ beim Arbeitsmarkteinstieg, welche mit der Forschungsfrage F3 verknüpft ist.

Weitere Forschungsfragen dieser Dissertation beziehen sich auf Ereignisse, die innerhalb eines Zeitraumes stattgefunden haben und für welche die Zeitkomponente für die Analyse entscheidend ist. Hierbei ist der Eventausgang für das Forschungssubjekt völlig offen. Hazard-Regressionen können die Frage nach der Zeitdauer bis zum (evtl.) Eventeintritt beantworten und bieten damit die optimale empirische Strategie für Kapitel 2 und 3. Ursprünglich und vergleichsweise häufig in der Medizin und Biologie verwendet, gewinnen sie in den Wirtschafts- und Sozialwissenschaften immer weiter an Bedeutung. Die Hazard- (auch Survival-/ Überlebenszeit-) Modelle, bzw. Ereignisanalysen, verdeutlichen die Ausfallwahrscheinlichkeit der Untersuchungssubjekte aus der Untersuchungspopulation (Ereignis) beim nächsten Zeitpunkt, wobei das „Ausfallen“ nicht zwangsweise ein für das Untersuchungssubjekt negatives Event darstellen muss. Auf das Forschungsdesign der vorliegenden Dissertation angewendet, bedeutet der Eintritt des Events den Wechsel der Absolvent*innen in den Arbeitsmarkt (Kapitel 3) bzw. das Stattfinden eines Mobilitätsereignisses (Kapitel 2). Ein Vorteil dieses empirischen Vorgehens ist das Bestimmen der Veränderungen von Wahrscheinlichkeiten über einen Zeitraum. Voraussetzung sind kontinuierliche Daten, entsprechend hier die tagesgenauen spell-Information des Hochschulabsolvent*innenpanels. Hazard-Raten-Modelle unterscheiden sich nach verschiedenen Ansätzen. Im Rahmen dieser Dissertation wurde der parametrische Ansatz gewählt (*Cox proportional hazard model*). Dieser hat den Vorteil, dass die erklärenden Kovariablen in das Modell integrieren werden und somit Informationen darüber bereitstellen, wovon der Eintritt des Ereignisses abhängt. Ferner ist es so möglich, mittels parametrischer Schätzungen Prognosen für die Verweildauer von Individuen zu erhalten. Für die Baseline-Hazard-Rate wurde dafür eine Weibull-Verteilung angenommen, welche im Gegensatz beispielsweise zum Exponential-Modell flexible Verläufe der Hazard-Raten zulässt. Ein weiterer Vorteil der Hazard-Raten-Modelle ist in dem Untersuchungskontext die Möglichkeit,

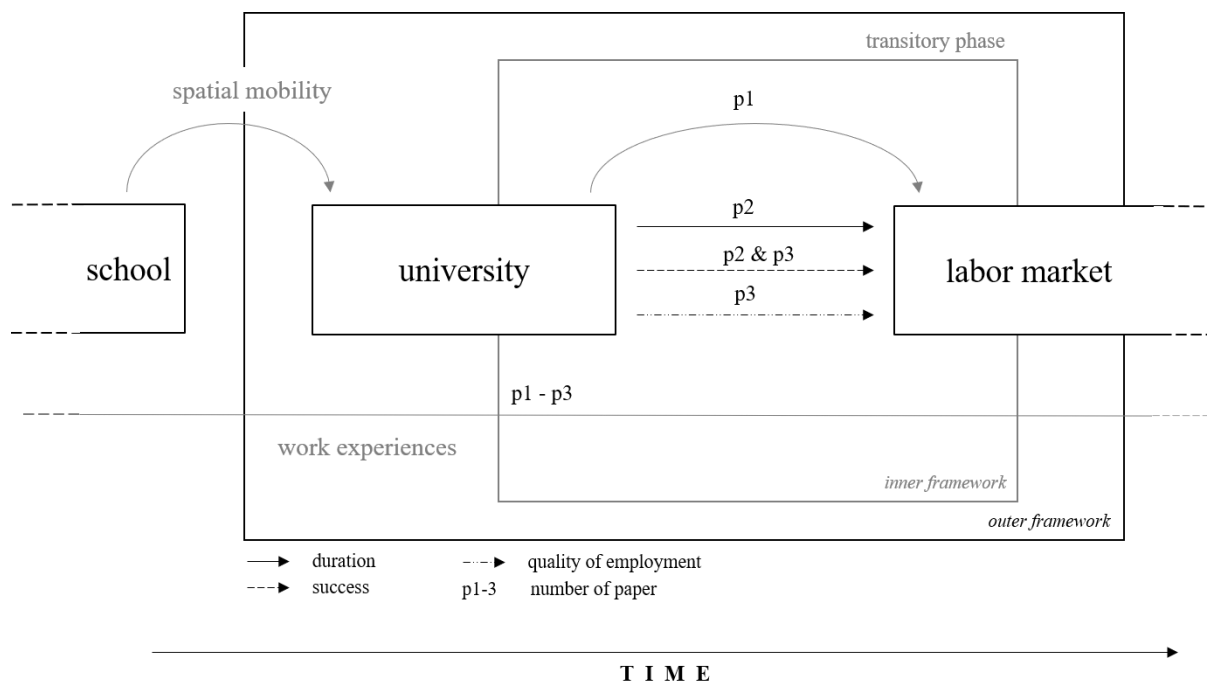
Kovariablen mit zeitveränderlichen Werten einfließen zu lassen, was eine deutlich höhere Realitätsnähe darstellt. Hierbei wird unterschieden zwischen zeitabhängigen Variablen, deren Wert sich kontinuierlich in Abhängigkeit der Zeit verändert (beispielsweise das Alter der Absolvent*innen) und zeitvariierenden Kovariablen, deren Wert sich unabhängig von der Zeit verändert (z.B. Entgelt) (Reimer & Barrot, 2009).

1.4 Forschungsrahmen und Publikationen

Die inhaltlichen Kapitel 2-4 folgen einem stringenten, konsekutiven und additiven Aufbau zur Beantwortung der in Kapitel 1.1.2 aufgezeigten Forschungsfragen. Hierbei spiegeln sie den Forschungsprozess wider, der zu dieser Dissertation geführt hat. Sie stellen für sich geschlossene, dem Forschungsüberbau unterliegende Artikel dar, die konsequenterweise der Veröffentlichung bzw. dem Veröffentlichungsprozess in einschlägigen, internationalen Fachzeitschriften zugeführt wurden. Sie wurden hierzu dem Standard folgend in englischer Sprache verfasst. Tabelle 1 zeigt eine Übersicht über den Inhalt und die Methoden der einzelnen Artikel und ihres Publikationsstatus zum 22. Februar 2021.

Der konzeptionelle Rahmen in Abbildung 2 wurde durch die thematische Ausgestaltung der einzelnen Artikel umgesetzt. Im Forschungsrahmen (im engeren Sinne) befassen sich die Artikel übergeordnet mit der transitiven Phase der Absolvent*innen im Übergang von Hochschule und Arbeitsmarkt. Da die Arbeitslosigkeit unter Akademiker*innen zeitstabil sehr niedrig ist (OECD, 2020b; Bundesagentur für Arbeit, 2019) und auch aus der Theorie heraus ein Arbeitsmarkteintrittswillen den Absolvent*innen unterstellt werden kann (siehe Kapitel 1.2), wird im Folgenden auch von eben diesem gesprochen, auch wenn formal gesehen weitere Ausgestaltungen der transitiven Phase existieren. Hierzu gehören beispielsweise die (un)gewollte Arbeitslosigkeit, Eintritt in die Familienphase, Beginn eines weiteren Studiums oder auch die Migration ins Ausland. Die Ausgestaltung der transitiven Phase wird in dieser Dissertation anhand der Geschwindigkeit und des Erfolgs des Arbeitsmarkteintritts, sowie der Qualität der Beschäftigung analysiert. Die Einflussfaktoren auf die transitive Phase beinhalten sowohl Informationen der Absolvent*innen aus der Zeit des Studiums, als auch Informationen über Arbeitserfahrungen und Mobilität vor dem Studium. Diese Bereiche stellen den äußeren Forschungsrahmen (im weiteren Sinne) dar.

Fig. 2: Konzeptioneller Überbau



Eigener Entwurf

Die Artikel sind thematisch so angelegt, dass sie die beiden zentralen Forschungselemente Arbeitsmarkteinstieg und Mobilität miteinander verbinden. Entsprechend beschäftigt sich **Artikel 1** mit den Einflüssen auf eine mögliche Migrationsentscheidung beim Arbeitsmarkteinstieg und der damit einhergehenden räumlichen Mobilität von Absolvent*innen (F1). Das Verbleiben des ausgebildeten Humankapitals und die Integration in den regionalen Arbeitsmarkt sind entscheidend für das wirtschaftliche Profitieren der Region von der Hochschulausbildung (Krabel & Flöther, 2014). Gleichzeitig werden Hochschulabsolvent*innen als eine der mobilsten Personengruppe angesehen (Sjaastad, 1962). Artikel 1 geht der Frage nach, welche Faktoren für den Verbleib oder Weggang aus der Hochschulregion verantwortlich sein können und konzentriert sich hierbei auf die von den Absolvent*innen vorher generierten regional-spezifischen Arbeitsmarktkenntnissen und Arbeitserfahrungen. Eine dezidierte Aufgliederung der Verschiedenartigkeit und der Örtlichkeit der Arbeitserfahrungen ermöglicht ein tiefergehendes Verständnis der Migrationsförderer bzw. -hemmnisse.

Artikel 2 legt den Fokus auf die Dauer der transitiven Phase bis zum Arbeitsmarkteinstieg der Hochschulabsolvent*innen (F2). Ein weit verbreitetes und intuitives Bewertungskriterium eines „erfolgreichen“ Arbeitsmarkteinstieg ist die möglichst nahtlose Übergangszeit, also der

unmittelbare Einstieg in das Berufsleben nach dem Abschluss. Ungewollte Arbeitslosigkeit erhöht die ökonomischen Belastungen der Absolvent*innen und kann – wenn über einen längeren Zeitraum nicht angewendet – zu einer Entwertung des angeeigneten Wissens und Fähigkeiten führen (z.B. Kunze, 2002). Entsprechend stellt sich Artikel 2 die Frage, inwiefern vor und während des Studiums erworbene Arbeitserfahrungen und räumliche Mobilität einen Einfluss auf die Eintrittsgeschwindigkeit haben. Die detaillierte Differenzierung der Arbeitsmarkterfahrungen hilft dabei zu verstehen, welche Rolle soziale Netzwerke durch vorherige Beschäftigungen und sektorspezifisches Wissen beim Arbeitsmarkteintritt spielen können.

Artikel 3 stellt die Geographieabsolvent*innen in den Mittelpunkt. Länderübergreifend wird darauf hingewiesen, dass Geograph*innen vermehrt Herausforderungen auf dem Arbeitsmarkt gegenüberstehen, mit unterschiedlichen Begründungen. Beispielsweise stelle die Abstinenz konkreter Berufsbilder ein Informationsdefizit für potenzielle Arbeitgebende dar und assoziiert ein Einstellungshemmnis. Weiterhin wird häufig unterstellt, dass die Curricula vieler Geographiestudiengänge sich nicht genügend an arbeitsmarktrelevanten Inhalten orientieren und so die Beschäftigungsfähigkeit von Absolvent*innen nicht ausreichend fördern (Gould, 2016; Piróg, 2018). So gewonnene Erkenntnisse entstammen entweder Studien, die die Geographie mit anderen Fächern aggregiert analysieren, oder Absolvent*innenstudien, die nur die Geographie betrachten und somit keine Einordnung ermöglichen. Entsprechend begegnet Artikel 3 diesen beiden Forschungslücken, indem er mit administrativen Daten eine genaue Quantifizierung der Arbeitsmarktperformance der Geographieabsolvent*innen vornimmt und zeitgleich diese in einem systematischen Vergleich mit Absolvent*innen zweier weiterer Studiengänge einordnet (F3). Eingebettet in einen konzeptionellen Rahmen der Beziehung von Studiengang und Arbeitsmarkt, vergleicht der Artikel die Erfolgsparameter des Arbeitsmarkteintritts, Entgelt und Qualität der Beschäftigung. Konzeptioniert als *most-different-case* Design legt er einen weiteren Fokus auf die Einflussfaktoren, die die Performance der Absolvent*innen beeinflussen.

Tab. 1: Überblick über die Dissertationsartikel

| Title and authors | Objective | Data and Methods | Journal |
|---|--|--|--|
| <p>Work experience and graduate migration: an event history analysis of German data</p> <p><i>Teichert, Niebuhr, Otto, Rossen</i></p> | <p>Determinants of the decisions about spatial mobility after graduation from university in the context of previous work experiences</p> | <p>Linked university panel</p> <p>Hazard rate model Cox-regression</p> | <p>Regional Studies</p> <p><i>published</i></p> |
| <p>University-to-work transitions in Germany – Do graduate job searches benefit from migration and work experience?</p> <p><i>Teichert, Niebuhr, Otto, Rossen</i></p> | <p>Determinants of the labor market entry duration of graduates, focusing on the impact of spatial mobility and previous work experience</p> | <p>Linked university panel</p> <p>Hazard rate model Cox-regression</p> | <p>Review of Regional Research</p> <p><i>major revision</i></p> |
| <p>How wide is the gap? Comparing Geography graduates' labor market success with that of peers from business and computer science</p> <p><i>Teichert, Liefner, Otto</i></p> | <p>Systematic comparison of the labor market performance in terms of wages and full-time employment with a focus on geography graduates</p> | <p>Linked university panel</p> <p>Logistic regression OLS regression</p> | <p>Journal of Geography in Higher Education</p> <p><i>major revision</i></p> |

KAPITEL 2

Work experience and graduate migration: an event history analysis of German data

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Abstract

We use administrative social security records and event history analysis to investigate the significance of previous work experience for the migration decision of German university graduates. The regression results suggest that work experience gained previously and while studying in the university region reduces the likelihood of graduates out-migrating, while extra-regional work activity enhances the probability of labor market entry outside the region of study. The size of the effect depends on the type of work experience. The findings point to the importance of knowledge about local labor markets and social networks for graduates' migration decision at the start of their career.

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2.1 Introduction

Human capital is a key determinant of regional development, and universities evidently play a crucial role for regional human capital accumulation (Harrison & Turok, 2017). However, graduates of local universities will only increase the human capital endowment if they stay in the university region (e.g. Fratesi, 2014). Findings by Abel and Deitz (2012) indicate that migration is an important factor for the geographic distribution of human capital. Outward migration might especially be an issue for smaller and economically lagging regions, which usually have problems keeping and attracting young, highly skilled workers. Graduates tend to move to large urban agglomerations (Frenkel & Leck, 2017; Krabel & Flöther, 2014). The options for economically weak regions to increase their human capital endowment are rather limited (Haussen & Uebelmesser, 2017). Therefore, understanding the migration decision of graduates when looking for a job after studying is of particular importance for lagging regions with institutions of higher education (Haapanen & Tervo, 2012).

There is an extensive body of literature on student and graduate migration, which provides robust evidence on the importance of individual, study-related and regional factors for migration decisions after graduation (e.g. Buenstorf et al., 2016; Faggian et al., 2006; Faggian et al., 2007).

The impact of graduates' prior work experience on the decision of where to take up a job after graduation has received little attention so far. This is surprising, as previous studies highlight that the majority of graduates have several jobs before completing studies and thus gain considerable work experience. Full-time students often work part-time due to financial necessity. Universities increasingly seek to provide students with practical learning opportunities (Evans & Richardson, 2017).

There is some evidence concerning the role of work experience for successful labor market entry of young workers. Early work experience gives rise to social capital because it allows graduates to establish social networks at the workplace and to gain access to job-relevant information (Granovetter, 1973; Weiss et al., 2014). Kramarz & Nordström Skans (2014) highlight the significance of networks for labor market entry of young workers. Weiss & Klein (2011) and Robert & Saar (2012) stress that the quality of information and network resources may depend on the kind of jobs in this context.

There are only a few studies exploring the effects of previous work experience on graduate migration. Employment prior to graduation might influence migration because it gives rise to

location-specific knowledge (DaVanzo, 1983) and job-relevant networks. Graduates' contacts with local employers evidently affect the migration decision (Krabel & Flöther, 2014). Haapanen & Karhunen (2017) and Haussen & Uebelmesser (2017) examine the significance of work experience for migration, but they do not consider the role of the location of previous employment. Depending on where work experience could be gained, however, it might affect post-graduation mobility.

This study aims to provide new evidence on the importance of different types of work experience for graduate migration. We use a unique micro data set which combines student records of German universities with administrative social security records. We investigate the moves linked to labor market entry of a sample of about 25,000 students who graduated between 1996 and 2012. As the data encompasses graduates' employment biographies on a daily basis, employment episodes, including information on the type of jobs and the location of the workplace, can be precisely identified.

The results show that a significant proportion of the graduates have gained work experience before graduation. A specific feature of the German education system is the opportunity for school leavers to attend the (dual) system of vocational education and training. Apprentices with a university entrance diploma can pursue higher education after having obtained a vocational degree. This explains that almost 22% of the graduates in our sample completed vocational training before enrolment at university or university of applied science.⁸ Moreover, the majority of graduates had either regular jobs (42.2%) or so-called marginal jobs (62.1%) before studying. In Germany, these marginal jobs are temporary and casual part-time jobs with up to a maximum of 15 working hours per week, and thus typical student jobs. The corresponding percentages during studies amount to 5.5% for regular and 21.5% for marginal employment.

Our results indicate that the majority of migration events take place during the first 2 years after graduation. We detect significant relationships between prior work experience gained inside or outside the university region and the probability of outward migration, pointing to the importance of labor market contacts, local human capital and social networks for labor market entry and related mobility. However, the size of the effects depends on the type of work experience. We find stronger effects of regular jobs compared to marginal employment. The same applies to sector-specific and occupation-specific versus non-specific work experience.

⁸ Further information on the German education system is provided in Appendix 3.

The rest of the paper is organized as follows. The following section briefly reviews the literature on graduate migration and discusses the theoretical framework. In sections 2.3 and 2.4, we describe the event history model and the data set. We discuss the results of the duration analysis in section 2.5, and section 2.6 concludes.

2.2 Literature and theoretical framework

An extensive body of empirical literature shows that individual, study-related and regional factors influence the spatial mobility of young, highly educated workers. There is robust evidence for a significant correlation between individual characteristics, such as gender and age, and migration behavior after graduation. Human capital factors such as the length and the field of study and final grades affect the migration decision as well. Moreover, the findings of many studies highlight the role of the regional context for graduate mobility. We abstain from a review of this voluminous amount of literature, since these effects are well documented. Corcoran & Faggian (2017) and Buenstorf et al. (2016) provide excellent surveys.

Instead, our analysis focuses on a specific aspect of the regional context that has received little attention so far: location-specific work experience of graduates that might be an important determinant of migration behavior after graduation. Local work experience might increase graduates' attachment to the region of studies through accumulation of work-related human and social capital.

Empirical evidence on the relationship between work experience, in particular location-specific experience, and graduate mobility is scarce. Krabel & Flöther (2014) and Haussen & Uebelmesser (2017) show that the migration decision of graduates is influenced by contacts to local employers and work experience. Haapanen and Karhunen (2017) find a negative relationship between mobility and work experience obtained during studies for Finnish graduates. They argue that this outcome could be driven by local work experience, but information on the location of prior employment is not available in their data.⁹

Social capital approaches (Granovetter, 1973) highlight the importance of establishing contacts to employers and colleagues who might provide useful information on employment opportunities for job searching. Some studies indicate that such contacts facilitate job placement and labor market entry of the young highly-educated (e.g. Weiss et al., 2014). As these contacts

⁹ Haussen & Uebelmesser (2017) find that the propensity of outward migration significantly declines once the graduates are employed in the school or university region.

are location-specific, they likely also influence the migration decision after graduation. The value of work experience for spatial job searching probably differs depending on the type of employment. Regular employment might enable students to establish more sustainable networks for job searching compared to loose contacts acquired through casual jobs and marginal employment. Moreover, some studies show that it is work activity related to the field of study (Robert & Saar, 2012; Weiss & Klein, 2011) or the occupation of aspired jobs (Hammen, 2009) that matters for job searching after graduation. In the view of human capital theory (e.g. Becker, 1962), work-related knowledge and skills acquired through work experience may become less valuable over time. Due to this depreciation work-related human capital obtained before studies might be less useful when looking for a job after studies than work experience acquired during studies.

While the majority of graduate mobility studies resort to regional human capital models (e.g. Sjaastad, 1962) and study usually graduate migration at specific points in time after completion of the studies, this leaves unresolved the issue of how the migration behavior develops over time (Haapanen & Tervo, 2012). The model of cumulative stress and inertia (Huff & Clark, 1978) views the migration decision as a dynamic process. Two conflicting forces determine the likelihood of moving: there is a certain resistance to moving (*cumulative inertia*), as well as circumstances which accelerate a migration process (*residential stress*). An individual's probability of moving – as a result of these interacting forces – can thus change over time. In this setting, migration corresponds to the termination of a continuous spell of residence, and the length of these spells varies between individuals (Haapanen & Tervo, 2012).

A small number of studies use this model and event history methods for analyzing inter-regional mobility. Only two studies apply this approach to examine graduate migration, although it might be particularly relevant for the decision to stay or leave the region of study after graduation. Results by Busch & Weigert (2010) for Germany and Haapanen & Tervo (2012) for Finland indicate that the probability of leaving becomes smaller as the length of residence in the region of study increases. With final exams approaching, graduates will start to look for an acceptable job in the university region and beyond, with the propensity to outwardly migrate thereby rising. The pressure to migrate may rise as the length of a residence spell increases if it turns out that there are no adequate jobs and residential opportunities available in the university region. In contrast, graduates with previous education and work experience are therefore likely to have accumulated significant location-specific knowledge (DaVanzo, 1983) and to have

established social networks. Hence, *cumulative inertia* may determine the migratory behavior of such well embedded graduates.

Since work experience might be cumulated in the university region or elsewhere, it may influence migration behavior after graduation. Social networks may facilitate labor market entry either in the study region or in other areas. Against this background, we expect a negative relationship between extra-regional work experience and the propensity to stay in the region. In contrast, graduates might be less prone to out-migrate if their embeddedness in the region is strengthened over time through work-related contacts (*cumulative inertia*). Besides, we expect that the interplay of location and type of work experience affects the migration decision of graduates when looking for a job. Work experience related to regular employment might be more important for spatial job searching and migration behavior than experience gained in marginal employment. Furthermore, the relationship between migration and specific work experience obtained in the sector or occupation of the aspired job should be stronger compared to non-specific experience.

2.3 Empirical models

We use event history techniques to investigate the effects of work experience on graduate migration. Applying these methods allows us to deal with the likely correlation between work experience and the length of a residence spell in the university region, as we can control for duration dependence. Ignoring an important duration dependence will lead to biased estimates of the effect of work experience if the two factors are correlated.

To model the mobility of university graduates, we examine the hazard rate of migration. Formally, the hazard rate $h_i(t)$ is the probability of migration given that the graduate i has stayed in the university region up to the period t after graduation:

$$h_i(t) = Pr(T_i < t + 1 | T_i \geq t) \quad (1)$$

Where T_i is the length of a residence spell in the university region.¹⁰ In the analysis, we define outward migration as labor market entry outside the university region. In order to determine

¹⁰ While migration literature resorts to a residence spell as the entire period a person resides in a region (see e.g., Andrews et al., 2011), we had to adapt this definition to the setting of our analysis. Hence, it is important to keep in mind that the length of a residence spell in the duration model does not correspond with the entire period of a stay in the university region, but rather with the time since graduation, as this determines the date after which the

corresponding migration events, we make use of continuous data that comprises information on the exact starting date of the first (full-time) employment relationship after the graduation date and the corresponding place of work, which coincides with the location of the establishment.

We estimate a proportional hazard specification in order to identify important determinants of migration behavior:

$$h_i(t, x_i) = h_0(t) \exp(x_i \beta) \quad (2)$$

Where $h_0(t)$ is the baseline hazard and x_i is a vector of influential factors that includes individual characteristics such as gender and age of the graduates at graduation, information on pre-study mobility, study related characteristics, the employment biography, as well as regional labor market characteristics. For a detailed description of all explanatory variables, see Appendix 4

We apply a parametric model and assume that the baseline hazard $h_0(t)$ can be described by a Weibull distribution:¹¹

$$h_i(t, x_i) = pt^{p-1} \exp(x_i \beta) \quad (3)$$

The regression analysis provides an estimate of the shape parameter p that indicates whether hazard rates increase or decrease exponentially with time.

However, the estimates might be affected by unobserved heterogeneity at the individual level. Therefore, we include a frailty term u_i that captures unobserved heterogeneity. The hazard of an individual is thus a function of observed characteristics x_i and a latent random effect u_i that enters multiplicatively on the hazard function. It is assumed that graduates differ randomly in a

graduates are at risk of moving. This determination of tenure, starting with the individuals being at risk, is the common definition in event history analysis, and our approach closely resembles the setting in corresponding studies on graduate migration (Busch & Weigert, 2010; Haapanen & Tervo, 2012). Individual tenure thus does not refer to pre-graduation tenure, which may be substantial. However, we control to some extent for differences in pre-graduation tenure by including mobility before studies, study length, and previous work experience as explanatory variables.

¹¹ We also estimate a semi-parametric Cox model but do not present the results in this paper. A disadvantage of the Cox model in the present setting is that the baseline hazard is not parametrized and not estimated, i.e. it does not provide explicit information on duration dependence. The corresponding results are available upon request and largely resemble the estimates from the Weibull model. In particular, the findings regarding work experience turn out to be fairly robust. We choose a Weibull distribution because the raw hazards derived from Kaplan-Meier estimates resemble hazards drawn from a Weibull distribution with $p < 1$ (see Andrews et al., (2011) for a corresponding discussion).

manner that is not fully accounted for by the observed characteristics and that u_i is independent of x_i (Cameron & Trivedi, 2005). The corresponding shared-frailty model is given by:

$$h_i(t, x_i | u_i) = pt^{p-1} u_i \exp(x_i \beta) = pt^{p-1} \exp(x_i \beta + \vartheta_i) \text{ with } \vartheta_i = \ln(u_i) \quad (4)$$

With the shared-frailty models, we take into account that observations for a given graduate are correlated because they share the same frailty. When $u_i > 1$ ($u_i < 1$), the individual risk of outward migration of graduate i is larger (smaller) than for the average graduate. We assume that the young workers have different propensities to migrate, and this approach allows us to distinguish between heterogeneity and duration dependence (Cameron & Trivedi, 2005; Andrews et al., 2011).

2.4 Data

Our analysis of graduate mobility rests on a university panel that combines information from student records of five medium-sized German universities located in three distinct regions¹² and from the Integrated Employment Biographies (henceforth: IEB) of the Institute for Employment Research (IAB). Using this administrative data, we avoid problems that often come with the use of survey data (e.g. non-response or selection bias) (Porter, 2011). The IEB includes all employment spells available in social security records, enabling us to identify the exact date of a move and to precisely measure work experience before graduation.

The student records comprise individual information (e.g. date of birth, gender, nationality, pre-study mobility) and study-related information such as the duration of study, graduation date, final grade, type of graduation and field of study. The IEB contains daily information on unemployment, benefit receipt and employment for all workers covered by the social security system (vom Berge et al., 2013a). Job characteristics (type of employment, occupation, industry, region of workplace) and the region of residence are available as well. The student records and the IEB are merged via a record linkage using individual identifiers (e.g. first name, surname, date of birth).

¹² The corresponding functional (planning) regions are medium-sized university locations and are representative for the majority of university regions in Germany, but not for large agglomerations. Our results on the migration behavior of graduates might therefore not apply to young workers who graduate in large urban regions. However, most universities in Germany are located outside the major agglomerations, and our data should be representative for smaller and more lagging regions which suffer from significant outward migration of graduates.

We focus on mobility after the last degree from each graduate's higher education. Graduates subject to mobility restrictions are excluded. Due to specific regulations, it is difficult for teachers to take up employment in a publicly-maintained school in another federal state in Germany. Graduates older than 35 years at the date of graduation are also not taken into account.¹³ We end up with a sample of 24,766 graduates who completed their studies from 1996 to 2012.

Workplace information in the IEB is available on a daily basis. Continuous workplace data is used to identify a move, i.e. labour market entry outside the university region. We only consider employment of at least one year outside the university region as outward migration. Therefore, short-term temporary migration, linked to an internship for example, is excluded from the analysis.

The employment spells are monitored until the graduate moves away from the region of studies, the first (last) year of observation being 1996 (2015). The maximum observed duration thus amounts to 20 years. This implies that the data is possibly right-censored and that some spells are right-censored at shorter duration. However, allowing for a minimum observation period of three years after graduation should reduce the censoring problem compared to previous studies in which the observation ends after only one year after graduation for some workers (e.g. Haapanen & Tervo, 2012; Busch & Weigert, 2010).

However, we cannot rule out commuting when using the workplace information to detect moves, i.e. the graduates might take up a job outside the university region, but they may keep their residence. We try to cope with this problem by using functional labor market regions (planning regions). Migration is thus defined as a move across the borders of functional regions that consist of several counties (NUTS 3 level) which are linked by intense commuting. Commuting takes place mainly within these regions.

To measure work experience, we cumulate all employment episodes of the graduates until the starting date of their studies and from the beginning of their studies until graduation. We consider different types of work experience and distinguish between regular jobs (RE), which are subject to social security contributions, and marginal employment (ME), which refers to temporary and casual part-time jobs with a limited number of working hours. Vocational training is a specific form of prior experience. We also examine whether or not the graduates gained specific work experience in the same sector or occupation as the first full-time job after

¹³ For a comprehensive description of the data preparation and summary statistics, see Appendix 2, 4, 5.

graduation (non-specific experience).¹⁴ We combine information on the workplace with the different types of work experience and make a distinction based on whether graduates gained the corresponding work experience inside the region of studies (functional region) or outside.

2.5 Empirical results

2.5.1 Descriptive results

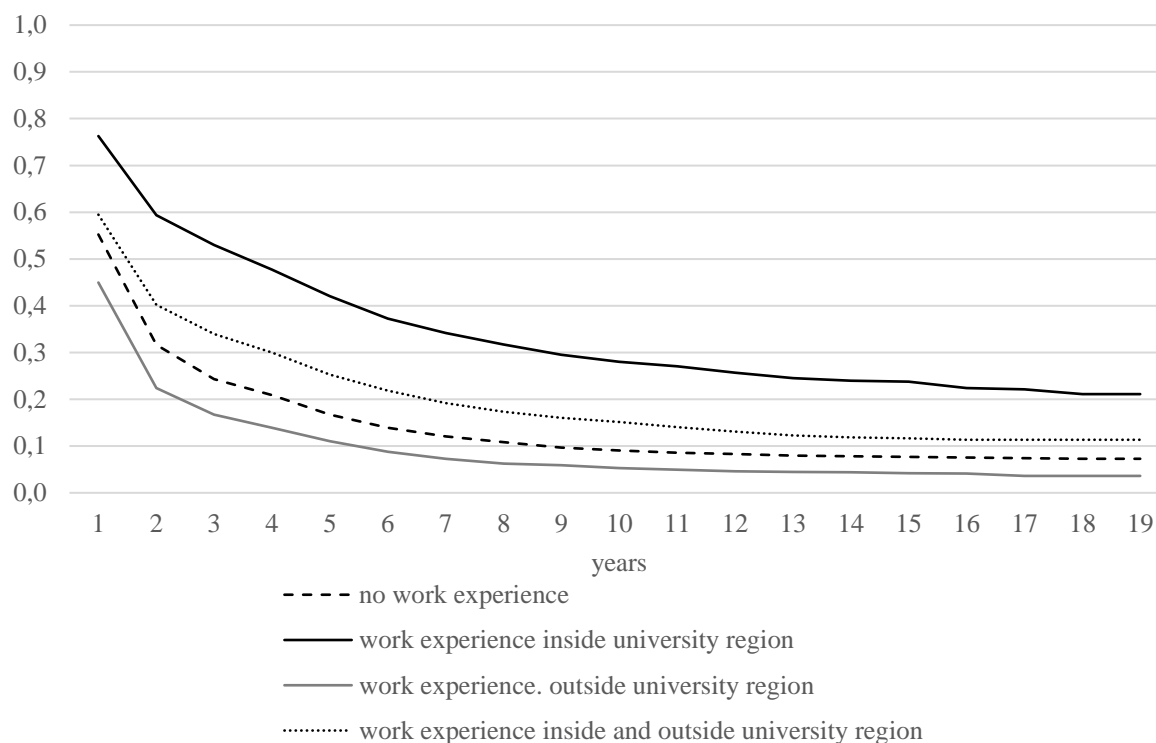
Figure 3 displays survival functions which are based on non-parametric Kaplan-Meier estimates depending on whether graduates gained work experience inside and/or outside the university region or have no experience at all. The survival rate indicates the probability of staying in the university region until time t after the beginning of the corresponding spell. While the gradients of the curves are rather similar, there are significant differences in the long-term share of ‘stayers’ across groups. All survival functions show that the majority of migration events happen during the first seven years - and particularly in the first two years - after graduation.¹⁵ Afterwards, there are only moderate changes in the share of stayers, pointing to predominant *cumulative inertia*. These results are in line with the findings of Busch & Weigert (2010) and Haapanen & Tervo (2012).

The long-term share of stayers differs significantly depending on whether and where graduates gained work experience before having obtained their degree. We detect the highest percentage of stayers among those graduates who gained work experience exclusively within the region of studies. 19 years after completing studies, 21% of these graduates never left the university region for a full-time employment that lasted more than a year. In line with expectation, we observe the lowest share of stayers among graduates who worked solely outside the university region (3.6%). The percentages for the other two graduate groups range between the lower and upper benchmark (11.3% for work experience inside and outside region of studies and 6.6% with no work experience). These results point to the importance of the location to which the work experience refers for graduate migration.

¹⁴ We check whether employment spells prior to graduation are assigned to the same sector or occupation as the first full-time job at the 1, 2 and 3-digit level of the corresponding classifications (see Federal Statistical Office Germany, 2018; Bundesagentur für Arbeit, 2015).

¹⁵ Buenstorf et al. (2016) provide similar evidence for graduate migration between functional (planning) regions: the share of stayer amounts to 43% 1.5 years after graduation in their analysis. This is in line with the findings for most subsamples in Figure 3. However, the fraction of stayers among graduates with local work experience is considerably larger (around 60%).

Fig. 3: Survival functions (Kaplan-Meier estimates) for graduate groups with different work experience



Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors own calculations

2.5.2 Regression analysis

Tables 2 and 3 summarize the regression results for different continuous-time duration models, applying a proportional hazard approach. The migration event is defined as taking up a full-time job outside the (functional) university region.¹⁶ The models in Table 2 only differ with respect to the considered measurements of work experience. Model 1 includes basic information on experience, while the other models include more detailed information on the type of work experience. Table 3 reports results for sector-specific and non-specific work experience.¹⁷ All models include individual, study-related and regional characteristics.

¹⁶ All model specifications take into account frailty. The estimated frailty variance θ is always significant at the 5% level, pointing to an important within-group correlation. Regression results for the field of study and type of degree are depicted in Appendix 6.

¹⁷ The estimates for occupation-specific work experience closely resemble the results for sector-specific experience, the only exception being some partly counterintuitive results for vocational training. Corresponding results are summarized in Appendix 7.

Tab. 2: Regression results – labor market entry outside the university region

| | (1) | | (2) | | (3) | |
|---|----------|---------|----------|---------|----------|---------|
| | coef | se | coef | se | coef | se |
| Personal characteristics | | | | | | |
| Female | -0.095** | (0.030) | -0.094** | (0.030) | -0.097** | (0.030) |
| Age | 0.521** | (0.099) | 0.441** | (0.101) | 0.435** | (0.099) |
| Age ² | -0.010** | (0.002) | -0.009** | (0.002) | -0.009** | (0.002) |
| Foreigner | 0.120 | (0.080) | 0.118 | (0.079) | 0.117 | (0.080) |
| Mobility before studies | 0.708** | (0.032) | 0.718** | (0.032) | 0.787** | (0.031) |
| University entrance qualification abroad | -0.091 | (0.089) | -0.114 | (0.088) | -0.144 | (0.088) |
| Studies | | | | | | |
| Exam grade | -0.033 | (0.018) | -0.031 | (0.018) | -0.029 | (0.018) |
| Study length | | | | | | |
| Bachelor degree | 0.029 | (0.015) | 0.032* | (0.015) | 0.029 | (0.015) |
| Diploma | -0.038** | (0.006) | -0.039** | (0.006) | -0.039** | (0.006) |
| Master Degree | 0.022 | (0.017) | 0.015 | (0.017) | 0.015 | (0.017) |
| Other degree | -0.071** | (0.009) | -0.066** | (0.009) | -0.065** | (0.009) |
| Employment biography | | | | | | |
| Vocational training (dummy variables) | | | | | | |
| inside university region | -0.345** | (0.054) | -0.273** | (0.055) | | |
| outside university region | 0.266** | (0.046) | 0.264** | (0.046) | | |
| Experience (in 100 days) | | | | | | |
| inside university region, before studies | | | | | | |
| total | 0.018** | (0.003) | | | | |
| ME | | | 0.024** | (0.003) | 0.023** | (0.003) |
| RE | | | -0.002 | (0.005) | -0.010 | (0.005) |
| inside university region, during studies | | | | | | |
| total | -0.227** | (0.013) | | | | |
| ME | | | -0.170** | (0.014) | -0.169** | (0.014) |
| RE | | | -0.493** | (0.031) | -0.489** | (0.031) |
| outside university region, before studies | | | | | | |
| total | 0.023** | (0.003) | | | | |
| ME | | | 0.032** | (0.004) | 0.032** | (0.004) |
| RE | | | 0.008 | (0.005) | 0.017** | (0.005) |
| outside university region, during studies | | | | | | |
| total | 0.272** | (0.020) | | | | |
| ME | | | 0.093** | (0.024) | 0.093** | (0.024) |
| RE | | | 0.597** | (0.032) | 0.594** | (0.032) |
| Previous employer | -0.587** | (0.046) | -0.590** | (0.047) | -0.597** | (0.047) |
| Regional characteristics¹ | | | | | | |
| Population density | 0.055** | (0.010) | 0.056** | (0.010) | 0.052** | (0.010) |
| Yearly GDP growth | 0.051** | (0.009) | 0.051** | (0.009) | 0.052** | (0.009) |
| Share of people younger than 24 years | -0.336 | (0.175) | -0.358* | (0.170) | -0.300 | (0.170) |
| Income per capita | -0.964** | (0.121) | -0.962** | (0.120) | -0.966** | (0.120) |
| Unemployment rate | -0.341** | (0.014) | -0.333** | (0.014) | -0.334** | (0.014) |
| Ln(p) | 0.391** | (0.010) | 0.402** | (0.010) | 0.401** | (0.010) |
| Ln(θ) | 1.100** | (0.041) | 1.066** | (0.041) | 1.077** | (0.040) |
| Implied p | 1.478 | (0.015) | 1.494 | (0.148) | 1.494 | (0.015) |
| θ | 3.004 | (0.123) | 2.903 | (0.119) | 2.937 | (0.118) |

| | | | |
|--------------------|---------|---------|---------|
| Log Likelihood | -30,922 | -30,711 | -30,754 |
| Number of students | 24,766 | 24,766 | 24,766 |
| Observations | 153,172 | 153,172 | 153,172 |

Notes: ¹: university region; * significance at the 0.05 level, ** significance at the 0.01 level; robust standard errors in parenthesis. All models include time effects and fixed effects for university, field of study and type of degree.

ME: marginal employment, RE: regular (part-time or full-time) employment.

The regression results in column (1) in Table 2 indicate that work experience gained prior to and during studies turns out to be an important determinant of post-graduation mobility. Graduates who completed a vocational training before enrolment show a lower (higher) probability of outward migration if the training took place inside (outside) the university region. A local apprenticeship decreases the hazard by 29.1% [$1 - \exp(-0.345 \times 1)$]. An extra-regional apprenticeship increases the propensity to leave by 30.5%. We detect corresponding results for other types of work experience before and during studies. The only exception is work experience inside the university region before studies, as we would expect a negative effect on the probability to leave.¹⁸

Taking up a job with a previous employer often coincides with a job inside the university region. In Appendix 8 in column (1) we include different types of previous employers. We find the strongest negative relationship between the former training firm in which the graduate has completed an apprenticeship before studies and the likelihood to leave. Graduates might have been especially encouraged by their former training firms for pursuing their career in the same firm, but after a subsequent academic education. It is surprising that the coefficient of the previous employer-dummy for regular employment before studies is insignificant. This result indicates that graduates with regular jobs before studies explicitly look for other employers after higher education. Besides, a re-estimation of the main model (see Appendix 8, column (3)) with an exclusion of those graduates returning to previous employers shows quite similar results. This might indicate that social networks accruing from work experience before and during studies beyond previous employers also impact graduate mobility.

The estimates in Table 2 clearly underline the specific relationships between types of work experience and migration behavior. The results in column (2) and (3) show that experience obtained during studies in regular jobs tends to exert a greater influence on the probability of leaving than marginal jobs, this difference does not exist before studies. Extending the work

¹⁸ As we compare regression results within and across numerous models, we do not show test results for the significance to these differences for each finding. However, t-test results show that the differences are significant. Results are available upon request.

period in regular employment by 100 days inside (outside) the university region while studying reduces (increases) the hazard by 38.9% (81.7%). In contrast, the coefficient for experience gained in regular jobs before enrolment is insignificant. However, this result is driven by the fact that regular employment prior to studying predominantly coincides with vocational training. Once we exclude the variables which capture vocational training from the model (column (3)), the coefficients of regular employment before studying increase in absolute size and become statistically significant (outside university region). Yet, the impact of regular employment before enrolment is still substantially smaller than the coefficient of regular jobs during studies. These differences might point to some kind of depreciation phenomenon, i.e. the importance of corresponding knowledge and underlying social networks for migration behavior of graduates seems to diminish with increasing time lag.

The role of regular and marginal employment for graduate migration seems to differ significantly. In particular, marginal employment before enrolment tends to have small or even counterintuitive effects. The positive coefficient of marginal employment in the university region before studying in particular does not correspond with the theoretical arguments outlined in section 2.2. We suppose that these findings rather indicate that graduates who pursue marginal employment before their studies are a highly motivated group that might show in general an above-average propensity to move. In contrast, regular employment during studies seems to give rise to location-specific knowledge and helpful social networks. The corresponding estimation results confirm the argument of cumulative inertia, while temporary and casual jobs appear to provide fewer opportunities to develop sustainable labor market contacts. For Finnish graduates, Haapanen & Karhunen (2017) find similar evidence, with a stronger impact of full-time than of part-time employment during studies on graduate mobility. Moreover, we observe a positive relationship between the number of job changes before and during studies and the propensity to leave while graduates who often change jobs after studies are more likely to stay (see Appendix 8, column (2)). Graduates cumulate knowledge on employers by changing jobs before graduation and might be therefore more choosy when looking for a job in a new firm, hence they might be more apt to look for jobs at a wider spatial scale than the university region. One possible explanation for job changes after studies and a lower migration propensity could be less stable employment biographies with many different temporary (low-paid) jobs and thus making it for these persons less likely to leave.

The theoretical arguments put forth in section 2.2 also suggest that work experience which corresponds with the sector/occupation of the aspired job is particularly important for the

decision of where to take up the first job after studies. In Table 3, we differentiate between sector-specific and non-specific work experience. As we move from column (1) to (3), the sector definition broadens, and the match between the sector in which experience was gained and the sector of the first job after graduation thus becomes less precise. The estimates highlight the importance of sector-specific experience for the spatial job searching of graduates. Almost all sector-specific coefficients are in line with theoretical expectations. The only noteworthy exception is that we find only insignificant coefficients for sector-specific regular employment before studying. This is probably due to the inclusion of sector-specific vocational training in the models.

The estimates for non-specific knowledge are rather inconsistent, and the relationship with migration behavior is considerably weaker compared to specific experience. However, as argued above, some results rather seem to indicate an above-average propensity to migrate of students who pursue non-specific (marginal) employment before or during studies.

The relationship between sector-specific work experience and migration propensity is sizeable, in particular if the experience was obtained during studies. Moreover, there is clear evidence that this relationship becomes stronger as the match between sector of the first job and the sector in which experience was obtained improves. More precise knowledge about the industry of the desired job and more specific networks give rise to more pronounced effects on migration behavior. Extending experience in specific regular jobs at the 3(1)-digit-level by 100 days during studies inside the university region decreases the probability of leaving by 83.2% (65.5%). The corresponding results for marginal employment amount to 57.5% (41.8%). Adding 100 days of specific work experience associated with regular jobs outside the university region during studies increases the hazard by 76.6% (81.5 %) at the 3(1)-digit-level.

We abstain from a detailed discussion of the findings for control variables due to comprehensive evidence for corresponding effects in the graduate migration literature. Our results for the individual, study-related and regional characteristics confirm, by and large, the findings of previous studies. The estimates summarized in Table 2, column 1 indicate that female graduates tend to manage labor market entry via a full-time job more often in the region of studies than young males. The variable age has a positive, but declining impact on the hazard rate of migration. This partly confirms results by Haapanen & Tervo (2012), while Busch & Weigert (2010) report a declining probability of outward migration with increasing age of German graduates.

Tab. 3: Effects of sector-specific and non-specific work experience

| | | (1) | (2) | (3) | | |
|---------------------------|---------------------------|--------------------------|---------------------|---------------------|---------------------|--------------------|
| | | Sector (3-digit) | Sector (2-digit) | Sector (1-digit) | | |
| Vocational training | | | | | | |
| specific | inside university region | -0.595** (0.132) | -0.414** (0.115) | -0.336** (0.088) | | |
| | outside university region | 0.167 (0.089) | 0.233** (0.082) | 0.316** (0.069) | | |
| not specific | inside university region | -0.193** (0.053) | -0.216** (0.055) | -0.232** (0.060) | | |
| | outside university region | 0.208** (0.045) | 0.207** (0.047) | 0.204** (0.052) | | |
| Experience (in 100 days) | | | | | | |
| specific | inside university region | ME, before studies | -0.051** (0.009) | -0.037** (0.008) | -0.012* (0.005) | |
| | | RE, before studies | -0.007 (0.016) | -0.006 (0.013) | -0.001 (0.009) | |
| | inside university region | ME, during studies | -0.855** (0.039) | -0.775** (0.034) | -0.541** (0.024) | |
| | | RE, during studies | -1.783** (0.135) | -1.651** (0.118) | -1.035** (0.065) | |
| | outside university region | ME, before studies | 0.001 (0.009) | 0.010 (0.008) | 0.015* (0.007) | |
| | | RE, before studies | 0.007 (0.007) | 0.009 (0.007) | 0.008 (0.007) | |
| | | ME, during studies | 0.016 (0.039) | 0.022 (0.038) | 0.054 (0.033) | |
| | | RE, during studies | 0.569** (0.032) | 0.576** (0.033) | 0.596** (0.032) | |
| | not specific | inside university region | ME, before studies | 0.032** (0.003) | 0.033** (0.003) | 0.035** (0.003) |
| | | | RE, before studies | -0.004 (0.005) | -0.005 (0.006) | -0.003 (0.007) |
| ME, during studies | | | 0.108** (0.013) | 0.109** (0.013) | 0.124** (0.015) | |
| RE, during studies | | | 0.069* (0.028) | 0.079** (0.028) | 0.079* (0.033) | |
| outside university region | | ME, before studies | 0.031** (0.003) | 0.031** (0.004) | 0.034** (0.004) | |
| | | RE, before studies | 0.003 (0.006) | 0.002 (0.006) | 0.004 (0.007) | |
| | | ME, during studies | 0.160** (0.024) | 0.155** (0.024) | 0.154** (0.028) | |
| | | RE, during studies | 0.331** (0.003) | 0.334** (0.058) | 0.329** (0.067) | |

Notes: * significance at the 0.05 level, ** significance at the 0.01 level; robust standard errors in parenthesis. All models include time effects and fixed effects for university, field of study and type of degree.

ME: marginal employment, RE: regular (part-time or full-time) employment.

The micro data at hand allows a differentiation between international and interregional migration prior to studies. This difference is evidently important for subsequent migration. Interregional mobility at entry to university, in line with previous evidence, enhances the probability of leaving the university region.¹⁹ In contrast, graduates who obtained the university entrance qualification abroad show no higher risk of outward migration compared to immobile students.²⁰

A heterogeneous effect emerges for the length of study as the impact varies across types of degrees. We refrain from a detailed discussion of further study-related factors.²¹

Several regional characteristics seem to influence the location of labor market entry. Corresponding results are not always in line with theoretical expectations and previous evidence. These outcomes might accrue presumably from a fairly low regional variation in our data because we can only consider graduates in a very small number of university regions. However, main results are robust if we use region-year dummies instead of regional context variables.

We detect a positive duration dependence pointing to cumulative stress. The corresponding parameter of the Weibull distribution (implied p) is significantly larger than 1 for all models. This suggests that the probability of taking up a full-time job outside the university region increases with elapsed time. Positive duration dependence might be driven by graduates who initially search for a job in the region of study, but do not find (adequate) employment (*residential stress*) and eventually extend their job search area beyond the borders of the university region.

2.6 Limitations

We acknowledge that our empirical analysis has several limitations. First, our analysis is based on observational data, and we cannot rule out that work experience itself can also reflect other unobserved characteristics of graduates. Our method therefore allows more statements to be made on a descriptive correlation between work activities and graduate migration, rather than a causal interpretation of the results. Second, we can only control for unobserved characteristics

¹⁹ Faggian et al. (2007) and Krabel & Flöther (2014) provide corresponding evidence for the UK and Germany respectively.

²⁰ However, the latter effect might be biased because graduates who move abroad are not captured in the IEB and thus not in our data set.

²¹ In all fields of study, hazard rates of migration are smaller than in the reference group, business administration and economics (see Appendix 6).

of the graduates to some extent, which could give rise to endogeneity. Third, our focus is not on (non-) local work experience over and beyond (not) having lived in the study region before studies, but on the effect of pre-graduation work experience in general. Yet, we can provide rather robust evidence on the impact of work experience during studies because we can control for the length of studies. With respect to pre-study work experience, it is only possible to control for the effect that the graduates received their university entry certificate in the region of study. However, if we assume that the length of the residence spell before studying might reduce the probability of leaving, and that work experience and the length of the stay are positively correlated, not controlling precisely for the length of the residence spell, should introduce an upward bias (in absolute terms). Thus, the difference in the size of effects between experience before and during studies would be even larger (stronger depreciation). In contrast, we would expect a downward bias if the length of the residence spell increases the probability of leaving.

2.7 Conclusions

We use administrative social security records and event history analysis to investigate the significance of previous work experience for the mobility of German university graduates. The regression results suggest that work experience obtained before or while studying and the location where it was gained are of sizeable importance for the migration decision. The likelihood of a job entry within the university region significantly increases if graduates were employed there before or during their studies. This result is in line with the argument of cumulative inertia. However, the type of work experience clearly matters in this context. Regular employment exerts a stronger influence on graduates' migration behavior than marginal jobs. The same applies to specific versus non-specific work experience. We detect the strongest effects for sector-specific experience obtained during studies through regular employment in the university region. The impact of corresponding experience gained outside the university region falls short of the former effect by factor 9.

The decision on the location of labor market entry clearly depends on where and in what type of jobs graduates could establish job-relevant knowledge and labor market contacts before graduation. We suppose that these results can be generalized to some extent and also apply to graduate migration in other countries. Evidence provided by Haapanen & Karhunen (2017) corresponds with this assumption. The issue of retaining local university graduates in regions apart from large metropolitan areas is discussed in various countries (see, for example, Saarivirta & Consoli, 2014; Venhorst et al., 2010; Kazakis & Faggian, 2017). Therefore, lessons learned from our results might add to the regional policy debate on this issue in other countries.

Our results might be considered as potential contribution to further development of already established policies that aim to increase the likelihood of labor entry of local graduates in the university region. Providing opportunities to gain knowledge about the local labor market and establishing labor market contacts via (regular) employment might be a possible strategy to deepen ties of graduates to the region of studies. Local authorities could therefore take into consideration to intensify intra-regional collaborations (e.g. job fairs) between universities, firms and other relevant actors, such as employment agencies and Chambers of Commerce, in order to retain young, highly educated workers, at least to some extent. In Germany, there are so-called ‘knowledge regions’ such as *FrankfurtRheinMain* (see Fürst, 2008) that have established an institutionalized framework for corresponding measures.

Work experience is usually perceived as an activity in addition to academic education. Instead, universities may embed more practical elements and learning opportunities as components in the curricula. For instance, courses can combine the transfer of theoretical knowledge and practical work experience in local firms. This approach requires, of course, that companies offer adequate work opportunities for students enabling them to enhance their employability. Such work experience might contribute to obtain more targeted contacts for entry into the local labor market (see Evans & Richardson, 2017).

To retain graduates in higher education regions is certainly easier in those regions where local labor demand adequately matches the academic education and salary expectations of graduates. Labor market entry outside the university region could go along with a more adequate job match and a wage premium (e.g. Di Cintio & Grassi, 2013). Hence, a potential conflict may arise between future prospects of university regions on the one hand and graduates’ career outcomes on the other. This may be particularly true for lagging regions which likely offer less favorable labor market conditions for the career start of graduates than prosperous urban areas. The policy implications discussed above are only considered to be reasonable options if adequate jobs for graduates are available in the university regions.

KAPITEL 3

University-to-work transitions in Germany – Do graduate job searches benefit from migration and work experience?

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Abstract

We investigate the effects of migration and work experience on university-to-work transitions of German university graduates. A job search model that explains the labor market behavior of students at the final stage of their academic studies provides the theoretical framework for our empirical analysis. We apply event history analyses and make use of administrative social security records to examine whether work experience and pre-study as well as post-study migration accelerates the labor market entry of graduates. Our regression results stress the importance of both mobility and work experience for the length of the transition period. However, whether the effect is beneficial or adverse depends on the type of graduate migration and previous employment.

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3.1 Introduction

The expansion of tertiary education in OECD countries has led to a growing supply of university graduates, but demand has increased at a slower pace (Reimer et al., 2008). These opposing trends sparked an intense debate over graduates' labor market outcomes and whether they are deteriorating (see Beaudry et al., 2014; Lauder and Mayhew 2020). Although German higher education graduates have a very low risk of becoming unemployed, there is also an intense discussion on these issues in Germany (e.g. Alda et al., 2020; Reinhold and Thomsen, 2017; Reisz and Stock, 2013).

We use event history methods to investigate university-to-work transitions of German university graduates, focusing on the role of mobility²² and work experience for labor market entry. A job search model by Van der Klaauw and van Vuuren (2010), which describes the labor market behavior of students at the final stage of their academic studies, provides the theoretical framework for our empirical analysis. Student record data from six German universities that is linked with administrative biographical data reported in social security records provides detailed information on work experience of students and on mobility of the graduates.

Graduates' labor market outcomes are usually evaluated with indicators such as pecuniary returns, (in)adequate employment or the degree to which skills acquired at university match skills required on the labor market. However, there are also several duration analyses which examine the length of university-to-work transition (e.g. Chuang, 1999; Barros et al., 2011; Salas-Velasco, 2007). To study the length of this transition phase is an important research issue because rough and too long transitions from education to work tend to have persistent adverse effects on subsequent working histories. The works of Mroz and Savage (2006), von Wachter and Bender (2006) and Waldorf and Yun (2016) provide, for instance, evidence for scarring effects of a period of unemployment at the starting point of one's employment biography.

The findings of studies on the length between graduation from university and labor market entry indicate that most graduates succeed in finding a regular job within a few months after final examinations and start job search before graduation (Böpple, 2010; Van der Klaauw and van Vuuren, 2010). Moreover, there is robust evidence on the importance of individual characteristics as well as study-related, labor market and institutional factors for labor market

²² In this study, we refer only to internal migration of higher education graduates after labour market entry within Germany and not to external migration when graduates take up a job abroad after studies.

entry. However, little is known so far about the role of spatial mobility and prior work experience. This is striking because the young highly educated are among the most mobile groups on the labor market (Faggian et al., 2007) and there is ample evidence that graduate migration sustains their career success (e.g. Di Cintio & Grassi, 2013; Ganesch et al., 2019). Furthermore, previous studies show that the majority of graduates have several jobs before completing studies and thus gain considerable work experience. Analyzing the relationship between these two determinants on one side and the length of the transition on the other can contribute to a better understanding for policy actors in which ways support measures might contribute to improve the conditions for a swift labor market entry. In particular, having opportunities while attending university to gain practical work experience has gained in importance in the recent past as signal when looking for a job because conventional signals such as the degree have become less relevant in this respect due to expansion of higher education (Reimer et al., 2008).

Our results indicate that immobile resident graduates enter the labor market more rapidly than all mobile graduates having entered the labor market outside the region of studies. However, return migrants who moved already to the region of studies for attending university and return back to their home region when taking up a job there enter sooner the labor market than other mobile graduates. These findings point to the importance of location-specific knowledge and contacts for swift university-to-work transition. The results also suggest a supportive role of work experience for graduates' labor market entry. In particular, apprenticeship training before studying seems to matter, which may point to significant signaling and network effects. The type of job seems to matter, too. An apprenticeship is a regular employment with liabilities to the German social insurance system. In contrast, marginal employment, especially during studies, seems to prolong labor market entry. Marginal jobs are typical student jobs because they are temporary jobs with maximal 15 weekly working hours.

The remainder of the paper is organized as follows: In section 3.2, we discuss theoretical arguments and review the empirical literature. We introduce the survival model and the data set in section 3.3. Section 3.4 discusses the empirical findings of the event history analysis, while the final section presents the conclusions.

3.2 Theoretical considerations and empirical literature

In this section, we use a job search model as our theoretical framework to highlight different direct and indirect channels through which work experience and mobility might influence the length of the transition from graduation to labor market entry. We then discuss related empirical evidence on labor market entry of higher education graduates provided by duration analyses.

3.2.1 Theoretical considerations

We use job search theory introduced by Mortensen (1970) as a theoretical framework for the analysis of labor market entry of German university graduates. Van der Klaauw and van Vuuren (2010) apply this approach to analyze the transition of graduates from college to work in the Netherlands. In particular, their model takes into account a trade-off between devoting effort to studying and to job searching in the final stage of academic studies, i.e. students not only spend time to prepare for final examinations, but also start looking for a job. Allowing for job searching while studying is in line with our data, since we observe that a significant percentage of graduates start working very shortly after final examinations.

Van der Klaauw and van Vuuren (2010) stress that study-to-work transitions, labor market outcomes and academic achievement are jointly determined, and it is important to consider the inter-dependency between these variables. In their model, students might invest time in studying ($e \geq 0$) and searching for a job ($s \geq 0$). The two activities are supposed to be substitutes. Checking different media for vacancies and applying for jobs gives rise to job search effort and costs $c(s, e)$, which increase with both search effort and study effort. The authors assume that study effort improves grades g , while job search effort s gives rise to job offers, described by the arrival rate $\lambda(s, g)$ with $0 \leq \lambda(s, g) \leq 1$. The probability of receiving a job offer increases with search effort, but marginal returns for search effort decrease [$\partial \lambda / \partial s > 0, \partial^2 \lambda / \partial s^2 < 0$]. Students with zero effort do not receive any job offers, i.e. $\lambda(0, g) = 0$. However, there might also be an indirect adverse effect of search effort, since investing more time in job search reduces study effort, which lowers grades and thereby decreases the arrival rate and delays labor market entry. Study effort might also influence the timing of labor market entry via different channels: there is a prolonging effect, since search effort declines as study effort increases. However, study effort also improves grades and, in turn, increases the arrival rate.

The crucial feature of a job offer is the wage offered w , which is assumed to be a random draw from a wage offer distribution. A student who receives an offer decides immediately whether

to accept or reject it. Acceptance means that the graduate enters the labor market in the next period. Graduates are supposed to start working in regular jobs only after graduation. They will enter the labor market and exit non-employment if the wage associated with the best job offer exceeds the student's reservation wage (w^r). After graduation, therefore, students either become unemployed (or continue with non-regular employment) or start working in a regular job. Immediate labor market entry requires job searching to start before final examinations.²³

In a search model framework, the duration of labor market entry process is influenced by the job offer arrival rate and the reservation wage. Salas-Velasco (2007) argues that the signaling approach proposed by Spence (1973) might add important aspects to this setting and discusses a framework that integrates the search processes of workers and firms. As information is imperfect, employers use observable characteristics such as age, field of study and grades as signals to assess the productivity of job applicants. The probability of taking up employment and the timing of labor market entry then becomes the product of three factors: graduates searching for a vacancy, firms offering jobs to an applicant and acceptance on the part of the graduate. In the following section, we assume that the job offer arrival rate and the reservation wage of the graduates capture these factors.

Caliendo et al. (2019) argue that search effort might also be reflected by the geographic distance between the region of residence and the location of potential employers, i.e. the spatial scope of the search. They assume that workers tend to have better knowledge about local labor markets and access to local networks. Applying this reasoning to our setting implies that it will be easier for graduates to search for a job in their study region. This may be especially true for resident graduates with location-specific advantages accruing through prior schooling and studying (DaVanzo, 1983). However, labor market entry outside the study area might reflect an increased search effort, giving rise to a shorter transition period. If the job search of the graduates precedes migration, a change of residence likely reflects a more intense search in terms of spatial range, and we might expect that mobility should go hand in hand with more rapid labor market entry (see also Guglielminetti et al., 2015). However, there are also theoretical arguments, which suggest that labor market entry outside the region of studies may be associated with longer transition phases, as mobile graduates, except for return migrants, are

²³ In the model, students have an infinite horizon and they know the job offer arrival function, the cost function and the wage offer distribution. However, they have no information on the time of job offer arrivals and the corresponding wages in advance. Van der Klaauw and van Vuuren (2010) assume that graduates maximize the expected present value of future utility, which is influenced by the costs of job search, arrival rate, discount rate, and the wage or welfare benefits, depending on whether the graduate accepts a job offer or becomes unemployed after graduation. We refrain from a more detailed description of the formal model and refer to the presentation by Van der Klaauw and van Vuuren (2010).

unlikely to be able to make use of local network-based information advantages for job placement after studies (Faggian et al., 2007).

Moreover, the reservation wage might differ depending on whether acceptance of the job requires a move. The existence of significant migration costs suggests that the reservation wage increases with distance between region of study and prospective workplace. In the model by Caliendo et al. (2019), individuals choose their optimal search effort by equating the marginal costs of job searching with the marginal benefits associated with additional searching. The return of an additional search effort is an increased probability of receiving a job offer paying more than the reservation wage.

In the theoretical framework outlined above, working while studying will reduce search effort before graduation and, therefore, has a dampening effect on the job arrival rate, which in turn postpones labor market entry. It is important to note that in this case, there is no countervailing effect of an increased study effort, since working while studying may reduce both study effort and search effort. However, there are likely additional (beneficial) effects of work experience on labor market entry not addressed in the model, which might be based on signaling and network effects. If firms have to rely on signals when assessing the expected productivity of job candidates, work experience might provide valuable information for the recruiting process and may influence the probability that an applicant receives a job offer. Work experience might also be a favorable signal if it lowers the costs of initial skill adaptation training (Conelly et al., 2011). Most importantly, social capital approaches (Granovetter, 1973) emphasize the significance of establishing contacts to firms and co-workers who might provide valuable information for job searching (de Graaf-Zijl et al., 2011).

With respect to our empirical model, we presume that a high probability of a match, i.e. acceptance of a job offer, should correspond with a swift labor market entry. The probability of a match is influenced by the job offer arrival rate and the reservation wage, which, in turn, are likely determined by various factors, including our pivotal variables, work experience (ω) and migration, i.e. the expanded spatial scope of search (μ). Thus, we assume that their effect on the timing of labor market entry will be mediated via their impact on λ and w^r . Below we discuss the different channels through which the two factors may affect the likelihood of a match in more detail.²⁴

²⁴ We refrain from a corresponding extension of the formal model since this is beyond the scope of the present paper, which focuses on the empirical analysis of graduates' labor market entry.

In order to describe the effects that operate via λ , we expand the arrival function and include characteristics of the young workers x and ω . Moreover, we consider indirect effects, which might arise as ω and μ likely affect search effort and grades. The extended function is given by $\lambda(s, g, x, \omega)$ with $\partial \lambda / \partial s > 0$ and $\partial \lambda / \partial g > 0$.²⁵ The arguments outlined above suggest that work experience positively affects the arrival rate because knowledge on the (local) labor market and contact to employers should enhance job search [$\partial \lambda / \partial \omega > 0$]. Moreover, ω may also increase the probability of receiving a job offer because it could act as a positive signal pointing to high productivity and ambition of the candidate.

Apart from these direct effects there might be important indirect channels through which ω and μ influence the arrival rate. With respect to search effort we suppose that working while studying will reduce search effort before graduation and, therefore, has an indirect dampening effect on the job arrival rate [$s(e, \omega, \mu)$ with $\partial s / \partial \omega < 0$].²⁶ In contrast, increased search effort is assumed to go hand in hand with an extended spatial scope of search μ as reflected by migration [$\partial s / \partial \mu > 0$]. Finally, there is another indirect effect of work experience operating via grades as we expect that working during studies reduces study effort and, thereby, grades [$g(e(\omega))$ with $\partial g / \partial e > 0$ and $\partial e / \partial \omega < 0$]. With lower grades, in turn, the job offer arrival rate declines.

The influence of work experience on job offer arrivals is therefore indeterminate and depends on the size of a positive direct and the negative indirect effects. The impact of migration on the arrival rate is supposed to be positive in this setting.

However, in order to arrive at a net effect of both ω and μ on the duration of labor market entry process, we need to account for their influence on the reservation wage. Study-related factors such as grades, individual characteristics of the graduates and migration might also impact the length of labor market entry via the reservation wage $w^r(g, x, \mu)$. The arguments put forth above suggest that an extended spatial job search should increase the reservation wage [$\partial w^r / \partial \mu > 0$] because a corresponding migration event involves migration costs. Moreover, we suppose an indirect effect of work experience on w^r that operates via its impact on grades. The relationship between w^r and ω is likely negative if working during studies reduces study

²⁵ We assume that g increases as grades improve. The grades might capture the effects of various study-related factors that influence the likelihood of receiving a job offer. We do not discuss in detail the effects of graduate characteristics x on λ because x is thought to represent distinct attributes whose effects on λ are supposed to differ.

²⁶ However, we might assume that this specific effect of work experience gained during studies on the transition time arises only during the first few months after graduation. We are grateful to a referee for this suggestion. Yet, as we identify net effects in the empirical analysis, it is not possible to provide evidence on this supposition.

effort and grades. As the latter may increase reservation wages, we expect a negative indirect effect of work experience on the reservation wage.

To summarize, there are various channels through which work experience and migration may affect the transition from university to work, potentially giving rise to opposing direct and indirect effects. For instance, migration might increase the length of the transition period via its impact on the reservation wage while the effect operating through job arrivals is supposed to be negative. The setting for work experience is even more complex. In the regression analysis, we therefore expect to detect net effects. Furthermore, due to the coexistence of a range of positive and negative influences, the impact of ω and μ on the duration of graduates' labor market entry is theoretically indeterminate.

3.2.2 Empirical literature

Thus far, several duration analyses have identified and evaluated the factors determining the length of graduates' university-to-work transitions. Apart from one European cross-country study (Salas-Velasco 2007), these studies refer to individual countries such as Italy (e.g. Biggeri et al., 2001; Pozzoli, 2009; Sciulli & Signorelli, 2011), Canada (Betts et al., 2000), Germany (Böpple, 2010; Haak & Rasner, 2009), France (Barros et al., 2011) or Taiwan (Chuang, 1999).

Empirical evidence of these studies is in line with the proposition of the job search model that many graduates already begin to look for a job before final examinations. This applies, for instance, to 53 % of the students from Mannheim University in Germany (Böpple, 2010). Only 20 % of Dutch graduates had not looked for a position before finally leaving university (Van der Klaauw and van Vuuren, 2010). Moreover, most of the duration analyses corroborate that a significant proportion of graduates enter the labor market within a few months after final examinations.

The duration analyses provide robust evidence on the relevance of individual characteristics and study-related factors for labor market entry. For instance, female and older graduates tend to have longer non-employment spells after studies than their male and younger counterparts (Salas-Velasco, 2007). There is some indication that high academic achievement is associated with an immediate career start. The shorter the duration of enrollment at university, the faster graduates take up their first job after studies (Sciulli & Signorelli, 2011). The same applies to the completion of studies within the regular time scheduled for the course program and better final marks (Biggeri et al., 2001). In contrast, Sciulli and Signorelli (2011) and Pozzoli (2009) ascertain a longer transition phase for better performing students. This may be due to an indirect

effect, since better graduates likely have higher reservation wages and thus lower acceptance rates of job offers.

The theoretical framework discussed above suggests a supportive role of local information and network advantages for labor market entry. Teichert et al. (2020) show that the likelihood of German graduates entering the local or extra-regional labor market depends on where they could gain access to relevant networks through previous work experience. However, according to our theoretical argumentation an extension of the spatial scope of job searching might also point to an increased search effort and foster a career start shortly after graduation (Caliendo et al., 2019; Guglielminetti et al., 2015, see section 3.2.1). There is ample evidence that graduates' labor market outcomes are positively affected by spatial mobility²⁷, but only a few studies consider the effect of migration on the length of the university-to-work transition. Betts et al. (2000) do not detect a significant effect of whether graduates moved to the higher education for attending university on the length of the transition. Sciulli and Signorelli (2011) explore the timing of labor market entry on the provincial labor market of the university in Perugia (Italy). They show first a faster labor market entry of resident graduates. This finding confirms a positive effect of location-specific advantages. Yet, these results are biased due to unobserved transitions of graduates finding a job outside the province of Perugia. Controlling for this bias the advantage of resident graduates does not longer exist.

To study the interplay of graduates' access to local social networks, pre-study migration experience and their post-study migration decision with graduates' labor market outcomes Faggian et al. (2007) developed a migration typology (see for description section 3.3.2, Figure 4) which is employed in this paper. Evidence on the relationship between these migration types and graduates' labor market performance does not exist for the length of the transition phase, but for the wage level. The works of Jewell and Faggian (2014), and Kazakis and Faggian (2017), for instance, disclose the highest wage premium for repeat migrants who move for education and later for work. For Chinese graduates Zhao and Hu (2019) find a higher wage premium for return migrants than repeat migrants, the former probably might have benefited from location-specific advantage compared to the latter.

The empirical evidence of most studies on the length of the university-to-work-transition relates to work experience acquired while attending higher education, but no differentiation is made what types of jobs were carried out. On one side, various studies provide empirical evidence

²⁷ e.g. Waldorf & Yun (2016) or Iammarino & Marinelli (2015) see migration in the context of a reduced probability to get an education-job mismatch referring to overeducation.

for the supportive role of generic work experience for swift labor market entry of the young highly educated (Sciulli & Signorelli, 2011; Biggeri et al., 2001; Salas-Velasco, 2007). In contrast, Pozzoli (2009) and Barros et al. (2011) reveal that graduates with work experience gained during studies have a lower likelihood of exiting unemployment. However, the effect of work experience on job searching and the transition to employment likely differs depending on the type of employment. Regular employment might enable students to establish more useful job search networks compared with loose contacts acquired through casual jobs and marginal employment (Teichert et al., 2020). There is also evidence that, in particular, specific work experience linked to the field of study (Weiss et al., 2014) or the occupation of desired jobs (Hammen, 2009) facilitates the labor market entry of graduates.

The only duration analysis to differentiate between different types of working experience stems from Haak and Rasner (2009). They compare the importance of work experience for the career entry of German tertiary graduates between different fields of study. They detect that different types of work experience, such as vocational training before studies, working while studying and an internship, shorten the transition phase. This applies particularly to humanities, but less to law, economics and engineering. Haak and Rasner (2009) conclude that graduates in humanities rely on additional ‘practical’ signals when applying for a job because they have a degree in a field of study with less occupation-specific curricula.

Böpple (2010), however, finds that an internship does not contribute to a shorter transition phase. There may be at least two reasons for these inconclusive results. The theoretical framework discussed above points to different effects of work experience on labor market entry. Depending on the size of the partly opposing effects, the net effect of experience might be positive or negative. Moreover, the effect might differ across types of work experience. Unlike Haak and Rasner (2009), the other above-mentioned duration analyses do not distinguish in detail between different types of work experience. But the findings of different studies suggest that the access to labor-market-relevant information and network resources crucially depends on the type of experience (e.g. Robert & Saar, 2012; Hammen, 2009; section 3.3.1). Moreover, the effect of these resources on labor market entry may also depend on whether a student is employed prior to and during higher education. However, the above-mentioned duration analyses mostly use information on whether a student has gained work experience or not.

3.3 Empirical model and data

3.3.1 Econometric approach

To model the labor market entry of university graduates, we examine the hazard rate of transition from higher education to employment. Formally, the hazard rate $h_i(t)$ is the probability²⁸ of being employed given that the graduate i was not employed up to the period t after graduation:

$$h_i(t) = Pr (T_i < t + 1 \vee T_i \geq t) \quad (5)$$

where T_i is the length of a non-employment spell. We define labor market entry as taking up a regular part-time or full-time job with a minimum duration of three months. Hence, non-employment captures all other types of labor market statuses such as unemployment, participating in measures of active labor market policy or marginal employment. In order to determine the transition event, we make use of continuous data that comprises information on the exact starting date of the first full-time or part-time employment after graduation (see section 3.3.2).

We estimate a proportional hazard specification in order to identify important determinants of labor market entry:

$$h_i(t, x_i) = h_0(t) \exp(x_i \beta) \quad (6)$$

where $h_0(t)$ is the baseline hazard and x_i is a vector of explanatory variables that includes individual characteristics such as gender, nationality and age, as well as study information such as examination grade or field of study. In the regression analysis, we focus on the effects of graduates' work experience before and during studies and on the impact mobility before studying and after graduation.

We apply a parametric model and assume that the baseline hazard $h_0(t)$ can be described by a Weibull distribution:

$$h_i(t, x_i) = p t^{p-1} \exp(x_i \beta) \quad (7)$$

The regression analysis provides an estimate of the shape parameter p that indicates whether hazard rates increase or decrease exponentially over time. The probability of labor market entry might increase²⁸ or decline with the length of the non-employment period after graduation. The

²⁸ To be precise, the hazard rate is the probability divided by time and therefore may be larger than one. In the continuous case, it can vary between zero and infinity and is rather a rate than a probability. When we speak of probabilities later in the results section, it should be understood against this background.

pressure to take up a job perceived by young workers is likely to rise, e.g. due to financial necessity or threat of stigma. In their model, Van der Klaauw and van Vuuren (2010) assume that unemployed graduates do not change their search effort and reservation wage across periods. However, we might well suppose that the reservation wage declines and search effort rises as the period of non-employment after graduation increases. This behavior might give a rise to a positive duration dependence, pointing to an increasing probability of taking up a job as the period since final exams increases.

The detailed information on graduates and their studies available in our data set enables us to consider a wide range of factors that likely influence their labor market entry. However, the estimates might be affected by unobserved heterogeneity at the individual level. We are not able to preclude that migration and work experience capture the effects of other unobserved features of graduates such as motivation. These unobserved characteristics might be important factors for job search effort and may thus influence labor market entry. Neglecting these factors might give rise to biased estimates of the “effects” of migration and work experience. Hence, our analysis allows statements about correlations between the labor market entry of graduates and the pivotal variables, rather than a causal interpretation of the results. Nevertheless, we include a frailty term that captures unobserved heterogeneity in our model. It is assumed that graduates differ randomly in a manner that is not fully accounted for by the observed characteristics, and that the frailty term is independent of these observed characteristics.

3.3.2 Data, sample and key variables

Our analysis is based upon a comprehensive micro-level database which links information from student records of six medium-sized German universities with the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB) (for detailed information see Teichert et al., 2020). The student records contain individual characteristics (e.g. sex, nationality, age, type of university entrance qualification) and study-related information (e.g. subject, type of degree, examination grade, study length, graduation date). The IEB data provide information on starting and ending dates of different labor market episodes (i.e. periods of unemployment, benefit receipt, employment, participation in training measures) for each individual who is subject to social insurance contributions. Sociodemographic characteristics (e.g. sex, date of birth, nationality, qualification level) and job features (type of employment, occupation, industry affiliation, region of workplace) are also available. This continuous (daily) biographical data enables us to determine the exact length of the transition period between graduation date and the starting date of the first regular job. We define the labor market entry

as the first full-time or part-time employment spell with a minimum length of three months after graduation²⁹. We only consider regular employment subject to social security contributions. We thereby seek to rule out transition through short-term employment such as internships and temporary jobs. Furthermore, we only consider graduates who do not take longer than 730 days for their labor market entry. This implies that our data is right-censored. This restriction enables us to rule out (at least to some extent) a prolongation of the labor market transition, which might be driven by unobserved heterogeneity among graduates with respect to their propensity to look for a job. For instance, graduates might not seek to look for a job first, but realize other plans such as traveling, sabbaticals, gap years, family phases or further education. Moreover, we cannot observe labor entry abroad or via employment as civil servants or self-employment. Non-random self-selection of graduates into these entry options might affect our results as well. Nevertheless, this restriction seems to be a reliable assumption, since existing evidence suggests that almost all graduates take up a job within two years after graduation (see section 3.4).

We restrict the sample to graduates who are 20 to 35 years old at the date of certification and completed studies within 20 semesters. While we exclude graduates with a bachelor or PhD degree, graduates with a Master, Diploma or other degrees (e.g. state examination) are taken into account.³⁰ We use the latest tertiary degree to ensure that graduates subsequently enter the labor market. In addition, we must exclude graduates of certain study fields, as the entry of these graduates into the labor market is subject to certain restrictions (e.g. teacher training). The graduates in our sample do not necessarily have to have lived in Germany before studying. Indeed, some graduates have obtained their higher education entrance qualification abroad. However, we only include graduates for whom we can observe their first employment within two years after graduation in Germany.

In the sample, graduates already employed in regular jobs before the date of certification are disregarded, because their post-graduation job search may be different from that of the rest of the sample, and they might be less interested in finding another job (Pozzoli, 2009). We also exclude those graduates who have their first regular employment spell at universities or research

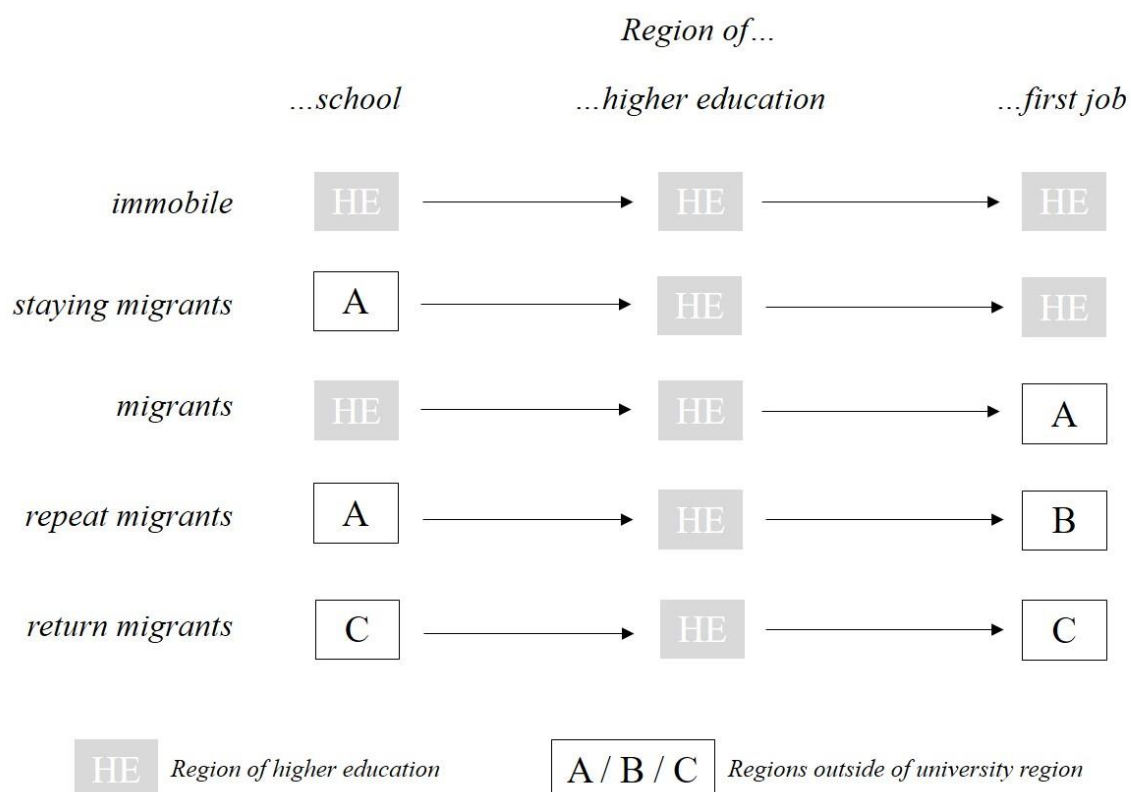
²⁹ The data at hand do not allow us to control for the intensity and timing of job searching in our models. A significant number of graduates start searching for jobs before final examinations (Böpple, 2010; Van der Klaauw & Van Vuuren, 2010). In the empirical model, we cannot differentiate between early job search before graduation and job search that starts after final exams. However, our empirical model assumes (like most of the other duration analyses) that only after the date of certification the graduates are at risk of taking up a first regular employment.

³⁰ We exclude graduates with a bachelor degree from the analysis because at least in Germany most of them do not immediately enter the labor market but pursue a Master's degree. Furthermore, the two groups have very different requirements for entering the labor market and are therefore not comparable. Another reason is that we cannot subsequently observe graduates with a bachelor's degree in the data when they continue studying for a Master's degree.

and development institutions because they are likely to pursue a doctoral education after studying. The final sample consists of 19,860 young workers who graduated between 1996 and 2012, and whose employment histories we can trace up to 2016.

Two variables, mobility and work experience, are the focus of our analysis.³¹ Other studies investigating the role of prior work experience for career entry usually rely on survey data with limited information on the graduates' employment histories. The advantage of our data set is its coverage of graduates' labor market biographies before, during and after studies on a daily basis. In order to measure work experience, we cumulate all employment spells (number of days) in either marginal jobs or regular part-time and full-time jobs before and during studies. Moreover, we observe whether a graduate had completed a vocational training before studying. In a next step, we differentiate according to whether work experience is sector-specific or not. For this purpose, we check whether graduates had already gained work experience in the same industry in which their first job after studies is situated.

Fig. 4: Types of graduate migration



Source: Faggian et al. (2007)

³¹ For a detailed description of all explanatory variables, see Appendix 9. For summary statistics, see Appendix 10.

Furthermore, the data contain detailed information on the residence and workplace at the NUTS3³² level that enables us to determine the mobility before and after studies. We use functional labor market regions as the regional unit to determine mobility. These consist of several counties (NUTS 3 regions) which are connected via strong commuter flows. While the location where the graduates received their university entrance qualification (home region) is reported in the student records, the location of the workplace and the residence are documented in the IEB. Mobility before studies corresponds to a move from the home region to the university region. Mobility after studies is defined as a move from the region of studies to the region of the first regular job after graduation.

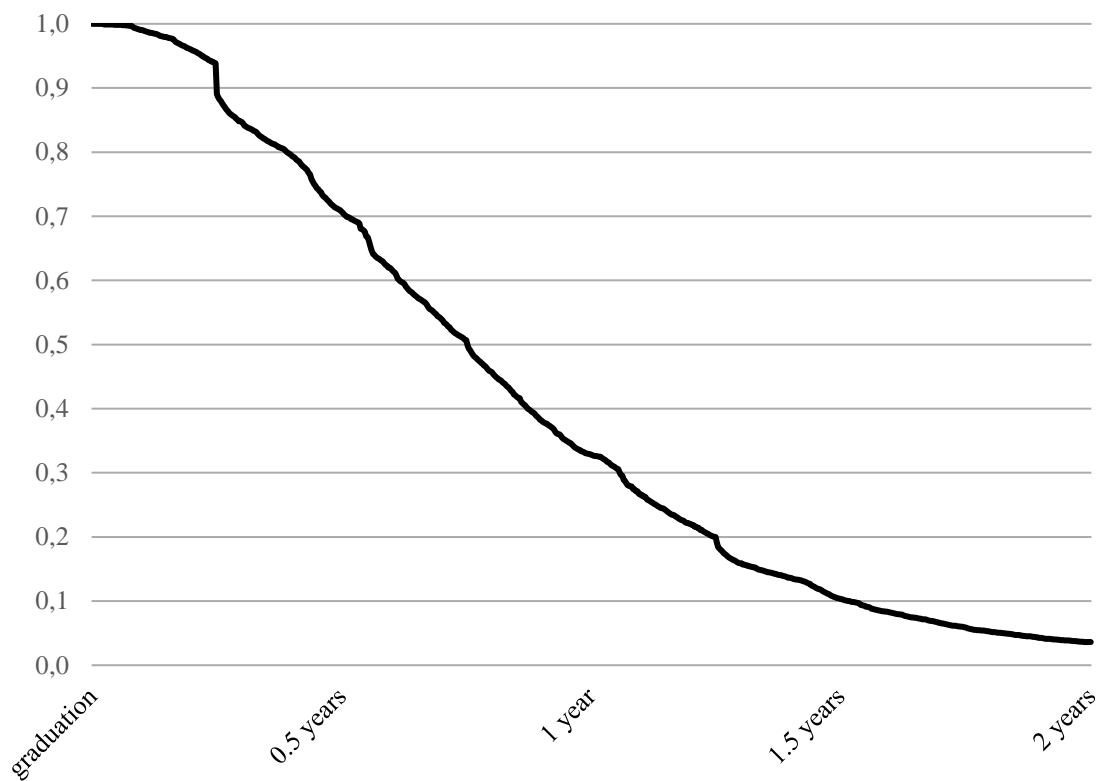
Moreover, we employ a typology of graduate mobility (see Figure 4) which has been developed by Faggian et al. (2007) and applied in numerous further studies (see e.g., Kazakis & Faggian, 2017). This typology combines mobility before and after studies and allows thereby to show the relationship between pre- and post-study migration on one side and between migration propensity and local social networks on the other. Graduates who studied in their home region take up the first job either in the same region (*immobile*) or enter the labour market elsewhere (*migrants*). Graduates who were already mobile before studies and find the first regular job inside the region of studies are *staying migrants*. Graduates who leave the home region for studies and move from the region of studies to the region of the new workplace are *return migrants* if the workplace is in the home region or *repeat migrants* if the workplace is located neither in the home region nor in the university region.

3.4 Empirical results

Graduates' entry durations are rather short. The estimated survival function based upon the non-parametric Kaplan-Meier method (Figure 5) shows that the majority of the graduates (65.7 %) in our sample enter the labor market within one year after graduation. This finding is in line with previous evidence (see, for example, Pozzoli, 2009; Haak & Rasner, 2009; Sciulli & Signorelli, 2011; Salas-Velasco, 2007).

³² Germany consists of 401 NUTS 3 regions, which consist of urban ("kreisfreie Städte") and rural counties ("Landkreise").

Fig. 5: Survival function (Kaplan-Meier estimates) for graduates



Source: University panel linked to the IEB of IAB, own calculations.

In this section, we examine the relationship between spatial mobility and work experience on one side and the length of the transition phase between graduation and taking up the first job on the other. The outcomes of the continuous-time duration models based upon a proportional hazard approach are presented in the following sections: spatial mobility (section 3.4.1), general work experience (section 3.4.2), sector-specific and non-specific work experience (section 3.4.3) and further control variables (section 3.4.4). All models include individual characteristics and study-related factors as control variables.

Tab. 4: Regression results – determinants of transition time into first regular full-time and part-time jobs

| | (1) | | (2) | | (3) | |
|--|-----------|-------|-----------|-------|-----------|-------|
| | coef | se | coef | se | coef | se |
| Individual characteristics | | | | | | |
| Female | -0,092*** | 0,023 | -0,099*** | 0,024 | -0,092*** | 0,024 |
| Age | -0,065 | 0,084 | -0,021 | 0,086 | 0,084 | 0,085 |
| Age ² | 0,001 | 0,001 | -0,000 | 0,002 | -0,002 | 0,001 |
| Foreigner | -0,143** | 0,056 | -0,137** | 0,057 | -0,173*** | 0,057 |
| Spatial mobility | | | | | | |
| Spatial mobility before studies | 0,050** | 0,021 | 0,052** | 0,021 | 0,049** | 0,022 |
| Spatial mobility after studies | -0,119*** | 0,024 | -0,122*** | 0,024 | -0,119*** | 0,024 |
| Higher education | | | | | | |
| University Ref.: university of applied sciences) | -0,193*** | 0,040 | -0,191*** | 0,041 | -0,233*** | 0,042 |
| Examination grade (Ref.: sufficient) | | | | | | |
| Satisfactory | 0,081* | 0,046 | 0,079* | 0,047 | 0,090* | 0,047 |
| Good | 0,017 | 0,040 | 0,015 | 0,040 | 0,026 | 0,040 |
| Excellent/very good | -0,066 | 0,044 | -0,066 | 0,045 | -0,061 | 0,045 |
| Other degrees (Ref: Diploma/Master) | -0,330*** | 0,043 | -0,328*** | 0,043 | -0,336*** | 0,044 |
| Study length | -0,024*** | 0,004 | -0,023*** | 0,004 | -0,028*** | 0,004 |
| Work experience | | | | | | |
| Vocational training | 0,213*** | 0,029 | 0,202*** | 0,030 | | |
| Experience (in 100 days) before higher education | | | | | | |
| total | -0,001 | 0,002 | | | | |
| marginal empl. | | | -0,004 | 0,002 | -0,005** | 0,002 |
| regular empl. | | | 0,008** | 0,004 | 0,012*** | 0,004 |
| during higher education | | | | | | |
| total | -0,201*** | 0,015 | | | | |
| marginal empl. | | | -0,228*** | 0,016 | -0,228*** | 0,016 |
| regular empl. | | | 0,007 | 0,036 | -0,001 | 0,036 |
| Previous employer | 0,293*** | 0,037 | 0,272*** | 0,038 | 0,285*** | 0,038 |
| Ln(<i>p</i>) | 0,672*** | 0,025 | 0,677*** | 0,028 | 0,680*** | 0,029 |
| Ln(θ) | -1,272*** | 0,241 | -1,211*** | 0,259 | -1,164*** | 0,269 |
| Implied <i>p</i> | 1,959 | 0,049 | 1,968 | 0,054 | 1,973 | 0,058 |
| θ | 0,280 | 0,068 | 0,298 | 0,077 | 0,312 | 0,084 |
| Log Likelihood | -8.932,22 | | -8.908,76 | | -8.927,23 | |
| Number of students | 19.860 | | 19.860 | | 19.860 | |
| Observations | 22.959 | | 22.959 | | 22.959 | |

Notes: * significance at the 0.1 level, ** significance at the 0.05 level, *** significance at the 0.01 level; robust standard errors in parentheses. All models include time effects and fixed effects for field of study.

marginal empl.: marginal employment

regular empl.: regular (part-time or full-time) employment

3.4.1 Mobility

Regression results on pre-study and post-study mobility are shown in Table 4, model (1) to (3). The results in these models suggest that graduates who moved to another region for attending university (spatial mobility before studies) have a significantly higher likelihood of exiting non-employment after having taken the university degree. In other words, graduates migrating before studies seem to find a job faster after studies than young workers who completed their

studies in the region where they obtained their university entrance qualification. The difference in the hazard between two graduates who vary only with respect to pre-study mobility amounts to 5.1 % ($[1 - \exp(0.05 \times 1)] \times 100$). We suppose that these mobile graduates are possibly particularly motivated and might show a relatively high job search effort. We find the opposite effect for mobility after studies.

Differentiating between the four graduate mobility types provides more detailed information on the effect of post-graduation migration. Corresponding regression results are summarized in Table 5. The immobile graduates are the reference category in all models. The estimates indicate that migrants and repeat migrants are significantly less likely than immobile graduates to be quickly employed after graduation. Hence, immobile graduates seem to enter the labor market faster. Graduates starting their career in their home (university) region seem to benefit from cumulated location-specific knowledge and network advantages through previous schooling and studying as pointed out in our theoretical considerations in section 3.2. Staying migrants and return migrants do not significantly differ from immobile graduates. Staying migrants might have developed local networks during higher education. Returning migrants who accept a job offer in their home region could obviously benefit, unlike the other two mobile graduate groups, from the access to already established networks.

Tab. 5: Regression results – mobility types and transition time into first regular full-time and part-time jobs

| | (1) | | (2) | | (3) | |
|---------------------------------------|-----------|-------|-----------|-------|-----------|-------|
| | coef | se | coef | Se | coef | se |
| Mobility types (Ref: Immobile) | | | | | | |
| Staying migrants | 0,058 | 0,038 | 0,060 | 0,038 | 0,052 | 0,039 |
| Migrants | -0,114*** | 0,032 | -0,117*** | 0,032 | -0,117*** | 0,033 |
| Returning migrants | -0,049 | 0,039 | -0,051 | 0,039 | -0,048 | 0,039 |
| Repeat migrants | -0,073** | 0,030 | -0,073** | 0,030 | -0,077** | 0,030 |

Notes: ** significance at the 0.05 level, *** significance at the 0.01 level; robust standard errors in parentheses. All models include time effects, personal and study-related variables (e.g. fields of study).

Our finding of a longer entry duration of the two mobile graduate types is not in line with our initial assumption (section 3.2) that graduates who look beyond the region of studies increase their search effort and thus find a job faster. Many graduates might first search for a job in the university region because they seek to make use of their location-specific knowledge and perhaps try to avoid migration costs. However, those young workers who do not manage to enter the labor market quickly might extend the spatial scope of their job search as they increasingly face pressure to find an adequate job. In this setting, migration goes hand in hand with a relatively late career start. Another reason for the delayed career entry of mobile

graduates might arise from a more selective job search behavior that is driven by high (initial) reservation wages. Reservation wages are, as argued in section 3.2, determined by individual characteristics and study-related factors. For instance, graduates with high grades likely have high reservation wages and are thus more choosy when searching for a position (Pozzoli, 2009). Moreover, reservation wages might be relatively high if labor market entry involves migration costs.

It is noteworthy that all graduate mobility types that are likely to have some knowledge on the region in which they take up their first job after graduation (immobile, staying migrants, return migrants) seem to enter the labor market more quickly than graduates for whom we assume that they have no or only little information on the regional labor market (migrants, repeat migrants).

3.4.2 General work experience

In Table 4, model (1) comprises information on pre-study and post-study mobility and on general work experience, while model (2) and model (3) differentiate additionally between marginal and regular employment before and during studies. These regression results indicate that work experience is relevant for labor market entry of university graduates. The effect of vocational training in particular is fairly large in all models. Having completed vocational training before studying increases the likelihood of starting a regular part-time or full-time employment by 23.7 % (model 1). This outcome confirms results by Haak and Rasner (2009) for German graduates. This finding might be due to a signaling effect if an apprenticeship is evaluated as a positive productivity signal by employers, thus increasing the probability of receiving a job offer. Moreover, an apprenticeship training likely gives rise to network contacts in the training firm and the local labor market that might facilitate job searching after graduation. Both findings are in line with our theoretical arguments in section 3.2.

We do not detect a significant effect of work experience before studies in addition to an apprenticeship in model (1). However, this outcome seems to be caused by opposing effects of regular and marginal employment before higher education. While there is a significant positive effect of regular jobs on labor market entry in models (2) and (3), the estimates also point to an adverse relationship of marginal employment, though of moderate size: increasing work experience via marginal employment before studying by 100 days decreases the hazard of labor market entry by 0.5 %. The effect of regular employment increases remarkably once we exclude the vocational training dummy in model (3). Hence, vocational training captures an important part of the experience effect induced by regular employment prior to studies.

While work experience that is gained before studying tends to facilitate labor market entry, there seems to be a detrimental effect of employment during higher education. But again, it is important to distinguish between types of employment. The coefficient for regular employment does not significantly differ from zero in all models. This result might be due to opposing effects of working while studying discussed in section 3.2. When students are working during higher education, they might reduce either job search efforts or study efforts or may invest less time in both finding a job and studying. The job search model suggests that this gives rise to unfavorable direct and indirect effects on labor market entry. This adverse influence may counteract positive network and signaling effects of regular employment during studies. The opposing effects might offset each other and result in an insignificant net effect of regular employment.

Work experience that is gained during studies is primarily due to marginal employment. The negative effect of experience in model (1) is solely caused by this type of employment. The main motivation to take up these jobs while studying is probably financial necessity, and often they will not provide many helpful work-related contacts for job searching later on. This is in line with the significant negative coefficient of marginal employment during studies in the models (2) and (3). The adverse effect of marginal jobs is much stronger if students work during higher education compared to marginal employment before enrollment. This difference probably points to a delayed university-to-work transition as a result of less intense job searching and reduced study effort caused by marginal employment during studies. These adverse effects cannot be triggered by jobs before enrollment.

There is also direct evidence of important beneficial network effects on labor market entry of university graduates. Starting the first regular job after studies at a previous employer increases the likelihood of exiting non-employment after studies by 34 % in model (1). This provides clear evidence on the importance of labor market contacts obtained via previous work experience as argued in section 3.2.

3.4.3 Sector-specific versus non-specific work experience

Prior work experience, which is related to the sector of the first job, is expected to be of particular importance when searching for a job after studies. If graduates have already worked in the same sector of their subsequent job, they could probably benefit from sector-specific knowledge and contacts making it easier to find employment (see section 3.2). We therefore include different types of sector-specific and non-specific work experience in the regressions (Table 6). Switching from model (1) to model (3), the definition of sector-specific experience

becomes wider (from 3-digit to 1-digit sectors) and the measurement of sector-specific experience thus less accurate.

Tab. 6: Regression results – sector-specific and non-specific work experience and transition time into first regular full-time and part-time jobs

| | (1) 3-digit | | (2) 2-digit | | (3) 1-digit | |
|--|----------------|-------|----------------|-------|----------------|-------|
| | coef | se | coef | se | coef | se |
| Work experience | | | | | | |
| Sector-specific vocational training | 0,349*** | 0,058 | 0,309*** | 0,053 | 0,304*** | 0,042 |
| Non-specific vocational training | 0,172*** | 0,032 | 0,177*** | 0,033 | 0,141*** | 0,036 |
| Sector-specific experience (in 100 days) | | | | | | |
| before higher education | | | | | | |
| marginal empl. | -0,025*** | 0,008 | -0,025*** | 0,007 | -0,013*** | 0,005 |
| regular empl. | 0,006 | 0,009 | 0,009 | 0,008 | 0,004 | 0,006 |
| during higher education | | | | | | |
| marginal empl. | -0,137*** | 0,039 | -0,139*** | 0,036 | -0,175*** | 0,027 |
| regular empl. | 0,135* | 0,070 | 0,133** | 0,068 | 0,099* | 0,056 |
| Non-specific experience (in 100 days) | | | | | | |
| before higher education | | | | | | |
| marginal empl. | -0,001 | 0,002 | -0,001*** | 0,002 | -0,001 | 0,002 |
| regular empl. | 0,008* | 0,004 | 0,008 | 0,004 | 0,010** | 0,005 |
| during higher education | | | | | | |
| marginal empl. | -0,245*** | 0,018 | -0,249*** | 0,018 | -0,253*** | 0,019 |
| regular empl. | -0,043 | 0,042 | -0,046 | 0,042 | -0,061 | 0,046 |

Notes: * significance at the 0.1 level, ** significance at the 0.05 level, *** significance at the 0.01 level; robust standard errors in parentheses. All models include time effects, personal and study-related variables (e.g. fields of study) and mobility types.

The regression results in Table 6 suggest, in fact, that sector-specific work experience enables graduates to enter the labor market faster after studies. By far the strongest positive effect is observed for sector-specific vocational training. A sector-specific apprenticeship training increases the hazard of starting the first job by 41.3 % at the 3-digit level. The corresponding percentage for a non-specific apprenticeship is much lower and amounts to merely 19 %. An apprenticeship accounts again (see previous section) for the largest proportion of the experience effect induced by regular employment before enrollment: the effect of specific experience is insignificant in all models and there is some indication of a beneficial influence of non-specific experience which is, however, not very robust across the models.

In contrast, sector-specific regular employment during higher education seems to foster a swift labor market entry. Extending this type of work experience by 100 days increases the likelihood

of taking up a regular job after graduation by 14 % with a match at the 3-digit level. The regression results for non-specific experience are not significant.

Even though all types of marginal employment show a positive correlation with the length of the non-employment spell after graduation, it is noteworthy that the size of the adverse effect is smaller for sector-specific experience than for non-specific experience. Marked differences arise in particular for marginal employment during studies. The specificity of marginal work experience seems to matter, as the results suggest that negative effects on job search and study effort are partly offset by valuable sector-specific knowledge and networks.

There are good reasons to assume that the magnitude of positive effects increases as sector-specific experience becomes more precise. However, the size of the coefficients does not significantly change across the three models (1-digit to 3-digit level) in Table 6. There is some weak indication that the quality of the match might matter for sector-specific vocational training.

3.4.4 Further control variables

Finally, we will briefly discuss the regression result for the control variables and the evidence on duration dependence and compare our findings with previous evidence. The results show that gender and nationality are of importance for the duration of the university-to-work transitions. Women and foreigners usually take longer to find their first regular job in Germany after graduation.

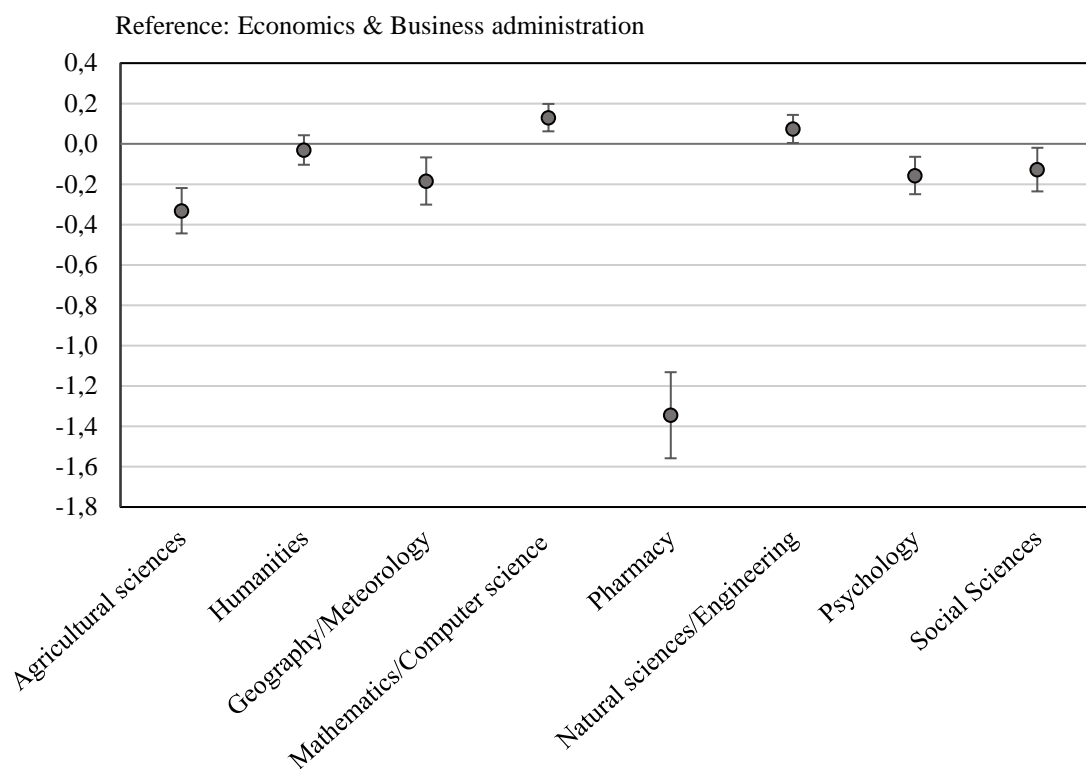
The effect of age on the likelihood of finding a job after graduation is insignificant. Interestingly, however, the coefficient of study length is negative and might point to a signaling effect and to potential employers who interpret a study duration beyond the standard study period as a negative signal, possibly indicating relatively low productivity or motivation of the candidate.

Individuals graduating from a university of applied sciences have a higher likelihood of entering the labor market faster than those leaving regular universities. This difference is plausible because universities of applied sciences provide more practically oriented curricula and often offer cooperation with companies during studies (e.g. internships, dual study courses). Beyond valuable contacts to firms, employers might therefore expect a shorter phase of skill adaption of these students (Jacob & Weiss, 2010, section 3.2).

The examination grade does not seem to play an important role for the speed of labor market entry. There is some weak evidence that graduates with the grade satisfactory enter more

quickly than the other groups. Regarding the type of degree, the results indicate that the probability of entering the labor market is 28 % lower for graduates with other degrees relative to master/diploma graduates. These are degrees such as magister artium, which are mainly awarded in subjects that provide less occupation-specific curricula.

Fig. 6: Effect of field of study on time to first job



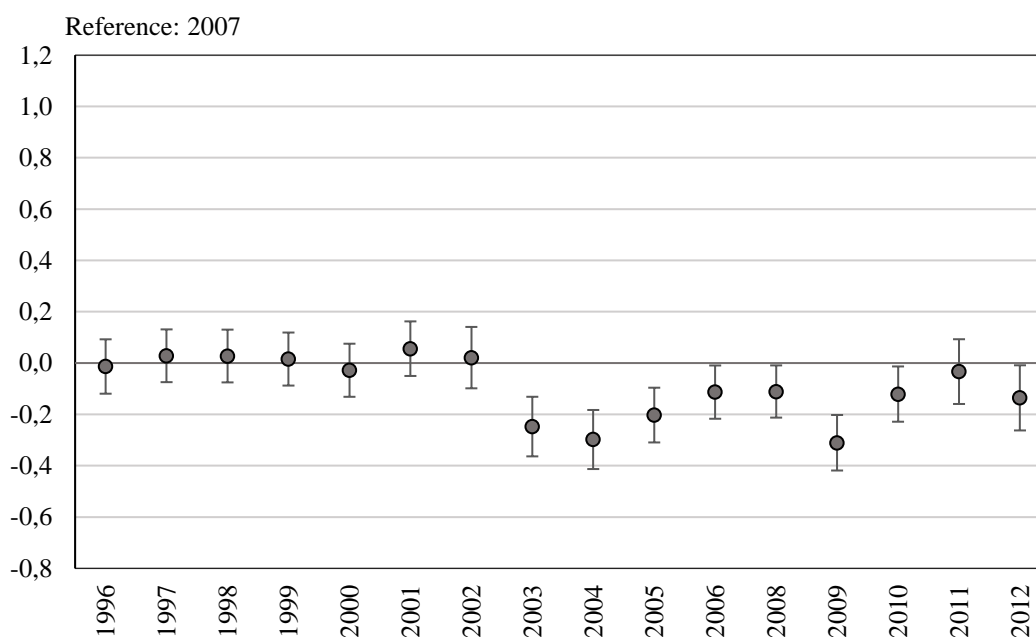
Source: university panel linked to the IEB of IAB, own calculations

A closer look at the effects of field of study on the length of the non-employment spells after graduation shows some important variation across different fields of studies (see Figure 6). Relative to the reference group (economics and business administration), graduates of agricultural sciences, psychology, social sciences and geography/meteorology show a lower likelihood of exiting unemployment. Furthermore, it is noticeable that pharmaceutical graduates have a significantly lower probability (74 %) of finding their first regular employment. One explanation could be that the pharmaceutical field of study prepares students for a relatively small, highly specialized job market. Another reason may be the specific examination rules in this subject. A "practical year" is common in this course of studies, which

concludes with an additional examination.³³ In contrast, mathematics and natural sciences graduates show a higher probability of finding a job after graduation than the reference group. Overall, the literature on entry duration confirms our findings regarding differences across fields of study (see, for example, Haak & Rasner, 2009; Böpple, 2010; Biggeri et al., 2001).

Figure 7 shows the effects of year of graduation on the likelihood of finding a job. We chose 2007, the year with the highest number of graduates, as the reference year. It is apparent that between 1996 and 2002, the probability of finding a regular job after graduation did not significantly differ from the likelihood in 2007. However, between 2003 and 2006, when unemployment rates in Germany were relatively high, it was more difficult for university graduates to enter the labor market. In addition, the economic and financial crisis in 2009 obviously affected the university-to-work transition. Relative to the reference year 2007, the likelihood of ending unemployment after studies was 26 % lower in 2009. This finding points to an increased pressure for graduates to settle in regular employment in times of major economic shocks.

Fig. 7: Effects of graduation year on the likelihood of finding a job



Source: university panel linked to the IEB of IAB, own calculations

³³ We have displayed the regression models without graduates in the pharmaceutical field, but then regression results do not change.

The estimate of the share parameter of the Weibull distribution (implied p) is larger than 1 (see Table 4), pointing to a positive duration dependence. Therefore, labor market entry of the graduates becomes more likely as the time elapsed since final examinations increases. The positive duration dependence might be caused by graduates who adjust their job search intensity and reservation wage after a significant period of unsuccessful search due to financial necessity or the threat of stigma effects.

3.5 Conclusions

We extend previous duration analyses on university-to-work transitions by focusing particularly on the effects of spatial mobility and work experience of graduates on the probability of entering the labor market. Our study shows that immobile graduates take up the first regular job more rapidly than mobile graduates. However, this result is mainly caused by those migrant groups who probably cannot make use of location-specific knowledge and networks. Hence, our findings are in line with the hypothesis that location-specific knowledge and contacts might accelerate labor market transitions.

In particular, an apprenticeship before studies and taking up a job at a previous employer support a rapid career entry. These findings are in line with important signaling and network effects. Typical student jobs (marginal employment), especially during studies, tend to have a dampening effect on the speed of labor market entry, while regular employment may be a door-opener to relevant labor market knowledge and networks for desired jobs. However, this beneficial effect of regular employment is likely counteracted by having less time for studying and job searching if experience is gained during studies.

Public investments in higher education are under a high pressure of legitimacy. Therefore, a major concern is that labor market absorption of graduates should take place shortly after the completion of studies in order to decrease the risk of skill-deterioration and to ensure direct returns. Our main findings suggest that the matching process after graduation might benefit from an improved access to labor-market-relevant knowledge and contacts. Therefore, higher education institutions and labor market actors might provide more opportunities to gather this information over and above existing measures in order to improve university-to-work transitions of graduates.

We acknowledge that universities have already invested much effort in this direction. For instance, local fairs between firms and students have become commonplace in most higher education institutions in Germany. However, most of them still lack the inclusion of more

practical elements and learning opportunities in their study programs. This may apply particularly to universities, where work experience is still often perceived as an extra-curricular element. One possibility is the inclusion of dual courses in the curricula. In such courses, students are taught both theoretical knowledge and practical components and skills. In this respect, one option may be a combination of theoretical knowledge and practical work experience in firms. This may also enable students to better handle the trade-off between working on the one hand and efforts towards study and job searching on the other. This issue is of great importance for students. A recent national student survey revealed that two out of three students in Germany had a paid job in the winter semester 2014/2015 (Studitemps and Maastricht University 2015). This trade-off might be a major concern especially for those students who rely heavily on student jobs to finance their studies. More opportunities combining theoretical and practical elements may enable these students in particular to benefit from improved possibilities to establish more useful contacts than in pure student jobs for finding an adequate job after graduation faster.

Future research on individuals' motivations and strategies underlying their career starts might provide more insights on the duration of job entry and the role of mobility, location-specific knowledge and labor market networks in this context. More detailed information on periods and intensity of job searching, on the channels used to obtain information on vacancies, on graduates' expectations for their desired job and on their spatial preferences would be helpful to learn more about the underlying mechanisms.

KAPITEL 4

How wide is the gap? Comparing Geography graduates' labor market success with that of peers from business and computer sciences

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Abstract

With growing numbers of university graduates, the choice of academic programs gains in importance to successfully enter the labor market. Simultaneously, the link between the field of study and actual professional career is becoming increasingly blurry. This paper aims to contribute to a better understanding of these relations and to position geography in this wide spectrum. We develop a conceptual framework to systematically categorize the relations between academic programs and their associated labor markets. We employ this framework in a most-different-case design to quantitatively analyze the influence of the field on the graduates' career prospects, using student records of several German universities linked with administrative biographical data from social security records. We find evidence that the influence of the field of study on full-time employment and wage is substantial, controlling for various factors. Geographers do face difficulties on the labor market but the demand for their core competencies - interdisciplinary, spatially specific and sustainability-related thinking - is rising through current societal developments. Moreover, we find some indication that those performance gaps are not an exceptional phenomenon of geographers but also apply to graduates of different fields of study with multidimensional and indirect links to the associated labor markets.

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4.1 Introduction

Evidence published over more than four decades shows that geographers tend to have a hard time entering the labor market and earn comparatively moderate wages. The nature of their occupation is often unclear to society (Darkoh, 1981; Solem et al., 2013; Gould, 2016; Piróg, 2018). The core competencies of geographers, however, such as interdisciplinary and spatially specific complex thinking, the processing of issue-centered analyses or education for sustainability, are now more important than ever for society (Spronken-Smith, 2013). Satisfaction from studying and doing meaningful work seems to be compensating geographers for obtaining relatively lower incomes.

At the same time, developments in higher education have been characterized by educational expansion and an increase in complexity. On the one hand, universities are challenged with the strong need to produce work-ready graduates (Stewart, 2020), while on the other hand, graduates face increasingly unsteady career paths, as asymmetrical employment biographies seem to be the new normal (Bennett et al., 2020; Fortuijn, 2020). As the number of graduates with a tertiary education increases, a degree alone no longer seems to be a guarantee for adequate employment, and the field of study in which the degree is obtained gains in importance. But the link between the field of study and working life is currently becoming more blurred (Tura, 2020). As a consequence, future students now have to consider the possible career prospects more than ever *before* choosing their education and field of study (Piróg, 2018).

In contrast to academic disciplines that train their students for precise and narrowly defined occupations and specific labor market segments, geography programs teach a broad set of knowledge, methods and skills, and prepare students for a wide range of different occupations. The employability of geography graduates is thus of particular concern (e.g. Piróg, 2014a, Hennemann & Liefner, 2010). Employability manifests itself in successful careers, and empirical studies usually approximate educational success with a smooth transition to the labor market, with adequate employment and job profiles, and with adequate salaries.

How well geographers fare in the labor market in comparison to the graduates from other disciplines, however, is still difficult to establish beyond hearsay evidence and information provided on platforms (e.g. ididio.com, 2020). This paper addresses this void by analyzing the early career phase by comparing geography graduates with those from business/economics and computer science. This comparison is based on the understanding that the graduate programs

of different academic disciplines attract very different students, teach different types of knowledge using different teaching formats, and prepare students for different labor markets, and that geography, business/economics and computer science represent very different types of subjects.

We thus apply a most different case design to analyze the influence of the field of study on the graduates' career prospects.

Focusing particularly on two standard, quantitative and easy to measure success indicators, "labor market entry performance" and "wages obtained in the early career phase", the paper specifically asks the following research questions:

Research question 1: "How large is the gap between geographers and business/economics and computer science graduates regarding labor market entry and remuneration?"

Research question 2: "Which factors other than the field of study explain the existing differences?"

Taking the angle of geography, this paper thus provides a systematic and data-driven comparison of labor market entry performance of geography graduates with those of graduates from business/economics and management and from computer science: computer science teaches the handling of a complex technology, and its student population shows a high – and necessary – technical affinity. Business/economics, a combination of the two disciplines in one study program frequently found at German universities, focuses on abstract economic contexts as well as handling business processes, and prepares mainly for management jobs. Geography, which - like no other field of study - counts interdisciplinarity and education for sustainability as two of its core competences, draws on a wide variety of student motivations, ranging from interest in natural science (physical geography) to social science (human geography) and technical affinity (GIS).

This paper seeks to objectify the discourse on the monetary and quantitative attributes of geographers' early careers in comparison to other graduates. It contrasts existing, partly anecdotal evidence with a broad data-based analysis using the example of German geography graduates in the German labor market. Existing studies on this issue either focus solely on geographer's labor market performance or compare outcomes across disciplines, but geography is very often lumped together with other related study programs. Thus, detailed evidence between geographers and their peers in other disciplines is still scarce. Since most of these studies use survey data, selection problems and/or (un)intentional false information regarding

sensitive topics (like wage) may be of concern (e.g. Kolek, 2012; Kendall, 1964). In this paper, the study's analysis benefits from the existence of a unique administrative data set, which links university and social security data on an individual level. Geographers, economists and computer scientists from four German middle-sized universities in semi-urban areas who graduated between 2000 and 2012 were included.

This paper will not attempt to include the otherwise important factors of meaningfulness, intrinsic motivation, and non-monetary rewards, as the database offers no possibility to integrate those subjective parameters. Many geographers probably acknowledge that the love of what they do is part of their compensation, but attempting to integrate this dimension is far beyond the scope of this paper.

The paper is structured as follows: the next section (4.2) introduces the conceptual framework and briefly discusses the theoretical scopes. After a short data and sample description (section 4.3), the results of both labor market entry and wage development are presented and discussed (4.4). Section 4.5 concludes.

4.2 Theoretical and conceptual framework

International empirical evidence suggests that labor market rewards are partly determined by the disciplines in various study programs. Graduates in 'soft fields', such as humanities, social sciences or geography, obtain rather low wages compared to those in 'hard fields', such as natural sciences. Similar results are found in many countries (for an international overview see Reimer et al., 2008). Large variations across fields of study have also been detected for non-pecuniary returns such as occupational prestige (Katz-Gerro & Yaish, 2003; Shwed & Shavit, 2006), employment status (Reimer & Steinmetz, 2009; Smyth, 2005) and over-education (Dolton & Vignoles, 2000; Ortiz & Kucel, 2008). Graduates from humanities, social sciences and geography usually face greater difficulties as they enter the labor market and obtain adequate regular employment compared to graduates from natural sciences (Klein, 2011). These field-specific disparities in labor market rewards have been extensively documented, but currently the forces that drive these differences have not yet been adequately explored (e.g. van de Werfhorst, 2002; Klein, 2011).

4.2.1 The role of characteristics of individuals and study-related characteristics

The seminal approaches put forward to explain these disparities are human capital theory and signal theory, both of which focus on characteristics of the individual. The human capital approach suggests that investments in human capital improve skills and knowledge, thereby

increasing productivity, which leads to higher wages (Becker, 1962; Bowman, 1966; Mincer, 1958, 1989; Schultz, 1962). Income differentials across study programs can result from the time that graduates have spent on education. The signal theory assumes that employers cannot directly assess the productivity of applicants, and hence employ new workers having incomplete information on their true abilities. Spence (1973) assumes that employers use individual traits, educational credentials and practical credentials (e.g. previous work experience) as "signals" to assess the potential differences in productivity among applicants. Reimer et al. (2008) conducted an international comparison of graduates' subject-specific wages between 22 countries and found increased wage disparities across fields of study due to expansion in higher education. Consequently, educational level appears to have lost some of its potential as a productivity signal, whereas fields of study have gained in importance as signals for employers. Empirical evidence suggests, however, that variations in field-specific outcomes are not sufficiently explained by individual characteristics and study-related human capital factors (for example, exam grades, study length, type of degree or work experience, e.g. Grave & Goerlitz, 2012; Di Paolo & Tansel, 2017). Other factors and mechanisms were found to be responsible for these discrepancies.

4.2.2 The role of study programs

Thurow's (1975) job-competition theory postulates that labor productivity is influenced by job characteristics. Since job-specific skills are mainly obtained while working, applicants with the lowest training costs on the job are the most attractive and are ranked in the top positions of employers' hypothetical job queues. Graduates' relative positions in such a queue depend on the various fields of study, which require different additional training costs on the job. As this theory does not provide indicators to proxy these costs, the training costs model (Glebbeeck et al., 1989) proposes occupational specificity and selectivity. Occupational specificity is reflected by the degree of employability: fields of study that rely on a specific occupational profile produce lower additional training costs for employers for acquiring job-specific skills, thereby increasing job matching probability. Klein (2011) shows that more occupation-specific study programs are more favorable to graduates' non-pecuniary labor market outcomes when they enter the labor market. The opposite situation holds for fields of study that convey more general skills, which can be employed in a more diverse set of occupations. Heijke & Meng (2011), used labor survey data for nine European countries to provide similar evidence: graduates of fields with a strong discipline-specific competence orientation obtain higher wages than those from fields focusing on general academic skills. The study by van de Werfhorst (2002) reveals

lower earnings for graduates who acquired more general cultural skills during higher education compared with others, with technical or economic skills.

The selectivity of a study program proxies the average quality of students with respect to motivation and other cognitive and affective characteristics. Selectivity relates to discrepancies between study programs, but also to ability variations among subjects. The greater the heterogeneity of graduates' abilities, the higher the risk for employers of choosing a candidate who does not meet the job requirements. Selective study programs therefore increase the probability of finding a suitable candidate for the job. A few studies that explicitly address this endogeneity problem of subject choice in their empirical approach provide evidence for the relevance of such selection processes (Arcidiacono, 2004; Kinsler & Pavan, 2015). Expansion in higher education may have contributed to an increased selection of lower ability students concentrating in "less challenging" fields of study. Consequently, unemployment risk and occupational status of graduates in humanities is evidently higher than in other subjects, such as natural sciences, in countries which already have high percentages of university graduates. This finding of a study comparing 22 European countries therefore provides supportive evidence for decreasing signaling values of "less challenging" "soft fields" such as humanities and social sciences due to educational expansion (Reimer et al., 2008). In the course of higher education expansion in Great Britain, Walker & Zhu (2008) detect increasing labor market returns for college graduates in engineering and math, while a declining trend is observed in the other fields of study.

Further, market mechanisms may determine different labor market outcomes between fields of study. In labor market research, it is a longstanding issue that the labor market demand for competencies, skills and graduates from "soft fields of study" (e.g. humanities) is not as high as in "hard fields of study" (e.g. natural sciences). This aspect may, however, be less relevant for geography graduates due to its interdisciplinary curriculum. From a rationalist economic perspective, studying soft fields thus seems to be a less promising investment monetarily. However, studies show that a significant proportion of enrollment still takes place in these "less challenging" study programs (Reimer et al., 2008; Klein, 2011). Indeed, previous studies confirm that study program choice is driven by individual preferences rather than by pecuniary motives alone (e.g. Beffy et al., 2012). These arguments can be linked to recent research on the factors – monetary as well as psychological – that contribute to job satisfaction. The meaningfulness of one's own work, for instance, when it is related to issues such as sustainability, becomes an explanatory factor for the readiness to forego the highest possible

salaries for the sake of doing important work (e.g. Nikolova & Cnossen, 2020). Based on these theoretical considerations, the subsequent empirical analyses will include individual characteristics (e.g. sex, age, grades obtained, previous work experience) and labor market characteristics (sector, region) as additional control factors in the analysis of program-related differences.

4.2.3 Relations between academic programs and their associated labor markets

The literature review has shown that research on labor market performance requires a differentiation of academic subjects regarding the nature of their links to particular occupations or labor market segments. To our knowledge, a systematic and comparative assessment of academic subjects' links to the labor market does not exist. Therefore, we propose classifying academic programs into different groups, providing a simplified and non-exhaustive working typology encompassing skills and knowledge, which is sufficiently useful for our purpose (Figure 8).

Group 1: subjects with a direct and one-dimensional link between study program and occupation / labor market, i.e. providing *education for a particular occupation*;

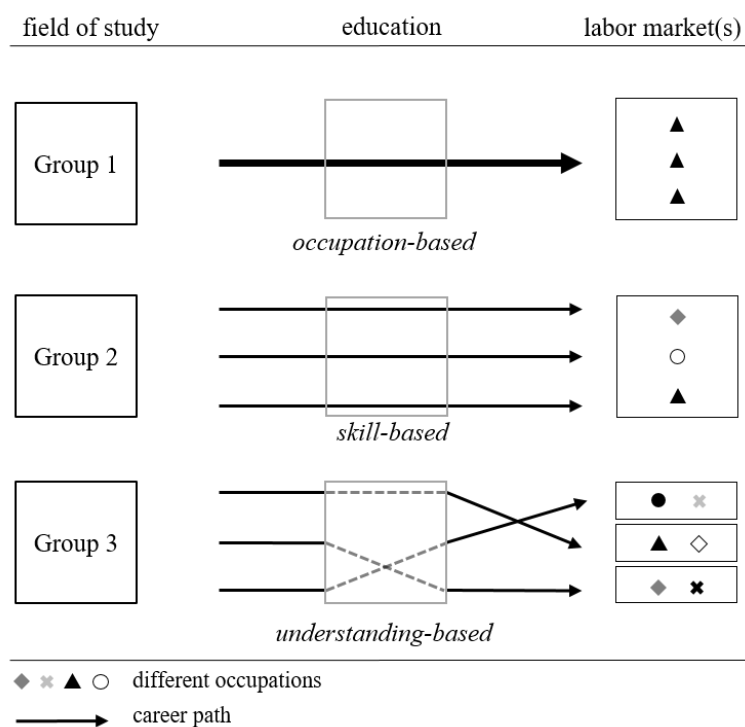
Group 2: subjects with a direct but multi-dimensional link between study program and occupation / labor market, i.e. providing *education for a particular skill*;

Group 3: subjects with an indirect and multi-dimensional link between study program and occupation / labor market, i.e. *education for a particular understanding*

Concerning the connection between an academic discipline and the occupation of its graduates, this paper proposes categorizing academic disciplines accordingly (see Figure 8). The first group comprises programs that provide an education for a particular occupation. Examples include physicians, lawyers and, with a somewhat broader approach, managers. In the case of these programs, the occupational specificity of the training is quite high, conditions of labor market entry and performance criteria are known, and career paths often follow established patterns (e.g. Forster & Bol, 2018; Roska & Levey, 2010). The second group is formed by programs that teach a particular skill and competence that is distinct, but can be employed in different occupations. Examples include mathematicians, computer scientists and mechanical engineers, who may enter different jobs in different industries, but which are related to the skills

they acquired, e.g. developing and using algorithms (e.g. Noonan, 2017). The third group of programs comprises synthetic and problem-centered (issue-centered) subjects such as geography, social and cultural studies. These subjects provide an education that informs about societal and environmental conditions and challenges and enables graduates to understand and assess complex problems in their field of competence and to design ways to handle these problems (e.g. Blewitt, 2004). The most different case design requires representatives from each group to cover the whole range of subjects, which leads to this specific selection of programs. Furthermore, geography includes interdisciplinary overlaps with the other two study programs (1) + (2) - economic geography and the GIS section. In addition, focusing on geography, economics/business (group 1) is a popular and well-known study program and represents the largest number of graduates in our sample. Computer science graduates (group 2) are the top performers, both in terms of obtained wages and full-time employment.

Fig. 8: Relations between academic programs and the labor markets



Source: own draft

This figure is not meant to provide a comprehensive and clear-cut classification of academic disciplines' relations to the labor market, but it provides a useful way to address the fact that the relationships between academic education and the labor market are obviously very different, at least for these three categories of programs.

From the perspective of geographers, the most interesting is group 3, since an education meant for developing a synthetic understanding of our environment and society does not prepare students for a distinct set of occupations. The geographers' labor market is, by nature of the discipline, broad and diverse, and labor market entry must be confronted with the need to "sell" a profile of competencies that is neither directly related to a particular occupation nor based on a particular skill. Many accounts of geographers' employability more or less systematically address this feature of the subject and its graduates (Piróg, 2014a; Spronken-Smith, 2013; Hennemann & Liefner, 2010).

Based on these considerations, one must assume that graduates from a "group 3" subject experience more difficulties regarding labor market entry and performance than graduates of "group 1" or "group 2" programs. These challenges should not be mistaken, however, for being the most important feature describing programs such as geography, since case studies clearly show that geographers are satisfied with their study and career decisions despite these difficulties. Moreover, it shall be noted that geographers obtain higher average wages than the graduates of many other "group 3" – disciplines (Appendix 16).

To illustrate the gap in labor market outcomes between graduates of these three groups at the start of their careers and during the early career phase, we select one subject from each of these three groups - economics/business, computer science and geography - for the comparative empirical analysis in section 4.4.

4.3 Data, key variables and empirical strategy

For this study, we make use of the university panel, a comprehensive micro database, that links student records from four German universities with information from the Integrated Employment Biographies (henceforth IEB) of the Institute for Employment Research. The university panel covers graduates' higher education and their working histories. The student records stem from medium-sized universities located in semi-metropolitan areas in Germany³⁴. The data content for each graduate is a set of personal information such as date of birth, gender, nationality and information about their higher education (e.g. duration of study, certification date, final grade, types of graduation and subject of study). Moreover, the student records provide information on the place where the graduates obtained their university entrance

³⁴ Although these universities are medium-sized, they provide a broad spectrum of study programmes. Moreover, students have the opportunity to study physical geography as well as human geography at each location. These four universities are located in different regions in Germany, which are medium-sized, less densely populated and not part of large urban agglomerations.

diploma. The IEB contain detailed information on all individuals who are subject to social insurance contributions (vom Berge et al., 2013a), but does not include civil servants, self-employed persons and family workers. The database covers roughly 80 % of the workforce in Germany. The IEB are composed of episode data on unemployment, benefit receipt and employment as reported in the German Social Insurance System. Beginning and ending dates of each episode are contained in the IEB. The advantage of the university panel is that we can clearly depict the performance of a graduate's career entry and early career phase. Firstly, we are able to specify precisely the time period between the certification date and the begin date of the first reported employment episode after studying. Because the IEB contain detailed information on employment (type of employment, occupation, industry, wage) (further details in Teichert et al. 2020), we can secondly identify the types of jobs and salaries graduates obtain after studying. Thirdly, based on a legal requirement, the data is system-generated and administratively collected. Potential bias caused by selection errors within the studied sample of this paper and/or (un)conscious misrepresentation of sensitive variables such as wage or employment relationships is thus of less concern.

We seek to construct a relatively homogeneous sample of graduates contained in the university panel. We consider only graduates who having a degree in geography, computer science and business/economics. The geography degree is awarded to geography graduates regardless of their specialization within the discipline. Business/economics integrates management science and economics as a combined study program. Only the equivalent degrees Master³⁵, "Diplom" and "Magister Artium" are considered. Doctoral graduates are excluded because their degrees represent a further qualification, which should enable a better career start. Students who were older than 35 at the date of certification and those who have been enrolled for more than 20 semesters were excluded. Those with unreliable wage information and short employment spells (< seven days) were also removed. Implausibly high (more than twice the social security contribution assessment limit) or low (less than 450€ per month income for a full-time job) wages were not included in the analysis. The final sample consists of roughly 5,800 graduates who have completed their higher education in the period between 1996 and 2012 at the four universities of the panel in the three fields of study considered (geography: 1,200, economics/business: 2,900, computer science: 1,800). This sample has to be adjusted separately for each individual analysis step in this study.

³⁵ Please note: the vast majority of Master programs in Germany are consecutive, which means that they build on the Bachelor program and keep students in the same field of study.

In our empirical analysis, we first seek to illustrate the relationship between the three study programs and labor market outcomes at the start of graduates' careers by examining the top occupations and sectors of graduates in full-time positions one year after finishing their studies or how long it took them to enter the labor market. The completion of such a transition is equated with settlement in stable employment: a regular full-time job (ILO, 2017). We capture the length of this transition using the period between the last examination date and the start date of the first regular full-time employment period.

We then explore the labor market outcomes of graduates during their early career phase. The observation period ranges from the first year (certification date + 365 days) to the fourth year (certification date + 1,480 days) after final exams. We study how the employment status and the wage level evolve in this time period. We compare the shares of full-time employment versus other employment statuses (e.g. part-time jobs, marginal employment³⁶, unemployment) and the wages in full-time positions between graduates of the three selected study programs. We conduct regression analyses to obtain the gaps in full-time employment and wages between study programs and add different sets of control variables step by step to find other factors that could determine the gaps in labor market outcomes. Moreover, we check whether there are changes in the regression results between the first and fourth year of observation.

In line with our theoretical and conceptual considerations and existing empirical evidence, we include a large set of control variables: individual and study-related characteristics, work experience, job characteristics (sector affiliation), spatial mobility and regional characteristics (for definitions see Appendix 13). To measure work experience, we accumulate the number days in full/part-time and marginal employment periods and assign them to the corresponding time periods (before/during/after studies). The professional specialization in the German education system is complementary to a pronounced professional and sectoral segmentation of the labor market (Leuze & Strauß, 2009). For this reason, sector affiliations of jobs are included as control variables³⁷. The jobs of graduates are assigned to four sectors: universities, research & development, other public sector, and private sector. Because graduates are highly mobile at the start of their careers and in the early career phase, we adopt the widely used migration typology of Faggian (2007) and Faggian & McCann (2009) to capture migration patterns of graduates entering the labor market. If job changes occurring between the first and fourth year

³⁶ In Germany, so-called marginal employment encompasses casual and temporary jobs with a maximum of 15 working hours per week. Marginal jobs are traditional student jobs in Germany.

³⁷ For instance, wages and accession possibilities differ between sectors, and some sectors are characterized by special wage development mechanisms (e.g. collective agreements).

after final exams involve a change of workplace within or between regions, we constructed respective variables for the number of intra/inter-regional job changes. The administrative units for the mobility variables and regional features are spatial planning regions, which correspond to labor market regions.

4.4 Empirical results

4.4.1 Top 10 occupations and sectors

Firstly, we seek to illustrate whether the jobs of graduates in the three chosen fields of study concentrate in a small number of labor market segments or are widely spread across segments. For this purpose, we examine the top 10 occupations and sectors of the full-time jobs³⁸ in which graduates are employed one year after graduation. For business/economics (group 1), the direct and one-dimensional link between this study program and occupations (see section 4.2.3) is clearly evident. Here, most of the top ten occupations can be directly assigned to the banking/financial and consulting sector. This sector also accounts for the majority of full-time jobs one year after final exams³⁹. The top four occupations are office administrator (23 %), accountant (13%), banker (11%) and management consultant (8%) (Appendix 11). In comparison, the degree of skill specificity in education is highest among computer scientists, as 45% of the graduates in this subject work as "data processing specialists". However, they work in a wide range of different industries (Appendix 12). These two findings highlight the direct, but multidimensional link between this group 2 study program and the labor market. In the case of geographers, the top four occupations do not provide any indication of a clear-cut field of activity, because they carry out occupations with rather general unspecific tasks such as "office administrator" (20%), "natural scientist without further specification" (9%) or even "senior administrative specialist" (4 %). The occupation "natural scientist without further specification" comprises a range of occupations such as geographers, geologists, biologists etc. However, only a small fraction of geographers work in their original occupation. The full-time positions of geographers are also widely spread across sectors (Appendix 12). As occupations and sectors are rather heterogeneous, the indirect and multidimensional links between program and occupation blur the relationship between this group 3 study program and the labor market

³⁸ We observe similar rankings of the top 10 occupations when taking into account all regular full-time and part-time jobs in the first year after completing studies. However, there is one notable difference: many graduates work part-time as "lecturers/university teachers" at university. This is the second most important target occupation of geographers when regarding full and part-time jobs in the ranking.

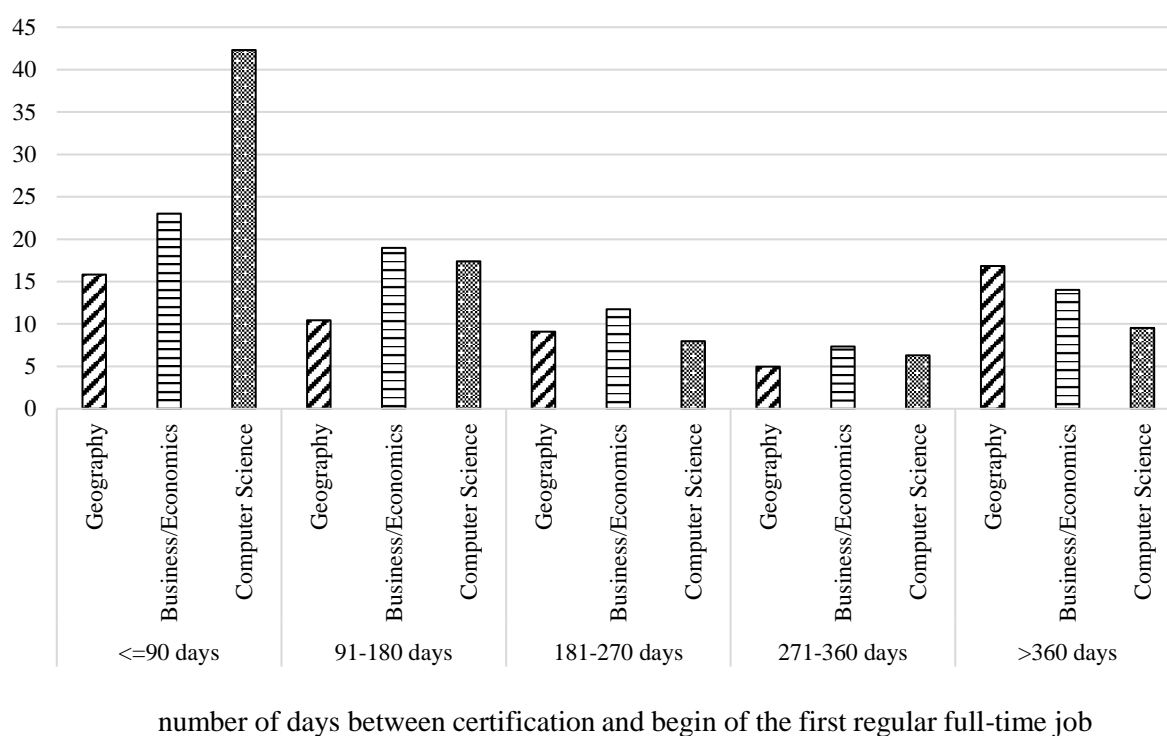
³⁹ The subject-specific rankings of the shares of full-time jobs in the top 10 sectors are depicted in Appendix 12.

(see section 4.2). The training of geographers in a particular occupational field therefore appears to be neither appropriate nor efficient.

4.4.2 Length of labor market transitions

Secondly, we focus on the length of university-to-work transitions (Figure 9). Overall, 27 % of the graduates in our sample take a full-time job within 90 days of graduation. It takes much longer for geographers to find a full-time position after completing their university studies than their peers. Almost 45 % of all computer science graduates enter the labor market within 90 days of finishing studies, with 23 % of the graduates in business/economics doing so. The corresponding share for geography graduates, with 16 %, is considerably lower. The proportion of geography graduates looking for a full-time job for more than 360 days is 17 %, much greater than the other two disciplines (computer science: 9 %; business/economics: 14 %).

Fig. 9: Length of university-to-work transitions



Note: Percentage shares of graduates in degree programs (n=5,828). The figure displays the share of graduates obtaining a *full-time* position by field of study and respective time period only.

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations.

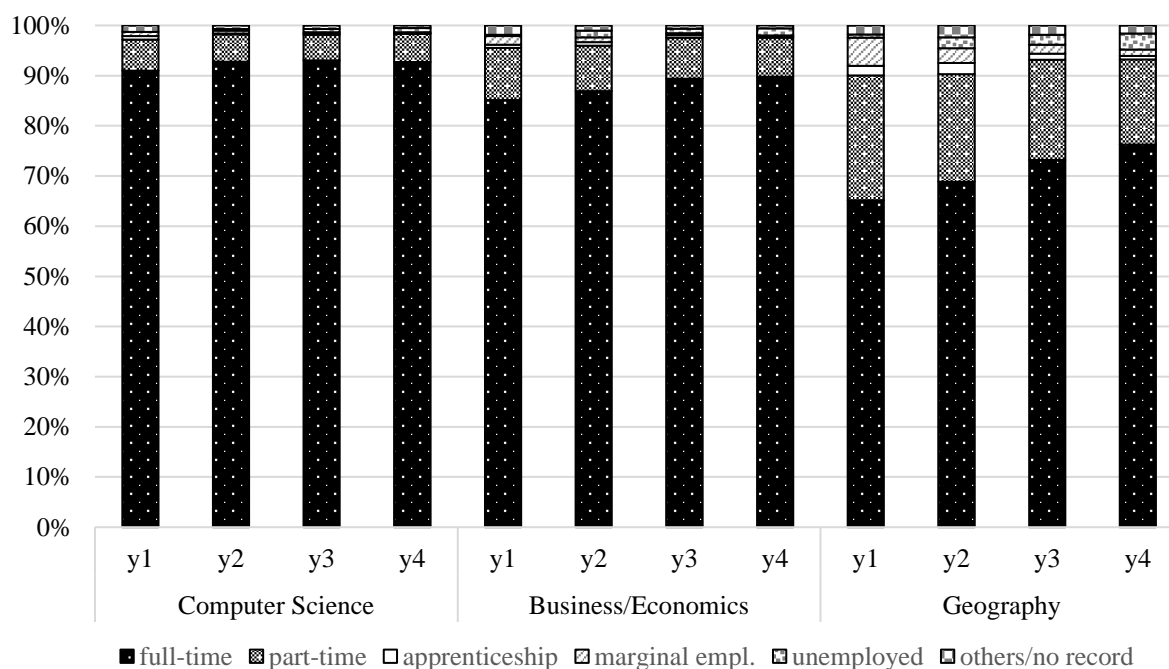
Overall, 61 % of the graduates in our sample found regular full-time employment within the first year after graduation. The proportion of graduates who need longer than one year to enter the labor market with a full-time position is 13 %. There is a sizable share of graduates (26%)

not finding a full-time job, but having other jobs such as part-time jobs, marginal jobs and apprenticeships, being unemployed or not registered in the IEB for diverse reasons (e.g. self-employment, civil service, foreign activity, subsequent studies, family phase, etc.) (see section 4.3).

4.4.3 Employment status

In this section, we depict in Figure 10 the employment status of the graduates after the four relevant time periods following final exams (see section 4.3). The share of graduates having a full-time job increases over time. This applies to all study programs. However, both the initial size of this share in the first year and the pace at which it increases in subsequent years differ considerably between fields of study. The majority of graduates in computer science (91%) held a full-time position one year after completing studies. A similar situation exists for business/economics with high shares of full-time jobs in year 1 (85%) and 4 (90%). The share of full-time employed geographers is 26 (20) percentage points lower than in computer science (business/economics) one year after graduation. In turn, a quarter (25 %) of the geography graduates are employed part-time in the first year, with the corresponding percentages in computer science (6 %) and in business/economics (10 %) being considerably smaller. Even though this share decreases afterwards among geographers, a sizable proportion (17%) of geographers are still working part-time in the fourth year after completing studies. Moreover, 10 % (7%) of geographers have employment statuses other than a regular full or part-time job, and are not well embedded in the labor market. This is true particularly for those graduates in this group who are either unemployed or have temporary and casual jobs (marginal employment). Unemployment among geographers even rises between the first and fourth year. Four years after graduation, the fraction of full-time employed geographers is still much lower than in the other two disciplines. The gap in full-time employment between geographers and the other two fields of study appears to persist. In Germany, but also in numerous other countries, social security standards (e.g. unemployment benefits, pension entitlements) are much better in full-time jobs than they are in part-time jobs, marginal jobs or internships, although standards differ between those job types. Since a sizable proportion of geographers engage in part-time or marginal jobs during the early career phase, a greater fraction of graduates in this subject face lower social security standards than in the other two fields of study.

Fig. 10: employment status year 1 to year 4 after graduation



Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Figure shows percentage shares of graduates in degree programs (n=4,879).

To summarize, a broad portfolio of occupations and sectors characterizes geographers' full-time jobs in the first year after completing studies. Computer scientists, and graduates in business/economics, take up a full-time position on the labor market much sooner after completing studies than geographers. In addition, geographers work more in part-time jobs rather than full-time jobs compared to graduates from the other two subjects. The indirect and multi-dimensional link of this group 3 study program goes along with an obviously longer job search and orientation period and also with lower quality kinds of employment. Hence, geographers have career prospects that are more uncertain and less clear when entering the labor market. Corresponding with our considerations in sections 4.2.2 and 4.2.3, a larger degree of occupational and/or skill specificity in the other two study programs appears to increase graduates' employability, enabling more advantageous labor market outcomes.

To explore which factors explain the likelihood of obtaining a full-time job, we conducted logit regressions (Table 7) for the first and fourth year after graduation. All other employment statuses (part-time, apprenticeship, marginal jobs, unemployment, not registered) are lumped

together, so that our dependent outcome variable is binary (full-time employment = 1).⁴⁰ The different sets of control variables (see section 4.3) are included step by step in Models 1 to 3 which refer altogether to the first year after completing studies. We then compare the effects of the full models between the first year (Model 3) and fourth year (Model 4). In Model 4, we additionally include accumulated working experience and intra/inter-regional job mobility after graduation.

The main finding of our regression analysis is that geographers have a significantly lower probability of holding a full-time job one year after graduation compared to economists (reference category), whereas computer scientists have an even greater likelihood. This difference is not only evident when the pure (unadjusted) effects of fields of study (see Appendix 14) are considered in the first year, but the result holds even when all sets of explanatory variables are included in Models 1 to 3. These differences between the subject-specific coefficients can still be observed four years after graduation. Hence, the lower likelihood of geographers being employed full-time, compared to the reference category seems to be more entrenched during the early stages of their careers.

A closer look at the control variables in Model 1 shows that study-related signals such as exam grades,⁴¹ type of degree and specific types of previous work experience – vocational training before studies and regular employment during studies – strongly affect the likelihood of having a full-time job in the first year after completing studies. In this regard, regular employment and an apprenticeship have two advantages: first, these are more reliable jobs with better access to local contacts and knowledge of job offers compared to casual and temporary student jobs (marginal employment), and second, regular employment and vocational training can be considered as practical signals for lower training costs (Teichert et al. 2020). Mobile graduates (migrants, repeat migrants, return migrants) who leave the university region are more likely to have a full-time position one year after graduation. The same applies to the sector affiliation of jobs. We find indications that all sectors considered (private sector, R&D, other public service) employ significantly more people in full-time positions than a university job. The greater

⁴⁰ The regressions refer to a reduced sample of graduates because only those with a recorded spell in the IEB at both time points - one year and four years after the date of certification - are taken into account.

⁴¹ The effect presented here may be surprising: graduates with the grades "satisfactory" and "good" seem to be more likely to obtain a full-time job than graduates with "very good". Pozzoli (2009) assume that very good graduates are more choosy and are initially somewhat hesitant to accept a job if it does not completely meet their expectations. However, when controlling for the employment sector, the significant disadvantage is no longer apparent. It is important to note that graduates with very good degrees are more inclined to do a PhD, i.e. they are more likely to enter the labor market at university as part-time research assistants.

positive sector coefficients in the fourth year after graduation indicate that this difference has even become stronger.

Tab. 7: Logit-regressions on the probability of having a full-time job (=1)

| Model | Year 1 | | Year 1 +sector | | Year 1 all explanatory var. | | Year 4 all explanatory var. | |
|-------------------------------------|-----------|---------|-------------------|---------|--------------------------------|---------|--------------------------------|---------|
| | (1) | | (2) | | (3) | | (4) | |
| | coef | se | coef | se | coef | se | coef | se |
| Field of study | | | | | | | | |
| (ref. Business/economics) | | | | | | | | |
| Geography | -0.727*** | (0.143) | -1.009*** | (0.153) | -0.984*** | (0.155) | -0.769*** | (0.194) |
| Computer science | 1.288*** | (0.154) | 1.444*** | (0.171) | 1.354*** | (0.177) | 0.905*** | (0.207) |
| Individual characteristics | | | | | | | | |
| Female | -0.100 | (0.121) | -0.197 | (0.127) | -0.183 | (0.128) | -0.584*** | (0.155) |
| Age | -0.027 | (0.488) | -0.230 | (0.519) | -0.139 | (0.521) | 0.059 | (0.619) |
| Age ² | 0.002 | (0.009) | 0.005 | (0.009) | 0.004 | (0.009) | -0.001 | (0.011) |
| Foreigner | 0.071 | (0.271) | 0.034 | (0.283) | -0.024 | (0.284) | 0.381 | (0.377) |
| Higher education | | | | | | | | |
| Exam grade (Ref.: very good) | | | | | | | | |
| Satisfactory | 0.841*** | (0.173) | -0.281 | (0.194) | -0.295 | (0.194) | 0.007 | (0.261) |
| Good | 0.637*** | (0.124) | 0.007 | (0.138) | 0.006 | (0.138) | -0.142 | (0.164) |
| Other degrees (Ref: Diploma/Master) | | | | | | | | |
| Study length | -0.416 | (0.233) | -0.856*** | (0.249) | -0.910*** | (0.250) | -0.509 | (0.309) |
| Year of graduation | -0.015 | (0.018) | -0.026 | (0.018) | -0.022 | (0.019) | -0.010 | (0.024) |
| | yes | | yes | | yes | | yes | |
| Work experience | | | | | | | | |
| Vocational training | 0.396* | (0.169) | 0.301 | (0.175) | 0.307 | (0.175) | 0.048 | (0.227) |
| Experience (in 100 days) | | | | | | | | |
| before higher education | | | | | | | | |
| marginal empl. | 0.023* | (0.010) | 0.016 | (0.010) | 0.014 | (0.010) | 0.027* | (0.014) |
| regular empl. | -0.016 | (0.020) | -0.023 | (0.020) | -0.023 | (0.020) | -0.037 | (0.023) |
| during higher education | | | | | | | | |
| marginal empl. | -0.068 | (0.045) | -0.028 | (0.050) | -0.022 | (0.050) | -0.099 | (0.064) |
| regular empl. | 0.247* | (0.103) | 0.222* | (0.108) | 0.212* | (0.107) | 0.181 | (0.146) |
| after higher education | | | | | | | | |
| regular empl. | | | | | | | 0.209*** | 0.027 |
| Mobility | | | | | | | | |
| Mobility (ref. stayer) | | | | | | | | |
| staying migrants | -0.069 | (0.147) | 0.160 | (0.165) | 0.174 | (0.164) | | |
| migrants | 1.252*** | (0.161) | 0.922*** | (0.174) | 0.715*** | (0.186) | | |
| returning migrants | 1.392*** | (0.220) | 0.927*** | (0.234) | 0.750** | (0.240) | | |
| repeat migrants | 1.347*** | (0.143) | 1.020*** | (0.157) | 0.779*** | (0.173) | | |
| N. of intra-regional job moves | | | | | | | -0.008 | 0.011 |
| N. of inter-regional job moves | | | | | | | 0.016 | 0.018 |
| Sector | | | | | | | | |
| Sector (ref. University) | | | | | | | | |
| R&D | | | 0.738** | (0.229) | 0.620** | (0.237) | 0.614* | (0.279) |
| other public sector | | | 1.959*** | (0.268) | 1.902*** | (0.268) | 2.155*** | (0.273) |
| private sector | | | 2.454*** | (0.153) | 2.362*** | (0.155) | 3.022*** | (0.187) |

| Spatial | | | | |
|------------------------------|---------|----------|---------|----------|
| Regional GDP in mill. Euro | 0.000 | (0.000) | 0.000** | (0.000) |
| Regional GDP growth per year | 0.041 | (0.044) | 0.023 | (0.042) |
| Region (ref. Agglomeration) | | | | |
| urbanized region | -0.293 | (0.170) | 0.039 | (0.199) |
| rural region | -0.345 | (0.199) | -0.008 | (0.240) |
| constant | 0.065 | (-6.868) | 1.800 | (-7.289) |
| | | | 0.545 | (-7.320) |
| Wald-Chi ² | 395.113 | | 564.759 | 575.983 |
| Prob. > Chi ² | 0.000 | | 0.000 | 0.000 |
| Pseudo R ² | 0.1542 | | 0.2521 | 0.2561 |
| N. of cases | 3766 | | 3766 | 3766 |
| | | | | -2.859 |
| | | | | (-8.782) |
| | | | | 504.631 |
| | | | | 0.000 |
| | | | | 0.3035 |
| | | | | 3766 |

* p<0.05, ** p<0.01, *** p<0.001

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: coefficients and robust standard errors are reported.

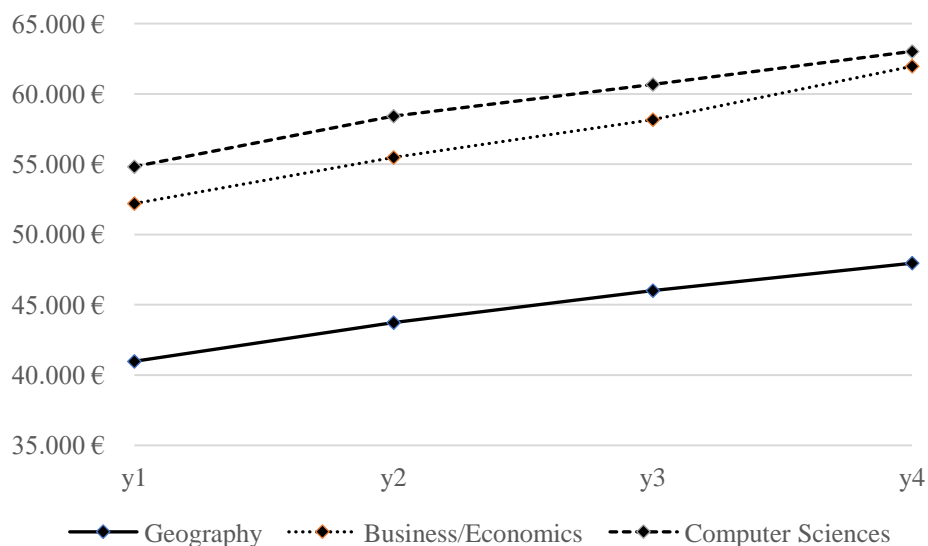
Four years after graduation, the strongest effects on the likelihood of being employed full-time are observed for the sector affiliation of the full-time job and the study program (Model 4). Graduates are most likely to hold a full-time position when employed outside the university sector. Geographers (computer scientists) still face a lower (higher) chance of obtaining a full-time job than economists (base category). Human capital acquired before graduation, study-related characteristics and previous work experience no longer have an impact. Instead, work experience acquired after studies has relevance for obtaining a regular position. The probability of female graduates having full-time employment is significantly lower. For instance, working part-time due to family commitment or discrimination caused by an employer's assumption that women of childbearing age could become pregnant might drive this outcome.

4.4.4 Wage level

In this section, we analyze the trends in earnings that graduates obtained in full-time positions during their early career phase and the factors affect the wage level. As outlined in section 4.2.2, pecuniary motives, the financial returns of educational investments, also drive the choice of field of study. Wage reports to the social security system are right-censored because wages are only reported up to the upper contribution limit of German social insurance (for 2020 about € 83,000 / US\$ 98,000 annually). We account for this issue with a wage imputation following Gartner (2005). This implies that the wage distribution above the contribution limit is estimated. Accordingly, the influence of the right-censored bias on the regression is eliminated. The wage information was also deflated to be able to study changes over time. Because wage information is only reliable for full-time employment, the sample is restricted to those graduates holding a

full-time position in the first and fourth years after graduation⁴². This section is organized similarly to 4.4.1, describing the geographers' lag in wages first, and then analyzing its causes.

Fig. 11: Yearly gross median wages in full-time jobs



Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: n=4,229.

Figure 11 shows the trends of yearly gross median wages obtained in full-time employment after completing studies. Geographers in our sample earn about € 41,000 before tax (currently about US\$ 48,000) in the first year, which is about € 12,000 (€ 13,800) less than graduates of business/economics (computer sciences). Note, having a closer look at the starting salaries of graduates in other disciplines of group 3, it is clearly evident that geographers obtain considerably higher wages. For instance, graduates of social sciences, arts or cultural studies earn up to € 8,000 less per year than geographers at the start of their career (see Appendix 16). This wage gap between geographers and their peers of the other two disciplines does decrease slightly during the first four years. After the four-year period, business/economics graduates earn almost as much as the computer science graduates. The linear and parallel wage increases of the three study programs' graduates imply a gradual and partial closing of this wage gap in relative terms.

⁴² The methodological challenges described in section 4.3 are particularly evident for this topic. Voluntary information on sensitive issues such as wage is subject to many responses of social desirability. Since we are *not* using survey-based but rather administrative data, this issue does not apply to us and emphasizes the value of our unique data set

Table 8 shows the results of log-linear OLS regressions with the log yearly gross wage in full-time positions as the dependent variable in the first year (Model 1 to 3) and fourth year (Model 4) after graduation. If only fields of study are taken into account (Appendix 15), geographers receive a salary 21.9 % below that of economists (reference category). Even if we include a large set of control variables in our full Model 3 for the first year after completing studies, the wage gap between geographers and the base category (economics/business) does not change considerably. Geographers with comparable academic achievements, similar work experience, a willingness to migrate and corresponding sector affiliations of jobs etc. nevertheless earn a salary 23 % lower than that of graduates in economics/business (reference). We obtain similar regression results in the fourth year after studies: the pure (unadjusted) wage gap between geographers and the base group amounts to -22.5%, while the corrected gap in the full model (Model 4) is -20.8 %.

With respect to the control variables, the regression results indicate that individual and study-related characteristics are relevant for graduates' wages in the first and fourth year after completing studies. The full models (Model 3, Model 4) show that female graduates earn less than their male counterparts, and better performing graduates obtain significantly higher salaries than graduates with lower final grades. Moreover, a shorter study length pays off in terms of higher wages. However, work experience obtained during studies impacts the wage level only at the start of graduates' careers. Having gained experience in regular jobs during the study period also increases the likelihood of obtaining better wages. This, however, is not the case for temporary and casual student jobs (marginal employment). These educational credentials and practical work experiences may be interpreted by employers as additional signals to the field of study for a higher productivity of graduates and thus a shorter phase of training on the job, and are rewarded with higher pecuniary returns. In the fourth year, only post-university work experience matters, because the skills learned on the job gain in importance during the early career phase. Taking up a full-time position outside the university region in the first year is positively correlated with the wage level. This applies to the three mobility types - repeat migrants, return migrants, and migrants. Intra and inter-regional job changes during the early career phase show only a rather small or no effect.

When controlling for sector effects, the full models for the first year (Model 3) and fourth year (Model 4) indicate stronger effects of the fields of study on wages than those of sectors. In both years, graduates have better earning opportunities in the private sector than at university (base category).

Tab. 8: OLS regression with logarithmic yearly gross wage in full-time jobs

| | <i>year1</i> | | <i>year1</i> +sector | | <i>year1</i> all explanatory var. | | <i>year4</i> all explanatory var. | |
|-------------------------------------|--------------|--------|-------------------------|--------|--------------------------------------|--------|--------------------------------------|-------|
| | (1) | | (2) | | (3) | | (4) | |
| | coef | se | coef | se | coef | se | coef | se |
| Field of study | | | | | | | | |
| (ref. Business/economics) | | | | | | | | |
| Geography | -0.275*** | -0,02 | -0.277*** | -0.021 | -0.266*** | -0.021 | -0.234*** | 0.021 |
| Computer science | 0.027* | -0,012 | 0.032** | -0.012 | 0.035** | -0.012 | -0.038** | 0.013 |
| Individual characteristics | | | | | | | | |
| Female | -0.105*** | -0,013 | -0.105*** | -0.013 | -0.106*** | -0.013 | -0.115*** | 0.014 |
| Age | 0.039 | -0,054 | 0.041 | -0.054 | 0.052 | -0.054 | 0.154** | 0.051 |
| Age ² | -0.001 | -0,001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.003** | 0.001 |
| Foreigner | -0.025 | -0,025 | -0.024 | -0.025 | -0.026 | -0.025 | 0.028 | 0.028 |
| Higher education | | | | | | | | |
| Exam grade (Ref.: very good) | | | | | | | | |
| Satisfactory | -0.098*** | -0,018 | -0.110*** | -0.019 | -0.110*** | -0.019 | -0.088*** | 0.019 |
| Good | -0.019 | -0,013 | -0.028* | -0.014 | -0.028* | -0.014 | -0.002 | 0.015 |
| Other degrees (Ref: Diploma/Master) | | | | | | | | |
| Study length | -0.035 | -0,028 | -0.041 | -0.028 | -0.038 | -0.028 | 0.017 | 0.025 |
| Study length | -0.005** | -0,002 | -0.005** | -0.002 | -0.006** | -0.002 | -0.005* | 0.002 |
| Year of graduation | yes | | yes | | yes | | yes | |
| Work experience | | | | | | | | |
| Vocational training | 0.024 | -0,015 | 0.021 | -0.015 | 0.018 | -0.015 | 0.019 | 0.016 |
| Experience (in 100 days) | | | | | | | | |
| before higher education | | | | | | | | |
| marginal empl. | 0.001 | -0,001 | 0.001 | -0.001 | 0.001 | -0.001 | 0.002 | 0.001 |
| regular empl. | 0.003 | -0,002 | 0.003 | -0.002 | 0.003 | -0.002 | 0.003 | 0.002 |
| during higher education | | | | | | | | |
| marginal empl. | -0.009* | -0,004 | -0.008 | -0.004 | -0.008 | -0.004 | -0.008 | 0.005 |
| regular empl. | 0.048*** | -0,009 | 0.048*** | -0.009 | 0.049*** | -0.009 | 0.011 | 0.010 |
| after higher education | | | | | | | | |
| regular empl. | | | | | | | 0.037*** | 0.004 |
| Mobility | | | | | | | | |
| Mobility (ref. stayer) | | | | | | | | |
| staying migrants | -0.007 | -0,019 | -0.003 | -0.019 | -0.004 | -0.02 | | |
| migrants | 0.110*** | -0,015 | 0.102*** | -0.015 | 0.062*** | -0.017 | | |
| returning migrants | 0.083*** | -0,021 | 0.075*** | -0.022 | 0.041 | -0.022 | | |
| repeat migrants | 0.134*** | -0,015 | 0.125*** | -0.015 | 0.084*** | -0.017 | | |
| N. of intra-regional job moves | | | | | | | -0.003* | 0.001 |
| N. of inter-regional job moves | | | | | | | 0.000 | 0.001 |
| Sector | | | | | | | | |
| Sector (ref. University) | | | | | | | | |
| R&D | | | -0.057* | -0.027 | -0.065* | -0.028 | 0.015 | 0.028 |
| other public sector | | | 0.039 | -0.028 | 0.032 | -0.028 | 0.104*** | 0.024 |
| private sector | | | 0.042** | -0.014 | 0.028* | -0.014 | 0.144*** | 0.016 |
| Spatial | | | | | | | | |
| Regional GDP in mill. Euro | | | | | 0.000*** | 0 | 0.000*** | 0.000 |
| Regional GDP growth per year | | | | | -0.004 | -0.004 | -0.002 | 0.004 |
| Region (ref. Agglomeration) | | | | | | | | |

| | | | | |
|------------------|----------|--------|----------|--------|
| urbanized region | 0 | -0.017 | 0.012 | 0.017 |
| rural region | -0.009 | -0.02 | -0.020 | 0.023 |
| constant | 4.453*** | -0.753 | 4.399*** | -0.755 |
| R-squared | 0.253 | | 0.257 | 0.266 |
| Prob. > F | 0.000 | | 0 | 0 |
| N. of cases | 3030 | | 3030 | 3030 |

* p<0.05, ** p<0.01, *** p<0.001

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: robust standard errors.

4.5 Discussion and Conclusion

This article analyzed the size of the gap between geographers, business/economics and computer science graduates regarding their labor market entry and performance remuneration, based on data from German university graduates. The results show, for example, that one in four geography graduates have not successfully sought a full-time position four years after graduation, and that their annual full-time salaries trail 14,000 € behind those of business/economics or computer science graduates. Even though, geographers obtain considerably higher wages than graduates of other disciplines such as social sciences, arts or cultural studies. Although these numbers reflect the situation of the German labor market, they may be taken as an indication of general discipline-related differences.

Because the data analyzed allow for a multivariate calculation of statistical relations, this paper has explored which factors in addition to the field of study explain the existing differences. The results of the regression models highlight the effects of individual and study-related characteristics as well as sector affiliations, mobility and regional features, but among many other interesting relations, they clearly illustrate the strong effect of the field of study even when applying a range of other important controls.

The existence of performance gaps and their direction can be understood against the background of well-established theoretical approaches that were outlined in section 4.2. This analysis contributes to these established labor market theories, as it points to the need to pay more attention to the nature and impact of different subjects and in particular to the relations between university subjects and labor markets.

This paper's empirical findings can be compared with previous findings of education and labor market studies. For example, according to Tura (2020), the different durations of transitional periods into a regular full-time job may be due to required extra-curricular training, internships or postgraduate courses, among other things that improve employability and to overcome

potential deficiencies in the existing curricula. However, discussing the results based on higher education geography may lead to more specific insights and avenues for further research.

The assumption that geographers face particular difficulties on the labor market has sometimes been used to question geography as a study field, particularly in situations of budgets constraints and attempts at restructuring university education programs. This paper provides information that helps to objectify geographers' labor market performance on the one hand and its determinants on the other: the performance gap is visible, but its magnitude seems too limited to objectively distract prospective students. Further, the geographers' performance gap is also reduced in absolute or at least relative terms over time. Besides, graduates of other fields of study with indirect and multi-dimensional links to the labor market (group 3) often earn much less than geographers.

Moreover, the characteristics of the student population in relation to the prospective labor market constitute a major argument, which is hidden in the variables that were applied in the regression analyses. Geography students not only enter academia with slightly lower grades, they also choose a broad and issue-centered field that promotes a synthetic perspective on spatial problems. This corresponds with the variety of professions targeted by geographers, indicating a good match between motivations and preconditions of the student population and their readiness to invest the time and effort in studying important content at the expense of a pre-determined job perspective. Higher education geography successfully prepares students for a career under conditions of variety and unspecified career paths, and thus labor market performances are not unconditionally comparable to those of other subjects. Many people will acknowledge that the dramatic changes which are underway in our natural systems and our societies create a growing need for graduates who are ready to apply their knowledge where it is needed, and not necessarily where the highest salaries are paid.

Although people may accept the existence and importance of these qualitative attributes of the subject and its students, those who are responsible for teaching geography in universities should still aim to improve graduates' labor market performance. A few starting points become evident from this paper's analysis. Firstly, the subject-inherent uncertainty about careers calls for a focus on teaching adaptable skills, in particular concepts that help to deal with complexity and methods that may be broadly applied in different contexts. Secondly, it will be important to provide students with opportunities to explore the relevance of what they learn in the context of professional work (see Spronken-Smith, 2013), i.e. in the form of internships. Thirdly,

professors should encourage the discussion of job perspectives and arrange opportunities for students to establish contact with geography professionals from different jobs.

Looking forward, it seems reasonable to anticipate a growing need for professionals with a problem-centered geographical background who can contribute to exploring and implementing solutions in the context of climate change, resource depletion and social divisions, etc. that will secure job opportunities for geographers. The meaningfulness of geographers' knowledge may thus be understood as having characteristics of a merit good, which may allow for a low degree of skill-specificity and direct job-relatedness.

Future research should address this assumption. This implies, firstly, establishing a concept, and hopefully a measurement, for meaningfulness or societal need. Secondly, such an understanding should be used to test the hypothesis that the degree of meaningfulness may negatively correlate with monetary rewards, which explains a part of the as yet unresolved remuneration gap reported in this paper. Third, this could also be achieved with a more differentiated analysis that compares the labor market performance of geographers with different specializations (e.g. GIS-specialists versus ecologists). Fourthly, it seems necessary to learn more about the motivations and values of geography students and graduates, again in comparison to other subjects.

These avenues for further research address some of the obvious limitations of the present study. Other limitations, which also narrow the findings' relevance and invite further research, result from the selection of geography, business/economics and computer science as study fields, and from this focus on the German example, which may of course reflect country-specific elements. Increasing the number of observations would allow for more fine-grained regression models, and a more content-rich job classification scheme would allow for a better specification of the exact tasks carried out.

KAPITEL 5

Resümee

In den folgenden und abschließenden Kapiteln werden die Ergebnisse dieser Dissertation zusammengefasst und die Forschungsbeiträge benannt. Ferner beschäftigt sich dieser Abschnitt mit den daraus ergebenden Implikationen für Theorie und Politik und schließt mit einer kritischen Einordnung sowie dem Aufzeigen von weiterem Forschungsbedarf.

5.1 Zusammenfassung der Hauptergebnisse

Die gesellschaftlichen und individuellen Rückflüsse der getätigten Bildungsinvestitionen in Humankapital hängen maßgeblich davon ab, ob und vor allem wie Absolvent*innen ihre Bildung im Arbeitsmarkt verwenden können (Iammarino & Marinelli, 2015). Räumliche Mobilität kann hierbei ein Mittel sein, die individuellen Arbeitsmarkterträge bzw. den regionalen Humankapitalstock zu beeinflussen. Diese Dissertation trägt dazu bei, das Zusammenspiel zwischen der Ausgestaltung des Arbeitsmarkteinstiegs und der damit verbundenen Mobilität näher zu beleuchten.⁴³

Artikel 1 beschäftigt sich in diesem Kontext mit der Frage, inwieweit vor und während des Studiums gewonnene Arbeitserfahrungen und deren räumliche Verortung einen Einfluss auf die Mobilität in der transitiven Phase haben, in der Hochschulabsolvent*innen den Übergang in den Arbeitsmarkt vollziehen. Hierbei wurde zwischen dem Ort, der Zeit, der Spezifität und der Art der Arbeitserfahrung differenziert. Die Ergebnisse deuten zunächst auf eine signifikante Verbindung zwischen dem Ort der gesammelten Arbeitserfahrung und der Wahrscheinlichkeit, die Hochschulregion zu verlassen, hin. Die Effektstärke hängt hierbei substanziell von der Art der Arbeitserfahrung ab. Reguläre Beschäftigungen in der Hochschulregion während des Studiums führen zu den deutlichsten regionalen „Klebeeffekten“ der Absolvent*innen. Ein differenzierter Blick zeigt, dass berufs- und sektorspezifische Erfahrungen in der Region in stark negativem Zusammenhang mit post-graduierter Mobilität stehen. Diese Ergebnisse betonen die Relevanz von Arbeitsmarktkontakten, lokalem Humankapital und sozialen Netzwerken für den Arbeitsmarkteinstieg und der damit verbundenen Mobilität.

Der zweite Artikel trägt dazu bei, die Einflussfaktoren auf die Länge der transitiven Phase besser verstehen zu können. Die Analyse konzentriert sich im Speziellen auf Arbeits- und

⁴³ Die statistischen Effekte von individuellen, studiumsbezogenen und regionalen Faktoren werden in der Zusammenfassung der Hauptergebnisse der drei Artikel nicht berücksichtigt.

Mobilitätserfahrungen der Absolvent*innen. Die Regressionsergebnisse zeigen, dass Absolvent*innen, die zum Studium in die Hochschulregion gezogen sind, schneller in den lokalen Arbeitsmarkt kommen als solche, die nach dem Studium eine (erneute) Mobilitätsentscheidung treffen. Unter Letzteren haben die sog. Heimkehrer (*return migrants*) die geringste Übergangsdauer. Beide Ergebnisse weisen auf den positiven Einfluss von lokal-spezifischen Arbeitsmarktkennntnissen und Kontakten für einen schnellen Einstieg hin. Jene müssen allerdings erst über eine gewisse Zeit aufgebaut werden und stehen hochmobilen Absolvent*innen, die zum Studium in und direkt nach dem Studium aus der Hochschulregion ziehen, entsprechend weniger zur Verfügung (mit Ausnahme der *return migrants*, die für die Heimatregion entsprechende Kenntnisse aufweisen können). Der Einstieg bei vorherigen Arbeitgeber*innen oder auch eine abgeschlossene Berufsausbildung wirken als starke Signale und haben einen positiven Einfluss auf die Kürze der Übergangszeit. Typische „Studierendenjobs“ – also Tätigkeiten mit max. 15 Arbeitsstunden/Woche, die vermehrt der Finanzierung des Lebensunterhaltes während des Studiums dienen, haben eine negative Wirkung auf die Dauer der transitiven Phase. Absolvent*innen mit Arbeitserfahrungen aus regulären Beschäftigungen während des Studiums stehen ambivalenten Einflüssen auf die Übergangsdauer gegenüber. Einerseits bleibt bei zeitgleicher regulärer Beschäftigung weniger Zeit zum Studieren, andererseits – in Einklang mit signaltheoretischen Ansätzen – kann es, gerade bei sektorspezifischer Tätigkeit, dem potenziellen Arbeitgebenden als Signal für erhöhte Produktivität und vermindertem Einarbeitungsaufwand dienen.

Artikel 3 identifiziert den Einfluss des Studienfachs auf die *performance* beim Arbeitsmarkteinstieg von Hochschulabsolvent*innen. Aus Sicht der Geographieabsolvent*innen ergeben die Analysen deutliche, über die Zeit sich nur relativ annähernde Entgeltunterschiede zu den Vergleichsstudiengängen (Wirtschaftswissenschaften und Informatik) in den ersten vier Jahren nach dem Arbeitsmarkteinstieg. Diese Herausforderung ist allerdings kein Alleinstellungsmerkmal der Geographie, sondern struktureller Natur bei Studiengängen mit indirekten und multidimensionalen Verbindungen zwischen Fach und assoziiertem Arbeitsmarkt. Deutlich werden diese differenzierten Verbindungen ferner durch die Analyse der Zielarbeitsmärkte, die bei den Geographieabsolvent*innen stark heterogen sind, was weitreichende Bedeutung für die Hochschulausbildung in diesem Fach hat. Ein weiteres performance-Merkmal im Arbeitsmarkt ist der Beschäftigungsstatus. Über 90% der Absolvent*innen der Geographie sind in den ersten vier Jahren nach Abschluss in regulärer Beschäftigung, allerdings deutlich vermehrt in Teilzeit als beispielsweise die Informatiker*innen. Die Auswertung der Einflussfaktoren auf diese unterschiedlichen

Arbeitsmarkteinstiege zeigt, dass die Wirkung des Studienfachs bedeutsam ist. Darüber hinaus ergibt sich eine erhöhte Teilzeitquote bei Frauen vier Jahre nach Abschluss. Auch gelingt der adäquate Einstieg je nach Beschäftigungssektor unterschiedlich, wobei die Vollzeitbeschäftigungswahrscheinlichkeit in der Privatwirtschaft am höchsten ist. Unabhängig davon wird deutlich, dass das Mobilitätsverhalten der untersuchten Absolvent*innen bei den zwei zentralen Merkmalen Beschäftigungsstatus und Entgelt eine Rolle spielt. Beide sind bei Absolvent*innen, die die Hochschulregion nach dem Studium verlassen, besser bzw. höher als bei solchen, die im lokalen Arbeitsmarkt einsteigen.

5.2 Forschungsbeitrag und Implikationen

Mit der kurzen Einordnung der oben genannten empirischen Ergebnisse werden die Forschungsbeiträge benannt und im Weiteren auf die daraus folgenden Implikationen eingegangen. Die Forschungsziele dieser Dissertation wurden unter anderem konzipiert, um eine Möglichkeit aufzuzeigen, wie mit neuen empirischen Wegen und bewährten methodischen Ansätzen thematisch neue Aspekte im Bereich der Hochschulabsolvent*innenforschung analysiert werden können.

Forschungsziel 1 strebt die Erstellung eines Datensatzes an, der mit der Verknüpfung administrativer Datenquellen mehrerer Hochschulen und Erwerbsbiographien in dieser Form einzigartig ist. Es entstanden über die Zeit einzelne Hochschulpanels, aus denen durch die in Kapitel 1.3.2 beschriebene Zusammenführung, Homogenisierung und Optimierung das Hochschulabsolvent*innenpanel generiert werden konnte, das die Grundlage dieser Dissertation bildet. Der wissenschaftliche Mehrwert ist nicht nur durch die Analysen der Kapitel 2 bis 4 belegt, auch wird dieser Datensatz wissenschaftspolitisch in der Stellungnahme des Evaluationsausschusses des Wissenschaftsrates zum IAB als Baustein der Hochschulforschung am IAB dezidiert honoriert (Wissenschaftsrat, 2019). Der mit dem Promotionsprojekt assoziierte Datensatz dient über die bereits durchgeführten Analysen hinaus als Grundlage für weitere, laufende Forschungs- und Publikationsprojekte. Nicht nur als Blaupause für weitere Hochschulstudien, sondern auch für andere, inhaltlich verwandte Projekte. Seine Anwendungsbereiche sind im Rahmen dieser Dissertation noch nicht ausgeschöpft (siehe Kapitel 5.3). Auch wird das Hochschulabsolvent*innenpanel für aktuelle politische Beratungsprojekte seitens des IAB genutzt.

Dass der Bedarf an Verlaufsdaten gerade in der Hochschulforschung und implizit auch in der Hochschulpolitik hoch ist, wird dadurch ersichtlich, dass die rechtlich stark reglementierte

Erfassung von Verlaufsdaten im Zuge der Novellierung des Hochschulstatistikgesetzes 2016 angepasst wurde (BGBl 2016, Teil I, Nr. 11, S. 342). Hierbei geht es auch um die Schaffung des rechtlichen Rahmens, die Verknüpfung von Stamm- und Prüfungsdaten zu ermöglichen. Somit können künftig Prädiktoren möglicher Misserfolge besser erkannt und gezielter beeinflusst werden. Die Erstellung des Hochschulabsolvent*innenpanels hat die Vorteile und Möglichkeiten solcher Datenstrukturen aufgezeigt und konnte mit der Inkorporation der Erwerbsbiographien von Absolvent*innen bei der Analyse der wichtigen Lebensphase der frühen Karriere helfen.

Das zweite Forschungsziel dieser Dissertation beinhaltet die Beantwortung von drei Forschungsfragen. Kapitel 2 stellt die Forschungsfrage F1 nach dem Einfluss verschiedener Faktoren der Arbeitserfahrung auf die Mobilitätsentscheidung der Hochschulabsolvent*innen. Bisherige Studien finden in dem Kontext Hinweise auf die Relevanz von Kontakten in den Arbeitsmarkt (Krabel & Flöther, 2014) oder betonen den negativen Zusammenhang zwischen Mobilitätsneigung der Absolvent*innen beim Arbeitsmarkteinstieg, wenn diese während des Studiums Arbeitserfahrungen gesammelt haben. Haapanen und Karhunen (2017) vermuten hierbei, dass dies an lokal gewonnenen Erfahrungen und Kontakten liegt. Allerdings fehlt diesen Studien die genaue Verortung der Arbeitserfahrungen, noch weisen sie eine Differenzierung eben dieser auf. Die in Artikel 1 durchgeführte Analyse versucht genau diese Forschungslücke zu schließen, indem sie Arbeitserfahrungen in die Faktoren Ort, Zeit, Spezifität und Art unterteilt und den Einfluss dieser auf die Mobilitätsentscheidung untersucht. Aus den gewonnen Erkenntnissen lassen sich multiple Implikationen ableiten. Aus regionalpolitischer Sicht scheint es sinnvoll, die Anstrengung der Zusammenarbeit von Hochschulen, lokalen Arbeitgeber*innen, Industrie- und Handelskammern und weiterer Akteur*innen voranzutreiben, um den Studierenden die Möglichkeiten des lokalen Arbeitsmarktes aufzuzeigen. Auch die Implementierung von praktischen Studienelementen in die Curricula ermöglicht es Studierenden, ohne größeren Zeitverzug Einblicke in den Arbeitsmarkt zu erlangen und entsprechende Kontakte zu knüpfen. Solche Implikationen sind gebunden an die Verfügbarkeit passender Jobs und Vergütungsmöglichkeiten in der Hochschulregion, da es sonst zur Abwanderung der Absolvent*innen kommen kann. Sollte dies geschehen, ergäbe sich hieraus ein Konflikt zwischen den Entwicklungschancen der Hochschulregion und den Karriereaussichten der Absolvent*innen.

Kapitel 3 setzt sich mit der Länge der Übergangsphase von der Hochschule in den Arbeitsmarkt auseinander. Robuste Evidenzen bestehen in diesem Kontext bereits zu dem Einfluss von

individuellen und studiumsbezogenen Faktoren. Ferner ist die Bedeutung von Arbeitserfahrungen und Mobilität für den Erfolg im Arbeitsmarkteinstieg von jungen Hochschulabsolvent*innen bereits wesentlich untersucht – allerdings nicht deren Einfluss auf die Länge der Übergangszeit. Um die Forschungsfrage F2 zu beantworten, erweitert die vorliegende Untersuchung die bestehenden Verbleibsdaueranalysen um differenzierte Angaben zur Art, Zeit und Spezifität der Arbeitserfahrung und bezieht etablierte Mobilitätstypen mit ein. Die Ergebnisse geben Hinweise darauf, dass Arbeitsmarktkenntnisse und entsprechende Netzwerke auch die Dauer der transitiven Phase verkürzen. Ferner legen sie nahe, dass Mobilität nach dem Studium (außer bei Rückkehrer*innen) die transitive Phase verlängert. Um die Entwertung des Humankapitals durch eine zu lange Übergangsphase zu vermeiden, ist es aus individueller Sicht wichtig, passende Maßnahmen zu ergreifen. Hochschulpolitische Implikationen unterstützen ferner weitestgehend Empfehlungen des vorigen Abschnitts. Zur Weiterentwicklung des verwendeten theoretischen Ansatzes, des job search models, wurden differenzierte Elemente aus Mobilität und Arbeitserfahrungen ergänzt, welche signifikante Einflüsse aufwiesen.

Die Quantifizierung der Erfolgsunterschiede beim Arbeitsmarkteinstieg, gemessen am Entgelt und der Vollzeitbeschäftigung, und deren Wirkungsfaktoren standen im Fokus von Forschungsfrage F3. Zur Beantwortung dieser wurde in Kapitel 4 aus der Perspektive der Geographie ein systematischer Vergleich zu Absolvent*innen aus den Wirtschaftswissenschaften und der Informatik durchgeführt. Bisherige Studien betrachtet die Geographie im Forschungskontext entweder aggregiert in größeren Forschungsfeldern oder singular, was den Vergleich zu anderen Studienfächern und die Einordnung der Ergebnisse erschwert. Die im *most-different-case* Design konzipierte Untersuchung basiert auf einem hierfür entwickelten konzeptionellen Rahmen, der die Studiengänge aufgrund ihrer Beziehung zu den jeweils assoziierten Arbeitsmärkten kategorisiert. Stellvertretend für die betrachteten Kategorien wurden Absolvent*innen der drei oben genannten Studiengänge ausgewählt. Mit allen dem Datensatz inhärenten Vorteilen konnte somit erstmals herausgearbeitet werden, dass die Entgelthöhe der Geograph*innen in den ersten vier Jahren nach ihrem Abschluss rund 14.000€ hinter dem der Informatiker*innen und Wirtschaftswissenschaftler*innen zurückbleibt, sich aber relativ gesehen verkleinert. Auch zeigt sich, dass Geographieabsolvent*innen deutlich häufiger in Teilzeitbeschäftigungen angestellt sind, als die Vergleichsgruppen. Als Einflussgrößen neben dem Studienfach werden individuelle, weitere studiumsbezogene und regionale Faktoren identifiziert. Als hochschulpolitische Implikation lässt sich ableiten, dass den uneindeutigen Karrierewegen der Geographieabsolvent*innen dadurch Rechnung zu tragen ist,

im Studium transferierbare Fähigkeiten und Methodenkenntnisse zu vermitteln, die dann im Arbeitsmarkt in verschiedenen Kontexten angewendet werden können. Ferner auch hier der Appell nach – sofern nicht schon implementiert – verstärkten Möglichkeiten, praktische Erfahrungen im Studium einzubetten und auch Informationen über und von Absolvent*innen mit unterschiedlichsten Karriereverläufen den Studierenden zugänglich zu machen, damit diese eine klarere Vorstellung bekommen können, an welchem Karriereweg sie ihre Ausbildung ausrichten.

Zusammenfassend betonen die Forschungsbeiträge die Wichtigkeit der Berücksichtigung von Arbeitserfahrungen und Mobilitätsverhalten bei der Analyse des Arbeitsmarkteintritts von Hochschulabsolvent*innen. Diese bis dato nicht zusammen und in dem vorliegenden Differenzierungsgrad analysierten Einflussfaktoren wirken sehr heterogen auf die untersuchten Messgrößen des Arbeitsmarkteintritts. Die in Kapitel 1.1 genannten Zielgruppen können unterschiedliche Erkenntnisse aus dieser Arbeit ziehen. Studierende haben die Möglichkeit, durch spezifische Arbeitserfahrungen während des Studiums notwendige Kontakte und Netzwerke in den Arbeitsmarkt zu knüpfen, die ihnen später helfen, die Übergangsphase nach dem Abschluss signifikant zu verkürzen. Wenn dies Berücksichtigung bei der Gestaltung der Curricula findet und praktische Studienelemente eingebettet werden, profitieren Studierende auch von einem verzögerungsfreien Studienverlauf. Ferner zeigt sich, dass Doppelqualifizierte – mit ihren praktischen Erfahrungen – Vorteile aus der ihrem Studium vorgeschalteten Bildungsinvestition ziehen können. Darüber hinaus ist ersichtlich, dass die Wahl des Studienfachs der mit Abstand wichtigste Prädiktor für Indikatoren wie beispielsweise das Entgelt ist. Hochschulen können mit auf diese Art gewonnen Informationen zu dem Arbeitsmarkterfolg „ihrer“ Absolvent*innen beitragen, indem potenziellen Studierenden eine breitere Informationsbasis zur Verfügung gestellt und so ein Beitrag zu verminderten Abbruchquoten geleistet wird. Auf der anderen Seite sind diese Informationen im Werben um Nachwuchskräfte ein hilfreiches Instrument. Regionale Arbeitgebende können durch genau angepasste Beschäftigungsangebote Vorteile aus der frühen Beschäftigtenbindung ziehen und haben so Einfluss auf mögliche Mobilitätspläne der späteren Absolvent*innen. Aus regionalpolitischer Sicht bietet es sich an, den Austausch zwischen den beteiligten Akteur*innen von Hochschule und regionalen Arbeitgebenden stärker zu institutionalisieren, um so den Absolvent*innen die Beschäftigungsperspektiven der Region besser zu vermitteln und entsprechend mittel- und langfristig von einer gelungenen Integration der Hochqualifizierten in den regionalen Arbeitsmarkt zu profitieren.

5.3 Limitationen und zukünftige Forschungsansätze

Die empirischen Ergebnisse dieser Arbeit sind vor dem Hintergrund einiger Limitationen zu verstehen. Hierbei ist zunächst auf die Anzahl der im Hochschulabsolvent*innenpanel integrierten Hochschulen einzugehen. Sechs davon konnten bis dato die erforderlichen administrativen und rechtlichen Voraussetzungen schaffen, um die benötigten Daten bereitzustellen. Diese Hürden und der enorme Aufwand bei der Verknüpfung und Optimierung der Datensätze lies eine Ausweitung nicht zu. Alle sechs Hochschulen liegen in Deutschland, was entsprechend mit spezifischen Besonderheiten einhergeht und die Generalisierbarkeit über die Landesgrenze hinaus beeinträchtigt. Auf der anderen Seite sind die behandelten Mechanismen an strukturelle Faktoren gebunden und diese sind wiederum in gewissem Maße vergleichbar. So ist beispielsweise der Vorteil von Kenntnissen und Kontakten in den (lokalen) Arbeitsmarkt nicht primär an nationale Begebenheiten gebunden. Ferner liegen alle Hochschulen in semi-metropolitanen Regionen in den alten Bundesländern. Die lokale Verfügbarkeit von Arbeitsplätzen beeinflusst maßgeblich den Arbeitsmarkteinstieg und das Mobilitätsverhalten der Absolvent*innen. Da diese in Großstädten und stark urbanen Räumen naturgemäß größer ist, kann die Betrachtung von mittelgroßen Städten hierbei nur grundsätzliche Aspekte beleuchten. Der Fokus der Analysen dieser Arbeit liegt allerdings auf der Betrachtung von eben diesen Räumen, da sie vermehrt Probleme aufweisen, hochmobile Absolvent*innen zu halten. In der Natur der verknüpften Daten liegt es, dass tatsächliche Motive der Absolvent*innen für/gegen Mobilität und Arbeitsmarkteinstieg nicht abgebildet werden können. Gerade auch Beweggründe für ein Studium mit weniger ausgiebigen monetären Bildungsrenditen (Kapitel 4) würden in der Analyse auch theoretische Weiterentwicklungen ermöglichen, da inhaltsbezogene Begründungen für ein Studium hier noch wenig Aufmerksamkeit erhalten haben. Eine Verbindung mit qualitativer Forschung würde daher einen Mehrwert bringen und helfen, die vorhandenen Ergebnisse besser einordnen zu können. Die Motivlage der einzelnen Absolvent*innen war allerdings nicht Schwerpunkt dieser Arbeit, sondern zunächst das quantitative Abbilden der Einflussfaktoren auf den Arbeitsmarkteinstieg und die Mobilität. Einige Variablen sind nicht flächendeckend verfügbar und wurden daher in den Analysen nicht berücksichtigt. Beispielhaft zu nennen ist hier die Note der Hochschulzugangsberechtigung. Diese hätte faktischen Mehrwert für die Analysen bedeutet, da sie im Forschungskontext dieser Arbeit eine Rolle spielt (z.B. Braakmann, 2013; Di Cinto & Grassi, 2013).

Einige dieser Limitationen adressieren konkrete Forschungsansätze, die zukünftig weiterentwickelt und umgesetzt werden (könnten). Offenkundig ist zunächst eine Erweiterung an Hochschulen, die in das Absolvent*innenpanel mit aufgenommen werden. Hierdurch kann das Herausarbeiten von räumlichen Unterschieden besser ermöglicht werden. Allerdings ist der administrative Aufwand, die Daten so vorzubereiten, dass die Integration dieser möglichst ressourcenschonend von statten gehen kann, sehr hoch. Da im Zuge der Novellierung des Hochschulstatistikgesetzes von 2016 substanziell mehr Informationen zu Studienverläufen von den Hochschulen erfasst und auch rückwirkend nach festen Vorgaben codiert werden, bestehen zumindest technisch und theoretisch bessere Voraussetzungen, geeignete Daten seitens der Hochschulen bereitstellen zu können.

Die empirischen Herausforderungen, die mit Befragungsdaten in Zusammenhang stehen, sind in Kapitel 1.1.1 aufgeführt. Hierzu zählen unter anderem Selektionsfehler und Verzerrungen durch Antworten der sozialen Erwünschtheit. Als Weiterentwicklung von dem vorliegenden Forschungsprojekt könnte der Datensatz dazu verwendet werden, das Ausmaß dieser Fehler zu quantifizieren. Dies wäre aus wissenschaftlicher Sicht sehr vielversprechend und könnte dabei helfen, die Störgrößen einordnen bzw. bei struktureller Verzerrung Korrekturfaktoren zu berechnen. Das Hochschulabsolvent*innenpanel erfasst für die betrachteten Jahrgänge und Hochschulen fast die gesamte Absolvent*innenpopulation. Für einzelne beteiligte Hochschulen gibt es auch vergleichbare hochschulinterne Absolvent*innenbefragungen. Somit ließen sich die verknüpften administrativen Daten als interpretative Kontrastfolie der Befragungsergebnisse nutzen. Plausibilitätsanalysen gerade bei sensiblen Angaben zum Gehalt oder Berufseinstieg, wären hierdurch möglich und könnten auch dazu beitragen, die hochschulinternen Absolvent*innenbefragungen weiter zu optimieren.

Junge Nachwuchskräfte gewinnen im Zuge des Fachkräftemangels und des verstärkten Bedarfs an Akademiker*innen für den Arbeitsmarkt immer weiter an Bedeutung. Entsprechend steigen die Studierendenzahlen kontinuierlich an (Statistisches Bundesamt, 2020; OECD, 2020a). Zum vollständigen Bild gehört aber auch die Tatsache, dass laut DZHW zwischen 27% und 30% der Studierenden in Deutschland ihr Studium vorzeitig abbrechen (Heublein et al., 2017). Nicht nur die individuellen, sondern auch die gesellschaftlichen Kosten sind hierbei relevant. Die Gruppe der Abbrechenden ist nicht nur wegen ihrer mengenmäßigen Größe, sondern auch in ihrer Eigenschaft als „fast hochqualifiziert“ besonders interessant. Der in dieser Dissertation verwendete Datensatz lässt sich in Teilen um die Angaben der Abbrecher*innen erweitern und ermöglicht so die quantitative und komparative Analyse beispielsweise der Arbeitsmarkt-

einstiege und des Mobilitätsverhalten sowohl der abbrechenden Studierenden als auch der Absolvent*innen. Bestehende Studien in Bereichen der Hochschul- oder auch Arbeitsmarktforschung beschäftigen sich vermehrt mit den Gründen für den Abbruch. Die Analyse der grundlegenden Unterschiede in der Beschäftigungsfähigkeit der beiden Gruppen allerdings ist bis dato mit solchen Daten noch nicht erfolgt und würde erheblichen wissenschaftlichen Mehrwert darstellen.

Um hochschulspezifische Erkenntnisse und daraus abgeleitete Handlungsimplicationen gewinnen zu können, ist es ferner in Betracht zu ziehen, weitere Hochschulstudien zu den im Hochschulabsolvent*innenpanel enthaltenen Hochschulen anzufertigen. Durch komparative Analysen wäre dies aus hochschulpolitischer Sicht auch deshalb interessant, um im verstärkten Konkurrenzdruck unter den Hochschulen auf eine breitere empirische Basis zurückgreifen zu können. Dahingehende Erkenntnisse würden über den wissenschaftlichen Mehrwert hinaus sicherlich den Weg in die (hochschul)politischen Debatten finden. Aber auch der Vergleich von Arbeitsmarktperformances von Absolvent*innen gleicher Studiengänge aus unterschiedlichen Standorten könnte Ansätze liefern, wie mit den veränderten Bedingungen des mit dem Studienfach assoziierten Arbeitsmarktes umgegangen werden kann. Aus Sicht potenzieller Studierender können solche vergleichenden Analysen als Entscheidungsgrundlage dienen, sich aus fachspezifischen Gründen für einen bestimmten Studienort zu entscheiden und evtl. damit verbundene Migrationskosten zu rechtfertigen.

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ANHANG

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Appendix 1: Untersuchungseinheit Raumordnungsregionen in Deutschland

Kartographie: Stephan Pohl, (n=96, Gebietsstand 31.12.2017).

Appendix 2: Data description

University panel data base

The university panel encompasses detailed information on students who graduated from five medium-sized universities in three distinct regions in Germany: University of Kiel (CAU), Giessen University (JLU), Saarland University (UdS), Kiel University of Applied Sciences (FHK) and University of Applied Sciences Saarland (HTW). Our data set combines individual information from student records with the employment biographies of the graduates. The latter information is available in the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB) which covers roughly 80 percent of the German workforce. The student records and the IEB are merged via a record linkage using individual identifiers such as first name, surname and date of birth. Using this method, about 85 percent of the students could be linked to the IEB. With the exception of one university, graduates from all fields of study in which students can enrol are covered. For JLU, we merely have information for graduates from natural sciences and economics & business administration. Some information in the student records needed to be harmonised. This applies particularly to the different grading scales (e.g. decimal numbers, marks) which were transformed according to the conversion rules of the examination regulations into a five-tier scale (1 (with honours) to 5 (sufficient)).

To construct the sample for our analysis, we impose some restrictions on the data. In our analysis, we only consider the last degree from each graduate's education at the respective university. We can thus make sure that the student has finally left university. We focus on graduates between 20 and 35 years of age at the date of certification and on those who manage to complete their studies in less than 20 semesters. Since internships of 2 years are obligatory for teachers in Germany after graduation and due to specific mobility restrictions, we exclude these graduates from the analysis. Medical graduates (human and dental) are also excluded, since we do not have reliable information for them from all universities. To be able to compare labour market entry among Bachelor and Master students, spells associated with doctoral degrees are deleted. Furthermore, we only consider graduates for whom we observe a first full or part-time employment or apprenticeship training that lasted at least 7 days within two years after final exams. Graduates who leave the university region, but return within a year are not counted as migrants.

In principle, extra-curricular and –occupational programs are often attended by students who are already employed in a regular job in a (partner) firm. Hence, the social networks which may be established by these students during studies in these regular jobs might affect the migration

decision after the completion of such a program. At the very end of our observation period, the three universities have begun to offer a small number of extra-curricular and -occupational study programmes. Most of the involved partner enterprises are located inside the university region. Therefore, we suppose that extra-curricular programs are only of minor importance for the migration decision.

Regional data and indicators

Moreover, we prepared regional data for the respective university regions in order to construct regional control variables for the regression analysis. We displayed the population per square metre and the share of young people (0 to 24 years) with data derived from regional population statistics (Statistisches Bundesamt, 2016). The variable income per capita corresponds to the primary income of private households per inhabitant in 1,000 Euro. Note, primary income includes income from working activity and wealth accruing to domestic households (Statistische Ämter der Länder, 2017). Yearly GDP growth refers to annual changes of the nominal GDP in university regions. The data for these two indicators stems from national accounts statistics. The unemployment rate is defined as the ratio of the number of unemployed persons to the number of civilian labour force (Statistik der Bundesagentur für Arbeit, 2018).

Data sources

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Appendix 3: German education system

The German education system provides various options to pursue further vocational and/or academic education after leaving school. The direct transition from general schooling to university is the acquisition of a higher education entrance qualification and enrolment at university. Normally, pupils complete their university-entrance diploma at the upper secondary school and begin their studies at the regular university. Another possibility is to study at a university or a university of applied sciences after the completion of (dual) vocational training, given that the trainee has a university entrance qualification. Then, these graduates obtain a double qualification, a vocational degree and a tertiary degree. A vocational training normally takes two to three years, and during this time the apprentices are employed by a training company. Hence, they have already gained practical work experience during vocational training before starting their studies at university. In 2013, a quarter of the apprentices starting a vocational education in Germany had a university entrance diploma and would have been therefore also entitled to study. In 2011/2012 11 percent of all German first-year students at university had already completed a vocational training prior to higher education (BMBF, 2015). However, considering all first-year students at German universities and universities of applied science, 22 percent had already completed successfully a vocational training when entering higher education (Scheller et al., 2013).

Appendix 4: Description of explanatory variables (article 1)

| Personal characteristics | |
|---|---|
| Female | 1 if female, 0 if male |
| Age | Age at time of graduation |
| Age ² | Age (at time of graduation) squared divided by 100 |
| Foreigner | 1 if foreign graduate, 0 if German graduate |
| Mobility before studies | 1 if not studying in home region, 0 otherwise |
| University entrance qualification abroad | 1 if graduate received university entrance qualification abroad, 0 otherwise |
| Studies | |
| Exam grade | From sufficient (1) to excellent (5) |
| Study length | Number of semesters |
| Field of study | <ul style="list-style-type: none"> • Agricultural sciences • Humanities • Geography/Meteorology • Mathematics/Computer science • Health sciences • Natural sciences • Engineering • Psychology • Law • Social sciences • Business administration & Economics |
| Type of degree | Bachelor, Master/Diploma, other degrees (dummy variables) |
| University | CAU, FHK, JLU, UdS, HTW (dummy variables) |
| Employment biography | |
| Vocational training | 1 if graduate was undergoing (outside/inside university region) vocational training before studying, 0 otherwise |
| Experience (in 100 days) | <ul style="list-style-type: none"> • ME/RE work experience outside university region before studies • ME/RE work experience within university region before studies • ME/RE work experience outside university region during studies • ME/RE work experience within university region during studies |
| Previous employer | <ul style="list-style-type: none"> • 1 if first job after graduation at former employer, 0 otherwise |
| Regional characteristics (university region) | |
| Population density | Population per square metre, in 1,000 inhabitants |
| Yearly GDP growth | in percent |
| Share 0-24 years old | Share of persons aged 0 to 24 |
| Income per capita | Primary income of households, in 1,000 Euro |
| Unemployment rate | Unemployed as percentage of labour force (in percent) |

Note: While personal, study-related and biographical characteristics are constant over time, regional characteristics are time-varying control variables.

Appendix 5: Summary statistics (article 1)

| | Obs. | Mean | Std. | Min. | Max. |
|--|---------|--------|--------|------|------|
| Personal characteristics | | | | | |
| Female | 153,172 | 0.43 | 0.50 | 0 | 1 |
| Age at graduation | 153,172 | 27.59 | 2.54 | 19 | 35 |
| Age ² at graduation | 153,172 | 767.71 | 144.71 | 361 | 1225 |
| Foreigner | 153,172 | 0.04 | 0.20 | 0 | 1 |
| Mobility before studies | 153,172 | 0.37 | 0.48 | 0 | 1 |
| University entrance qualification abroad | 153,172 | 0.04 | 0.19 | 0 | 1 |
| Studies | | | | | |
| Exam grade | 153,172 | 2.98 | 0.98 | 1 | 5 |
| Study length | | | | | |
| Bachelor degree | 11,239 | 7.47 | 2.66 | 1 | 20 |
| Master degree | 7,840 | 4.66 | 1.80 | 1 | 20 |
| Diploma | 100,926 | 11.57 | 3.07 | 1 | 20 |
| Other degrees | 33,158 | 12.01 | 3.51 | 1 | 20 |
| Field of Study | | | | | |
| Agricultural sciences | 153,172 | 0.04 | 0.20 | 0 | 1 |
| Humanities | 153,172 | 0.15 | 0.36 | 0 | 1 |
| Geography/Meteorology | 153,172 | 0.04 | 0.19 | 0 | 1 |
| Mathematics/Computer science | 153,172 | 0.09 | 0.28 | 0 | 1 |
| Pharmacy | 153,172 | 0.03 | 0.17 | 0 | 1 |
| Natural sciences | 153,172 | 0.10 | 0.30 | 0 | 1 |
| Psychology | 153,172 | 0.16 | 0.36 | 0 | 1 |
| Law | 153,172 | 0.04 | 0.19 | 0 | 1 |
| Social sciences | 153,172 | 0.08 | 0.27 | 0 | 1 |
| Business administration & Economics | 153,172 | 0.05 | 0.22 | 0 | 1 |
| Others | 153,172 | 0.22 | 0.42 | 0 | 1 |
| Type of degree | | | | | |
| Bachelor degree | 153,172 | 0.07 | 0.26 | 0 | 1 |
| Diploma/Master degree | 153,172 | 0.71 | 0.45 | 0 | 1 |
| Other degrees | 153,172 | 0.22 | 0.41 | 0 | 1 |
| Employment biography | | | | | |
| Vocational training | | | | | |
| outside university region | 153,172 | 0.07 | 0.26 | 0 | 1 |
| inside university region | 153,172 | 0.15 | 0.36 | 0 | 1 |
| outside university region, sector-specific (3-digit) | 153,172 | 0.01 | 0.10 | 0 | 1 |
| outside university region, not sector-specific (3-digit) | 153,172 | 0.06 | 0.24 | 0 | 1 |
| inside university region, sector-specific (3-digit) | 153,172 | 0.03 | 0.16 | 0 | 1 |
| inside university region, not sector-specific (3-digit) | 153,172 | 0.12 | 0.33 | 0 | 1 |
| outside university region, sector-specific (2-digit) | 153,172 | 0.01 | 0.11 | 0 | 1 |
| outside university region, not sector-specific (2-digit) | 153,172 | 0.06 | 0.24 | 0 | 1 |
| inside university region, sector-specific (2-digit) | 153,172 | 0.03 | 0.17 | 0 | 1 |
| inside university region, not sector-specific (2-digit) | 153,172 | 0.12 | 0.33 | 0 | 1 |
| outside university region, sector-specific (1-digit) | 153,172 | 0.02 | 0.15 | 0 | 1 |
| outside university region, not sector-specific (1-digit) | 153,172 | 0.05 | 0.22 | 0 | 1 |
| inside university region, sector-specific (1-digit) | 153,172 | 0.05 | 0.21 | 0 | 1 |
| inside university region, not sector-specific (1-digit) | 153,172 | 0.10 | 0.30 | 0 | 1 |
| outside university region, occupation-specific (3-digit) | 153,172 | 0.01 | 0.12 | 0 | 1 |

Appendix 5: Summary statistics (article 1)

| | Obs. | Mean | Std. | Min. | Max. |
|---|---------|------|------|------|-------|
| outside university region, not occupation-specific (3-digit) | 153,172 | 0.05 | 0.23 | 0 | 1 |
| inside university region, occupation-specific (3-digit) | 153,172 | 0.03 | 0.16 | 0 | 1 |
| inside university region, not occupation-specific (3-digit) | 153,172 | 0.11 | 0.32 | 0 | 1 |
| outside university region, occupation-specific (2-digit) | 153,172 | 0.02 | 0.14 | 0 | 1 |
| outside university region, not occupation-specific (2-digit) | 153,172 | 0.05 | 0.22 | 0 | 1 |
| inside university region, occupation-specific (2-digit) | 153,172 | 0.04 | 0.19 | 0 | 1 |
| inside university region, not occupation-specific (2-digit) | 153,172 | 0.10 | 0.30 | 0 | 1 |
| outside university region, occupation-specific (1-digit) | 153,172 | 0.03 | 0.18 | 0 | 1 |
| outside university region, not occupation-specific (1-digit) | 153,172 | 0.04 | 0.18 | 0 | 1 |
| inside university region, occupation-specific (1-digit) | 153,172 | 0.07 | 0.26 | 0 | 1 |
| inside university region, not occupation-specific (1-digit) | 153,172 | 0.07 | 0.26 | 0 | 1 |
| Experience (in 100 days) | | | | | |
| inside university region, before studies | 153,172 | 5.52 | 6.79 | 0 | 51.22 |
| inside university region, during studies | 153,172 | 0.99 | 1.26 | 0 | 4.51 |
| outside university region, before studies | 153,172 | 1.57 | 3.96 | 0 | 52.47 |
| outside university region, during studies | 153,172 | 0.14 | 0.56 | 0 | 4.47 |
| inside university region, before studies, ME | 153,172 | 4.13 | 5.78 | 0 | 45.53 |
| inside university region, before studies, RE | 153,172 | 1.39 | 3.71 | 0 | 51.22 |
| inside university region, during studies, ME | 153,172 | 0.77 | 1.17 | 0 | 4.51 |
| inside university region, during studies, RE | 153,172 | 0.22 | 0.67 | 0 | 4.47 |
| outside university region, before studies, ME | 153,172 | 1.04 | 3.19 | 0 | 38.43 |
| outside university region, before studies, RE | 153,172 | 0.52 | 2.10 | 0 | 52.47 |
| outside university region, during studies, ME | 153,172 | 0.10 | 0.48 | 0 | 4.47 |
| outside university region, during studies, RE | 153,172 | 0.04 | 0.27 | 0 | 4.42 |
| inside univ. region, before, ME, sector-specific (3-digit) | 153,172 | 1.15 | 3.24 | 0 | 45.53 |
| inside univ. region, before, RE, sector-specific (3-digit) | 153,172 | 0.39 | 2.14 | 0 | 48.21 |
| inside univ. region, during, ME, sector-specific (3-digit) | 153,172 | 0.40 | 0.93 | 0 | 4.46 |
| inside univ. region, during, RE, sector-specific (3-digit) | 153,172 | 0.16 | 0.57 | 0 | 4.47 |
| outside univ. region, before, ME, sector-specific (3-digit) | 153,172 | 0.15 | 1.35 | 0 | 33.69 |
| outside univ. region, before, RE, sector-specific (3-digit) | 153,172 | 0.09 | 1.01 | 0 | 52.47 |
| outside univ. region, during, ME, sector-specific (3-digit) | 153,172 | 0.04 | 0.32 | 0 | 4.47 |
| outside univ. region, during, RE, sector-specific (3-digit) | 153,172 | 0.02 | 0.23 | 0 | 4.42 |
| inside univ. region, before, ME, not sector-specific (3-digit) | 153,172 | 2.99 | 4.96 | 0 | 42.8 |
| inside univ. region, before, RE, not sector-specific (3-digit) | 153,172 | 1.00 | 3.03 | 0 | 40.37 |
| inside univ. region, during, ME, not sector-specific (3-digit) | 153,172 | 0.37 | 0.85 | 0 | 4.51 |
| inside univ. region, during, RE, not sector-specific (3-digit) | 153,172 | 0.07 | 0.36 | 0 | 4.43 |
| outside univ. region, before, ME, not sector-specific (3-digit) | 153,172 | 0.89 | 2.86 | 0 | 38.43 |
| outside univ. region, before, RE, not sector-specific (3-digit) | 153,172 | 0.44 | 1.81 | 0 | 39.71 |
| outside univ. region, during, ME, not sector-specific (3-digit) | 153,172 | 0.06 | 0.36 | 0 | 4.45 |
| outside univ. region, during, RE, not sector-specific (3-digit) | 153,172 | 0.01 | 0.15 | 0 | 4.2 |
| inside univ. region, before, ME, sector-specific (2-digit) | 153,172 | 1.23 | 3.37 | 0 | 45.53 |
| inside univ. region, before, RE, sector-specific (2-digit) | 153,172 | 0.42 | 2.23 | 0 | 48.21 |
| inside univ. region, during, ME, sector-specific (2-digit) | 153,172 | 0.41 | 0.94 | 0 | 4.46 |
| inside univ. region, during, RE, sector-specific (2-digit) | 153,172 | 0.16 | 0.57 | 0 | 4.47 |
| outside univ. region, before, ME, sector-specific (2-digit) | 153,172 | 0.18 | 1.43 | 0 | 33.69 |
| outside univ. region, before, RE, sector-specific (2-digit) | 153,172 | 0.10 | 1.08 | 0 | 52.47 |
| outside univ. region, during, ME, sector-specific (2-digit) | 153,172 | 0.04 | 0.33 | 0 | 4.47 |

Appendix 5: Summary statistics (article 1)

| | Obs. | Mean | Std. | Min. | Max. |
|---|---------|------|------|------|-------|
| outside univ. region, during, RE, sector-specific (2-digit) | 153,172 | 0.03 | 0.23 | 0 | 4.42 |
| inside univ. region, before, ME, not sector-specific (2-digit) | 153,172 | 2.90 | 4.87 | 0 | 42.8 |
| inside univ. region, before, RE, not sector-specific (2-digit) | 153,172 | 0.97 | 2.98 | 0 | 40.37 |
| inside univ. region, during, ME, not sector-specific (2-digit) | 153,172 | 0.36 | 0.84 | 0 | 4.51 |
| inside univ. region, during, RE, not sector-specific (2-digit) | 153,172 | 0.06 | 0.36 | 0 | 4.43 |
| outside univ. region, before, ME, not sector-specific (2-digit) | 153,172 | 0.86 | 2.81 | 0 | 38.43 |
| outside univ. region, before, RE, not sector-specific (2-digit) | 153,172 | 0.42 | 1.77 | 0 | 39.71 |
| outside univ. region, during, ME, not sector-specific (2-digit) | 153,172 | 0.06 | 0.35 | 0 | 4.45 |
| outside univ. region, during, RE, not sector-specific (2-digit) | 153,172 | 0.01 | 0.15 | 0 | 4.2 |
| inside univ. region, before, ME, sector-specific (1-digit) | 153,172 | 1.68 | 3.85 | 0 | 45.53 |
| inside univ. region, before, RE, sector-specific (1-digit) | 153,172 | 0.61 | 2.64 | 0 | 48.21 |
| inside univ. region, during, ME, sector-specific (1-digit) | 153,172 | 0.47 | 0.99 | 0 | 4.47 |
| inside univ. region, during, RE, sector-specific (1-digit) | 153,172 | 0.17 | 0.60 | 0 | 4.47 |
| outside univ. region, before, ME, sector-specific (1-digit) | 153,172 | 0.29 | 1.71 | 0 | 33.69 |
| outside univ. region, before, RE, sector-specific (1-digit) | 153,172 | 0.18 | 1.32 | 0 | 52.47 |
| outside univ. region, during, ME, sector-specific (1-digit) | 153,172 | 0.05 | 0.36 | 0 | 4.47 |
| outside univ. region, during, RE, sector-specific (1-digit) | 153,172 | 0.03 | 0.24 | 0 | 4.42 |
| inside univ. region, before, ME, not sector-specific (1-digit) | 153,172 | 2.45 | 4.51 | 0 | 42.8 |
| inside univ. region, before, RE, not sector-specific (1-digit) | 153,172 | 0.77 | 2.60 | 0 | 38.4 |
| inside univ. region, during, ME, not sector-specific (1-digit) | 153,172 | 0.30 | 0.78 | 0 | 4.51 |
| inside univ. region, during, RE, not sector-specific (1-digit) | 153,172 | 0.05 | 0.32 | 0 | 4.43 |
| outside univ. region, before, ME, not sector-specific (1-digit) | 153,172 | 0.75 | 2.61 | 0 | 38.43 |
| outside univ. region, before, RE, not sector-specific (1-digit) | 153,172 | 0.35 | 1.60 | 0 | 34.26 |
| outside univ. region, during, ME, not sector-specific (1-digit) | 153,172 | 0.05 | 0.32 | 0 | 4.45 |
| outside univ. region, during, RE, not sector-specific (1-digit) | 153,172 | 0.01 | 0.13 | 0 | 4.13 |
| inside univ. region, before, ME, occ.-specific (3-digit) | 153,172 | 1.15 | 3.22 | 0 | 45.53 |
| inside univ. region, before, RE, occ.-specific (3-digit) | 153,172 | 0.43 | 2.23 | 0 | 46.43 |
| inside univ. region, during, ME, occ.-specific (3-digit) | 153,172 | 0.39 | 0.92 | 0 | 4.46 |
| inside univ. region, during, RE, occ.-specific (3-digit) | 153,172 | 0.16 | 0.57 | 0 | 4.47 |
| outside univ. region, before, ME, occ.-specific (3-digit) | 153,172 | 0.16 | 1.29 | 0 | 33.69 |
| outside univ. region, before, RE, occ.-specific (3-digit) | 153,172 | 0.13 | 1.19 | 0 | 52.47 |
| outside univ. region, during, ME, occ.-specific (3-digit) | 153,172 | 0.04 | 0.30 | 0 | 4.46 |
| outside univ. region, during, RE, occ.-specific (3-digit) | 153,172 | 0.03 | 0.23 | 0 | 4.42 |
| inside univ. region, before, ME, not occ.-specific (3-digit) | 153,172 | 2.83 | 4.84 | 0 | 42.8 |
| inside univ. region, before, RE, not occ.-specific (3-digit) | 153,172 | 0.93 | 2.94 | 0 | 44.35 |
| inside univ. region, during, ME, not occ.-specific (3-digit) | 153,172 | 0.37 | 0.86 | 0 | 4.51 |
| inside univ. region, during, RE, not occ.-specific (3-digit) | 153,172 | 0.07 | 0.36 | 0 | 4.43 |
| outside univ. region, before, ME, not occ.-specific (3-digit) | 153,172 | 0.82 | 2.77 | 0 | 38.24 |
| outside univ. region, before, RE, not occ.-specific (3-digit) | 153,172 | 0.38 | 1.68 | 0 | 39.11 |
| outside univ. region, during, ME, not occ.-specific (3-digit) | 153,172 | 0.06 | 0.36 | 0 | 4.47 |
| outside univ. region, during, RE, not occ.-specific (3-digit) | 153,172 | 0.01 | 0.14 | 0 | 4.26 |
| inside univ. region, before, ME, occ.-specific (2-digit) | 153,172 | 1.26 | 3.32 | 0 | 45.53 |
| inside univ. region, before, RE, occ.-specific (2-digit) | 153,172 | 0.48 | 2.34 | 0 | 46.43 |
| inside univ. region, during, ME, occ.-specific (2-digit) | 153,172 | 0.41 | 0.94 | 0 | 4.46 |
| inside univ. region, during, RE, occ.-specific (2-digit) | 153,172 | 0.16 | 0.57 | 0 | 4.47 |
| outside univ. region, before, ME, occ.-specific (2-digit) | 153,172 | 0.19 | 1.37 | 0 | 33.69 |
| outside univ. region, before, RE, occ.-specific (2-digit) | 153,172 | 0.16 | 1.27 | 0 | 52.47 |

Appendix 5: Summary statistics (article 1)

| | Obs. | Mean | Std. | Min. | Max. |
|---|---------|--------|-------|--------|--------|
| outside univ. region, during, ME, occ.-specific (2-digit) | 153,172 | 0.04 | 0.31 | 0 | 4.46 |
| outside univ. region, during, RE, occ.-specific (2-digit) | 153,172 | 0.03 | 0.23 | 0 | 4.42 |
| inside univ. region, before, ME, not occ.-specific (2-digit) | 153,172 | 2.73 | 4.77 | 0 | 42.8 |
| inside univ. region, before, RE, not occ.-specific (2-digit) | 153,172 | 0.88 | 2.83 | 0 | 44.35 |
| inside univ. region, during, ME, not occ.-specific (2-digit) | 153,172 | 0.35 | 0.84 | 0 | 4.51 |
| inside univ. region, during, RE, not occ.-specific (2-digit) | 153,172 | 0.06 | 0.35 | 0 | 4.43 |
| outside univ. region, before, ME, not occ.-specific (2-digit) | 153,172 | 0.80 | 2.73 | 0 | 38.24 |
| outside univ. region, before, RE, not occ.-specific (2-digit) | 153,172 | 0.36 | 1.62 | 0 | 39.11 |
| outside univ. region, during, ME, not occ.-specific (2-digit) | 153,172 | 0.05 | 0.35 | 0 | 4.47 |
| outside univ. region, during, RE, not occ.-specific (2-digit) | 153,172 | 0.01 | 0.13 | 0 | 4.26 |
| inside univ. region, before, ME, occ.-specific (1-digit) | 153,172 | 1.60 | 3.70 | 0 | 45.53 |
| inside univ. region, before, RE, occ.-specific (1-digit) | 153,172 | 0.71 | 2.87 | 0 | 48.21 |
| inside univ. region, during, ME, occ.-specific (1-digit) | 153,172 | 0.45 | 0.97 | 0 | 4.46 |
| inside univ. region, during, RE, occ.-specific (1-digit) | 153,172 | 0.17 | 0.59 | 0 | 4.47 |
| outside univ. region, before, ME, occ.-specific (1-digit) | 153,172 | 0.29 | 1.67 | 0 | 35.79 |
| outside univ. region, before, RE, occ.-specific (1-digit) | 153,172 | 0.23 | 1.48 | 0 | 52.47 |
| outside univ. region, during, ME, occ.-specific (1-digit) | 153,172 | 0.05 | 0.34 | 0 | 4.46 |
| outside univ. region, during, RE, occ.-specific (1-digit) | 153,172 | 0.03 | 0.24 | 0 | 4.42 |
| inside univ. region, before, ME, not occ.-specific (1-digit) | 153,172 | 2.38 | 4.47 | 0 | 42.8 |
| inside univ. region, before, RE, not occ.-specific (1-digit) | 153,172 | 0.66 | 2.34 | 0 | 38.4 |
| inside univ. region, during, ME, not occ.-specific (1-digit) | 153,172 | 0.30 | 0.79 | 0 | 4.51 |
| inside univ. region, during, RE, not occ.-specific (1-digit) | 153,172 | 0.05 | 0.32 | 0 | 4.43 |
| outside univ. region, before, ME, not occ.-specific (1-digit) | 153,172 | 0.70 | 2.52 | 0 | 38.24 |
| outside univ. region, before, RE, not occ.-specific (1-digit) | 153,172 | 0.29 | 1.43 | 0 | 34.31 |
| outside univ. region, during, ME, not occ.-specific (1-digit) | 153,172 | 0.05 | 0.32 | 0 | 4.47 |
| outside univ. region, during, RE, not occ.-specific (1-digit) | 153,172 | 0.01 | 0.12 | 0 | 4.2 |
| Previous employer | | | | | |
| Total | 153,172 | 0.10 | 0.30 | 0 | 1 |
| ME, before studies | 153,172 | 0.07 | 0.25 | 0 | 1 |
| RE, before studies | 153,172 | 0.04 | 0.20 | 0 | 1 |
| Apprenticeship, before studies | 153,172 | 0.02 | 0.13 | 0 | 1 |
| ME, during studies | 153,172 | 0.04 | 0.20 | 0 | 1 |
| RE, during studies | 153,172 | 0.03 | 0.17 | 0 | 1 |
| Apprenticeship, during studies | 153,172 | 0.00 | 0.03 | 0 | 1 |
| Number of job changes after studies | 153,172 | 2.61 | 1.47 | 0 | 13 |
| Number of job changes before and during studies | 153,172 | 2.44 | 1.98 | 0 | 19 |
| Regional characteristics¹ | | | | | |
| Population density | 153,172 | 298.26 | 97.66 | 190.13 | 421.84 |
| Yearly GDP growth | 153,172 | 2.13 | 3.11 | -9.58 | 5.74 |
| Share of people younger than 24 years | 153,172 | 24.69 | 1.22 | 22.06 | 28.02 |
| Income per capita | 153,172 | 20.35 | 2.01 | 15.17 | 25.02 |
| Unemployment rate | 153,172 | 10.54 | 1.56 | 6.57 | 14.15 |

Notes: ¹: university region occ.: occupation, univ.: university, ME: marginal employment, RE: regular (part-time or full-time) employment.

Source: university panel linked to the IEB of IAB, own calculations.

Appendix 6: Regression results for field of study and type of degree

| | (1) | | (2) | | (3) | |
|---|----------|---------|----------|---------|----------|---------|
| | coef | se | coef | se | coef | se |
| Field of study | | | | | | |
| (ref: Business administration and economics) | | | | | | |
| Agricultural sciences | -0.435** | (0.071) | -0.413** | (0.070) | -0.405** | (0.070) |
| Humanities | -0.725** | (0.061) | -0.714** | (0.061) | -0.726** | (0.060) |
| Geography/Meteorology | -0.825** | (0.080) | -0.830** | (0.080) | -0.841** | (0.080) |
| Mathematics/Computer science | -0.520** | (0.060) | -0.486** | (0.060) | -0.488** | (0.060) |
| Health sciences | -0.895** | (0.091) | -0.852** | (0.091) | -0.868** | (0.091) |
| Natural sciences | -0.905** | (0.057) | -0.907** | (0.056) | -0.912** | (0.056) |
| Engineering | -0.225** | (0.050) | -0.228** | (0.050) | -0.237** | (0.050) |
| Psychology | -0.807** | (0.091) | -0.821** | (0.091) | -0.833** | (0.091) |
| Law | -1.334** | (0.082) | -1.315** | (0.082) | -1.324** | (0.082) |
| Social sciences | -0.849** | (0.074) | -0.813** | (0.075) | -0.816** | (0.074) |
| Type of Degree | | | | | | |
| (ref: Diploma/Master) | | | | | | |
| Bachelor | -0.261 | (0.140) | -0.282* | (0.140) | -0.255 | (0.140) |
| Other degrees | 0.581** | (0.121) | 0.477** | (0.124) | 0.460** | (0.124) |

Notes: * significance at the 0.05 level, ** significance at the 0.01 level; robust standard errors in parentheses.

Source: university panel linked to the IEB of IAB, own calculations.

Appendix 7: Effects of occupation-specific and non-specific work experience

| | | (1) | (2) | (3) | |
|---------------------------------|---------------------------|---------------------|---------------------|---------------------|---------------------|
| | | <i>Occupation</i> | <i>Occupation</i> | <i>Occupation</i> | |
| | | <i>(3-digit)</i> | <i>(2-digit)</i> | <i>(1-digit)</i> | |
| Vocational training | | | | | |
| specific | outside university region | 0.327** (0.081) | 0.362** (0.070) | 0.379** (0.057) | |
| | inside university region | -0.061 (0.107) | -0.127 (0.092) | -0.130 (0.071) | |
| not specific | outside university region | 0.154** (0.048) | 0.135** (0.052) | 0.097 (0.062) | |
| | inside university region | -0.338** (0.057) | -0.327** (0.060) | -0.418** (0.073) | |
| Experience (in 100 days) | | | | | |
| specific | inside university region | ME, before studies | -0.022** (0.008) | -0.008 (0.007) | 0.005 (0.005) |
| | | RE, before studies | 0.009 (0.011) | 0.011 (0.011) | 0.008 (0.008) |
| | | ME, during studies | -0.861** (0.038) | -0.760** (0.032) | -0.570** (0.024) |
| | | RE, during studies | -1.460** (0.098) | -1.261** (0.079) | -1.028** (0.061) |
| | outside university region | ME, before studies | -0.002 (0.011) | 0.006 (0.009) | 0.010 (0.007) |
| | | RE, before studies | -0.001 (0.007) | -0.005 (0.007) | 0.001 (0.006) |
| | | ME, during studies | -0.050 (0.048) | -0.025 (0.043) | -0.007 (0.038) |
| | | RE, during studies | 0.598** (0.033) | 0.615** (0.033) | 0.618** (0.033) |
| not specific | inside university region | ME, before studies | 0.031** (0.003) | 0.031** (0.003) | 0.033** (0.003) |
| | | RE, before studies | -0.003 (0.006) | -0.005 (0.006) | -0.006 (0.008) |
| | | ME, during studies | 0.089** (0.013) | 0.098** (0.014) | 0.109** (0.015) |
| | | RE, during studies | 0.015 (0.030) | 0.017 (0.031) | 0.044 (0.035) |
| | outside university region | ME, before studies | 0.031** (0.003) | 0.033** (0.004) | 0.038** (0.004) |
| | | RE, before studies | 0.010 (0.006) | 0.015* (0.006) | 0.013 (0.008) |
| | | ME, during studies | 0.142** (0.024) | 0.133** (0.025) | 0.145** (0.028) |
| | | RE, during studies | 0.331** (0.058) | 0.315** (0.063) | 0.291** (0.079) |

Notes: * significance at the 0.05 level, ** significance at the 0.01 level; robust standard errors in parenthesis. All models include time, university, field of study and type of degree fixed effects and further control variables.

ME: marginal employment, RE: regular (part-time or full-time) employment.

Appendix 8: Additional regression results

| | (1) | | (2) | | (3) | |
|---|----------|---------|----------|---------|----------|---------|
| | coef | se | coef | se | coef | se |
| Personal characteristics | | | | | | |
| Female | -0.096** | (0.030) | -0.058 | (0.030) | -0.104** | (0.031) |
| Age | 0.447** | (0.101) | 0.318** | (0.104) | 0.536** | (0.106) |
| Age ² | -0.009** | (0.002) | -0.007** | (0.002) | -0.010** | (0.002) |
| Foreigner | 0.119 | (0.079) | 0.034 | (0.080) | 0.137 | (0.082) |
| Mobility before studies | 0.721** | (0.032) | 0.606** | (0.032) | 0.740** | (0.033) |
| University entrance qualification abroad | -0.119 | (0.088) | -0.065 | (0.088) | -0.103 | (0.091) |
| Studies | | | | | | |
| Exam grade | -0.029 | (0.018) | -0.060** | (0.018) | -0.030 | (0.018) |
| Study length | | | | | | |
| Bachelor degree | 0.031* | (0.015) | 0.035* | (0.016) | 0.024 | (0.017) |
| Diploma | -0.040** | (0.006) | -0.030** | (0.006) | -0.040** | (0.007) |
| Master Degree | 0.014 | (0.017) | 0.027 | (0.017) | 0.011 | (0.018) |
| Other degree | -0.066** | (0.009) | -0.051** | (0.009) | -0.067** | (0.009) |
| Employment biography | | | | | | |
| Vocational training (dummy variables) | | | | | | |
| inside university region | -0.258** | (0.055) | -0.334** | (0.056) | -0.222** | (0.059) |
| outside university region | 0.274** | (0.046) | 0.148** | (0.046) | 0.232** | (0.049) |
| Experience (in 100 days) | | | | | | |
| inside university region, before studies | | | | | | |
| ME | 0.024** | (0.003) | 0.012** | (0.003) | 0.026** | (0.003) |
| RE | -0.004 | (0.006) | -0.009 | (0.006) | -0.002 | (0.006) |
| inside university region, during studies | | | | | | |
| ME | -0.163** | (0.014) | -0.075** | (0.015) | -0.154** | (0.014) |
| RE | -0.494** | (0.032) | -0.447** | (0.033) | -0.486** | (0.034) |
| outside university region, before studies | | | | | | |
| ME | 0.031** | (0.004) | 0.020** | (0.004) | 0.028** | (0.004) |
| RE | 0.004 | (0.005) | -0.004 | (0.005) | -0.001 | (0.006) |
| outside university region, during studies | | | | | | |
| ME | 0.101** | (0.024) | 0.160** | (0.024) | 0.040 | (0.025) |
| RE | 0.590** | (0.034) | 0.531** | (0.030) | 0.515** | (0.038) |
| Previous employer | | | | | | |
| total | | | -0.741** | (0.049) | | |
| ME, before studies | -0.498** | (0.062) | | | | |
| RE, before studies | -0.131 | (0.076) | | | | |
| APP, before studies | -0.547** | (0.112) | | | | |
| ME, during studies | -0.230** | (0.076) | | | | |
| RE, during studies | -0.187* | (0.073) | | | | |
| APP, during studies | 0.110 | (0.314) | | | | |
| Number of job changes | | | | | | |
| after studies | | | -0.667** | (0.015) | | |
| before and during studies | | | 0.132** | (0.008) | | |
| Regional characteristics¹ | | | | | | |
| Population density | 0.056** | (0.010) | 0.058** | (0.010) | 0.055** | (0.011) |
| Yearly GDP growth | 0.051** | (0.009) | 0.050** | (0.009) | 0.043** | (0.009) |
| Share of people younger than 24 years | -0.366* | (0.170) | -0.423** | (0.161) | -0.303 | (0.176) |

| | | | | | | |
|---------------------------|----------|---------|----------|---------|----------|---------|
| Income per capita | -0.956** | (0.120) | -0.919** | (0.118) | -0.808** | (0.124) |
| Unemployment rate | -0.334** | (0.014) | -0.291** | (0.014) | -0.331** | (0.014) |
| Ln(p) | 0.403** | (0.010) | 0.493** | (0.010) | 0.395** | (0.010) |
| Ln(θ) | 1.071** | (0.041) | 1.008** | (0.038) | 1.065** | (0.040) |
| Implied p | 1.496 | (0.014) | 1.638 | (0.016) | 1.484 | (0.149) |
| θ | 2.918 | (0.119) | 2.740 | (0.104) | 2.901 | (0.117) |
| Log Likelihood | | -30,702 | | -29,087 | | -28,168 |
| Number of students | | 24,766 | | 24,766 | | 22,572 |
| Observations | | 153,172 | | 153,172 | | 137,430 |

Notes: * significance at the 0.05 level, ** significance at the 0.01 level; robust standard errors in parenthesis. All models include time, university, field of study and type of degree fixed effects and further control variables. APP: Apprenticeship, ME: marginal employment, RE: regular (part-time or full-time) employment.

(1): including different types of previous employer

(2): including number of job changes before/during and after studies

(3): without graduates who return to a previous employer

Appendix 9: Description of explanatory variables (article 2)

| Personal characteristics | |
|---------------------------------|--|
| Female | 1 if female, 0 if male |
| Age | Age at time of graduation |
| Age ² | Age (at time of graduation) squared divided by 100 |
| Foreigner | 1 if foreign graduate, 0 if German graduate |
| Spatial mobility before studies | 1 if not studying in home region, 0 otherwise |
| Spatial mobility after studies | 1 if not working in study region, 0 otherwise |
| Mobility types | <ul style="list-style-type: none"> • Immobile • Staying migrants • Migrants • Repeat migrants • Return migrants |
| Higher education | |
| Type of university | 1 if studying at university, 0 if studying at university of applied sciences |
| Examination grade | <ul style="list-style-type: none"> • Sufficient • Satisfactory • Good • Excellent/very good |
| Study length | Number of semesters |
| Type of degree | 1 if other degrees (e.g. state examination), 0 if master/diploma |
| Field of study | <ul style="list-style-type: none"> • Agricultural sciences • Humanities • Geography/meteorology • Mathematics/computer science • Natural sciences/engineering • Psychology • Social sciences • Economics & business administration • Other subjects |
| Work experience | |
| Vocational training | 1 if graduate completed a vocational training before studying, 0 otherwise |
| Experience (in 100 days) | <ul style="list-style-type: none"> • Marginal/regular employment work experience before studies • Marginal/regular employment work experience during studies |
| Previous employer | 1 employer-specific work experience before/during studies, 0 otherwise |

Appendix 10: Summary statistics (article 2)

| | Obs. | Mean | Std. | Min. | Max. |
|-------------------------------------|--------|--------|--------|------|------|
| Personal characteristics | | | | | |
| Female | 19,860 | 0,44 | 0,50 | 0 | 1 |
| Age at graduation | 19,860 | 27,37 | 2,26 | 22 | 35 |
| Age ² at graduation | 19,860 | 753,98 | 127,98 | 484 | 1225 |
| Foreigner | 19,860 | 0,04 | 0,19 | 0 | 1 |
| Mobility before studies | 19,860 | 0,56 | 0,50 | 0 | 1 |
| Mobility after studies | 19,860 | 0,66 | 0,47 | 0 | 1 |
| Mobility type | | | | | |
| Immobile | 19,860 | 0,22 | 0,42 | 0 | 1 |
| Staying migrant | 19,860 | 0,12 | 0,32 | 0 | 1 |
| Migrants | 19,860 | 0,22 | 0,41 | 0 | 1 |
| Return Migrants | 19,860 | 0,11 | 0,31 | 0 | 1 |
| Repeat Migrants | 19,860 | 0,44 | 0,50 | 0 | 1 |
| Higher education | | | | | |
| Type of university: University | 19,860 | 0,84 | 0,37 | 0 | 1 |
| Exam grade | | | | | |
| Excellent/very good | 19,860 | 0,25 | 0,43 | 0 | 1 |
| Good | 19,860 | 0,56 | 0,50 | 0 | 1 |
| Satisfactory | 19,860 | 0,12 | 0,33 | 0 | 1 |
| Sufficient | 19,860 | 0,06 | 0,25 | 0 | 1 |
| Study length | 19,860 | 11,43 | 3,29 | 0 | 20 |
| Field of Study | | | | | |
| Agricultural sciences | 19,860 | 0,04 | 0,18 | 0 | 1 |
| Humanities | 19,860 | 0,16 | 0,37 | 0 | 1 |
| Geography/Meteorology | 19,860 | 0,04 | 0,19 | 0 | 1 |
| Mathematics/Computer science | 19,860 | 0,09 | 0,29 | 0 | 1 |
| Pharmacy | 19,860 | 0,03 | 0,17 | 0 | 1 |
| Natural sciences | 19,860 | 0,13 | 0,33 | 0 | 1 |
| Psychology | 19,860 | 0,06 | 0,24 | 0 | 1 |
| Social sciences | 19,860 | 0,05 | 0,22 | 0 | 1 |
| Business administration & Economics | 19,860 | 0,40 | 0,49 | 0 | 1 |
| Others | 19,860 | 0,00 | 0,07 | 0 | 1 |
| Type of degree | | | | | |
| Diploma/Master degree | 19,860 | 0,85 | 0,35 | 0 | 1 |
| Other degrees | 19,860 | 0,15 | 0,35 | 0 | 1 |

Notes: ME: marginal employment, RE: regular (part-time or full-time) employment.

Source: university panel linked to the IEB of IAB, own calculations.

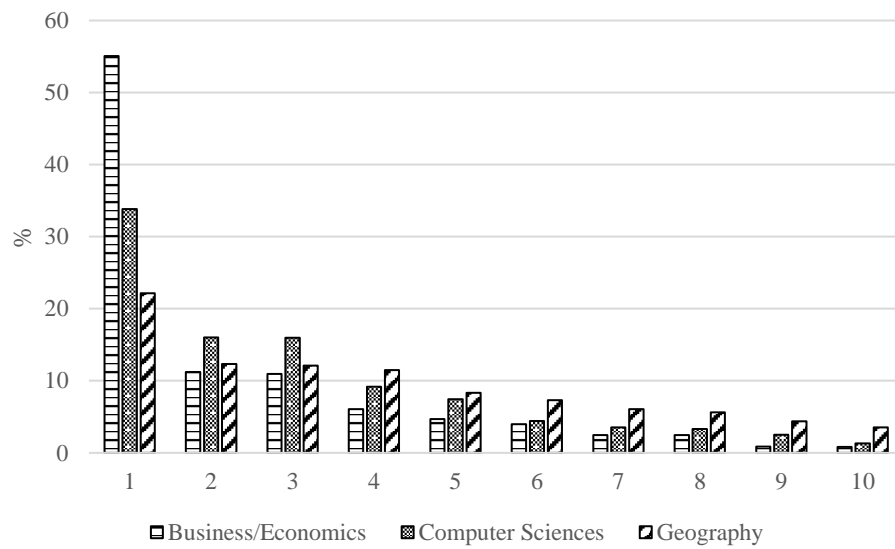
Appendix 11: Ranking of top 10 target occupations of full-time jobs

| Code | Occupation | abs. | %* |
|-------------------------------------|---|------|------|
| Geography (n=479) | | | |
| 781 | Office administrators | 130 | 19.6 |
| 883 | Scientists n.e.c. (geographers, geologists, geophysicists, biologists etc.) | 57 | 8.6 |
| 774 | Data processing specialists | 23 | 3.5 |
| 762 | Senior administrative officials | 22 | 3.3 |
| 881 | Economic and social scientists, statisticians | 18 | 2.7 |
| 751 | Entrepreneurs, managing directors, divisional managers | 17 | 2.6 |
| 607 | Other engineers | 15 | 2.3 |
| 603 | Architects, civil engineers | 14 | 2.1 |
| 681 | Wholesale and retail trade buyers, buyers | 13 | 2.0 |
| 628 | Other technicians | 12 | 1.8 |
| Computer science (n=1,384) | | | |
| 774 | Data processing specialists | 667 | 45.1 |
| 781 | Office administrators | 146 | 9.9 |
| 871 | University teachers, lecturers at higher technical schools and academies | 101 | 6.8 |
| 752 | Management consultants, organizers | 93 | 6.3 |
| 883 | Scientists n.e.c. (geographers, geologists, geophysicists, biologists etc.) | 44 | 3.0 |
| 882 | Humanities specialists, n.e.c. | 32 | 2.2 |
| 691 | Bank specialists | 31 | 2.1 |
| 753 | Chartered accountants, tax advisers | 29 | 2.0 |
| 602 | Electrical engineers | 28 | 1.9 |
| 607 | Other engineers | 27 | 1.8 |
| Economics/business (n=1,809) | | | |
| 781 | Office administrators | 457 | 22.5 |
| 753 | Accountants, tax advisers | 273 | 13.4 |
| 691 | Bank specialists | 225 | 11.1 |
| 752 | Management consultants, organizers | 160 | 7.9 |
| 881 | Economic and social scientists, statisticians | 118 | 5.8 |
| 774 | Data processing specialists | 81 | 4.0 |
| 871 | University teachers, lecturers at higher technical schools and academies | 54 | 2.7 |
| 694 | Life, property insurance specialists | 49 | 2.4 |
| 681 | Wholesale and retail trade buyers, buyers | 48 | 2.4 |
| 751 | Entrepreneurs, managing directors, divisional managers | 38 | 1.9 |

* cumulative % of occupations 1-10

Note: Percentage shares of graduates in degree programs, one year after graduation. Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations.

Appendix 12: Ranking of top 10 target sectors of full-time jobs one year after graduation



Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: percentage shares of graduates in degree programs (n=3672).

Appendix 13: Definitions of explanatory variables (article 3)

| Field of study | |
|-------------------------------------|---|
| Field of study | - Business/economics - Computer sciences - Geography |
| Individual characteristics | |
| Female | 1 if female, 0 if male |
| Age | Age at time of graduation |
| Age ² | Age (at time of graduation) squared divided by 100 |
| Foreigner | 1 if foreign graduate, 0 if German graduate |
| Higher education | |
| Exam grade | - Sufficient - Satisfactory - Good - Excellent/very good |
| Other degrees (Ref: Diploma/Master) | 1 if other degrees (e.g. Magister Artium), 0 if master/"Diplom" |
| Study length | Number of semesters |
| Year of graduation | Graduation year 1996-2012 |
| Work experience | |
| Vocational training | 1 if graduate completed a vocational training before studying, 0 otherwise |
| Experience (in 100 days) | - marginal/regular employment, work experience before studies - marginal/regular employment, work experience during studies - regular employment, work experience after studies |
| Mobility | |
| Mobility | - Stayer/immobile - Staying migrants - Migrants - Repeat migrants - Return migrants |
| N. of intra-regional job moves | Number of intra-regional job moves |
| N. of inter-regional job moves | Number of inter-regional job moves |
| Sector | |
| Sector | - University - R&D - Other public sector - Private sector |
| Spatial (university region) | |
| Regional GDP in mill. Euro | absolute number |
| Regional GDP growth per year | in percent |
| Region | - agglomeration - urbanized region - rural region |

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB)

Appendix 14: Logit regression on full-time job (=1) in year 1 and year 4

| | <i>year1</i> | | <i>year4</i> | |
|---------------------------|--------------|---------|--------------|---------|
| | coef | se | coef | se |
| Field of study | | | | |
| (ref. Business/economics) | | | | |
| Geography | 1.154*** | (0.112) | 1.205*** | (0.133) |
| Computer science | 0.585*** | (0.125) | 0.309* | (0.149) |
| constant | 1.910*** | (0.070) | 2.518*** | (0.089) |
| Wald-Chi ² | 184.918 | | 119.548 | |
| Prob. > Chi ² | 0.000 | | 0.000 | |
| Pseudo R ² | 0.0588 | | 0.0480 | |
| N. of cases | 3766 | | 3766 | |

* p<0.05, ** p<0.01, *** p<0.001

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: robust standard errors.

Appendix 15: OLS regression with logarithmic gross daily wage in full-time jobs

| | <i>year1</i> | | <i>year4</i> | |
|---------------------------|--------------|---------|--------------|---------|
| | coef | se | coef | se |
| Field of study | | | | |
| (ref. Business/economics) | | | | |
| Geography | 0.248*** | (0.020) | 0.255*** | (0.019) |
| Computer science | 0.058*** | (0.011) | 0.003 | (0.012) |
| constant | 4.931*** | (0.008) | 5.126*** | (0.008) |
| Prob. > F | 0.000 | | 0.000 | |
| R ² | 0.0919 | | 0.0687 | |
| N. of cases | 3030 | | 3030 | |

* p<0.05, ** p<0.01, *** p<0.001

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: robust standard errors.

Appendix 16: Yearly gross median wages in full-time jobs in year 1 after graduation

| <i>Field of study</i> | <i>Yearly gross median wages</i> |
|--|----------------------------------|
| Geography | 40,979 € |
| Humanities (including: theology, philosophy, history, literature, linguistics, cultural studies) | 37,638 € |
| Sports science | 35,898 € |
| Social sciences (including: Regional sciences [e.g. African studies], Political science, Pedagogy) | 40,516 € |
| Psychology | 41,542 € |
| Physics, Mathematics | 51,903 € |
| Biology, Chemistry | 37,919 € |
| Agricultural and nutritional sciences | 42,091 € |
| Engineering, Material sciences | 54,907 € |
| Arts, Musicology | 33,298 € |

Source: University panel linked to the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB); authors' own calculations. Note: semi-aggregated fields of study, selection.

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