Start-Up Subsidies for the Unemployed - New Evaluation Approaches and Insights

Start-Up Subsidies for the Unemployed - New Evaluation Approaches and Insights

Dissertation

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Tag der Disputation: 14. Dezember 2017

Acknowledgements

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Chapter 1

General Introduction

1.1 Start-up incentives for unemployed individuals

Start-up incentives targeted at unemployed individuals have become an important public policy tool in many countries in recent years, which is reflected, for instance, by total expenditures for these measures of 5.4 billion Euros in the European Union in 2010 (Eurostat, 2017). The start-up support ranges from soft measures like, e.g., coaching, counseling, and training, to hard measures, such as start-up subsidies, loans, or grants, depending on the specific national context. There are two fundamental policy rationales for start-up incentives targeted at job seekers (European Commission, 2014): start-up incentives for unemployed individuals serve as (i) employment and social policy to activate job seekers and combat unemployment and as (ii) business policy to promote entrepreneurship.

Start-up incentives targeted at unemployed individuals are usually implemented as part of the Active Labor Market Policy (ALMP) toolset and, thus, constitute explicitly an employment and social policy. To address the adverse consequences of unemployment,[1] many countries provide both active and passive labor market policies. While passive measures of labor market policy (e.g., unemployment benefits, unemployment assistance, early retirement) support the income maintenance of out-of-work individuals, active measures are aimed

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[1] Unemployment induces severely harmful effects on both the affected individual as well as the society as a whole. On the individual level, unemployment leads to reductions in available income and adaptions in consumption, depreciation of human capital, potential stigmatization, and higher risks of physical and mental stress. From a macro economic perspective, unemployment increases social and economic inequality, produces high fiscal costs (e.g., higher social security expenditures, loss of tax revenues) and implies an under-utilization of productive capacities that could otherwise have contributed to economic growth (e.g., Block and Kohn, 2011; Biewen and Steffens, 2010).

at assisting job seekers with their job searches and at helping them to acquire relevant skills, gain work experience, and reduce or remove specific employment barriers to enable a permanent reintegration into the labor market.

Traditional ALMP measures focus on the reintegration of job seekers into *dependent* employment and can be summarized into the following three broad categories (Heckman *et al.*, 1999): first, job search assistance measures, such as job search training or counseling, are intended to provide information on vacancies, increase search efficiency, and improve job matches. Second, the goal of training measures is to increase human capital and to mitigate potential skill mismatches between job seekers and vacancies. And third, wage and employment subsidies allow job seekers to stop the deterioration of their human capital and to acquire work experience instead. Common forms of this measure are wage subsidies, which are hiring incentives for employers that compensate for shortcomings in workers' productivity, and job creation schemes, which are usually targeted at long-term unemployed or other hard-to-place individuals as a last resort to prepare them for a later re-integration into regular employment. The empirical evidence on the effectiveness of these traditional instruments of ALMP is rather mixed, however (Card *et al.*, 2010). In the case of wage subsidies, findings are ambiguous and sensitive to the evaluation method (Jaenichen and Stephan, 2011; Schünemann *et al.*, 2013), whereas training programs show overall disappointing effects (Lechner and Wunsch, 2008). Job creation schemes are found to even harm participants in their long-term labor market prospects (Caliendo *et al.*, 2008).

In contrast, start-up incentives are a fundamentally different approach to ALMP, in that they intend to encourage and help unemployed individuals to exit unemployment by entering *self-employment* and, thus, by creating their own jobs. The various forms of start-up incentives targeted at unemployed individuals in general are expected to remove, reduce or compensate for shortcomings in human, financial and social capital, or entrepreneurial skills and experiences (see, e.g., Meager, 1996; Pfeiffer and Reize, 2000; Perry, 2006; Niefert, 2010), and to open the strong focus of job seekers on dependent employment during job search resulting from imperfect information (Storey, 2003, refers to it as "lack-of-awareness"). Start-up subsidies in particular also serve as a mechanism to insure the unemployed individual against the risk of low or no income during

the initial start-up phase. In this sense, these measures exhibit a unique nature among the ALMP toolset, in that they simultaneously also directly serve as an entrepreneurship policy by promoting new business formation.[2] The important role of entrepreneurship and new businesses in spurring economic growth, inducing additional job creation, and fostering the emergence of new inventions and the diffusion of new technology (see, among others, Koellinger and Thurik, 2012; Fritsch, 2008; Audretsch and Thurik, 2001; Storey, 1994) can be summarized in three main points (Caliendo and Kritikos, 2009): first, business founders generate their own jobs in terms of self-employment (e.g., Evans and Leigthon, 1989). Second, entrepreneurs are likely to make substantial investments, grow their companies, and create further employment (e.g., Parker and Johnson, 1996). Third, and probably most importantly, entrepreneurs are expected to introduce innovations (e.g., Arrighetti and Vivarelli, 1999) and, therefore, are the foundation of future economic growth (see, e.g., Audretsch, 2007).

To illustrate the relative importance of start-up incentives compared to traditional ALMP tools, the solid lines in Figure 1.1 depict the magnitude of total ALMP expenditures as share of gross domestic product (GDP), whereas the dashed lines report the corresponding amount of ALMP expenditures spent on start-up incentives, again as share of GDP. Germany is represented by the black lines, other EU-27 countries (excluding Germany and, due to data unavailability, Cyprus, Greece, Malta, and the United Kingdom) by the medium-grey lines, and the OECD average by the light-grey lines.

Public expenditures for ALMP relatively increased internationally in the wake of the Great Recession during the late 2000s and early 2010s and have remained constant at approximately 0.6% (0.4%) for the EU-27 countries (OECD average) in recent years. Start-up incentives have gained importance at the European level, where expenditure levels have reached and stabilized at 0.03% of GDP. Internationally, the OECD average reaches slightly lower levels (0.01% to 0.02%). In Germany, which was relatively weakly affected by the crisis and has experienced a very favorable development of the economy in general and the labor market in particular ever since, ALMP expenditures have decreased to less than 0.3% of GDP in 2015. The relative high importance of start-up support measures targeted at unemployed individuals displayed during the mid-2000s has

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[2] See Block and Kohn (2011) for a summary and discussion of the overlap of and differences between social and economic goals of start-up subsidies.

Figure 1.1: Active labor market policy expenditures

also declined substantially in recent years. In addition to the relatively favorable development of the labor market, this downward trend can also be explained by restrictive institutional reforms of the start-up programs, as elaborated in more detail in the following Section 1.2 below.

The international empirical evidence on start-up incentives targeted at unemployed individuals is still relatively scarce. Previous studies mainly focus on the individual ALMP perspective. They yield promising results so far with respect to survival rates and program effectiveness for the individual participant (see, e.g., Duhautois *et al.*, 2015, for France, Tokila, 2009, for Finland, O'Leary, 1999, for Hungary and Poland, Perry, 2006, for New Zealand, Rodriguez-Planas, 2010, for Romania, and Behrenz *et al.*, 2016, for Sweden). The European Commission has recognized start-up incentives as a crucial element of its overall activation

strategy and their potential in fighting youth unemployment (Eurofound, 2016; European Commission, 2014). In contrast, these policies in general and those targeted at unemployed individuals in particular are increasingly becoming subject to criticism from entrepreneurship scholars (see, e.g., Shane, 2009; Acs *et al.*, 2016), who criticize the high expenditures and question the contributions of the businesses arising from these programs to productivity, innovation, and economic growth. Despite the growing body of evidence on the high effectiveness of these policies from an individual ALMP perspective, a comprehensive assessment of them is very challenging given the lack of evidence beyond that, in particular from a business and entrepreneurship perspective. The aim of this dissertation is, therefore, to extend the available evidence on start-up incentives into multiple directions to provide policy-makers, scholars, and the public with additional relevant information about the benefits of and concerns about these programs.

1.2   The German case

The main focus of this dissertation is on the new start-up subsidy program (*Gründungszuschuss*) in Germany. This is why in the following, the German context will be described more closely. Germany has a relatively long tradition of incentivizing unemployed individuals to found a business, starting with the introduction of the bridging allowance (*Überbrückungsgeld*) in 1986. Figure 1.2 illustrates the relevant key indicators of the German context for the period from 1998 to 2016. First, entry numbers for start-up programs targeted at unemployed individuals are represented by the light- to dark-blue bars on the left. Second, the dashed black line reports the unemployment rate (right scale). And third, as Germany lacks a centralized administrative register for all business founders and new businesses, we have to rely on other (imperfect) data sources or representative estimates to describe the overall start-up activity. We present two commonly used statistics, the estimated total start-up entries in main activity based on the German Microcensus[3] (center light-red bars) as well as inventory numbers provided by the IfM Bonn start-up statistic[4] (dark-red bars on the right).

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[3] The Microcensus is an annual representative 1% population sample collected by the Federal Statistical Office. Start-ups are identified on the basis of individuals with a new main employment status that started within the previous twelve months. Estimates tend to undercover the entirety of start-up activity (Piorkowsky *et al.*, 2013; Suprinovič and Norkina, 2015).

[4] The IfM Bonn start-up statistic is based on the inventory count of commercial business registrations and does not cover liberal professions (Günterberg, 2011).

Figure 1.2: Start-up entries and unemployment over time
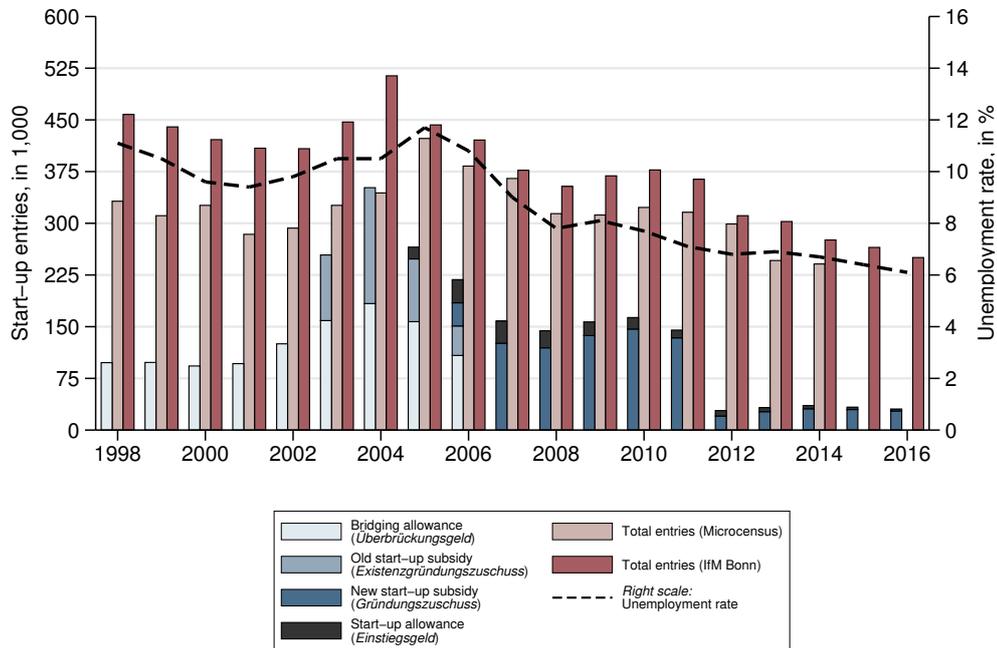
Note: The unemployment statistic was reformed in 2005 (Statistics of the Federal Employment Agency, 2017). The survey method of the German Microcensus was changed in 2005 from a fixed reference week to a uniform distribution of interviews over the whole year (see Piorkowsky *et al.*, 2013, for details). The documentation of business registrations was reformed in 2003. Comparability of figures over time might thus be limited.
Source: Own illustration. Unemployment data based on Statistics of the Federal Employment Agency (2017); data on subsidized start-ups based on Noll and Wießner (2006) and IfM Bonn (2017a); data on overall start-ups (Microcensus) based on Piorkowsky *et al.* (2013) and Suprinovič and Norkina (2015); data on overall start-ups (IfM Bonn) based on Günterberg (2011) and IfM Bonn (2017b).

Because start-up subsidy entries are a function of unemployment, it is not surprising to find that aggregated subsidized entry numbers run relatively parallel to the unemployment rate. Yet, this observation is also true for overall entrepreneurial activity, which supports the *recession-push* hypothesis arguing for a positive link between unemployment and entrepreneurship. According to this view, more individuals are pushed into self-employment in times of economic recession due to high unemployment and the lack of vacancies for dependent employment (Thurik *et al.*, 2008).[5]

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[5] The competing *prosperity-pull* hypothesis states that individuals are instead pulled into entrepreneurship during economic prosperous times since markets are growing, unemployment is declining, and demand for products and services is increasing, which spurs the formation of new businesses (Thurik *et al.*, 2008).

The importance of subsidized entries from unemployment relative to the overall start-up activity in Germany has experienced an inverse-u shaped development over the last twenty years and was heavily influenced by several institutional reforms. The scope of the bridging allowance program remained moderate during the late 1990s. In the early 2000s, the old start-up subsidy (*Existenz-gründungszuschuss*, also known as *Ich-AG*), was introduced. Entries into both start-up subsidy programs increased substantially during this period, which was characterized by relatively high unemployment rates, and peaked in 2004 with a total of more than 350,000 new participants. In August 2006, both instruments were replaced by a single new start-up subsidy program (*Gründungszuschuss*), which combined elements of its two predecessors (see Caliendo *et al.*, 2012, for details). The average entry numbers of the new program stabilized at an average of 130,000. At the end of 2011 and motivated by major budget cuts, the new start-up subsidy program underwent a restrictive reform, and its importance declined sharply as a result, to no more than 20,000 to 30,000 annual entries (Bernhard and Grüttner, 2015; Evers and Schleinkofer, 2015). While the programs mentioned so far were targeted at short-term unemployed, the start-up allowance (*Einstiegsgeld*), introduced in 2005, offers support for job seekers who receive means-tested welfare benefits and want to start a business. The program has remained rather small in scope, however (see Wolff and Nivorozhkin, 2012; Wolff *et al.*, 2016, for details).

The available empirical evidence on the effectiveness of these German programs so far mainly focuses on the individual labor market perspective. It is concentrated on the bridging allowance, the old start-up subsidy, and the start-up allowance, whereas the new start-up subsidy has not been evaluated yet. Caliendo and Künn (2011, 2015) show for the former two that participation has a persistent positive impact on employment prospects and earned income for both men and women. Examinations of the start-up allowance for unemployed welfare recipients find similar positive long-term results on the probability of not reentering unemployment (Wolff and Nivorozhkin, 2012; Wolff *et al.*, 2016). Taken together, the available findings for Germany are in line with the international evidence and confirm the overall positive assessments of this type of program from an individual ALMP perspective.

1.3   Outline and contributions

The main part of the thesis at hand consists of four empirical analyses that extend the existing evidence on start-up incentives for unemployed individuals in several directions and from multiple perspectives. All four subsequent Chapters 2 through 5 are stand-alone analyses and can be read independently. Nevertheless, each of them highlights and empirically examines specific aspects about the new start-up subsidy program (*Gründungszuschuss*) for unemployed individuals and provides new evidence from different angles. Broadly speaking, Chapter 2 extends the evidence on the individual ALMP perspective, while Chapters 3 and 4 provide analyses from an individual business and entrepreneurship perspective. Chapter 5, by contrast, takes a look at the aggregated regional dimension. Jointly, they are intended to serve as a basis for a better informed debate about the benefits and concerns related to this type of public policy.

In the following, the main motivation, research questions, and contributions of each chapter will be summarized, and a preview of the key findings will be provided. Chapters 2 and 3 are based on joint work with Marco Caliendo and Steffen Künn, while Chapter 4 is co-authored by Marco Caliendo and Maximilian Göthner. Table 1.1 gives an overview and reports titles, co-authors, and publication states of each Chapter 2 through 5. Chapter 6 summarizes the key findings and provides some concluding remarks.

Chapter 2: Personality traits and the evaluation of start-up subsidies

This chapter integrates recent findings from entrepreneurship and labor market research about the importance of personality traits for start-up decisions, business performance, and general labor market outcomes, into the impact evaluation of start-up incentives and makes two major contributions to the evidence from an individual ALMP perspective. The first one consists of providing the first impact evaluation of the new start-up subsidy in Germany. We evaluate the short- and long-run effectiveness of the new subsidy program up until 40 months after entry and assess, whether the positive results of former programs can be confirmed for the new policy. Following previous evaluations of similar programs, we rely on data on participants and a comparison group of other unemployed job seekers, and apply propensity score matching methods under the conditional

Table 1.1: Overview of Chapters

Chapter	Title	Co-authors	Published version
2	Personality Traits and the Evaluation of Start-Up Subsidies	Marco Caliendo, Steffen Künn	European Economic Review, Vol. 86 (July 2016), pp. 87-108.
3	Catching Up or Lagging Behind? The Long-Term Business Potential of Subsidized Start-Ups out of Unemployment	Marco Caliendo, Steffen Künn	
4	Entrepreneurial Persistence Beyond Survival: Measurement and Determinants	Marco Caliendo, Maximilan Göthner	
5	Start-Up Subsidies and Regional Entrepreneurship - Evidence from Germany		

independence assumption (CIA) to estimate the causal treatment effects. To be specific, we have information on a random sample of participants, who entered the program in the first quarter of 2009, and a comparison sample of other job seekers, who were also unemployed and principally eligible but did not join the subsidy program during the same period. The very detailed and informative data set combines administrative records (Integrated Employment Biographies), provided by the Institute for Employment Research (IAB), with additional survey information collected in two waves of computer-assisted telephone interviews 21 and 40 months after entry into the program. Consequently, we are able to control for a standard set of covariates similar to other studies, such as socio-demographics, human capital, labor market histories, regional characteristics, and intergenerational determinants of self-employment. In addition and most importantly, we are the first to also include variables on individuals' personalities such as the "big-five," locus of control, and risk attitudes in our propensity score specification, which have been neglected in earlier studies, mainly due to data restrictions.

This brings us to the second, methodological contribution of this chapter. Most evaluation studies on start-up incentives, including our own as described

above, rely on a comparison of a treated and an untreated group under the CIA. The CIA is a strong assumption because it requires that all variables simultaneously relevant for both the participation decision as well as the outcome equation are controlled for. In the context of evaluating start-up incentives, the justification of the CIA and, therefore, the causal interpretation of the estimated effects, is often met with skepticism, even despite the availability of very detailed administrative records in recent years. One of the sources for these concerns can be found in growing evidence from the entrepreneurship literature emphasizing the key role of an individual's personality in affecting not only the decision to start a new business (participation decision), but also the business development/success over time (for two meta-analytical surveys on this topic, see Rauch and Frese, 2007; Zhao *et al.*, 2010). These variables also affect wages (Heckman *et al.*, 2006), job search intensities (Caliendo *et al.*, 2015a; McGee, 2015), and unemployment durations (Uysal and Pohlmeier, 2011), which are also relevant labor market outcomes for the estimation of program effects. Thus, our second contribution is a new innovative sensitivity analysis of the treatment effects with respect to the inclusion and exclusion of usually unobserved personality variables in the estimation procedure. Our findings are highly relevant as they indicate whether earlier evaluation results, which were obtained without the explicit inclusion of individuals' personalities, are reliable, or whether they are prone to a hidden bias due to the omission of these variables.

Our results indicate that participation in the new start-up subsidy has significant positive and persistent effects on both reintegration into the labor market as well as the income profiles of both male and female participants, in line with previous evidence on comparable programs. The sensitivity analysis with regard to the inclusion and exclusion of usually unobserved personality variables reveals that differences in the estimated treatment effects are small in magnitude and mostly insignificant. We find supporting evidence that personality is already implicitly captured to a large extent by other control variables, in particular variables that have been potentially affected by personality themselves, such as human capital attainment and labor market histories. This is why the explicit inclusion or exclusion of personality in the propensity score matching procedure changes the estimation results only marginally, given that the set of other control variables is informative enough.

Chapter 3: Catching up or lagging behind? The long-term business potential of subsidized start-ups out of unemployment

Despite the high effectiveness from an individual ALMP perspective, the concept of start-up incentives targeted at unemployed individuals is discussed very controversially from a business perspective (see, e.g., Santarelli and Vivarelli, 2007; Shane, 2009; Acs *et al.*, 2016). Two of the main objections are that these policies induce an adverse selection, which attracts less qualified individuals with lower opportunity costs and more severe restrictions in their availability or access to human, social, and financial capital into entrepreneurship, as well as a moral hazard problem, which implies that subsidized businesses lower their effort during subsidy receipt because the subsidy serves as a mechanism to insure them against the risk of low or no income.[6] In this sense, the subsidy distorts market selection (survival-of-the-fittest mechanism) and implies that subsidized businesses underperform from a business perspective (see Caliendo *et al.*, 2015c, for a discussion). As a result, the policy is expected to produce mostly small businesses with low growth potentials, little innovation, and only marginal contributions to productivity and economic growth.

Chapter 3 is a contribution to this ongoing critical debate and provides an empirical assessment of the start-up subsidy program from a medium- to long-term business perspective. It requires a different comparison group than traditional ALMP evaluations, however, since we are interested in the relative business performance compared to regular businesses (non-subsidized out of non-unemployment). Direct comparisons between subsidized start-ups out of unemployment and regular new businesses in the empirical literature are very scarce so far (see Andersson and Wadensjö, 2007, for evidence on Sweden). For the German context, Caliendo *et al.* (2015c) provide evidence confirming initial negative self-selection into the new start-up subsidy. They also find shortcomings in business performance with respect to business growth and innovation in the short run compared to a representative sample of regular businesses. Since the data for their analysis stem from a survey conducted only shortly after the subsidy expired, however, results might still be influenced by the subsidy.

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[6] Other concerns relate to deadweight and displacement effects and are addressed in Chapter 5 (see below).

The analysis in Chapter 3 expands on these short-term results with the following three contributions. First, we analyze to what extent subsidized start-ups successfully survive and thrive in the market 40 months after start-up, i.e., when the subsidy had expired more than two years earlier. Second, we examine whether the surviving subsidized businesses can catch up to regular businesses in terms of profitability, job creation, innovation, and investment activity once all businesses were equally exposed to full market selection mechanisms, or whether previously found short-term differences persist or even grow in the medium to longer run. And third, we conduct a decomposition analysis to investigate possible reasons for the remaining gaps in business outcomes between the two groups. The rich data set we use to this end is a longitudinal extension of the data analyzed by Caliendo *et al.* (2015c) and comprises the sample of male participants in the new start-up subsidy program from Chapter 2, who started their businesses in the first quarter of 2009. As comparison group, it also includes information on a representative sample of regular (i.e. non-unemployed) male business founders, who started their business during the same period but did not receive the subsidy.

Our results indicate that 40 months after start-up, formerly subsidized founders show slightly lower survival rates compared to regular business founders, but a clear majority of more than 70% of them is successfully established in the market. A comparison of business performance indicators reveals that formerly subsidized businesses exhibit persistently lower levels of income, productivity, job creation (both at the extensive and intensive margin), innovation, and investment activity. A decomposition analysis shows that only the shortcomings in survival can be entirely explained by initial differences in (observable) start-up characteristics (such as personal characteristics, business sector, and start-up capital). In contrast, we find suggestive evidence that gaps in business development and growth paths are rather due to restricted access to capital and differences in unobserved factors like business strategies and early business dynamics.

Chapter 4: Entrepreneurial persistence beyond survival: Measurement and determinants

Expanding on the individual business and entrepreneurship perspective, this chapter focuses on the determinants and measurement of entrepreneurial persistence.

Entrepreneurial persistence is usually defined as the continuously maintained motivation and decision to actively engage in an entrepreneurial venture despite challenges, opposing forces, or attractive alternatives (Holland and Shepherd, 2013; Holland, 2011; Gimeno *et al.*, 1997). The underlying idea is that in order to exploit the business potential of a given business opportunity, individuals must not only choose once to start their businesses, but persist with them time and time again. And while the start-up decision is often taken under conditions that are likely to be favorable to the creation of the new venture (otherwise it would not occur at this point in time), persistence is also required if environments are changing and conditions are challenging (Holland and Garrett, 2015). Entrepreneurial persistence can, thus, be regarded as a prerequisite for realizing the economic benefits and gains of a given entrepreneurial venture and, in this sense, a necessary condition for business success (Patel and Thatcher, 2014).

Despite the dominant focus of entrepreneurship research on the start-up decision, there is a growing interest in entrepreneurial persistence more recently due to the recognition of its central role in the entrepreneurial process. The prevailing view in the entrepreneurship literature considers persistence as a function of individual, business-related and contextual factors (Holland and Shepherd, 2013; DeTienne *et al.*, 2008).[7]

Primarily, Chapter 4 is a contribution to the entrepreneurship literature and aims to advance our understanding of entrepreneurial persistence in the following two directions: first, the complex nature of entrepreneurial persistence has produced a variety of measurements in empirical applications, which makes a direct comparison of results rather challenging and could be the source of ambiguous findings for particular covariates in previous studies. Based on a review of the relevant literature, we identify several persistence measures that can roughly be summarized into three distinct groups. Most studies use survival as a proxy for persistence, while others apply more subjective measures that capture the psychological commitment to the business. A third alternative is to combine survival and subjective measures into hybrid measures. Using the same rich data on male start-up participants and regular new business founders from Chapter 3 for our empirical analysis, we are able to construct the three

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[7] Some earlier work interpreted persistence as a trait (e.g., Baum and Locke, 2004).

measures corresponding to the three groups of persistence variables identified in the literature from one single data set, which allows us to directly compare the results between the three approaches and, thus, the sensitivity of findings to the choice of persistence measure. Second, several previous studies investigate the influence of limited sets of determinants on persistence, but there is still a need for a more holistic approach to answer the question why some individuals persist while others do not. A rich list of individual-level, business-related, and contextual variables allows for an in-depth analysis of the determinants of persistence and their importance *relative* to each other while minimizing the potential threat of omitted variable bias.

In addition, and directly contributing to the bigger topic of this thesis on start-up incentives for unemployed individuals, we conduct a detailed investigation of persistence between subsidized and regular founders that takes into account the heterogeneity of business owners. Given the results from Chapter 3, which indicate that subsidized founders generally have shortcomings in terms of availability and/or access to human, social and financial capital, and the fact that they are more likely to be necessity founders with lower business attachment, their persistence is likely to depend on different factors compared to regular founders. In our heterogeneity analysis, we therefore conduct separate estimations for both groups to investigate differences in and specific determinants of entrepreneurial persistence between the groups.

Our empirical results reveal that, first, only a few factors (locus of control, start-up capital) exhibit a robust effect on all persistence indicators, whereas the influence of most determinants is sensitive to the choice of persistence measure (e.g., unemployment and industry-specific experience, big five, local labor market conditions). Second, we find that, for the full sample, human capital and business-related characteristics have the highest predictive power for survival. In contrast, socio-demographics and personality, together with these two factors, are of similar importance in explaining subjective measures of persistence. And third, our heterogeneity analysis shows that the subjective psychological commitment of formerly unemployed founders to their businesses is lower on average and more susceptible to changes of the local labor market situation compared to regular non-unemployed founders.

Chapter 5: Start-up subsidies and regional entrepreneurship - Evidence from Germany

Chapter 5 elevates the level of analysis from an individual business founder perspective to a more aggregated, regional dimension in order to both account for the fact that entrepreneurship and new business formation are essentially regional phenomena, which start-up subsidy entries by definition directly contribute to, and to examine how subsidized new businesses affect incumbents in regional markets. Using annual aggregated regional data on business entries, exits, and start-up subsidy entries for a sample of German regional labor markets covering the years 2008 to 2014, we make two major contributions.

The first one is to empirically examine the interplay between start-up subsidy entries and overall entrepreneurial activity at a regional level and is motivated by two observations. On the one side, there is evidence for regionally distinct, long lasting entrepreneurship cultures (Fritsch and Wyrwich, 2014), which are positively related to regional development (see, e.g., Fritsch and Mueller, 2008, 2004, Acs and Armington, 2004, for evidence on employment growth and, e.g., Audretsch and Keilbach, 2004, 2005, for evidence on economic growth and productivity). They are reflected by highly persistent regional new business formation patterns over time, which survive even radical, abrupt changes in the contextual conditions, and high variation in start-up rates between regions (Andersson and Koster, 2011; Fritsch and Mueller, 2007). On the other side, as already shown in Section 1.2, start-up subsidy entries contribute greatly to the overall start-up activity in Germany (at least up until the restrictive reform in 2011) at a national level. The goal of Chapter 5 is to bring these two aspects together. To this end, we investigate how regional start-up subsidy participation and its relative importance to overall entrepreneurial activity are spatially distributed. Furthermore, we aim to answer whether there is an association between subsidized entries and regular entries at the regional level. To be specific, we want to explore whether subsidized new business formation by the unemployed occurs mainly in more entrepreneurial regions, which might indicate that the beneficial effects of entrepreneurship cultures translate to unemployed nascent entrepreneurs, or whether program participation is driven by entries in less entrepreneurial regions, which would indicate that the subsidy is used mainly as an escape from unemployment in regions with poorer economic or labor market conditions.

As the second contribution, the regional data further allow us to empirically examine two major concerns about start-up subsidy programs: displacement and deadweight effects.[8] On the one side, displacement (in a broad sense) is a key feature of market selection mechanisms and Schumpeterian (1934) "creative destruction" and involves the process in which new, innovative market entrants replace existing, less efficient incumbents. In the context of start-up subsidies, displacement (in a narrower sense) describes a negative external effect of the subsidy that occurs, when subsidized entrants utilize the subsidy as an artificial competitive advantage in the marketplace to replace other potential start-ups or to displace incumbents that are, in absence of the subsidy, (at least marginally) more productive (Kösters, 2010). Market churning, a closely related concept, covers cases of revolving door entrants (Santarelli and Vivarelli, 2007), i.e., ill-equipped businesses, who enter the market and, shortly after the subsidy expires, fail and exit again. Empirical evidence on displacement and market churning is very scarce so far (Meager, 1996). On the other side, deadweight effects (in a broad sense) occur when subsidy participants would have started a new business even in absence of the subsidy (Meager, 1996). In a narrower sense, deadweight effects describe to what extent the subsidy did not have any impact on the recipients, i.e., did not affect either their entry decisions nor their subsequent performances. Internationally, the empirical evidence finds deadweight effects (broad sense) for start-up schemes of 30% to 70% (Meager, 1996; Meager *et al.*, 2003) while for German programs, deadweight losses range from 50% to 60% (broad sense) and 10% to 20% (narrow sense) (Caliendo *et al.*, 2015c; Evers and Schleinkofer, 2015). Because the more recent evidence is usually based on self-reported survey statistics recorded retrospectively several months after start-up, estimates are prone to bias, and they should be interpreted with caution (Caliendo *et al.*, 2015c; Caliendo and Kritikos, 2010). The regional data and the specific nature of the restrictive subsidy reform at the end of 2011 allow us to estimate potential deadweight effects using observational data. To sum up, our examination of displacement patterns is intended to shed light on the effects of regional subsidized entrants on regional business *exits*, while the analysis of deadweight effects investigates the effects of a massive restriction of access to the subsidy on regional business *entries*.

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[8] As mentioned above, other concerns relate to adverse selection and moral hazard (see Chapter 3 for details).

Our empirical results indicate that, first, there is high regional variation in the importance of start-up subsidy entries for the overall regional new business formation, which is greatly reduced after the restrictive program reform at the end of 2011. Furthermore, we observe a positive correlation between regular entrepreneurial activity and the share of subsidized entrants relative to the potentially-eligible participant pool, which suggests that regional environments and entrepreneurship cultures, which are favorable to entrepreneurial activity, also positively affect unemployed founders. And second, with respect to displacement, we observe that subsidized entries exhibit slightly larger descriptive displacement effects, which affect mainly small-scale solopreneurs with low market attachment, and there is some suggestive evidence for market churning, but differences are not significant. Moreover, our deadweight estimates range between 70% and 80% and are, thus, slightly higher than survey-based statistics for the same program (50% to 60%), applying the same very broad definition.

Chapter 2

Personality Traits and the Evaluation of Start-Up Subsidies

Abstract

Many countries support business start-ups to spur economic growth and reduce unemployment with different programs. Evaluation studies of such programs commonly rely on the conditional independence assumption (CIA), allowing a causal interpretation of the results only if all relevant variables affecting participation and success are accounted for. While the entrepreneurship literature has emphasized the important role of personality traits as predictors for start-up decisions and business success, these variables were neglected in evaluation studies so far due to data limitations. In this paper, we evaluate a new start-up subsidy for unemployed individuals in Germany using propensity score matching under the CIA. Having access to rich administrative-survey data allows us to incorporate usually unobserved personality measures in the evaluation and investigate their impact on the estimated effects. We find strong positive effects on labor market reintegration and earned income for the new program. Most importantly, results including and excluding individuals' personalities do not differ significantly, implying that concerns about potential overestimation of program effects in absence of personality measures might be less justified if the set of other control variables is rich enough.

2.1   Introduction

It has been shown that entrepreneurship induces economic growth and lowers
unemployment by increasing competition and hence firm productivity, induc-
ing innovation and new technologies and transmitting knowledge spillovers (see
Koellinger and Thurik, 2012; Fritsch, 2008; Audretsch and Thurik, 2001; Storey,
1994, for theoretical concepts and empirical evidence). Therefore, many countries
provide various support measures to remove existing barriers for nascent en-
trepreneurs with the goal of increasing the overall start-up rate in their economies.
The support ranges from soft measures such as counseling, coaching, training,
or technical advice to direct financial support such as subsidized loans, grants,
or start-up subsidies for the unemployed. In order to understand whether these
programs indeed achieve their main goal – i.e. fostering successful start-ups –
causal empirical evidence is needed. In the past, many evaluation studies have
been conducted investigating the effectiveness of soft (e.g. Fairlie *et al.*, 2015;
Rotger *et al.*, 2012; Wren and Storey, 2002, among others) as well as hard support
measures (e.g. Duhautois *et al.*, 2015; Caliendo and Künn, 2011; Tokila *et al.*,
2008; Rodriguez-Planas and Jacob, 2010, among others). Since experimental
evidence is very limited, in particular for industrialized countries, most of the
studies rely on a comparison of a treated and a non-treated group under the
conditional independence assumption (CIA). This is a very strong assumption
as it only allows a causal interpretation of the estimated outcome difference
between the two groups if all information relevant for the decision to start a
business and/or receive support as well as business development and labor market
outcomes in general are observed by the researcher. Although the quantity and
quality of data have significantly been improved in recent years, in particular
due to the better availability of administrative data, there still exist substantial
concerns about the justification of using the CIA in the context of the evaluation
of start-up support programs and hence the causal interpretation of treatment
effects.

One of the reasons for this skepticism is based on the recent entrepreneurship
literature that emphasizes the key role of an individual's personality in affecting
not only (i) the decision to become an entrepreneur but also (ii) the business
development/success over time (for two meta-analytical surveys on this topic,

see Rauch and Frese, 2007; Zhao *et al.*, 2010). In a similar vein, it has been shown that personality also affects other labor market outcomes – such as wages (Heckman *et al.*, 2006), search intensity (Caliendo *et al.*, 2015a; McGee, 2015) and unemployment duration (Uysal and Pohlmeier, 2011) – which are relevant for the estimation of program effects.

Hence, one major aim of our paper is to bring together these two strands of literature and investigate the role that individuals' personalities play for the estimation of causal program effects under the CIA. This is especially relevant for our empirical analysis of a new start-up subsidy program for unemployed individuals in Germany (*"Gründungszuschuss"*). The program, which was introduced in August 2006 and has replaced two already existing programs (*"Überbrückungsgeld"* and *"Existenzgründungszuschuss"*), financially supports start-ups from previously unemployed potential entrepreneurs for up to 15 months. While the former programs have been evaluated extensively (using the aforementioned identifying assumption, see e.g. Caliendo and Künn, 2011; Caliendo and Künn, 2015), no evidence for the new program exists so far. One important advantage for our purpose is the availability of very informative data. In addition to administrative records on program participants using the start-up subsidy and a comparison group of other unemployed job seekers, we have access to extensive information collected in a survey. Besides information on individuals' family backgrounds and intergenerational transmissions, the survey added specific information on individuals' personalities such as the "big-five," locus of control, and risk preferences. Since this type of data is (usually) not observable in administrative sources, it is ideally suited for our research purpose.

We contribute to the existing literature in three important dimensions: (i) we provide the first empirical evidence on the short- and long-run effectiveness of the new subsidy program and assess whether the high effectiveness of the former programs can be confirmed. (ii) Most importantly, we examine the sensitivity of the treatment effects with respect to the inclusion of usually unobserved personality variables in the estimation procedure. Although we do not claim that personality is the only component that was unobserved in earlier studies and, thus, might have biased the results under the CIA, it can be argued, based on the evidence stemming from the entrepreneurship literature, that it plays a significant role. Therefore, this study is of high relevance to the literature as our results will

contribute to the discussion of whether earlier results estimated without explicit consideration of individuals' personalities are reliable or not, and it will investigate the necessity to collect personality information in prospective evaluation studies. And finally (iii), we analyze effect heterogeneity with respect to personality characteristics. While earlier studies revealed heterogeneity regarding education, age, gender, and the regional economic situation, the personality component has yet to be examined due to data limitations. This is especially interesting as the expected relationship between the effectiveness of the start-up subsidy and higher degrees of particular personality characteristics (e.g., is the program more effective for risk-averse or risk-loving individuals) is ambiguous from a theoretical point of view.

Based on an extensive propensity score specification – including not only a standard set of control variables similar to other studies, such as socio-demographics, labor market history, regional characteristics, and intergenerational determinants of self-employment, but in addition also personality traits – we find positive employment and income effects for the new subsidy program over the entire 40 month observation period after start-up. We further find that the inclusion of personality variables in addition to the standard set of control variables leads to only small and mostly insignificant changes in the treatment effects. This indicates that the large set of control variables in the estimation of the propensity score, even when not directly controlling for personality, already sufficiently captures individuals' personalities. The analysis on effect heterogeneity reveals that there is only limited interaction between program effectiveness and personality.

The paper is organized as follows. In Section 2.2, we provide a summary of the economic rationale behind start-up subsidies for the unemployed, take a closer look at the entrepreneurship literature by discussing recent theoretical concepts and empirical findings about the importance of individuals' personalities on the start-up decision and business development, introduce the institutional setting in Germany, summarize the previous empirical findings and outline the research questions of our study. Section 2.3 presents the data and some descriptive results. Section 2.4 discusses the estimation strategy, the potential occurrence of a hidden bias, and the implementation of the propensity score matching approach. In Section 2.5, we present the main estimation results and robustness analyses before Section 2.6 concludes.

2.2 Start-up subsidies and the role of personality

2.2.1 The economic rationale behind start-up subsidies for the unemployed

The main justification for the existence of start-up subsidies for the unemployed is based on the assumption that unemployed nascent entrepreneurs face disadvantages compared to business founders out of non-unemployment. Such disadvantages might arise because of more severe credit constraints due to lower financial means or discrimination by credit markets (see Meager, 1996; Perry, 2006), a depreciation of their start-up specific human and social capital during unemployment (Pfeiffer and Reize, 2000; Niefert, 2010), a strong focus on dependent employment during job search resulting from imperfect information (Storey, 2003, refers to it as "lack-of-awareness") and finally a higher share of necessity start-ups due to missing employment alternatives. Caliendo *et al.* (2015c) provide descriptive evidence for the existence of such disadvantages by comparing subsidized start-ups (considering the same program as under scrutiny here) with regular start-ups in Germany. The start-up subsidy aims at removing such barriers for the unemployed by providing financial assistance to compensate for these disadvantages. Moreover, in a recent study, Bianchi and Bobba (2013) show that insurance (instead of credit) constraints are most binding for nascent entrepreneurs, i.e., they are hindered by the (financial) risk of failure. In this sense, the subsidy can be considered as insurance against the risk of low or no income during the start-up period, stimulating nascent entrepreneurs among the unemployed to start a business. However, the existence of the subsidy might also induce some negative effects such as adverse selection, moral hazard, and deadweight effects (see Caliendo *et al.*, 2015c, for a discussion and empirical evidence).

2.2.2 The influence of personality in entrepreneurship research

The entrepreneurship literature stresses the importance of personality with respect to business creation and performance. Entrepreneurs identify opportunities and create businesses to pursue them (Bygrave and Hofer, 1991). Setting up and successfully managing a business are inherently related to higher degrees of personal initiative and discretion, making risky decisions in uncertain

environments, showing perseverance in the face of obstacles, setbacks, and stress, as well as setting up and maintaining relationships with investors, suppliers, and clients. A comparison of personality characteristics with the tasks required in an entrepreneurial context yields intuitive indications about the direction of the relationship. One of the most widely examined personality constructs in this context is the five-factor model, commonly referred to as the "big five" with its dimensions conscientiousness, extraversion, agreeableness, neuroticism, and openness (Costa and McCrae, 1992; McCrae and Costa, 2008). On top of that, more specific personality constructs have gained attention, most importantly risk attitudes (Chell *et al.*, 1991), locus of control (Rotter, 1966), achievement orientation (McClelland, 1965b), self-efficacy (Baum and Locke, 2004), or innovativeness (Heunks, 1998).[1] We restrict the discussion below to the personality characteristics available in our dataset, i.e., big five, locus of control, and readiness to take risks. Given that these items are highly correlated with others like achievement orientation or self-efficacy (Judge *et al.*, 2002), we are confident that we capture the most important variables, without making any claim that all usually unobservable personality-related factors are included.

Personality and start-up   Comparing the entrepreneurial tasks with the attributes associated with each of the personality dimensions, the following intuitive predictions can be made (see, e.g., Zhao *et al.*, 2010; Caliendo *et al.*, 2014, and column 1 in Table 2.1 for a summary): The decision to set up a business should be related positively to extraversion (indicating higher levels of ambition and optimism, seeking leadership roles) and openness (higher levels of creativity) and negatively to neuroticism (higher levels of self-confidence and self-esteem, less vulnerable to psychological stress in face of challenges). Conscientiousness (dedication, perseverance, efficiency) might only become more relevant once the business is set up, such that the influence on the start-up decision is ambiguous. The same is true for agreeableness, where both extremes of the factor – high values (trusting, altruistic, cooperative) and low values (self-centered, hard-bargaining, suspicious) – might have positive and negative effects on the entry decision. For internal locus of control a positive association is expected reflecting that individuals who believe their own actions determine their future outcomes are

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[1] This list is not intended to be exhaustive. For meta-analytical surveys on the topic, see, e.g., Stewart and Roth (2001), Rauch and Frese (2007), and Zhao *et al.* (2010).

Table 2.1: The role of personality

	Decision to start a business (1)	Survival as entrepreneur (2)	Exit from unemployment (3)	Interaction with program effect (4)
Big five				
Conscientiousness	$^+/_-$	$+$	$+$	$^+/_-$
Extraversion	$+$	$+$	$^+/_-$	$^+/_-$
Agreeableness	$^+/_-$	$^+/_-$	$^+/_-$	$^+/_-$
Neuroticism	$-$	$-$	$-$	$^+/_-$
Openness	$+$	$^+/_-$	$+$	$^+/_-$
Locus of control	$+$	$+$	$^+/_-$	$^+/_-$
Readiness to take risks	$+$	inverse u	$-$	$^+/_-$

Note: The table summarizes the hypotheses about the direction of the effects of personality characteristics on start-up (1), business survival (2), exit from unemployment (3), and the interaction with program effectiveness (4) as discussed in Section 2.2.2.
$+$ denotes a positive effect, $-$ denotes a negative effect, and $^+/_-$ denotes no or an ambiguous effect.

more likely to actively pursue new business opportunities (Rauch and Frese, 2007). Given that being self-employed is a more risky occupational choice, a positive relationship with readiness to take risks is assumed (Cramer *et al.*, 2002; Ekelund *et al.*, 2005).

The empirical evidence on these hypotheses is less clear-cut. While Zhao *et al.* (2010) conclude that entrepreneurial intentions are positively related to conscientiousness, extraversion, and openness, and negatively to neuroticism, Caliendo *et al.* (2014) find significant positive impacts on actual start-up activity only for extraversion and openness. Further, a positive link between start-up activity and internal locus of control (Evans and Leigthon, 1989; Caliendo *et al.*, 2014) as well as risk tolerance (Cramer *et al.*, 2002; Ekelund *et al.*, 2005; Skriabikova *et al.*, 2014) is supported by empirical results. When taking gender differences into account, findings for openness and risk hold for both men and women whereas the predictive power for start-up activity of extraversion and locus of control is confirmed only for men (Hansemark, 2003; Caliendo *et al.*, 2009, 2015b).

Personality and business success The influence of personality on professional behavior and success is likely to be stronger for entrepreneurs compared to most other professions due to the characteristics of the entrepreneurial role itself (Brandstätter, 2011). The hypotheses regarding business survival can be derived with a similar intuitive reasoning as mentioned above for the start-up activity, but

some noteworthy deviations occur (see, e.g., Ciavarella *et al.*, 2004; Zhao *et al.*, 2010; Caliendo *et al.*, 2014, and column 2 in Table 2.1). The positive relations to conscientiousness (higher work motivation, dedication, perseverance, and efficiency), extraversion (higher levels of assertiveness, advantages in developing and maintaining social networks with investors, suppliers, and customers), and internal locus of control as well as the negative link to neuroticism (higher levels of stress-tolerance and self-security, less prone to anxiety and depression) are straightforward. With respect to agreeableness, higher levels, that imply more trusting and cooperative business relations with stakeholders, might be beneficial on the one hand (Ciavarella *et al.*, 2004), whereas on the other hand, too agreeable entrepreneurs might lack bargaining abilities and the required ruthlessness to survive (Zhao *et al.*, 2010). The expectations for openness are also ambiguous as higher levels (innovative thinking, creativity) might be less important once the business is set up (Baron and Markman, 2005). Finally, entrepreneurs are required to manage risk to preserve sustainability and avoid too risky investments that could lead to large losses, resulting in an inverse-u shaped relationship with business success (Chell *et al.*, 1991, Zhao *et al.*, 2010.)

The empirical evidence on business survival finds support for the positive impacts of conscientiousness (Ciavarella *et al.*, 2004) and internal locus of control (Rauch and Frese, 2000), the negative link with agreeableness (Caliendo *et al.*, 2014), and suggests a negative association with openness (Ciavarella *et al.*, 2004). Finally, the assumed inverse u-shaped relation of risk tolerance on entrepreneurial survival also finds empirical support (Caliendo *et al.*, 2010a).

Personality and program effectiveness   In the heterogeneity analysis, we examine the interplay between personality and effectiveness of the subsidy program to provide the first empirical evidence on which type of individual benefits most from participation. As we will show in the following, it is not obvious from a theoretical point of view if individuals with higher degrees in a particular personality variable are expected to benefit more or less from the start-up subsidy program. To derive hypotheses about the direction of this interaction, we need to examine the net effect of two distinct relationships: First, the connections between personality and business survival, as elaborated above, yield indications in the case of participation. Second, the link between personality and exit from unemployment (column 3 in Table 2.1) reveals the direction of the impact of

personality in the counterfactual situation of non-participation. The net effect of these two gives the expected interaction effect between personality and program effectiveness (column 4). The literature on the influence of personality on job search behavior and the transition out of unemployment is very scarce. Uysal and Pohlmeier (2011) hypothesize that exit from unemployment is positively connected to conscientiousness and openness, whereas they assume a negative relation to neuroticism. Further, they reason that, ex ante, the link to agreeableness is ambiguous and stress the context-dependency (e.g., job, sector) of these expectations. With respect to locus of control, McGee (2015) and Caliendo *et al.* (2015a) argue that a more internal locus of control predicts both a higher search intensity as well as higher reservation wages. As a consequence, the net effect on transitions from unemployment is ambiguous. Furthermore, it is assumed that higher risk-aversion is associated with lower reservation wages and thus shorter unemployment durations (Pissarides, 1974).

Empirically, Uysal and Pohlmeier (2011) find support for the positive link with conscientiousness and openness as well as for the negative influence of neuroticism on transitions from unemployment. The empirical results for internal locus of control are inconclusive, with McGee (2015) finding no significant impact, whereas Caliendo *et al.* (2015a) report a positive net effect on the probability of leaving unemployment. The evidence on risk attitudes is also less clear cut: while more risk-loving individuals tend to have higher reservation wages (Pannenberg, 2010) and longer durations in unemployment (Feinberg, 1977), Diaz-Serrano and O'Neill (2004) find that they are less likely to be unemployed. The findings in Oberschachtsiek and Ullrich (2010) meanwhile suggest a non-linear pattern between risk aversion and unemployment duration.

2.2.3 Institutional setting in Germany

The new start-up subsidy (*"Gründungszuschuss"*, SUS) offers unemployed job seekers financial support to start their own business and hence to escape unemployment. The program was introduced in August 2006 and replaced two already existing start-up subsidy programs, the bridging allowance (*"Überbrückungsgeld"*) and a former version of the start-up subsidy (*"Existenzgründungszuschuss"*) (see Caliendo and Kritikos, 2010, for a description). The SUS program pays a subsidy for a maximum duration of 15 months after start-up which is split into two

parts: (i) All sponsored individuals receive a monthly amount equivalent to the individual's last unemployment benefit and a lump sum of 300 euros to cover social security costs for nine months. (ii) Afterwards, individuals can apply for an optional second period (no legal claim) by proving sufficient business activity. Based on the caseworker's discretion, individuals received the lump sum payment for another six months.[2] Eligibility for the SUS program required unemployed individuals to have a minimum entitlement to *unemployment benefit I*[3] of at least 90 days at the time of program start. Moreover, individuals applying for the subsidy had to provide a business case and financing plan to the Employment Agency, which had to be evaluated by a competent external institution. Between 2007 and 2011 (afterwards the program conditions changed), around 130,000 job seekers entered the start-up subsidy program per year, resulting in public annual expenditures of about 1.6 billion euros (e.g., compared to 0.8 billion euros for vocational training). This illustrates that the program is an integral part of the German Active labor Market Policy (ALMP) and is expected to remove existing disadvantages faced by nascent entrepreneurs among the unemployed compared to the employed workforce.

2.2.4   Previous evidence and research questions

While the effectiveness of this new program has not been examined yet, evaluation studies on the two former programs show very positive results in terms of employment and income (Caliendo and Künn, 2011; Caliendo and Künn, 2015, 2014) that are larger than those reported for traditional ALMP programs such as training or wage subsidies. All of these studies are using a propensity score matching approach – the workhorse in this literature – and claim that the rich data at hand allows them to control for all relevant variables to make the CIA a reliable assumption. A similar picture arises from international evidence on start-up programs for the unemployed. The identification of causal program effects is most often based on the CIA, and the findings are predominately positive based on propensity score matching approaches (see, e.g., Duhautois *et al.*, 2015, for France, O'Leary *et al.*, 1998, and O'Leary, 1999, for Hungary and Poland,

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[2]   65.5% of the business founders received the subsidy for 15 months in our sample.
[3]   In Germany, every individual who has been in employment subject to social security for at least one out of the last three years is eligible for unemployment benefit I. The amount of the benefit consists of 60% (67% with children) of the last net wage and is basically paid for a period of 12 months, with the exception of older individuals (see Caliendo and Hogenacker, 2012).

Rodriguez-Planas and Jacob, 2010, and Rodriguez-Planas, 2010, for Romania, or Perry, 2006, for New Zealand).

The large positive results for Germany, in particular in comparison to other ALMP programs, and other countries raise concerns about the justification of the CIA in this context, i.e., whether all relevant aspects are included in the vector of observable characteristics or whether the results are still affected by (at this time) unobserved factors. These concerns stem primarily from the growing entrepreneurship literature stressing the importance of personality as outlined above. However, due to data limitations, this aspect has not (directly) been included in existing evaluation studies estimating causal program effects under the CIA, and hence, the previous very positive findings might be biased as important personality variables were missing.[4] Therefore, the central question in this paper is whether the inclusion of personality variables, in addition to other control variables as used in earlier studies, would change the estimation of treatment effects significantly. On top of that, we will further provide the first long-term evidence on the effectiveness of the new SUS program. This is interesting itself as the new program combines elements of the two earlier programs, leading to a different selection of participants where the average participant is more similar to the former bridging allowance than the former start-up subsidy (Caliendo *et al.*, 2012). The question thus arises as to whether the new program is as successful as its two predecessors. Moreover, we will have a closer look at effect heterogeneity with respect to personality. While earlier evaluation studies have shown that start-up subsidy programs are particularly effective for certain subgroups of the labor market, e.g., women, low-educated, or low-qualified individuals (see Caliendo and Künn, 2011; Caliendo and Künn, 2015), the question remains whether the effects also vary with personality characteristics.

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[4] For the evaluation of traditional ALMP like training and wage subsidy programs under the CIA, Caliendo *et al.* (2017c) find no significant differences in treatment effects when including these measures in addition to a standard set of control variables. However, this evidence is not directly adoptable for the evaluation of business support programs given that they are likely to be most prone to remaining selection bias due to unobserved personality variables because they involve a higher level of individual initiative, risky decisions, and uncertainty.

2.3   Data and descriptive results

2.3.1   Estimation sample

For the empirical analysis, a random sample of unemployed individuals who entered the subsidy program in the first quarter of 2009 serves as our treatment group; a sample of other unemployed job seekers who did not join the program during that period are the control group.[5] The data combines administrative information (Integrated Employment Biographies) provided by the Institute for Employment Research (IAB) with survey information collected in telephone interviews. The survey is constructed as a panel, where the same individuals were interviewed twice – in the last quarter of 2010 (21 months after business start) and in the fall of 2012 – such that we observe all respondents for 40 months after business start-up.

From the administrative data, we obtain detailed information on the time prior to participation in the start-up program, including spells in employment and participation in ALMP programs as well as wages and unemployment benefits. For the period after entry into the subsidy, we use the survey information to calculate labor market outcomes, as spells in self-employment are not recorded in the administrative data. Moreover, the survey allows us to observe characteristics usually not included in the administrative records such as parental self-employment. In addition, and central to our analysis, the questionnaire contains items measuring various personality characteristics, e.g., for the big five (locus of control), respondents were given 10 (6) different statements about themselves and were asked how much they agreed with them on a seven-point Likert-type scale. Risk preferences were measured on a scale ranging from zero to ten, where higher values indicate a higher readiness to take risks. The item wordings and the construction of the variables are documented in Table 2.9 in the Appendix, Section 2.7.1, and are similar to other questionnaires such as the German Socio-Economic Panel (SOEP). It has to be noted, however, that the personality variables in our data were surveyed more parsimoniously than in

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[5] Non-participants were selected by a pre-matching procedure, i.e., those most similar to participants in key socio-demographic characteristics were selected. A fictitious entry month for the program was attributed to each non-participant which corresponds to the actual entry month of the pre-matching partner in the participant group. We further note that having access to only one particular quarter of entrants might restrict the external validity of the results if the composition of subsidized business founders has changed over time.

Table 2.2: Definition of the estimation sample

	Participants (1)	Non-participants (2)
Respondents in first interview	2,306	2,307
Random subsample (50%)	1,143	1,390
Respondents in second interview	632	789
Consent to link administrative data	617	776
Estimation sample	589	699
Men	367	439
Women	222	260

Note: Number of observations. The first interviews were conducted in November and December 2010, the second interviews in August through October 2012.

other surveys, such that we need to be careful with the interpretation for some of the traits. The personality characteristics were surveyed during the second interview and thus recorded after the program start. Following the literature, we assume in our analysis that personality variables are exogenous and thus not related to labor market events, i.e., unaffected by the entry into the start-up subsidy program and subsequent success.[6]

Table 2.2 shows the definition of our estimation sample. Initially, 2,306 participants and 2,307 non-participants were interviewed in the first wave. We use a 50% random subsample for which the information on personality and business characteristics was collected, and we further consider only individuals who participated in the second interview, gave their consent to link their survey information to the administrative data, and responded to all questions relevant for our analysis. Our final estimation sample consists of 589 participants (367 men and 222 women) and 699 non-participants (439 men and 260 women). A selectivity analysis at each step in Table 2.2 yields practically no empirical evidence for a systematic attrition pattern.[7] The gender composition in our treatment group of 62% men and 38% women is relatively similar to the general shares observed for business founders in Germany in 2009 (cf. Fritsch *et al.*, 2012). Since start-up decisions and actually founded businesses are very different across gender

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[6] Personality variables are shown to be relatively stable over the adult life-cycle and not related to lifetime events in a meaningful way (Cobb-Clark and Schurer, 2012, 2013). Although we cannot explicitly test the exogeneity of personality variables in our setting, Hamilton *et al.* (2015) did not find any evidence for simultaneity or reverse causality of personality variables and self-employment status or earnings.

[7] Detailed results for the selectivity of attrition analysis are available in the Appendix, Section 2.7.2.

(Georgellis and Wall, 2005; Caliendo *et al.*, 2015b), we conduct our analysis separately for men and women.

2.3.2   Descriptive results

Table 2.3 presents selected descriptive statistics with respect to basic individual characteristics at start-up (Panel A), personality characteristics (Panel B), and labor market outcomes 21 months (Panel C) and 40 months after business start (Panel D). Results are reported separately for male (columns 1 through 3) and female (column 4 to 6) participants and non-participants.

Socio-demographics and labor market history: Both male participants (column 1) and non-participants (column 2) are on average 41 years old, and more than 50% have completed upper secondary school. While basic socio-demographics are balanced between the two groups,[8] we find that participants are characterized by a higher labor market attachment in the past but do not substantially differ in benefit levels from their non-participant counterparts. For women (columns 4 and 5), the comparison of the two groups yields a similar picture. Between men and women, however, we find the usual differences. Women are less attached to the labor market, earn less and have stronger family commitments, irrespective of participation status.

Personality: Both male and female participants are characterized by stronger 'entrepreneurial personality' characteristics than non-participants (as expected in Table 2.1, column 1). For instance, participants are significantly more extraverted, more open to new experiences, and have a more internal locus of control. Also, male participants show a higher willingness to take risks, while female participants are significantly more confident (less neurotic). A comparison of men and women indicates meaningful differences in mean levels, again irrespective of participation status. For instance, women have higher values in the big five, while men show a higher readiness to take risks. This reinforces our decision to analyze men and women separately.

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[8] This is not surprising given the pre-matching procedure of participants and non-participants with respect to key socio-demographic characteristics mentioned above.

Table 2.3: Selected descriptive statistics

	Men			Women		
	Particip.	Non-part.	p-val.	Particip.	Non-part.	p-val.
	(1)	(2)	(3)	(4)	(5)	(6)
A. Selected individual characteristics[a]						
Age at start-up (years)	40.92	41.02	0.89	41.05	40.42	0.47
Married	0.64	0.56	0.02	0.55	0.55	0.94
East Germany	0.20	0.24	0.18	0.26	0.27	0.76
Upper secondary school	0.52	0.54	0.45	0.55	0.60	0.35
Lifetime unemployment (share)[b]	0.04	0.08	0.00	0.05	0.08	0.00
Dependent employed before unempl.	0.63	0.51	0.00	0.51	0.46	0.26
Monthly unemployment benefit (euros)	1,093	1,080	0.77	803	793	0.80
B. Personality measures[c]						
Big five[d]						
Conscientiousness	5.95	5.89	0.36	6.19	6.18	0.88
	(0.82)	(0.88)		(0.76)	(0.78)	
Extraversion	5.63	5.47	0.04	6.07	5.79	0.00
	(1.08)	(1.12)		(1.00)	(1.05)	
Agreeableness	5.93	5.97	0.59	6.34	6.28	0.41
	(0.96)	(1.08)		(0.76)	(0.78)	
Neuroticism	3.83	3.88	0.56	4.27	4.76	0.00
	(1.35)	(1.30)		(1.41)	(1.24)	
Openness	4.86	4.69	0.07	5.34	5.06	0.01
	(1.36)	(1.33)		(1.27)	(1.27)	
Locus of control[d]	5.48	5.25	0.00	5.43	4.99	0.00
	(0.80)	(0.86)		(0.83)	(0.87)	
Readiness to take risks[e]	6.33	6.06	0.05	5.82	5.70	0.51
	(1.87)	(2.01)		(2.10)	(1.97)	

(Table continued on next page)

Labor market outcomes: The relatively high descriptive shares of self-employed participants in the short- (after 21 months) and long-run (after 40 months) indicate a persistent integration into self-employment of a striking majority of former subsidy recipients. Given a 15 month maximum duration of the subsidy, 77% of male and 69% of female participants are self-employed two years after the subsidy expired. A comparison of self-employment rates between participants and non-participants is not very informative, however, as all participants are self-employed at the start of the program by definition, whereas non-participants might seek dependent employment instead. Thus, we focus on a joint employment outcome, i.e., self- or regular employment subject to social security contributions. For male participants, we find employment shares consistently higher than 90%, while for females the numbers are slightly lower. Both experience an advantage in

(Table 2.3 continued)

	Men			Women		
	Particip.	Non-part.	*p*-val.	Particip.	Non-part.	*p*-val.
	(1)	(2)	(3)	(4)	(5)	(6)
C. Short-term labor market outcomes (21 months after start-up)						
Self-employed	0.853	0.114	0.00	0.797	0.096	0.00
Self- or regular employed	0.943	0.731	0.00	0.901	0.673	0.00
Unemployed or in ALMP	0.052	0.257	0.00	0.054	0.188	0.00
Net earned income						
(euros/month)^f	2,332	1,381	0.00	1,279	853	0.00
	(2,158)	(1,672)		(1,200)	(865)	
	[2,000]	[1,200]		[1,000]	[750]	
D. Long-term labor market outcomes (40 months after start-up)						
Self-employed	0.774	0.128	0.00	0.689	0.096	0.00
Self- or regular employed	0.929	0.786	0.00	0.865	0.692	0.00
Unemployed or in ALMP	0.033	0.123	0.00	0.059	0.081	0.34
Net earned income						
(euros/month)^f	2,813	1,836	0.00	1,611	978	0.00
	(2,397)	(2,125)		(2,257)	(919)	
	[2,500]	[1,500]		[1,054]	[900]	
Number of observations	367	439		222	260	

Note: Reported are sample averages and *p*-values for *t*-tests of equal means. Standard deviations are denoted in parentheses, medians in brackets.
[a] The full list of individual characteristics used in the subsequent propensity score matching estimations can be found in Table 2.8 in the Appendix, Section 2.7.1.
[b] Shares are calculated by dividing the cumulative time spent in unemployment in the past by the total time spent in the labor market (as approximated by age-15).
[c] For details on the construction of the personality variables, see Table 2.9 in the Supplementary Appendix.
[d] The big five and locus of control are measured on a scale from 1 to 7, where higher values indicate a stronger degree of the respective trait or a more internal locus of control.
[e] Risk is measured on a scale from 0 to 10, where higher values indicate a higher willingness to take risk.
[f] Income measures are based on slightly lower numbers of observations due to item non-responses.

employment chances over non-participants of around 15 points each. In addition to employment, we also consider earned income. Former male participants earn 2,813 euros/month after 40 months, whereas the mean monthly income in the male comparison group amounts to 1,836 euros. Conditional on being employed, the difference between the two groups is less pronounced (3,003 euros versus 2,300 euros) but still meaningful.[9] For women, we again observe a similar pattern between participants and non-participants but on substantially lower absolute levels compared to men.

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[9] To set these figures in perspective, the German Federal Statistical Office (2012, p. 106) reports average monthly gross earnings of 2,976 Euros for a male full-time worker in dependent employment in Germany in the third quarter of 2012 (when income measures 40 months after start-up were surveyed). Applying a net-to-gross ratio of 70%, assuming a three-person household (married couple, one child) with one breadwinner and residence in West Germany (Federal Statistical Office, 2013, p. 10), this translates into net monthly earnings of 2,083 euros. Although the range of earned incomes among the group of employed male participants is pretty broad, the mean income level 40 months after start-up clearly exceeds this benchmark.

Table 2.4: Descriptive statistics with respect to business outcomes

	Men		Women	
	Outcome variable		Outcome variable	
	21 mo. after start-up	40 mo. after start-up	21 mo. after start-up	40 mo. after start-up
	(1)	(2)	(3)	(4)
Net earned income (euros/month)[a]	2,609	3,189	1,488	1,988
	(2,228)	(2,477)	(1,326)	(2,601)
	[2,000]	[2,500]	[1,300]	[1,450]
Working time (hours/week)[a]	51.0	50.5	42.0	40.8
	(13.5)	(14.4)	(16.9)	(18.0)
	[50.0]	[50.0]	[40.0]	[40.0]
Net earned hourly income (euros)[a]	12.52	15.03	9.01	13.17
	(10.36)	(10.96)	(7.36)	(15.61)
	[10.62]	[12.44]	[7.34]	[9.22]
At least one employee	0.391	0.437	0.307	0.353
Number of full-time equivalent				
employees (if > 0)[b]	3.6	3.6	2.5	2.3
	(10.1)	(5.2)	(4.5)	(4.7)
	[1.3]	[2.0]	[1.3]	[1.0]
Filed patent application	0.018	0.018	0.007	0.013
Filed application to protect corporate ID	0.074	0.102	0.039	0.059
Number of observations	284	284	153	153

Note: Reported are sample averages for all participants self-employed 40 months after start-up. Standard deviations are denoted in parentheses, medians in brackets.
[a] Income and working time measures are based on slightly lower numbers of observations due to item non-responses.
[b] Full-time equivalent employees are calculated as the weighted sum of full-time employees (weight 1), part-time employees (weight 0.5), and other employees (weight 0.25). Apprentices are not considered in the calculations.

Business outcomes: We further consider business outcomes for those 77% male and 69% female participants who are self-employed after 40 months (see Table 2.4). First, focusing on the long-run outcomes after 40 months (column 2) shows that men are working on average 50 hours per week with an hourly income of 15 euros. While a majority of male self-employed remain solo-entrepreneurs, around 40% create, on average, 3.6 full-time equivalent jobs. Formal indications of innovation show relatively low rates. For female founders in our sample (column 4), we observe lower weekly working time, less innovation implemented, and a lower amount of job creation in terms of both the extensive and intensive margin. Second, a comparison of the business outcomes achieved after 20 and after 40 months reveals that businesses show improvements in growth, productivity, innovation, and job creation over time. This finding holds true for both genders.

2.4 Estimation strategy

2.4.1 Identification of causal treatment effects under the CIA

The aim of the paper is to estimate the causal impact of participating in SUS on labor market outcomes and to investigate the sensitivity of the treatment effects to the inclusion of personality variables. Similar to the majority of evaluation studies in the past (see Section 2.2.4), we do this by applying a propensity score (PS) matching approach. While matching is easy to implement, the validity of its results hinges on the strong identifying conditional independence assumption (CIA).

To illustrate the idea behind PS matching, we use the well known potential outcome framework (Roy, 1951; Rubin, 1974). The two potential outcomes are denoted as Y^1 (in case of treatment) and Y^0 (in case of non-treatment). We focus on the usual parameter of interest in most evaluation studies, the average treatment effect on the treated (ATT):

$$\Delta_{ATT} = E(Y^1 \mid D = 1) - E(Y^0 \mid D = 1), \qquad (2.1)$$

where D is a binary treatment indicator. The fundamental evaluation problem arises because the last term on the right hand side of equation (2.1) is not observed. If participants and non-participants are selected groups in terms of (un)observed characteristics who would have different potential outcomes even in the absence of treatment, selection bias arises.

To correct for this selection bias, propensity score matching estimators rely on the unconfoundedness or conditional independence assumption (CIA), which states that conditional on observed characteristics (X), the counterfactual outcome is independent of treatment (Rosenbaum and Rubin, 1983). In addition, we also assume overlap: $Pr(D = 1 \mid P(X)) < 1$, for all X. The ATT is then identified as:

$$\Delta_{ATT}^{MAT} = E(Y^1 \mid P(X), D = 1) - E_X\Big[E(Y^0 \mid P(X), D = 0) \,\Big|\, D = 1\Big], \quad (2.2)$$

where the counterfactual situation can now be estimated from the mean outcomes of the matched control group, i.e., taking the outer expectation over the distribution of $P(X)$ in the treatment group.

The CIA is a very strong assumption which relies heavily on the availability of relevant data that allow the researcher to control for all relevant variables that simultaneously influence the participation decision and the (untreated) outcome variable (Lechner and Wunsch, 2013). In previous evaluation studies of start-up subsidies for the unemployed, it has been argued that controlling for individual socio-demographic and qualification factors along with information on labor market history and parental self-employment makes it plausible that the CIA holds (see, e.g., Caliendo and Künn, 2011). This can be criticized because crucial information was missing, in particular, due to the recent findings in the entrepreneurship literature stressing the key role of personality characteristics affecting the decision to start a business and the subsequent performance (see Section 2.2.2).

2.4.2 The risk of hidden bias

If the concerns are justified and the missing variables indeed have a significant impact on the selection into the program and labor market outcomes, a *hidden bias* might arise to which the above defined Δ_{ATT}^{MAT} is not robust (see Rosenbaum, 2002; Caliendo *et al.*, 2017c, for an extensive discussion and recent application). To illustrate the underlying idea, we introduce a vector U in addition to the usually observed vector X and assume that the participation probability depends on both sets of variables. The participation probability can then be specified as:

$$P(D = 1 \mid X, U) = F(\beta X + \gamma U), \tag{2.3}$$

where γ is the effect of U on the participation decision. If $\gamma = 0$, the study is free of hidden bias and the participation decision is solely determined by X. However, if there is hidden bias, two individuals with the same observed covariates X have different chances of receiving treatment. The magnitude of the bias depends on γ and the correlation between X and U.

In contrast to earlier studies evaluating the effectiveness of start-up subsidies, we now have access to more informative data which allow us to observe the standard set of control variables used in earlier studies (X) and, in addition, usually unobserved characteristics (U) such as personality and risk preferences. Therefore, we can now model the selection process with and without personality variables (U) and compare the estimated treatment effects. Thus, we can examine

the sensitivity of the effects of the start-up subsidy program with respect to the availability of personality variables. Finally, we clearly emphasize that we do not claim that personality is the only component that was unobserved in earlier studies which might have biased the results under the CIA. However, based on the evidence as presented in Section 2.2.2, it can be argued that it is likely to be a significant part of U.

2.4.3   Propensity score estimation and matching quality

The first step of our matching routine is to estimate the propensity score based on a probit model. The specification of the model is primarily guided by previous evaluation studies (see e.g. Caliendo and Künn, 2011, for an elaborate discussion on the choice of variables). It contains a rich set of detailed information on socio-demographics, intergenerational transmissions, regional labor markets, human capital, and labor market history including details on the unemployment spell preceding start-up (summarized as X). On top of these standard controls, we extend our model by usually unobserved personality measures of the big five, locus of control, and readiness to take risks (summarized as U). The results of the probit estimation in Table 2.10 in the Appendix, Section 2.7.1, show that, for both men (column 3) and women (column 6), openness and locus of control have a positive and significant influence on the start-up decision, in line with our theoretical expectations (cf. Table 2.1, column 1). For the other big five factors as well as risk attitudes, we do not find any significant impact. At first glance, especially the insignificant result on risk might be surprising, but it is in line with previous empirical evidence that suggests that risk preferences do not play a role in start-up decisions for unemployed or inactive individuals (Caliendo *et al.*, 2009). Overall, the additional set of information on personality characteristics has a significant impact on the decision to participate in the start-up program and improves the overall model fit, as indicated by the joint significance test for all personality variables. Among the conventional controls, primarily variables on household composition, parental self-employment, characteristics on labor market history, the current unemployment spell, as well as the regional cluster influence the selection into the program.

Figure 2.1 plots the distributions of the estimated propensity scores for participants and non-participants, separately by gender. As expected, the distributions

Figure 2.1: Propensity score distributions

a. Men

b. Women

Participants   Non–participants
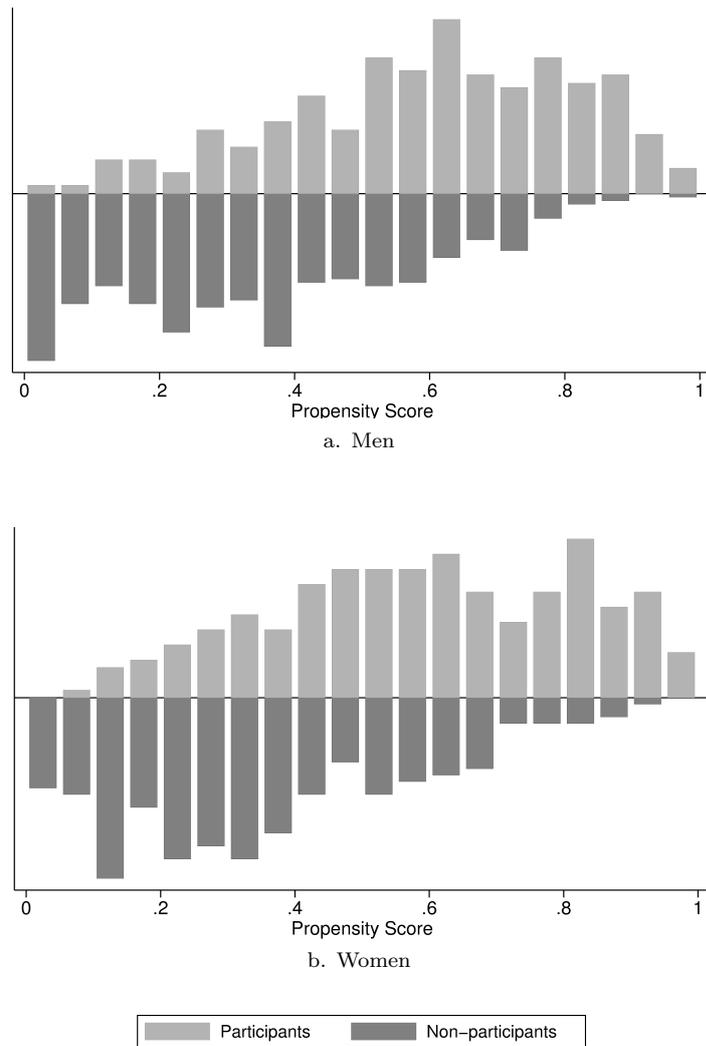
Note: Depicted are propensity score distributions for participants and non-participants based on the propensity score probit specification including variables on socio-demographics, intergenerational information, regional labor market, human capital, labor market history, and personality characteristics (extended specification). The results of the underlying probit estimations are reported in Table 2.10 in the Appendix, Section 2.7.1.

Table 2.5: Matching quality indicators

	Men		Women	
	Before matching	After matching	Before matching	After matching
	(1)	(2)	(3)	(4)
A. Number of variables with significant differences in means[a]				
at 1%-level	10	0	6	0
at 5%-level	18	0	9	0
at 10%-level	25	2	12	0
B. Number of variables with absolute standardized bias[b]				
$< 1\%$	5	12	7	11
1% until $< 3\%$	8	24	14	26
3% until $< 5\%$	9	18	6	16
5% until $< 10\%$	22	14	21	19
10% until $< 15\%$	14	4	12	0
$\geq 15\%$	14	0	12	0
Mean absolute standardized bias in %	10.02	3.66	9.22	3.57
Median absolute standardized bias in %	6.88	2.97	6.57	2.93
C. (Re)Estimation of the propensity score[c]				
Pseudo-R^2	0.2202	0.0305	0.2027	0.0309
p-value of joint significance test	0.0000	1.0000	0.0000	1.0000
Total number of variables	72	72	72	72
Participants off support		2		15

Note: Reported are indicators for covariate balancing before and after matching using a bandwidth of 0.24 for the extended specification (cf. Table 2.10 in the Appendix, Section 2.7.1). The matching quality indicators for all optimal bandwidths from Table B.1.3 are reported in the Appendix, Section 2.7.1, Table 2.12.
[a] Equality of means is tested based on t-tests.
[b] The standardized bias is calculated as the difference of sample means for participants (P) and (matched) non-participants (NP) as a percentage of the square root of the average of sample variances in both groups $SB = 100 \cdot (\overline{X}_P - \overline{X}_{NP})/(0.5 \cdot V_P(X) + 0.5 \cdot V_{NP}(X))^{0.5}$ following Rosenbaum and Rubin (1985).
[c] The pseudo-R^2 and the p-value of joint significance test stem from a probit (re)estimation of the propensity score on the (un)matched sample (Sianesi, 2004).

for men (Figure 2.1a) and women (Figure 2.1b) are both asymmetric between participants and non-participants and skewed towards the tails. Hence, participants have, on average, a higher probability to enter the program. Although we find individuals in each group along the entire distribution of the propensity score, there is only limited overlap between participants and non-participants in the tails. To ensure that we only compare individuals with similar values of the propensity score, we impose common support by excluding treated observations with a propensity score above (below) the maximum (minimum) value in the non-participant group.

In the second step of the matching routine, we implement an Epanechnikov kernel matching algorithm with optimal bandwidth choice based on leave-one-out

cross-validation.[10] The estimator choice is based on results by Huber *et al.* (2013), who assess the finite sample properties of different matching estimators and find kernel matching with optimally chosen bandwidth parameters to perform very well in particular with small sample sizes as in our case. Based on this matching algorithm, Table 2.5 reports different indicators summarizing the very good matching quality for both the male (column 1 and 2) and female sample (column 3 and 4) for an optimal bandwidth of 0.24.[11] While the characteristics of male (female) participants and non-participants differ significantly in 25 (12) out of 72 covariates in the unmatched sample, all significant differences disappear at the 5% (10%) level in the matched sample (Panel A). Matching also reduces the mean standardized bias (Rosenbaum and Rubin, 1985) from 10.0% (9.2%) before matching to 3.7% (3.6%) after matching (Panel B), confirming the good matching quality, which is usually characterized by values lower than 3-5% (Caliendo and Kopeinig, 2008). In line with these results, Panel C reports for both genders that the Pseudo-R^2 from a probit reestimation of the propensity score for the matched sample (Sianesi, 2004) sharply decreased compared to the unmatched case, whereas the *p*-value of joint significance test increases to 1. Thus, the included characteristics have no significant explanatory power for the selection into the subsidy program after matching, implying a successful matching procedure.

2.5 Estimation results

2.5.1 The effectiveness of the new start-up subsidy in Germany

We start the discussion of our estimation results with an answer to our first research question. Using the extended specification including personality variables to estimate the propensity score, we find strong positive effects of participation in the subsidy program on employment and income (see Table 2.6, column 3). It can be seen from Panel A (B) that 40 months after start-up, former male (female) participants face an 8%-point (10.5%-point) higher probability to be in

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[10] See Table 2.11 in the Appendix, Section 2.7.1, for details on the bandwidth choice. Given that the implementation of the matching estimator might affect our results, we test the sensitivity of the results with respect to the matching algorithm, definition of the estimation sample and common support in Section 2.5.4.

[11] Matching quality results for all optimal bandwidths are presented in Table 2.12 in the Appendix, Section 2.7.1.

Table 2.6: Matching estimation results

	Propensity score specification			Comparison	
	Auxiliary $P(X \setminus W)$ (1)	Standard $P(X)$ (2)	Extended $P(X+U)$ (3)	Auxiliary v. extended (4)	Standard v. extended (5)
A. Treatment effects for men					
Short-term labor market outcomes (21 months after start-up)					
Self- or regular employed	0.2065***	0.1396***	0.1336***	0.0730***	0.0061
	{0.0000}	{0.0000}	{0.0000}	{0.0069}	{0.6245}
Net earned income (euros/mo.)[a]	901.13***	634.77***	600.55***	300.58**	34.22
	{0.0000}	{0.0000}	{0.0010}	{0.0344}	{0.6433}
Long-term labor market outcomes (40 months after start-up)					
Self- or regular employed	0.1373***	0.0921***	0.0800***	0.0573**	0.0122
	{0.0000}	{0.0000}	{0.0010}	{0.0102}	{0.2612}
Cumulated ($\sum_{i=0}^{40}$, months)	10.71***	8.12***	7.76***	2.95***	0.36
	{0.0000}	{0.0000}	{0.0000}	{0.0005}	{0.3499}
Net earned income (euros/mo.)[a]	865.79***	774.85***	736.64***	129.15	38.21
	{0.0000}	{0.0000}	{0.0010}	{0.4208}	{0.6945}
Participants off support	1	2	2		
Number of observations	806	806	806		
B. Treatment effects for women					
Short-term labor market outcomes (21 months after start-up)					
Self- or regular employed	0.2284***	0.1864***	0.1669***	0.0615	0.0195
	{0.0000}	{0.0000}	{0.0000}	{0.1200}	{0.4548}
Net earned income (euros/mo.)[a]	418.85***	343.96***	313.48***	105.37	30.48
	{0.0000}	{0.0010}	{0.0030}	{0.2330}	{0.6396}
Long-term labor market outcomes (40 months after start-up)					
Self- or regular employed	0.1749***	0.1231***	0.1056***	0.0693*	0.0175
	{0.0000}	{0.0010}	{0.0090}	{0.0806}	{0.5134}
Cumulated ($\sum_{i=0}^{40}$, months)	11.56***	9.44***	8.56***	3.00**	0.88
	{0.0000}	{0.0000}	{0.0000}	{0.0250}	{0.3258}
Net earned income (euros/mo.)[a]	632.85***	624.88***	608.57***	24.28	16.31
	{0.0400}	{0.0040}	{0.0040}	{0.7876}	{0.8063}
Participants off support	1	11	15		
Number of observations	482	482	482		
C. Propensity score specification					
Socio-demographics	✓	✓	✓		
Intergenerational information	✓	✓	✓		
Regional labor market	✓	✓	✓		
Human capital		✓	✓		
Labor market history		✓	✓		
Personality			✓		

Note: Reported are average treatment effects on the treated (ATT) as the difference in mean outcomes between participants and matched non-participants using Epanechnikov kernel propensity score matching with optimal bandwidth based on leave-one-out cross-validation for the indicated specification. Following Huber *et al.* (2014), *p*-values are bootstrapped and based on 999 replications. *p*-values for the differences in ATTs are based on bootstrapped robust Hausman tests with 999 replications (see Cameron and Trivedi, 2009, for details). All *p*-values are reported in braces. ***/**/* indicate significance at the 1/5/10% level.
[a] Income measures are based on slightly lower number of observations due to item non-responses.

self- or regular employment than matched non-participants. In addition to the static effect, the black solid lines in Figure 2.2 show the effects at each month during our observation window. The effects are positive throughout but decrease over time. The ATT drops from initially 60%-points to 20%-points after one year and becomes somewhat stable at 8-10%-points after 30 months. For females, the development of the effects is similar over time but on a slightly higher level.

If we cumulate all monthly effects over the entire observation period, we find that male (female) participants spent on average 7.8 (8.6) months more in self- or regular employment than matched non-participants (see Table 2.6, column 3 of Panels A and B). With respect to income, we also find statistically significant positive effects. For instance, 40 months after start-up, male (female) participants earn on average 740 (610) euros per month more than matched non-participants. Given the average working income of 2,800 (1,600) euros for participants (see Table 2.3, Panel D), this treatment effect is substantial but can be partly attributed to the significant gap in the employment probability between participants and matched non-participants.

The overall positive results for the new start-up subsidy confirm previous findings for its two predecessors in Germany (as reported by Caliendo and Künn, 2011; Caliendo *et al.*, 2010b), indicating that the program is an effective tool in helping unemployed individuals reintegrate into the labor market. Compared to both previous schemes, though, the ATTs for the new subsidy with regard to labor market integration after 40 months are with 8-11%-points substantially smaller in magnitude (for the old programs the ATTs were in the area of 20-30%-points). On the one hand, the effect differences might arise due to the institutional changes resulting in a different selection pattern of participants, or the different observation periods with different economic conditions. The latter point is empirically supported by the (descriptive) shares of participants in self- or regular employment after 40 months. These shares are higher for the new subsidy program (around 90%) compared to its two predecessors (closer to 80%). On the other hand, however, the lower ATTs for the new program might also be explained by the additional consideration of individuals' personalities in the estimation process. Due to data limitations, this was not possible in evaluation studies on the two former programs, and hence, the estimated effects might have been biased. We will take a closer look at this issue in the next section.

Figure 2.2: Program effects over time
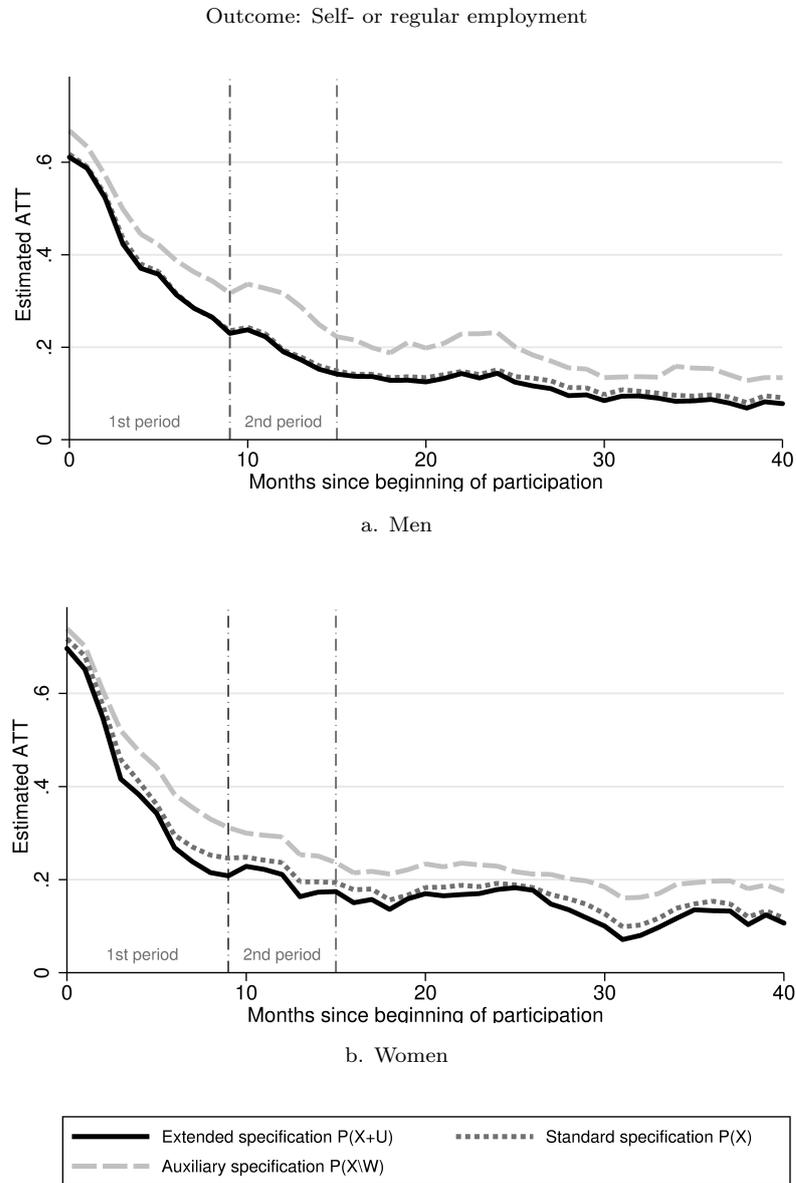
Outcome: Self- or regular employment

a. Men

b. Women

| Extended specification P(X+U) | Standard specification P(X) |
| Auxiliary specification P(X\W) | |

Note: Depicted are average treatment effects on the treated (ATT) as the difference in mean outcomes between participants and matched non-participants over time using Epanechnikov kernel propensity score matching. The first funding period consisted of 9 months during which an amount equivalent to the individual's last unemployment benefit and a lump sum of 300 euros per month for social security coverage were paid. During the optional second period of 6 months, the subsidy was reduced to the lump sum. The specifications include variables on socio-demographics, intergenerational information, and regional labor market (auxiliary specification, $P(X \setminus W)$), plus variables on human capital and labor market history (standard specification, $P(X)$), and additionally personality characteristics (extended specification, $P(X + U)$).

2.5.2 Influence of personality on the estimation of program effects

2.5.2.1 Estimation results

To investigate whether the inclusion of individuals' personalities indeed has a significant impact on the estimation of program effects, we rerun the matching procedure (estimation of the propensity scores and ATTs), yet this time, we exclude the usually unobserved personality variables (U). We thus end up with a specification similar to those used in previous evaluation studies of start-up subsidy programs in Germany that contains detailed information on socio-demographics, intergenerational transmissions, regional labor markets, human capital, and labor market history including the unemployment spell preceding start-up (X).

As shown by the dotted grey line in Figure 2.2a, the estimated ATTs for men based on this standard specification are very close to the ones with the extended specification over the whole observation period with a small deviation upward. For women (Figure 2.2b), the upward differences are slightly more pronounced but overall appear moderate in size as well. Full estimation results for the standard specification are presented in column 2 of Table 2.6 whereas column 5 reports the differences in ATTs between both specifications, where *p*-values are based on a bootstrapped robust Hausman test.[12] For instance, while we estimate a cumulated effect of 7.76 months more in self- or regular employment over the observation period for male participants compared to matched non-participants (column 3), a specification ignoring the personality variables yields an effect of 8.12 months (column 2). The difference of 0.36 months (column 5) implies an insignificant overestimation of 4% if we neglect personality measures. Overall, we find a relatively consistent pattern. The evidence suggests that taking personality characteristics U into account corrects for a positive selection that remains even after having controlled for a large set of other important characteristics X. However, the differences between both point estimates are overall small to moderate in size, and we do not find any significant differences even on the 10% significance level. We will explore potential reasons for this finding in the next subsection.

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[12] The robust bootstrapped Hausman test does not require one of the estimators to be fully efficient under the null hypothesis, see Cameron and Trivedi (2009, p. 443f.) for details.

2.5.2.2   Explaining the weak role of personality

Why does the explicit inclusion of personality have no significant impact on the estimation of the program effects? One possible explanation is that personality is already implicitly reflected to a large extent by other covariates which have been affected by personality themselves. Considering the strong role of personality in human capital decisions (e.g., Coleman and Deleire, 2003; Almlund *et al.*, 2011) and for (previous) labor market performance (e.g., Heckman *et al.*, 2006; Heineck and Anger, 2010; Judge and Bono, 2001), we split our set of standard covariates X into two groups: the first group is assumed to be unaffected by personality U, while the second group, denoted as W, contains covariates that are potentially affected by personality, in particular variables on human capital and labor market history. Thus, we expect that controlling for these potentially affected variables W in the standard specification already removes part of the selection bias due to personality measures without explicitly accounting for them. We therefore examine the role of W in more detail. For one, we rerun the propensity score matching procedure, this time considering an auxiliary specification that excludes those variables potentially affected by personality (X excluding W) and compare the results to our standard specification (X) and our extended specification ($X + U$).

Figure 2.2a illustrates for men that the major part of the selection bias is removed when covariates on human capital and labor market history are added to the matching specification (standard specification, $P(X)$) compared to a specification where variables potentially affected by personality are excluded (auxiliary specification $P(X \setminus W)$). The bias accounted for by the additional explicit inclusion of usually unobserved personality measures U is very small in comparison (extended specification, $P(X + U)$).

Moreover, we explore in Table 2.7 how the balancing of the personality variables is impacted by the inclusion of these different sets of covariates in the propensity score specifications, in particular the special role of W. In the upper part of each Panel, we report balancing indicators of the separate covariate blocks that jointly constitute our extended matching specification. In addition, the lower parts contain balancing measures of the single personality variables where higher values of the reported standardized biases indicate a worse balancing. We compare the balancing for the unmatched sample (column 1) as well as for the

Table 2.7: Balancing of personality and control variables

	Descriptive	Propensity score specification		
	raw	Auxiliary	Standard	Extended
	difference	$P(X \setminus W)$	$P(X)$	$P(X + U)$
	(1)	(2)	(3)	(4)
A. Men				
Mean absolute standardized bias in %				
Unaffected covariates ($X \setminus W$)				
Socio-demographics	9.69	5.72	5.46	5.47
Intergenerational information	8.45	5.19	3.52	5.03
Regional labor market	4.46	2.65	2.96	2.75
Potentially affected variables (W)				
Human capital	11.52	13.21	4.05	4.88
Labor market history	12.44	10.98	3.21	2.91
Usually unobserved variables (U)				
Personality variables	11.75	10.72	9.77	3.14
Standardized bias in %				
Big five				
Conscientiousness	6.56	6.18	4.73	4.54
Extraversion	14.74	14.17	9.71	2.31
Agreeableness	-3.80	-0.98	1.12	0.28
Neuroticism	-4.11	-1.74	3.35	6.03
Openness	12.94	12.85	19.63	3.60
Locus of control	27.71	25.16	18.19	4.26
Readiness to take risks	14.20	14.97	13.18	-0.39
Read. to take risks squared	-9.92	-9.67	-8.24	3.74
B. Women				
Mean absolute standardized bias in %				
Unaffected covariates ($X \setminus W$)				
Socio-demographics	4.04	3.30	2.07	2.53
Intergenerational information	4.88	2.66	1.60	4.12
Regional labor market	5.52	4.24	1.60	3.76
Potentially affected variables (W)				
Human capital	9.41	9.84	3.55	3.48
Labour market history	10.41	10.46	2.72	3.41
Usually unobserved variables (U)				
Personality variables	20.15	20.90	21.08	4.79
Standardized bias in %				
Big five				
Conscientiousness	1.36	3.41	3.71	-1.24
Extraversion	26.91	27.68	21.27	6.96
Agreeableness	7.48	7.43	6.43	4.34
Neuroticism	-36.63	-35.39	-33.83	-9.99
Openness	22.36	23.15	27.92	3.90
Locus of control	51.33	52.67	54.42	4.56
Readiness to take risks	6.08	7.45	8.20	1.37
Read. to take risks squared	9.03	10.03	12.86	5.93

Note: Reported are the mean standardized biases for each covariate block calculated over the absolute standardized biases of all covariates in the block. The standardized bias is the difference of sample means for participants and non-participants as a percentage of the square root of the average of sample variances in both groups (Rosenbaum and Rubin, 1985). For each personality variable, the table reports the individual standardized bias. The numbers are reported for the unmatched sample (descriptive raw difference) and the matched sample using the indicated propensity score specification and a bandwidth of 0.24. The results of the underlying probit estimations are reported in Table 2.10 in the Appendix, Section 2.7.1.

matched sample based on the auxiliary $P(X \setminus W)$, standard $P(X)$, and extended specification $P(X + U)$.

As can be seen in the upper part of Panel A, the inclusion of variables potentially affected by personality W in the matching procedure improves the balancing of the personality variables for men from a mean standardized bias of 10.7 (column 2) to under 9.8 (column 3) without explicitly controlling for the personality measures. When we look at the evidence on the single personality variables, the impact of additionally controlling for W is much stronger for most of the personality measures. For instance, the standardized bias of locus of control changes from 27.7 in the unmatched sample only slightly to 25.2 for the auxiliary specification, while adding human capital and labor market history to the specification reduces it to 18.2 without explicitly accounting for personality. It has to be noted, however, that the balancing of openness actually worsens once W is included, which explains the only moderate impact of W on the mean standardized bias over all personality variables mentioned above. Still, in total, these results support the notion that covariates potentially affected by personality at least partly capture the usually unobserved personality characteristics U, resulting in a small and insignificant impact of personality on the estimated program effects. For women, however, the evidence is less clear cut. The inclusion of W does not, on average, lead to a better balancing of personality, and the results for the single personality variables are rather mixed (Table 2.7, Panel B). This might be one explanation for why the differences in ATTs between the standard and extended specification are, on average, higher for women than for men (cf. Table 2.6 and Figure 2.2). A possible reason for this observation might be found in the lower labor market attachment of women, which results in personality being less captured by these variables compared to men.

2.5.3 Effect heterogeneity with respect to personality characteristics

In the final part of our analysis, we investigate effect heterogeneity to address the question of which participant "personality type" benefits most from the program. Therefore, for each of the big five factors – conscientiousness, extraversion, agreeableness, neuroticism, and openness – as well as locus of control and readiness to take risks, we construct a dummy indicator that reflects a high degree (i.e., higher than the median in the gender-specific participant group) in this characteristic.

We then conduct post-matching weighted regressions of our outcome variables on a constant, the treatment indicator, these personality dummies, and the interactions between treatment indicator and personality dummies using weighted least squares and the matching weights obtained for the extended specification:

$$Y = \lambda_0 + \lambda_1 conscient.^{high} + \ldots + \lambda_7 risk^{high} \qquad (2.4)$$
$$+ \delta_0 D + \delta_1 (D \times conscient.^{high}) + \ldots + \delta_7 (D \times risk^{high}) + v.$$

The coefficients $\delta_1 \ldots \delta_7$ of the interaction terms between the treatment dummy and each personality dummy then indicate the average difference in the ATT between individuals with a high and a low degree in this personality characteristic while holding all other personality variables constant. We choose this strategy for two reasons: (i) the alternative, where we would split the sample into subsamples based on the personality dummies and conduct the full matching procedure on these subsamples, would lead to very small sample sizes, resulting in unsatisfying common support, poorer matching quality, and results of limited validity. (ii) We observe moderately sized significant correlations between various personality variables. The joint inclusion of all personality variables in the post-matching regressions allows us to estimate the effect heterogeneity with regard to one particular personality variable while holding all other personality variables constant. Therefore, the differences in ATTs are not confounded by these correlations.

The results for the cumulated employment effect are graphically displayed in Figure 2.3. Overall, there is only limited interaction between the program effects and personality. For men (upper bars), we find a significantly higher effectiveness for more open (compared to less open) and for less risk loving (compared to more risk loving) individuals. For the other big five factors and for locus of control, the differences in ATTs between males with a lower and a higher degree are limited in size and insignificant. These findings hold quite consistently for the other outcome variables as well (full estimation results are reported in Table 2.14 in the Appendix, Section 2.7.1). For women (lower bars), the picture remains rather mixed, as we find no significant interactions with the cumulated employment effect. Over all outcomes we only find two significances with respect to openness and readiness to take risk, yet in the reverse direction compared to men.

In total, the empirical evidence on the effect heterogeneity thus suggests only limited interaction between the effectiveness of the subsidy and the personality

Figure 2.3: Treatment effect heterogeneity analysis

Outcome: Cumulated effect in self- or regular employment (in months)
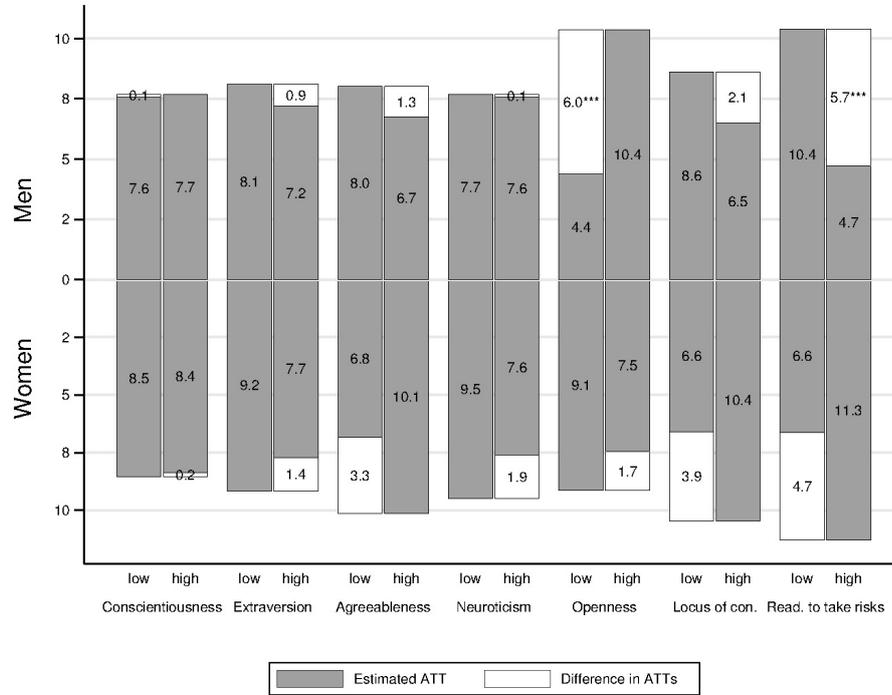
Note: Depicted are average treatment effects on the treated (ATT) for individuals with low and high degrees of the respective personality measure as well the differences in ATTs between the two groups based on post-matching weighted regressions, separately for men (upper bars) and women (lower bars). ***/**/* indicate significant differences at the 1/5/10% level. For details, see Section 2.5.3 and Table 2.14 in the Appendix, Section 2.7.1.

variables. Given that the theoretical expectations were entirely ambiguous, these results might express that the two opposing effects of personality – on the one hand, on labor market reintegration in the case of participation and, on the other hand, on exit from unemployment in the counterfactual case of non-participation – are generally similar in size. We also emphasize that significance levels might be improved with larger sample sizes; results should thus be interpreted with caution.

2.5.4   Robustness analysis

The practical use of propensity score matching requires a series of choices in the implementation that can affect the estimation results. We therefore test the sensitivity of our main effects with respect to different issues. We impose

three alternative common support restrictions, alter the choice of the matching algorithm and examine the robustness of the ATT if we account for time-invariant unobserved heterogeneity by estimating two conditional difference-in-differences approaches. In total, the results of the robustness checks are very similar to our main analysis (for details, see Section 2.7.3 in the Appendix). Moreover, for the comparison between the standard and the extended specification, we conduct a sensitivity analysis on a working age subsample (30 to 60 year olds) because for those individuals the evidence supporting no systematic changes in personality variables is strongest (Cobb-Clark and Schurer, 2013). We find a similar pattern with regard to the differences in ATTs between the two specifications. They are generally small to moderate in size and highly insignificant (see Table 2.13 in the Appendix, Section 2.7.1, for details), confirming the weak impact of personality variables on the estimated ATT. On top of that, a sensitivity analysis with respect to potential classical measurement error in the personality variables reveals that our results are very robust (for details, see Section 2.7.4 in the Appendix).

2.6 Conclusion

The recent entrepreneurship literature emphasizes the key role of an individual's personality on the start-up decision and future business success. While this finding is well established for many different countries and settings, it has not yet been transferred into the literature on the evaluation of start-up subsidies and other business support programs mainly due to data limitations. In our paper, we provide the first evidence on the long-term effectiveness of a new start-up subsidy for unemployed individuals in Germany and incorporate the growing evidence on the important role of personality traits in our evaluation approach. The data at hand – a combination of administrative and survey data – gives us the unique opportunity to study the specific role of personality characteristics when evaluating start-up subsidies. This is of high relevance as it contributes to the ongoing debate about the reliability of earlier evaluation results which have been estimated under the CIA without taking personality into account.

To this end, we implement a propensity score matching approach and control not only for covariates that have been used in earlier studies – such as socio-demographics, human capital, and labor market history – but also for different dimensions of an individual's personality such as the big five, locus of control,

and risk preferences. We find that the new subsidy program has strong positive effects on employment probabilities and income for both men and women over the whole 40 month observation window. To answer our central question as to whether the inclusion of personality variables, in addition to the other control variables, changes the estimated treatment effects significantly, we rerun the analysis excluding the personality traits and compare results. We find only small and insignificant differences in the estimated treatment effects between the two specifications. One possible explanation is that personality is already implicitly reflected to a large extent by other covariates which have been affected by personality themselves. We find evidence supporting this notion, with particular emphasis on the important role of human capital attainment and labor market history. In this sense, our empirical evidence is in line with findings by Lechner and Wunsch (2013), who stress the importance of detailed employment histories for the validity of propensity score matching estimators in evaluating traditional ALMPs. Additionally, we complement similar results for the evaluation of traditional ALMP instruments like short-/long-term training and wage subsidies (Caliendo *et al.*, 2017c). Furthermore, we also consider effect heterogeneity with respect to personality. From a theoretical point of view, there is no clear prediction of which "personality type" is likely to benefit most from program participation. We provide the first evidence on this issue and find a limited interaction between the effectiveness of the subsidy and openness and risk attitudes for men. The overall evidence is rather mixed and does not allow us to draw major conclusions about effect heterogeneity with respect to personality; further research is needed, ideally with larger samples.

From a policy perspective, our results have the following two important implications: First, the new start-up subsidy program is an effective tool to persistently reintegrate formerly unemployed individuals into the labor market, a similar finding to earlier versions of start-up subsidy programs in Germany. While it should be noted that general equilibrium effects, such as substitution or crowding out, cannot be taken into account within the micro-setting of this study, the positive results on the individual level contribute to the overall promising evidence on the benefits of start-up subsidies for unemployed individuals. Second, existing concerns about the potential overestimation of program effects in earlier evaluation studies of start-up subsidy programs, because of missing

information on individuals' personalities, might be less justified as long as the set of observed control variables is rich enough. It should be clear that our findings are restricted to the personality variables available in our data (and some of them are measured more parsimoniously than in other surveys), and we do not claim that these measures reflect all factors that were unobserved in earlier studies. Still, given the overwhelming evidence from the entrepreneurship literature stressing the important role of personality in start-up decisions and business success, we are confident that they represent a major component of what usually remains unobserved. However, it should be noted that we have to be cautious in generalizing these findings to other programs or institutional settings. The inclusion of personality measures might be of greater importance for certain subgroups that have lower labor market attachment (like women) or in situations with simply not rich enough data on human capital attainment or employment histories available yet (like younger individuals). Here, personality is probably insufficiently captured by other control variables, and thus an explicit inclusion of personality might be necessary.

2.7 Appendix

2.7.1 Additional tables

Table 2.8: Descriptive statistics for control variables

	Men			Women		
	Particip.	Non-part.	*p*-val.	Particip.	Non-part.	*p*-val.
	(1)	(2)	(3)	(4)	(5)	(6)
Socio-demographics						
Age at start-up						
Average age (years)	40.92	41.02	0.89	41.05	40.42	0.47
Younger than 30 years	0.13	0.17	0.08	0.14	0.14	0.92
30 to less than 40 years	0.31	0.27	0.28	0.30	0.33	0.38
40 to less than 50 years	0.36	0.30	0.05	0.37	0.34	0.4
50 years and older	0.20	0.26	0.06	0.20	0.19	0.79
East Germany	0.20	0.24	0.18	0.26	0.27	0.76
German citizen	0.95	0.95	0.94	0.97	0.97	0.99
Health restrictions	0.04	0.05	0.31	0.03	0.03	0.85
Married	0.64	0.56	0.02	0.55	0.55	0.94
Children						
No children	0.63	0.67	0.21	0.57	0.59	0.65
Children under 10	0.23	0.18	0.07	0.24	0.26	0.57
Children 10 years or older	0.13	0.14	0.68	0.19	0.15	0.21
Single parent	0.02	0.01	0.07	0.13	0.13	0.88
Intergenerational information						
Highest schooling degree of father						
Lower secondary school	0.45	0.43	0.60	0.36	0.36	0.98
Middle secondary school	0.15	0.21	0.05	0.18	0.23	0.22
Upper secondary school	0.26	0.21	0.05	0.32	0.28	0.36
Other/no degree	0.14	0.16	0.31	0.14	0.13	0.78
One or both parents born abroad	0.17	0.18	0.50	0.16	0.18	0.57
Father and/or mother						
is/was self-employed	0.33	0.29	0.28	0.31	0.31	0.90
Father employed when						
respondent 15 years old	0.90	0.88	0.34	0.88	0.89	0.74
Regional labor market						
Regional cluster						
Type Ia	0.14	0.13	0.79	0.18	0.17	0.76
Type Ib	0.10	0.09	0.57	0.09	0.10	0.59
Type IIa	0.07	0.07	0.79	0.06	0.05	0.68
Type IIb	0.09	0.13	0.07	0.09	0.08	0.83
Type IIc	0.07	0.06	0.93	0.05	0.06	0.53
Type IIIa	0.16	0.16	0.94	0.14	0.15	0.66
Type IIIb	0.04	0.05	0.47	0.06	0.05	0.54
Type IVa	0.09	0.08	0.53	0.06	0.05	0.82
Type IVb	0.07	0.08	0.46	0.06	0.07	0.63
Type IVc	0.04	0.03	0.50	0.04	0.01	0.07
Type Va	0.04	0.03	0.39	0.05	0.07	0.20
Type Vb	0.08	0.07	0.32	0.08	0.08	0.99
Type Vc	0.04	0.04	0.90	0.07	0.05	0.53

(Table 2.8 continued)

	Men			Women		
	Particip.	Non-part.	*p*-val.	Particip.	Non-part.	*p*-val.
	(1)	(2)	(3)	(4)	(5)	(6)
Human capital						
Highest schooling degree						
Lower secondary school	0.19	0.16	0.33	0.11	0.09	0.46
Middle secondary school	0.30	0.28	0.65	0.32	0.31	0.70
Upper secondary school	0.52	0.54	0.45	0.55	0.60	0.35
Other/no degree	0.00	0.01	0.02	0.01	0.00	0.47
Professional education						
Vocational training	0.44	0.38	0.13	0.41	0.49	0.10
Professional/vocational academy	0.18	0.13	0.08	0.12	0.05	0.01
Technical college/university degree	0.33	0.43	0.00	0.41	0.41	0.95
Other/no training	0.06	0.06	0.86	0.05	0.05	0.86
Professional qualification						
Unskilled workers	0.68	0.56	0.00	0.62	0.56	0.19
Skilled workers	0.25	0.28	0.33	0.27	0.28	0.88
Top management	0.08	0.16	0.00	0.11	0.16	0.09
Labor market history						
Lifetime unemployment (share)[a]	0.04	0.08	0.00	0.05	0.08	0.00
Second to last year before start-up						
Months employed	9.84	8.92	0.00	8.38	8.25	0.78
Months in labor market program	0.20	0.49	0.01	0.45	0.56	0.50
Next to last year before start-up						
Months employed	10.30	9.90	0.11	8.77	9.14	0.35
Months in labor market program	0.14	0.24	0.13	0.24	0.42	0.21
Last year before start-up						
Months employed	9.76	9.70	0.80	8.72	8.87	0.69
Months in labor market program	0.41	0.34	0.36	0.70	0.67	0.86
Employment status before						
unemployment						
Dependent employment	0.63	0.51	0.00	0.51	0.46	0.26
Disable to work/unemployable	0.03	0.08	0.00	0.05	0.13	0.00
Other	0.19	0.35	0.00	0.26	0.36	0.02
Occupational group before						
unemployment						
Manufacturing	0.21	0.22	0.69	0.05	0.03	0.41
Technical profession	0.08	0.08	0.92	0.02	0.02	0.92
Services	0.69	0.66	0.39	0.90	0.91	0.57
Other	0.02	0.04	0.15	0.04	0.03	0.93
Daily income from						
last employment (euros)	90.29	86.89	0.39	51.74	57.55	0.18

(Table 2.8 continued)

	Men			Women		
	Particip.	Non-part.	*p*-val.	Particip.	Non-part.	*p*-val.
	(1)	(2)	(3)	(4)	(5)	(6)
Duration of last unemployment spell						
Average number (months)	4.01	4.62	0.08	5.59	5.47	0.83
Less than 1 month	0.18	0.06	0.00	0.09	0.03	0.01
1 to less than 3 months	0.32	0.39	0.03	0.26	0.27	0.83
3 to less than 6 months	0.22	0.24	0.47	0.26	0.31	0.26
6 to less than 12 months	0.23	0.24	0.62	0.29	0.33	0.32
12 months and above	0.06	0.07	0.44	0.10	0.07	0.13
Monthly unemployment benefit						
Average amount (euros)	1,092.85	1,080.48	0.77	802.85	793.12	0.80
Less than 300 Euros	0.11	0.08	0.12	0.11	0.07	0.13
300 to less than 600 euros	0.08	0.09	0.81	0.22	0.28	0.13
600 to less than 900 euros	0.17	0.24	0.02	0.31	0.31	0.90
900 to less than 1200 euros	0.21	0.22	0.83	0.18	0.17	0.94
1200 to less than 1500 euros	0.15	0.13	0.46	0.13	0.08	0.14
1500 euros and above	0.27	0.24	0.36	0.06	0.08	0.43
Remaining unemployment benefit entitlement						
Average number (months)	8.05	7.26	0.02	6.18	6.55	0.40
Less than 3 months	0.16	0.21	0.04	0.24	0.27	0.46
3 to less than 6 months	0.17	0.16	0.72	0.24	0.16	0.03
6 to less than 9 months	0.11	0.17	0.01	0.14	0.18	0.28
9 to less than 12 months	0.24	0.23	0.70	0.15	0.22	0.08
12 months and above	0.33	0.23	0.00	0.22	0.17	0.19
Number of placement offers	1.66	2.07	0.25	1.64	2.00	0.41
Number of observations	367	439		222	260	

Note: Reported are sample averages. *p*-values are based on *t*-tests of equal means.
[a] Shares are calculated by dividing the cumulative time spent in unemployment in the past by the total time spent in the labor market (as approximated by age-15).

Table 2.9: Measurement of personality variables

Big five: *To what degree do the following statements apply to you personally?*
Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies perfectly".

I see myself as someone who . . .

    Q1.   does a thorough job.
    Q2.   is communicative, talkative.
    Q3.   worries a lot.
    Q4.   tends to be lazy.
    Q5.   is outgoing, sociable.
    Q6.   values artistic experiences.
    Q7.   gets nervous easily.
    Q8.   does things effectively and efficiently.
    Q9.   is considerate and kind to others.
    Q10.   has an active imagination.

Aggregated big five indices scaled from 1 to 7:

    Conscientiousness = [Q1+R(Q4)+Q8]/3
    Extraversion = [Q2+Q5]/2
    Agreeableness = [Q9]
    Neuroticism = [Q3+Q7]/2
    Openness = [Q6+Q10]/2

Locus of control: *To what degree do you personally agree with the following statements?*
Please answer on the basis of a scale ranging from 1 "do not agree at all" to 7 "agree completely".

    Q1.   How my life takes course is entirely dependent on me.
    Q2.   What one achieves is, in the first instance, a question of destiny and luck.
    Q3.   I often experience that others make decisions about my life.
    Q4.   Success is gained through hard work.
    Q5.   When I encounter difficulties in life, I often doubt my abilities.
    Q6.   I have little control over things which happen in my life.

Aggregated locus of control index scaled from 1 to 7:

    Locus of control = [Q1+R(Q2)+R(Q3)+Q4+R(Q5)+R(Q6)]/6

Readiness to take risks: *To what degree are you ready to take risks in general?*
Please answer on the basis of a scale ranging from 0 "not at all ready" to 10 "perfectly ready".

Note: R() indicates reverse coding. The choice of items in our data set is closely related to the German "Socio-Economic Panel" (SOEP) survey. The SOEP uses a list of 15 items for the big five (wave 2009) based on John *et al.* (1991) (see Dehne and Schupp, 2007) and 10 items for locus of control (wave 2010) based on Nolte *et al.* (1997) where all items are surveyed using a 7-point Likert-type scale. Due to budget constraints, however, we had to restrict the number of items to 10 for the big five and to 6 for the locus of control in our survey. The readiness to take risks is surveyed using the general risk question with an 11-point scale (Dohmen *et al.*, 2011) which is also implemented in the SOEP.

Table 2.10: Propensity score estimation

| | Men | | | Women | | |
| | Propensity score specification | | | Propensity score specification | | |
	Auxiliary $P(X \setminus W)$ (1)	Standard $P(X)$ (2)	Extended $P(X + U)$ (3)	Auxiliary $P(X \setminus W)$ (4)	Standard $P(X)$ (5)	Extended $P(X + U)$ (6)
Socio-demographics						
Age at start-up						
(ref.: younger than 30 years)						
30 to less than 40 years	0.196	0.203	0.174	-0.109	-0.244	-0.378
40 to less than 50 years	0.189	0.056	0.021	-0.029	-0.275	-0.425*
50 years and older	-0.034	-0.062	-0.025	-0.010	-0.220	-0.291
East Germany	-0.557***	-0.712***	-0.687***	-0.094	-0.089	-0.394
German citizen	-0.052	-0.324	-0.368	0.005	0.019	-0.056
Health restrictions	-0.151	0.025	0.072	-0.029	0.077	0.231
Married	0.216**	0.028	0.054	-0.042	-0.036	-0.060
Children						
(ref.: no children)						
Children under 10	-0.025	0.106	0.150	0.021	-0.020	0.092
Children 10 years or older	-0.133	0.165	0.189	0.227	0.354*	0.424*
Single parent	0.794*	0.900*	1.012**	-0.089	-0.051	0.044
Intergenerational information						
Highest schooling degree of father						
(ref.: other/no degree)						
Lower secondary school	0.119	0.033	0.012	-0.068	-0.120	-0.119
Middle secondary school	-0.101	-0.181	-0.173	-0.204	-0.149	-0.238
Upper secondary school	0.302*	0.227	0.206	0.055	0.020	0.007
One or both parents born abroad	-0.053	-0.009	-0.023	-0.121	-0.197	-0.244
Father and/or mother is/was self-employed	0.126	0.251**	0.259**	-0.056	0.010	-0.028
Father employed when respondent 15 years old	0.132	0.167	0.170	-0.041	-0.045	-0.018

(Table continued on next page)

(*Table 2.10 continued*)

	Men			Women		
	Propensity score specification			Propensity score specification		
	Auxiliary $P(X \setminus W)$ (1)	Standard $P(X)$ (2)	Extended $P(X+U)$ (3)	Auxiliary $P(X \setminus W)$ (4)	Standard $P(X)$ (5)	Extended $P(X+U)$ (6)
Regional labor market						
Regional cluster (ref.: type Ia)						
Type Ib	0.134	-0.107	-0.095	-0.158	-0.334	-0.355
Type IIa	-0.036	-0.170	-0.209	0.048	0.219	0.171
Type IIb	0.123	0.360	0.403	0.009	0.054	0.259
Type IIc	0.090	0.235	0.249	-0.232	-0.131	-0.270
Type IIIa	0.012	0.0001	0.028	-0.144	-0.160	-0.216
Type IIIb	-0.022	0.049	0.106	0.100	0.249	0.360
Type IVa	0.158	0.059	0.108	-0.011	-0.220	-0.345
Type IVb	-0.057	-0.115	-0.147	-0.158	-0.108	-0.059
Type IVc	0.204	0.076	0.103	0.680	0.408	0.259
Type Va	0.806**	0.934**	0.978**	-0.292	-0.264	0.077
Type Vb	0.771***	0.982***	0.961***	0.012	-0.164	0.138
Type Vc	0.64*	0.599	0.641*	0.147	0.311	0.553
Human capital						
Highest schooling degree						
(ref.: other/no degree)						
Lower secondary school		6.170	6.621		-0.336	0.057
Middle secondary school		5.849	6.242		-0.529	-0.262
Upper secondary school		5.931	6.337		-0.866	-0.662
Professional education						
(ref.: other/no training)						
Vocational training		-0.132	-0.185		-0.374	-0.403
Professional/vocational academy		-0.158	-0.206		0.284	0.355
Technical college/university degree		-0.557**	-0.572**		0.103	-0.014
Professional qualification						
(ref.: unskilled workers)						
Skilled workers		0.237	0.211		0.149	0.144
Top management		-0.171	-0.245		-0.214	-0.119
Labor market history						
Lifetime unemployment (share)^b		-15.544***	-15.762***		-6.888***	-6.727***
Lifetime unemployment (share^b, squared)		22.843***	23.506***		6.795*	6.152

(Table 2.10 continued)

	Men			Women		
	Propensity score specification			Propensity score specification		
	Auxiliary $P(X \setminus W)$ (1)	Standard $P(X)$ (2)	Extended $P(X+U)$ (3)	Auxiliary $P(X \setminus W)$ (4)	Standard $P(X)$ (5)	Extended $P(X+U)$ (6)
Second to last year before start-up						
Months employed		0.003	0.007		0.019	0.037*
Months in labor market program		-0.010	-0.001		0.091*	0.106**
Next to last year before start-up						
Months employed		0.004	0.011		-0.028	-0.035
Months in labor market program		0.022	0.019		-0.115**	-0.084
Last year before start-up						
Months employed		-0.033*	-0.035*		-0.016	-0.022
Months in labor market program		0.089*	0.094*		-0.005	-0.017
Employment status before unemployment (ref.: other)						
Dependent employment		0.164	0.163		0.011	-0.004
Disable to work/unemployable		-0.706***	-0.769***		-0.511**	-0.308
Occupational group before unemployment (ref.: other)						
Manufacturing		0.034	0.018		0.818*	1.022**
Technical profession		0.222	0.268		0.126	0.202
Services		0.277	0.279		0.410	0.529
Daily income from last employment (euros)		-0.002	-0.002		-0.004**	-0.004*
Duration of last unemployment spell (ref.: less than 1 month)						
1 to less than 3 months		-0.781***	-0.788***		-0.749**	-0.889**
3 to less than 6 months		-0.514**	-0.549**		-0.736**	-0.929**
6 to less than 12 months		-0.438*	-0.470*		-0.885**	-1.063***
12 months and above		-0.559*	-0.566*		-0.162	-0.333
Monthly unemployment benefit (ref.: less than 300 euros)						
300 to less than 600 euros		0.041	0.166		-0.282	-0.259
600 to less than 900 euros		-0.202	-0.151		-0.170	-0.155
900 to less than 1200 euros		-0.029	0.005		-0.189	-0.206
1200 to less than 1500 euros		-0.122	-0.004		0.217	0.215
1500 euros and above		-0.195	-0.139		0.221	0.073

(Table 2.10 continued)

	Men			Women		
	Propensity score specification			Propensity score specification		
	Auxiliary $P(X \setminus W)$ (1)	Standard $P(X)$ (2)	Extended $P(X+U)$ (3)	Auxiliary $P(X \setminus W)$ (4)	Standard $P(X)$ (5)	Extended $P(X+U)$ (6)
Remaining unemployment benefit entitlement						
(ref.: less than 3 months)						
3 to less than 6 months		0.048	0.033		0.448**	0.374*
6 to less than 9 months		-0.210	-0.251		-0.128	-0.137
9 to less than 12 months		-0.026	-0.073		-0.239	-0.287
12 months and above		-0.101	-0.135		-0.085	-0.151
Number of placement offers		0.009	0.009		-0.003	-0.002
Personality traits						
Big five						
Conscientiousness			-0.044			-0.055
Extraversion			-0.001			0.067
Agreeableness			-0.046			0.015
Neuroticism			0.026			-0.117
Openness			0.155***			0.203***
Locus of control			0.142**			0.354***
Readiness to take risks			0.062			-0.073
Readiness to take risks squared			-0.047			0.032
Constant	-0.566*	-4.359	-4.742	0.127	2.371**	2.291*
p-value of joint significance test of all personality variables			{0.017}			{0.000}
log-Likelihood	-534.4	-444.2	-434.6	-326.3	-286.8	-264.9
Pseudo-R^2	0.038	0.200	0.218	0.019	0.138	0.204
Hitrate (in %)	59.93	72.58	71.71	54.56	66.81	70.75
Number of observations	806	806	806	482	482	482

Note: Reported are probit coefficients. ***/**/* indicate significance at the 1/5/10% level.
[a] All personality variables are standardized. The big five and locus of control are initially measured on a scale from 1 to 7, where higher values indicate a stronger degree of the respective trait respectively a more internal locus of control. Risk is initially measured on a scale from 0 to 10, where higher values indicate a higher readiness to take risk.
[b] Shares are calculated by dividing the cumulative time spent in unemployment in the past by the total time spent in the labor market (as approximated by age–15).

Table 2.11: Kernel bandwidth choice

	Optimal kernel bandwidth	
	Men	Women
	(1)	(2)
Outcome variables 21 months after start-up		
Self- or regular employed	0.21	0.27
Net earned income (euros/month)	0.26	0.31
Outcome variables 40 months after start-up		
Self- or regular employed	0.28	0.29
Cumulated effect ($\sum_{i=0}^{40}$, in months)	0.24	0.24
Net earned income (euros/month)	0.17	0.38

Note: Reported are the optimal kernel bandwidth for each outcome variable according to a leave-one-out cross-validation.

Table 2.12: Matching quality indicators

	Before	After kernel matching with bandwidth				
	matching	0.17	0.21	0.24	0.26	0.28
Men	(1)	(2)	(3)	(4)	(5)	(6)
A. Number of variables with significant differences in means[a]						
at 1%-level	10	0	0	0	0	0
at 5%-level	18	0	0	0	0	1
at 10%-level	25	1	0	2	1	1
B. Number of variables with absolute standardized bias[b]						
< 1%	5	10	16	12	16	9
1% until < 3%	8	23	19	24	22	27
3% until < 5%	9	20	17	18	14	19
5% until < 10%	22	17	17	14	16	13
10% until < 15%	14	2	3	4	4	4
≥ 15%	14	0	0	0	0	0
Mean absolute standardized bias in %	10.21	3.74	3.60	3.66	3.74	3.77
Median absolute standardized bias in %	6.89	3.28	3.13	2.97	2.76	2.95
C. (Re)Estimation of the propensity score[c]						
Pseudo-R^2	0.2202	0.0294	0.0285	0.0305	0.0340	0.0347
p-value of joint significance test	0.0000	1.0000	1.0000	1.0000	1.0000	0.9999
Total number of variables	72	72	72	72	72	72
	Before	After kernel matching with bandwidth				
	matching	0.24	0.27	0.29	0.31	0.38
Women	(1)	(2)	(3)	(4)	(5)	(6)
A. Number of variables with significant differences in means[a]						
at 1%-level	6	0	0	0	0	0
at 5%-level	9	0	0	0	0	0
at 10%-level	12	0	0	0	0	1
B. Number of variables with absolute standardized bias[b]						
< 1%	7	11	10	9	15	10
1% until < 3%	14	26	23	24	16	22
3% until < 5%	6	16	19	19	20	16
5% until < 10%	21	19	19	19	20	22
10% until < 15%	12	0	1	1	1	1
≥ 15%	12	0	0	0	0	1
Mean absolute standardized bias in %	9.22	3.57	3.66	3.75	3.58	4.12
Median absolute standardized bias in %	6.57	2.93	3.31	3.25	3.29	3.30
C. (Re)Estimation of the propensity score[c]						
Pseudo-R^2	0.2027	0.0309	0.0328	0.0342	0.0363	0.0429
p-value of joint significance test	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total number of variables	72	72	72	72	72	72

Note: Reported are indicators for covariate balancing before and after matching using the indicated optimal bandwidth from Table 2.11 for the extended specification (cf. Table 2.10).
[a] Equality of means is tested based on t-tests.
[b] The standardized bias is calculated as the difference of sample means for participants and non-participants as a percentage of the square root of the average of sample variances in both groups (Rosenbaum and Rubin, 1985).
[c] The pseudo-R^2 and the p-value of joint significance test stem from a probit (re)estimation of the propensity score on the (un)matched sample (Sianesi, 2004).

Table 2.13: Estimation results for working age population

	Working age men			Working age women		
	Specification		Standard	Specification		Standard
	Standard	Extended	vs. extended	Standard	Extended	vs. extended
	(1)	(2)	(3)	(4)	(5)	(6)
Short-term labor market outcomes (21 months after start-up)						
Self- or regular employed	0.1387***	0.1252***	0.0136	0.1430***	0.1319***	0.0111
	{0.0000}	{0.0010}	{0.3633}	{0.0000}	{0.0000}	{0.7231}
Net earned inc. (euros/month)[a]	557.48***	534.36**	23.12	240.82**	193.90	46.92
	{0.0010}	{0.0110}	{0.7965}	{0.0260}	{0.1061}	{0.6114}
Long-term labor market outcomes (40 months after start-up)						
Self- or regular employed	0.0766***	0.0682**	0.0084	0.1026**	0.0999**	0.0027
	{0.0020}	{0.0100}	{0.4899}	{0.0120}	{0.0300}	{0.9368}
Cumulated ($\sum_{i=0}^{40}$, months)	7.87***	7.37***	0.50	7.97***	7.60***	0.37
	{0.0000}	{0.0000}	{0.2586}	{0.0000}	{0.0000}	{0.7295}
Net earned inc. (euros/month)[a]	659.45***	639.74***	19.70	621.97***	560.72***	61.25
	{0.0030}	{0.0040}	{0.8606}	{0.0090}	{0.0030}	{0.5114}
Participants off support	4	3		22	21	
Number of observations	665	665		412	412	

Note: We exclude all individuals outside working age (30-60 years). The age restriction affects a total of 141 men (50 participants and 91 non-participants) and 70 women (32 participants and 38 non-participants). Reported are estimated average treatment effects on the treated (ATT) as the difference in mean outcomes between participants and matched non-participants using Epanechnikov kernel propensity score matching. Following Huber *et al.* (2014), *p*-values for ATTs are bootstrapped based on 999 replications while *p*-values for the differences in ATTs are based on bootstrapped robust Hausman tests with 999 replications (see Cameron and Trivedi, 2009, for details). All *p*-values are reported in braces. The specifications are presented in more detail in the Appendix, Section 2.7.1, Table 2.10. ***/**/* indicate significance at the 1/5/10% level.
[a] Income measures are based on slightly lower number of observations due to item non-responses.

Table 2.14: Regression results on effect heterogeneity

	Outcome variable				
Difference in ATTs:	Self or regular employment			Net earned income (euros/mo.)	
High - low degree	after 21 mo.	after 40 mo.	cumulated	after 21 mo.	after 40 mo.
A. Men					
Conscientiousness					
Difference in ATTs	-0.0202	0.0166	0.11	198.42	451.58
	{0.7798}	{0.7898}	{0.9650}	{0.6196}	{0.2593}
Extraversion					
Difference in ATTs	-0.0586	0.0518	-0.92	-58.63	-367.63
	{0.3554}	{0.3704}	{0.6496}	{0.8779}	{0.3904}
Agreeableness					
Difference in ATTs	-0.0198	-0.0535	-1.26	311.69	-130.20
	{0.7588}	{0.3794}	{0.5556}	{0.4454}	{0.7497}
Neuroticism					
Difference in ATTs	0.0268	-0.0047	-0.10	-166.82	-298.78
	{0.6747}	{0.9359}	{0.9459}	{0.6837}	{0.5115}
Openness					
Difference in ATTs	0.1615**	0.0879	6.00***	218.26	768.58*
	{0.0170}	{0.1431}	{0.0050}	{0.5375}	{0.0751}
Locus of control					
Difference in ATTs	-0.0332	-0.0784	-2.13	-573.91	-456.51
	{0.5906}	{0.1602}	{0.2583}	{0.1772}	{0.3303}
Readiness to take risks					
Difference in ATTs	-0.1790***	-0.1184**	-5.68***	-321.30	-509.66
	{0.0060}	{0.0270}	{0.0020}	{0.3874}	{0.2062}
B. Women					
Conscientiousness					
Difference in ATTs	0.0606	-0.0408	-0.18	-286.83	-703.88
	{0.5526}	{0.6767}	{0.9469}	{0.3033}	{0.1041}
Extraversion					
Difference in ATTs	-0.0279	-0.0679	-1.44	488.25	174.35
	{0.7858}	{0.4835}	{0.6456}	{0.1171}	{0.7518}
Agreeableness					
Difference in ATTs	0.0448	0.0596	3.30	-98.23	67.30
	{0.6537}	{0.5736}	{0.2823}	{0.7407}	{0.8899}
Neuroticism					
Difference in ATTs	-0.0454	-0.0999	-1.88	102.34	-279.05
	{0.6216}	{0.2633}	{0.5455}	{0.7227}	{0.4645}
Openness					
Difference in ATTs	-0.0094	-0.1020	-1.67	-505.40*	-427.49
	{0.9359}	{0.3654}	{0.6797}	{0.0621}	{0.2553}
Locus of control					
Difference in ATTs	0.0232	0.1605	3.86	187.42	-87.64
	{0.8038}	{0.1051}	{0.2432}	{0.5415}	{0.8278}
Readiness to take risks					
Difference in ATTs	0.1302	0.1749*	4.68	309.79	346.05
	{0.1792}	{0.0851}	{0.1471}	{0.2823}	{0.4124}

Note: We construct a dummy variable indicating a high degree for each personality variable which takes on the value one if the value exceeds the median in the participant group and zero otherwise, separately for men and women. Presented are coefficients from a post-matching weighted regression of the outcome variables on a constant, the treatment dummy, the constructed dummy variables for all personality variables, and the interaction terms between treatment dummy and constructed personality dummies. Reported are the coefficients on the interaction terms, see Section 2.5.3 for details. p-values are bootstrapped based on 999 replications and denoted in braces. ***/**/* indicate significance at the 1/5/10% level.

2.7.2 Detailed data description and analysis of attrition bias

Our data set consists of a random sample of unemployed individuals who entered the start-up subsidy in the first quarter of 2009. Our comparison group contains a random sample of other unemployed individuals from the first quarter of 2009 who did not enter the program during that time period. We combine administrative data provided by the Federal Employment Agency (FEA) with survey data obtained in two interview waves. In the following, we will describe the stepwise attrition procedure leading from the initial full sample (s_{full}) to our final estimation sample (s_{est}). Following this, we will check whether we find evidence for selectivity in terms of observable characteristics for the specific attrition steps. The corresponding numbers are reported in Table 2.15.

The first interview wave was conducted in November and December of 2010 for participants and in January through March of 2011 for non-participants. The survey data were collected with computer assisted telephone interviews (CATI). The initial full sample (s_{full}, Table 2.15, column 1) consists of 2,306 individuals in the participant group (Panel A) and 2,307 individuals in the non-participant group (Panel B). Due to budget constraints, we collected a set of additional information during the interviews only for a 50% random subsample in both groups (s_{sub}, column 2). The subsamples consist of 1,143 participants and 1,390 non-participants. Since these individuals were chosen randomly from the initial full sample, the attrition is not selective.

Overall, 632 participants and 789 non-participants also took part in the second interview. This second wave was carried out in August through October of 2012. The reasons for panel attrition in the second wave consisted of failure to contact the targeted individuals, inability of the target individual to participate in the interview, and refusal to participate. Respondents also had to give their consent to combining administrative and survey data. Only a small minority (15 participants and 13 non-participants) objected to the data merge. The resulting sample size decreases to 617 participants and 776 non-participants. The number of observations in the final estimation sample (s_{est}, column 3) deviates from these numbers of respondents due to occasional item non-responses in variables relevant for our estimation procedure.

We conduct a selectivity analysis for each attrition step to check whether there is a systematic relationship between the attrition and the outcome variables

Table 2.15: Selectivity of attrition analysis

	Sample averages			*p*-value of equality test: (2) vs. (3)
	s_{full}	s_{sub}	s_{est}	
	(1)	(2)	(3)	(4)
A. Participants				
Age at start-up	40.4	40.4	41.0	0.261
Male	0.641	0.625	0.623	0.949
East Germany	0.223	0.222	0.222	0.993
Upper secondary school	0.488	0.493	0.531	0.134
Employment status: self- or regular employed				
cumulated $\sum_{i=0}^{20}$	19.2	19.2	19.7	0.040
at 1st interview	0.905	0.904	0.917	0.373
Income at first interview (euros/month)				
Net earned income	1,827	1,846	1,927	0.423
Max. number of observations[a]	2306	1143	589	
B. Non-participants				
Age at start-up	40.1	40.3	40.8	0.267
Male	0.610	0.615	0.628	0.566
East Germany	0.241	0.242	0.252	0.640
Upper secondary school	0.498	0.506	0.564	0.012
Employment status: self- or regular employed				
cumulated $\sum_{i=0}^{20}$	12.0	11.9	12.1	0.435
at 1st interview	0.633	0.635	0.657	0.336
Income at first interview (euros/month)				
Net earned income	1,064	1,103	1,183	0.227
Max. number of observations[a]	2307	1390	699	

Note: Reported are sample averages and *p*-values for *t*-tests of equal means (if not denoted otherwise).
[a] The number of observations can deviate from the maximum number of observations due to item non-response.

we consider in our main analysis. We therefore test for each potentially non-random attrition step whether the average outcome variables before and after the attrition differ significantly. If there is selective attrition, there should be systematic differences in the outcome variables before and afterwards.

In addition to outcome variables, we also consider selected socio-demographic features from the first interview because these variables are observed for all individuals. Outcome variables gathered in the second interview cannot be considered because they are unavailable for respondents who participate only in the first but not in the second interview. The selectivity analysis is conducted separately for participants (Table 2.15, Panel A) and non-participants (Panel B).

Since the selection of the 50% subsample (s_{sub}, column 2) was randomly determined by the survey institute, we test this subsample against our final

estimation sample (s_{est}, column 3). The p-values of the corresponding equality tests are reported in column 4. Overall, we do not find strong evidence for a systematic relationship between sample attrition and socio-demographic features or labor market outcomes of the respondents as indicated by the overall small differences in magnitude between the 50% subsample and the final estimation sample as well as by the overwhelming majority of high p-values in column 4. The same is true for non-participants as the numbers in column 4 of Panel B show.

In conclusion, we find no strong evidence for systematic selection. Thus, we do not have to introduce weights in our empirical analysis.

2.7.3   Sensitivity analysis

We test the sensitivity of our main estimation results for the extended specification by imposing three alternative common support restrictions, altering the choice of the matching algorithm, and we examine the robustness of the ATTs if we account for time-invariant unobserved heterogeneity by estimating two conditional difference-in-differences approaches. In sum, the results of the robustness checks (reported in Table 2.16) are very similar to our main analysis.

Trimming the estimation sample: If there is only a limited number of non-participant observations at certain parts of the propensity score distribution, this lack of overlap results in large weights for single non-participant observations in the propensity score matching procedure. This is most likely at the tails of the propensity score distributions. As a consequence, matching estimators will be prone to a large bias and variance. To deal with this problem, Crump *et al.* (2009) propose a systematic approach to optimally trim the sample in order to maximize estimation precision. Based on this approach, we trim the sample by dropping all 113 male observations with an estimated propensity score outside the interval $[0.1089; 0.8911]$, and 57 female observations with an estimated propensity score outside the interval $[0.1056; 0.8944]$ are dropped accordingly. The propensity score matching is then performed on the trimmed sample (see Table 2.16, lines labeled as 'trimmed sample 1').

Huber *et al.* (2013) propose an alternative two-step trimming procedure which also readjusts the sample after trimming to correct for implicit changes in the reference subpopulations induced by the trimming. The first step is to remove all non-participants from the sample with a weight share larger than a certain

Table 2.16: Sensitivity analysis

	Men		Women	
	ATT	*p*-value	ATT	*p*-value
	(1)	(2)	(3)	(4)
A. Short-term labor market outcomes (21 months after start-up)				
Self- or regular employed	0.1336***	0.0000	0.1669***	0.0000
trimmed sample 1	0.1423***	0.0040	0.1710***	0.0000
trimmed sample 2	0.1232***	0.0000	0.1948***	0.0000
trimmed sample 3	0.1233***	0.0000	0.1883***	0.0000
radius matching 1	0.1537**	0.0110	0.1540*	0.0581
radius matching 2	0.1468***	0.0000	0.1684***	0.0000
Net earned income (euros/month)	600.55***	0.0010	313.48***	0.0030
trimmed sample 1	625.94**	0.0250	329.42**	0.0210
trimmed sample 2	611.27***	0.0000	394.41***	0.0040
trimmed sample 3	578.91***	0.0070	340.59**	0.0160
radius matching 1	595.06**	0.0190	330.60*	0.0761
radius matching 2	629.25***	0.0010	337.19**	0.0130
B. Long-term labor market outcomes (40 months after start-up)				
Self- or regular employed	0.0800***	0.0010	0.1056***	0.0090
trimmed sample 1	0.0834	0.1431	0.1160**	0.0260
trimmed sample 2	(0.0800***)	(0.0040)	0.1192***	0.0050
trimmed sample 3	(0.0800***)	(0.0040)	0.1149**	0.0200
radius matching 1	0.0865**	0.0320	0.1072	0.1882
radius matching 2	0.0812***	0.0020	0.1312***	0.0010
Cumulated effect ($\sum_{t=0}^{40}$, in months)	7.76***	0.0000	8.56***	0.0000
trimmed sample 1	7.88***	0.0000	8.80***	0.0000
trimmed sample 2	7.27***	0.0000	10.19***	0.0000
trimmed sample 3	7.18***	0.0000	9.66***	0.0000
radius matching 1	9.25***	0.0000	7.98***	0.0010
radius matching 2	8.25***	0.0000	8.81***	0.0000
conditional DID 1	8.20***	0.0000	10.15***	0.0000
conditional DID 2	7.81***	0.0000	8.38***	0.0000
Net earned income (euros/month)	736.64***	0.0010	608.57***	0.0040
trimmed sample 1	741.80***	0.0040	658.38***	0.0030
trimmed sample 2	614.32***	0.0040	(608.57***)	(0.0070)
trimmed sample 3	589.61**	0.0220	(608.57***)	(0.0070)
radius matching 1	685.53**	0.0380	642.96**	0.0210
radius matching 2	745.90***	0.0020	618.82***	0.0040

Note: Presented are estimated average treatment effects on the treated as the difference in mean outcomes between participants and matched non-participants using Epanechnikov kernel propensity score matching for the extended specification with optimal bandwidth based on leave-one-out cross-validation (if not denoted otherwise). Following Huber *et al.* (2014) *p*-values are bootstrapped and based on 999 replications. ***/**/* indicate significance at the 1/5/10% level.
Trimmed Sample: The treatment effects are estimated based on an optimally trimmed sample following Crump *et al.* (2009) (trimmed sample 1), Huber *et al.* (2013) (trimmed sample 2), and, following the latter, with the additional imposition of common support (trimmed sample 3). For the optimal bandwidth in the male (female) sample for self- or regular employed (net earned income) after 40 months, no observations were trimmed in the second and third procedure so results are identical to the main results and reported in parentheses.
Radius Matching: The treatment effects are estimated using radius matching with bias adjustment following Huber *et al.* (2014, 2013) (radius matching 1) and radius matching using a caliper of 0.1 (radius matching 2).
Conditional DID: The treatment effects are estimated based on conditional difference-in-differences. The reference level is months in regular employment during the ten years prior to start-up (conditional DID 1) and six months prior to start-up (conditional DID 2).
See text for details.

threshold. In the second step, the weights of the remaining non-participant observations are normalized again. The correction ensures that the procedure is asymptotically unbiased. In our case, we remove all non-participants with a weight share larger than 1%. Overall, this trimming procedure leads to a reduction of our estimation sample by 11 to 18 male and 24 to 25 female non-participant observations (depending on the optimal bandwidth choice), while for the optimal bandwidth of 0.28 (0.38) for self- or regular employed after 40 months (net earned income after 40 months), no male (female) non-participant observation exceeds the threshold of 1% of the weight share. Estimation results are labeled 'trimmed sample 2' in Table 2.16.

As an alternative three-step procedure, the sample is additionally corrected for the trimming after the first step by dropping all participant observations with an estimated propensity score larger than the smallest propensity score of the dropped non-participant observations to ensure common support. In a third step, matching weights for non-participants are normalized again. In addition to the trimmed non-participant observations mentioned above, this procedures leads to a reduction of 96 to 104 male participants and 73 to 75 female observations who exceed the smallest propensity score of the dropped non-participants, again depending on the optimal bandwidth choice. In the case where no non-participants were dropped (see above), the participant subsample remains unchanged accordingly and results are reported in parentheses. Estimation results are labeled 'trimmed sample 3' in Table 2.16.

Altering the matching algorithm/radius matching: As an alternative matching algorithm, we consider the radius matching estimator with a bias adjustment proposed by Huber *et al.* (2014, 2013). It consists of distance-weighted radius caliper matching on the propensity score, where non-participant observations are weighted proportionally to their inverse distance to the participant observations within the caliper. In a second step, this estimator uses the weights from the matching procedure in the first step for a linear regression to correct the estimators for any remaining biases due to mismatches. Estimation results are reported in Table 2.16 in lines labeled 'radius matching 1.' As an alternative, we consider radius matching with a caliper of 0.1, where all comparison units within the caliper are weighted equally to construct the counterfactual outcome (Table 2.16, labeled 'radius matching 2').

Conditional difference-in-differences: To test the sensitivity of our results with respect to the presence of additive linear time-constant unobserved heterogeneity, we also perform a conditional difference-in-differences estimation approach for the cumulated employment effects. For the reference level before treatment, we consider the number of months in regular employment during two time periods: the ten years prior to start-up (Table 2.16, conditional DID1) and the six months prior to start-up (Table 2.16, conditional DID 2).

Overall, the various robustness checks yield point estimates that are very similar to our results from the main analysis for all outcome measures. In conclusion, the sensitivity checks thus show a consistent picture of robust positive and significant effects of participation in the start-up subsidy program with respect to labor market reintegration and earned income for both men and women.

2.7.4 Sensitivity analysis with respect to measurement error in the personality variables

We conduct another sensitivity analysis to investigate whether the estimation results in the extended specification are biased due to classical measurement error in the personality variables following Battistin and Chesher (2014). They show that measurement error in covariates used in treatment effect analyses based on the conditional independence assumption (like propensity score matching) does not necessarily imply attenuation in the estimated treatment effects. If the estimated treatment effects of our extended specification would potentially be attenuated, our estimate of the difference to the standard specification would be an upper bound to the real difference. Instead, the sign of the bias depends on the relationship of the erroneously measured covariate and the propensity score and on its relationship with the counterfactual outcome. Therefore, the potentially measurement error-contaminated personality variables could lead to a positive bias which in turn would lead to an underestimated difference between the specifications without and with the inclusion of our personality variables.

Table 2.17 reports the estimated approximate biases in the treatment effects of the extended specification containing all personality variables. To facilitate assessment of the magnitudes of the estimated biases, we report as a reference the estimated effects from our main results from Table 6 in the first line of each sub-panel labeled 'ATT' in Table 2.17. We vary the extent of measurement

Table 2.17: Sensitivity analysis with respect to measurement error in personality variables

	Men			Women		
	Extent of measurement error			Extent of measurement error		
	10%	30%	50%	10%	30%	50%
Estimated approximate bias	(1)	(2)	(3)	(4)	(5)	(6)
A. Short-term labor market outcomes (21 months after start-up)						
Self- or regular employed	ATT = 0.1336			ATT = 0.1669		
Big five						
Conscientiousness	0.0001	0.0004	0.0007	-0.0004	-0.0013	-0.0021
Extraversion	0.0000	0.0000	0.0000	0.0004	0.0012	0.0021
Agreeableness	-0.0001	-0.0003	-0.0005	-0.0001	-0.0002	-0.0003
Neuroticism	-0.0000	-0.0001	-0.0001	-0.0003	-0.0009	-0.0016
Openness	-0.0002	-0.0007	-0.0011	-0.0000	-0.0001	-0.0001
Locus of control	0.0007	0.0020	0.0033	0.0019	0.0057	0.0096
Readiness to take risks	-0.0002	-0.0006	-0.0010	-0.0014	-0.0042	-0.0070
Net earned income (euros/month)	ATT = 600.55			ATT = 313.48		
Big five						
Conscientiousness	0.98	2.95	4.91	-0.16	-0.47	-0.78
Extraversion	-0.01	-0.02	-0.03	-0.11	-0.32	-0.54
Agreeableness	-0.40	-1.20	-1.99	-0.13	-0.39	-0.65
Neuroticism	0.40	1.20	2.00	1.30	3.89	6.49
Openness	-2.24	-6.71	-11.18	0.44	1.32	2.21
Locus of control	3.81	11.43	19.06	4.62	13.87	23.11
Readiness to take risks	-1.00	-3.01	-5.01	-1.38	-4.15	-6.92

(Table continued on next page)

error in the personality variables from a signal-to-noise ratio of 10% up to 50%. For instance, the estimated treatment effect for the outcome variable "self- or regular employed 21 months after start-up" for males is 13.36 percentage points (Panel A, column 1 to 3, as already reported in Table 6). If the big five variable "conscientiousness" was measured with error that accounted for 10% of the total variance in conscientiousness (column 1), the treatment effect for males would be overestimated by 0.01 percentage points. If the measurement error was responsible for 50% of the total variance in conscientiousness (column 3), the bias for males would amount to 0.07 percentage points. For females, the corresponding treatment effect is 16.69 percentage points while a measurement error of 10% (50%) would lead to an underestimation by 0.04 (0.21) percentage points (column 4 and 6, respectively).

The numbers in Table 2.17 show that the estimated approximations for the biases due to measurement error in the personality variables are small in

(Table 2.17 continued)

	Men			Women		
	Extent of measurement error			Extent of measurement error		
	10%	30%	50%	10%	30%	50%
Estimated approximate bias	(1)	(2)	(3)	(4)	(5)	(6)
B. Long-term labor market outcomes (40 months after start-up)						
Self- or regular employed	ATT = 0.0800			ATT = 0.1056		
Big five						
Conscientiousness	-0.0000	-0.0001	-0.0002	-0.0004	-0.0013	-0.0021
Extraversion	0.0000	0.0000	0.0000	0.0002	0.0007	0.0012
Agreeableness	0.0001	0.0004	0.0007	-0.0000	-0.0001	-0.0002
Neuroticism	-0.0001	-0.0002	-0.0004	-0.0002	-0.0006	-0.0010
Openness	0.0002	0.0005	0.0009	0.0004	0.0011	0.0018
Locus of control	0.0015	0.0045	0.0074	0.0001	0.0003	0.0005
Readiness to take risks	-0.0002	-0.0005	-0.0009	-0.0011	-0.0032	-0.0053
Cumulated effect ($\sum_{t=0}^{40}$, months)	ATT = 7.76			ATT = 8.56		
Big five						
Conscientiousness	-0.0011	-0.0034	-0.0057	-0.0095	-0.0286	-0.0476
Extraversion	0.0001	0.0002	0.0003	0.0142	0.0425	0.0709
Agreeableness	-0.0002	-0.0005	-0.0008	-0.0037	-0.0112	-0.0187
Neuroticism	0.0013	0.0038	0.0063	-0.0047	-0.0142	-0.023
Openness	-0.0078	-0.0235	-0.0392	0.0066	0.0197	0.0329
Locus of control	0.0283	0.0850	0.1417	0.0806	0.2417	0.4028
Readiness to take risks	-0.0063	-0.0190	-0.0317	-0.0526	-0.1577	-0.2629
Net earned income (euros/month)	ATT = 736.64			ATT = 608.57		
Big five						
Conscientiousness	1.79	5.36	8.93	-1.03	-3.09	-5.15
Extraversion	-0.01	-0.04	-0.07	0.23	0.69	1.15
Agreeableness	0.48	1.44	2.39	-0.09	-0.27	-0.46
Neuroticism	0.45	1.35	2.25	-1.01	-3.04	-5.07
Openness	-2.29	-6.89	-11.44	-3.79	-11.37	-18.95
Locus of control	8.95	26.84	44.74	7.17	21.51	35.86
Readiness to take risks	-1.20	-3.59	-5.98	-4.02	-12.07	-20.12

Note: Presented are estimated approximations to measurement error biases in the estimated treatment effect of the extended specification due to classical measurement error in the listed personality variables following Battistin and Chesher (2014). The extent of measurement error is defined as the noise-to-signal ratio. See text for details. Standard errors are bootstrapped and based on 999 replications. ***/**/* indicate significance at the 1/5/10% level.

magnitude throughout and insignificant at conventional levels without exception for men and women. Thus, we are confident that our results are robust with respect to measurement errors in personality variables. The varying signs of the biases confirm that measurement errors in treatment effect analyses based on the conditional independence assumption do not generally lead to attenuation of the effects.

Chapter 3

Catching Up or Lagging Behind? The Long-Term Business Potential of Subsidized Start-Ups out of Unemployment

Abstract

From an active labor market policy perspective, start-up subsidies for unemployed individuals are very effective in improving long-term labor market outcomes for participants. From a business perspective, however, the assessment of these public programs is less clear since they might attract individuals with low entrepreneurial abilities and produce businesses with low survival rates and little contribution to job creation, innovation, and economic growth. In this paper, we use a rich data set to compare participants of a German start-up subsidy program for unemployed individuals to a group of regular founders who started from non-unemployment and did not receive the subsidy. The data allows us to analyze their business performance up until 40 months after business formation. We find that formerly subsidized founders lag behind in business survival, income, job creation, innovation and investment. While the gap in business survival can be entirely explained by initial differences in observable start-up characteristics, the gap in business development remains and seems to be the result of restricted access to capital as well as differential business strategies and dynamics.

3.1 Introduction

Many industrialized countries offer financial support to unemployed individuals encouraging them to start their own businesses, and hence to escape unemployment, as part of their active labor market policy (ALMP). The subsidy is expected to remove, reduce or compensate for disadvantages in human, financial and social capital as compared to non-unemployed founders and act as a mechanism to insure the unemployed against the risk of low or no income during the initial start-up phase. A large body of empirical evidence shows the effectiveness of start-up subsidies to sustainably integrate formerly unemployed individuals into (self-)employment and improve their earning profiles (Wolff *et al.*, 2016; Caliendo *et al.*, 2016; Caliendo and Künn, 2011; Rodriguez-Planas and Jacob, 2010; Duhautois *et al.*, 2015; O'Leary, 1999). As a consequence, the policy can be considered highly effective on the individual level from an *ALMP perspective*.

However, the entrepreneurship literature discusses the concept of start-up subsidies for the unemployed more critically from a *business perspective* (see, e.g., Shane, 2009; Acs *et al.*, 2016). The major concern is that start-up subsidies in general are likely to produce marginal businesses that do not have any significant contribution to productivity, innovation, or economic growth. The main reasoning follows an occupational choice model that predicts an adverse selection where the subsidy attracts less able individuals to entrepreneurship due to lower opportunity costs and reduced entry barriers (*self-selection view*, see Nanda, 2008; Hvide and Møen, 2007).[1] This might be even more pronounced if the subsidy is specifically targeted towards unemployed individuals who already face more severe restrictions with respect to the availability or access to human, social and financial capital (Caliendo *et al.*, 2015c).

In addition, subsidy receipt might induce a moral hazard problem inhibiting the market selection process of profitable and non-profitable businesses among subsidized firms during subsidy receipt (survival-of-the-fittest). As a consequence, subsidized start-ups can be expected to underperform from a business perspective. This is particularly a concern if subsidized businesses crowd out incumbent firms or regular start-ups due to their temporary artificial cost advantages

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[1] The competing *experimentation view* claims that individuals only have incomplete information about their entrepreneurial abilities ex ante and learn about them as they operate their businesses (Jovanovic, 1982; Hombert *et al.*, 2014). The subsidy thus lowers entry barriers for more constrained individuals but does not induce a negative selection.

(see, e.g., Santarelli and Vivarelli, 2007; Meager, 1996). Finally, the subsidy is also vulnerable to deadweight effects in the sense that it will be exploited by nascent entrepreneurs (among the unemployed) who would start a business even without the subsidy. Therefore, the entrepreneurship literature suggests a rethinking of the concept of start-up subsidies for the unemployed due to the high opportunity costs. For instance, financial resources might be used instead to support regular businesses or those start-ups with high growth potential (Román *et al.*, 2013; Congregado *et al.*, 2010; Santarelli and Vivarelli, 2007).

Empirical results for start-up subsidies for the unemployed on the business perspective are very scarce. Using data on EU-15 countries, Millán *et al.* (2012) find that higher national public expenditures on start-up subsidies for unemployed individuals decrease exit rates for self-employed individuals who had entered self-employment from unemployment. They conclude that overall the subsidies might not only increase entry into self-employment but also equalize business survival chances of formerly unemployed and formerly non-unemployed business founders. In a related study, Román *et al.* (2013) find that higher national subsidy expenditures increase transitions from unemployment to solopreneurship but do not affect transitions to new businesses with additional job creation, emphasizing the low growth potentials of subsidized businesses out of unemployment. Both of these studies are based on macro indicators for start-up subsidy expenditures on a national level and thus indirectly also reflect cross-country effects. The empirical evidence based on pure micro data is even more scarce. Andersson and Wadensjö (2007) find that in Sweden individuals entering entrepreneurship from unemployment with a subsidy perform better than unemployed individuals not receiving the subsidy in terms of income and, to a lesser extent, with respect to hiring employees, conditional on a small set of basic controls. But they perform worse than formerly dependently employed founders. It remains unclear, however, whether this finding reflects the subsidy effect of additional help or a cream-skimming selection effect where case workers approve those candidates for subsidy receipt who display the highest entrepreneurial potential.

There is in principle so far only one study, by Caliendo *et al.* (2015c), that directly compares subsidized start-ups out of unemployment with regular start-ups (non-subsidized out of non-unemployment) in various dimensions of success. They created a unique data set comprising representative samples of male participants

in a German start-up subsidy and male regular founders that allows for a comprehensive and in-depth comparison. The empirical findings support the theoretical arguments above, i.e., subsidized businesses lag behind in business growth and innovation 19 months after business formation. However, the results have to be interpreted with caution as they are likely still influenced by the subsidy itself, which expired only a few months before the survey. Therefore, the question remains as to whether the initial differences in business outcomes compared to regular founders persist (or even grow), or whether subsidized businesses can catch up in the medium- and long-run. On the one hand, it can be argued that the initial disadvantages for subsidized business founders result in lower initial growth intentions and business strategies, which negatively affect long-term business outcomes, leading to persisting or widening gaps. On the other hand, it might be the case that *surviving* subsidized businesses catch up once the subsidy has fully expired and all businesses were equally exposed to full market mechanisms.

To contribute to this debate and fill this research gap, our paper provides a comparison up to 40 months after business formation between subsidized start-ups out of unemployment and non-subsidized start-ups out of non-unemployment in Germany in terms of various business outcomes. Individuals in both groups started their businesses in the first quarter of 2009. The subsidized businesses were started out of unemployment and received the *"Gründungszuschuss,"* which consists of a monthly payment equivalent to the individual's last unemployment benefit plus a lump sum of €300 to cover social security costs for an initial period of 9 months and the possibility to extend the lump-sum payment for another six months. Germany is exceptionally suited for this analysis because policies promoting entrepreneurship among unemployed individuals have a long tradition going back to the introduction of the bridging allowance in 1986 (see Caliendo and Kritikos, 2010, for more details). Furthermore, the scale of such policies in Germany has been considerable, accounting for roughly between 40% and 60% of all full-time start-ups in Germany between 2006 and 2011 (Caliendo *et al.*, 2015c).[2] In this sense, our study is also a contribution to the examination of "everyday entrepreneurship" in the spirit of Welter *et al.* (2017). The data set is a longitudinal extension of the data used by Caliendo *et al.* (2015c) and contains

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[2] The importance of the start-up subsidy program in Germany has sharply declined as the result of a restrictive reform at the end of 2011 (see Bellmann *et al.*, 2017, for details).

not only detailed information on an extensive list of start-up characteristics but also includes business performance measures in various dimensions, thus allowing for an in-depth analysis of business development over time.

Based on this data set, we provide evidence on the following aspects: First, we investigate whether initially subsidized businesses can successfully survive and thrive in the market even when the subsidy had expired more than two years earlier. Second, we compare the business performance as reflected by income, job creation, innovation and investment activity between formerly subsidized and regularly founded businesses 40 months after business formation. And third, we further investigate possible reasons for the persistent gaps in business outcomes between the two groups. We find that 40 months after start-up, formerly subsidized founders lag behind regular businesses in terms of all observed business outcomes. The gap in business survival can entirely be explained by initial differences in observable start-up characteristics (such as personal characteristics, business sector, and start-up capital), while the remaining gaps seem mainly to be driven by restricted access to capital and differences in business strategies and dynamics.

The remainder of this paper is organized as follows: In Section 3.2, we present the institutional settings of the start-up subsidy, describe the data as well as the estimation sample, and discuss panel attrition. Following that, in the empirical part, we compare the business developments and performances between the two groups (Section 3.3) before we explore reasons for the revealed differences (Section 3.4). After that, we summarize the short-term results 19 months after start-up by Caliendo *et al.* (2015c) and our (further) findings in Section 3.5. Section 3.6 discusses policy implications and concludes.

3.2   Institutional details and data

3.2.1   Institutional details

The subsidized founders in our sample received the *"Gründungszuschuss"* (start-up subsidy, SUS), which was initially introduced in August 2006 in Germany.[3] In order to be eligible for the subsidy, unemployed individuals had to have a

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[3] This program replaced its two predecessor programs that essentially differed in terms of subsidy length and amount (see Caliendo and Kritikos, 2010; Caliendo *et al.*, 2012, for a description).

minimum entitlement to *unemployment benefit I*[4] of at least 90 days at the time of program entry. Moreover, individuals applying for the SUS had to provide a business and financing plan to the Employment Agency that also had to be evaluated by a competent external institution.

If all requirements were fulfilled, SUS was paid for a maximum duration of 15 months, with the subsidy comprising of two parts: During the first nine months after business start-up, an amount equivalent to the individual's last unemployment benefit and a lump sum of €300 to cover social security costs was paid monthly.[5] After nine months, individuals could apply for an optional second period to receive the lump sum of €300 for another six months. While the first period of SUS could be legally claimed by all individuals who fulfilled all legal requirements, the founders had to apply for the second period by proving that their businesses are sufficiently economically active. Approval for the second period was entirely subject to the assessment of the respective caseworker.[6] Finally, it should be mentioned that subsidized start-ups out of unemployment constituted a large share of about 40% to 60% of all full-time start-ups in Germany between 2006 and 2011 (depending on the underlying data source, see Caliendo *et al.*, 2015c).[7]

3.2.2 Data creation and estimation sample

The data set we use is a longitudinal extension of a telephone survey which was initially collected by Caliendo *et al.* (2015c). They created a unique data set that allows a comprehensive and in-depth comparison between subsidized start-ups out of unemployment and non-subsidized start-ups out of non-unemployment. Based on different data sources, they drew representative random samples of subsidized and non-subsidized founders who started a full-time business in the first quarter of 2009 in Germany. The cohort of subsidized founders consists of initially unemployed individuals who received the start-up subsidy from the

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[4] In Germany, every individual who has been in employment subject to social security for at least one out of the last three years is eligible for unemployment benefit I. The amount of the benefit consists of 60% (67% with children) for the last net wage and is basically paid for a maximum period of 12 months, with the exception of older individuals (see Caliendo and Hogenacker, 2012).

[5] Without program participation, the individuals would lose their unemployment benefit entitlement given that they start their own business and hence work full-time. The subsidy receipt was offset against the remaining unemployment benefit I entitlement, however.

[6] We find that 61.7% of the subsidized business founders in our sample received the subsidy for 15 months.

[7] Meanwhile, a major restrictive reform of the SUS at the end of 2011 has reduced SUS entry numbers substantially (see Bellmann *et al.*, 2017, for details).

Figure 3.1: Data generation and sample restrictions
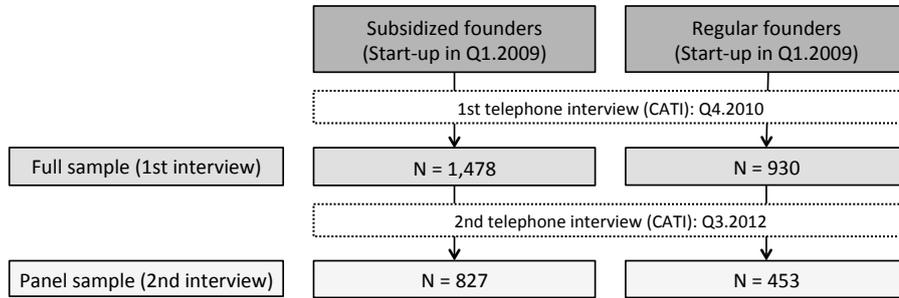
Federal Employment Agency, while non-subsidized start-ups consist of founders who were not unemployed directly prior to start-up and consequently did not receive the subsidy (see Caliendo *et al.*, 2015c, for details on data construction).

The selected business founders were initially surveyed about 19 months after start-up (wave 1) on an extensive list of start-up characteristics, socio-demographics, previous labor market experiences, intergenerational transmissions, as well as their labor market status and, conditional on the ongoing business activity of their initial start-up from the first quarter in 2009, their business performance across various dimensions. Restricting the analysis to male founders, 1,478 (930) valid interviews could be completed with subsidized (regular) founders; see Figure 3.1. Based on this sample, Caliendo *et al.* (2015c) show that subsidized founders significantly lag behind regular founders in terms of income, business growth, and innovation. We now have access to a second interview wave with the same individuals that extends the observation window to 40 months after start-up (wave 2). This allows us to analyze the persistence of initial differences in business outcomes between the subsidized and non-subsidized male founders up until 3.5 years after business formation. Figure 3.1 shows that we have 827 (453) panel observations on subsidized (regular) founders available in wave 2.

3.2.3 Examination of selective panel attrition

As in many other surveys, we find a positive panel selection (see Table 3.8 in the Appendix, Section 3.7.2, for details): Respondents participating in both

interview waves (panel sample) are on average older, have a higher educational and professional background, had higher earnings in the past, and experienced less lifetime unemployment compared to the full sample in wave 1. More importantly, the panel attrition also induces a weak selective bias in our outcome variables. Table 3.9 in the Appendix, Section 3.7.2, shows a raw comparison of the outcome variables between the full and the panel sample for each subgroup of founders. It can be seen that wave 2 respondents are on average more likely to be self-employed and report higher earnings in wave 1 than the full sample.

Although only the difference in unemployment shares for regular founders is statistically significant, we nevertheless decided to precautionally use a weighting procedure in order to correct for selective panel attrition for two reasons: First, the low numbers of observations might reduce the power of these significance tests and lead us – incorrectly – not to reject the absence of significantly selective panel attrition. And second, while the estimated gaps in the empirical analysis are not sensitive to the weighting procedure, it nonetheless removes the small positive biases in the *absolute levels* of business outcomes and ensures their representativeness for the underlying populations.

As the chosen correction procedure, we implement inverse probability weighting (see Wooldridge, 2002).[8] The weighting procedure removes almost all statistically significant differences in observable characteristics (see Table 3.8) and reduces the differences in means for the outcome variables even further (see Table 3.9). Therefore, the empirical analysis will rely on the weighted outcome variables.

3.3 Empirical results

In order to analyze whether formerly subsidized businesses still lag behind regular businesses, we compare their performances up to 40 months after start-up, i.e., more than two years after the subsidy has expired. In the following empirical analysis, we start with a descriptive comparison of business survival between formerly subsidized and regular founders (Section 3.3.1). After that, we restrict our analysis to founders who are still self-employed and actively operating the same business that was created in the first quarter of 2009 and compare the business performance between the two groups over time (Section 3.3.2).

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[8] A detailed description of the weighting procedure is included in the Appendix, Section 3.7.2.

3.3.1 Comparison of business survival and labor market status

We measure business survival at the time of the interview by creating a dummy variable which is equal to one if the individual's main employment activity is self-employment with the same business started in the first quarter of 2009, and zero otherwise.[9] Table 3.1 also reports the share of initial founders who report their main activity to be dependent employment or unemployment at the time of interview.

It can be seen that the survival rate significantly decreases for formerly subsidized founders from 79.7% in wave 1 to 71.1% in wave 2, while the share for regular founders increases over time from 71.7% to 77.9%. These diverging developments result in a significant negative gap of 6.8%-points for subsidized founders compared to regular founders 40 months after start-up.

On the one hand, the decline in self-employment share for formerly subsidized founders might indicate that the subsidy artificially increased the survival rate of subsidized founders in wave 1, while in wave 2 market competition sorted out less profitable businesses in line with the survival-of-the-fittest mechanism (Fritsch and Schroeter, 2011). On the other hand, the share of necessity start-ups is generally more pronounced among formerly unemployed founders (Caliendo *et al.*, 2017a, 2015c), which might result in a substantial share of formerly subsidized founders preferring dependent employment over self-employment in the medium and long run. Taking a closer look at the shares of founders in dependent employment and unemployment reveals that in wave 2 close to 20% of formerly subsidized founders are dependently employed, while the unemployment share is relatively low at 3.3%.

In contrast, the slight increase in the survival rate of regular founders can be explained by individuals who temporarily ran their businesses only part-time in wave 1 (predominately due to parallel higher education) and return to their businesses as the main activity in wave 2. In fact, this is true for 11.2% of regular founders. Since 5% of self-employed regular founders from wave 1 quit their businesses as the main activity by wave 2, this results in a net increase

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[9] We restrict the sample to founders operating the same business as at start-up because we are interested in the survival and business development of the initially subsidized businesses. Furthermore, detailed business outcomes are only observed for the original start-up cohort of businesses created in the first quarter of 2009. Restricting it to self-employment as main activity excludes businesses which are run only as secondary or part-time activities, e.g., in addition to another full-time job or attending university.

Table 3.1: Main labor market status

	Subsidized founders			Regular founders			Comp.: Sub. v. reg.	
	Wave 1	Wave 2	Change	Wave 1	Wave 2	Change	Wave 1	Wave 2
	(1)	(2)	(1) v. (2)	(3)	(4)	(3) v. (4)	(1) v. (3)	(2) v. (4)
Self-employed with same business[a]	0.797	0.711	-0.086***	0.717	0.779	0.062***	0.079***	-0.068***
Dep. employed	0.122	0.196	0.073***	0.104	0.132	0.027**	0.018	0.064***
Unemployed[b]	0.051	0.033	-0.018*	0.012	0.012	-0.000	0.038***	0.021***
Number of obs.	827	827		453	453		1,280	1,280

Note: Reported are shares for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment). Positive (negative) intergroup differences indicate a higher (lower) value among subsidized founders. Wave 1 (wave 2) values are measured 19 (40) months after start-up. Missing categories not reported here are marginal employment, higher education/vocational training, and other main activity. Outcomes are weighted for panel attrition. ***/**/* indicates significant difference at the 1/5/10% level.
[a] Self-employed with same business as at start-up.
[b] Unemployed or participation in active labor market program (ALMP).

in business survival of 6.2%-points, as reported in Table 3.1. The share of dependently employed (unemployed), at 13.2% (1.2%), is significantly lower than for subsidized founders.

Taken together, while labor market integration is comparable between the two groups, the descriptive shares indicate a lower business survival among formerly subsidized business founders compared to regular founders 40 months after start-up.

3.3.2 Comparison of business performance

To assess the business performance, we restrict our sample to founders who are still self-employed and actively operating the same business as at start-up in the first quarter of 2009 at each interview. We consider four different sets of variables: (i) income, (ii) job creation, (iii) degree of innovation as outcome variables, and (iv) access to capital as an intermediate business indicator. Income is measured as monthly and as hourly net earned income from self-employment (in euros, inflation-adjusted to 2010 levels following the Federal Statistical Office, 2014). With respect to job creation, we consider both the extensive and intensive margin, i.e., the share of businesses with at least one employee and the number of full-time equivalent employees, both unconditionally and conditional on having at least one employee. The number of full-time equivalent employees is a weighted sum where full-time employees are assigned a weight of 1, part-time employees and apprentices are weighted by 0.5, and others by 0.25. The degree of innovation is measured by the share of founders who filed at least one patent application or an application to protect corporate identity since start-up.[10] Finally, access to capital is reflected by the share of founders who have received a loan since start-up and the share of founders whose access to capital was constrained in that they wanted to borrow but did not receive a loan.[11]

Figure 3.2 shows the results of a comparison of formerly subsidized and regular businesses with respect to the defined business indicators measured at wave 1 (19 months after start-up) and wave 2 (40 months after start-up). The dark bars represent the average outcome of formerly subsidized founders, while the light bars depict the gaps to regular founders for a given point in time. The dashed

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[10] While patent applications are an imperfect measure of innovation activity, it is nevertheless a widely used innovation indicator (see Griliches, 1990, for an extended discussion)

[11] As a limitation, we neither observe the total amount of the loan nor whether individuals who did not receive a loan but wanted to borrow actually applied for a loan.

lines connecting the bars between waves illustrate the intragroup development over time. Significant gaps between groups and significant changes over time are indicated by stars attached to the reported differences.

Income The development of the earnings profiles of subsidized founders in Figures 3.2a and 3.2b shows a significant increase over time in both monthly net income (from €2,400 to €2,800)[12] and hourly net earnings (from €11.7 to €14.4), which might be explained by market selection as well as increased productivity or profitability. In comparison, monthly earned net income for regular founders stagnates over time, yet on a significantly higher level around €3,100. In sum, this results in a reduced monthly income gap between both groups (from €700 to about €230). However, while monthly incomes are converging, the gap in hourly earnings grew from €4.10 in wave 1 to €6.60 in wave 2, indicating an increasing disparity with respect to productivity or profitability between the two groups.

Job creation Figures 3.2c, 3.2d and 3.2e report significantly increasing numbers for job creation among formerly subsidized and regular businesses on both the extensive as well as intensive margin over time. While the majority of formerly subsidized businesses still operate as solopreneurs in wave 2, 45% of this group employ on average 3.3 full-time equivalent employees (FTE), a significant increase on both margins compared to wave 1 by 10%-points and 0.4 FTE, respectively. Overall, this represents a significant increase in the average number of FTE from 1.0 in wave 1 to 1.4 per operating business by the end of our observation window. Combining these job creation numbers with the self-employment shares in each wave (see Table 3.1 again) yields the direct employment effects per subsidy granted, irrespective of business survival. On top of helping the founder to start a business and thus providing him with an employment opportunity, each subsidy in the initial start-up cohort results on average in an *additional* 0.8 FTE (0.797 × 1.0 FTE) after 19 months and in *additional* 1.0 FTE (0.711 × 1.4 FTE) after 40 months. This indicates a substantial "double dividend" of the subsidy.

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[12] To set these figures in perspective, the German Federal Statistical Office (2012, p. 106) reports average monthly gross earnings of €2,976 for a male full-time worker in dependent employment in Germany in the third quarter of 2012 (when income measures 40 months after start-up were surveyed). Applying a net-to-gross ratio of 70%, assuming a three-person household (married couple, one child) with one breadwinner and residence in West Germany (Federal Statistical Office, 2013, p. 10) and adjusting for inflation to 2010 levels, this translates into net monthly earnings of €2,001.

Figure 3.2: Business development over time

a. Monthly earned
net income[a]

b. Hourly earned
net income[a]

c. At least
one employee

Full-time equivalent employees[b]

d. Unconditionally

e. Conditional on FTE>0

f. Patent
application[c]

g. Application to
protect corporate ID[c]

h. Loan received

i. Constrained[d]

Access to capital since start-up
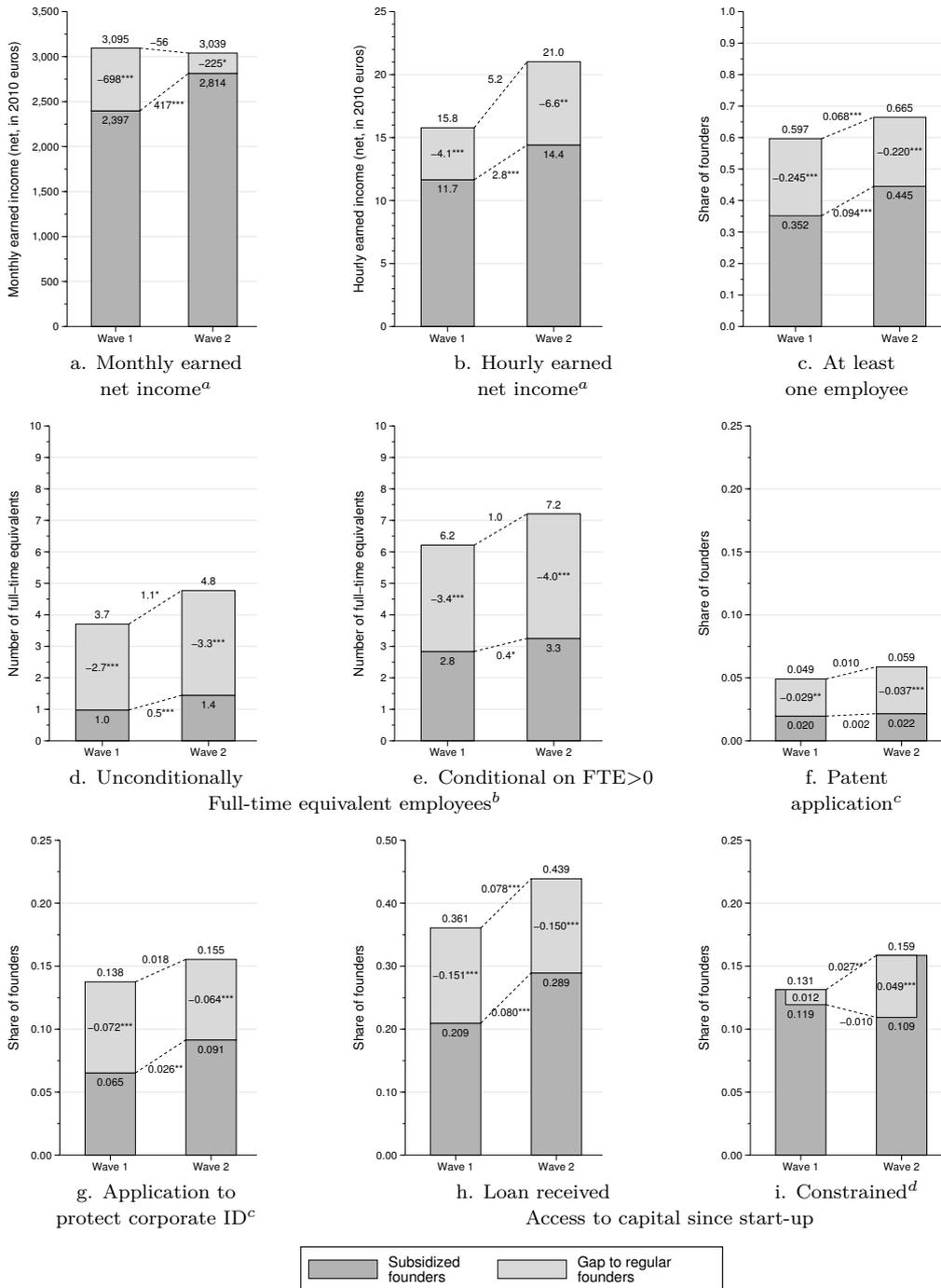
Note: Reported are shares and averages for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment) for all founders who are self-employed at the respective point in time with the same business as at start-up. Wave 1 (wave 2) values are measured 19 (40) months after start-up. Outcomes are weighted for panel attrition. ***/**/* indicates significant difference at the 1/5/10% level.

[a] Income measures are inflation-adjusted to 2010 levels (Federal Statistical Office, 2014). We excluded outliers who reported a monthly income from self-employment larger than €25,000.

[b] Number of full-time equivalent employees (FTE) is a weighted sum, where full-time employees are assigned a weight of 1, part-time employees and apprentices are weighted by 0.5, and others by 0.25. We excluded some outliers from the analysis who reported implausibly high values.

[c] Innovation was surveyed only for a random 50% subsample.

[d] Constrained access to capital indicates that founders wanted to borrow but did not receive a loan.

In contrast, only one third of regular business founders are solopreneurs in wave 2 and the remaining businesses employ seven FTE on average. In total, the group differences between formerly subsidized and regular businesses on all job creation indicators in both waves are statistically significant. While there is some minor catching up on the extensive margin by wave 2, the employer rate is still 50% (or 22%-points in absolute terms) higher among regular founders. Furthermore, the gaps on the intensive margin are highly persistent and even widening over time. Among all employer businesses, the average number of FTE for regular founders is 7.2, more than twice as high compared to 3.3 for formerly subsidized businesses.[13] Compared to subsidized founders, the additional direct employment effects among regular businesses are higher and on average amount to 2.7 FTE (0.717 × 3.7 FTE) after 19 months and 3.7 FTE (0.779 × 4.8 FTE) after 40 months per newly founded business of the initial start-up cohort.

Innovation   With respect to the degree of innovation induced by the businesses, we find a similar pattern. Figures 3.2f and 3.2g show that both types of business founders are increasingly involved in innovation over time. The application rates for patents as a common measure for innovative activity reaches 2.2% for formerly subsidized businesses, but is more than twice as high for regular businesses (5.9%) in wave 2.[14] As an alternative innovation indicator, we also analyze the shares of businesses that apply for protection of their corporate ID. We find a similar pattern as for patents, i.e., the rates are increasing over time but on a higher level. The rates are 9.1% for formerly subsidized businesses and 15.5% for regular ones. Overall, both indicators show that formerly subsidized founders persistently lag behind in innovative activities.

Capital constraints   As an additional intermediate business indicator, we investigate access to capital as a critical factor for business development and growth

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[13] Based on the German Microcensus, an annual representative 1% survey of the German population, Petermann and Piorkowsky (2013, pp. 15, 177) find that in 2009 (parallel to the business start-ups in our sample), 72.2% of male business founders in main activity started as solopreneurs, while in 2012 (parallel to wave 2) 52.4% of all men with self-employment as their main activity have at least one employee.

[14] For comparison, Niefert (2005), using data from the ZEW Foundation Panel (Almus *et al.*, 2000), finds that 3.2% of a sample of German start-ups founded in the early 1990s applied for at least one patent by 1999/2000. However, these numbers are not conditional on survival and therefore underestimate patent applications for survivors. Engel and Keilbach (2007) report, based on a sample of 21,517 German businesses founded between 1995-1998 originating from the same data source, that at the time of business formation, 2.2% of all start-ups applied for at least one patent.

(Aghion *et al.*, 2007; Wiklund and Shepherd, 2003; Pissarides, 1999). Figure 3.2h shows that the (cumulative) share of formerly subsidized founders who have successfully received a loan since start-up increased from 21% in wave 1 to 29% in wave 2. The shares are 15%-points lower compared to regular founders in both waves. It is not directly clear, however, whether these gaps in take-up rates reflect differential access to capital or merely differences in the demand for capital. This is why Figure 3.2i reports the share of founders whose access to credit was constrained in the sense that they wanted to borrow but did not receive a loan. Credit constraints affect 13% of formerly subsidized founders in wave 1 and 16% in wave 2. For regular founders, the numbers decrease over time from 12% to 11%, which represents a significant gap of 5%-points compared to formerly subsidized founders at the end of our observation window. This evidence is in line with unemployed founders facing more severe barriers to access loans (see, e.g., Perry, 2006). Taking both shares from Figures 3.2h and 3.2i together as a crude measure for total loan demand (satisfied and unsatisfied), we nevertheless find higher prevalence among regular founders by about 14%-points in wave 1 and 10%-points in wave 2. This result might also reflect less capital intensive business opportunities and lower growth oriented ambitions and strategies of formerly subsidized businesses.

All in all, we can conclude that formerly subsidized businesses indeed grow and become more innovative over time. Compared to regular businesses, however, they still significantly lag behind 40 months after start-up, with decreasing differences in monthly incomes but growing gaps with respect to productivity, job creation, innovation, and investments.

3.4   What explains the differences?

We now want to explore possible explanations for this finding. As discussed in the introduction, the groups of subsidized and regular founders differ in their individual and business-related start-up characteristics for several reasons. Besides the fact that the subsidy might induce an adverse selection, starting a business out of unemployment by itself might also lead to more severe disadvantages and restrictions compared to regular founders. This suggests that unemployed individuals who enter entrepreneurship might have lower human capital and entrepreneurial

abilities and set up smaller businesses with less growth potential due to more restrictive access to resources like social networks or capital, less time to explore business opportunities and strategies, or lower growth ambitions. Caliendo *et al.* (2015c) indeed find evidence indicating initial differences in observable characteristics at the time of business formation, showing that subsidized founders suffer from a shortage of employment- and industry-specific experience, more severe capital constraints, and fewer spillovers from intergenerational transmissions than regular founders.

Using the panel data, in a first step, we now look at whether these differences remain for the surviving businesses over time or whether the two groups converged once the subsidy has fully expired and both groups were equally exposed to full market mechanisms. Although one could assume that the surviving businesses in wave 2 are more similar in their characteristics than the two full initial start-up cohorts, we will see in Section 3.4.1 that this is not the case, and significant differences in observable characteristics remain. Hence, in a subsequent step, we analyze in Section 3.4.2 to what extent these differences can explain the gap in business survival and business development.

3.4.1   Comparison of observable start-up characteristics

Table 3.2 shows a comparison of some selected observable characteristics at business formation for the start-up cohort in the first quarter of 2009 (columns 1 and 2) and for all self-employed individuals with the same business as at start-up in wave 2 (columns 3 and 4).[15] While subsidized founders at start-up do not lag behind in formal education, they show less intergenerational transmissions in terms of parental self-employment and business takeover from their parents, have lower employment experiences, operate under less favorable local market conditions, are more likely to have push instead of pull motives and have less industry-specific experience and capital. As reported in columns 3 and 4, initial differences, to a large degree, have not vanished once we restrict the comparison to formerly subsidized and regular founders who remain active with the same business up until wave 2. It can be seen that the distribution of observable characteristics changes slightly for both groups, reflecting the selection of

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[15] The full list of observables characteritsics at business formation is reported in Table 3.5 in the Appendix, Section 3.7.1.

Table 3.2: Comparison of selected start-up characteristics between subsidized and regular founders

Selected list[b] of start-up characteristics	Self-employed founders					
	at start-up			with same business in wave 2[a]		
	Sub. founders (1)	Reg. founders (2)	Mean diff. (1) v. (2)	Sub. founders (3)	Reg. founders (4)	Mean diff. (3) v. (4)
A. *Personal characteristics*						
Age (in years)	42.0	45.2	-3.2***	41.8	45.3	-3.5***
Not German	0.076	0.044	0.032***	0.060	0.051	0.009
B. *Human capital*						
Upper secondary school	0.474	0.475	-0.001	0.479	0.494	-0.016
Technical college education						
(master craftsman)	0.173	0.252	-0.079***	0.190	0.280	-0.090***
University education	0.309	0.282	0.027	0.310	0.298	0.011
C. *Intergenerational transmission*						
Parents are/were self-employed	0.328	0.462	-0.134***	0.332	0.501	-0.169***
Business takeover from parents	0.034	0.170	-0.135***	0.047	0.214	-0.167***
Upper sec. schooling of father	0.253	0.249	0.004	0.236	0.239	-0.003
D. *Labor market history*						
Monthly net income from						
last dep. employment						
right before start-up						
€0−€1,000	0.094	0.050	0.045***	0.090	0.042	0.048***
>€2,500	0.206	0.164	0.042***	0.214	0.178	0.036*
No unemployment experience						
before start-up	0.051	0.542	-0.491***	0.062	0.581	-0.519***
E. *Regional information*						
Local macroecon. conditions						
Vacancies related to						
stock of unemployed	14.9	15.6	-0.7**	15.0	15.6	-0.6*
Unemployment rate	8.6	7.5	1.0***	8.6	7.6	1.0***
F. *Start-up motives*[c]						
Desire to be one's own boss	0.376	0.412	-0.036*	0.389	0.461	-0.072***
Unavailability of regular job	0.227	0.101	0.126***	0.190	0.091	0.099***
G. *Business-related characteristics*						
Business sector						
Manufacturing, crafts	0.140	0.223	-0.083***	0.170	0.240	-0.070***
Other services	0.245	0.193	0.052***	0.220	0.186	0.034*
Industry-spec. experience before						
start-up due to former						
self-employment	0.202	0.265	-0.063***	0.192	0.278	-0.085***
Capital invested at start-up						
None	0.193	0.178	0.016	0.162	0.150	0.012
≥€50,000	0.080	0.181	-0.101***	0.101	0.204	-0.104***
Number of obs.	827	453	1,280	614	360	974

Note: All reported numbers are shares (unless stated otherwise) for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment) and refer to start-up. Positive (negative) intergroup differences indicate a higher (lower) value among subsidized founders. Variables are weighted for panel attrition. ***/**/* indicate significantly different means between the two groups at the 1/5/10% level.
[a] Self-employed with same business in wave 2 as at start-up.
[b] A full list of start-up characteristics is reported in Table 3.5 in the Appendix, Section 3.7.1.
[c] Reported are shares of individuals with values of 6 and 7 on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely".

surviving businesses over time. There is no clear pattern of the selection mechanism, though. While the two groups become more similar, e.g., with respect to nationality, university education, or sector choice, the differences between the groups get even more pronounced over time in other characteristics like parental self-employment, unemployment or industry-specific experience. Overall, the differences between the groups remain significant and substantial, in particular with respect to intergenerational transmissions, lifetime unemployment, start-up motives, industry-specific experience, and start-up capital.

3.4.2   Decomposition analysis

Given that these differences still exist 40 months after start-up, the question arises as to what extent the structural differences in observable characteristics at start-up explain the gap in business development. To shed light on this question, we conduct a Blinder-Oaxaca decomposition analysis (Blinder, 1973; Oaxaca, 1973) and decompose the raw gaps in business performance Δ^{Raw} into an explained part due to differences in initial characteristics and an unexplained part:[16]

$$
\begin{aligned}
\Delta^{Raw} &= \overline{Y}_{Sub} - \overline{Y}_{Reg} = \overline{F(\beta_{sub}X_{i,sub})} - \overline{F(\beta_{reg}X_{i,reg})} \\
&= \underbrace{\{\overline{F(\beta_{sub}X_{i,sub})} - \overline{F(\beta_{sub}X_{i,reg})}\}}_{Explained} + \underbrace{\{\overline{F(\beta_{sub}X_{i,reg})} - \overline{F(\beta_{reg}X_{i,reg})}\}}_{Unexplained} \quad (3.1)
\end{aligned}
$$

More specifically, we arrange the full list of 70 observable characteristics at business formation into seven blocks of related variables on personal characteristics, human capital, intergenerational transmissions, labor market history, regional information, start-up motives, as well as business characteristics (further divided into business sector, industry-specific experience, and start capital for more detailed insight) and control for the blocks individually and jointly (X_i). Our two main outcome variables of interest are business survival and whether the business has created any employment. Since both outcomes are binary, we choose a probit approach, setting $F(\cdot) = \Phi(\cdot)$, and use maximum likelihood for estimation.[17] Results are reported in Table 3.3.

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[16] For details on the implementation of the decomposition analysis, see Table 3.6 in the Appendix, Section 3.7.1.

[17] Estimations are conducted in Stata using the *nldecompose*-package (Sinning *et al.*, 2008).

Table 3.3: Decomposition analysis of business performance gaps between formerly subsidized and regular founders

	Raw gap	Specification										
		(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(7c)	(7)	(8)
A. *Outcome variable:* Self-employed with same business in wave 2[a]												
Unexplained	-0.068***	-0.087***	-0.065**	-0.032	0.003	-0.066**	-0.047	-0.049*	-0.096***	-0.067**	-0.073**	0.006
Explained		0.019	-0.003	-0.036***	-0.071**	-0.002	-0.021**	-0.019**	0.028***	0.000	0.005	-0.075**
% Explained		-27.5	4.6	53.3	104.2	2.5	30.9	28.4	-41.1	-0.4	-8.0	109.2
Number of obs.	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
B. *Outcome variable:* At least one employee in wave 2												
Unexplained	-0.220***	-0.253***	-0.208***	-0.188***	-0.256***	-0.204***	-0.192***	-0.207***	-0.216***	-0.179***	-0.171***	-0.188***
Explained		0.034**	-0.011	-0.031	0.036	-0.016	-0.027**	-0.013	-0.004	-0.040**	-0.049**	-0.033
% Explained		-15.6	5.1	14.2	-16.3	7.4	12.3	5.9	1.7	18.3	22.2	15.1
Number of obs.	974	974	974	974	974	974	974	974	974	974	974	974
C. *Control variables[b]:*												
Start-up characteristics:												
(1) *Personal charact.*		✓										✓
(2) *Human capital*			✓									✓
(3) *Intergen. transm.*				✓								✓
(4) *Labor market hist.*					✓							✓
(5) *Regional info.*						✓						✓
(6) *Start-up motives*							✓					✓
(7) *Business charact.*												
(a) *Business sector*								✓			✓	✓
(b) *Ind.-spec. exper.*									✓		✓	✓
(c) *Start capital*										✓	✓	✓
Total number of control variables		9	5	7	16	6	7	7	6	7	20	70

Note: Reported are estimation results of a Blinder-Oaxaca probit decomposition for subsidized business founders (out of unemployment) as the base group using the Stata package *nldecompose* (Sinning *et al.*, 2008). For details, see Table 3.6 in the Appendix, Section 3.7.1. Standard errors are bootstrapped using 499 replications. Outcomes are weighted for panel attrition. ***/**/* indicates statistical significance at the 1/5/10% level.
[a] Self-employed with same business as at start-up.
[b] A detailed list and summary descriptives of the underlying control variables are reported in Table 3.5 in the Appendix, Section 3.7.1.

Start-up characteristics   Panel A in Table 3.3 shows that, unconditionally, formerly subsidized founders have a negative raw gap in business survival of 6.8%-points in wave 2 compared to regular founders (as already reported in Table 3.1). Controlling for each of the covariate blocks reported in Panel C individually (specifications 1 to 7) reveals that this gap is mainly explained by differences in intergenerational transmissions (accounting for 53% of the survival gap, spec. 3) and labor market histories (104%, spec. 4).[18] Start-up motives (31%, spec. 6) and business sector choice (28%, spec. 7a) are also important, but to a lesser extent. Once we condition on all start-up characteristics available (spec. 8), the unexplained gap in business survival virtually vanishes, becomes positive but close to zero and insignificant.

Panel B repeats the exercises for the dummy variable indicating at least one employee in wave 2. This time, the control variables only explain a small fraction of the raw gap, with intergenerational transmissions (14%, spec. 3) and business-related characteristics (22%, spec. 7) having the highest but, in absolute terms, very low explanatory power. The full list of variables reduces the unexplained performance gap by only 15% (spec. 8). This implies that the differences in job creation are driven by other factors that are not sufficiently captured by our list of available start-up characteristics.

As an interesting side note, if we conduct a decomposition analysis for the employment dummy in wave 1 (see Table 3.7 in the Appendix, Section 3.7.1), start-up characteristics explain almost 50% of the employment gaps in wave 1, with start-up capital (25%), intergenerational transmissions (22%), and start-up motives (11%) providing the highest explanatory contributions. Thus, while start-up characteristics are strong determinants of short-term business performance, business growth in the longer run instead seems to be more affected by other factors.

Business strategies and dynamics   To test alternative explanations for the gaps in employment growth in wave 2, we extend the list of control variables X_i in the decomposition analysis by adding factors that capture business strategies and dynamics. In a first step, we include two indicators on access to capital. As

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[18] An explained share of more than 100% indicates that the inclusion of the control variables changes the initially negative unconditional gap to a positive conditional gap. A negative explained share means that the control variables *increase* the absolute amount of the initial gap.

already reported in Section 3.3.2, while formerly subsidized founders have lower demand for capital and face more severe credit constraints than regular founders, access to capital is a crucial factor for business growth (Aghion *et al.*, 2007; Wiklund and Shepherd, 2003). In a second step, we aim to consider unobserved factors that can be summarized into two groups. On the one hand, there are unobserved variables at start-up that reflect the fundamental business strategy, like the founder's intention and opportunity for growth at business formation. On the other hand, there are business dynamics after start-up, where founders implement their initial strategies and adapt their decisions as a reaction to challenges and changes in their business environment. Since these variables are unobserved in our data, we instead include the intermediate wave 1 outcome on employment as a proxy variable. It can be seen as the *result* of all observable and unobservable factors in the early business phase up until wave 1 and thus should best incorporate the unobserved initial business strategies as well as early business dynamics that we do not capture in our previous analysis. Results are reported in Table 3.4.

To recap our baseline results from above, the raw employment gap in wave 2 amounts to 22%-points (first column of Table 3.4), and only 15% (or 3%-points) of the gap can be explained once we control for all available start-up characteristics (spec. 8), as already reported in Table 3.3. If we additionally include the two indicators on access to capital (spec. 9), the explained part almost doubles to 28%, once again emphasizing the important role for business growth. Taken together with the results above, we thus find that while start-up capital explains a substantial part of short term growth, access to capital is increasingly important for business growth in the longer term.

Controlling for the wave 1 outcome as a proxy for initial business strategies and early business dynamics along with all available start-up characteristics (spec. 10) increases the explained share to more than 53%. The specification including all start-up characteristics, access to capital indicators as well as the wave 1 outcome (spec. 11) explains more than 60% of the employment gap in wave 2 between formerly subsidized founders and regular founders.

In summary, the decomposition analysis shows that differences in business survival disappear entirely once we control for the (observable) structural differences between the types of businesses and founder characteristics at start-up.

Table 3.4: Additional decomposition analysis of employment gaps between formerly subsidized and regular founders

	Raw	Specification			
	gap	(8)	(9)	(10)	(11)
A. *Outcome variable:* At least one employee in wave 2					
Unexplained	-0.220***	-0.188***	-0.161***	-0.102*	-0.083
Explained		-0.033	-0.061	-0.115**	-0.134***
% Explained		15.1	27.5	53.1	61.6
Number of obs.	974	974	974	974	974
B. *Control variables*:					
Start-up characteristics[a]:					
(1) *Personal characteristics*		✓	✓	✓	✓
(2) *Human capital*		✓	✓	✓	✓
(3) *Intergen. transmissions*		✓	✓	✓	✓
(4) *Labor market history*		✓	✓	✓	✓
(5) *Regional information*		✓	✓	✓	✓
(6) *Start-up motives*		✓	✓	✓	✓
(7) *Business characteristics*		✓	✓	✓	✓
Additional business indicators in wave 2:					
(9) *Access to capital since start-up*[b]			✓		✓
Wave 1 outcome:					
(10) *At least one employee*[c]				✓	✓
Total number of control variables		70	72	71	73

Note: Reported are estimation results of a Blinder-Oaxaca probit decomposition for subsidized business founders (out of unemployment) as the base group using the Stata package *nldecompose* (Sinning *et al.*, 2008). For details, see Table 3.6 in the Appendix, Section 3.7.1. Standard errors are bootstrapped using 499 replications. Outcomes are weighted for panel attrition. ***/**/* indicates statistical significance at the 1/5/10% level.
[a] A detailed list and summary descriptives of the underlying control variables are reported in Table 3.5 in the Appendix, Section 3.7.1.
[b] Access to capital includes two dummy variables indicating whether the founder received a loan since start-up and whether the founder wanted to borrow but did not receive a loan. Summary descriptive statistics are reported in Figures 3.2h and 3.2i.
[c] Summary descriptive statistics are reported in Figure 3.2c.

Yet, only the short-run gap in job creation can be explained by initial endowment differences to a larger extent (49%). The long-run gap in business growth paths rather seems to be driven by unobserved factors like initial business strategies, differential access to capital, and post-start-up business dynamics.

3.5 Summary

In this paper, we compare the survival and performance of businesses emerging from a German start-up subsidy program targeted at unemployed individuals to regular businesses that were started out of non-unemployment and did not receive the subsidy. The comparison up until 40 months after business formation permits an in-depth assessment of the development and growth potential of subsidized start-ups.

Taking the key evidence on the start-up process and the short-term survival in wave 1 by Caliendo *et al.* (2015c), we can state that: First, there are significant initial differences between the two groups at start-up. While subsidized founders have similar levels of formal education, they show disadvantages with respect to employment and entrepreneurial experience, fewer spillovers from intergenerational transmissions, more restrictions on the availability of and access to capital, and they differ in sector choice. Second, although deadweight effects occur for the subsidy program under examination, they are less pronounced than often assumed and amount to no more than 10-20%. And third, the slightly inflated short-term survival rates measured 19 months after business formation, shortly after the subsidy expired, indicate the potential of some moral hazard during subsidy receipt that delays market selection among subsidized founders (see Caliendo *et al.*, 2015c, for details).

In this paper, we add evidence on the business performance at 3.5 years after start-up and find, first, that formerly subsidized businesses are successfully established in the market with an overall survival rate of more than 70%. General reintegration into the labor market is relatively high, and less than 4% of initially subsidized business founders are unemployed 40 months after business formation. Second, compared to regular businesses, however, formerly subsidized businesses show lower survival rates and lag behind in a variety of business success indicators. While we observe some catch-up in terms of monthly income compared to wave 1, formerly subsidized founders display persistent shortcomings in business productivity, job creation in both the extensive as well as the intensive margin, innovation, and investment activity. Third, within the sample of founders who are still actively operating their businesses in wave 2, market selection did not lead to a substantial convergence of (observable) start-up characteristics between the two groups. While these differences can entirely explain the gap in business survival, they do not represent the major empirical reason for the shortcomings in business growth. Exploring this point further, we find suggestive evidence that particularly a restricted access to capital as well as fundamentally different business strategies and early business dynamics explain a large part of the persistent gap in business development and growth.

3.6   Discussion and policy conclusions

Policies encouraging and supporting unemployed individuals to start a business have become common instruments of ALMP in many developed countries. But despite this recent growth in popularity, they are increasingly becoming subject to criticism. Our paper provides evidence on the longer term business potentials of participants in a German start-up subsidy program targeted at unemployed individuals. Our findings provide new evidence from a *business perspective* and contribute to the ongoing critical debate about the benefits and concerns related to this type of public policy (Shane, 2009; Acs *et al.*, 2016). In sum, we find that the subsidy attracts individuals who face more severe restrictions with respect to the availability of or access to human, social, and financial capital. These individuals also display lower ambitions, intentions, strategies, or capabilities for growth and innovation. Consequently, while survival rates are relatively high, initially subsidized founders persistently perform worse than regular founders from a *business perspective*, especially in terms of job creation and innovation activity. The gaps are relatively constant or even widening over time. Hence, we do not see any indication of catching up in the longer run.

These findings are in stark contrast to the robust empirical evidence from an *ALMP perspective* showing that unemployed individuals are much better off participating than not participating in start-up subsidy programs (see Wolff *et al.*, 2016; Caliendo *et al.*, 2016; Caliendo and Künn, 2011, among others). Therefore, from a policy standpoint, start-up subsidies are seen as a highly effective tool to persistently reintegrate formerly unemployed individuals into the labor market and improve their income situations. On average, the program costs amount to €4,900 per participant,[19] which is relatively low compared to other major ALMP programs (e.g., €8,200 for public employment schemes and €4,150 for wage subsidies in 2009), and in particular, given the additional job creation of 1.0 FTE per participant after 40 months (as calculated above).

Considering these conflicting results for the assessment of the subsidy program, policy makers need to carefully weigh the costs and benefits of such an ALMP

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[19] The subsidy consisted of an amount equivalent to the previous unemployment benefit averaging €1,093 and a lump sum of €300 paid for nine months and an optional six month lump sum payment extension of which 61.7% benefited, yielding average total costs of €13,650 (calculation is based on results in Caliendo *et al.* (2016)). Taking into account that the subsidy receipt was offset against the remaining unemployment benefit entitlement of on average 8 months, the "net" costs thus drop to €4,900.

strategy. While these programs are highly effective in sustainably improving individual labor market prospects and stimulate some additional job creation, they fall short of succeeding as an entrepreneurship policy in that they do not spur the creation of high-growth or innovative new businesses, and the magnitude of additional job growth is rather limited. Direct changes to the subsidy program are likely to cause trade-off effects between effectiveness as an *active labor market policy* and as a *business policy*. For instance, to improve the average performance of subsidized businesses, acceptance into the subsidy program could be combined with better screening or more restrictive selection on certain (observable) founder and start-up characteristics to identify and approve only the most promising business proposals. One downside of this approach is that while observable start-up characteristics entirely explain the survival gaps, they contribute little to the explanation of the shortcomings in business growth. Thus further investigations and a careful implementation would be necessary. Furthermore, this approach would likely result in higher rejection rates of those unemployed nascent entrepreneurs who need the subsidy the most, and thus it would likely yield increasing deadweight effects. Also, this approach implies lower access to the subsidy for disadvantaged individuals with less favorable characteristics, who, in turn, derive the highest labor market benefits from participation (Caliendo and Künn, 2011).

To spur job creation and economic growth, nascent founders and in particular unemployed nascent founders might need additional encouragement and advice during the pre or early start-up phase to improve and mature their business idea and plan for and factor in future business growth. In this sense, additional soft support measures like coaching, counseling, mentoring, or training (accompanying the subsidy) during the pre or early start-up phase might improve business potential and long-term development (see, e.g., Rotger *et al.*, 2012; Wren and Storey, 2002). An additional issue that might hinder business growth for formerly unemployed subsidized founders seems to be higher restrictions to access capital. Since we cannot clearly identify whether they are mainly supply- or demand-driven, further research to investigate this topic more closely is necessary.

Targeting and promoting high-growth firms instead, as is often proposed as a public policy alternative specifically focussing on the business perspective, is a fundamentally different approach and comes with its own major practical

challenges. For instance, the definition of high growth-potential firms and their targeted identification ex ante is not straightforward. The necessary instruments required to foster actual high-growth firms are very specific to the individual firm, context, and timing and are thus very demanding and difficult to implement (Daunfeldt *et al.*, 2014; Mason and Brown, 2013).

On a final note, it should also be kept in mind that in micro level studies on an individual ALMP or business perspective, general equilibrium effects such as displacement or crowding out usually cannot be taken into account. Although evidence on these effects would be highly informative for policy makers as well, empirical analyses on the macro effects of start-up subsidy programs on aggregated (un)employment and growth are very rare due to severe data limitations. Nevertheless, potential displacement effects of any business support measure should also always be carefully considered in this context.

3.7 Appendix

3.7.1 Additional tables

Table 3.5: Full comparison of start-up characteristics between groups

	Self-employed founders					
	at start-up			with same business in wave 2[a]		
	Sub.	Reg.	Mean	Sub.	Reg.	Mean
Full list of	founders	founders	diff.	founders	founders	diff.
start-up characteristics	(1)	(2)	(1) v. (2)	(3)	(4)	(3) v. (4)
A. *Personal characteristics*						
East Germany	0.213	0.116	0.098***	0.213	0.128	0.085***
Age distribution						
<25	0.033	0.052	-0.020**	0.025	0.044	-0.020**
25−<35	0.237	0.197	0.039**	0.232	0.189	0.042**
35−<45	0.318	0.261	0.056***	0.352	0.275	0.077***
45−<56	0.289	0.237	0.052***	0.292	0.244	0.048**
≥56	0.124	0.252	-0.128***	0.101	0.247	-0.147***
Children under six years						
in household	0.209	0.149	0.060***	0.235	0.164	0.070***
Children between six and						
14 years in household	0.232	0.212	0.019	0.253	0.219	0.034*
Married	0.572	0.629	-0.057***	0.597	0.631	-0.034
Not German	0.076	0.044	0.032***	0.060	0.051	0.009
B. *Human capital*						
School achievement						
None or lower secondary						
school	0.213	0.212	0.001	0.207	0.203	0.004
Middle secondary school	0.313	0.314	-0.000	0.314	0.303	0.012
Upper secondary school	0.474	0.475	-0.001	0.479	0.494	-0.016
Professional education						
Skilled workers						
(apprenticeship)	0.455	0.361	0.094***	0.446	0.326	0.120***
Technical college education						
(master craftsman)	0.173	0.252	-0.079***	0.190	0.280	-0.090***
University education	0.309	0.282	0.027	0.310	0.298	0.011
Unskilled workers/others	0.063	0.106	-0.043***	0.054	0.095	-0.041***
C. *Intergenerational transmission*						
Parents born abroad	0.201	0.157	0.044***	0.203	0.153	0.051***
Parents are/were self-employed	0.328	0.462	-0.134***	0.332	0.501	-0.169***
Business takeover from parents	0.034	0.170	-0.135***	0.047	0.214	-0.167***
School achievement of father						
None or lower secondary						
school	0.553	0.585	-0.032	0.560	0.607	-0.047**
Middle secondary school	0.176	0.162	0.014	0.194	0.148	0.046**
Upper secondary school	0.253	0.249	0.004	0.236	0.239	-0.003
Father unknown	0.019	0.005	0.014***	0.011	0.006	0.005
Father of respondent employed						
at age 15	0.888	0.883	0.004	0.901	0.896	0.006

(Table continued on next page)

(Table 3.5 continued)

| | Self-employed founders | | | | | |
| | at start-up | | | with same business in wave 2[a] | | |
Full list of start-up characteristics	Sub. founders (1)	Reg. founders (2)	Mean diff. (1) v. (2)	Sub. founders (3)	Reg. founders (4)	Mean diff. (3) v. (4)
D. *Labor market history*						
Duration of dependent employ-						
ment right before start-up						
<1 year	0.067	0.043	0.024**	0.055	0.028	0.028***
5 or more years	0.550	0.495	0.054***	0.585	0.517	0.068***
Monthly net income from						
last dep. employment						
right before start-up						
Dependently employed and						
income not specified	0.039	0.069	-0.030***	0.034	0.085	-0.051***
€0−€1,000	0.094	0.050	0.045***	0.090	0.042	0.048***
>€1,000−€1,500	0.261	0.143	0.118***	0.247	0.143	0.104***
>€1,500−€2,500	0.318	0.218	0.099***	0.345	0.193	0.152***
>€2,500	0.206	0.164	0.042***	0.214	0.178	0.036*
In apprenticeship or						
marginal employment	0.045	0.134	-0.088***	0.039	0.129	-0.091***
In other status	0.036	0.222	-0.186***	0.032	0.230	-0.198***
Unemployment experience						
before start-up[b]						
Not specified	0.018	0.002	0.016***	0.019	0.003	0.017***
0	0.051	0.542	-0.491***	0.062	0.581	-0.519***
>0−≤2	0.340	0.234	0.106***	0.378	0.233	0.145***
>2−≤5	0.294	0.137	0.156***	0.297	0.124	0.173***
>5−≤15	0.251	0.071	0.180***	0.207	0.056	0.150***
>15	0.045	0.013	0.032***	0.037	0.002	0.035***
Employment experience						
before start-up[b]						
Not specified	0.011	0.005	0.006	0.013	0.006	0.006
≤50	0.174	0.162	0.012	0.163	0.142	0.021
>50−≤70	0.202	0.143	0.060***	0.198	0.136	0.062***
>70−≤90	0.361	0.331	0.030	0.358	0.349	0.009
>90−≤99	0.123	0.149	-0.025*	0.140	0.144	-0.004
>99	0.129	0.211	-0.082***	0.129	0.222	-0.093***
E. *Regional information*						
Federal state (selected states)						
Baden-Wuerttemberg	0.123	0.145	-0.022	0.131	0.144	-0.013
Bavaria	0.173	0.242	-0.069***	0.179	0.260	-0.081***
Saxony	0.051	0.055	-0.003	0.057	0.061	-0.004
Local macroeconomic conditions						
Vacancies related to						
stock of unemployed	14.9	15.6	-0.7**	15.0	15.6	-0.6*
Unemployment rate	8.6	7.5	1.0***	8.6	7.6	1.0***
Real GDP per capita in 2008						
(in €1,000)	36.3	32.2	4.1***	36.3	32.4	4.0***

(Table 3.5 continued)

| | Self-employed founders | | | | | |
| | at start-up | | | with same business in wave 2[a] | | |
Full list of start-up characteristics	Sub. founders (1)	Reg. founders (2)	Mean diff. (1) v. (2)	Sub. founders (3)	Reg. founders (4)	Mean diff. (3) v. (4)
F. *Start-up motives*[c]						
Realization of business idea	0.290	0.304	-0.014	0.299	0.303	-0.004
Discovery of a market niche	0.116	0.131	-0.014	0.121	0.136	-0.015
Desire to be one's own boss	0.376	0.412	-0.036*	0.389	0.461	-0.072***
Desire to earn more money	0.284	0.297	-0.013	0.270	0.279	-0.009
Discrimination at previous job	0.173	0.086	0.088***	0.174	0.089	0.086***
Unavailability of regular job	0.227	0.101	0.126***	0.190	0.091	0.099***
Recommendation by others	0.088	0.041	0.047***	0.075	0.041	0.033***
G. *Business-related characteristics*						
Business sector						
Agriculture, forestry, fishing	0.004	0.017	-0.012***	0.005	0.022	-0.017***
Manufacturing, crafts	0.140	0.223	-0.083***	0.170	0.240	-0.070***
Construction	0.115	0.103	0.013	0.130	0.107	0.024
Retail	0.128	0.168	-0.040***	0.114	0.164	-0.050***
Transport, logistics	0.053	0.025	0.028***	0.044	0.026	0.018**
Financial service, insurance industry	0.064	0.035	0.029***	0.055	0.038	0.017
IT	0.063	0.073	-0.010	0.072	0.059	0.013
Other services	0.245	0.193	0.052***	0.220	0.186	0.034*
Other sectors	0.188	0.163	0.024	0.190	0.159	0.031*
Industry-specific experience before start-up						
Due to dependent employment	0.725	0.620	0.104***	0.772	0.663	0.109***
Due to former self-employment	0.202	0.265	-0.063***	0.192	0.278	-0.085***
Due to secondary employment	0.221	0.172	0.048***	0.240	0.162	0.078***
Due to hobby	0.259	0.270	-0.011	0.271	0.223	0.048**
Due to honorary office	0.056	0.076	-0.020*	0.050	0.068	-0.018
None	0.095	0.110	-0.015	0.072	0.094	-0.022*
Capital invested at start-up						
None	0.193	0.178	0.016	0.162	0.150	0.012
<€1,000	0.047	0.092	-0.045***	0.033	0.057	-0.024**
€1,000−<€5,000	0.173	0.133	0.040***	0.163	0.117	0.047***
€5,000−<€10,000	0.158	0.074	0.084***	0.169	0.076	0.093***
€10,000−<€50,000	0.337	0.307	0.030	0.365	0.352	0.013
≥€50,000	0.080	0.181	-0.101***	0.101	0.204	-0.104***
Capital at start consisted entirely of own equity	0.470	0.456	0.014	0.483	0.493	-0.009
Number of obs.	827	453	1,280	614	360	974

Note: All reported numbers are shares (unless stated otherwise) for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment) and refer to start-up. Positive (negative) intergroup differences indicate a higher (lower) value among subsidized founders. Variables are weighted for panel attrition. ***/**/* indicate significantly different means between the two groups at the 1/5/10% level.

[a] Self-employed with same business in wave 2 as at start-up.

[b] Reported as the share of working time, standardized by age−15.

[c] Reported are shares of individuals with values of 6 and 7 on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely".

Table 3.6: Implementation of Non-Linear Blinder-Oaxaca Decomposition

Non-Linear Blinder-Oaxaca Decomposition:
- Idea: The raw gaps are decomposed into an explained part due to differences in characteristics and an unexplained part due to differences in coefficients.

$$\Delta^{Raw} \quad = \quad \overline{Y}_{Sub} - \overline{Y}_{Reg} \quad = \overline{F(\beta_{sub}X_{i,sub})} - \overline{F(\beta_{reg}X_{i,reg})}$$

$$= \quad \underbrace{\{\overline{F(\beta_{sub}X_{i,sub})} - \overline{F(\beta_{sub}X_{i,reg})}\}}_{Explained} \quad + \quad \underbrace{\{\overline{F(\beta_{sub}X_{i,reg})} - \overline{F(\beta_{reg}X_{i,reg})}\}}_{Unexplained}$$

- Probit estimation using weights to correct for panel attrition.
- Standard errors are bootstrapped using 499 replications.
- Control variables[a] (X_i):

  Personal characteristics (East Germany, age distribution, children under six year in household, children between six and 14 years in household, married, not German)

  Human capital (School achievement, professional education)

  Intergenerational transmission (Parents born abroad, parents are/were self-employed, business takeover from parents, school achievement of father, father of respondent employed at age 15)

  Labor market history (Duration of dependent employment right before start-up, monthly net income from last dependent employment right before start-up, unemployment experience before start-up, employment experience before start-up)

  Regional information (Federal state, local macroeconomic conditions)

  Start-up motives (Realization of business idea, discovery of market niche, being one's own boss, earn more money, discrimination at previous job, unavailability of regular job, recommendation by others)

  Business-related characteristics (Sectoral distribution of businesses, industry-specific experience before start-up, capital invested at start-up, capital at start consisted entirely of own equity)

Note: The Blinder-Oaxaca probit decomposition was implemented using the Stata package *nldecompose* (Sinning *et al.*, 2008).
[a] Descriptive statistics of all control variables are reported in Table 3.5 in the Appendix, Section 3.7.1.

Table 3.7: Decomposition analysis of wave 1 employment gaps between formerly subsidized and regular founders

	Raw gap	Specification										
		(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(7c)	(7)	(8)
A. Outcome variable: At least one employee in wave 1												
Unexplained	-0.245***	-0.261***	-0.229***	-0.191***	-0.279***	-0.231***	-0.218***	-0.230***	-0.245***	-0.184***	-0.173***	-0.124**
Explained		0.016*	-0.016*	-0.054***	0.034	-0.014	-0.026***	-0.015*	-0.000	-0.061***	-0.075***	-0.123**
% Explained		-6.5	6.4	22.1	-13.7	5.8	10.8	5.9	0.1	24.9	30.2	49.8
Number of obs.	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026
B. Control variables[a]:												
Start-up characteristics:												
(1) *Personal charact.*		✓										✓
(2) *Human capital*			✓									✓
(3) *Intergen. transm.*				✓								✓
(4) *Labor market hist.*					✓							✓
(5) *Regional info.*						✓						✓
(6) *Start-up motives*							✓					✓
(7) *Business charact.*												
(a) *Business sector*								✓			✓	✓
(b) *Ind.-spec. exper.*									✓		✓	✓
(c) *Start capital*										✓	✓	✓
Total number of control variables		9	5	7	16	6	7	7	6	7	20	70

Note: Reported are estimation results of a Blinder-Oaxaca probit decomposition for subsidized business founders (out of unemployment) as the base group using the Stata package *nldecompose* (Sinning *et al.*, 2008). For details, see Table 3.6 in the Appendix, Section 3.7.1. Standard errors are bootstrapped using 499 replications. Outcomes are weighted for panel attrition. ***/**/* indicates statistical significance at the 1/5/10% level.
[a] A detailed list and summary descriptives of the underlying control variables are reported in Table 3.5 in the Appendix, Section 3.7.1.

3.7.2 Panel attrition

Details on the weighting procedure to correct for selective panel attrition
As shown in the paper, the implementation of the panel survey in wave 2 introduced a weak selection bias due to panel attrition (see Section 3.2.3 and Tables 3.8 and 3.9 for details). To correct for this endogenous panel attrition, we apply a weighting procedure that is based on weighting panel observations with the inverse participation probability, i.e., the inverse of the individual probability to participate in the wave 2 survey. The participation probability is estimated using probit regression:

$$p_i = Prob(s_i = 1|x_{i1}), \qquad (3.2)$$

where p_i is the probability to participate in the wave 2 interview and s_i is an individual response indicator, taking the value 1 if individual i participated in the wave 2 interview, and 0 otherwise. X_{i1} denotes a vector of observable characteristics available in wave 1, i.e., characteristics at start-up as well as outcome variables at the time of the wave 1 interview.

The inverse of the participation probability $\hat{p}_i$ is then used to correct the outcome variables in the second wave y_i:

$$\hat{y}_i = \frac{N\hat{w}_i}{\sum_{i=1}^{N} \hat{w}_i}(y_i|s_i = 1) \qquad , \quad with \quad \hat{w}_i = \frac{s_i}{\hat{p}_i}. \qquad (3.3)$$

This weighting method assumes that interview drop-outs are random, conditional on observable characteristics (x_i) included in the probit model. Therefore, it is important to have a large vector of observable characteristics available to make the weighting procedure a valid strategy. The data at hand allow us to control for both general characteristics such as age, education, and labor market history as well as outcome variables as collected during the first interview; see Table 3.10 for details.[20] As mentioned in the paper, the inverse probability weighting procedure removes almost all significant differences in observable characteristics and reduces the (insignificant) differences in outcome variables even further, see columns 3 and 6 in Tables 3.8 and 3.9. Thus, the large set of variables used in the construction of the panel weights makes us confident that the conditional on observables assumption is fulfilled in our case.

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[20] Detailed probit estimation results are available from the authors upon request.

Table 3.8: Selected descriptive statistics for full and panel sample

	Subsidized founders			Regular founders		
	Full sample	Panel sample		Full sample	Panel sample	
		Raw	Weighted		Raw	Weighted
	(1)	(2)	(3)	(4)	(5)	(6)
A. *Personal characteristics*						
East Germany	0.217	0.213	0.213	0.109	0.106	0.116
Age distribution						
<25	0.031	0.024	0.033	0.060	0.049	0.052
25−<35	0.243	0.207**	0.237	0.205	0.174	0.197
35−<45	0.325	0.322	0.318	0.269	0.272	0.261
45−<56	0.281	0.317*	0.289	0.242	0.260	0.237
≥56	0.120	0.131	0.124	0.224	0.245	0.252
Children under six						
years in household	0.206	0.202	0.209	0.154	0.143	0.149
Children between six and						
14 years in household	0.230	0.236	0.232	0.214	0.238	0.212
Married	0.572	0.602	0.572	0.611	0.667**	0.629
Not German	0.067	0.056	0.076	0.049	0.040	0.044
B. *Human capital*						
School achievement						
None or lower secondary						
school	0.210	0.170**	0.213	0.216	0.188	0.212
Middle secondary school	0.313	0.299	0.313	0.316	0.296	0.314
Upper secondary school	0.478	0.531**	0.474	0.468	0.517*	0.475
Professional education						
Skilled workers						
(apprenticeship)	0.459	0.423*	0.455	0.361	0.338	0.361
Technical college education						
(master craftsman)	0.171	0.163	0.173	0.249	0.252	0.252
University education	0.309	0.357**	0.309	0.276	0.311	0.282
Unskilled workers/others	0.062	0.057	0.063	0.113	0.099	0.106
C. *Intergenerational transmission*						
Parents born abroad	0.204	0.163**	0.201	0.159	0.148	0.157
Parents are/were self-employed	0.329	0.340	0.328	0.466	0.472	0.462
Business takeover from parents	0.028	0.036	0.034	0.144	0.172	0.170
School achievement of father						
None or lower						
secondary school	0.555	0.548	0.553	0.584	0.589	0.585
Middle secondary school	0.182	0.184	0.176	0.174	0.172	0.162
Upper secondary school	0.248	0.256	0.253	0.238	0.234	0.249
Father unknown	0.014	0.012	0.019	0.004	0.004	0.005
Father of respondent						
employed at age 15	0.873	0.897*	0.888	0.875	0.887	0.883

(Table continued on next page)

(Table 3.8 continued)

	Subsidized founders			Regular founders		
	Full	Panel sample		Full	Panel sample	
	sample	Raw	Weighted	sample	Raw	Weighted
	(1)	(2)	(3)	(4)	(5)	(6)
D. *Labor market history*						
Duration of dependent employ-						
ment right before start-up						
<1 year	0.067	0.059	0.067	0.029	0.035	0.043
5 or more years	0.548	0.580	0.550	0.498	0.506	0.495
Monthly net income from						
last dep. employment right						
before start-up						
Dependently employed and						
income not specified	0.038	0.022**	0.039	0.072	0.046**	0.069
€0−€1,000	0.094	0.085	0.094	0.048	0.044	0.050
>€1,000−€1,500	0.253	0.238	0.261	0.143	0.143	0.143
>€1,500−€2,500	0.321	0.339	0.318	0.218	0.230	0.218
>€2,500	0.214	0.248*	0.206	0.159	0.177	0.164
In apprenticeship or						
marginal employment	0.044	0.039	0.045	0.144	0.128	0.134
In other status	0.036	0.030	0.036	0.215	0.232	0.222
Unemployment experience						
before start-up[a]						
Not specified	0.018	0.015	0.018	0.006	0.002	0.002
0	0.053	0.060	0.051	0.535	0.536	0.542
>0−≤2	0.333	0.360	0.340	0.235	0.249	0.234
>2−≤5	0.303	0.307	0.294	0.120	0.135	0.137
>5−≤15	0.250	0.216*	0.251	0.080	0.064	0.071
>15	0.043	0.041	0.045	0.023	0.013	0.013
Employment experience						
before start-up[a]						
Not specified	0.009	0.007	0.011	0.010	0.004	0.005
≤50	0.164	0.178	0.174	0.146	0.152	0.162
>50−≤70	0.214	0.218	0.202	0.165	0.146	0.143
>70−≤90	0.379	0.359	0.361	0.347	0.349	0.331
>90−≤99	0.110	0.120	0.123	0.125	0.141	0.149
>99	0.123	0.119	0.129	0.208	0.208	0.211
E. *Regional information*						
Federal state (selected states)						
Baden-Wuerttemberg	0.124	0.120	0.123	0.153	0.146	0.145
Bavaria	0.168	0.173	0.173	0.244	0.258	0.242
Saxony	0.055	0.053	0.051	0.047	0.046	0.055
Local macroeconomic conditions						
Vacancies related to						
stock of unemployed	15.0	14.9	14.9	15.4	15.8	15.6
Unemployment rate	8.6	8.6	8.6	7.5	7.4	7.5
Real GDP per capita in 2008						
(in €1,000)	35.7	36.7	36.3	32.5	32.2	32.2

(Table continued on next page)

(Table 3.8 continued)

	Subsidized founders			Regular founders		
	Full sample	Panel sample		Full sample	Panel sample	
		Raw	Weighted		Raw	Weighted
	(1)	(2)	(3)	(4)	(5)	(6)
F. *Start-up motives*[b]						
Realization of business idea	0.307	0.291	0.290	0.310	0.305	0.304
Discovery of a market niche	0.142	0.122	0.116**	0.155	0.126	0.131
Desire to be one's own boss	0.398	0.369	0.376	0.403	0.419	0.412
Desire to earn more money	0.315	0.265**	0.284*	0.310	0.298	0.297
Discrimination at previous job	0.173	0.179	0.173	0.086	0.082	0.086
Unavailability of regular job	0.234	0.236	0.227	0.111	0.104	0.101
Recommendation by others	0.089	0.086	0.088	0.052	0.049	0.041
G. *Business-related characteristics*						
Business sector						
Agriculture, forestry, fishing	0.009	0.006	0.004	0.023	0.018	0.017
Manufacturing, crafts	0.152	0.134	0.140	0.222	0.214	0.223
Construction	0.112	0.105	0.115	0.099	0.099	0.103
Retail	0.140	0.129	0.128	0.160	0.157	0.168
Transport, logistics	0.049	0.047	0.053	0.025	0.020	0.025
Financial service, insurance						
industry	0.058	0.065	0.064	0.039	0.040	0.035
IT	0.064	0.070	0.063	0.078	0.073	0.073
Other services	0.226	0.243	0.245	0.208	0.216	0.193
Other sectors	0.191	0.200	0.188	0.147	0.163	0.163
Industry-specific experience						
before start-up						
Due to dependent employment	0.717	0.734	0.725	0.613	0.618	0.620
Due to former self-employment	0.194	0.206	0.202	0.246	0.258	0.265
Due to secondary employment	0.211	0.219	0.221	0.170	0.172	0.172
Due to hobby	0.250	0.248	0.259	0.273	0.263	0.270
Due to honorary office	0.061	0.059	0.056	0.072	0.084	0.076
None	0.110	0.093	0.095	0.124	0.113	0.110
Capital invested at start-up						
None	0.179	0.185	0.193	0.173	0.168	0.178
<€1,000	0.044	0.044	0.047	0.087	0.095	0.092
€1,000−<€5,000	0.198	0.181	0.173*	0.124	0.119	0.133
€5,000−<€10,000	0.161	0.160	0.158	0.085	0.079	0.074
€10,000−<€50,000	0.317	0.336	0.337	0.329	0.318	0.307
≥€50,000	0.078	0.086	0.080	0.161	0.194	0.181
Capital at start consisted						
entirely of own equity	0.459	0.490	0.470	0.472	0.470	0.456
Number of obs.	1,478	827	827	930	453	453

Note: All numbers are shares (unless stated otherwise) and measured at start-up for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment). ***/**/* indicate significantly different means from the full sample at the 1/5/10% level.
[a] Reported as the share of working time, standardized by age−15.
[b] Reported are shares of individuals with values of 6 and 7 on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely".

Table 3.9: Selected outcome variables in wave 1 for full and panel sample

	Subsidized founders			Regular founders		
	Full sample	Panel sample		Full sample	Panel sample	
		Raw	Weighted		Raw	Weighted
	(1)	(2)	(3)	(4)	(5)	(6)
A. Main labor market status (unconditional)						
Self-employed						
with same business	0.805	0.830	0.797	0.717	0.751	0.717
Dep. employed	0.114	0.099	0.122	0.109	0.097	0.104
Unemployed (or ALMP)	0.049	0.045	0.051	0.016	0.007*	0.012
Conditional analysis: only self-employed individuals with same business at time of interview						
B. Income measures^a (net, in 2010 euros)						
Monthly earned income	2,392	2,486	2,397	3,178	3,222	3,095
Hourly earned income	11.9	12.1	11.7	15.9	16.4	15.8
C. Employee structure						
At least one employee	0.361	0.359	0.352	0.630	0.615	0.597
Number of full-time equivalent employees (FTE)^b						
Unconditionally	1.0	1.0	1.0	4.2	3.9	3.7
Conditional on FTE>0	2.9	2.9	2.8	6.8	6.3	6.2
D. Innovation implemented by businesses since start-up^c						
Filed patent application	0.019	0.019	0.020	0.048	0.051	0.049
Filed application to legally						
protect corporate identity	0.066	0.066	0.065	0.130	0.132	0.138
E. Access to capital since start-up						
Loan received	0.215	0.210	0.209	0.352	0.356	0.361
Constrained^d	0.153	0.127	0.131	0.115	0.115	0.119

Note: Reported are shares and averages measured for subsidized business founders (out of unemployment) and regular business founders (i.e., non-subsidized out of non-unemployment) in wave 1 (19 months after start-up). ***/**/* indicate significantly different means from the full sample at the 1/5/10% level.
^{a} We excluded outliers who reported a monthly income from self-employment larger than € 25,000.
^{b} Number of full-time equivalent employees (FTE) is a weighted sum, where full-time employees are assigned a weight of 1, part-time employees and apprentices are weighted by 0.5, and others by 0.25. We excluded some outliers from the analysis who reported implausibly high values.
^{c} Innovation was surveyed only for a random 50% subsample.
^{d} Constrained access to capital indicates that founders wanted to borrow but did not receive a loan.

Table 3.10: Summary of the weighting procedure to correct for selective panel attrition

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Step 1: Probit estimation (separate for subsidized and regular founders)

− Maximum likelihood estimation of probit model with wave 2 participation dummy as dependent variable.

− Covariates (total number: 75):

Personal characteristics (East Germany, age distribution, children under six year in household, children between six and 14 years in household, married, born in Germany)

Human capital (School achievement, professional education)

Intergenerational transmission (Parents born abroad, parents are/were self-employed, paternal *schooling*)

Labor market history (Employment status right before start-up, duration of employment status right before start-up, monthly net income from last employment status right before start-up, unemployment experience before start-up)

Wave 1 outcomes (Employment status, household income, satisfaction with life, satisfaction with health, satisfaction with employment status, reason for business exit, mode of business exit)

Interview-related characteristics (Weekday of interview)

Step 2: Inverse probability weighting

− Based on probit estimation, we predict individual wave 2 participation probability $\hat{p}_i$ following eq. (3.2).

− Outcome variables are weighted using the inverse of $\hat{p}_i$ following eq. (3.3).

Chapter 4

Entrepreneurial Persistence Beyond Survival: Measurement and Determinants

Abstract

Entrepreneurial persistence is demonstrated by an entrepreneur's continued positive maintenance of entrepreneurial motivation and constantly renewed active engagement in a new business venture despite counter forces or enticing alternatives. It is thus a crucial factor for entrepreneurs when pursuing and exploiting their business opportunities and to realize potential economic gains and benefits. Using rich data on a representative sample of German business founders, we investigate the determinants of entrepreneurial persistence and contribute to the literature in three dimensions: First, we are able to construct the three different types of persistence measures established in the literature from one data set and compare results. Second, we take a more holistic approach and analyze the influence of a multitude of individual-level, business-related, and contextual characteristics as well as their relative importance. We find that the three indicators emphasize different aspects of persistence, and results are thus sensitive to the choice of persistence measure. And third, findings are heterogeneous across subgroups. In particular, formerly unemployed founders do not differ in survival chances, but they are more likely to lack a high psychological commitment to their business ventures and more strongly affected by local labor market conditions in their business attachment compared to regular founders.

4.1 Introduction

Entrepreneurship has been recognized as vital to increasing productivity, spurring innovation, and enhancing employment opportunities (Koellinger and Thurik, 2012; Fritsch, 2008; Audretsch *et al.*, 2006). However, to realize the economic benefits of their entrepreneurial activity, individuals must not only choose to become entrepreneurs but also persist with their business venture (Patel and Thatcher, 2014). In this sense, persistence can be viewed as a prerequisite to exploit the business potential of a given venture and, consequently, for the chance of its success as a business. Entrepreneurial persistence entails two distinct components: First, the motivation and decision to continue to actively pursue a previously selected entrepreneurial opportunity, and second, doing so in the face of adversity or attractive alternatives (Holland and Shepherd, 2013; Holland, 2011; Gimeno *et al.*, 1997). As such, an entrepreneur's persistence decision is fundamentally different from the initial start-up decision. An entrepreneur makes the decision to start a new business at a single point in time and under conditions that are likely to be favorable to the creation of the new venture. By contrast, the decision to persist with the new venture has to be made time and time again and is often most salient if the environment is changing and conditions are challenging (Holland and Garrett, 2015). Persistence is, thus, particularly crucial in the context of entrepreneurship since entrepreneurial activity is full of uncertainties, challenges, and obstacles (Adomako *et al.*, 2016; Cardon and Kirk, 2015).

Despite the necessity of understanding entrepreneurial persistence, most prior research has focused on differences between individuals who start up and those who do not (Shane *et al.*, 2003). While some early work has considered persistence to be a trait (e.g., Baum and Locke, 2004), the dominant understanding of more recent research is that entrepreneurial persistence is a function of individual, business-related and contextual factors (Holland and Shepherd, 2013; DeTienne *et al.*, 2008). Thus, there is an emerging stream of literature that has sought to explain differences in entrepreneurs' persistences. For instance, studies have found that individual dispositions derived from personality factors (e.g., Caliendo *et al.*, 2014; Patel and Thatcher, 2014), and competencies, skills and knowledge all strongly relate to persistence with a newly founded business (e.g., Freeland and Keister, 2016; Gimeno *et al.*, 1997). DeTienne *et al.* (2008) also showed that entrepreneurs are more likely to persist if personal investment is high, even with

underperforming firms. Other studies emphasize the predictive role of firm- and opportunity-related factors, such as start-up capital (e.g., DeTienne *et al.*, 2008; Brüderl and Preisendörfer, 1998) and industry sector (Fritsch *et al.*, 2006) or the regional economic conditions (Millán *et al.*, 2012; Gimeno *et al.*, 1997).

While a variety of studies focus on the particular relationship between persistence and different limited sets of factors, we still lack a more holistic approach to answering the question of why some individuals choose to persist while others do not, and if there are differences across distinct subgroups of entrepreneurs. In particular, not much is known about the *relative* importance of the multitude of persistence predictors identified in previous studies. Moreover, given the complex nature of the concept of entrepreneurial persistence, there is a diverse variety of persistence measures established in the literature, which makes a direct comparison of previous results challenging and could be the source of ambiguous findings for particular covariates. Previous persistence variables can roughly be grouped into three different types of measures. While many studies use business survival as a proxy for entrepreneurial persistence, others apply more subjective measures to capture the motivational commitment to the business venture. Finally, some studies combine survival and subjective persistence to obtain hybrid measures.

Using data from representative samples of regular and formerly unemployed entrepreneurs in Germany (Caliendo *et al.*, 2017b, 2015c), we contribute to the literature on entrepreneurial persistence in three important ways. First, we can construct all three types of persistence measures commonly used in the previous literature from one single data set. In particular, the data contain indicators of entrepreneurial persistence in terms of both observed survival as well as a subjective measure capturing the motivational dimension of persistence (i.e., strong commitment to the business despite a hypothetical offer of a similar job in paid employment). The hybrid measure is constructed by taking both dimensions simultaneously into account. We can, thus, directly compare results between the commonly applied survival indicator with findings using the individual-level hybrid and motivational measures of entrepreneurial persistence, which more directly reflect the psychological commitment part of entrepreneurial persistence. Second, we have access to a rich list of predictors of entrepreneurial persistence covering a multitude of individual-level, business-related, and contextual characteristics. This allows for an in-depth analysis of predictors of entrepreneurial

persistence and for testing the robustness of results when including other relevant determinants while also minimizing potential threats of omitted variable bias. Furthermore, the availability of this extensive variable list enables a more holistic approach to investigate the relative importance for entrepreneurial persistence between covariate groups. And third, we take account of the fact that entrepreneurs are heterogeneous (Alvarez and Busenitz, 2001). We provide a separate analysis for the subgroups of unemployed and regular (non-unemployed) founders for the following reasons. Unemployed founders represent a substantial share of all founders in Germany, partly due to a series of active labor market policies promoting self-employment (Caliendo *et al.*, 2015c; Caliendo and Kritikos, 2010), and are different from the "general population" of founders in terms of availability of and/or access to human, social, and financial capital (Caliendo *et al.*, 2017b, 2015c). They are more likely to be necessity founders with lower business attachment and, thus, their persistence is likely to depend on different factors compared to regular founders.

Overall, our empirical results yield the following findings: First, while some factors (locus of control, start-up capital) have a robust influence on persistence, the importance of most other factors is sensitive to the choice of the persistence measure (e.g., unemployment and industry-specific experience, big five, local labor market conditions). Second, by taking a more holistic approach, we are further able to assess the relative importance of predictors for entrepreneurial persistence, finding that human capital and business-related characteristics play a very dominant role in determining the survival of a business. In contrast, those two factors, together with socio-demographics and personality, seem to more evenly affect an entrepreneur's psychological commitment to the business. And third, our heterogeneity analysis allows for a detailed sub-group analysis and reveals that the psychological commitment of unemployed founders is more susceptible to changes in the local labor market situation compared to regular founders.

The remainder of this paper is organized as follows. In Section 4.2, we review the literature on entrepreneurial persistence. Section 4.3 introduces our dataset, describes the construction of our persistence measures, and presents some descriptive statistics. Our empirical strategy is described in Section 4.4, while results are presented in Section 4.5. The paper concludes with a summary and discussion of our results.

4.2 Literature review

4.2.1 Measurement of entrepreneurial persistence

The notion of individual persistence in the context of entrepreneurship usually involves two aspects. First, the founders maintain their entrepreneurial motivation, choosing to continue their effortful and active engagement in their business ventures at a particular point in time. And second, they do so despite challenging conditions, impediments, counter forces, or attractive alternatives (Holland and Shepherd, 2013; Holland, 2011; Gimeno *et al.*, 1997).[1] Given the complexity of the concept, we find a varied range of persistence measures applied in previous entrepreneurship studies on this topic. All in all, we identify three distinct approaches in the literature to measure entrepreneurial persistence (see Table 4.1 for an overview).

First, the most common practice is to use the founder's objective *survival* in self-employment or running a business as a proxy variable for persistence if longitudinal data are available (Table 4.1, Panel A). While survival and persistence are undoubtedly closely linked, they are not necessarily identical. The definition of persistence usually involves a psychological commitment, i.e., the motivation to actively engage in and the decision to continue business activities irrespective of circumstances. For instance, founders might be observed operating their businesses despite actively seeking alternative business opportunities, thus lacking full commitment to their original business ventures. The difference between survival and persistence can also be illustrated by founders who were motivated to start a business predominantly by push factors as a last resort (e.g., a lack of employment alternatives). These founders might show a persistent survival of their businesses, yet not so much due to their motivational dedications or preferences but rather because there is still a shortage of employment opportunities. Second, as an alternative to survival, a cross-section of entrepreneurs is surveyed on *subjective measures* of persistence, oftentimes by presenting to them hypothetical scenarios and asking them about their decisions whether or

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[1] Davidsson (2012) distinguishes this shorter term perspective from a longer term view, in which entrepreneurial persistence captures re-entries to the venture creation processes after previous efforts have been concluded. Although, in principle, persistence can also be defined on the level of the business venture, we follow the large majority of previous studies in the literature and consider persistence on the individual founder's level.

Table 4.1: Persistence measurements in the literature

Persistence measurement	Literature references
A. Survival	a. Block and Sandner (2009)
	b. Brüderl and Preisendörfer (1998)
	c. Brüderl *et al.* (1992)
	d. Caliendo *et al.* (2014)
	e. Ciavarella *et al.* (2004)
	f. Fritsch *et al.* (2006)
	g. Georgellis *et al.* (2007)
	h. Gimeno *et al.* (1997)
	i. Millán *et al.* (2012)
	j. Oberschachtsiek (2012)
	k. Patel and Thatcher (2014)
	l. van Praag (2003)
	m. Zhu *et al.* (2011)
B. Hybrid	n. Davidsson (2012)
	o. Freeland and Keister (2016)
C. Subjective	p. Cardon and Kirk (2015)
	q. DeTienne *et al.* (2015)
	r. DeTienne *et al.* (2008)
	s. Holland and Garrett (2015)
	t. Holland and Shepherd (2013)
	u. Wu *et al.* (2007)

not they would continue operations under the described circumstances in the future (e.g., Holland and Garrett, 2015; DeTienne *et al.*, 2008, applying conjoint analyses); see Table 4.1, Panel C. Purely subjective measures could be criticized because they solely rely on self-reported assessments of artificial, hypothetical scenarios and might differ from actual behavior or attitudes displayed in reality. As a third option in the literature, Davidsson (2012) and Freeland and Keister (2016) combine survival measures with a subjective question about the founder's projected active business engagement in the near future to construct a *hybrid* persistence measure (Table 4.1, Panel B.).

4.2.2 Determinants of entrepreneurial persistence

The prevailing view in the entrepreneurship literature is that entrepreneurial persistence is a function of a variety of predictors (Holland and Shepherd, 2013; DeTienne *et al.*, 2008). The empirical evidence on the determinants as investigated in existing studies can be grouped into individual-level attributes, business characteristics, and contextual factors, which we will each briefly summarize in the following. Table 4.2 provides an overview of previous findings.

Table 4.2: Determinants of persistence in the empirical literature

Covariate	Sign of relation	Literature references
(1) *Socio-demographics*		
Age	$+$	a, h, i, l, o
German	$+$	a
Residence	$^+/_-$	a, f
Married	$^+/_-$	a, m, o, u
Children	0	a, i
(2) *Human Capital*		
Schooling	$^+/_0$	a, b, c, h, i, k, n, o
Professional education	$+$	a, j, o
Unemployment experience	$^+/_-$	g, i, j, l, o
Industry-specific experience	$+$	b, c, e, j, l, n, o
Skills and knowledge		
Strategy/Leadership	0	c, h, j
Back office	$+$	h
Front office	0	j
Industry knowledge	$+$	h
(3) *Personality*		
Big five		
Openness	$^0/_-$	d, e, k
Conscientiousness	$^+/_0$	d, e, k
Extraversion	0	d, e, k
Agreeableness	$^0/_-$	d, e, k
Neuroticism	$^+/_0$	d, e, k
Locus of Control	0	d
Self-efficacy	$+$	p
Readiness to take risk	concave	d
(4) *Intergen. transmissions*		
Business takeover from parents	$+$	h
Parental self-employment	$^+/_0$	c, g, h, m, u
(5) *Start-up motives*		
Opportunity	$^+/_-$	j, l
Autonomy	$-$	h, k, m, q
Financial reward	$+$	q
Necessity	$-$	a, l
(6) *Business characteristics*		
Start-up capital	$+$	b, c, h, j, m, o, r
Business sector	$^+/_-$	b, c, f, g, h, l, n
(7) *Regional econ. context*		
GDP growth	$+$	g, h
Unemployment	$-$	g, i, l

Note: The table summarizes the findings of the literature review about the direction of the relationship between covariates and entrepreneurial persistence. $+$ denotes a positive effect, $-$ denotes a negative effect, 0 denotes no effect and $^+/_-$, $^+/_0$, and $^0/_-$ denote ambiguous effects. For literature references, see Table 4.1.

4.2.2.1 Individual-level determinants

Socio-demographic characteristics   Older entrepreneurs seem to be more likely to persist with a new venture than younger entrepreneurs (Block and Sandner, 2009; van Praag, 2003; Gimeno *et al.*, 1997), due to, among others, the amount of time it takes to acquire resources, business networks, and experience required for business survival. Drawing from threshold theory, Gimeno *et al.* (1997) further posit that older entrepreneurs might be more persistent than younger ones because of the practical difficulties and higher switching costs of moving to alternative employment.

Evidence on the effect of family variables, such as being married or having children, on entrepreneurs' persistence decisions is rather inconclusive (Block and Sandner, 2009; Zhu *et al.*, 2011). On the one hand, resource absorption and time spent caring for children may lead to the termination of business operations in the face of adversity. On the other hand, family support in terms of both labor and financial capital might make self-employment less demanding than it would be otherwise.

Human capital   Previous research provides some support for a positive relationship between the level of education and self-employment longevity (Freeland and Keister, 2016; Millán *et al.*, 2012; Gimeno *et al.*, 1997). Block and Sandner (2009) further demonstrate an even stronger predictive role of education related to the professional area in which the business is started. In contrast to this, there are also studies that do not find any significant link between education and entrepreneurial persistence (e.g., Patel and Thatcher, 2014; Davidsson, 2012; Georgellis *et al.*, 2007).

Furthermore, industry-specific experience provides knowledge and information about rules and regulations specific to the industry sector, customer and supplier networks, and employment practices. In several studies, this kind of human capital has been found to be positively associated with entrepreneurial survival (e.g., Freeland and Keister, 2016; Davidsson, 2012; Ciavarella *et al.*, 2004). Likewise, skills related to labor market experience, management experience, and previous entrepreneurial experience have a strong and positive impact on persistence (e.g., Oberschachtsiek, 2012; Georgellis *et al.*, 2007; Gimeno *et al.*, 1997). Unemployment experience, on the other hand, may imply skill obsolescence

or reflect a lack of business acumen that might indicate a lower probability of survival. In line with these arguments, van Praag (2003), Georgellis *et al.* (2007), and Millán *et al.* (2012) report that individuals with previous unemployment experience are more likely to terminate their current start-up projects. This negative effect on survival seems to be pronounced for longer unemployment spells. Oberschachtsiek (2012) finds that a duration of unemployment of less than four months before starting a business indeed positively relates to survival in self-employment.

Personality The importance of individual personality for entrepreneurship has been widely established (McClelland, 1965a; Brandstätter, 2011). Similar to human capital, differences in personality traits lead entrepreneurs to cognitively frame and perceive information and situations differently, which leads them to make different choices regarding the continuance of business operations. The person-job fit literature additionally emphasizes that people seek to secure a good match between their personal predispositions and their career choices (Kristof, 1996). We restrict the discussion below to the personality characteristics available in our dataset, i.e., big five, locus of control, self-efficacy, and risk attitudes.

One of the most commonly applied personality constructs is the Five-Factor model of personality (Barrick *et al.*, 2003; Schmitt-Rodermund, 2004, 2007; Rauch and Frese, 2007; Zhao and Seibert, 2006), which establishes the five broad personality dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism (the "big five", McCrae and Costa, 2008, Costa and McCrae, 1992; see, e.g., John and Srivastava, 1999, for a detailed description of each factor). So far, evidence on the relationship between the big five personality traits and persistence in self-employment is rather ambiguous. Patel and Thatcher (2014) find that less open and more neurotic individuals are more likely to persist in self-employment, while Ciavarella *et al.* (2004) demonstrate the importance of conscientiousness for long-term venture survival. Caliendo *et al.* (2014) report a positive link between agreeableness and exit from self-employment, whereas no significant relationship can be found for the other big five traits.

Control beliefs, such as locus of control (Rotter, 1966) and self-efficacy (Bandura, 1997), represent more specific personality constructs and are key in theories on vocational choice in general (Lent *et al.*, 1994), and also play a prominent role in entrepreneurship research in particular (e.g., Rauch and Frese, 2007). One

basic result in past entrepreneurship studies is that interindividual differences in control beliefs, e.g., higher levels of self-efficacy or internal locus of control, are among those personal factors that show the strongest effects on entrepreneurial success (Rauch and Frese, 2007) and self-employment entry and exit decisions (Caliendo *et al.*, 2014).

Creating and sustaining a business involves risky decisions with uncertain outcomes, which implies a positive relationship with the willingness to take risks. However, too risky investments can lead to large losses and business failure. Taken together, this implies an inverse u-shaped influence of risk tolerance on entrepreneurial persistence (Chell *et al.*, 1991), which also has been found to have empirical support (Caliendo *et al.*, 2014, 2010a).

Intergenerational transmissions   Studies consistently find that a high proportion of self-employed people report that their parents were also self-employed (for reviews see, e.g., Aldrich and Kim, 2007; Parker, 2009). The most obvious explanation is the takeover of the parental business. In addition, parental role modeling and intergenerational transmissions of resources and human capital play a crucial role (Parker, 2009). Empirical evidence on the link between parental self-employment and entrepreneurial persistence is not as conclusive as expected, however. While Cooper *et al.* (1994), Gimeno *et al.* (1997), Wu *et al.* (2007), Zhu *et al.* (2011), and Millán *et al.* (2012) all report a higher probability of survival if the entrepreneur's parents had owned a business, no significant influence of the parental background has been found in studies by Georgellis *et al.* (2007), van Praag (2003), or Brüderl *et al.* (1992).

Start-up motives   Start-up motivations are largely discussed in terms of opportunity and necessity entrepreneurship, which has clear parallels to the notion of pull and push motives. Opportunity entrepreneurs start businesses to exploit a previously detected market opportunity or because they seek autonomy or financial reward. In contrast, necessity entrepreneurs are pushed into entrepreneurship because of dissatisfaction with their current position or the absence of alternative employment opportunities. There is ample evidence that opportunity entrepreneurs perform better in terms of entrepreneurial persistence than necessity entrepreneurs (e.g., Patel and Thatcher, 2014; Oberschachtsiek, 2012; Gimeno *et al.*, 1997). For example, Oberschachtsiek (2012) distinguishes between

entrepreneurs who are motivated by self-fulfillment or potential improvements in income (i.e., pull motivations) rather than the threat of unemployment (i.e., push motivations) and finds longer duration in self-employment for those with pull motivations. Gimeno *et al.* (1997) show that intrinsically motivated opportunity entrepreneurs are willing to accept a lower level of venture performance and, therefore, persist longer in the face of adversity.

4.2.2.2   Business-related determinants

Generally, the amount of financial resources available at start-up increases the chances for a new venture to survive and grow (Brüderl *et al.*, 1992; Cooper *et al.*, 1994) by, among others, providing a buffer against random shocks, such as market downturns or managerial mistakes, and facilitating the pursuit of resource-intensive growth strategies (Cooper *et al.*, 1994). A number of studies underpin a positive influence of a higher level of start-up capital on an entrepreneur's persistence decision (Freeland and Keister, 2016; Oberschachtsiek, 2012; Gimeno *et al.*, 1997).

Industry affiliation also plays a significant role for explaining persistence differences (e.g., Fritsch *et al.*, 2006). Industries differ in competition intensity, capital intensity, demand structure, or barriers to exit. In some industries, switching to wage employment is less difficult due to local demand conditions than in other industries. Overall, evidence is quite diverse and does not provide a consistent picture of the relation between chosen industry sector and the entrepreneur's probability of persisting (e.g., Davidsson, 2012; Georgellis *et al.*, 2007; van Praag, 2003).

4.2.2.3   Contextual determinants

Contextual factors describe the macro environment in which an entrepreneur operates. Specifically, we consider regional GDP growth and local labor market conditions because they best reflect the economic development. Theory suggests that higher unemployment may act as a push factor for self-employment, but favorable labor market conditions may also be an indicator of higher entrepreneurial opportunities (Audretsch and Thurik, 2000). These ambiguous theoretical predictions are reflected by existing empirical evidence. Georgellis *et al.* (2007) and van Praag (2003) suggest that the unemployment rate does

not affect self-employment, while Millán *et al.* (2012) observe how the national unemployment rate increases the risk of exiting. For the GDP growth rate, there seems to be a positive relationship with entrepreneurial persistence (Georgellis *et al.*, 2007).

4.3   Data

4.3.1   Data creation and estimation sample

We use data, originally collected by Caliendo *et al.* (2017b, 2015c), on a sample of male founders who started full-time businesses in the first quarter of 2009 in Germany. The data set comprises random samples of unemployed founders, who participated in the German start-up subsidy program for unemployed individuals (*Gründungszuschuss*), and "regular" founders, i.e., founders who were not unemployed directly prior to start-up and, consequently, did not receive the subsidy (see Caliendo *et al.*, 2017b, 2015c, for details on data construction). The start-up subsidy could be legally claimed if the eligible unemployed individuals met the following two requirements: First, they had to have a remaining unemployment benefit I entitlement[2] of at least another 90 days, which was then offset against the subsidy receipt, and second, they were required to provide a business and financing plan, evaluated by a competent external institution, to the Employment Agency. The subsidy amount was equivalent to the individual's last unemployment I benefit plus a lump sum of 300 euros to cover social security costs during the first nine months, with an optional six month extension during which only the lump sum was paid. Finally, it should be mentioned that subsidized start-ups out of unemployment constituted a large share, of about 40% to 60%, of all full-time start-ups in Germany between 2006 and 2011 (depending on the underlying data source, see Caliendo *et al.*, 2015c), which is why we include them in our analysis.[3]

The business founders in our sample were surveyed twice. The first interview was conducted about 19 months after start-up (wave 1) on an extensive list of start-up characteristics, socio-demographics, previous labor market experiences, intergenerational transmissions, as well as their labor market status and,

---

[2] In Germany, every individual who has been in employment subject to social security for at least one out of the two previous years is eligible for unemployment benefit I. The amount of the benefit consists of 60% (67% with children) of the last net wage and is basically paid for a period of 12 months, with the exception of older individuals (see Caliendo and Hogenacker, 2012).

[3] Meanwhile, a major reform of the program at the end of 2011 has reduced entry numbers substantially (see Bellmann *et al.*, 2017, for details)

Figure 4.1: Data generation and sample restrictions

	Unemployed founders Q1.2009	Regular founders Q1.2009	Pooled sample (unemp.+reg. founders)
	1st telephone interview (CATI): Q4.2010		
Full sample (wave 1)	N = 1,478	N = 930	N = 2,408
	2nd telephone interview (CATI): Q3.2012		
Panel sample (wave 2)	N = 827	N = 453	N = 1,280
Random subsample	Additional variables surveyed in 2nd interview		
Full estimation sample:	N = 388	N = 265	N = 653
Survivor (same business)	N = 287	N = 208	N = 495
Non-survivor	N = 101	N = 57	N = 158

Note: For details, see Caliendo *et al.* (2017b, 2015c).

conditional on ongoing business activity with their initial start-up from the first quarter in 2009, their business performance. In total, 1,478 (930) valid interviews could be completed with male, formerly unemployed (regular) founders; see Figure 4.1. The second interview (wave 2), conducted with the same individuals, extends the observation window to 40 months after start-up. Figure 4.1 shows that we have 827 (453) panel observations on formerly unemployed (regular) founders in wave 2. Some of the variables important to our analysis were surveyed only for a random subsample due to budget constraints, which results in 653 observations for our final estimation sample, of which 388 (265) are formerly subsidized (regular) founders. An examination of selective sample attrition shows that our estimation sample is very similar to the original full sample. Most importantly, survival rates in wave 1 are not affected by significant sample selectivity.[4] The estimation sample contains 495 founders who are still self-employed in wave 2 with the same business as at start-up in 2009. This total is then divided between 287 formerly subsidized and 208 regular founders.

---

[4] See Table 4.9 in the Appendix, Section 4.7, for details.

4.3.2   Variables and descriptive statistics

Persistence measures   As explained in the literature review, we classify previous empirical studies on the topic of persistence into the following three categories according to the persistence measures used: survival, subjective measures, and hybrid measures combining survival with subjective persistence indicators (revisit Table 4.1 for details). Our data set allows for the construction of three persistence variables, which reflect these three types of measures for our sample (see Table 4.3, Panel C, for details).

1. Survival   The majority of studies use *survival* as a proxy variable for entrepreneurial persistence. Thus, our first persistence measure is a binary survival dummy indicating whether the founder is still self-employed and actively operating the same business in wave 2 as at the original start-up in the first quarter of 2009, i.e., 40 months after business formation.

$$
\text{Survival} \quad
\begin{cases}
= 1 & \text{if self-employed with the same business in wave 2,} \\
= 0 & \text{if not self-employed with the same business in wave 2.}
\end{cases}
$$

2. Motivational persistence   The second category comprises of *subjective measures* of entrepreneurial persistence that explicitly involve the business founder's psychological commitment to the business venturing activity. In our data set, we capture this aspect by surveying the founder's willingness to stay self-employed while having the hypothetical option of performing the same type of job in wage employment. In the wave 2 survey, all surviving founders were asked whether they would terminate their current self-employment in the hypothetical case that they were offered a similar job as a dependent employee, using a 7-point Likert-type scale (see Panel A in Table 4.3). Based on the reverse scores, we construct a persistence index for which higher values indicate higher entrepreneurial motivation to continue to actively pursue self-employment despite the (hypothetical) presence of potentially attractive job alternatives. The distribution of this persistence index is depicted in Panel B of Table 4.3. A clear and distinctive majority is fully motivated and committed to continue their self-employment and score the highest value on the index, a result that is true across all subgroups. Based on

Table 4.3: Definition and construction of outcome variables

A. *Survey question in wave 2 (cond. on survival):*

Persistence: *Now, I would like to know how satisfied you are overall with your professional self-employment. Assume you were offered a similar job as a dependent employment. Would you terminate your current self-employment and accept the offer of the dependent employment? Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies completely".*

B. *Construction and distribution of persistence index (cond. on survival):*

Persistence index = $8 - $ score

Distribution:
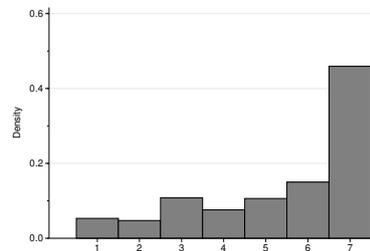
a. Pooled survivor sample
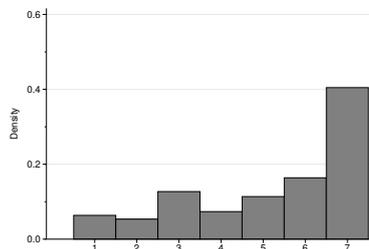
b. Unemployed founders
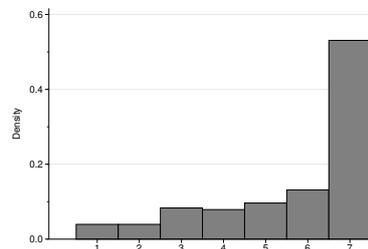
c. Regular founders

C. *Construction of outcome variables:*

Survival (same business)
    = 1 if self-employed with the same business in wave 2,
    = 0 if not self-employed with the same business in wave 2.

Motivational persistence
    = 1 if self-employed with the same business in wave 2 *and* persistence index $\in \{7\}$,
    = 0 if self-employed with the same business *and* persistence index $\in \{1, 2, 3, 4, 5, 6\}$,
    = missing if not self-employed with the same business in wave 2.

Hybrid persistence
    = 1 if self-employed with the same business in wave 2 *and* persistence index $\in \{7\}$,
    = 0 if not self-employed with the same business *or* persistence index $\in \{1, 2, 3, 4, 5, 6\}$.

this finding, we construct a *motivational persistence* dummy that takes on the value one if respondents score the highest value on the index, and the value zero if not.[5] The motivational persistence is measured conditional on survival and, thus, compares self-employed founders with a high subjective persistence to all other self-employed founders, whereas non-surviving founders are excluded from this indicator.

$$
\text{Motivational persistence}
\begin{cases}
= 1 & \text{if self-employed with the same business in wave 2} \\
 & \quad \textit{and} \text{ persistence index} \in \{7\}, \\
= 0 & \text{if self-employed with the same business in wave 2} \\
 & \quad \textit{and} \text{ persistence index} \in \{1, 2, 3, 4, 5, 6\}, \\
= \text{missing} & \text{if not self-employed with the same business} \\
 & \quad \text{in wave 2.}
\end{cases}
$$

3. Hybrid persistence   For the third type of measure, *hybrid persistence*, we combine the two previous approaches (survival and subjective measure) into one indicator. A highly persistent founder according to the hybrid measure is defined as someone who is still self-employed with the same business and shows a high commitment to their business activity, identical to the subjective measure. But the comparison group now comprises all other individuals in our sample, i.e., those who either are no longer self-employed with the same business or who are self-employed with the same business but do not show a high commitment, judging by their low score on the subjective persistence index.

$$
\text{Hybrid persistence}
\begin{cases}
= 1 & \text{if self-employed with the same business in wave 2} \\
 & \quad \textit{and} \text{ persistence index} \in \{7\}, \\
= 0 & \text{if not self-employed with the same business in} \\
 & \quad \text{wave 2 } \textit{or} \text{ persistence index} \in \{1, 2, 3, 4, 5, 6\}.
\end{cases}
$$

---

[5] In this sense, our motivational indicator reflects the presence of very strong persistence. Given the wording and design of the scale, motivational persistence could alternatively be defined as scoring 5, 6, or 7 on the index. While some few results are no longer significant at conventional levels for this alternative, findings are qualitatively robust to this slight change in the definition. Detailed estimation tables are available from the authors upon request.

In this sense, the hybrid measure differs from survival by imposing the additional requirement of a high score on the subjective persistence index in order to be considered persistent (analog to the motivational measure). The difference of this compared to the motivational measure is the additional inclusion of all non-survivors in the comparison group (analog to the survival measure).

All in all, each persistence measure emphasizes a different aspect of persistence, and, consequently, the examination of their determinants has different implications depending on which measure is applied. While the analysis of survival reveals which factors contribute to the founder's mere continuation of the business venture (compared to non-survival), the examination of the motivational measure shows which variables contribute to a high psychological commitment of the founder (within a group of surviving founders). The hybrid measure, in turn, captures both aspects, and its determinants, thus, lead to survival with a high commitment compared to non-survival or survival with a higher preference to abandon self-employment.

Distribution of persistence measures The top panel in Table 4.4 reports the mean values for our three persistence measures. The survival indicator reveals that 75.8% of all founders are still self-employed in wave 2. Comparing across subgroups, we find moderately lower survival rates among formerly unemployed founders (74.0%, column 2) compared to regular founders (78.5%, column 3). Moving to our hybrid persistence indicator reveals that 35.5% of all founders display high persistence in the full sample (column 1), where the share of highly persistent formerly unemployed founders is significantly lower (30.4%) than the respective share of regular founders (43.0%). Conditional on survival (column 4), this implies a share of 46.9% who display high motivational persistence among all survivors. The pattern across subgroups is the same as above. 41.1% of formerly unemployed surviving founders show high entrepreneurial motivational persistence compared to a significantly higher 54.8% among regular surviving founders (columns 5 and 6).

Control variables Based on our review of the entrepreneurship literature, we arrange a comprehensive list of 53 observed individual-level, business-related, and contextual characteristics into seven blocks of related variables X_i, with $i = 1, \ldots, 7$. They are comprised of (1) socio-demographic characteristics,

Table 4.4: Descriptive statistics

	Full estimation sample			Survivor estimation sample		
	Pooled est. sample	By former emp. status		Pooled est. sample	By former emp. status	
		Unempl. founders	Regular founders		Unempl. founders	Regular founders
	(1)	(2)	(3)	(4)	(5)	(6)
Number of obs.	653	388	265	495	287	208
Persistence measures[a]						
Survival (same business)	0.758	0.740	0.785			
Hybrid/motivational						
persistence	0.355	0.304	0.430***	0.469	0.411	0.548***
(1) *Socio-demographics*						
Age category at start-up						
<25 years	0.058	0.026	0.106***	0.042	0.017	0.077***
25 -<35 years	0.219	0.258	0.162***	0.216	0.247	0.173**
35 -<45 years	0.337	0.379	0.275***	0.362	0.408	0.298**
45 -<56 years	0.265	0.265	0.264	0.271	0.272	0.269
≥56 years	0.121	0.072	0.192***	0.109	0.056	0.183***
German	0.956	0.951	0.962	0.960	0.962	0.957
Residence						
North Germany	0.152	0.149	0.155	0.160	0.153	0.168
East Germany	0.179	0.209	0.136**	0.184	0.209	0.149*
South Germany	0.351	0.314	0.404**	0.358	0.314	0.418**
West Germany	0.319	0.327	0.306	0.299	0.324	0.264
Married	0.649	0.644	0.657	0.681	0.693	0.663
Children in household						
Aged <6	0.153	0.186	0.106***	0.170	0.209	0.115***
Aged 6-<15	0.242	0.263	0.211	0.257	0.282	0.221
(2) *Human capital*						
Highest schooling certificate						
Upper secondary school	0.518	0.518	0.517	0.537	0.540	0.534
Professional education						
University education	0.325	0.332	0.313	0.337	0.334	0.341
Unemployment experience						
before start-up[b]						
0 or not specified	0.248	0.072	0.506***	0.263	0.087	0.505***
>0-2	0.332	0.381	0.260***	0.345	0.397	0.274***
>2-5	0.225	0.281	0.143***	0.232	0.289	0.154***
>5-10	0.115	0.170	0.034***	0.103	0.160	0.024***
>10	0.080	0.095	0.057*	0.057	0.066	0.043
Industry-specific experience						
before start-up						
Due to former self-emp.	0.225	0.193	0.272**	0.230	0.181	0.298***
Due to dependent emp.	0.784	0.812	0.743**	0.828	0.857	0.788*
None	0.093	0.082	0.109	0.071	0.056	0.091
Skills and knowledge[c]						
Strategy and leadership	5.6	5.6	5.5	5.6	5.6	5.6
Back office	4.6	4.6	4.7	4.7	4.7	4.7
Front office	4.8	4.9	4.8	4.9	4.9	4.9
Industry knowledge	5.8	5.9	5.8	6.0	6.0	6.0

(Table continued on next page)

(Table 4.4 continued)

	Full estimation sample			Survivor estimation sample		
	Pooled est. sample	By former emp. status		Pooled est. sample	By former emp. status	
		Unempl. founders	Regular founders		Unempl. founders	Regular founders
	(1)	(2)	(3)	(4)	(5)	(6)
(3) *Personality*						
Big five[c]						
Openness	4.8	4.9	4.8	4.9	4.9	4.8
Conscientiousness	5.9	6.0	5.8**	5.9	6.0	5.8**
Extraversion	5.6	5.6	5.4**	5.5	5.6	5.4
Agreeableness	5.9	5.9	6.0	5.9	5.9	6.0
Neuroticism	3.8	3.8	3.8	3.8	3.8	3.7
Locus of control[c]	5.5	5.5	5.5	5.5	5.5	5.6
General self-efficacy[c]	5.3	5.3	5.3	5.4	5.3	5.4
Readiness to take risk[d]	6.2	6.3	6.1	6.2	6.2	6.1
(4) *Intergen. transmission*						
Business takeover						
from parents	0.100	0.039	0.189***	0.127	0.052	0.231***
Parental self-employment	0.389	0.332	0.472***	0.392	0.314	0.500***
Paternal human capital						
Upper secondary school	0.254	0.260	0.245	0.240	0.237	0.245
University education	0.214	0.235	0.185	0.200	0.216	0.178
(5) *Start-up motives*[c]						
Opportunity	3.5	3.5	3.4	3.5	3.6	3.4
Career ambition	4.2	4.1	4.3	4.3	4.2	4.4
Necessity	2.3	2.6	1.8***	2.2	2.5	1.8***
(6) *Business characteristics*						
Subsidy receipt	0.594	1.000	0.000	0.580	1.000	0.000
Start-up capital						
None or not spec.	0.161	0.160	0.162	0.137	0.143	0.130
<10,000 euros	0.349	0.379	0.306*	0.307	0.345	0.255**
10,000-<50,000 euros	0.322	0.345	0.287	0.356	0.369	0.337
≥50,000 euros	0.149	0.108	0.208***	0.178	0.136	0.236***
Share of own equity						
at start-up	0.575	0.589	0.556	0.592	0.588	0.596
Business sector						
Manufacturing,						
construction	0.271	0.242	0.313**	0.317	0.293	0.351
Retail	0.152	0.144	0.162	0.141	0.125	0.163
Information, financial,						
and IT services	0.164	0.183	0.136	0.147	0.178	0.106**
Other services	0.315	0.320	0.309	0.291	0.282	0.303
Other sector	0.098	0.111	0.079	0.103	0.122	0.077*
(7) *Regional econ. context*						
GDP growth (2012)	-0.1	-0.1	-0.1	-0.0	-0.1	0.1
Vacancies per stock						
of unemployed	21.0	19.7	22.8***	21.0	19.7	22.8***
Change in unemployment						
rate (2012 v. 2011)	-1.0	-1.0	-0.9	-1.0	-1.0	-0.9
Unemployment rate (2012)	6.6	6.9	6.1***	6.6	7.0	6.1***

Note: Reported are mean values. ***/**/* indicate significant different means between subgroups at the 1/5/10% level.
[a] For details on the definition and construction of the persistence measures, see Table 4.3.
[b] Measured as share of working time, standardized by age−15.
[c] Measured on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table 4.10 in the Appendix, Section 4.7, for details.
[d] Measured on a 11-point Likert-type scale from 0 "not at all willing to take risks" to 10 "very willing to take risks", see Table 4.10 in the Appendix, Section 4.7, for details.

(2) human capital, (3) personality, (4) intergenerational transmissions, (5) start-up motives, (6) business characteristics as well as (7) the current regional economic context at the time of the second interview.[6] Taking into account that our sample consists of regular founders and formerly unemployed participants in a start-up subsidy program, our list also includes a corresponding group dummy. Descriptive statistics are reported in Table 4.4, where columns 1 to 3 refer to the full estimation sample and columns 4 to 6 describe the subsample restricted to surviving founders in wave 2.

The founders in our full estimation sample (column 1) are, on average, 42 years old. A majority has German citizenship (95%), is married (65%) and has completed upper secondary school (52%). About 1 in 4 founders has industry-specific experience due to former self-employment, whereas 10% do not have any such experience prior to business formation. Close to 40% have at least one parent who is currently or was self-employed in the past. The average start-up capital amounts to around 30,000 euros, and one-fourth of all businesses were set up in the manufacturing or construction sector.

Surviving business founders (column 4) obtained more schooling and professional education, experienced less unemployment, gained more industry-specific experience and industry knowledge, and invested more start-up capital compared to the full start-up cohort. In addition, the sector composition of surviving businesses is slightly different from the full estimation sample, indicating a differential market selection relative to business sector.

Comparing the subgroups of formerly unemployed and regular business founders, we find similar differences for both the full (column 2 versus 3) and survivor sample (column 5 versus 6). Formerly unemployed founders have more unemployment experience but less industry-specific experience prior to their new business formation. They also suffer from shortages in intergenerational transmissions, in particular with respect to parental self-employment. Necessity motives were more pronounced among formerly unemployed business founders, who also invest less capital in their new businesses at start-up. Moreover, formerly unemployed founders also operate in slightly less favorable regional economic environments in terms of open vacancies and unemployment rates.

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[6] For details on the construction of selected control variables, see Table 4.10 in the Appendix, Section 4.7.

4.4 Empirical strategy

Our main goal for the empirical section is twofold: First, we examine the main determinants of entrepreneurial persistence and their relative importance. And second, we compare results across the three distinct persistence measures to reveal differences and the sensitivity of findings to the choice of persistence indicator.

To this end, we conduct a series of robust OLS estimations for each persistence measure.[7] In a first step, we regress persistence on each covariate block X_i separately in the simple specifications 1 to 7, see equation (4.1) below, and determine their individual coefficients vector $\tilde{\beta}_i$ and goodness-of-fit measures, which indicate their joint explanatory power. Since we do not condition on any other covariate blocks at this stage, the results will be labeled "unconditional."

$$\text{Persistence} = \tilde{\beta}_0 + \tilde{\beta}_i \cdot X_i + \tilde{u} \quad \forall i = 1, \dots, 7 \tag{4.1}$$

In a second step, we regress persistence on all covariate blocks jointly (full specification), see equation (4.2) below, and determine the individual coefficients vector β_i and the *partial* joint explanatory contribution for each covariate block X_i. Since these findings relate to a full specification and describe the results *conditional* on all other covariate blocks, we will refer to them as "conditional" results.

$$\text{Persistence} = \beta_0 + \sum_{i=1}^{7} (\beta_i \cdot X_i) + u \tag{4.2}$$

The comparison of unconditional and conditional results for a particular covariate block and a given persistence measure reveals how sensitive results are to the inclusion of other covariate blocks. As goodness-of-fit measures, we choose the joint significance of all control variables in each covariate block X_i as well as the (partial) regression-R_i^2 for this block, which reflects the share of explained variance in persistence.[8]

In the first part (Sections 4.5.1 to 4.5.3) of the following empirical discussion, we conduct the analysis for the full sample. In the second part (Section 4.5.4),

---

[7] Results are robust to applying a probit approach. We use robust OLS because the interpretation of R^2 measures is more straightforward than in probit/logit approaches.

[8] Since the number of control variables varies across covariate blocks, we also calculate the adjusted R_a^2, which is better comparable across non-nested specifications because it adjusts the original R^2 for the number of included control variables.

we account for the heterogeneous nature of our sample and distinguish between unemployed and regular founders to investigate heterogeneity across these two subgroups.

4.5 Empirical results

4.5.1 Individual effects of covariates

We begin our analysis by comparing the detailed regression results between the three persistence indicators and discuss the most notable similarities and differences. Table 4.5 reports the regression results for the survival indicator in columns 1 and 2, the hybrid persistence measure in columns 3 and 4, and the motivational persistence conditional on survival in columns 5 and 6. For each outcome variable, the first column contains the unconditional regression results $\tilde{\beta}$ from the simple specifications 1 to 7 (stacked over each other into one column to save space), where only the respective covariate block X_i is included; see equation (4.1) above. The second column per outcome variable reports the conditional results β from the full specification, which includes all seven covariate blocks jointly; see equation (4.2).

Socio-demographic characteristics In line with previous evidence, for survival, we find a positive (concave) influence of age on entrepreneurial persistence (column 1), which is not, however, robust to the inclusion of other covariate blocks (column 2). For hybrid (columns 3 and 4) and motivational persistence (columns 5 and 6), we do not find a significant relationship with age. Furthermore, business founders with children present in their households do not show significantly different survival behavior than founders without children (confirming previous studies), but we observe a robust negative association with hybrid and motivational persistence. This could be explained by a preference for higher (perceived) income stability and security in dependent employment.

Human capital A higher lifetime share of unemployment turns out to be negatively associated with survival. Its significant negative effect on hybrid persistence is not robust to the inclusion of other covariate blocks, and it does not affect the motivational persistence of surviving business founders in any significant way. This comparison shows that while a higher share of lifetime unemployment

Table 4.5: Main regression results: Regression coefficients

	A. Survival (same business)		B. Hybrid persistence		C. Motivational persistence	
	unc. $(\tilde{\beta})$	cond. (β)	unc. $(\tilde{\beta})$	cond. (β)	unc. $(\tilde{\beta})$	cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
(1) *Socio-demographics*						
Age category at start-up						
<25 years (ref.)						
25 -<35 years	0.154*	0.087	0.085	0.047	-0.010	0.022
35-<45 years	0.202**	0.093	0.074	0.035	-0.047	0.003
45-<56 years	0.180**	0.082	0.060	0.015	-0.051	-0.008
≥56 years	0.080	0.057	0.086	0.071	0.049	0.100
Joint F-stat.	[2.0]*	[0.3]	[0.3]	[0.3]	[0.5]	[0.5]
German citizen	0.066	-0.009	-0.005	-0.173**	-0.062	-0.236**
Residence						
North Germany (ref.)						
East Germany	-0.015	0.012	-0.208***	-0.137*	-0.256***	-0.171*
South Germany	-0.022	0.033	-0.045	-0.016	-0.042	-0.049
West Germany	-0.078	-0.020	-0.054	-0.060	-0.017	-0.072
Joint F-stat.	[1.0]	[0.4]	[5.1]***	[1.1]	[6.3]***	[1.2]
Married	0.073*	0.058	0.058	0.053	0.033	0.009
Children in household						
Aged <6	0.045	-0.000	0.087	0.056	0.078	0.070
Aged 6-<15	-0.012	-0.009	-0.103**	-0.126***	-0.123**	-0.120**
Joint F-stat.	[0.5]	[0.0]	[3.6]**	[4.2]**	[3.1]**	[3.0]*
(2) *Human capital*						
Highest schooling certificate						
Upper secondary school	0.048	0.093**	0.016	0.011	-0.013	-0.035
Professional education						
University education	0.004	0.016	-0.023	-0.029	-0.034	-0.043
Unemployment experience before start-up[a]						
0 (ref.)						
>0-2	-0.025	-0.008	-0.074	-0.006	-0.068	0.017
>2-5	-0.025	0.006	-0.096*	-0.008	-0.085	-0.003
>5-10	-0.101*	-0.093	-0.129**	-0.046	-0.107	-0.038
>10	-0.233***	-0.194**	-0.211***	-0.097	-0.103	-0.017
Joint F-stat..	[2.7]**	[2.3]*	[2.6]**	[0.6]	[0.8]	[0.1]
Industry-specific experience before start-up						
Due to former self-emp.	0.009	-0.008	0.107**	0.069	0.135**	0.096*
Due to dependent emp.	0.142**	0.125**	-0.034	-0.046	-0.153**	-0.167**
None	-0.004	0.006	0.018	0.021	0.021	-0.015
Joint F-stat.	[3.5]**	[2.7]**	[2.1]*	[1.4]	[5.2]***	[4.1]***
Skills and knowledge[b]						
Strategy and leadership	-0.017	-0.010	0.016	-0.014	0.041	0.004
Back office	0.039**	0.017	0.030	0.012	0.016	0.015
Front office	0.002	-0.003	0.052**	0.046**	0.071***	0.067**
Industry knowledge	0.069***	0.052**	0.034	0.027	0.006	0.005

(Table continued on next page)

(Table 4.5 continued)

	A. Survival (same business)		B. Hybrid persistence		C. Motivational persistence	
	unc. $(\tilde{\beta})$	cond. (β)	unc. $(\tilde{\beta})$	cond. (β)	unc. $(\tilde{\beta})$	cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
(3) Personality						
Big five[b]						
Openness	0.034*	0.034*	0.031	0.022	0.021	0.015
Conscientiousness	0.004	-0.014	-0.002	0.001	-0.001	0.006
Extraversion	-0.040**	-0.035**	0.009	0.001	0.034	0.018
Agreeableness	-0.023	-0.007	-0.033*	-0.031	-0.031	-0.042*
Neuroticism	-0.017	-0.018	-0.038*	-0.037*	-0.042*	-0.038*
Locus of control[b]	0.051***	0.047**	0.063***	0.060***	0.049*	0.041
General self-efficacy[b]	0.017	0.010	0.046**	0.023	0.051*	0.015
Readiness to take risk[c]	-0.012	-0.035	-0.060	-0.080*	-0.062	-0.101*
Squared	0.000	0.002	0.005	0.006	0.005	0.008*
Joint F-stat.	[0.3]	[0.5]	[0.8]	[1.6]	[0.7]	[1.5]
(4) Intergen. transmissions						
Business takeover						
from parents	0.273***	0.216***	0.117*	0.109	-0.020	0.013
Parental self-employment	-0.058	-0.060	0.032	0.016	0.076	0.060
Paternal human capital						
Upper secondary school	-0.031	-0.029	-0.102*	-0.143**	-0.110	-0.185**
University education	-0.034	-0.060	0.026	0.074	0.056	0.136*
(5) Start-up motives[b]						
Market opportunity	0.010	0.027	0.047**	0.036*	0.054**	0.031
Career ambition	0.022	0.020	0.018	0.004	0.013	-0.011
Necessity	-0.031*	0.009	-0.066***	-0.032	-0.070***	-0.054**
(6) Business characteristics						
Unemployed founder	-0.023	-0.005	-0.114***	-0.064	-0.129***	-0.061
Start-up capital						
None or not spec. (ref.)						
<10,000 euros	-0.030	0.028	0.019	0.095	0.065	0.114
10,000-<50,000 euros	0.126**	0.141**	0.178***	0.209***	0.169**	0.201**
≥50,000 euros	0.207***	0.192***	0.247***	0.249***	0.200**	0.201**
Joint F-stat.	[11.5]***	[7.3]***	[8.7]***	[7.0]***	[3.2]**	[3.2]**
Share of own equity	0.062	-0.006	0.070	0.004	0.046	0.011
Business sector						
Other sector (ref.)						
Manufacturing,						
construction	0.088*	0.114**	-0.042	-0.076	-0.093	-0.131
Retail	-0.099	-0.051	-0.080	-0.106	-0.044	-0.083
Information, financial						
and IT services	-0.083	-0.062	-0.123*	-0.190**	-0.106	-0.198**
Other services	-0.089	-0.052	-0.082	-0.105	-0.054	-0.126
Joint F-stat.	[7.5]***	[5.9]***	[0.9]	[1.9]	[0.5]	[1.3]

(Table continued on next page)

(Table 4.5 continued)

	A. Survival (same business)		B. Hybrid persistence		C. Motivational persistence	
	unc. ($\bar{\beta}$)	cond. (β)	unc. ($\bar{\beta}$)	cond. (β)	unc. ($\bar{\beta}$)	cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
(7) Regional econ. context						
GDP growth (2012)	0.006	0.005	0.002	0.000	-0.002	-0.001
Vacancies per stock						
of unemployed	0.002	-0.001	-0.001	-0.004	-0.002	-0.006
Change in unemployment						
rate (2012 v. 2011)	-0.016	-0.002	0.089***	0.087**	0.131***	0.124***
Unemployment rate (2012)	0.008	0.010	-0.004	0.005	-0.007	-0.004
Number of obs.	653	653	653	653	495	495
Joint F-stat.		4.3		4.7		4.8
Joint p-value		0.000		0.000		0.000
Regression-R^2		0.232		0.214		0.236

Note: Reported are robust OLS coefficients. The unconditional ("unc.") results $\bar{\beta}$ refer to a specification where only the covariates from the respective covariate block are included, see equation (4.1) in the text; separate results of all covariates blocks are stacked in one column to save space. The conditional ("cond.") results β refer to a full specification containing all covariates from all covariate blocks, see equation (4.2) in the text. For details on the definition and construction of the outcome variables, see Table 4.3. ***/**/* indicate significantly different means between subgroups at the 1/5/10% level.
[a] Measured as share of working time, standardized by age−15.
[b] Initially measured on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table 4.10 in the Appendix, Section 4.7, for details, and then standardized.
[c] Measured on a 11-point Likert-type scale from 0 "not at all willing to take risks" to 10 "very willing to take risks", see Table 4.10 in the Appendix, Section 4.7, for details.

does have negative implications for survival, presumably due to the greater lack of work experience, depreciation of human capital, and smaller professional and business networks, it does not affect persistence once we consider a motivational measure that includes the psychological commitment to the business activity.

Furthermore, we find ambiguous effects of industry-specific experience. First, previous self-employment has no significant effect on survival. As our heterogeneity analysis below will reveal, this finding is the result of a negative effect for formerly unemployed and a positive effect for regular founders, which together yield a net effect in the full sample close to zero. In contrast, former self-employment episodes have a large and robust positive effect on motivational persistence, which underlines the persistent motivational commitment to entrepreneurial activity of serial entrepreneurs. Second, industry-specific experience acquired through former dependent employment has a robust positive impact on survival. The negative coefficient for motivational persistence, however, indicates that founders who have previously been employed might feel a higher desire to return back to dependent employment and, therefore, exhibit lower psychological commitment to their businesses. The magnitudes of the results for hybrid persistence are, in each case, in-between those for survival and motivational persistence and, consequently, do not exhibit a robust statistical significance.

Personality While the signs of the personality variables are relatively similar across all three persistence measures, with the exception of extraversion, the magnitudes and significances of particular personality items differ. Locus of control has a relatively robust positive impact of similar magnitude on all three measures. The comparison across the outcome variables reveals that the personality traits openness and extraversion have a significant impact on business survival, whereas motivational persistence depends more strongly on agreeableness, neuroticism, and risk attitudes.

Intergenerational transmissions In line with previous findings, business takeover from parents significantly improves survival chances. Yet, it does not increase motivational persistence, implying that there does not seem to be substantially higher psychological business attachment for surviving founders who take over existing family businesses compared to original founders 40 months after start-up.

Start-up motives For the influence of start-up motives, our results are largely in line with previous evidence. The market opportunity motive has, in general, a positive association with all three persistence measures, but the relatively small magnitude, in particular with respect to survival, leads to statistical insignificance in some cases. The importance of career ambition motives is close to zero and insignificant throughout, which could be explained by the opposing influences of the underlying autonomy and financial reward motives as found in previous studies. The differences in survival rates for founders who were driven by strong necessity motives in their start-up decision is only moderate and not robust to the inclusion of other covariate blocks. But necessity founders do exhibit a substantial lack of motivational persistence. This finding is in line with the existence of partly involuntary necessity business founders, who remain self-employed due to a lack of employment alternatives but would prefer changing to dependent employment if this employment option was available to them.

Business characteristics Unemployed founders do not show any significant difference in survival chances after 40 months. With respect to the hybrid as well as the motivational persistence measure, unemployed founders show a relatively large and highly significant negative gap in the unconditional specification, which, however, decreases substantially in size and becomes insignificant once we control

for all covariate blocks in the full specification. The role of start-up capital is very robust and unambiguous across all three persistence measures. A higher start-up capital increases survival chances, hybrid persistence as well as the psychological commitment to the venture.

Regional economic context   The indicators for the regional economic context do not have any strong significant effect on business survival. In contrast, a negative development of the local labor market in terms of increasing unemployment rates significantly reinforces hybrid and, even more strongly, motivational persistence.

4.5.2   Relative importance of covariate blocks

After comparing the individual coefficients of all covariates for the three persistence measures, we now want to determine the relative importance of the seven covariate blocks X_i on (1) socio-demographic characteristics, (2) human capital, (3) personality, (4) intergenerational transmissions, (5) start-up motives, (6) business characteristics as well as (7) the current regional economic context relative to each other. We assess the relative importance as the share of the regression-R_i^2 of the covariate block i relative to the full regression-R^2 in the full specification. Results are reported in Table 4.6, where we again separate by survival (Panel A), hybrid persistence (Panel B) and motivational persistence conditional on survival (Panel C).[9] We again distinguish between unconditional regression results from the simple specifications 1 to 7, where only the respective covariate block X_i is included (cf. equation (4.1)), and conditional results from the full specification controlling for all other covariate blocks as well (cf. equation (4.2)).

Survival   All covariate blocks are individually significant at the 10% level in the simple specifications, with the exception of the regional economic context (column 7). The explanatory contributions vary considerably, however, with the highest unconditional contributions coming from human capital (41.4%, column 2) and business characteristics (38.4%, column 6). Socio-demographics, personality, and intergenerational transmissions display a moderate explanatory power of around 15%, whereas start-up motives and the regional context explain only very little.

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[9] Results of a robustness check applying the adjusted R_a^2, which is corrected for the number of variables in each block, are very similar to the standard regression-R^2 results reported here; see Table 4.11 in the Appendix, Section 4.7, for details.

Table 4.6: Main regression results: Explanatory contributions

	full	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Specification				
A. *Outcome variable:* Survival (same business)								
Unconditional contributions in the simple specification								
Joint p-value	0.000	0.011	0.000	0.004	0.000	0.097	0.000	0.671
Regression-R^2	0.232	0.038	0.096	0.033	0.034	0.010	0.089	0.004
% of full spec. R^2		16.2	41.4	14.2	14.8	4.3	38.4	1.6
Conditional contributions in the full specification								
Joint p-value	0.000	0.864	0.000	0.022	0.000	0.203	0.000	0.518
Partial regression-R^2	0.232	0.011	0.080	0.029	0.026	0.008	0.062	0.004
% of full spec. R^2		4.6	34.4	12.3	11.1	3.4	26.6	1.9
Number of obs.	653	653	653	653	653	653	653	653
B. *Outcome variable:* Hybrid persistence								
Unconditional contributions in the simple specification								
Joint p-value	0.000	0.002	0.000	0.000	0.067	0.000	0.000	0.013
Regression-R^2	0.214	0.037	0.067	0.063	0.014	0.031	0.074	0.016
% of full spec. R^2		17.3	31.3	29.2	6.5	14.6	34.4	7.8
Conditional contributions in the full specification								
Joint p-value	0.000	0.030	0.259	0.002	0.065	0.129	0.000	0.087
Partial regression-R^2	0.214	0.032	0.024	0.043	0.014	0.009	0.053	0.014
% of full spec. R^2		15.2	11.1	20.1	6.6	4.4	24.6	6.4
Number of obs.	653	653	653	653	653	653	653	653
C. *Outcome variable:* Motivational persistence								
Unconditional contributions in the simple specification								
Joint p-value	0	0.001	0.000	0.000	0.302	0.001	0.001	0.002
Regression-R^2	0.236	0.056	0.079	0.062	0.010	0.031	0.050	0.031
% of full spec. R^2		23.9	33.5	26.4	4.1	13.2	21.2	13.2
Conditional contributions in full specification								
Joint p-value	0.000	0.034	0.036	0.064	0.122	0.126	0.015	0.034
Partial regression-R^2	0.236	0.042	0.047	0.037	0.018	0.013	0.039	0.022
% of full spec. R^2		17.6	19.8	15.6	7.4	5.4	16.7	9.4
Number of obs.	495	495	495	495	495	495	495	495
D. *Control variables:*								
(1) *Socio-demographics*	✓	✓						
(2) *Human capital*	✓		✓					
(3) *Personality*	✓			✓				
(4) *Intergen. transmission*	✓				✓			
(5) *Start-up motives*	✓					✓		
(6) *Business characteristics*	✓						✓	
(7) *Regional econ. context*	✓							✓
Number of control variables	53	11	13	9	4	3	9	4

Note: Reported are results from robust OLS estimations. The reported results always refer to the joint block of indicated control variables in Panel D only. The unconditional contributions stem from regressions of the indicated outcome variable on only the indicated block of control variables, see equation (4.1) in the text, while the conditional contributions stem from regressions of the persistence measure on the indicated block of control variables and all other blocks (full specification), see equation (4.2) in the text. Detailed estimation results are reported in Table 4.5. For details on the definition and construction of the outcome variables, see Table 4.3.

The values for the *partial* regression-R^2 in the full specification controlling for all variables simultaneously are slightly lower than in the unconditional regressions as expected since correlations between covariates across blocks are now controlled for. Nevertheless, we find a similar pattern across covariate blocks, with human capital and business-characteristics having the largest predictive power. The only exception concerns socio-demographics, whose relative importance is not robust to the inclusion of additional covariate blocks, declines considerably, and is no longer significant. This is in line with the detailed results of the individual coefficients discussed above.[10]

Hybrid persistence For the hybrid indicator (Table 4.6, Panel B), the strong roles of human capital and business characteristics are confirmed, but now personality is similarly important, with unconditional R^2 shares around 30% for each of these three blocks. The unconditional explanatory power of intergenerational transmissions, in contrast, is lower, while start-up motives and the regional economic context now play a more important role compared to the survival measure.

The conditional contributions in the full specification confirm this observation with a notable difference: Human capital is no longer significant, and its predictive power declines sharply to one third of its unconditional value. This reflects the finding from the detailed coefficient results that some human capital variables in the full specification have opposing effects on survival and motivational persistence and cancel out with respect to the hybrid measure.

Motivational persistence Conditional on survival, the pattern for the motivational persistence measure is to some extent different compared to the pure survivor measure (Table 4.6, Panel C). The explanatory power is not strongly concentrated in human capital and business characteristics alone. Rather, socio-demographics, human capital, personality, as well as business characteristics provide more even explanatory contributions. Furthermore, in contrast to the survival case, the regional context is highly significant both unconditionally and conditionally.

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[10] The explanatory shares of the full specification R^2 do not add up to 100% across covariates blocks in either case because correlations between covariates across (unconditional case) and within covariate blocks (unconditional and conditional case) are not controlled for.

Table 4.7: Summary of empirical results on determinants of persistence

| | Sign of relation | | |
| | A. Survival (same business) (1) | B. Hybrid persistence (2) | C. Motivational persistence (3) |
Covariate (block)			
(1) *Socio-demographics*			
Joint explanatory contribution	4.6%	15.2%	17.6%
Age	(+)	*n.s.*	*n.s.*
German	*n.s.*	−	−
Residence	*n.s.*	$^+/_-$	$^+/_-$
Married	(+)	*n.s.*	*n.s.*
Children	*n.s.*	−	−
(2) *Human Capital*			
Joint explanatory contribution	34.4%	11.1%	19.8%
Schooling	+	*n.s.*	*n.s.*
Professional education	*n.s.*	*n.s.*	*n.s.*
Unemployment experience	−	(−)	*n.s.*
Industry-specific experience	+	(+)	$^+/_-$
Skills and knowledge			
Strategy/Leadership	*n.s.*	*n.s.*	*n.s.*
Back office	(+)	*n.s.*	*n.s.*
Front office	*n.s.*	+	+
Industry knowledge	+	*n.s.*	*n.s.*
(3) *Personality*			
Joint explanatory contribution	12.3%	20.1%	15.6%
Big five			
Openness	+	*n.s.*	*n.s.*
Conscientiousness	*n.s.*	*n.s.*	*n.s.*
Extraversion	−	*n.s.*	*n.s.*
Agreeableness	*n.s.*	(−)	−
Neuroticism	*n.s.*	−	−
Locus of Control	+	+	(+)
Self-efficacy	*n.s.*	(+)	(+)
Readiness to take risk	*n.s.*	−	convex

(Table continued on next page)

4.5.3 Summary

A summary of our empirical results is reported in Table 4.7, where we present for each persistence measure (columns 1 to 3) the relative importance of each covariate block (as the share of conditional explanatory power in the full specification from Table 4.6) as well as the sign of relation for each individual determinant (from the full specifications, see Table 4.5).

Overall, our results in Table 4.7 generally match previous evidence in the literature (summarized in Table 4.2), but they also reveal that findings depend to a certain extent on the choice of persistence measure applied. For the survival

(Table 4.7 continued)

	Sign of relation		
	A. Survival (same business)	B. Hybrid persistence	C. Motivational persistence
Covariate (block)	(1)	(2)	(3)
(4) *Intergen. transmissions*			
Joint explanatory contribution	11.1%	6.6%	7.4%
Business takeover from parents	+	(+)	*n.s.*
Parental self-employment	*n.s.*	*n.s.*	*n.s.*
(5) *Start-up motives*			
Joint explanatory contribution	3.4%	4.4%	5.4%
Opportunity	*n.s.*	+	+
Career ambition	*n.s.*	*n.s.*	*n.s.*
Necessity	(−)	(−)	−
(6) *Business characteristics*			
Joint explanatory contribution	26.6%	24.6%	16.7%
Unemployed founder	*n.s.*	(−)	(−)
Start-up capital	+	+	+
Business sector	$+/_-$	$+/_-$	$+/_-$
(7) *Regional econ. context*			
Joint explanatory contribution	1.9%	6.4%	9.4%
GDP growth	*n.s.*	*n.s.*	*n.s.*
Labor market conditions	*n.s.*	−	−
Unemployment	*n.s.*	*n.s.*	*n.s.*

Note: The table summarizes our empirical findings about the explanatory contributions of each covariate block and direction of the relationship between covariates and entrepreneurial persistence. The explanatory contribution is the share of the regression-R_i^2 of this covariate block in the full specification (cf. Table 4.6). + denotes a significant positive effect of this covariate, − denotes a significant negative effect, *n.s.* denotes an insignificant effect and $+/_-$ denote significant effects for categorical variables. Signs in parentheses indicate that significance holds only in the unconditional specification containing only the corresponding covariates block. For details on the definition and construction of the outcome variables, see Table 4.3.

indicator, the predictive power is concentrated in business characteristics and human capital, while for hybrid persistence, the dominant factors are business characteristics and personality. Motivational persistence of surviving founders is, in contrast, more evenly influenced by socio-demographics, human capital, personality, and business characteristics.

With respect to single determinants, we find, on the one hand, factors that affect persistence in a robust way irrespective of which measure is used, like start-up capital and locus of control. On the other hand, for the majority of determinants, we find that they exhibit a strong, significant effect on either survival or the psychological commitment of the founder to their business venture, whereas the impact on the other measure is small in size and insignificant, e.g., unemployment and industry-specific experience prior to start-up, big-five factors, or local labor market conditions. Results for hybrid persistence, which takes both

survival and motivational aspects of persistence into account by construction, reflect these differing findings and are, therefore, mostly located in-between.

4.5.4 Heterogeneity analysis

In the second part of our empirical analysis, we conduct a heterogeneity analysis to account for the fact that our full sample comprises of both unemployed and regular (non-unemployed) founders. As we have seen in the descriptive statistics, the share of necessity start-ups is significantly higher among unemployed founders, who also suffer from a shortage of intergenerational transmissions as well as industry-specific experience from former self-employment. They also set up smaller businesses. Thus, they might exhibit a lower level of business attachment and might be more affected in their persistence by external factors like the local labor market than regular founders. We, therefore, split the sample by former employment status and rerun the estimations for both subgroups separately. The conditional explanatory contributions from the full specification (cf. equation (4.2)) for the three persistence measures are reported in Table 4.8. The corresponding detailed regression results for the individual coefficients are presented in Table 4.12 in the Appendix, Section 4.7.

The separate results for unemployed and regular founders reported in Table 4.8 show in general higher overall regression-R^2 values for each subsample, indicating a better model fit for the split sample.

Survival The dominant roles of human capital and business characteristics for survival in the pooled sample are confirmed for both unemployed and regular founders (Table 4.8, Panel A). The most notable difference between the two groups concerns the role of personality and intergenerational transmissions. For unemployed founders, the transfer of resources and knowledge from their parents and in particular the takeover of their businesses (as evident in Table 4.12, columns 1 and 2 in the Appendix, Section 4.7) has a higher impact, given that they face higher restrictions in terms of social, human, and financial capital, whereas personality has only a moderate influence. For regular founders, the relative importances of these two factors are reversed.

Hybrid persistence For regular founders, hybrid persistence is mainly determined by business-related characteristics, while the importance for unemployed

Table 4.8: Heterogeneity results by former employment status

	Specification							
	full	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. *Outcome variable:* Survival (same business)								
Conditional contributions in full specification: Unemployed founders								
Joint p-value	0.000	0.826	0.001	0.616	0.002	0.541	0.000	0.629
Partial regression-R^2	0.260	0.021	0.096	0.019	0.033	0.007	0.070	0.007
% of full spec. R^2		8.1	36.9	7.3	12.6	2.6	26.9	2.9
Conditional contributions in full specification: Regular founders								
Joint p-value	0.000	0.851	0.004	0.038	0.098	0.963	0.002	0.526
Partial regression-R^2	0.370	0.027	0.113	0.069	0.024	0.002	0.127	0.012
% of full spec. R^2		7.3	30.6	18.7	6.6	0.4	34.2	3.3
Number of obs.								
Subsidized	388	388	388	388	388	388	388	388
Regular	265	265	265	265	265	265	265	265
B. *Outcome variable:* Hybrid persistence								
Conditional contributions in full specification: Unemployed founders								
Joint p-value	0.000	0.106	0.625	0.077	0.717	0.519	0.098	0.119
Partial regression-R^2	0.201	0.044	0.031	0.045	0.006	0.007	0.039	0.022
% of full spec. R^2		21.9	15.3	22.6	3.1	3.5	19.3	10.8
Conditional contributions in full specification: Regular founders								
Joint p-value	0.000	0.486	0.607	0.179	0.222	0.648	0.009	0.679
Partial regression-R^2	0.298	0.041	0.042	0.055	0.026	0.008	0.082	0.009
% of full spec. R^2		13.8	14.2	18.3	8.8	2.6	27.7	3.2
Number of obs.								
Subsidized	388	388	388	388	388	388	388	388
Regular	265	265	265	265	265	265	265	265
C. *Outcome variable:* Motivational persistence								
Conditional contributions in full specification: Unemployed founders								
Joint p-value	0.000	0.169	0.321	0.171	0.494	0.320	0.503	0.011
Partial regression-R^2	0.252	0.057	0.060	0.055	0.016	0.015	0.027	0.051
% of full spec. R^2		22.6	24.0	21.7	6.2	6.0	10.9	20.1
Conditional contributions in full specification: Regular founders								
Joint p-value	0.000	0.307	0.051	0.699	0.176	0.491	0.036	0.452
Partial regression-R^2	0.328	0.066	0.097	0.042	0.037	0.015	0.086	0.020
% of full spec. R^2		20.1	29.6	12.8	11.4	4.6	26.3	6.1
Number of obs.								
Subsidized	287	287	287	287	287	287	287	287
Regular	208	208	208	208	208	208	208	208
D. *Control variables:*								
(1) *Socio-demographics*	✓	✓						
(2) *Human capital*	✓		✓					
(3) *Personality*	✓			✓				
(4) *Intergen. transmission*	✓				✓			
(5) *Start-up motives*	✓					✓		
(6) *Business characteristics*	✓						✓	
(7) *Regional econ. context*	✓							✓
Number of control variables	52	11	13	9	4	3	8	4

Note: Reported are results from robust OLS estimations. The reported results always refer to the joint block of indicated control variables in Panel D only. The conditional contributions stem from regressions of the persistence measure on the indicated block of control variables and all other blocks (full specification), see equation (4.2) in the text. Detailed estimation results are reported in Table 4.12 in the Appendix, Section 4.7. For details on the definition and construction of the outcome variables, see Table 4.3.

founders is more evenly distributed among socio-demographic, personality, and business characteristics. A striking difference can be found in the relevance of contextual factors, which is almost three times as high for unemployed founders compared to regular founders.

Motivational persistence   A similar result can be observed for the purely motivational persistence for surviving founders. The regional economic context and in particular the labor market conditions (see Table 4.12, columns 5 and 6 in the Appendix, Section 4.7) play a major role in determining the psychological commitment of unemployed founders, whereas for regular founders, contextual factors are of lower relative importance.

To sum up, we find both differences between the three persistence measures as well as some heterogeneous results between unemployed and regular business founders. For unemployed founders, who are more prone to facing shortages in human, social and financial capital, intergenerational transmissions are relatively more important for survival compared to regular founders. For persistence measures involving a motivational dimension, we find the main difference between the two groups being that for unemployed founders local labor market conditions have a higher impact on entrepreneurial persistence than for regular founders. This finding implies that their business attachment is more susceptible to the availability of outside options.

4.6   Conclusion

Entrepreneurial persistence is the constantly renewed decision to commit to a previously selected business venture activity despite opposing forces and enticing alternatives, and is an essential prerequisite for entrepreneurs to exploit their business potential and realize economic gains and benefits (Patel and Thatcher, 2014). Based on a representative sample of German start-ups, in this paper, we add to the evidence on entrepreneurial persistence in three important ways:

First, we identify three basic approaches to measure entrepreneurial persistence (survival, subjective measure, and hybrid measure) that have typically been applied in the entrepreneurship literature, and are able to construct analog indicators from one data set and compare results. Second, we use a holistic approach to compare the *relative* importance of different predictors of entrepreneurial

persistence. Based on an extensive literature review, we incorporate a long list of individual-level, business-related, and contextual characteristics all at the same time, which were previously identified as individually important determinants. And third, we take account of the fact that the population of entrepreneurs is highly diverse and determinants of entrepreneurial persistence might be heterogeneous between unemployed and regular (non-unemployed) founders.

Our empirical results generally encompass previous findings, but they reveal that the influence of most of the determinants is sensitive to the choice of persistence measure. We find that, for the full sample, human capital and business-related characteristics have the highest explanatory contribution to survival, while socio-demographics and personality are of similar importance in explaining entrepreneurs' subjective psychological business commitments. Our heterogeneity analysis shows that for formerly unemployed founders, intergenerational transmissions are more relevant for survival, and the local labor market situation plays a more prominent role for the subjective psychological commitment to their businesses compared to regular non-unemployed founders.

Our findings underline the complex nature of entrepreneurial persistence. All three persistence measures are inevitably approximations, and each one emphasizes different aspects of the construct. Survival indicators reflect the mere continuation of a business venture and do not necessarily imply or capture the psychological commitment to actively engage in the business and to invest physical and/or psychological resources to advance the venture as implied by entrepreneurial persistence. Alternative subjective measures, which focus on this very aspect, suffer from their own shortcomings and might deviate from actually observed behaviors and attitudes, while hybrid measures take both dimensions into account. Moreover, the literature offers several subjective measures that, in turn, each accentuate a different component of subjective persistence. For instance, Davidsson's (2012) measure surveys whether business owners plan to sustain an active involvement in their business for at least another six months and is, thus, very general in nature. Our subjective measure, in contrast, is based on entrepreneurial commitment in the presence of a hypothetical offer of similar paid employment and, therefore, specifically accentuates an entrepreneur's commitment despite the availability of (potentially) attractive alternatives.

In the context of our German sample, which is comprised of unemployed

founders participating in a start-up subsidy program as well as regular founders, the nature of our subjective measure also allows us to draw some policy conclusions about the subsidy program. First, we find descriptive evidence that 40 months after start-up, the share of business owners with a high commitment to their businesses is significantly lower among formerly unemployed compared to regular founders, whereas we find only a small difference in survival rates. Second, results from our heterogeneity analysis indicate that the subjective persistence of unemployed founders is much more heavily influenced by local labor market conditions compared to regular founders or compared to other factors such as business characteristics. Combined, these findings imply that among the group of unemployed founders, there is a higher share of (successfully surviving) self-employed business owners with lower business attachment, who would prefer dependent employment if those job opportunities were indeed available. This could be one contributing factor in explaining why unemployed founders are shown to create fewer jobs, induce less innovation, and are investing less in their businesses, which can only insufficiently be explained by observable characteristics and endowments at business formation or (restricted) access to capital in post start-up phases (Caliendo *et al.*, 2017b) and, in turn, reinforces lower levels of entrepreneurial persistence (Zhu *et al.*, 2011; Gimeno *et al.*, 1997).

On a final note, it should be kept in mind that although persistence can be viewed as a prerequisite to exploit the potential of a given business opportunity, high persistence does not necessarily lead to positive results or outcomes (Holland and Shepherd, 2013). It rather depends on how persistent business founders react to feedback, changing environments, and adversity. On the one hand, there is evidence that persisting entrepreneurs with high resilience use their resourcefulness to adapt and improve their business performances (Ayala and Manzano, 2014). On the other hand, staying with a previously chosen but failing course of action is a sign of a perilous escalation of commitment. In this case, founders overly commit to their original strategies and react to negative feedback by investing too much into and staying too long with the same plan (McCarthy *et al.*, 1993). This then results in an inefficient and ineffective use of one's own and society's resources (DeTienne *et al.*, 2008). Thus, a deeper understanding of the link between entrepreneurial persistence and entrepreneurial success is important but beyond the scope of this paper.

4.7 Appendix

Table 4.9: Sample selectivity pattern

	Pooled sample		Unempl. founders		Regular founders	
	Full sample (1)	Est. sample (2)	Full sample (3)	Est. sample (4)	Full sample (5)	Est. sample (6)
Number of obs.	2,408	653	1,478	388	930	265
Survival (same business)	0.771	0.790	0.805	0.822	0.717	0.743
Age category at start-up						
<25 years	0.071	0.058	0.051	0.026***	0.102	0.106
25 -<35 years	0.248	0.219	0.271	0.258	0.211	0.162*
35 -<45 years	0.326	0.337	0.359	0.379	0.273	0.275
45 -<56 years	0.228	0.265*	0.231	0.265	0.222	0.264
≥56 years	0.127	0.121	0.087	0.072	0.192	0.192
German	0.939	0.956*	0.933	0.951	0.949	0.962
Residence						
North Germany	0.154	0.150	0.160	0.152	0.144	0.147
East Germany	0.175	0.179	0.217	0.209	0.109	0.136
South Germany	0.333	0.346	0.293	0.309	0.397	0.400
West Germany	0.338	0.325	0.329	0.330	0.351	0.317
Married	0.587	0.643***	0.572	0.634**	0.611	0.657
Children in household						
Aged <6	0.186	0.172	0.206	0.209	0.154	0.117
Aged 6-<15	0.224	0.259*	0.230	0.265	0.214	0.249
Highest schooling certificate						
Upper secondary school	0.474	0.518**	0.478	0.518	0.468	0.517
Professional education						
University education	0.297	0.325	0.309	0.332	0.276	0.313
Unemployment experience before start-up[a]						
0 or not specified	0.255	0.248	0.074	0.072	0.543	0.506
>0-2	0.294	0.332*	0.332	0.381*	0.235	0.260
>2-5	0.223	0.225	0.292	0.281	0.114	0.143
>5-10	0.132	0.115	0.181	0.170	0.053	0.034
>10	0.096	0.080	0.122	0.095	0.055	0.057
Industry-specific experience before start-up						
Due to former self-emp.	0.214	0.225	0.194	0.193	0.246	0.272
Due to dependent emp.	0.751	0.784*	0.787	0.812	0.695	0.743
None	0.115	0.093*	0.110	0.082*	0.124	0.109
Business takeover from parents	0.073	0.100**	0.028	0.039	0.144	0.189*
Parental self-employment	0.382	0.389	0.329	0.332	0.466	0.472
Paternal human capital						
Upper secondary school	0.244	0.254	0.248	0.260	0.238	0.245
University education	0.196	0.214	0.204	0.235	0.183	0.185

(Table 4.9 continued)

	Pooled sample		Unempl. founders		Regular founders	
	Full sample (1)	Est. sample (2)	Full sample (3)	Est. sample (4)	Full sample (5)	Est. sample (6)
Start-up motives[b]						
Opportunity	3.4	3.5	3.5	3.5	3.4	3.4
Career ambition	4.4	4.2**	4.4	4.1***	4.3	4.3
Necessity	2.3	2.3	2.6	2.6	1.8	1.8
Start-up capital						
None or not spec.	0.177	0.161	0.179	0.160	0.173	0.162
<10,000 euros	0.361	0.349	0.403	0.379	0.296	0.306
10,000 -<50,000 euros	0.322	0.322	0.317	0.345	0.329	0.287
≥50,000 euros	0.110	0.149**	0.078	0.108*	0.161	0.208*
Share of own equity at start-up	0.549	0.575	0.550	0.589	0.548	0.556
Business sector						
Manufacturing, construction	0.288	0.271	0.265	0.242	0.324	0.313
Retail	0.152	0.152	0.143	0.144	0.167	0.162
Information, financial, and IT services	0.162	0.164	0.174	0.183	0.144	0.136
Other services	0.306	0.315	0.316	0.320	0.291	0.309
Other sector	0.091	0.098	0.101	0.111	0.074	0.079

Note: ***/**/* indicate significantly different means at the 1/5/10% level. Missing variables compared to the full list of covariates in our analysis were not surveyed for the full sample and thus cannot be tested.
[a] Reported as share of working time, standardized by age−15.
[b] Measured on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table 4.10 in the Appendix, Section 4.7, for details.

Table 4.10: Construction of selected control variables

Skills and knowledge: *How do you rate your skills and knowledge in the following areas?*
Please answer on the basis of a scale ranging from 1 "very poor" to 7 "very good".

Q1.   Leading an organization.
Q2.   Conduct negotiations.
Q3.   Organization and development.
Q4.   Accounting.
Q5.   Merchandise purchase.
Q6.   Customer acquisition.
Q7.   Marketing.
Q8.   Industry knowledge.

Aggregated skills and knowledge indices scaled from 1 to 7:
Strategy and leadership = [Q1+Q2+Q3]/3
Front office = [Q6+Q7]/2
Back office = [Q4+Q5]/2
Industry knowlegde = [Q8]

Big five: *To what degree do the following statements apply to you personally?*
Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies entirely".

I see myself as someone who . . .
Q1.   does a thorough job.
Q2.   is communicative, talkative.
Q3.   worries a lot.
Q4.   tends to be lazy.
Q5.   is outgoing, sociable.
Q6.   values artistic experiences.
Q7.   gets nervous easily.
Q8.   does things effectively and efficiently.
Q9.   is considerate and kind to others.
Q10.   has an active imagination.

Aggregated big five indices scaled from 1 to 7:
Conscientiousness = [Q1+R(Q4)+Q8]/3
Extraversion = [Q2+Q5]/2
Agreeableness = [Q9]
Neuroticism = [Q3+Q7]/2
Openness = [Q6+Q10]/2

Locus of control: *To what degree do you personally agree with the following statements?*
Please answer on the basis of a scale ranging from 1 "do not agree at all" to 7 "agree completely".

Q1.   How my life takes course is entirely dependent on me.
Q2.   What one achieves is, in the first instance, a question of destiny and luck.
Q3.   I often experience that others make decisions about my life.
Q4.   Success is gained through hard work.
Q5.   When I encounter difficulties in life, I often doubt my abilities.
Q6.   I have little control over things which happen in my life.

Aggregated locus of control index scaled from 1 to 7:
Locus of control = [Q1+R(Q2)+R(Q3)+Q4+R(Q5)+R(Q6)]/6

(Table 4.10 continued)

General self-efficacy: *Now think of your overall professional situation. To what degree do you personally agree with the following statements?*
Please answer on the basis of a scale ranging from 1 "do not agree at all" to 7 "agree completely".

Q1.   If someone opposes me, I can find the means and ways to get what I want.
Q2.   I can always manage to solve difficult problems if I try hard enough.
Q3.   It is easy for me to stick to my aims and accomplish my goals.
Q4.   I am confident that I could deal efficiently with unexpected events.
Q5.   I can remain calm when facing difficulties because I can rely on my coping abilities.
Q6.   No matter what comes my way/I can usually handle whatever comes my way.
Q7.   I can solve most problems if I invest the necessary effort.

Aggregated general self-efficacy index scaled from 1 to 7:
General self-efficacy = [Q1+Q2+Q3+Q4+Q5+Q6+Q7]/7

Readiness to take risks: *To what degree are you ready to take risks in general?*
Please answer on the basis of a scale ranging from 0 "not at all ready" to 10 "perfectly ready".

Start-up motives: *Now, let us talk about your start-up motives. Please rate for each of the following start-up motives to what degree it applies to you?*
Please answer on the basis of a scale ranging from 1 "does not apply at all" to 7 "applies entirely".

Q1.   I wanted to be my own boss.
Q2.   Others recommended me to start a business.
Q3.   I discovered a market niche.
Q4.   I wanted to earn more money.
Q5.   I did not find a job.
Q6.   I wanted to implement an idea.
Q7.   I had been subject to discrimination at previous job.

Aggregated motive indices scaled from 1 to 7:
Opportunity = [Q3+Q6]/2
Career ambition = [Q1+Q4]/2
Necessity = [Q2+Q5+Q7]/3

Note: Big five and locus of control are closely related to analog measures in the German "Socio-Economic Panel" (SOEP, see Wagner *et al.*, 2007, for details) based on John *et al.* (1991) for big five (see Gerlitz and Schupp, 2005; Dehne and Schupp, 2007) and Nolte *et al.* (1997) for locus of control. General self-efficacy is based on Schwarzer and Jerusalem (1999). The readiness to take risks is surveyed using the general risk question with an 11-point scale (Dohmen *et al.*, 2011), which is also implemented in SOEP.

Table 4.11: Sensitivity analysis: Explanatory contributions

	full	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Specification				
A. *Outcome variable:* Survival (same business)								
Unconditional contributions in the simple specification								
Joint *p*-value	0.000	0.011	0.000	0.004	0.000	0.097	0.000	0.671
Adjusted R_a^2	0.164	0.021	0.078	0.019	0.028	0.005	0.076	-0.002
% of full spec. adj. R_a^2		12.8	47.3	11.8	17.4	3.3	46.6	-1.5
Conditional contributions in the full specification								
Joint *p*-value	0.000	0.864	0.000	0.022	0.000	0.203	0.000	0.518
Partial adjusted R_a^2	0.164	-0.006	0.061	0.015	0.020	0.003	0.049	-0.002
% of full spec. adj. R_a^2		-3.9	37.2	9.1	12.0	2.0	29.6	-1.1
Number of obs.	653	653	653	653	653	653	653	653
B. *Outcome variable:* Hybrid persistence								
Unconditional contributions in the simple specification								
Joint *p*-value	0.000	0.002	0.000	0.000	0.067	0.000	0.000	0.013
Adjusted R_a^2	0.145	0.020	0.048	0.050	0.008	0.027	0.061	0.010
% of full spec. R_a^2		14.1	33.3	34.2	5.4	18.5	41.9	7.2
Conditional contributions in the full specification								
Joint *p*-value	0.000	0.030	0.259	0.002	0.065	0.129	0.000	0.087
Partial adjusted R_a^2	0.145	0.016	0.004	0.030	0.008	0.005	0.039	0.008
% of full spec. R_a^2		11.0	2.8	20.5	5.6	3.3	27.2	5.2
Number of obs.	653	653	653	653	653	653	653	653
C. *Outcome variable:* Motivational persistence								
Unconditional contributions in the simple specification								
Joint *p*-value	0	0.001	0.000	0.000	0.302	0.001	0.001	0.002
Adjusted R_a^2	0.144	0.035	0.054	0.045	0.002	0.025	0.032	0.023
% of full spec. adj. R_a^2		24.2	37.6	31.2	1.1	17.5	22.5	16.1
Conditional contributions in full specification								
Joint *p*-value	0.000	0.034	0.036	0.064	0.122	0.126	0.015	0.034
Partial adjusted R_a^2	0.144	0.020	0.021	0.019	0.010	0.007	0.022	0.014
% of full spec. adj. R_a^2		13.7	14.5	13.1	6.6	4.6	15.0	9.9
Number of obs.	495	495	495	495	495	495	495	495
D. *Control variables:*								
(1) *Socio-demographics*	√	√						
(2) *Human capital*	√		√					
(3) *Personality*	√			√				
(4) *Intergen. transmission*	√				√			
(5) *Start-up motives*	√					√		
(6) *Business characteristics*	√						√	
(7) *Regional econ. context*	√							√
Number of control variables	53	11	13	9	4	3	9	4

Note: Reported are results from robust OLS estimations. The reported results always refer to the joint block of indicated control variables in Panel D only. The unconditional contributions stem from regressions of the indicated outcome variable on only the indicated block of control variables, see equation (4.1) in the text, while the conditional contributions stem from regressions of the persistence measure on the indicated block of control variables and all other blocks (full specification), see equation (4.2) in the text. Detailed estimation results are reported in Table 4.5. For details on the definition and construction of the outcome variables, see Table 4.3.

Table 4.12: Detailed heterogeneity results by former employment status

	Survival (same business)		Hybrid persistence		Motivational persistence	
	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
(1) *Socio-demographics*						
Age category at start-up						
<25 years (ref.)						
25 -<35 years	0.164	0.078	0.071	0.065	0.007	0.056
35-<45 years	0.137	0.074	0.046	0.087	-0.035	0.084
45-<56 years	0.130	0.045	0.008	0.064	-0.078	0.101
≥56 years	0.044	0.033	-0.042	0.170	-0.083	0.277
Joint F-stat.	[0.5]	[0.2]	[0.4]	[0.4]	[0.2]	[0.9]
German citizen	0.077	-0.168	-0.163	-0.184	-0.332**	-0.039
Residence						
North Germany (ref.)						
East Germany	0.012	-0.024	-0.165*	-0.138	-0.218*	-0.116
South Germany	0.028	-0.052	0.096	-0.169	0.139	-0.220
West Germany	0.013	-0.133*	0.009	-0.175	0.022	-0.183
Joint F-stat.	[0.0]	[1.1]	[1.5]	[1.0]	[1.5]	[1.1]
Married	0.104*	-0.026	0.092	-0.018	0.050	-0.081
Children in household						
Aged <6	0.012	-0.052	0.050	0.039	0.035	0.095
Aged 6-<15	-0.009	0.008	-0.137**	-0.146	-0.132*	-0.138
Joint F-stat.	[0.0]	[0.2]	[2.8]*	[1.4]	[1.6]	[1.5]
(2) *Human capital*						
Highest schooling certificate						
Upper secondary school	0.090	0.065	0.008	0.006	-0.065	0.028
Professional education						
University education	0.005	0.045	-0.011	-0.076	-0.023	-0.141

(Table 4.12 continued)

	Survival (same business)		Hybrid persistence		Motivational persistence	
	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment experience before start-up[a]						
0 (ref.)						
>0-2	-0.158**	0.038	-0.087	0.093	-0.023	0.127
>2-5	-0.105	0.046	-0.002	-0.088	0.042	-0.151
>5-10	-0.192**	-0.243	-0.082	-0.139	-0.089	-0.049
>10	-0.336***	-0.092	-0.171	-0.051	-0.099	0.019
Joint F-stat.	[2.9]**	[1.1]	[1.2]	[1.2]	[0.6]	[1.5]
Industry-specific experience before start-up						
Due to former self-emp.	-0.047	0.061	0.054	0.049	0.131	0.007
Due to dependent emp.	0.112	0.117	-0.055	-0.056	-0.147	-0.211*
None	-0.105	0.113	0.005	-0.024	0.105	-0.203
Joint F-stat.	[2.8]**	[1.1]	[0.6]	[0.3]	[2.7]**	[1.2]
Skills and knowledge						
Strategy and leadership	-0.039	0.046	-0.025	-0.001	0.011	-0.007
Back office	0.029	-0.041	0.007	-0.008	-0.014	0.042
Front office	0.000	-0.004	0.043	0.067*	0.059	0.110**
Industry knowledge	0.044	0.060*	0.031	0.028	0.010	0.012
(3) Personality						
Big five[b]						
Openness	0.042	0.013	0.012	0.030	-0.015	0.041
Conscientiousness	-0.005	-0.040	0.015	-0.031	0.026	-0.027
Extraversion	-0.016	-0.058**	0.004	-0.005	0.010	0.021
Agreeableness	-0.014	0.022	-0.042	-0.010	-0.040	-0.046
Neuroticism	-0.014	-0.035	-0.026	-0.049	-0.042	-0.027

(Table 4.12 continued)

	Survival (same business)		Hybrid persistence		Motivational persistence	
	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
Locus of control[b]	0.037	0.049	0.050	0.072*	0.027	0.042
General self-efficacy[b]	0.001	0.033	0.046	0.014	0.058	0.003
Readiness to take risk[c]	-0.023	-0.063	-0.073	-0.096	-0.129*	-0.151
Squared	0.002	0.004	0.006	0.007	0.010	0.013
Joint F-stat.	[0.1]	[0.9]	[0.8]	[0.8]	[1.4]	[0.7]
(4) *Intergen. transmissions*						
Business takeover						
from parents	0.295***	0.155**	0.051	0.153	-0.087	0.090
Parental self-employment	-0.078	-0.011	0.028	0.016	0.099	0.040
Paternal human capital						
Upper secondary school	-0.067	0.052	-0.099	-0.186*	-0.140	-0.256**
University education	-0.064	-0.035	0.039	0.117	0.132	0.146
(5) *Start-up motives*[b]						
Market opportunity	0.032	0.009	0.020	0.044	0.014	0.038
Career ambition	0.010	0.011	0.007	-0.016	0.011	-0.057
Necessity	0.007	0.004	-0.035	-0.011	-0.059*	-0.021
(6) *Business characteristics*						
Start-up capital						
None or not spec. (ref.)						
<10,000 euros	0.074	-0.120	0.104	0.076	0.093	0.257*
10,000-<50,000 euros	0.127	0.106	0.156*	0.270***	0.160	0.351***
≥50,000 euros	0.279***	0.038	0.233**	0.238**	0.181	0.308**
Joint F-stat.	[5.3]***	[3.7]**	[2.2]*	[3.6]**	[1.1]	[3.0]**
Share of own equity	-0.057	0.149**	-0.033	0.078	-0.013	0.013

(Table 4.12 continued)

	Survival (same business)		Hybrid persistence		Motivational persistence	
	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)	Unemployed founders cond. (β)	Regular founders cond. (β)
	(1)	(2)	(3)	(4)	(5)	(6)
Business sector						
Other sector (ref.)						
Manufacturing, construction	0.108	0.109	-0.034	-0.183	-0.057	-0.294*
Retail	-0.119	0.014	-0.116	-0.108	-0.058	-0.136
Information, financial and IT services	-0.043	-0.185	-0.184*	-0.258*	-0.176	-0.250
Other services	-0.112	0.002	-0.128	-0.126	-0.073	-0.242
Joint F-stat.	[4.8]***	[2.5]**	[1.6]	[0.9]	[0.8]	[1.2]
(7) Regional econ. context						
GDP growth (2012)	-0.005	0.012	-0.004	0.005	-0.007	-0.001
Vacancies per stock of unemployed	0.002	-0.003	-0.006	-0.002	-0.012**	0.002
Change in unemployment rate (2012 v. 2011)	-0.032	0.001	0.078*	0.074	0.154**	0.119
Unemployment rate (2012)	0.017	-0.002	0.018	-0.012	0.012	-0.006
Number of obs.	388	265	388	265	287	208
Joint F-stat.	3.1	3.2	2.5	4.8	3.2	3.9
Joint p-value	0.000	0.000	0.000	0.000	0.000	0.000
Regression-R^2	0.260	0.370	0.201	0.298	0.252	0.328

Note: Reported are robust OLS coefficients (β) using the full specification containing all covariates from all covariate blocks, see equation (4.2) in the text. For details on the definition and construction of the outcome variables, see Table 4.3. ***/**/* indicate statistical significance at the 1/5/10% level.
[a] Reported as share of working time, standardized by age−15.
[b] Initially measured on a 7-point Likert-type scale from 1 "does not apply at all" to 7 "applies completely", see Table 4.10 in the Appendix, Section 4.7, for details, and then standardized.
[c] Measured on a 11-point Likert-type scale from 0 "not at all willing to take risks" to 10 "very willing to take risks", see Table 4.10 in the Appendix, Section 4.7, for details.

Chapter 5

Start-Up Subsidies and Regional Entrepreneurship - Evidence from Germany

Abstract

Many countries offer business support measures to stimulate new business formation, as entrepreneurship is associated with spurring economic growth and reducing unemployment. In Germany, start-up subsidies for unemployed individuals contribute greatly to overall business start-up activity. While there is a growing literature on the effectiveness of these subsidy programs on an individual level, little is known so far about the link between start-up subsidies and entrepreneurship on a regional level. We use regional data on business entries and subsidized start-ups for a sample of regional labor markets to investigate the role of subsidized start-up activity and overall new business formation. In addition, we exploit a major reform of the subsidy program to estimate potential deadweight effects of the policy. Using a very broad definition of deadweight, our results indicate effects of 70% to 80%, which are slightly higher compared with estimates based on survey statistics. As a third contribution, we compare the displacement patterns of subsidized and regular business start-ups on regional business exits and find that, in the short-term, mainly small-scale solo-entrepreneurs with low market attachment are affected.

5.1   Introduction

Entrepreneurship and new business formation are essentially regional phenomena. There tends to be a high persistence of regional new business formation over time and simultaneously a high variation in start-up rates between regions (Andersson and Koster, 2011; Fritsch and Mueller, 2007). The long persistence of entrepreneurial activity lasts over time periods of several decades and survives even radical and abrupt changes in the contextual conditions, which implies the existence of regionally distinct and long-lasting entrepreneurship cultures (Fritsch and Wyrwich, 2014). There is also growing evidence of a positive relationship between regional levels of entrepreneurship and regional development and growth (see, e.g., Fritsch and Mueller, 2008, 2004, Acs and Armington, 2004, for evidence on employment growth and, e.g., Audretsch and Keilbach, 2004, 2005, for evidence on economic growth and productivity).

As a result, many developed countries have introduced various support measures to remove existing barriers for nascent entrepreneurs with the goal of increasing start-up rates and benefiting from the potential economic effects. One particular program is to provide start-up subsidies to unemployed individuals who start a new business to exit unemployment. The aim of the subsidy is to reduce, remove or compensate for disadvantages in human, financial or social capital as compared to non-unemployed business founders, and to act as a mechanism to insure the unemployed founders against the risk of no or low income during the early start-up phase (Caliendo *et al.*, 2017b). There is a growing body of evidence documenting substantial long-term positive effects of start-up subsidies on labor market reintegration and income profiles for program participants at the individual level (see, e.g., Wolff *et al.*, 2016, Caliendo *et al.*, 2016, Caliendo and Künn, 2011, for evidence on Germany and, e.g., Behrenz *et al.*, 2016, Cueto and Mato, 2006, for international findings). From a regional perspective, however, there is only one study, by Caliendo and Künn (2014), that investigates regional effect heterogeneity in the average individual effectiveness of start-up subsidy programs. They find that the program yields higher individual gains in regions with poorer economic conditions. On a more aggregated level, however, the evidence is so far very scarce. Evers and Schleinkofer (2015) find regional heterogeneity in the fraction of subsidized entries relative to the stock of unemployed. Little

is known, however, about the interplay between start-up subsidy entries and *general* regional entrepreneurial activity or their effect on business exits from regional markets.

Recently, public policies promoting new business formation have drawn some criticism (see, e.g., Acs *et al.*, 2016; Shane, 2009). Two of the main objections raised are deadweight and displacement effects associated with start-up subsidies.[1] In a broad sense, deadweight effects describe the extent to which unemployed individuals would have started a business even without the subsidy (Meager, 1996). In a narrower sense, the occurrence of deadweight requires additionally that the subsidy did not have any effect on business performance (Caliendo and Kritikos, 2010). As a summary of the available empirical evidence, Meager (1996) finds deadweight effects (broad sense) for start-up schemes ranging between 30% and 70% internationally.[2] For the first German start-up program, introduced in 1986, deadweight estimates are lower at around 20% (Meager, 1993), while for more recent German programs, based on self-reported survey statistics, deadweight losses range from 50% to 60% (broad sense) and 10% to 20% (narrow sense) (Caliendo *et al.*, 2015c; Evers and Schleinkofer, 2015). Because the more recent measures were surveyed retrospectively approximately 19 months after start-up, however, these estimates are prone to bias, and should be interpreted with caution (Caliendo *et al.*, 2015c; Caliendo and Kritikos, 2010).

The second concern relates to displacement effects. In a broad sense, displacement describes the replacement of existing incumbents by new, innovative and more efficient entrants and is an expected feature of market selection and "creative destruction" (Schumpeter, 1934). In a narrower sense, and with regard to start-up subsidies, it represents the negative external effect of the support measure. It occurs when subsidized businesses use the subsidy as an artificial competitive advantage in the marketplace to replace other start-ups or displace incumbents that are ex-ante (at least marginally) more efficient but did not receive the subsidy (Kösters, 2010). Empirical evidence on this phenomenon is very scarce because displacement is very hard to identify and estimate (Meager, 1996).

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[1] Other concerns relate to adverse selection and moral hazard, see Caliendo *et al.* (2015c, 2017b) for a discussion and empirical evidence.

[2] More recent evidence generally confirms this finding. Self-reported deadweight effects for Sweden amount to around 40% (The Swedish National Audit Office, 2008), whereas in Finland only 23% of unemployed recipients of a start-up grant stated that they would not have established their businesses without the support (Arnkil and Jokinsen, 2014), implying higher deadweight losses.

Closely related is the concept of market churning, which describes a situation in which ill-equipped firms continuously enter and exit the market (revolving door). In the context of start-up programs, this implies that once the subsidy expires, formerly subsidized businesses fail and exit the market (Santarelli and Vivarelli, 2007).

In this paper, we use regional data on business entries, exits, and subsidized start-ups for a sample of regional labor markets in Germany and apply quantitative econometric methods to make the following three contributions. First, we investigate descriptively the regional variation in subsidized start-up activity and its role in overall new business formation on a regional level. Second, we exploit a major reform of the subsidy program at the end of 2011 to estimate potential deadweight effects of the policy. And third, we estimate and compare regional displacement patterns between subsidized and regular entries. Germany is very well suited for these research questions because it has a relatively long tradition of providing start-up subsidies to unemployed individuals as part of its active labor market policy. In addition, business entries arising from these programs represented a substantial share of 35% to 50% of all new business formation between 2006 and 2011.

We find that, first, prior to the reform of the subsidy program, the relative importance of subsidized new business entries for overall entrepreneurial activity exhibited a high regional variation, with shares ranging between 20% and 60%. After the reform, the average share declined to 10% and regional variation has been greatly reduced. Although we do not find a clear pattern between subsidized and regular entry rates, we do find a positive association between regular entrepreneurial intensity and the share of subsidized entrants relative to the pool of potentially-eligible unemployed participants. Second, using a very broad definition of deadweight, we obtain results indicating effects of 70% to 80%, which is comparable to slightly lower measures based on self-reported survey statistics. And third, we observe relatively similar regional displacement patterns for subsidized and regular entries in the short term, with slightly higher effects in magnitude for subsidy entrants. As expected, displacement occurs mainly for small-scope businesses with no employees and low market attachment.

The remainder of this paper is structured as follows: Section 5.2 presents details on the institutional settings of the start-up subsidy program and the

general start-up activity in Germany as a whole before Section 5.3 introduces the regional data set and the estimation sample. Section 5.4 provides some descriptive statistics on the relationship between subsidized entries and overall new business formation on a regional level. After that, Section 5.5 relates to potential deadweight effects and Section 5.6 to displacement patterns before Section 5.7 concludes.

5.2 Institutional settings and start-up activity in Germany

5.2.1 Institutional settings

The start-up scheme we are focusing on in this analysis is the so-called *"Gründungszuschuss"* (new start-up subsidy, SUS), which was initially introduced in August 2006 in Germany and underwent a major reform at the end of 2011 (see Bellmann *et al.*, 2017, for details).[3] In order to be eligible for subsidy receipt, unemployed individuals were required to have a minimum amount of remaining unemployment benefit I entitlement[4] and had to submit a business and financing plan, which had to be evaluated by a competent external institution, to the Employment Agency. The subsidy payment was paid monthly, for a maximum of 15 months, which consisted of two parts: In the first period, participants received an amount equivalent to their previous unemployment benefit I and an additional lump sum of 300 Euros to cover social security costs. In an (optional) second phase, which participants could apply for, only the monthly lump sum was paid.

The major reform in 2011 consisted of three elements: First, eligibility requirements were tightened by increasing the remaining unemployment benefit I entitlement required to be eligible for the program from 90 to 150 days. Second, the first phase, in which the subsidy consisted of both the unemployment benefit amount and the lump sum, was reduced from nine to six months. Conversely, the second phase with the lower subsidy amount consisting only of the lump sum

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[3] This scheme replaced its two predecessor programs, *"Überbrückungsgeld"* (bridging allowance, introduced in 1986) and *"Existenzgründungszuschuss"* (old start-up subsidy, introduced in 2003), which essentially differed in terms of subsidy length and amount (see Caliendo and Kritikos, 2010; Caliendo *et al.*, 2012, for a comparison).

[4] In Germany, every individual who has been in employment subject to social security for at least one out of the last two years is eligible for unemployment benefit I. The amount of the benefit consists of 60% (67% with children) of the last net wage and, as a rule, is paid for a maximum period of 12 months, with the exception of older individuals (see Caliendo and Hogenacker, 2012).

was expanded from six to nine months leaving the total duration intact. And third, the reform changed the entitlement to the subsidy. While approval for the second period (comprising only the lump sum payment) was entirely subject to the assessment of the respective caseworker both before and after the reform, the first subsidy period was changed from a legal entitlement (conditional on meeting all eligibility criteria) to a discretionary decision by the case worker. This means that even if applicants met all requirements, they could still be denied participation after the reform.

5.2.2 Start-up activity in Germany

The reform was accompanied by major budget cuts and had substantial consequences for the scope of the subsidy program. Prior to the reform, annual entry numbers into the program ranged from 120,000 to 145,000 (see the dark gray bars in Figure 5.1a). Following the reform at the end of 2011, entry levels dropped to 20,000 in 2012 and remained at a relatively low level in the years after.

To illustrate the magnitude of the overall start-up activity and the relative importance of the start-up subsidy in Germany on a national level, Figures 5.1a and 5.1b also report the absolute entry levels and entry shares for all start-ups in main activity for Germany between 2008 and 2014.[5] While the Federal Employment Agency provides exact numbers of entries into the program, there is no centralized administrative register for all business founders and new businesses. We therefore have to rely on other (imperfect) data sources or representative estimates based on population surveys to describe the overall start-up activity. One commonly used estimate is based on the German Microcensus (Suprinovič and Norkina, 2015) and represented by the medium gray bars in Figure 5.1a.[6] As a second source, the light gray bars in Figure 5.1a present inventory numbers from the IfM Bonn start-up statistic (Günterberg, 2011), which is based on the official commercial business registrations that we will use later on in the regional analysis as well.

Depending on the data source, the start-up subsidy accounts for a substantial share of 35% to 50% of all business start-ups before the reform. Descriptively,

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[5] We restrict to main activity since program participation required business start-up in main activity as well.

[6] The Microcensus is an annual representative 1% population sample collected by the Federal Statistical Office (Suprinovič and Norkina, 2015).

Figure 5.1: Scope of start-up activity in Germany
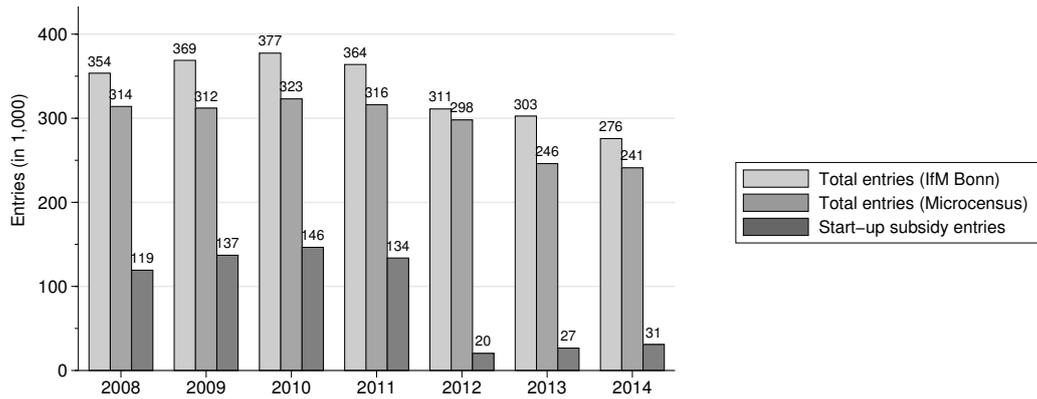
a. Start-up entries

b. Start-up rates

we also observe a development of overall new business formation parallel to the start-up subsidy entries, with a noticeable drop between 2011 and 2012, which is slightly delayed in the Microcensus figures due to its identification procedure of business entries.[7] The entry rates reported in Figure 5.1b, calculated with respect to the workforce, show a similar picture. Pre-reform overall entry rates range between 0.8% and 1.0%, and the SUS entry rate amounts to 0.3% to 0.4%. Post-reform, we observe a drop in overall entry rates (SUS entry rates) to the level of 0.6% to 0.8% (0.1%).

5.3   Data and sample selection

5.3.1   Key variables of interest

Business entries and exits   As mentioned above, Germany lacks a centralized administrative register for all business founders and new businesses. Thus, one of the main challenges is to obtain representative data on business entries and exits for Germany, in particular on a regional level. We will use data on regional commercial business registrations and deregistrations (Leiner, 2002; Fritsch *et al.*, 2002), and apply the same IfM correction procedure to our regional data as Günterberg (2011), who uses it to obtain the IfM Bonn start-up statistics on the national level, because these data are best suited to our research questions, as elaborated below.

According to German law, every new legal independent permanent business activity with the intention to make a profit is required to be registered at the local business registration office, with the exception of entries in primary production, liberal professions[8], as well as insurances and tax accountants (§ 6 *Gewerbeordnung*), which will be excluded from the analysis.[9]

We apply the IfM Bonn correction procedure, which isolates actual original new start-ups and accounts for several shortcomings of the initial business registration statistics as summarized in the following; for details on the structure

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[7] In the Microcensus, interviews are distributed uniformly over all calendar weeks (since 2005) and transitions into self-employment are identified via a retrospective question on the start of the current main employment status, (see Piorkowsky *et al.*, 2013, for details).

[8] There is no definitive legal definition of liberal professions in Germany, nor a centralized registry for all liberal professions (Suprinovič *et al.*, 2011; Kranzusch and Suprinovič, 2011), which makes a statistical collection of the magnitude of liberal professions very challenging, even on the national level. Particularly on the regional level, there are no reliable data available yet.

[9] Thus, business registrations undercover the entirety of start-up activity in Germany.

of the business registration statistics and the IfM Bonn correction procedure; see Figure 5.6a in the Appendix, Section 5.8.2. First, the procedure excludes all registrations due to business migration (relocation from/to another county), business restructuring (change in legal form, partners, or owners), and business conversion (merger, split-up), which are recorded as business registrations but do not represent original new start-ups. Second, the remaining new business formation can further be split up into new establishments and other new businesses. Among new establishments, only new main establishments are counted because subsidiaries and branches lack the crucial feature of business independence. Third, all other new businesses in secondary activity are excluded, which is in accordance with the requirement of the start-up subsidy to set up the new business as main activity. And fourth, the procedure adjusts the number of small business persons. These are, in contrast to main establishments, small-scope businesses that are neither registered at the trade register (*Handelsregister*), nor on the roll of craftsmen (*Handwerksrolle*), nor have any employees at start-up. The IfM Bonn estimates that approximately 10% of all registrations of small business persons are 'fake' in that no business is actually set up after registration. The final number is thus adjusted to 90% of the initial value. All in all, the correction procedure isolates 377,411 business entries for 2010 out of a total of 862,986 business registrations (102,509 main establishments and (adjusted) 274,902 small business persons). An analogous procedure is applied to business deregistrations (in 2010: 713,812) in order to identify actual business exits (in 2010: 251,232); see Figure 5.6b in the Appendix, Section 5.8.2.[10]

Unfortunately, the business registration data do not allow us to track individual businesses over time, and there are no stock data available either. In contrast to other commonly-used data sources for start-up activity in Germany, however, it has several strengths that make it the best-suited data source for our research questions on regional entrepreneurship. First, it is a complete inventory count and does not rely on sample-based estimates like, e.g., the KfW Start-up monitor (Kreditanstalt für Wiederaufbau, 2017). Second, it is collected on the county level and thus representative at a lower regional level, unlike, e.g., the German

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[10] In recent years, local business registration offices have conducted deregistrations on official notice since tax authorities inform them if tax numbers are terminated, so a potential undercoverage of deregistrations is unlikely (Günterberg, 2011). The adjustment for deregistration of fake businesses remains relevant, though.

Microcensus, which is only representative at the national and federal state level (Fritsch *et al.*, 2012). Third, it provides data on both business entries and exits from one consistent data source, unlike the KfW/ZEW Start-up Panel, which covers only entries (Fryges *et al.*, 2010). Fourth, it explicitly contains solo-entrepreneurs, i.e., founders who do not have any employees. This group is not reflected in, e.g., the IAB Establishment panel, where only establishments with at least one employee subject to social security insurance are represented (Ellguth *et al.*, 2014). And fifth, it also covers small-scale marginal businesses, which are heavily underrepresented in, e.g., the Mannheim Unternehmer Panel (Bersch *et al.*, 2016). While the consideration of these small-scope businesses is less relevant in questions of innovation and employment, since their contribution is likely to be negligible, their inclusion is particularly relevant to our analysis related to start-up subsidies for unemployed individuals.

Start-up subsidy (SUS) entries We have a complete inventory count of all entries into the start-up subsidy program on the county level, provided by the Federal Employment Agency. We have to adjust the entry numbers to account for the undercoverage of all business entries by the business registrations and to make our variables consistent. In principle, start-up subsidy entry into primary production and liberal professions, which were excluded for the business entries, is possible. Since we do not have county-specific information on start-up subsidy entries by industry, and because the reform did not lead to any substantial structural changes in importance of these business sectors before and after the reform (Bernhard and Grüttner, 2015), we apply a general correction procedure by reducing the number of start-up subsidy entries by 10%.[11]

5.3.2 Control variables

In our econometric analysis, we include a list of regional characteristics that are related to entrepreneurial activity and are supposed to control for time-varying

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[11] As mentioned above, there is no conclusive legal definition of liberal professions in Germany. In the industry classification WZ 2008, liberal professions are included in the category "liberal, scientific, and technical services," which makes up a share of 20% among SUS entries (Bernhard and Grüttner, 2015). The same category has a share of close to 10% among all start-ups based on the IfM Bonn start-up statistics, which exclude liberal professions. Primary production is negligible in both sources. Thus, we deduct 10% from SUS entries; the results of our empirical analyses are generally robust to moderate changes in this share.

regional effects that are not captured by regional and time fixed-effects; for details see Table 5.4, Panel B, in the Appendix, Section 5.8.1.

Business tax Entrepreneurial activity is generally hampered by administrative barriers and burdens. One possible way to capture this effect is to account for tax levels. In Germany, the only tax varying at the county level is the business tax (*Gewerbesteuer*), whereas the levels of the personal income tax and capital gains tax are set at the national level and are uniform across regions (Audretsch and Keilbach, 2007). Our data set includes information on the business tax multiplier (*Gewerbesteuersatz*), which we obtained from the Regional Database.

Unemployment Unemployment reflects labor market conditions. The direction of the relationship between entrepreneurial activity and the unemployment rate is ambiguous from a theoretical point of view. On the one hand, the recession-push hypothesis states that in times of higher unemployment and fewer vacancies, more people are pushed into self-employment due to a lack of dependent employment alternatives. On the other hand, the prosperity-pull hypothesis argues for a negative relationship. In economically prosperous times, markets grow, and the demand for products and services increases with decreasing unemployment, which spurs new business formation (Thurik *et al.*, 2008). In our case, SUS entries are also a function of unemployment. Data on unemployment stocks were obtained from the Federal Employment Agency and normalized with working-age population.

Economic performance As a measure of prosperity and market size, and thus of entrepreneurial opportunities, we include the gross value added (GVA), normalized by the working-age population. Since it does not include indirect taxes and subsidies, it is a more direct indicator of the goods and services produced in an economy than the gross domestic product (GDP). Data on GVA were obtained from the Regional Database.

Industry structure In order to account for the industry structure of a region, we include a measure of industry diversity. To this end, we construct the normalized Herfindahl index as an inverse measure of industry diversity, where zero represents a very diverse industry structure and the maximum value of 100

indicates maximum concentration (Audretsch and Keilbach, 2007). Information on industry structure is based on the share of establishments and was obtained from the Regional Database.

Working-age population   To normalize business entry/exit rates as well as start-up subsidy entry rates, we use the population in the working age 18 to 64, obtained from the Regional Database.

5.3.3   Unit of oberservation

The smallest administrative unit in Germany on which data on business entries, exits, and start-up subsidy entries are available is the county level (NUTS-3). However, there might be an incongruity between the location of start-up subsidy entry and the location of business entry/exit. Start-up subsidy participants in our data are counted in the county of residence, whereas the commercial business entry/exit has to be registered at the county business registration office where the business will be economically active. If this potential incongruity is not corrected for, regional indicators might be biased. In order to account for this problem, we apply as our unit of observation the concept of regional labor markets (Kosfeld and Werner, 2012). Kosfeld and Werner (2012) define 141 regional labor markets for Germany based on factor analysis under constraints (maximum commuting distances) of all 402 German counties.[12]

A regional labor market is characterized by high intra- but low inter-regional commuter flows and thus ensures an improved congruency between location of residence (start-up subsidy registration) and location of economic activity (business registration).[13] It defines an economic center and surrounding areas from which individuals commute to the center for work, or two close economic centers with high bidirectional commuter flows.

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[12] There were county reforms in Saxony (2008), Saxony-Anhalt (2009), and Mecklenburg-West Pomerania (2011) during our observation period. The regional labor market definitions and our estimation sample are based on the post-reform county demarcations. Data harmonization for the affected counties is straightforward since only affected counties in Saxony are included in our final estimation sample and the assignment from pre-reform counties to post-reform counties was unambiguous for them.

[13] A similar concept accounting for commuting flows is the definition of 96 German local planning regions (*Raumordnungsregionen*) based on commuting flows between counties. Local planning regions, however, are restricted by federal state lines, which is problematic in particular for city-states due to their high interdependences with surrounding counties.

5.3.4   Sample choice and selectivity

Our observation period covers the years 2008 through 2014. The detailed business registration statistics with the detailed subclassifications necessary to construct our business entry and exit measures for this time period could be obtained only for the states of Baden-Wuerttemberg, Berlin, Brandenburg, Bremen, Hamburg, Hesse, Lower Saxony, Rhineland-Palatinate, Saxony, and Thuringia.[14] As a consequence, our estimation sample includes 79 of the 141 regional labor markets (56%). In comparison, the estimation sample covers 54% of all business registrations of main establishments and 54% of all start-up subsidy entries in Germany.

To examine the representativeness of our estimation sample for Germany as a whole, we conduct several selectivity tests between the full sample of regional labor markets and our estimation sample, the results of which are reported in Table 5.5 in the Appendix, Section 5.8.1. We find that our estimation sample is very similar to the full sample in terms of start-up activity, regional characteristics, as well as labor market participation and structure. We do not find any significant differences at the usual significance levels, which makes us confident about the representativeness of our estimation sample.

5.4   Descriptive analysis

5.4.1   Empirical results

In the following empirical analysis, we will examine the spatial variation of business entries and the importance of SUS entries for regional entrepreneurial activity. Figure 5.2 illustrates the spatial distribution of absolute total business entries in 2010 (pre-reform) and 2013 (post-reform), where darker shaded areas imply higher entry numbers.

Not surprisingly, we observe a clear urban-rural divide in start-up activity. The highest absolute number of business entries occurs in the big metropolitan areas, with a maximum of 29,500 ventures created in Berlin in 2010 (Figure 5.2a). The distribution of start-ups is heavily skewed toward the lower end, however, with an average (median) number of start-ups amounting to 2,590 (1,300) in 2010. After the reform in 2013, the spatial distribution is relatively similar but at lower

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[14] Data from other states could not be obtained because they were not available or not freely accessible.

Figure 5.2: Regional absolute entries (in 1,000)

b. 2013

[4.30]
(2.4]
(1.2]
(.5,1]
[0,.5]

a. 2010

[4.30]
(2.4]
(1.2]
(.5,1]
[0,.5]

Note: White shaded regional labor markets are not part of the estimation sample.
*Source:* Own calculations based on business registration statistics, see text for details.
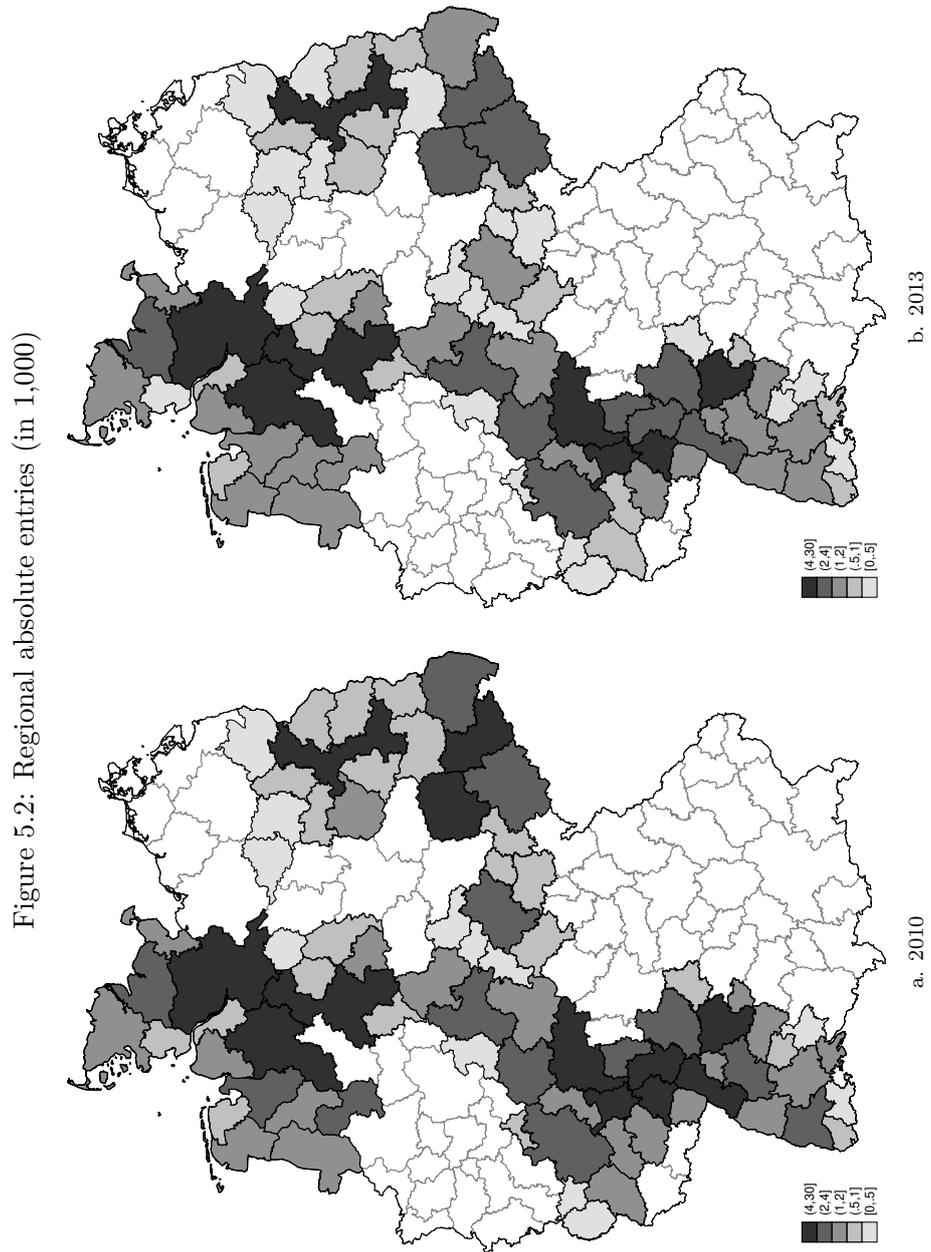
levels (Figure 5.2b). The average number of start-ups decreased to 2,150, the median amounts to 1,050.

To compare business start-up intensities across regional labor markets, the gray shaded areas in Figure 5.3 represent normalized entry rates with respect to the working-age population, again for 2010 and 2013. While the highest entry rates can be observed in big metropolitan areas in Berlin and Frankfurt/Main, others such as Hannover and Stuttgart in the West, and Leipzig and Dresden in the East, display intensities closer to the average of 6.2 (median: 6.0) before the reform (Figure 5.3a). After the reform, the spatial distribution is again similar in relative terms, but at lower levels (see Figure 5.3b). The average (median) entry rate decreases to 5.0 (4.9).

The white areas in the superimposed pie charts in Figure 5.3 represent the share of SUS entries over all entries and thus their relative importance for new business formation. On average (in the median), SUS entries constitute 39% (38%) of all business entries pre-reform in 2010 (Figure 5.3a), with high regional variation. While in Eastern regions and the very South shares range between 30% and 60%, the subsidy is less relevant in other areas, with shares as low as 20%. After the reform (Figure 5.3b), however, shares massively decreased and the regional variation is substantially reduced, with SUS intensities ranging between 2% and 29% and an average (median) value of 9% (8%), demonstrating the heavily restrictive impact of the subsidy reform.

To learn more about the relationship between regional SUS entries and overall regional start-up activity, Figure 5.4a plots SUS entry rates against regular entry rates (as the difference between overall and SUS entry rates). The light gray squares (black dots) represent regional labor markets in 2010 (2013). At first glance, there is no clear relationship between SUS and regular entries either prior to or after the reform. While there is substantial regional variation in regular entries along the horizontal axis, the range of SUS entries is rather limited and the pattern does not reveal any systematic relation, in particular for 2013. Consequently, we find only weak positive simple correlation coefficients that are insignificant at usual levels. As some obvious outliers might influence the findings, we verify our results with a trimmed sample in which the regional labor markets with the 5% lowest and highest entry rates are excluded. While results are robust for the post-reform year, the correlation becomes negative and significant for

Figure 5.3: Regional entry rates and shares of subsidized start-ups

a. 2010

b. 2013
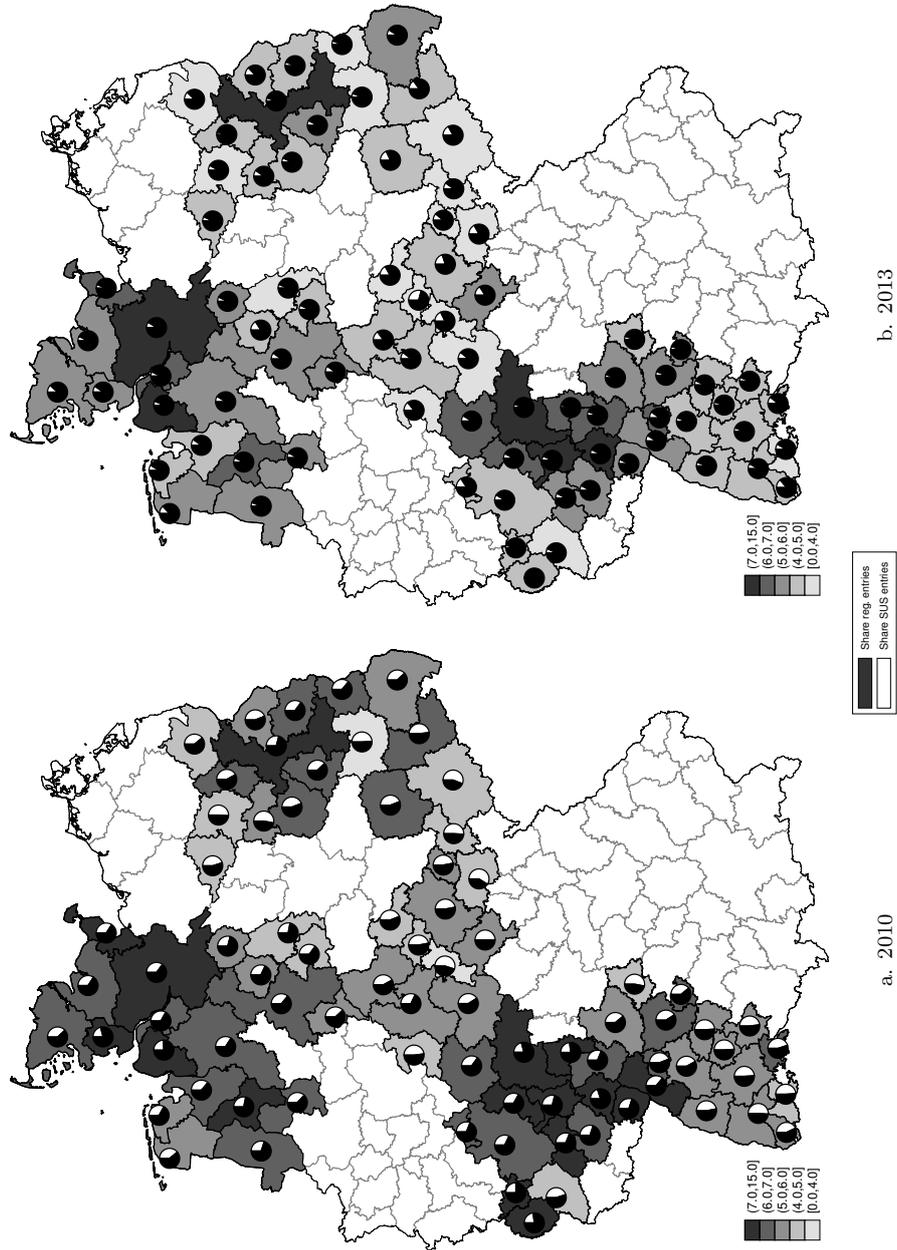
Note: Entry rates measured as entries per 1,000 in population aged 18–64. White shaded regional labor markets are not part of the estimation sample.
Source: Own calculations based on business registration statistics and the Federal Employment Agency, see text for details.

Figure 5.4: Association between regular entries and subsidized entries
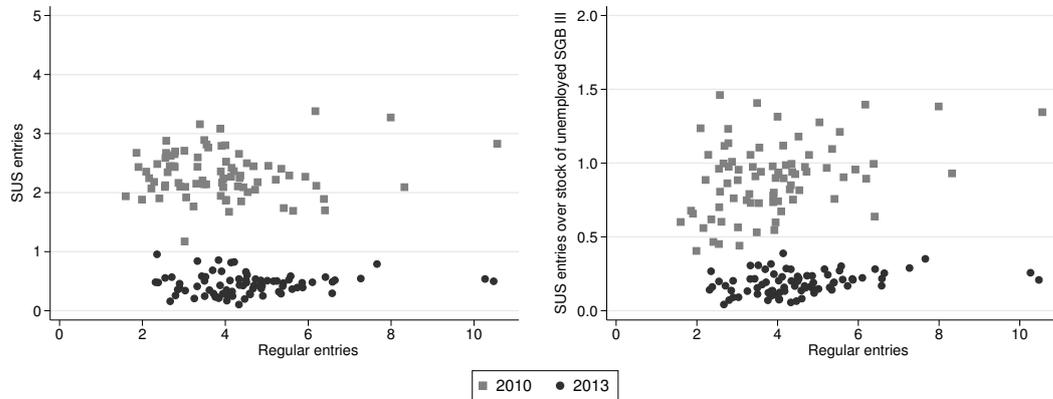
a. Subsidized entries versus regular entries

b. Subsidized entries over stock of
unemployed SGB III versus regular entries

Note: Entries measured as entries per 1,000 in population aged 18-64 (unless stated otherwise).
Source: Own calculations based on business registration statistics and the Federal Employment Agency, see text for details.

2010, implying that SUS entries could be relatively more important in areas with lower regular start-up activity.

Since subsidy entries are a function of unemployment and unemployment might simply be lower in areas with higher regular start-up activities, we plot the SUS entries relative to the stock of unemployed SGB III against regular entry rates (see Figure 5.4b) where unemployment SGB III is a proxy for the potentially-eligible participant pool for the start-up subsidy.[15] The purpose of this graph is thus to examine whether there is a relationship between regular business formation and the share of actual participants among all potentially-eligible participants. Both prior to and after the SUS reform, we find a positive relationship (correlation coefficients around 0.35 and significant). This implies that in regions with more regular entrepreneurial activity, there is lower unemployment SGB III[16] and, at the same time, a higher proportion of potentially-eligible unemployed individuals who participate in the program.[17,18]

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[15] In distinction from unemployed SGB III, other job seekers are counted as unemployed SGB II, which roughly covers recipients of means-tested welfare benefits who are ineligible for unemployment benefit I.

[16] The negative correlation is verfied by simple correlation coefficients and robust to using overall unemployment.

[17] Interestingly, in the first post-reform year, 2012, this positive correlation is muted and, for the trimmed sample, close to zero and insignificant, which shows the expected leveling effect of the restrictive (supply-side) reform in its direct aftermath (see Section 5.5 for details).

[18] As a robustness check, the same pattern emerges if we replace subsidy entries per *stock* of unemployed SGB III with subsidy entries relative to *entries* to unemployed SGB III (see Figure 5.7 in the Appendix, Section 5.8.2, for details).

5.4.2 Summary and discussion

To sum up, we find a high regional variation with respect to total new business formation where, in line with previous evidence on regional entrepreneurship (e.g., Fritsch and Mueller, 2007), the relative pattern is relatively constant over time. SUS entries represented on average 40% of all new business formation before the subsidy reform, with high regional variation. After the reform, the importance of SUS entries declined sharply to 10% on average, with lower regional variation, underlining the impact of the subsidy reform on a regional level. There is no clear pattern between SUS and regular entries pre- or post-reform, but we do find a positive relationship between regular entries and the share of SUS entries among all potentially-eligible unemployed individuals (in particular prior to the reform, when access to participation was easier). This positive association could reflect the fact that unemployed individuals benefit from an environment that is more favorable in terms of higher demand, the availability of regional networks, social capital, information and infrastructure in regions with higher regular start-up intensities. A closely related explanation could be a stronger regional entrepreneurship culture in terms of the social attitude towards or acceptance of entrepreneurship (Fritsch and Wyrwich, 2014), which evidently also translates to unemployed individuals.

5.5 Deadweight effects

5.5.1 Empirical strategy

In the following section, we examine the impact of the subsidy reform on the relationship between regional SUS entries and total new business formation in order to identify potential deadweight effects of the program. The particular institutional details of the reform and the accompanying circumstances allow us to exploit the structural change at the end of 2011 for this purpose.[19]

On the one hand, the reform imposed major supply-side restrictions. The crucial element of the institutional reform was the shift from (conditional) legal

---

[19] In general, there was only one other massive restructuring of start-up subsidy programs for unemployed individuals in Germany: the new start-up subsidy's replacement of its two predecessor programs (bridging allowance and old start-up subsidy) in 2006. That reform occurred shortly after the general overhaul of the German labor market (*Hartz reforms*), however, and all three programs offered (conditional) legal entitlement to participation, which is why the former reform is unsuitable for our analysis.

entitlement pre-reform, where every eligible applicant meeting the entry criteria had access to participation, to discretionary approval of the subsidy by the case-worker post-reform. Combined with the major budget cuts that motivated and accompanied the institutional reform, the policy shift led to a sharp decline in SUS entries after 2011 (Bernhard and Grüttner, 2015). The consequences of the reform and the accompanying budget cuts can be viewed in Figure 5.5a, where annual entries (dark bars, in 1,000) and annual expenditures (light bars, in 10 million Euros, in- or deflated to the base year 2010) are reported for the years 2008 to 2014. As described above, entry numbers peaked in 2010, with 146,000 participants starting the SUS program that year, and slightly decreased to 134,000 in 2011. After the reform, only 20,000 (2012) to 30,000 (2014) individuals entered the program per year. Accordingly, total annual SUS expenditures decreased from 1.87 billion Euros in the peak year 2010 to 0.3 billion Euros in 2014. The relatively high amount of 0.86 billion Euros in the first post-reform year, 2012, can be explained by funds commitments of SUS entries in 2011 that carried over into 2012.

On the other hand, no meaningful demand-side shocks can be observed for the period around the reform. In particular, labor market conditions were relatively stable between 2011 and 2012. Figure 5.5b shows the unemployment rate (solid line) and vacancies per unemployed (dashed line), both for unemployed individuals overall (dark gray) and for unemployed SGB III (light gray), where the latter again approximates the pool of potentially-eligible SUS applicants. In addition, the bars in Figure 5.5b depict entries into unemployment overall (sum of stacked bars) and into unemployment SGB III (light gray bars). For all indicators, the overall trend is very stable between 2011 and 2012, indicating that no major demand-side shock to the potentially-eligible applicant pool occurred during the reform that could provide a meaningful alternative explanation for the sharp reduction in SUS entry numbers. Bernhard and Grüttner (2015) conclude that the major decline in SUS entries originates predominantly from the reform. In line with this conclusion, the formal rejection rate of SUS applicants increased from 2% pre-reform (2011) to 30% in the first post-reform year (2012). Total application failures, which additionally cover withdrawals of applicants, increased from 9% to 50% in the same period (Bernhard and Grüttner, 2015). The ratio of monthly SUS entries over the stock of unemployed individuals SGB III, where

Figure 5.5: Consequences of the SUS reform and labor market conditions
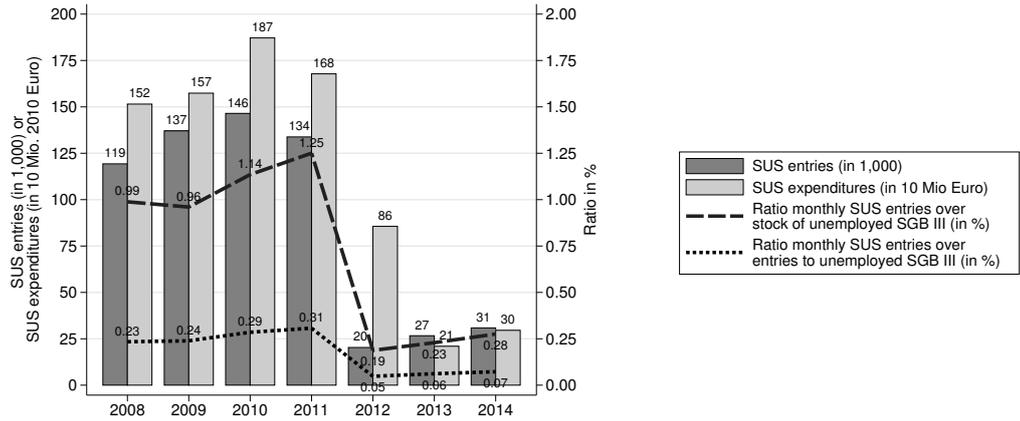
a. Reform of SUS
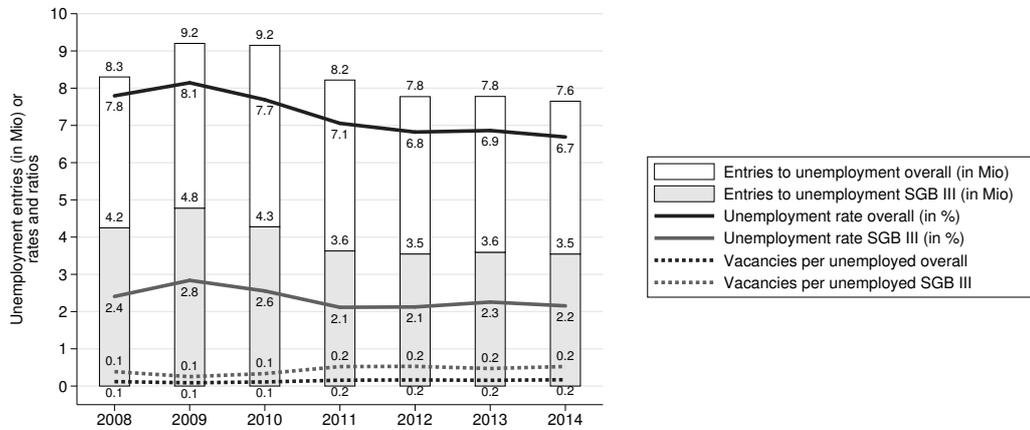
b. Labor market conditions

Note: Expenditures are in-/deflated to 2010. Unemployment rates are calculated with respect to the workforce.
Source: Own illustrations based on the Federal Employment Agency.

the denominator again works as a proxy for the pool of potentially-eligible SUS applicants, sharply decreased between 2011 and 2012, from 1.2 to 0.2 (see the dashed line in Figure 5.5b) (following Bernhard and Grüttner, 2015). The same is true for the ratio of monthly SUS entries over the inflow to unemployment SGB III (dotted line in Figure 5.5b), which also exhibits a noticeable drop between 2011 and 2012. To sum up, the institutional change from (conditional) legal entitlement to discretionary approval was implemented to massively restrict entry into the subsidy program, whereas no meaningful demand-side changes occurred.

These particular circumstances of the reform enable us to estimate deadweight effects. We restrict our analysis to the broad definition of deadweight to answer the question of how many individuals would have started a business even in the absence of the subsidy. To this end, we regress the change over time Δ in total business entries on the change in SUS entries, the change in SUS entries interacted with a post-reform dummy, and a vector of control variables:

$$
\begin{aligned}
\Delta\text{Total entries}_{it} \;=\; & \beta \cdot \Delta\text{SUS entries}_{it} \\
& + \; \delta \cdot \Delta\text{SUS entries}_{it} \times \mathbf{1}(\text{Post-reform}_t) \\
& + \; \alpha \cdot \Delta\text{Controls}_{it} \; + \; \nu_t \; + \; \Delta\epsilon_{it}, \quad\quad (5.1)
\end{aligned}
$$

where i and t are the regional and time indices and ϵ_{it} is an error term. In this simple econometric model, β describes the reaction of total entries to changes in SUS entries before the reform. We expect $\beta = 1$ because one additional SUS entry should ceteris paribus result in one additional entry overall. Our key parameter of interest is δ. It describes the *change in the reaction* of total entries to changes in SUS entries *post- versus pre-reform.* If there is zero deadweight, then we expect the reaction of total entries to a change in SUS entries to remain the same from before to after the reform, i.e., $\delta = 0$. This would imply that a reduction in SUS entries c.p. fully translates to a corresponding reduction in total entries on average. If, in contrast, we assume full deadweight, then we expect $\delta = -1$, as a reduction in SUS entries does c.p. not translate to any reduction in total entries.

Differencing over time eliminates unobserved time-constant regional fixed effects. To maximize the statistical power of the estimations, we use two-year differences (instead of first-differences) in our baseline approach so we can use

not only the first post-reform year 2012 but additionally include 2013 as well. To account for the panel nature of our data set, standard errors are clustered on the regional labor market level. To capture national time trends, all specifications include time fixed-effects ν_t. Our full specification additionally controls for changes in regional characteristics on the business tax multiplier, the unemployment rate, GVA_{t-1} per person, and industry diversity as described above (see Table 5.4 in the Appendix, Section 5.8.1, for details).

5.5.2 Empirical results

Results are reported in Table 5.1. Column 1 contains the results of a parsimonious base specification, whereas column 2 presents the findings for the full specification including regional control variables. The coefficients in Panel A are relatively stable across both specifications. The estimated β is close to 1 in both cases, the estimated change in the reaction δ amounts to -0.75 to -0.8 and is highly significant. They imply deadweight effects of between 75% and 80% using the broad definition of deadweight effects. The t-tests in Panel B examine the equality of β to unity and do not provide strong evidence against the null hypothesis, which we take as confirmation of the model and data. Since the β-coefficients slightly differ from 1 in absolute terms, presumably due to the measurement errors in the data and the parsimonious character of the model, we rescale the deadweight effects by dividing the change in the reaction δ by the initial reaction before the reform β. This procedure should give us a more accurate estimate of deadweight effects. The results are reported in Panel C. In both specifications, we find deadweight effects of 80%, which are highly significant.

To test the sensitivity of these findings, we apply several robustness checks, which generally confirm our findings. Results are reported in Table 5.6, Panel A, in the Appendix, Section 5.8.1. As a benchmark, our baseline results from Table 5.1 are reported in column 1. In column 2, we include the unemployment rate SGB III instead of the overall unemployment rate, in order to directly account for changes in the pool of potentially-eligible SUS participants. Column 3 replaces the overall unemployment rate with the entries to unemployment SGB III in order to control for changes in the inflow to the pool of potentially-eligible SUS participants. Column 4 considers the broad definition of business entries, including business transfers. In column 5, we restrict the pre-reform years to

Table 5.1: Deadweight effects

	Specification	
	Base	Full
	(1)	(2)
A. Regression results		
SUS entries (β)	1.000***	0.939***
$\times$ Post-reform (δ)	-0.801***	-0.752***
Business tax[a]		-0.000
Unemployment rate		0.073
GVA$_{t-1}$ p.p.		0.011***
Industry diversity		0.009***
Time fixed-effects	yes	yes
R^2	0.647	0.652
Number of obs.	316	316
B. t-test: $\beta = 1$		
p-value	0.999	0.728
C. Implied % change in response		
$= \beta/\delta \cdot 100\%$	-80.1***	-80.0***

Note: Entries are normalized with population aged 18-64. Standard errors are clustered on regional labor market level. ***/**/* indicates statistical significance at the 1/5/10% level.

2010 and omit 2011. Column 6 uses first-differences (in contrast to two-year differences). Results are moderately sensitive, presumably due to anticipation effects.[20] To mute the potential anticipation effect, we compute two-year averages pre- and post-reform and again apply first-differences (column 7). Overall, results of our various sensitivity checks are relatively robust and consistently yield deadweight effects of 70% to 80%. As a second sensitivity analysis, we trim the sample of those regional labor markets with the 5% lowest and highest entry rates, and rerun all regressions from above. Findings are reported in Panel B of Table 5.6. The coefficients are slightly lower, but the implied deadweight effects are in general very close to the original results.

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[20] There is anecdotal evidence that the restrictive nature of the reform was partly known during the second half of 2011. Bernhard and Grüttner (2015) speculate that particularly individuals with higher unemployment benefit I (and thus higher subsidy payments during the main funding period) initiated their program entry before the end of 2011. If these individuals are most prone to deadweight (since they are the least dependent on the payments due to higher available resources), this would induce an underestimation of deadweight in our model applying first-differences in line with our empirical evidence.

5.5.3   Discussion and limitations

Clearly, our estimated deadweight effects of 70% to 80% only reflect the broad definition (first dimension) of deadweight, i.e. whether individuals would have started a business even in the absence of the subsidy. Self-reported survey statistics on the same subsidy program find slightly lower estimates of 50% to 60% for this first dimension of deadweight (Bernhard and Grüttner, 2015; Caliendo *et al.*, 2015c). Since those were surveyed retrospectively approximately 19 months after start-up, and participants might be hesitant to admit to deadweight behavior, this deviation does not seem implausible. Comparing our findings to previous non-survey-based estimates in the literature, we note that Meager (1993) finds deadweight effects (broad sense) of only 10% to 20% for the bridging allowance in 1986, which was the first start-up support program for unemployed individuals in Germany and exhibited similar institutional settings as the current start-up subsidy (see, e.g., Caliendo and Kritikos, 2010, for details).[21] While Meager (1993) exploits the introduction of an entirely new program at that time, we use the massive restriction of access to an already existent subsidy in our analysis 25 years after this type of scheme was established in Germany. The difference in findings over time might reflect an additional, more subtle effect of this type of program. The existence of start-up subsidies for unemployed individuals, in particular of those with a substantial program scope as in Germany, could work as a signal informing about self-employment as a possible way out of unemployment and an "accepted" employment alternative to a regular job. The increase in deadweight effects (at least in its broader definition) over time thus might reflect changes in attitudes towards self-employment and an increase in "entrepreneurial spirit".[22] We take the increasing self-employment rates[23] in the non-primary sectors over the last three decades, reported in Figure 5.8 in the Appendix, Section 5.8.2, as descriptive supporting evidence of these reflections.

Our analysis faces several limitations: First, in contrast to survey-based estimates, we cannot consider the second dimension of deadweight in a narrow

---

[21] Meager (1993) analyzes outflows from unemployment to self-employment in 1986 to identify deadweight.

[22] In line with this finding, Fritsch *et al.* (2015) show that almost half of the rise in self-employment levels between 1991 and 2009 in Germany cannot be explained by demographic developments, the structural shift towards the service sector, or the larger share of population with tertiary education. Rather, this result is interpreted to reflect more positive attitudes towards entrepreneurship in the population, which can be attributed, inter alia, to policy measures promoting entrepreneurial activity.

[23] We use self-employment rates instead of business entries due to better data availability.

definition, i.e., whether the subsidy had any impact on business performance. Survey statistics incorporating both dimensions yield estimates of 20% to 30% for the German subsidy program (Bernhard and Grüttner, 2015; Caliendo *et al.*, 2015c). And second, we cannot observe whether individuals change the timing or scope of their business start-up, which could be taken into account for even more refined measures of deadweight.

5.6 Displacement patterns

5.6.1 Empirical strategy

As our third empirical analysis, we will examine the relationship between regional business entries and exits to determine short-term displacement patterns.[24] From a theoretical perspective, we anticipate that the short-term displacement patterns are higher for marginal small business person exits than for exits by main establishments, which generally exhibit a higher market attachment. If the concerns about the start-up subsidy program are valid, then we would also expect short-term displacements to be higher for SUS entries compared to regular entries for the following three reasons. First, unemployed (or, in our case, unemployed subsidized) founders are more likely to choose overcrowded, highly-competitive, low-margin sectors with low entry barriers (e.g., services), and less likely to enter into, e.g., manufacturing (Shane, 2009).[25] In these overcrowded markets, the competitive edge given by the subsidy is likely to have more direct, consequential, and prompt effects on incumbent businesses. Second, SUS entries are on average less innovative and less likely to be "novel entrepreneurship" (Acs *et al.*, 2016). That is to say, unemployed founders tend to compete *in* the market rather than *for* the market (Acs *et al.*, 2016; see Caliendo *et al.*, 2015c, 2017b, for descriptive evidence on innovativeness differences between SUS and regular entries). The third reason relates to market churning. Ill-equipped firms with lower survival chances enter and exit markets more quickly. In our context, this translates to a scenario where SUS businesses leave the market shortly after the subsidy expires (Santarelli and Vivarelli, 2007). Taken together, the differences in short-term aggregated displacement patterns between SUS and regular entries, in particular

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[24] Due to data limitations, we have to refrain from analyzing longer-term effects.

[25] We do not have any information on industry in our data. See Caliendo *et al.* (2015c) for descriptive evidence on sector choice differences between SUS and regular entries.

with respect to small business person exits, best reflect the negative effects of displacement (i.e., market churning and the replacement of incumbent businesses using the subsidy advantage) rather than the effects of creative destruction, where innovative disruptive entrances create or explore new markets, yield higher market efficiency and push less-efficient incumbents out of the market only after a longer period of time.

In general, entries have both a direct (instantaneous) and lagged effect on exits. We thus apply a macro-framework with lag-structure (e.g., Dahlberg and Forslund, 2005; Hujer *et al.*, 2006) using the following model:

$$
\begin{aligned}
\tau(L)\text{Exits}_{it} \;=\;& \theta(L)\text{SUS entries}_{it} \;+\; \gamma(L)\text{Reg. entries}_{it} \\
&+\; \alpha \cdot \text{Controls}_{it} \;+\; \mu_i \;+\; \nu_t \;+\; \epsilon_{it},
\end{aligned}
\tag{5.2}
$$

where $\tau(L)$, $\theta(L)$ and $\gamma(L)$ are polynomials in the lag operator, μ_i and ν_t are regional and time fixed-effects, and ϵ_{it} is an idiosyncratic error term. Since the maximum duration of the subsidy is 15 months and the main subsidy payment occurs during the first six to nine months, we specify the model using one lag. Rearranging and first difference transformation eliminate regional fixed-effects and yields:

$$
\begin{aligned}
\Delta\text{Exits}_{it} \;=\;& \theta_0 \cdot \Delta\text{SUS entries}_{it} \;+\; \theta_1 \cdot \Delta\text{SUS entries}_{it-1} \\
&+\; \gamma_0 \cdot \Delta\text{Reg. entries}_{it} \;+\; \gamma_1 \cdot \Delta\text{Reg. entries}_{it-1} \\
&+\; \tau_1 \cdot \Delta\text{Exits}_{it-1} \;+\; \alpha \cdot \Delta\text{Controls}_{it} \;+\; \nu_t \;+\; \Delta\epsilon_{it}.
\end{aligned}
\tag{5.3}
$$

In this model, the lagged dependent variable in first differences as regressor $\Delta\text{Exits}_{it-1} = \text{Exits}_{it-1} - \text{Exits}_{it-2}$ is per construction correlated with the error term $\Delta\epsilon_{it} = \epsilon_{it} - \epsilon_{it-1}$ via ϵ_{it-1}. To account for this endogeneity, Arellano and Bond (1991) (AB) propose an instrumental variable estimator that uses the lagged values of the dependent variable $\text{Exits}_{it-2}, \ldots, \text{Exits}_{it-K}$ as instruments. A similar endogeneity concern in this context could be that entries and exits

are determined simultaneously, for which we do not find any empirical evidence, however.[26]

We implement the AB estimator by a two-step optimal GMM procedure, where in the first step the optimal weighting matrix is obtained. To account for the asymptotical downward bias in the standard errors of this approach (Bond and Windmeijer, 2005), we apply the finite sample correction by Windmeijer (2005).

All specifications again include a full set of year dummy variables ν_t as controls to capture national trends. Our preferred full specification additionally includes regional characteristics on the business tax multiplier, the unemployment rate in $t-1$, GVA_{t-1} per person, and industry diversity as described above (see Table 5.4 in the Appendix, Section 5.8.1, for details).

The coefficients we estimate reflect conditional correlation patterns between entries and exits. Instead of focusing on the absolute levels of the estimated coefficients, however, we will concentrate on the differences between the patterns of SUS and regular entries. To this end, we will also report the so-called lag-coefficients. They describe how a change in entries in t affects exits in the current and future periods. These differ from the estimated model coefficients because the entries in $t-1$ have both a direct effect on $Exits_t$ (for SUS entries, the direct effect is θ_1) as well as an indirect effect via their effect on $Exits_{t-1}$ (for SUS entries, the indirect effect is $\theta_0 \cdot \tau_1$) (see, e.g., Stock and Watson, 2012, for details). Results for the individual and cumulated lag-coefficients will thus also be presented separately.

5.6.2 Empirical results

Results for the estimated displacement patterns are reported in Table 5.2, the corresponding lag-coefficients are presented in Table 5.3, where each time column (1) refers to total exits. In order to examine effect heterogeneity, we also divide total exits into exits by main establishments (column 2) and exits by small business persons (column 3), as described above.

---

[26] To test this, we conduct the estimations treating all entry variables as endogenous and instrument them accordingly with their lagged values $\text{Entries}_{it-2}, \ldots, \text{Entries}_{it-K}$. The results are very similar in magnitude. Hausman (1978) tests examining the equality of coefficients between these estimations and our baseline results do not lead to rejection of equality in any case (see Table 5.7 in the Appendix, Section 5.8.1, for details). Since the estimations with instrumented entries are less efficient, however, we prefer the baseline results.

Table 5.2: Displacement patterns

	Total exits (1)	Main estab. (2)	Small business pers. (3)
A. Estimation results			
SUS entries			
in t	0.195	0.004	0.183
in $t-1$	0.219*	0.016	0.222**
Reg. entries			
in t	0.216***	0.061***	0.163**
in $t-1$	0.140**	-0.020	0.152***
Exits			
in $t-1$	0.128	0.230*	0.058
Regional controls	yes	yes	yes
Time fixed-effects	yes	yes	yes
Model χ^2	312.9***	47.2***	390.1***
Sargan χ^2	20.1	24.1**	22.3*
AR(1)-z	-1.9*	-3.7***	-1.7*
AR(2)-z	-0.4	-0.8	-0.3
Number of obs.	395	395	395
B. Difference in coefficients between SUS and reg. entries			
in t	-0.021	-0.057	0.020
in $t-1$	0.078	0.036	0.070

Note: Reported are results using the Arellano-Bond (1991) approach. Entries and exits are normalized with population aged 18-64. Robust standard errors with Windmeijer (2005) correction are reported. ***/**/* indicates statistical significance at the 1/5/10% level.

Before taking a closer look at the detailed displacement patterns, we examine the model diagnostics. The overall model fit of our full specification for total exits as reported in Table 5.2, column (1), is highly significant. The Sargan test of overidentifying restrictions (Sargan, 1958; Hansen, 1982) cannot be rejected at usual significance levels, indicating that the additional instruments are valid. For consistent estimation results, the AB approach requires the errors ϵ_{it} in the original model (equation 5.2) to be serially uncorrelated, which implies for the transformed model (equation 5.3) in first-differences autocorrelation of order 1 but not of higher order.[27] The Arellano and Bond (1991) tests for autocorrelation do not provide any evidence against the consistency of our results. While the null hypothesis of no autocorrelation of order 1 can be rejected as expected, there is no significantly strong evidence to reject the null-hypothesis of there being no autocorrelation of order 2.

---

[27] To be precise, if ϵ_{it} are serially uncorrelated, then $\Delta\epsilon_{it} = \epsilon_{it} - \epsilon_{it-1}$ are correlated with $\Delta\epsilon_{it-1} = \epsilon_{it-1} - \epsilon_{it-2}$ via ϵ_{it-1} per construction. However, $\Delta\epsilon_{it}$ will not be correlated with $\Delta\epsilon_{it-s}$ for $s \geq 2$.

Table 5.3: Lag-coefficients of displacement patterns

	Total exits (1)	Main estab. (2)	Small business pers. (3)
A. SUS entries			
t	0.195	0.004	0.183
$t+1$	0.244**	0.017	0.233**
cumulated	0.438**	0.021	0.415***
B. Reg. entries			
t	0.216***	0.061***	0.163**
$t+1$	0.168***	-0.006	0.162***
cumulated	0.384***	0.055**	0.324***
C. Difference in lag-coef. betw. SUS and reg. entries			
t	-0.021	-0.057	0.020
$t+1$	0.076	0.023	0.071
cumulated	0.054	-0.034	0.091

Note: Results are based on estimations using the Arellano-Bond (1991) approach on the full specification, see Table 5.2. Entries and exits are normalized with population aged 18-64. ***/**/* indicates statistical significance at the 1/5/10% level.

Turning to our main results, we find for SUS entries relatively similar coefficients for the contemporaneous and lagged values on total exits, implying a relatively stable displacement pattern (Table 5.2, column 1) over the first two years. The displacement coefficient in t for regular entries is of similar magnitude, whereas the coefficient for lagged regular entries is lower. For both variables, the coefficients do not differ significantly, however, as reported in Panel B of Table 5.2. Once we split total exits into exits by main establishments (column 2) and small business persons (column 3), we discover that the results for total exits are mainly driven by the latter, as expected. While the displacement coefficients for main establishments are generally close to zero and mostly insignificant for both types of entries, the entry of new businesses affects mainly small-scale marginal businesses. For those, we observe for both contemporaneous as well as lagged entries that the magnitude of the displacement coefficients is higher for SUS entries compared to regular entries, though not significantly so.

Table 5.3 reports the corresponding lag-coefficients that express how one additional entry affects exits in the current and future periods by taking into account the dynamic nature of the underlying estimation model. As we can see, the pattern between SUS and regular entries differs to some extent in that the

effect of SUS entries is relatively stable or even increases over time. In contrast, regular entries have the strongest impact in the instant period, but the effect diminishes or at most remains stable in future periods. This result is true for total exits (column 1), main establishment exits (column 2), as well as small business person exits (column 3). These slightly-diverging patterns in the future period could be a sign of market churning by SUS entries, who exit the market after the subsidy period expires. If we cumulate the effects over the two periods, we observe that for both total exits and in particular small business person exits, which mainly drive the results, the cumulated displacement effects are (descriptively) higher for SUS entries. However, we again fail to observe statistical significance for the differences at the usual levels.

Our estimation results are relatively robust; in particular the higher (but insignificantly so) displacement patterns of SUS entries for small business persons are relatively insensitive to using the trimmed sample (excluding the regional labor markets with the 5% lowest and highest entry rates), as can be seen in columns 1 to 3 of Table 5.8 in the Appendix, Section 5.8.1. One concern might be that the results are confounded by the restrictive SUS policy reform and the massive shift from SUS to regular entries in 2012 that followed, which would have an equalizing effect on the displacement patterns between SUS and regular entries. This is why we rerun our estimations but exclude the year 2012, which is the year most directly affected by the policy shift; results are reported in Table 5.8, columns 4 to 6 (full sample) and 7 to 9 (trimmed sample) in the Appendix, Section 5.8.1. As expected, the higher displacement patterns for SUS entries with respect to total exits and in particular small business person exits are even more pronounced than in our baseline results, but differences to regular entries are still insignificant at usual levels.

5.6.3 Discussion and limitations

Overall, we observe similar short-term displacement patterns for SUS and regular entries, where displacements occur mainly for small-scale solopreneurs with presumably low market attachment as expected. We find descriptively slightly higher effects for SUS entries than for regular entries, but differences are not significant at usual levels. The slightly-diverging patterns for future periods might indicate the occurrence of some market churning and is in line with

individual-level evidence, which shows a spike in exit rates after the end of the main funding period (Bellmann *et al.*, 2017). These findings are likely to be a lower bound of the differences in displacement patterns since the restrictive reform of the subsidy shifted a substantial share of founders from SUS to regular entry, for which we find some weak descriptive evidence in our sensitivity analysis. Taken together, although we do not find significantly different patterns, presumably due to our small sample size, the descriptive evidence points to slightly higher short-term displacements of small-scale marginal businesses and market churning by SUS entries. If we take this as an indirect indicator of the negative displacement effects of the subsidy, this finding raises some concern that subsidized businesses enter mainly highly competitive markets and replace other marginal businesses or conduct market churning.

Our analysis is limited by several data restrictions. We cannot examine longer-term effects due to the given time window and thus cannot analyze effects on employment and market efficiency, which usually manifest themselves in the medium and longer run (e.g., Fritsch and Mueller, 2004, 2008). A distinction between displacement (exit of another business) and revolving door (exit of the same business) cannot be implemented because we cannot track individual businesses over time. In addition, we observe only realized exits so any displacement of business volume, market shares or employment is not captured. Therefore, we cannot isolate the (causal) displacement effect in a narrow sense, i.e. the induced negative external effect of the SUS, either. As a final remark, we also cannot observe the reason for the exit or the post-exit employment status, that means, not every business exit is necessarily equivalent to a business failure and a transition to unemployment.

5.7 Summary and conclusion

In many developed countries, programs encouraging and supporting unemployed individuals to escape unemployment by starting their own businesses have become a common tool of active labor market policy in recent years. While there is a growing literature providing mounting evidence of the individual-level effectiveness in improving labor market reintegration and income profiles for participants (e.g., Wolff *et al.*, 2016, Caliendo *et al.*, 2016, Behrenz *et al.*, 2016), empirical evidence about start-up subsidies and their link to overall entrepreneurship

on a more aggregated level is rather scarce.[28] Yet entrepreneurial activity is a profoundly regional phenomenon (Andersson and Koster, 2011; Fritsch and Mueller, 2007), to which participants of start-up subsidies by definition directly contribute. Using data on business entries, exits and start-up subsidy entries for a sample of German regional labor markets, this paper therefore examines start-up subsidies and their relation to overall entrepreneurship on a regional level to make the following three contributions.

First, we analyze the spatial distribution of subsidized entries and its relationship to regular entrepreneurial activity. We find that subsidized start-ups represent a substantial percentage of the overall regional new business formation, with an average share of 40% and high regional variation. After a major restrictive reform of the program at the end of 2011, both the level of and the variation in regional importance declined noticeably. We further observe a positive association between regular entrepreneurial activity and the share of subsidized entries relative to the potentially-eligible participant pool. This finding points to the existence of regional environments and entrepreneurship cultures, which are favorable to entrepreneurial activity, and from which unemployed founders also benefit.

Second, exploiting the particular nature and the institutional details of the policy reform, we identify deadweight effects of 70% to 80%, applying a very broad definition of deadweight. Compared to recent survey-based statistics (50% to 60% for the same program, applying the broad definition), these results indicate that self-reported measures are prone to small negative biases, which probably stem from the temporal distance in retrospective surveys and the potential reluctance to admit to socially negatively-perceived deadweight behavior. A narrower definition of deadweight usually reduces the effect by more than half. The further finding that deadweight estimates increased substantially over time since the introduction of this type of program in Germany in 1986 might indicate that start-up programs exhibit an additional subtle effect of contributing to changing public attitudes by promoting self-employment as an acceptable employment alternative to regular jobs.

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[28] Similarly, in previous macroeconometric evaluations of active labor market policies (ALMP), start-up subsidy programs are oftentimes excluded (e.g., Hujer *et al.*, 2009; Dahlberg and Forslund, 2005) or not analyzed separately from other instruments (e.g., Fertig *et al.*, 2006).

And third, we find relatively similar displacement patterns for the short-term between regular and subsidized entries, which replace mainly small-scale solopreneurs with low market attachment. Descriptively, subsidized entries exhibit larger displacement effects and there is some evidence to suggest market churning, but differences are not significant. However, results might be confounded by the major shift of entries from subsidized to regular founders as a consequence of the reform, which means our estimates are likely to be a lower bound of the differences.

On a more general note, and irrespective of the high benefits of start-up subsidy programs for the individual participant, these programs can be a severe market intervention potentially leading to inefficiencies and market distortions. In this context, deadweight and displacement effects of start-up subsidies are generally two sides of the same coin. Either subsidized businesses would have been started and have thrived even without the subsidy (deadweight), or, the subsidy was essential for the start-up decision and subsequent business performance, in which case the subsidy distorts market selection and negatively affects other, potentially even more efficient entrants or incumbents (see, e.g. Santarelli and Vivarelli, 2007, for a discussion).[29] From a labor market perspective, recent empirical evidence suggests that start-up subsidy programs for unemployed individuals do not contribute to a reduction of aggregated unemployment (Laffineur *et al.*, 2017). Along the same line, Hombert *et al.* (2014) find large crowding-out effects for a start-up reform for unemployed individuals in France, where employment in incumbent firms decreases by a similar magnitude as the number of jobs created in new start-ups. Policy-makers should thus take these effects into consideration and carefully weigh the benefits and costs of this (active labor market policy) strategy. In this sense, this paper is also a contribution to complement and expand the available body of evidence about start-up subsidy programs from an aggregated perspective. Due to data limitations, we could not analyze the aggregated longer-term net effects of start-up subsidies on, e.g., employment, economic growth, or innovation, nor analyze the effects by industry, which we leave for further research.

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[29] For Sweden, approximately 25% of participants of a start-up subsidy program believed they had been given an advantage over competitors, of which the majority stated the advantage consisted of a safe fixed income rather than lower prices, better marketing, or better customer service (Eurofound, 2016).

5.8 Appendix

5.8.1 Additional tables

Table 5.4: Variable overview

Variable	Definition	Source
A. Main variables of interest		
Business entries	Business entries in main activity following Günterberg (2011)[a]	Business registration statistics[b]
Business exits	Business exits in main activity following Günterberg (2011)[c]	Business registration statistics[b]
SUS entries	Number of entries into the start-up subsidy program	Federal Employment Agency
B. Regional control characteristics		
Business tax	Business tax multiplier	Regional Database[d], Table 356-11-5
Unemployment	Unemployment rate, normalized with working age population	Federal Employment Agency
GVA p.p.	Gross value added, normalized with working age population, de-/inflated to 2010 levels	Regional Database[d], Table 426-71-4
Industry diversity	Normalized Herfindahl index using industry shares	Regional Database[d], Table 401-32-4
Working age population	Population aged 18-64 to normalize entries/exits	Regional Database[d], Table 173-21-5

[a] For details, see Figure 5.6a in the Appendix, Section 5.8.2.
[b] Business registration statistics were provided by the Statistical Offices of the Federal States.
[c] For details, see Figure 5.6b in the Appendix, Section 5.8.2.
[d] The Regional Database is provided by the Federal Statistical Office and the Statistical Offices of the Federal States.

Table 5.5: Selectivity of estimation sample

| | 2010 (pre-reform) | | 2013 (post-reform) | |
| | Full sample | Est. sample | Full sample | Est. sample |
	(1)	(2)	(3)	(4)
A. Business entries and exits				
SUS entry rate (in %)	0.26	0.26	0.05	0.05
Business (de)registration rates (in %)				
Total business reg.	15.35	15.28	13.20	13.24
New business reg.	12.86	12.75	10.70	10.75
New establishment reg.	2.69	2.67	2.31	2.35
Total business dereg.	12.84	12.88	12.57	12.69
Business closure dereg.	10.34	10.41	10.14	10.30
Establishment closure dereg.	2.29	2.29	2.16	2.17
B. Regional control characteristics				
Population 18-64	365.20	350.06	360.16	343.98
Business tax	364.84	358.94	375.03	370.56
Unemployment rate (in %)	7.52	7.87	6.65	6.88
GVA p.p. (in 2010 Euros)	40,219	39,155	42,265	41,333
Industry diversity	5.47	5.51	5.11	5.18
C. Additional labor market indicators				
Labour force part. rate (in %)	83.03	82.74	85.71	85.66
Self-employment rate (in %)	8.70	8.53	9.05	8.87

Note: Rates are normalized by population aged 18-64. For a detailed description of business de-/registrations, see Figure 5.6 in the Appendix, Section 5.8.2. For details on the definition of regional control characteristics, see Table 5.4 in the Appendix, Section 5.8.1. ***/**/* indicates statistical significance at the 1/5/10% level.

Table 5.6: Sensitivity of deadweight effects

	Baseline results (1)	Sensitivity checks[a]					
		A (2)	B (3)	C (4)	D (5)	E (6)	F (7)
A. Full sample							
SUS entries (β)	0.939***	0.968***	0.939***	0.767***	0.772***	0.740**	0.951***
× Post-reform (δ)	-0.752***	-0.774***	-0.742***	-0.567**	-0.572***	-0.466	-0.764***
Regional controls	yes	yes	yes	yes	yes	yes	yes
Time fixed-effects	yes	yes	yes	yes	yes	yes	yes
Number of obs.	316	316	316	316	237	237	237
Implied % change ($\delta/\beta \cdot 100\%$)	-80.1***	-80.0***	-79.1***	-73.9***	-74.2***	-63.0**	-80.4***
B. Trimmed sample[b]							
SUS entries (β)	0.790***	0.793***	0.765***	0.611***	0.668***	0.608*	0.785***
× Post-reform (δ)	-0.611**	-0.609**	-0.583**	-0.437	-0.470**	-0.373	-0.605**
Regional controls	yes	yes	yes	yes	yes	yes	yes
Time fixed-effects	yes	yes	yes	yes	yes	yes	yes
Number of obs.	292	292	292	292	219	219	219
Implied % change ($\delta/\beta \cdot 100\%$)	-77.3***	-76.9***	-76.2***	-71.7**	-70.4**	-61.4*	-77.1***

Note: Entries are normalized with population aged 18-64. All specifications include as control variables business tax, unemployment rate, GVA$_{t-1}$ p.p., industry diversity, and time fixed-effects (unless stated otherwise), see Table 5.1 for details. Standard errors are clustered on regional labor market level. ***/**/* indicates statistical significance at the 1/5/10% level.
[a] A=Specification incl. stock of unemployment SGB III instead of total unemployment; B=Specification incl. entries to unemployment SGB III instead of total stock of unemployment; C=Total entries incl. business transfers as dependent variable; D=Only the year 2010 as pre-reform period; E=First differences; F=First differences with two-year averages pre- and post-reform; see text for details.
[b] The trimmed sample excludes observations with the 5% lowest and highest entries.

Table 5.7: Testing the endogeneity of entries for the estimation of displacement patterns

	Total exits		Main establ. exits		Small business p. exits	
	Baseline results	Entries instrumented	Baseline results	Entries instrumented	Baseline results	Entries instrumented
	(1)	(2)	(3)	(4)	(5)	(6)
A. Estimation results						
SUS entries						
in t	0.195	0.186	0.004	0.167	0.183	0.102
in $t-1$	0.219*	0.200	0.016	-0.088	0.222**	0.270
Reg. entries						
in t	0.216***	0.183	0.061***	0.121**	0.163**	0.125
in $t-1$	0.140**	0.129	-0.020	-0.040	0.152***	0.190
Exits						
in $t-1$	0.128	0.205	0.230*	0.102	0.058	0.156
Business tax	0.000	0.000	-0.000**	-0.000	0.001***	0.001
Unemployment rate$_{t-1}$	-0.049	-0.023	-0.058**	-0.027	0.022	0.009
GVA$_{t-1}$ p.p.	0.000	0.000	0.000	0.000	0.000	0.000
Industry diversity	0.012*	0.012	-0.001	-0.003	0.013***	0.015
Time fixed-effects	yes	yes	yes	yes	yes	yes
Model χ^2	312.9***	266.5***	47.2***	41.4***	390.1***	179.9***
Sargan χ^2	20.1	44.5	24.1*	40.4	22.3*	49.0
AR(1)-z	-1.9*	-1.6*	-3.7***	-2.1**	-1.7*	-1.7*
AR(2)-z	-0.4	-0.2	-0.8	-0.5	-0.3	-0.1
Number of obs.	395	395	395	395	395	395
B. Hausman test^a:						
Hausman χ^2		3.0		2.3		0.2

Note: Reported are results using the Arellano and Bond (1991) approach on the full specification (baseline results) as already reported in Table 5.2. As an endogeneity test, the columns labeled 'entries instrumented' report results using the Arellano and Bond (1991) approach on the full specification where all entry variables are instrumented by their lagged values Entries$_{it-2}, \ldots,$ Entries$_{it-K}$. Entries and exits are normalized with population aged 18-64. Robust standard errors with Windmeijer (2005) correction are reported. ***/**/* indicates statistical significance at the 1/5/10% level.
^{a} The Hausman (1978) test examines equality of coefficients between the baseline results and the results from the approach with instrumented entries. ***/**/* indicates statistical significance at the 1/5/10% level.

Table 5.8: Sensitivity of displacement patterns

	All observation years			Excluding the first post-reform year (2012)					
	Trimmed sample[a]			Full sample[a]			Trimmed sample[a]		
	Total exits	Main estab.	Small business pers.	Total exits	Main estab.	Small business pers.	Total exits	Main estab.	Small business pers.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Estimation results									
SUS entries									
in t	0.190	0.008	0.172	0.223	0.055	0.189	0.190	0.053	0.193
in $t-1$	0.200*	0.003	0.216**	0.221**	0.009	0.207*	0.210*	-0.002	0.204*
Reg. entries									
in t	0.263***	0.060**	0.172**	0.169**	0.045*	0.126	0.234***	0.047	0.139*
in $t-1$	0.131***	-0.017	0.166***	0.093	-0.063*	0.141***	0.093	-0.053	0.142**
Exits									
in $t-1$	0.187*	0.242*	0.126	0.169	0.273*	0.092	0.204*	0.212	0.123
Regional controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Model χ^2	328.9***	45.9***	283.6***	180.1***	38.1***	233.9***	159.9***	33.9***	167.3***
Sargan χ^2	15.1	22.9*	18.5	15.4	16.8	19.4*	13.4	16.8	17.3*
AR(1)-z	-1.8*	-3.7***	-1.8*	-2.8***	-3.5***	-2.7*	-2.7***	-3.2***	-2.6**
AR(2)-z	-0.2	-0.5	-0.2	-0.5	-1.1	-0.5	-0.4	-0.7	-0.4
Number of obs.	365	365	365	316	316	316	292	292	292
B. Lag-coefficients									
SUS entries									
t	0.190	0.008	0.172	0.223	0.055	0.189	0.190	0.053	0.193
$t+1$	0.236**	0.005	0.238**	0.259**	0.024	0.225*	0.249**	0.009	0.228*
cumulated	0.426**	0.013	0.410**	0.482**	0.079	0.414**	0.438**	0.062	0.421**
Reg. entries									
t	0.263***	0.060**	0.172**	0.169**	0.045*	0.126	0.234***	0.047	0.139*
$t+1$	0.180***	-0.002	0.188***	0.121**	-0.051	0.152***	0.141**	-0.043	0.159***
cumulated	0.443***	0.058	0.360***	0.291***	-0.006	0.279***	0.375***	0.004	0.299***
Difference									
t	-0.073	-0.053	-0.001	0.054	0.010	0.063	-0.044	0.006	0.054
$t+1$	0.056	0.008	0.050	0.138	0.075	0.072	0.108	0.053	0.069
cumulated	-0.017	-0.045	0.050	0.191	0.085	0.135	0.064	0.059	0.122

Note: Reported are results from sensitivity analyses using the Arellano and Bond (1991) approach, see text for details. Entries and exits are normalized with population aged 18-64. Robust standard errors with Windmeijer (2005) correction are reported. ***/**/* indicates statistical significance at the 1/5/10% level.
[a] The trimmed sample excludes observations with the 5% lowest and highest entries.

5.8.2 Additional figures

Figure 5.6: Definition of business entries and exits
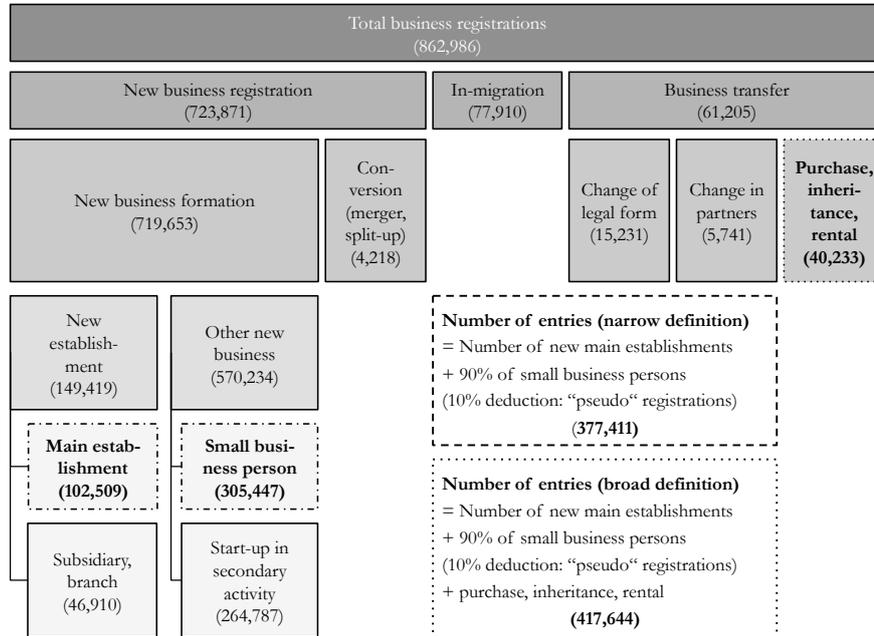
a. Business entries

b. Business exits

Figure 5.7: Subsidized entries over entries to unemployed SGB III versus regular entries
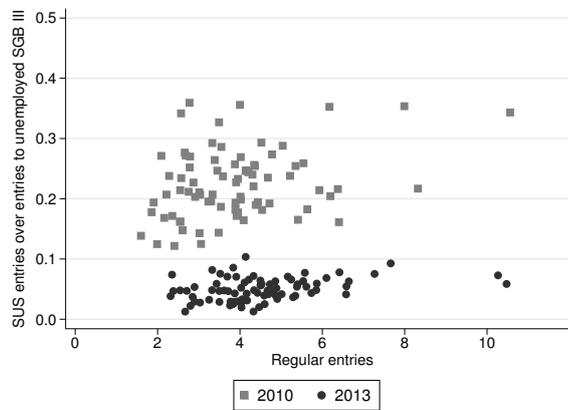
Note: Entries measured as entries per 1,000 in population aged 18-64 (unless stated otherwise).
Source: Own calculations based on business registration statistics and the Federal Employment Agency, see text for details.

Figure 5.8: Self-employment rates over time
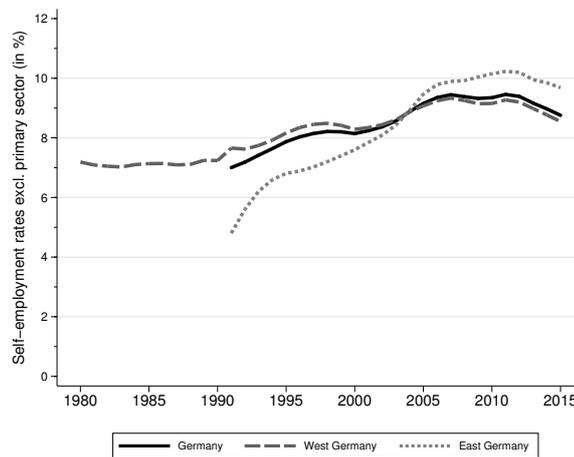
Note: Self-employed incl. unpaid family workers in non-primary sectors. Rates are calculated with respect to the workforce.
Source: Own illustration based on employment accounts, provided by the Federal Statistical Office. Results for East and West after 1990 based on the Regional Database, Table 13311-0002.

Chapter 6

Summary and Concluding Remarks

This dissertation is motivated by three observations. On the one hand, start-up subsidy programs targeted at unemployed individuals have become an established measure within the ALMP tool set in many countries and, because of their unique nature of promoting new business formation, also directly serve as a business and entrepreneurship policy. On the other hand, start-up incentives in general and those targeted at unemployed individuals in particular are increasingly becoming subject to criticism (see, e.g., Shane, 2009; Acs *et al.*, 2016). The major concern is that they are likely to produce solely marginal businesses that do not have any significant contribution to productivity, innovation, or economic growth. Finally, the available empirical evidence on these policies is heavily concentrated on the individual labor market perspective of participants so far and does not offer much insight beyond. This dissertation comprises four independent articles that make use of innovative evaluation approaches to provide new insights on this topic from multiple angles and, thus, contributes to the ongoing critical debate about the benefits and concerns related to this type of public policy. Taken together, they extend the available evidence on start-up subsidies for the unemployed in the following directions: first, from an individual ALMP perspective, we provide the first impact evaluation of the new start-up subsidy in Germany (*Gründungszuschuss*). Most importantly, we take up recent findings from entrepreneurship and labor market research, which indicate the important role of personality characteristics for business and labor market outcomes, and incorporate them into and assess their relevance for the empirical program evaluation of start-up incentives. Second, from a business and entrepreneurship perspective, we investigate the longer-term entrepreneurial persistence, business

performance and growth potential of the businesses arising from this program, and compare them to regular businesses. And third, from an aggregated regional perspective, we analyze how start-up subsidies for unemployed individuals relate to regional entrepreneurial activity and how they affect regional markets.

In Chapter 2, entitled *Personality traits and the evaluation of start-up subsidies*, we transfer the findings from entrepreneurship and labor market research about the key role of an individual's personality on start-up decision, business performance, as well as general labor market outcomes, to the literature on impact evaluation of start-up incentives in order to add two key insights. For one, we provide the first causal evidence on the long-term effectiveness of the new start-up subsidy for unemployed individuals in Germany. In contrast to previous studies, we are able to incorporate in our propensity score matching approach multiple dimensions of an individual's personality in addition to usual control variables used in earlier studies, such as socio-demographics, human capital, and labor market history, thanks to a combination of rich administrative and survey data. Results indicate that program participation effectively and persistently improves the employment and income situation compared to non-participation for both men and women over the whole 40 month observation period and, thus, are in line with findings from previous national and international studies on similar programs. In addition, we conduct an innovative sensitivity analysis to examine whether the omission of these personality variables significantly changes our evaluation results and find that differences are only small and insignificant. We find supporting evidence that personality is already implicitly captured to a large extent by other covariates, in particular human capital and labor market histories, which have been affected by personality themselves. As a consequence, concerns about potential overestimation of treatment effects in previous evaluation studies of similar start-up incentives due to usually unobservable personality variables are less justified, as long as the set of observed control variables is sufficiently informative. In this sense, our results confirm and complement similar results by Caliendo *et al.* (2017c) for the evaluation of traditional ALMP instruments, such as short-/long-term training and wage subsidies, as well as previous findings by Lechner and Wunsch (2013), which highlight the importance of controlling for detailed employment histories to ensure the validity of propensity score matching estimators in evaluation studies on traditional ALMPs. For subgroups with lower

labor market attachment (e.g., women) or in situations, in which data on human capital or employment histories are not sufficiently available or informative enough (e.g., for younger individuals), the explicit inclusion of personality variables might indeed be necessary, however.

The main limitation of this study is that the findings of our innovative sensitivity analysis, which tests the robustness of our evaluation results to the exclusion of usually unobserved variables, are restricted to the personality characteristics available in our data. Consequently, we do not claim that they represent all relevant factors that were omitted in previous studies. Nevertheless, personality traits are identified as a key determinant of start-up decision and business success in the entrepreneurship literature, which implies that they are a major component of what usually remains unobserved. It should further be mentioned that our partial-equilibrium analysis, which focuses on the effects for individual participants, does not take general-equilibrium effects, such as substitution or crowding out, into account.

Chapter 3 is entitled *Catching up or lagging behind? The long-term business potential of subsidized start-ups out of unemployment* and expands our knowledge about the longer-term business performance and potential of subsidized businesses arising from the start-up subsidy program, both in absolute terms as well as relative to regular new businesses. Using rich survey data on a representative sample of business founders, our analysis shows that, 40 months after start-up, a high share of more than 70% of formerly subsidized businesses are successfully established in the market. The subsidy also yields a "double dividend" amounting to an average additional job creation of 1.0 full-time equivalent employees per subsidy granted 40 months after start-up. Compared to regular new businesses, however, the economic and growth-related impulses set by participants of the subsidy program are only limited with regard to employment growth (both in terms of the extensive and intensive margin), innovation activity, or investment. The fact that the gaps are relatively persistent or even widening over time gives no indication of catching up in the longer run. Further investigations of possible reasons for these differences show that the subsidy attracts individuals who are more severely restricted in their availability or access to human, social, and financial capital. The exposure to full market selection mechanisms, after the subsidy receipt expires, does not lead to a substantial convergence of (observable)

start-up characteristics between the two groups. Still, initial endowment differences can solely explain a large part of short-run gaps in business growth. The differential business growth paths in the longer run seem to be mainly driven by higher restrictions to access capital and by unobserved factors, such as less growth-oriented initial business strategies and intentions, as well as divergent post-start-up dynamics.

The main limitation of this study is that we cannot explore and disentangle these unobserved factors in more detail due to data restrictions. In addition, we cannot clearly identify whether restrictions to access capital are mainly supply- or demand-driven. These aspects deserve more attention in future research. It should also be mentioned that, within the micro setting of this study, we again have to abstract from general-equilibrium effects, such as displacement or crowding out, which cannot be taken into account.

Chapter 4, entitled *Entrepreneurial persistence beyond survival: Measurement and determinants*, provides an in-depth examination of entrepreneurial persistence, which is defined as the constantly renewed motivation and decision to commit to a previously selected business venture activity despite opposing forces and enticing alternatives. As such, entrepreneurial persistence is considered an essential prerequisite for entrepreneurs when pursuing and exploiting their business opportunities and to realize potential economic gains and benefits. Primarily, Chapter 4 is a contribution to the entrepreneurship literature. We construct analog indicators to the three identified basic approaches in the literature to measure entrepreneurial persistence (survival, subjective measures, and hybrid measures) and show that, with some exceptions (e.g., locus of control, start-up capital), the influence of most determinants is sensitive to the choice of persistence indicator. Furthermore, the rich data and our holistic approach reveal that business-related characteristics and human capital are the dominant predictors of survival, whereas the subjective psychological commitment to the business depends more evenly on those two factors together with socio-demographics and personality. The heterogeneity of our results highlights the complex nature inherent in the concept of entrepreneurial persistence, of which all three persistence indicators are inevitably only approximations, and each one of them accentuates different aspects of the construct. In addition, Chapter 4 also offers some insights about the start-up subsidy program. Our results show that 40 months after

start-up, the descriptive share of business founders with a high psychological commitment to their businesses is significantly lower among formerly subsidized compared to regular business owners, whereas survival rates are very similar between the groups. Moreover, we find that this subjective persistence of formerly unemployed founders is much more strongly affected by local labor market conditions compared to regular founders and compared to other predictors such as business-related characteristics. Taken together, these findings imply that there is a certain share of start-up subsidy participants that successfully survive in the market, but who would rather prefer dependent employment if the local labor market indeed offered those job opportunities. Relating this to our findings from Chapter 3 above, this lack of (psychological) commitment could be one explanation why formerly subsidized founders invest less in their businesses and create fewer jobs and innovations, which in turn has been shown to reinforce lower levels of entrepreneurial persistence (Zhu *et al.*, 2011; Gimeno *et al.*, 1997).

As a limitation, the literature offers several subjective measures that, in turn, each accentuate a different component of subjective persistence. As a consequence, our results depend to some extent on our subjective indicator, which is based on psychological commitment in the presence of a hypothetical offer of similar paid employment and, thus, specifically emphasizes an entrepreneur's commitment despite the availability of (potentially) attractive alternatives. Furthermore, a detailed examination of the link between entrepreneurial persistence and entrepreneurial success is infeasible within the scope of our study due to data restrictions, but further research on this topic is strongly encouraged.

Chapter 5, entitled *Start-up subsidies and regional entrepreneurship - Evidence from Germany*, provides the first evidence on the start-up subsidy program for unemployed individuals at an aggregated regional level. Based on a sample of German regional labor markets, the analysis yields the following results: first, we observe a high regional variation in subsidized start-up activity and also in its relative importance compared to overall new business formation. We further find that in more entrepreneurial regions, i.e., where the regular start-up intensity is relatively high, the share among all unemployed individuals who participate in the start-up subsidy program is also relatively high compared to other regions. This suggests that the existence of regional entrepreneurship capital and cultures, which are favorable to entrepreneurial activity in general, have also

beneficial effects on (nascent) unemployed founders. Second, we use the particular characteristics of a restrictive institutional reform of the subsidy program to identify deadweight effects. Applying a very broad definition of deadweight, we obtain estimates of 70% to 80%, which are slightly higher than recent survey-based statistics (50% to 60%) for the same program and using the broad definition. The moderate differences suggest that self-reported measures are prone to small negative biases, which probably stem from the temporal distance in retrospective surveys and the potential reluctance to admit to socially negatively-perceived deadweight behavior. A narrower definition of deadweight, which additionally includes whether the subsidy had any effect on business performance, usually reduces the effect by more than half. The increase in deadweight compared to the introduction of the first start-up subsidy program of this type in Germany in 1986 implies an additional, subtle effect of this kind of policy, which seems to contribute to changing public attitudes towards entrepreneurship by promoting self-employment as an acceptable employment alternative to regular jobs. And third, we find some suggestive evidence for market churning by subsidized start-ups. They also exhibit slightly higher short-term displacement effects than regular business entries, which mainly affect small-scale businesses without employees and low market attachment, but differences are not significant.

The main limitation of this study relates to data restrictions, which prevent a more detailed analysis, for instance the tracking of individual businesses over time, the consideration of industries, or with respect to longer-term displacement effects on, e.g., employment, economic growth and productivity. Furthermore, the analysis of deadweight effects cannot consider the second dimension (whether the subsidy had any impact on business performance) and displacement effects might be confounded by the major shift of entries from subsidized to regular founders as a consequence of the institutional reform, which implies that our estimates are likely to be a lower bound.

All in all, the new evidence from multiple perspectives presented in this dissertation allows for a more comprehensive assessment of start-up subsidy programs targeted at unemployed individuals, and contributes to the critical debate about the benefits and concerns related to this type of public policy. Taken together, we can conclude the following three main points: first, from an ALMP perspective, start-up subsidies are a very effective tool to sustainably

reintegrate formerly unemployed individuals into the labor market and to improve their income situations. While the overall scalability of this ALMP instrument is limited due to the fact that not everyone is willing or able to successfully start and operate a business, it nevertheless emphasizes the general potential of start-up incentives as part of the broader ALMP toolset. Second, from a business and entrepreneurship perspective, a high share of the businesses arising from the start-up subsidy program are successfully established in the market in the medium to longer run, and they stimulate some additional job creation on the one hand. On the other hand, however, the subsidized founders are less innovative, invest less in their businesses, and generally spur less economic growth compared to regular business founders. These gaps can be explained by the fact that the subsidy attracts individuals who face more severe restrictions with regard to the availability or access to human, social, and financial capital. Participants also display lower growth intentions, ambitions, strategies, or capabilities for growth, and are less committed to their businesses. Taken together, the program has only limited potential as a business and entrepreneurship policy intended to induce innovation and economic growth. And third, from an aggregated regional perspective, the subsidy represents a market intervention, which affects incumbents and potentially produces inefficiencies and market distortions.

These conflicting results also highlight the possible trade-off effects between effectiveness as an active labor market policy and as a business and entrepreneurship policy. On the one hand, to improve the average business performance of subsidized businesses, only the most promising business proposals could be accepted into the program by introducing a more rigorous screening or by imposing a more restrictive selection on certain (observable) founder and start-up characteristics. This approach, however, runs the risk of excluding those nascent unemployed entrepreneurs with the most severe disadvantages and least favorable characteristics, who have been shown to gain the highest labor market benefits from participation (Caliendo and Künn, 2011). In turn, those applicants, who actually get accepted, are likely to depend on the subsidy the least, which would imply higher deadweight losses. On the other hand, if the subsidy included additional benefits or support measures, the artificial competitive advantage granted to its recipients would more severely distort market selection and negatively affect other, potentially even more efficient entrants or incumbents. Policy-makers are

thus advised to carefully weigh the costs and benefits of this ALMP strategy and to thoroughly consider the implications of institutional changes.

In this context, the recent reform of the new start-up subsidy in Germany at the end of 2011 offers a great opportunity for future research to examine the effects of institutional changes on the effectiveness of the program. Given the resulting high rejection rates in the aftermath of the reform, the very restrictive nature of the policy change also allows for a comprehensive comparison between unemployed subsidized and unemployed non-subsidized business founders, which should yield informative insights about the effectiveness of the program as well. Last but not least, the macro perspective deserves more attention and research in the future to examine the consequences of this type of policy on, e.g., aggregated unemployment, economic growth, and productivity, which will allow policy-makers and the public to make even better informed decisions in the assessment of this type of policy.

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List of Abbreviations

AB	Arellano-Bond
ALMP	Active labor market policy
ATT	Average treatment effect on the treated
CATI	Computer-assisted telephone interviews
CIA	Conditional independence assumption
DID	Difference-in-differences
EU	European Union
FEA	Federal Employment Agency (*Bundesagentur für Arbeit*)
FTE	Full-time equivalent employees
GDP	Gross domestic product
GMM	Generalized method of moments
GVA	Gross value added
IAB	Institute for Employment Research (*Institut für Arbeitsmarkt- und Berufsforschung*)
IfM Bonn	Institut für Mittelstandsforschung Bonn
KfW	Kreditanstalt für Wiederaufbau
NUTS	Classification of territorial units for statistics (*Nomenclature des unités territoriales statistiques*)
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least squares
p.p.	per person

PS	Propensity score
Reg.	Regular
SGB	Social code book (*Sozialgesetzbuch*)
SOEP	Socio-Economic Panel
SUS	Start-up subsidy
ZEW	Centre for European Economic Research (*Zentrum für Europäische Wirtschaftsforschung*)

German Summary

Gründungsförderprogramme für Arbeitslose haben in den letzten Jahren international einen erheblichen Bedeutungszuwachs erfahren, der sich nicht nur im Anstieg deren öffentlichen Ausgaben auf mittlerweile 5,4 Milliarden Euro (0,04% des Bruttoinlandsproduktes, 2010) in der Europäischen Union widerspiegelt (Eurostat, 2017). Er zeigt sich auch dadurch, dass Gründungsanreize für arbeitslose Personen inzwischen fester Bestandteil der Aktiven Arbeitsmarktpolitik (ALMP) in vielen Ländern sind und deren Potential bei der Aktivierung von Arbeitslosen und der Bekämpfung der Arbeitslosigkeit auch beispielsweise von der Europäischer Union erkannt und unterstützt wird (Eurofound, 2016; European Commission, 2014). Innerhalb des ALMP-Instrumentariums nehmen Gründungsförderprogramme für Arbeitslose eine Sonderstellung ein. Im Gegensatz zu traditionellen Instrumenten wie Fortbildungs- und Qualifikationsmaßnahmen, Lohnsubventionen oder Beschäftigungsprogrammen im öffentlichen Sektor ist das Ziel der Gründungsförderung keine Wiedereingliederung der Arbeitslosen in eine abhängige Beschäftigung, sondern ein Arbeitsmarktwiedereintritt in Selbständigkeit. Somit verfolgt dieses Instrument als ALMP-Maßnahme grundsätzlich nicht nur arbeitsmarkt- und sozialpolitische Ziele, sondern stellt indirekt auch eine Politik zur allgemeinen Förderung von Entrepreneurship und Existenzgründungen dar. Entrepreneurship wiederum wirkt sich positiv auf Wirtschaftswachstum, Beschäftigung, Innovationen und technologischen Fortschritt aus (u.a. Koellinger and Thurik, 2012; Audretsch and Thurik, 2001; Storey, 1994). In der jüngeren Vergangenheit ziehen solche Gründungsanreize jedoch zunehmend Kritik aus der Entrepreneurship-Forschung auf sich, insbesondere wenn sie sich dezidiert an Arbeitslose richten, da von ihnen generell nur geringe Wachstumsimpulse zu erwarten seien (z.B. Shane, 2009; Acs *et al.*, 2016).

Die vorliegende Dissertation mit dem Titel *Start-up Subsidies for the Unemployed - New Evaluation Approaches and Insights* beschäftigt sich eingehend mit dem deutschen *Gründungszuschuss*. In Deutschland haben Gründungsförderprogramme für Arbeitslose zum einen eine relativ lange Tradition, die bis zur Einführung des *Überbrückungsgeldes* im Jahr 1986 zurückreicht. Zum anderen ist der Anteil an geförderten Gründungen aus Arbeitslosigkeit an allen Existenzgründungen in Deutschland relativ hoch, was die Relevanz der Forschung zu diesem Thema unterstreicht. Die Dissertation besteht aus vier empirischen Studien in Form von eigenständigen englischsprachigen Aufsätzen, die unabhängig voneinander gelesen werden können. Zusammengenommen ergänzen und erweitern sie die bestehende Evidenz zu Gründungsförderprogrammen für Arbeitslose durch neue Erkenntnisse aus verschiedenen Perspektiven, die sich in der Vergangenheit hauptsächlich auf individuelle Arbeitsmarkteffekte konzentrierte und somit eine unzureichende Grundlage für eine umfassende Bewertung dieses Instruments darstellt.

Der erste Aufsatz trägt den Titel *Personality Traits and the Evaluation of Start-Up Subsidies.* Er integriert Erkenntnisse aus der Entrepreneurship- und Arbeitsmarktforschung über den starken Einfluss üblicherweise unbeobachteter Persönlichkeitseigenschaften auf Gründungsentscheidungen, Unternehmensentwicklungen und Arbeitsmarkterfolge in die Evaluation von Gründungsförderinstrumenten und liefert zwei wesentliche Resultate: Einerseits werden bei der erstmaligen Evaluation des *Gründungszuschusses* dank eines innovativen und informativen Datensatzes aus verknüpften administrativen und Befragungsdaten explizit Informationen zu Persönlichkeitsmerkmalen in die Propensity Score Matching Ansätze mit einbezogen, die in früheren vergleichbaren Studien aufgrund von Datenrestriktionen unberücksichtigt bleiben mussten. Die kausale Wirkungsanalyse zeigt unter Einbeziehung einer Vergleichsgruppe anderer Arbeitsloser, dass das Gründungszuschussprogramm lang anhaltende positive Effekte auf die durchschnittliche Beschäftigungswahrscheinlichkeit als auch auf das Erwerbseinkommen der Teilnehmenden aufweist. Der *Gründungszuschuss* bestätigt damit die vorteilhaften Befunde zu seinen zwei Vorgängern (*Überbrückungsgeld* und *Existenzgründungszuschuss*) und unterstreicht die hohe Effektivität des Programms bei der nachhaltigen Reintegration Arbeitsloser in den Arbeitsmarkt. Andererseits adressiert der Aufsatz Bedenken, die auf eine mögliche Verzerrung

der Ergebnisse von Propensity Score Matching Ansätzen aufgrund der bisherigen Vernachlässigung der Persönlichkeitseigenschaften abstellen. Eine innovative Sensitivitätsanalyse ergibt, dass die Ergebnisse der Programmevaluation nur geringfügig auf die (Nicht-)Berücksichtigung der Persönlichkeitsvariablen reagieren. Die Gefahr und das Ausmaß einer potentiellen Verzerrung der Ergebnisse durch das Auslassen von üblicherweise nicht-beobachteten Persönlichkeitsmerkmalen ist somit bei vergleichbaren Studien grundsätzlich als eher gering einzustufen, sofern die Liste der übrigen Kontrollvariablen informativ genug ist.

Der zweite Aufsatz mit dem Titel *Catching Up or Lagging Behind? The Long-Term Business Potential of Subsidized Start-Ups out of Unemployment* analysiert eingehend die Selbständigkeiten und Unternehmen, die aus dem Gründungszuschussprogramm hervorgehen, und deren mittel- bis längerfristige Entwicklung anhand von unternehmerischen Indikatoren. Als Vergleichsmaßstab wird zudem eine Stichprobe von regulären, d.h. nicht-arbeitslosen Gründerpersonen herangezogen, die im gleichen Quartal wie die Programmteilnehmenden gründeten. Eine Auswertung von Individualdaten zu Gründerpersonen und Unternehmen zeigt, dass ein hoher Anteil von über 70% der zuvor arbeitslosen Gründerpersonen auch 3,5 Jahre nach Gründung noch erfolgreich mit der ursprünglichen Selbständigkeit im Markt operiert. Zudem erzielt das Programm eine „doppelte Dividende" in Höhe von einem vollzeitäquivalenten zusätzlichen Arbeitsplatz pro Förderung, der in einem durchschnittlichen Unternehmen bis 3,5 Jahren nach Gründung geschaffen wird. Allerdings zeigen sich zum Teil deutliche Defizite in den Bereichen Einkommen, Innovation, Beschäftigungswachstum und Investitionen gegenüber regulären Existenzgründungen. Eine weitergehende Analyse deckt auf, dass dies nur unzureichend durch Unterschiede in den Charakteristiken zum Gründungszeitpunkt erklärt werden kann, sondern stattdessen teilweise in Restriktionen im Zugang zu Kapital und zudem in weniger wachstumsorientierten Unternehmensstrategien begründet ist.

Der Titel des dritten Aufsatzes lautet *Entrepreneurial Persistence Beyond Survival: Measurement and Determinants* und richtet seinen Fokus auf unternehmerische Persistenz, welche als kontinuierlich erneuerte Motivation und Entscheidung zur aktiven Fortführung der unternehmerischen Aktivität trotz Widerstände und attraktiver Alternativen erst die Grundvoraussetzung für jegliche unternehmerische Entwicklung darstellt. In der einschlägigen Literatur lassen sich

zur Operationalisierung von Persistenz drei grundlegende Ansätze unterscheiden. Zum einen wird als Proxy-Variable das Überleben der Unternehmung verwendet, daneben finden sich subjektive Maße sowie kombinierte Maße, die das Überleben mit subjektiven Einschätzungen verbinden. Da Persistenz ein komplexes Konstrukt darstellt, bilden alle drei Maße Persistenz zwangsläufig nur teilweise ab, was auch eine Erklärung für mehrdeutige Ergebnisse in früheren empirischen Arbeiten sein könnte. Die Individualdaten, die bereits im zweiten Kapitel zum Einsatz kamen, erlauben es nun, drei Maße aus einem Datensatz zu generieren, die den drei Ansätzen in der bisherigen Literatur entsprechen, wodurch sich die Sensitivität der Resultate hinsichtlich der konkreten Operationalisierung untersuchen lässt. Zudem enthält der Datensatz eine Vielzahl an potentiellen Determinanten von Persistenz auf Ebene der Gründerperson, des Unternehmens sowie des Kontexts, was eine detaillierte und umfassende Untersuchung ermöglicht und die relative Bedeutung der einzelnen Kovariaten bestimmen lässt. Separate Analysen für arbeitslose und reguläre Gründerpersonen geben zudem Aufschluss darüber, wie heterogen sich die Ergebnisse zwischen den beiden Subgruppen gestalten. Die empirischen Auswertungen verdeutlichen, dass die Ergebnisse mit wenigen Ausnahmen davon abhängen, welches Persistenzmaß verwendet wird. Humankapital und unternehmensbezogene Merkmale haben die größte Bedeutung für das Fortbestehen der Gründung, die subjektive Persistenz hängt stattdessen etwas gleichmäßiger von diesen beiden Faktoren sowie Persönlichkeitsmerkmalen und dem sozio-demografischen Hintergrund ab. Die Heterogenitätsanalyse zeigt sodann, dass die subjektive Persistenz und damit das psychologische Commitment arbeitsloser Gründerpersonen etwas niedriger ausgeprägt ist und empfindlicher auf Änderungen der regionalen Arbeitsmarktlage reagiert als jenes regulärer Unternehmer.

Der vierte und letzte Aufsatz schließlich trägt den Namen *Start-Up Subsidies and Regional Entrepreneurship - Evidence from Germany.* Im Gegensatz zu den vorangegangenen Aufsätzen analysiert er das Gründungszuschussprogramm aus einer aggregierten regionalen Perspektive anhand einer Stichprobe deutscher Regionalarbeitsmärkte im Zeitraum 2008 bis 2014. Er trägt damit der Tatsache Rechnung, dass zum einen Entrepreneurship ein zutiefst regionales Phänomen ist (Fritsch and Wyrwich, 2014), zu dem geförderte Existenzgründungen aus Arbeitslosigkeit per Definition direkt beitragen. Ein Ziel des Aufsatzes ist es daher,

die regionale Verteilung der geförderten Gründungen und den Zusammenhang zu der generellen Gründungsaktivität näher zu beleuchten. Zum anderen erlauben es die Regionaldaten, neben Mitnahmeeffekten des Gründungszuschussprogramms auch dessen Verdrängungseffekte auf den regionalen Märkten abzuschätzen. Die empirischen Analysen ergeben, dass eine hohe Variation in der relativen Bedeutung der Gründungsförderung besteht. Die positive Korrelation zwischen regulärer Gründungsaktivität und dem Anteil arbeitsloser Gründerpersonen an allen potentiell teilnahmeberechtigten Arbeitslosen deutet darauf hin, dass von den positiven Wirkungen von regionalem Entrepreneurship-Kapital und -Kultur auch arbeitslose Gründerpersonen profitieren. Zudem zeigt sich, dass das Programm Mitnahmeeffekte (in sehr weitem Sinne) in Höhe von 70% bis 80% aufweist, welche leicht über dem Niveau vergleichbarer Schätzungen auf Basis von Befragungsergebnissen liegen, und dass Markteintritte geförderter arbeitsloser Gründerpersonen leicht höhere Verdrängungseffekte auf regionalen Märkten nach sich ziehen als solche regulärer Entrepreneure.

Aus einer Gesamtbetrachtung der vorliegenden Dissertation können folgende Haupterkenntnisse zusammenfassend abgeleitet werden: Erstens weist das untersuchte Gründungszuschussprogramm positive und langfristig anhaltende individuelle Fördereffekte auf Arbeitsmarktreintegration und Erwerbseinkommen für teilnehmende Arbeitslose auf. Die sehr vorteilhaften Befunde bestätigen ähnliche nationale und internationale Ergebnisse zu vergleichbaren Programmen und setzen sich damit von den insgesamt durchwachsenen Evaluationsergebnissen traditioneller ALMP-Maßnahmen ab. Dies unterstreicht das grundsätzliche Potential der Gründungsförderung von Arbeitslosen im Rahmen des ALMP-Instrumentariums. Zweitens kann aus der Entrepreneurship-Perspektive konstatiert werden, dass ein hoher Anteil an geförderten Gründungen auch mittel- bis langfristig erfolgreich im Markt etabliert ist und eine „doppelte Dividende" der Förderung in Form von zusätzlicher Beschäftigung in den Unternehmen in begrenztem Umfang erzielt wird. Allerdings sind die geförderten Unternehmungen im Vergleich zu regulären Gründungen unterdurchschnittlich innovativ, investieren weniger und setzen geringere Impulse für Wachstum. Mögliche Gründe dafür sind Restriktionen bei der Kapitalbeschaffung, weniger wachstums- und innovationsorientierte Unternehmensvorhaben und -strategien, sowie eine weniger stark ausgeprägte unternehmerische (subjektive) Persistenz bei einem Teil der

arbeitslosen Gründer. Somit eignet sich die Gründungsförderung von Arbeitslosen nur in bedingtem Maße als Entrepreneurship-Maßnahme im engeren Sinne, die Wachstums- und Innovationspotenziale freisetzt. Drittens lässt sich aus einer regionalen Betrachtung heraus festhalten, dass Gründungsförderungen für Arbeitslose immer auch Eingriffe in bestehende Märkte sind, die direkte Auswirkungen auf existierende Unternehmen haben. Diese Makro-Ebene insbesondere ist noch untererforscht und verdient weitere Aufmerksamkeit, um Politik und Öffentlichkeit bei der Abwägung der Vor- und Nachteile dieser ALMP-Strategie umfassend zu informieren.

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