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Short communication

Worker-level and firm-level effects of a wage subsidy program for highly educated labor: Evidence from Denmark☆

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ABSTRACT

We study the effects of a Danish wage subsidy program for highly educated workers on the performance of the persons and firms participating in the program. Using data on the population of program participants, both workers and firms, we find that the program had positive effects on employment and annual earnings during program participation while there are no positive effects for the years after program expiration. At the employer-level, we find statistically significant effects on the number of highly educated employees for both the period of program participation and the subsequent time period. For the total number of employees we only find positive effects during program participation while there are no statistically significant effects for value added, net income, return on assets, wages per employee and labor productivity.

1. Introduction

Policy makers at the local, regional and national level have started a fair number of initiatives to combat increasingly high unemployment rates of high skilled labor. In May 2012, the Council of the European Union recommended "to adopt measures (...) aimed at increasing the employability of graduates leaving the education and training system".[1] A formal evaluation of such programs is, however, still lacking.

This paper studies the Danish "innovation assistant" (hereafter "IA") labor market scheme, a "targeted wage subsidy program" (Katz, 1996) for persons with a post-secondary (bachelor) or tertiary-level (master) education. The scheme served the dual purpose of getting more academics into employment and at transferring academic knowledge to SMEs since they have historically been reluctant to hire high qualified labor in Denmark and elsewhere, possibly due to information asymmetries on both sides. The IA program was launched by the Danish Agency for Science, Technology and Innovation (DASTI) in 2005 when the unemployment rate for high skilled workers was 3.7% and considered high given an average unemployment rate of 4.8% and the cost of educating academics.[2]

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[1] Source: http://www.parlament.gv.at/PAKT/EU/XXIV/EU/08/02/EU_80203/imfname_10027589.pdf. Appendix A provides an overview of initiatives that aim at bringing more academics into work.

[2] The program is more fully described at URL http://ufm.dk/en/research-and-innovation/funding-programmes-for-research-and-innovation/find-danish-funding-programmes/programmes-managed-by-innovation-fund-denmark/innovation-assistant/innovation-assistant.

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Our evaluation of the Danish IA program studies the effect of the subsidy on both persons and firms. We ask, (i) how do persons who participate in the program perform with regard to employment and income and (ii) how do participating firms perform in terms of employment, productivity and other success criteria. Existing studies on the effects of wage subsidies almost exclusively deal with programs geared at "the disadvantaged" (Katz, 1996), i.e., mostly low skilled workers.[3] In addition, comparatively little is known about the effects of training or wage subsidy programs on the performance of the firms involved and the long-run effects on wages and employment that generally tend to appear to be more positive than the short-run impacts (Card et al., 2010), possibly since they change the recruitment patterns of hiring firms in the longer run (Katz, 1996).

The general economic intuition behind wage subsidies is as follows: the subsidy is directly paid to the employer (and subsequently passed on to the IA), it hence shifts the labor demand rather than the labor supply curve to the right (Bell et al., 1999; Katz, 1996; Perloff and Wachter, 1979; Mofitt, 2002). Wages and employment will, however, increase by less than the value of the subsidy since employers will compete for the subsidized worker which in turn induces a higher labor supply as pointed out by Bell et al. (1999). The total effect of wages subsidies depends on the elasticity of labor supply – the greater it is, the smaller is the effect on wages and employment (Bell et al., 1999; Katz, 1996).

Eligible for the IA program were privately owned firms with at least two and at most 100 employees whereof no more than two may have been academics. In addition, firms needed to exist for at least one year and must make more than DKK 1 million (Euro 130,000) annually in revenues. SMEs needed to stipulate a specific development project that the IA was supposed to carry out. Firms that successfully applied for funding through the IA program received a wage subsidy of up to half of the IAs salary, with a maximum of DKK 12,500 (Euro 1700) per month – about half the average monthly wage in our data – for a period between six and twelve months. We do unfortunately not know much about how IA projects were initiated. Anecdotal evidence that we have collected does indicate, however, that it was mostly the potential IA who contacted the SME and suggested an employment relationship under the IA program. While we do not know anything about the mechanisms that match potential IAs with potential hosts, we do know that essentially all applications for wage subsidies were eventually granted. In order to cope with potential self-selection problems of firms and persons into the program, we apply "conditional differences in differences" (cDID) estimation methods (Heckman et al., 1999).

At the person-level, we find that the IA program had positive annual earnings – our measure of wages – and employment effects in the year of program participation as it should be by construction. There are no additional positive effects for participating persons in the subsequent years. For the first year after program expiration we even find a statistically significant negative effect which reflects the insignificance of the employment effect in the same year. At the employer-level, we find positive effects on the number of highly skilled employees for both the period of program participation and the subsequent time period.

2. Data

Our data stem from three main sources, (i) DASTI which contains information on individual IA-projects, an identifier for both the participating IA and the corresponding SME and the starting date of the project, (ii) Experian A/S, a credit rating agency whose financial reports have been used in prior research by Kaiser and Kuhn (2012) and which contains 1.7 mio. records on firms over the relevant time period and (iii) Statistics Denmark which provides population data on both persons and firms in Denmark that are linked to one another. Our final data set contains information on 364 IAs and 316 recruiting firms which we observe over a period of 6.7 years on average. Our set of control group observations essentially consists of the population of persons and firms in Denmark. We provide more details on our data set in Appendix B.

3. Empirical approach

For both the analysis of person-level and firm-level effects we first match treatment and potential control group observations on their observed characteristics in the year before entering the IA program, $t-1$. We subsequently run multivariate regressions on the matched treatment/control data.

3.1. Propensity score matching

To match treatment and control observations, we follow Kaiser and Kuhn (2012) by applying nearest neighbor caliper matching with a single neighbor and replacement. We match on the propensity scores which simply constitute the predicted probabilities of program participation which we calculate from binary logit regressions which control for a wide range of variables which affect both treatment choice and performance and that we measure at time $t-1$, the year before treatment. We stack these variables into matrix $\boldsymbol{X_{it-1}}$. The conditional probability of receiving treatment is $P[D_{it}|\boldsymbol{X_{it-1}}] = \boldsymbol{X_{it-1}}\,\beta + \epsilon_{it}$, where ϵ_{it} denotes a logistically distributed error term.[4]

3.2. Person-level analysis

We match our treatment group IAs to a total untreated population of 1,018,245 persons. Appendix C displays descriptive statistics of the variables involved in our estimations for both treated and control persons *before* matching and shows that program participants and control group persons differ substantially from one another with respect to basically all variables, an observation that is corroborated by our person-level program selection logit estimates displayed in Appendix D.

To start our person-level analysis we first remove any potential control group observations with characteristics not observed in the set of treated persons. Our set of conditioning variables of the propensity score matching model $\boldsymbol{X_{it-1}}$ includes (i) demographic information like age, gender and marital status, (ii) information on the persons' highest level of formal education which includes a total of 15 different categories, (iii) a dummy variable that specifies whether or not the person is currently enrolled in an education program, (iv) the average high school grade and sets of dummy variables for the persons' high school majors, (v) a person's occupational status like employment, unemployment or parental leave,[5]

[3] Reviews of the extant literature are provided by Card et al. (2010), Dar and Tzannatos (1999), Heckman et al. (1999), Kluve (2010) as well as Martin and Grubb (2001).

[4] We note at this stage already that all our matched control observations are on the "common support", i.e., persons and firms with the same observed characteristics have a positive probability of receiving both treatment and non-treatment (Heckman et al., 1999). All estimations are performed using Stata 11.0. We use the "psmatch2" module by Leuven and Sianesi (2003) implemented in Stata to perform our propensity score matching estimations.

[5] Note that we do *not* compare persons in treatment with persons who are unemployed as most of the empirical evaluation literature does. We compare persons with the same occupational status, e.g., unemployed to unemployed, wage-employed to wage-employed, etc.