From unemployed to self-employed: using an intention-to-treat approach

seo economisch onderzoek

Amsterdam, 12 December 2020

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SEO-Discussion paper nr. 96

Abstract

This paper evaluates the effectiveness of a program which aims to activate welfare recipients to become self-employed. Unique administrative data is used which contains applicants for the self-employment program between 2007 and 2010. The long-term effects on welfare recipience, employment and income up until 8 years after applying to the program are examined by using a matching technique. This paper distinguishes itself from earlier research by investigating the effect of applying to the program instead of joining it. Using this so-called intention-to-treat approach, the selection bias decreases. Furthermore, light is shed on the efficiency of the self-employment policy by performing a cost-benefit analysis. The results show that the self-employment program is an effective and efficient approach to integrate welfare recipients into the labour market.

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1 Introduction

Entrepreneurship is recognized as an important way to create jobs[1]. Specifically, the European Commission focuses on encouraging business start-ups by unemployed individuals. In 2018 2.5 percent of the unemployed individuals in the EU started a business (OECD/European Union (2019)). Because of the barriers that unemployed individuals face[2], self-employment programs are in place in many EU Member States[3]. These programs support unemployed individuals in starting a business. Empirical evidence of the effectiveness of such programs is growing and shows promising results on labour market outcomes[4]. We investigate the effect of a self-employment program for welfare recipients in the Netherlands.

Findings on the effectiveness of the program rely on the assumption that the variables that affect both the participation in the program and the outcome variables are observed. This assumption is known as the conditional independence assumption (CIA). We should realise that the CIA is a strong assumption. This study contributes to the literature as we diminish the unobserved differences between the treatment and the control group, by comparing the *applicants*, instead of the participants, to a control group. That is: we calculate the intention-to-treat effect (ITT). Since applicants are more comparable with the average welfare recipient than the participants, selection bias is reduced. Using this technique, we are able to identify the long run effects on welfare recipience, employment and income up until eight years after the application to the program. Unlike most studies, we study the effect of the program for welfare recipients only. Recent literature shows that start-up programs are most effective for disadvantaged unemployed individuals[5]. Therefore, it is of special interest to analyse the effectiveness for welfare recipients. Based on the effects of the self-employment program, we conduct a cost-benefit analysis to shed light on the efficiency of the program. The analysis provides an answer to the question whether the program is efficient from the perspective of the government and individuals. Dvouletý et al. (2016) evaluated 18 studies concerning the effects of start-up subsidies and mentions that a cost-benefit analysis is a missing link in earlier literature.

The results show that the self-employment program decreases unemployment. The effect is robust with respect to deviations from the conditional independence assumption. We find that the program is most effective for the disadvantaged group in the labour market: low educated individuals and non-western immigrants. Furthermore, we show that the benefits outweigh the costs for both the government and the participants.

The remainder of the paper is structured as follows. Descriptions of the theory behind self-employment programs and relevant literature are given in section 2 and 3, respectively. Section 4 describes the start-up program in more detail. Subsequently, section 5 gives an overview of the data. Section 6 explains the matching methodology. The results are shown in section 7. The efficiency of the program is discussed in section 8. Section 9 concludes.

1 Europe 2020 strategy.
2 Credit restrictions for example.
3 Approximately half of the EU Member states offer support for unemployed to start a business (OECD/European Union (2019)).
4 Positive effects on labour market outcomes are found by for example Behrenz et al. (2016) (Sweden), Caliendo and Künn (2011), Wolff et al. (2016) (Germany), Tokila (2009) (Finland), O'Leary (1999) (Hungary and Poland) and Duhautois et al. (2015) (France).
5 The largest effects for the most disadvantaged individuals on the labour market are found by for example Caliendo and Künn (2011), Behrenz et al. (2016), Wolff et al. (2016).

2 Theory

The expected direct effect of a self-employment program is that it decreases the unemployment rate by reemployment through self-employment. Moreover, starting up a business improves the participant's labour market network and human capital: in case the business fails, the participants have increased labour market opportunities. Additionally, helping the unemployed to start up a business will potentially create more jobs in the future, as they will employ other individuals (Cowling et al., 2004). Next to the positive effect on the employment rate, there could be a macro economic effect: new firms entering the market will increase competition.

The question is, why do we need a program for this? Government intervention is not essential in case of a good functioning capital market: people can get a loan to start a business. The Social and Economic Council in the Netherlands identifies four potential market failures in the credit market: information-asymmetry, transaction costs, market power and external effects (SER, 2014). It concludes that in the Dutch context information-asymmetry and transaction costs are the main market failures, inhibiting a well-functioning credit market for small enterprises in general and for those starting from unemployment in particular. Information-asymmetry occurs because it is difficult and relatively expensive for banks to assess the creditworthiness of smaller companies. Those companies are not always able to provide the information banks need to make a credit assessment. This creates uncertainty for banks, which leads to a risk premium on the interest rate or stricter conditions (Hebbink et al. 2015). The problem becomes more acute when companies have less collateral (Blanchflower and Oswald, 1998). Inadequate information also affects viable companies with stricter conditions and possible refusals of credit applications (Hebbink et al. 2015). Especially, unemployed individuals face difficulties to receive financing by a bank, as they do not have a fixed income. Transaction costs might inhibit access to credit, because small loans are relatively laborious compared to the size of the loan. When passing on in the price, the transaction costs will become so high that providing a credit is not profitable. According to the Social and Economic Council, external effects in the form of innovation due to start ups are not relevant in the Dutch context. Research reveals that there seem to be no spill-over effects of innovation of start-ups to other companies (Ter Weel et al., 2017). However, external effects on labour participation might be a factor banks do not completely incorporate in their price. Dromel et al., 2010 show that countries with stricter credit restrictions also have higher unemployment. Government intervention thus might be beneficial to reduce the barrier of starting entrepreneurs, especially those starting from unemployment.

Economic theory argues there are not only positive but also negative consequences of self-employment programs. First of all, according to Shane (2009), start-up programs attract businesses that are not promising to begin with. This is called adverse selection. The businesses are not innovative, create few jobs, and generate little wealth. Most important of all: they have little impact on employment. Not all literature acknowledges this view. Caliendo et al. (2015) states that the subsidy will remove a barrier for individuals with considerable constraints and similar potentials as the entrepreneurs that start a business without the grant. The goal is helping the most disadvantaged (lower educated and less skilled) unemployed out of unemployment. Another problem could be moral hazard. It suggests that starting entrepreneurs will reduce their effort because they face less risk: if the business fails you do not have to reimburse the received income support. Furthermore, there is a risk of financing start-ups that would be there without financial support and there is a risk of subsidizing individuals that could have found a job as an employee. In these cases the program is

not additive. Findings on the magnitude of this so-called deadweight loss are limited. Caliendo et al. (2015) states that former literature overestimated the deadweight loss, as they did not incorporate whether the subsidy would lead to a more profitable company. He concludes that the deadweight loss exists, only on a much smaller scale than was thought before: only 21% of entrepreneurs who start a business with subsidy, would also have done so without subsidy, and the subsidy did not affect the survival of those businesses.

3 Previous literature

Earlier literature investigates the effect of self-employment policies in other countries. Overall, positive effects of start-up programs are found. Most studies analyse the impact of the program by comparing the previously unemployed starting entrepreneurs to a control group. This control group is defined by either unemployed individuals that do not participate in the program or regular starting entrepreneurs. Both methods study the effect of the program on different outcome variables. Using unemployed individuals in the control group allows to investigate the effect of the program on employment and income. The effect on business performance and survival can be analysed by using regular entrepreneurs as a comparison group. In our analysis the control group consists of unemployed individuals.

Several studies analyse the effect based on the comparison between the participants and unemployed individuals. Caliendo and Künn (2011) find long term effects of two German start-up subsidies on employment and income almost five years after participation, where the largest effect is achieved for the disadvantaged groups on the labour market (low educated and low qualified). However, they also show that the German programs seem to be more effective for natives. Behrenz et al. (2016) did similar research for the Swedish program and also finds a positive impact five years after participation. They conclude that the start-up program is a sustainable way out of unemployment. In terms of employment, the low educated benefit the most. Earlier, Carling and Gustafson (1999) evaluated the Swedish start-up program by a comparison between the participants of the self-employment program and the participants of an employment program. They find that the risk of becoming unemployed after participating in one of the programs is twice as large for the employment program, compared to the self-employment program. Furthermore, they find that the effect is limited to native Swedes. O'Leary (1999) investigated the impact of the start-ups program in Poland and Hungary. He finds a large positive effect on employment. Furthermore, in Poland a positive estimated earnings effect is shown, in Hungary it is negative. Contrary to the previously mentioned studies, Meager et al. (2003) find no impact of participating in a self-employment program for young unemployed individuals in the UK on being employed and on their income. Where previously mentioned studies analyse the effect of a start-up program for unemployed individuals, Wolff et. al (2016) investigate the effect of the German program for welfare recipients only. The authors show a positive effect on employment and on welfare recipience six years after participation.

The alternative approach is to study the differences in performance and survival between businesses with financial aid and business without support. Most studies show higher survival rates for the subsidized businesses compared to the regular start-ups (Caliendo et al. 2015, Duhautois et al. 2015, Tokila 2011), yet they show lower performances in terms of income, business growth and innovation (Caliendo et al, 2015). The higher survival rates might be accounted for by the lower employability of the subsidized previously unemployed entrepreneurs, which gives them less opportunities in the labour market (Caliendo et al. 2015). This is in line with the work of Tokila (2011). She found that the supported individuals were more prone to unemployment after the business failed than regular business founders. Andersson and Wadensjö (2007) conclude that start-up subsidies for the unemployed should be implemented with care. They compare previously unemployed entrepreneurs with regular starting entrepreneurs in Sweden and find that the regular starting entrepreneurs have higher income and more employees than individuals that were unemployed or inactive.

4 Institutional setting in the Netherlands

The Dutch self-employment program is a labour market policy that supports initiatives of welfare recipients to found a business[6]. It was introduced in 1985 with the purpose to support the welfare recipients to reintegrate into the labour market. The fact that the program is intended for welfare recipients makes the Dutch program different from policies in most other countries. Generally, self-employment programs are targeted at unemployed individuals, and not specifically welfare recipients.

The instrument is administered by municipalities and provides professional guidance and financial support. The financial assistance consists of two parts: income support and credit. The income support is an interest-free loan that supplements income to the level of a social welfare payment, and in most cases is converted to an allowance. The income support can last for a maximum of three years. The credit is a loan of at most € 37.398[7] at 5 percent interest[8], and should be paid off within a maximum period of ten years. In practice, municipalities try to restrict the period to three to five years. To be eligible for credit it should be impossible to get financing from a bank. Next to the financial assistance, the program provides professional guidance through training and coaching. The Dutch start-up program differs from the German and Swedish self-employment programs, in that it includes a possibility of receiving a loan and professional guidance.

To be eligible for the program, one should receive social welfare benefits at the end of the year before application. Another condition to qualify, is that the company is expected to be viable. The condition is verified based on a submitted business plan[9]. Moreover, based on the business plan, municipalities decide on the duration and the magnitude of the credit.

6 Employees whose jobs are under thread are also eligible to enlist in the program. However, this analysis is restricted to social welfare benefits recipients. There are also other self-employment programs in place in the Netherlands, targeted at for example unemployed individuals.

7 Maximal loan in 2020. https://www.rvo.nl/subsidie-en-financieringswijzer/besluit-bijstandverlening-zelfstandigen-bbz#:~:text=De%20maximale%20lening%20is%20%E2%82%AC,is%20alleen%20voor%20gevestigde%20zelfstandigen.

8 After July 2009 the interest rate changed to 8 percent.

9 Municipalities generally submit the business plan to a third party: in most of the cases this is the private national SME agency IMK or Friedeberg Consultancy B.V..

5 Data

The analysis focuses on applications between 2007 and 2010. By combining data on the applicants[10] with administrative data from Statistics Netherlands between 2002 and 2018, we are able to follow the applicants over a period of fourteen years: from five years before until eight years after the application to the program. A total of 2.140 applicants are observed. The comparison group is formed out of a group of individuals who did not apply to the program (the non-applicants), but were eligible at the moment of matching. To be eligible one has to receive social welfare benefits at the end of the previous year.

The resulting dataset contains information of the applicants and non-applicants about labour market status, personal characteristics and income. Labour market status includes indicators of self-employment, employment and unemployment status. Note that, as a result of the data availability eight years after application, nearly all participants stop receiving financial support in the period that is considered.

Descriptive statistics

Table 1 gives a short overview of the descriptive statistics of the participants and non-participants[11]. Much of the characteristics differ significantly between the two groups. On average, applicants are younger, are more often male, have a higher level of education, spend more months in employment prior to application, and are less often native Dutch than non-applicants. We include these characteristics in the matching procedure such that we correct for the differences between the two groups.

10 Data on applicants of the self-employment program are derived from the private national SME agency IMK and Friedeberg Consultancy B.V. They handle 60 to 70 percent of the submitted business plans. Other participants are excluded from the control group.

11 For a more detailed overview of the descriptive statistics of the participants and non-participants, see Appendix A.

	Appli-cants	Non-appli-cants	t-test equal means
Number of observations	2138	1,141,224	
Female	0.332	0.623	***
Age			
18 to 30 years	0.120	0.137	**
31 to 40 years	0.344	0.218	***
41 to 55 years	0.469	0.401	***
56+ years	0.067	0.244	***
Education			
Low	0.265	0.360	***
Medium	0.247	0.144	***
High	0.101	0.035	***
Background			
Native Dutch	0.394	0.481	***
Western immigrant	0.082	0.078	
Moroccan/Surinam/Antillean/Turkish immigrant	0.197	0.249	***
Other non-western immigrant	0.327	0.192	***
Employment history (number of months prior to appli-cation)			
Employed	0.233	0.136	***
Regular employed	0.158	0.121	***
Self-employed	0.084	0.017	***
Social welfare benefit recipient	0.729	0.834	***
Unemployment benefit	0.063	0.030	***
Disability benefits	0.029	0.042	***
Other benefits	0.018	0.022	*

Table 1 Selective overview descriptive statistics. ***/**/* denote significance at the 1/5/10 % level.

Descriptives of outcome variables

Throughout the analysis the focus lies on the effect on labour market status and personal income. The outcome variables of interest are defined as follows:

- *Self-employed or regular employed*. The goal of the start-up program is to incorporate the unemployed into the labour market. Therefore, the outcome variable of interest is not only self-employment but also regular employment. The variable is defined as: *part of the year self-employed or regular employed*. That is, the number of months registered as self-employed or regular employed divided by the total number of observed months.
- *Social welfare recipient*. This is defined as: *part of the year social welfare recipient*.
- *Labour income*, which is defined as *total yearly labour income*. It includes income from self-employment employment as well as income from regular employment.

- *Total income*. It is defined as *total yearly income*, and includes labour income and financial support such as social welfare benefits and unemployment benefits.

Table 2 shows large significant differences in outcome variables between applicants and non-applicants. These numbers point in the direction of better employment outcomes for the participants four and eight years after application. However, note that the differences should purely be seen as descriptive evidence and should not be interpreted as a causal effect.

		Applicants	Non-applicants	t-test equal means
Self-employed or regular employed	**After four years**	0.537	0.187	***
	After eight years	0.501	0.190	***
Labour income	**After four years**	€ 8,645	€ 3,663	***
	After eight years	€ 10,960	€ 4,416	***
Total income	**After four years**	€ 17,280	€ 15,936	***
	After eight years	€ 18,794	€ 16,369	***
Social welfare recipient	**After four years**	0.420	0.665	***
	After eight years	0.425	0.578	***

Table 2 Descriptive statistics on outcome variables, four and eight years after application. ***/**/* denote significance at the 1/5/10 % level.

6 Methodology

The standard framework for evaluating the causal effect of a program is the potential outcome framework (Roy (1951) and Rubin (1974) model). The treatment effects can be calculated by comparing the outcome of the individuals that join the self-employment program (Y^1) with the potential outcome in the case the individual do not join the program (Y^0). As the potential outcome is not observed, a group should be found that does not receive treatment: the control group. However, this control group differs from the participants even in the absence of the treatment. This will lead to selection bias.

The selection bias consists of two components. The first component is a self-selection bias by applying to the program. This occurs when applicants differ in characteristics from individuals that do not apply to the self-employment program. They could for example differ in their motivation to leave unemployment. The second component is selection bias as a result of the approval of the business proposal and occurs when the participants differ from the applicants whose business proposal is rejected. The two groups could for example differ in their abilities.

A matching technique reduces the selection bias by searching for a group that is similar in observed characteristics to the treatment group but did not participate in the program. Instead of conditioning on all relevant observables, it is more efficient to condition on a function of the observed characteristics, called a balancing score. Specifically, the propensity score (P(X)) can be used as a balancing score. It is the probability of participating in the program given observed characteristics X. The method is referred to as propensity score matching (PSM) (Rosenbaum and Rubin

1983). Specifically, we follow Huber et al. (2013), who suggest the use of biased adjusted radius matching. They show that the radius matching estimator combined with regression performs best compared to all other major classes of propensity-score-based estimators, especially when the robustness to misspecification of the propensity score is of importance and when there are different types of outcome variables.

Instead of examining the average treatment effect on the treated, the impact on the applicants is considered[12]. This is known as the intention-to-treat-effect (ITT-effect). It will reduce the bias as the control and treatment group both consist of talented and less talented individuals. Using this approach, we only have to account for self-selection into the program and not for the selection into the program (the approval of the business proposal). The ITT-effect is defined by

$$\tau = E[Y^1|D = 1] - E[Y^0|D = 0],$$

where D is the treatment indicator, indicating whether an individual did apply for the program.

There are two key assumptions when applying the potential outcome framework: the conditional independence assumption (CIA) and weak overlap assumption. The CIA assumes that the potential outcomes are independent of the treatment assignment conditional on the observed characteristics (X). The weak overlap assumption if defined by $\Pr(D = 1|P(X)) < 1$, and eliminates the possibility of a perfect predictor for participation.

Validity of the CIA

Previous studies have already emphasized the importance of the CIA (e.g., Caliendo & Kopeinig 2008). The validity of the assumption is important to be able to interpret the outcome as a causal effect. Because the CIA cannot be tested, it is argued that the assumption holds if a rich set of variables is included that explain the participation of an individual in the program and the outcome variables. The rich set of variables often consists of background characteristics and employment history. For the evaluation of active labour market programs for the unemployed, Lechner (2013) shows that information as personal characteristics, duration of current unemployment, regional information, recent labour market history and pre-treatment outcomes eliminates nearly all selection bias. Self-employment history might be an important determinant for becoming self-employed in the future too. In addition to these major determinants, self-employment of parents increases the probability of self-employment of the child (see Dunn & Holtz-Eakin, 2000; Colombier & Masclet, 2008).

It is important to realize that ignoring important characteristics increases the bias of the estimates (Heckman et al. 1997). To check whether the previously mentioned rich set of variables is sufficient, additional variables can be used. Caliendo et al. (2016) include usually unobserved personality traits, such as individuals' personalities, locus of control and risk preferences, because these measures are likely to affect both the treatment and employment related outcomes. It appears however that, if the set of control variables is rich enough, the usually unobserved personality traits do not have to be included in the analysis.

[12] In this paper we study the effect of applying to the program. We are not able to compare this to the effect of participating to the program (the average treatment effect of the treated), as the data does not allow us to isolate the participating individuals from the non-participating ones.

We have an exhaustive dataset including background characteristics, recent (un)employment history, self-employment history, regional information, pre-treatment outcomes and parental entrepreneurship. Based on our rich dataset and by examining the ITT-effect, instead of the average treatment effect, we assume that the CIA holds. Since the CIA is untestable, we assess the sensitivity of our results by deviating from the assumption.

Results of matching analysis

A matched control group that is similar in observed characteristics to the treatment group is found using propensity score matching[13]. The regression includes covariates as recent income history, employment history, parental self-employment history, and personal characteristics including age, gender, migration background, education level and household composition. The quality of the match is verified by comparing means of the treatment and control group with a t-test. The results (Appendix A) indicate that most of the covariates of the treatment group resemble the covariates of the control group. Furthermore, only two observations of the treatment group lie outside the common support region, see Appendix C. These observations are excluded from the analysis. Furthermore, we performed some other quality checks, such as the standardized mean bias (see Appendix C).

7 Results

Main results

Figure 1 shows the mean of the employment outcome variables for the treatment and control group over time. Before treatment, the proportion of months that the two groups are employed is similar. This indicates that the common trend assumption is fulfilled. From time *t* (year of application) onwards a difference between the groups emerges. If we take a look at the outcome variable self-employed or regular employed, the outcome for the treatment group is 50 percent after eight years, whereas the outcome for the control group equals 28 percent. Hence, a long-term treatment effect eight years after the application is present. The difference equals 22 percentage points, which means the mean proportion of employment is 22 percentage points higher for the group of applicants than for the matched control group. In other words, the ITT-effect equals 22 percentage points. Similar results are shown for the ATET of two self-employment programs in Germany. Caliendo and Künn (2011) find an effect of 14 and 23 percentage points of the two programs after 56 months. The results of Caliendo and Tübbicke (2020) show an effect of the reformed German program of 22 percentage points after 40 months. Next, consider the outcome variable self-employed. After eight years, the treatment group is on average 36 percent of the year self-employed. This indicates long-run self-employment for a large proportion of the participants. The ITT-effect equals 25 percentage points after eight years. Since regular employment does not differ significantly between the two groups, the increase in employment, whether it is regular employment or self-employment, is fully due to the increase in self-employment and is not at the expense of regular employment.

13 Results of the probit-estimation can be found in Appendix B.

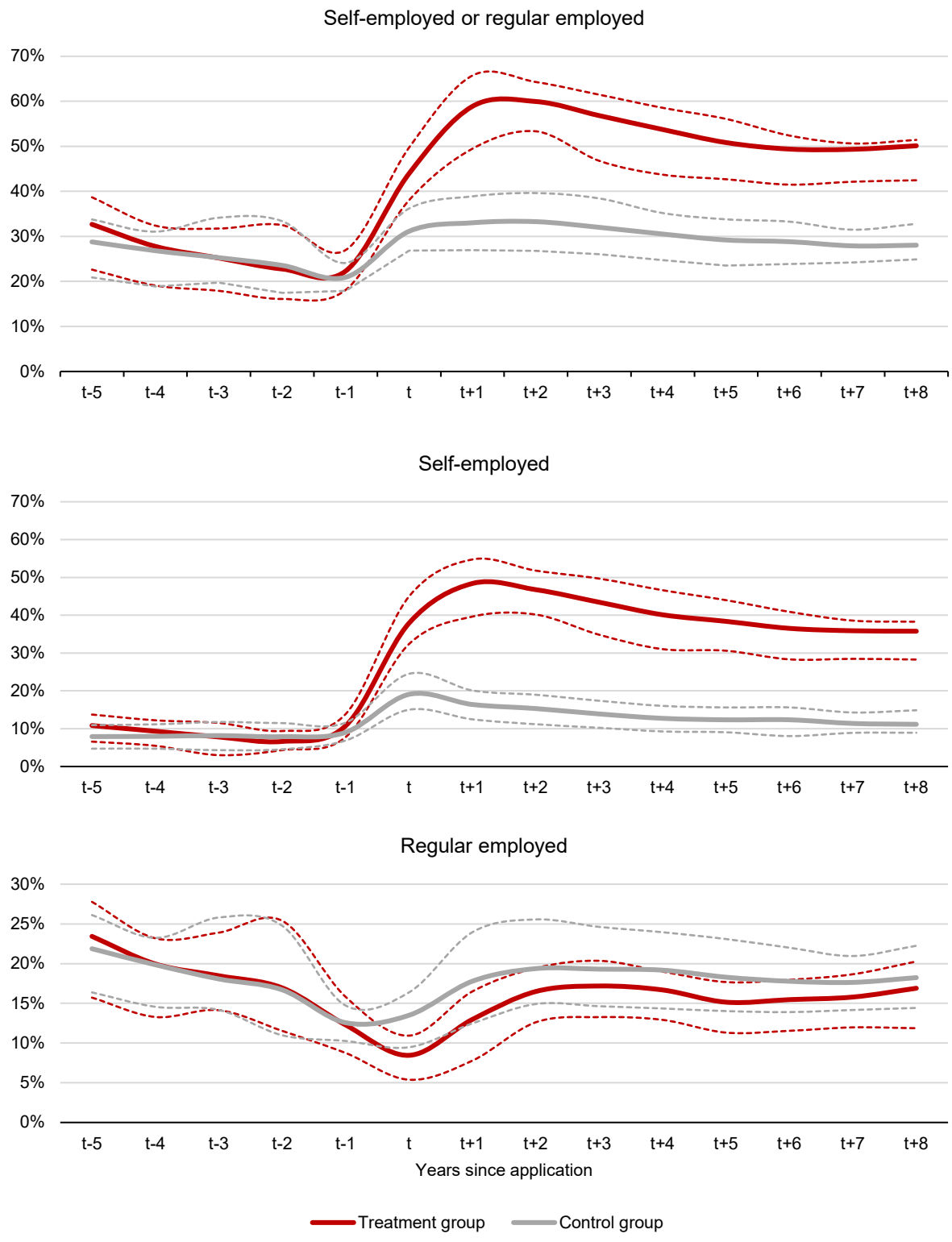

Figure 1: Mean of proportion of the year employed over time. Time t is the moment of application. The difference between the two lines equals the ITT-effect. The dotted lines indicate a 95 percent confidence interval, based on 100 bootstrap replications.

In Figure 2 the mean of the outcome variable social welfare recipient is depicted for the treatment and the control group. In the year before application the mean proportion of the year on social

welfare benefits is nearly 90 percent for both the control and the treatment group. The largest difference between the two groups is present the first years after application. The difference between the two groups decreases from 27 percentage points the first year after application, to 10 percentage points after eight years. The difference between one year and eight years after application is mainly due to the decrease in social welfare benefit receipt in the control group. In conclusion, eight years after application, the applicants of the program are on average 10 percent less on social welfare than non-applicants. Hence, the ITT-effect equals 10 percentage points after eight years. Wolff et. al (2016) find similar results for the ATET. Six years after participation the effect is between 9 and 15 percentage points for different subgroups.

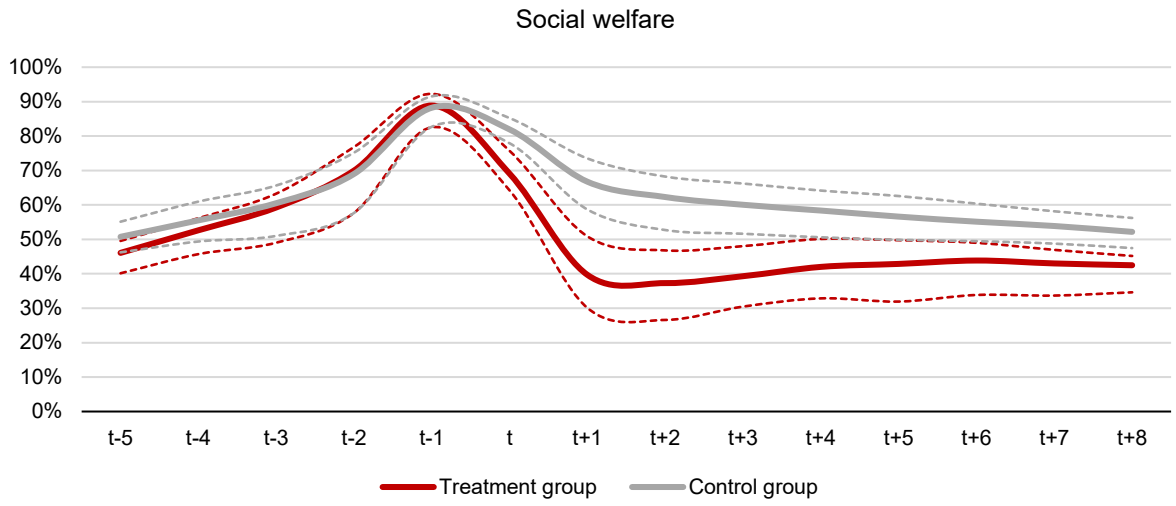

Figure 2: Mean of proportion of the year on social welfare over time. Time t is the moment of application. The difference between the two lines equals the average ITT-effect. The dotted lines indicate a 95 percent confidence interval, based on 100 bootstrap replications.

Next, we consider the effect on income. Figure 3 shows the labour income over time. After eight years the difference in income between the treatment and control group equals nearly 5,000 euros. This is consistent with the findings on the income effect of Caliendo and Künn (2011).

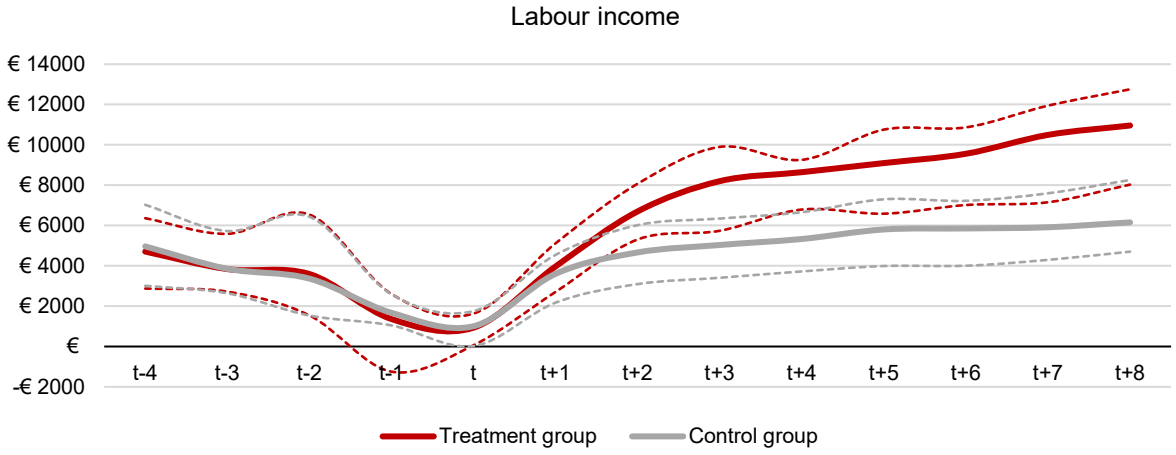

Figure 3: Mean labour income over time. Time t is the moment of application. The difference between the two lines equals the average ITT-effect. The dotted lines indicate a 95 percent confidence interval, based on 100 bootstrap replications.

In Figure 4 results of the outcome variable total income are shown. As total income includes welfare benefits, the differences between the two groups is smaller. After eight years the difference in income between the treatment and control group equals nearly 3,500 euros. However, this difference is not significant.

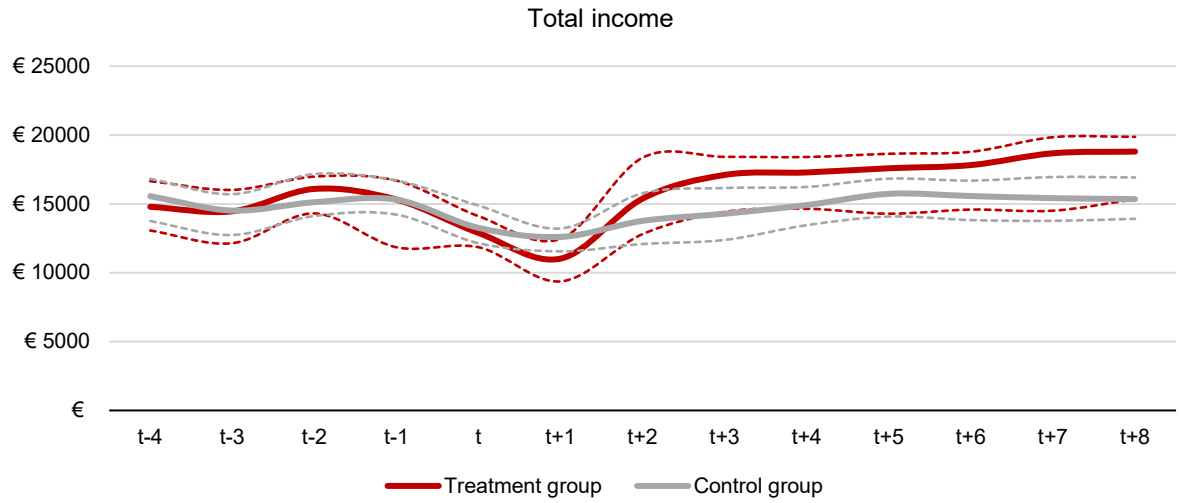

Figure 4: Mean total income over time. Total income includes benefits. Time t is the moment of application. The difference between the two lines equals the ITT-effect. The dotted lines indicate a 95 percent confidence interval, based on 100 bootstrap replications.

Heterogeneous effects

To see which groups benefit most from the self-employment program the estimation procedures are replicated on different subgroups of the data, with respect to education, migration background and age. Most active labour market programs are most effective for those with a relatively low probability to find work, including low educated and immigrants (Lammers and Kok, 2019). Our findings confirm these previous results. The results are summarized in Table 3. For most of the subgroups, we find significant results. However, we find no significant effect on social welfare recipience for individuals older than 45. For the group of native Dutch and western immigrants, eight years after application there is no significant effect on welfare recipience.

First of all, let's consider the effect by education level. The effect in the long run is larger for low educated individuals compared to middle or high educated individuals. After eight years the ITT-effect for employment is equal to 24 percentage points for the low educated whereas it is 19 percentage points for the middle or highly educated. The effect on welfare recipience is also larger for low educated. Accordingly, in the long run low educated individuals benefit more than high or middle educated individuals, on average. If we take a look at the stratified results by background, we see that the effect on employment is larger for non-western immigrants than for native Dutch or western immigrants. The difference between the two groups increases over time. After eight years the ITT-effect is equal to 25 percentage points for the non-western immigrants, whereas it equals 18 percentage points for native Dutch or western immigrants. So, in the long run non-western immigrants benefit more than native Dutch or western immigrants, on average. Furthermore, it seems that age does not matter much. The effect on individuals older than 45 years is relatively similar to the effect on younger individuals.

Education	High/middle		low	
Number treated	740		553	
Number control	191679		293971	
Outcome self-employed or regular employed				
After four years (in percentage points)	0.229	**	0.234	**
After eight years (in percentage points)	0.190	**	0.238	**
Outcome social welfare				
After four years (in percentage points)	-0.139	**	-0.157	**
After eight years (in percentage points)	-0.084	**	-0.114	**

Nationality	Native Dutch/western immigrant		Non-western immigrant	
Number treated	1010		1117	
Number control	590436		450066	
Outcome self-employed or regular employed				
After four years (in percentage points)	0.225	**	0.236	**
After eight years (in percentage points)	0.175	**	0.246	**
Outcome social welfare				
After four years (in percentage points)	-0.118	**	-0.202	**
After eight years (in percentage points)	-0.047		-0.132	**

Age	45-		45+	
Number treated	1368		754	
Number control	499289		496993	
Outcome self-employed or regular employed				
After four years (in percentage points)	0.230	**	0.242	**
After eight years (in percentage points)	0.219	**	0.205	**
Outcome social welfare				
After four years (in percentage points)	-0.166	**	-0.142	
After eight years (in percentage points)	-0.109	**	-0.057	

Table 3 IIT-effect on employment and welfare recipience for different subgroups four and eight years after application. ∗∗ denote significance at the 5 % level, based on 100 bootstrap replications.

8 Sensitivity analysis

Provided that the CIA is an assumption that cannot be tested, a sensitivity analysis of the CIA is of importance to see whether the results are robust. Two methods are applied to check the reliability of the CIA. First of all, by visualizing the outcomes during a period five years before applying to the program, time-invariant unobserved characteristics between the treatment and control group become evident. Second, the reliability of the CIA is examined by testing to what degree the results are robust against a simulated unobserved factor.

Common trend

First, we investigate the sensitivity of the main results by comparing the control and the treatment group before treatment. As can be seen in Figures 1-4, the outcome variables of both groups are approximately equal until time t. This indicates that when we would allow for time-invariant unobserved characteristics that differ between treatment and control, the results would be similar.

Rosenbaum bounds

To test the sensitivity of the matching estimator to a hidden bias we follow the approach of Rosenbaum (2002). The Rosenbaum bounds sensitivity test evaluates the robustness of the matching estimator by adding an unobserved factor (Γ). Increasing the hidden bias enables us to find a point such that the results are no longer significant. This point indicates how strongly the unobserved factors have to influence the probability of treatment, such that the matching results are no longer significant.

Let π_i and π_j denote the probability of treatment of two individuals with identical observed characteristics (X). The individuals differ in unobserved characteristics (u). When this unobserved variable affects the probability of treatment, a hidden bias arises. Consequently, the probability of treatment is defined by

$$\pi_i = \mathrm{P}(D_i = 1|X_i, u_i) = \mathrm{F}(\beta X_i + \gamma u_i),$$

and does rely on observed characteristics (X), as well as on observed characteristics (u).

Rosenbaum (2002) shows the following relation between Γ and the odds ratio of receiving treatment

$$\frac{1}{\Gamma} \leq \frac{\pi_i(1-\pi_i)}{\pi_j(1-\pi_j)} \leq \Gamma\,,$$

where $\Gamma = \exp^{\gamma}$. When Γ is equal to one, there are no unobserved characteristics that affect the treatment assignment. When Γ is larger than one, a hidden bias emerges and increases with Γ.

We start with setting $\Gamma = 1$. In that case, we do not add any unobserved factors, which means that the results are identical to the main results in the previous section. Next, we increase the hidden bias, so we increase Γ, up to a point where the results turn insignificant. We call this point Γ^*. The larger Γ^* is, the more robust the results are to an unobserved factor. We find $\Gamma^* = 4.2$ for the self-

employed or regular employed outcome variable eight years after application[14]. In other words, for the results to turn insignificant, an unobserved characteristic needs to increase the odds of treatment with a factor 4.2 compared to an individual without this unobserved characteristic. To clarify, consider an individual with an estimated probability of treatment of 50 percent. For the results to turn insignificant, there must be an unobserved characteristic that influences the probability of treatment in such a way that the real probability of treatment is larger than 96 percent or less than 4 percent. Hence, according to the Rosenbaum sensitivity test, the unobserved factor should be large to turn the results insignificant. When comparing this value of Γ^* with other studies we see that the results of Caliendo and Künn (2011) of the effectiveness of the two German start-up programs are robust to $\Gamma^*=3$ and $\Gamma^*=1.5$ and Behrenz et al. (2016) finds values of Γ^* ranges from 5.4 to 7.4.

Different matching algorithm

We investigate the robustness of the results regarding different estimators by applying nearest neighbour matching and kernel matching. The results of the ITT-effect are shown in Table 1. The choice of the matching algorithm has no large effect on the estimates.

	After four years			After eight years		
	Self-employed or regular employed	Labour income	Social welfare recipient	Self-employed or regular employed	Labour income	Social welfare recipient
Baseline results (radius matching)	0.232***	3,313***	-0.163***	0.221***	4,804***	-0.100***
Nearest neighbour matching	0.214***	2,974 ***	-0.176***	0.185***	4,012***	-0.133***
Kernel matching	0.259***	3,558 ***	-0.217***	0.226***	4,597 ***	-0.173***

Table 4: Results of ITT-effect of the base model and variations to this base model with respect to the matching algorithm. The matching algorithms are (1) Kernel matching with a bandwidth of 12 and (2) a one-to-one Nearest neighbour matching with replacement. *** denotes significance at 1%-level.

9 Cost-benefit analysis

Until now, we have discussed the effectiveness of the self-employment program. We have shown that the program is beneficial to the participant in terms of employment and income up until eight years after application. Next, we consider the benefits in a broader sense. The cost-benefit analysis focuses on the financial efficiency of the self-employment program[15]. The goal of such an analysis is to shed light on the total costs and benefits of the policy from the perspective of the participant,

14 For the welfare recipience outcome variable find $\Gamma^* = 1.9$.

15 The cost-benefit analysis is performed conform the guidelines specified in Koopmans et al (2016). Costs and benefits are analysed over the period of eight years. All cashflows are discounted to the time of the admission into the program.

the local government and the national government. The costs and benefits from these three perspectives are combined to form an overall conclusion of the efficiency of the program[16]. The results are summarized in Table 5.

The analysis distinguishes the effects of the program on administration costs, non-refunded loans, productivity, benefits payments and taxes. Administrative costs consist of the costs of counselling and the assessment of the business plan.[17] Partly, these tasks are performed by the local government, and partly by third parties. Local governments indicate that they spend on average 0.05 FTE on each participant[18]. In monetary terms that is 3,500 euros[19]. 35 percent of the business proposals are assessed by a third party. Each assessment costs 2,300 euros. That is 1,800 euros per participant[20]. Ten percent is accounted for by the local government, whereas 90 percent is paid for by the national government. External counselling is used for 90 percent of the participants and costs 1,500 euros. The calculation of the costs of the non-refunded loans assumes that the share of refunded loans is equivalent to the average of the sum of the costs of credit divided by the sum of refunded loans over the years 2007 till 2015. It equals 77 percent. That means that on average non-refunded loans cost 3,200 euros to the government[21], of which 25 percent is accounted for by local municipalities.

The effects of the program on income, benefits and tax payments are defined as the cumulated difference between the participants and the control group over eight years. As a result of the higher total income of the participant compared to the control group each year after application, there is an increase in productivity of participants relative to the control group, of more than sixty thousand euros over eight years. This implies higher tax payments of almost seven thousand euros. Benefit payments decrease on balance by nearly thirty thousand euros per participant. The program includes income support for a maximum of three years. This is in the form of an interest-free loan, but is often converted to an allowance. The savings on benefits due to a higher labour force participation thus outweigh the costs of the initial income support.

For all three different actors, we show positive monetary efficiency. This indicates that the program is, in the long run, not only beneficial to the participant, but also to the government. For the government, the decrease in the spending on benefit payments, and an increase in the receipt of tax payments, outweigh the direct costs of the program. All in all, it appears that the total benefits outweigh the total costs over the period of eight years. The total benefits of the self-employment program equal 55,500 euros. Ultimately, this is the result of the higher employment rate among the starting entrepreneurs, compared to the control group. In contrast, Baumgartner and Caliendo (2007) find other results for the efficiency of the two start-up programs in Germany[22]. Over the observation period of 28 months, they show a negative monetary efficiency for one of the programs (Start-up Subsidy) of approximately minus six to minus seven thousand euros and positive results for the other program (Bridging Allowance) of approximately one to three thousand euros. The

16 Because our data does not allow us to distinguish participants from non-participant, we assign the effect and the costs of the applicants to the participants. We are able to do this using an approximation of the fraction of accepted applications, which is 46 percent.
17 The direct costs of the program are based on results of Kok et al. (2018).
18 Rejected applications are included in the 0.05 FTE.
19 We assuming an income of council officials of 74,000 euros (pay scale 10 including bonusses).
20 0.35*2,300/0.46=1,800
21 74 percent of the participants have a credit of on average 19,000 euros. Over all participants that is a mean credit of 14,000.
22 Baumgartner and Caliendo (2007) analyse the efficiency for the provider of the program: the Federal Employment Agency.

differences in outcomes is likely not only due to the use of a shorter time period, but also because Baumgartner and Caliendo (2007) make some simplifications causing an underestimation of the benefits of the programs. In fact, they only take savings on unemployment benefits into account, and therefore not the savings on welfare benefits, and they omit the increase of tax revenues due to the program.

	Participant	Local government	National government	Total
Administration costs				
• Training, coaching and viability assessment of business plan by local government		-€ 3,500.00		-€ 3,500.00
• External training and coaching		-€ 1,300.00		-€ 1,300.00
• External viability assessment of business plan		-€ 200.00	-€ 1,600.00	-€ 1,800.00
Non-refunded loans	€ 3,200.00	-€ 800.00	-€ 2,400.00	€ 0.00
Productivity	€ 62,000.00			€ 62,000.00
Benefit payments	-€ 28,800.00	€ 28,800.00		€ 0.00
Taxes	-€ 6,700.00		€ 6,700.00	€ 0.00
Total	€ 29,800.00	€ 23,000.00	€ 2,700.00	€ 55,500.00

Table 5: Costs and benefits up until eight years after application.

The cost-benefit analysis does not include some immaterial costs and benefits for the participant. It is well documented that unemployed who return to work report a higher quality of life (see for example Winkelman, 2014). On the other hand the unemployed that start a job will have less leisure time, which is a welfare loss. In theory, the value of leisure time is equal to the hourly net wage rate. However, this is only valid for marginal changes and only if there is free choice of the number of hours worked. These conditions are obviously not met for involuntary unemployed who return to work. The value of leisure time will therefore be much lower than 100% of the net wage increase for them. As a sensitivity analysis, we assume that the value of leisure time is 70% of the net income increase (net wage earnings minus lost benefits). This would amount to € 18.600. Including the costs of the loss of leisure would decrease the net gain for the participant to € 11.200 per participant per year.

10 Conclusion and discussion

This paper analyses the effect of the self-employment program for welfare recipients in the Netherlands. We observe individuals for a total of 13 years: five years before application and eight years after application. This enables us to identify the long-term effect of the program. The effectiveness is analysed using propensity score matching on a rich dataset. This, together with the fact that we consider the effect of application instead of participation, allows us to attribute the differences between the treatment and control group to the effect of the program.

Our results suggest that the effect of applying to the program on employment is positive and robust with respect to deviations from the identifying assumption. The program decreases unemployment,

and applicants rely less on welfare benefits. Eight years after application the ITT-effect on employment is 22 percentage points and 10 percentage points on welfare recipience. We find that the decrease in unemployment is fully due to the increase in self-employment and hence is not at the expense of regular employment. Next to the positive effect on employment, we find a positive income effect of 5,000 euros, eight years after application. It is important to realize that the effect of participation on employment and income is even larger than the effect of applying to the program, as approximately half of the applications are rejected. Our estimated effect of application is similar to the estimated effect of participation in previous literature: Caliendo and Künn (2011) and Caliendo and Tübbicke (2020) find a treatment effect on employment between 14 and 23 percentage point, and Wolff et. al (2016) find an effect on welfare recipience between 9 and 15 percentage points for different subgroups. Consequently, if we assign the effect of the applicants to the participants, we a find larger treatment effect than was previously found. Since we control for similar background characteristics, we conclude that the larger effect is due to the differences between the programs. Unlike the programs in other countries, the Dutch policy is intended for welfare recipients and there exists a possibility of receiving a loan and professional guidance. Concerning the heterogeneity in the treatment effect, we find that the program is especially effective for low educated and non-western immigrants. This is partly in line with the findings of Caliendo and Künn (2011) on the self-employment program in Germany. They find that low educated benefit the most. However, Carling and Gustafson (1999) and Caliendo and Künn (2011) find that the effect of the self-employment programs is largest for natives. Furthermore, we show that the program is not only effective for the participant but also beneficial to both local and national government. Over a time span of eight years, the benefits outweigh the direct costs of the program.

Nevertheless, we need to point out that our study is subject to some limitations. First of all, the identification of the effect relies on the strong CIA. Therefore, selection bias is a common problem when evaluating the effectiveness of such programs. However, by means of a sensitivity analysis, we show that the unobserved factors must be large to turn our results insignificant. The second limitation is that we only focus on the effect on the applicants, and therefore possible macroeconomic effects are not identified. It could for example be that non-subsidized firms are replaced by subsidized firms or employees are substituted by the subsidized self-employed individuals. Since Gautier et al. (2018) show that these effects are small for subsidised employment, we expect that this is also the case for subsidized self-employment. However, further research is needed to address the crowding out and substitution effects. Another limitation of our study is that the data at hand does not enable us to compare our estimated effect of application to the effect of participation.

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Appendix A Descriptive statistics

	Applicants	Non-applicants	t-test equal means	Control group	t-test equal means
Number of observations	2138	1141224		1112286	
Female	0.332	0.623	***	0.332	
Age					
18 to 30 years	0.120	0.137	**	0.120	
31 to 40 years	0.344	0.218	***	0.344	
41 to 55 years	0.469	0.401	***	0.469	
56+ years	0.067	0.244	***	0.067	
Education					
Low educated	0.265	0.360	***	0.265	
Middle educated	0.247	0.144	***	0.247	
High educated	0.101	0.035	***	0.101	
Background					
Native Dutch	0.394	0.481	***	0.424	***
Western immigrant	0.082	0.078		0.068	**
Moroccan/Surinam/Antillean/Turkish	0.197	0.249	***	0.251	***
Other non-western immigrant	0.327	0.192	***	0.257	***
Household composition					
Couple with children	0.346	0.192	***	0.346	
Couple without children	0.070	0.114	***	0.070	
Single with children	0.211	0.238	***	0.211	
Single without children	0.319	0.388	***	0.319	
Living with parents	0.046	0.046		0.046	
Other	0.005	0.007		0.006	
Empl. history (number of months prior to application)					
Employed	0.233	0.136	***	0.233	
Regular employed	0.158	0.121	***	0.158	
Self-employed	0.084	0.017	***	0.084	
Social welfare benefit recipient	0.729	0.834	***	0.729	
Unemployment benefit	0.063	0.030	***	0.063	
Disability benefits	0.029	0.042	***	0.029	
Other benefits	0.018	0.022	*	0.018	
Yearly working income year of application					
<€-25k	0.006	0.000	***	0.006	
Between €-25k and €-10k	0.027	0.000	***	0.027	
Between €-10k and €0	0.162	0.002	***	0.162	
Between €0 and €10k	0.732	0.885	***	0.732	
Between €10k and €25k	0.058	0.084	***	0.058	
Between €25k and €50k	0.013	0.020	***	0.013	

>€50k	0.003	0.008	***	0.003	
Total yearly income year of application					
<€-25k	0.004	0.000	***	0.004	
Between €-25k and €-10k	0.009	0.000	***	0.009	
Between €-10k and €0	0.036	0.002	***	0.036	
Between €0 and €10k	0.245	0.105	***	0.245	
Between €10k and €25k	0.666	0.844	***	0.666	
Between €25k and €50k	0.036	0.041		0.036	
>€50k	0.004	0.009	***	0.004	
Yearly working income year before application					
<€-25k	0.002	0.000		0.002	
Between €-25k and €-10k	0.041	0.002	***	0.041	
Between €-10k and €0	0.893	0.935	***	0.893	
Between €0 and €10k	0.055	0.052		0.055	
Between €10k and €25k	0.006	0.003		0.006	
Between €25k and €50k	0.003	0.008	***	0.003	
>€50k	0.003	0.001	*	0.003	
Total yearly income year before application					
<€-25k	0.002	0.000		0.002	
Between €-25k and €-10k	0.001	0.001		0.001	
Between €-10k and €0	0.128	0.121		0.128	
Between €0 and €10k	0.824	0.850	***	0.824	
Between €10k and €25k	0.041	0.021	***	0.041	
Between €25k and €50k	0.004	0.008	***	0.004	
>€50k	0.001	0.001		0.001	
Urban-Rural					
1	0.283	0.383	***	0.385	***
2	0.336	0.311	**	0.306	***
3	0.162	0.145	*	0.144	*
4	0.158	0.108	***	0.105	***
4	0.062	0.053		0.060	
Province					
Groningen	0.038	0.052	***	0.053	***
Friesland	0.029	0.039	**	0.037	*
Drenthe	0.045	0.027	***	0.029	***
Overijssel	0.034	0.057	***	0.056	***
Flevoland	0.030	0.021	**	0.021	**
Gelderland	0.138	0.095	***	0.098	***
Utrecht	0.076	0.056	***	0.060	**
North Holland	0.162	0.191	***	0.193	***
South Holland	0.245	0.261		0.255	
Zeeland	0.026	0.016	***	0.013	***
North Braband	0.109	0.109		0.112	
Limburg	0.068	0.077		0.073	

Parents are/were self-employed	0.127	0.079	***	0.127

Table A.1 Descriptvie statistics. * 10%, ** 5%, *** 1% significance level.

Appendix B Propensity score estimation

	2007	2008	2009	2010
Age (ref: 18 to 30 years)				
31 to 40 years	0.126**	0.160**	0.146*	0.219***
41 to 55 years	0.0817	0.0843	0.0589	0.159**
56+ years	-0.237***	-0.369***	-0.302***	-0.169*
Female	-0.466***	-0.440***	-0.489***	-0.470***
Background (ref: Native Dutch)				
Moroccan/Surinam/Antillean/Turkish	0.0132	0.0315	-0.0175	0.0413
Other non-western immigrant	0.173***	0.151***	0.178***	0.242***
Western immigrant	0.159**	0.137*	-0.0384	0.0745
Education (ref: unknown)				
Low educated	0.0121	-0.0422	-0.103*	-0.0587
Middle educated	0.236***	0.174***	0.145**	0.183***
High educated	0.324***	0.341***	0.220**	0.248***
Household composition (ref: other)				
Couple with children	0.352***	0.441***	0.378***	0.207**
Couple without children	0.154*	0.201*	0.131	0.0684
Single with children	0.362***	0.366***	0.445***	0.308***
Single without children	0.136*	0.152	0.140	-0.00589
Yearly working income year of application (ref: >€50k)				
<€-25k	1.846***	4.409	1.585**	1.849***
Between €-25k and €-10k	2.222***	5.491	2.262***	2.093***
Between €-10k and €0	1.802***	5.130	1.731***	1.481***
Between €0 and €10k	0.0175	3.318	-0.0936	-0.137
Between €10k and €25k	-0.146	3.033	-0.256	-0.328
Between €25k and €50k	-0.323	2.965	-0.581	-0.317
Yearly working income year before application (ref: >€50k)				
< €-10k	-0.388	0.573	0	-0.809
Between €-10k and €0	-0.186	0.199	3.094	-0.198
Between €0 and €10k	-0.229	0.659	3.131	-0.118
Between €10k and €25k	-0.330	0.529	3.090	-0.210
Between €25k and €50k	-0.372	0.215	2.809	-0.107
Yearly working income 2 year before application (ref: >€50k)				
< €-10k	-0.225	-0.516	0	0.0167
Between €-10k and €0	-1.059***	-0.447*	-0.580*	-0.353
Between €0 and €10k	-0.0616	-0.193	0.182	-0.0310
Between €10k and €25k	-0.101	-0.0780	0.226	0.0909
Between €25k and €50k	-0.163	-0.114	0.445*	-0.0162
Personal income unknown year of application	-0.622**	-0.148	-0.616	-0.156
Personal income unknown year before application	-0.361	0.399	0.0594	0.246

Personal income unknown 2 years before application	-0.132	0.0558	0.242**	0.0645
Household income below social minimum 2 years before application	-0.0310	-0.0758*	0.0134	-0.0177
Household income below social minimum 1 year before application	-0.130***	-0.0158	-0.0305	-0.0169
Household income below social minimum year of application	0.149***	0.168***	0.101*	0.0193
Household income unknown year of application	-0.166**	-0.310***	-0.277**	-0.162*
Household income unknown year before application	0.433***	0.428***	0.340***	0.229**
Province (ref:Limburg)				
Groningen	0.127	-0.0177	-0.0920	-0.675***
Friesland	0.0325	-0.384**	-0.118	0.0340
Drenthe	0.0792	0.0466	0.212*	0.199*
Overijssel	0.00157	-0.218*	-0.176	-0.337**
Flevoland	0.388***	-0.00217	-0.200	0.0469
Gelderland	0.213**	0.158*	0.0961	0.0490
Utrecht	0.337***	0.197*	0.0695	0.193*
North Holland	0.142*	0.0991	0.172*	-0.0272
South Holland	0.263***	0.155*	0.125	0.156*
Zeeland	0.260*	0.152	0.188	0.247*
North Braband	0.104	-0.0838	0.0919	0.0548
Urban-Rural (ref: Rural, 5)				
1	-0.195**	-0.342***	-0.375***	-0.178*
2	-0.00706	-0.0973	-0.0359	-0.102
3	0.0666	-0.0924	-0.0743	-0.0715
4	0.183*	0.0738	0.0413	-0.107
Empl. history (number of months 2-4y prior to application)				
Social welfare benefit recipient	-0.0754	-0.134	-0.267***	-0.236***
Disability benefits	-0.357**	-0.463**	-0.354*	-0.219
Unemployment benefit	0.185	0.248*	0.258	0.359**
Other benefits	0.0186	0.0947	-0.141	0.0600
Regular employed	-0.0260	-0.0253	0.0470	0.0908
Employed	0.125	0.204	-0.0409	-0.140
Self-employed	0.313	0.339	0.252	0.451
Parents are/were self-employed	0.187***	0.0227	0.108	0.199***
Constant	-2.927***	-6.806	-6.142	-2.590***
N	317677	287909	259500	278110

Table B.1 Results of probit-estimation. * 10%, ** 5%, *** 1% significance level.

Appendix C Matching quality

	Total treatment group	Treatment group - on support	Treatment group - off support	Total control group	Control group - on support	Control group - off support
2007	2187	688	1	316988	314802	2186
2008	9460	550	0	287359	277899	9460
2009	9506	402	0	259098	249592	9506
2010	7619	498	1	277611	269993	7618
Total	28772	2138	2	1141056	1112286	28770

Table C1: Common support

		Mean standardized bias	Pseudo R-squared
2007	**Before matching**	13.4	0.18
	After matching	9.7	0.143
2008	**Before matching**	15.4	0.204
	After matching	10.2	0.164
2009	**Before matching**	16.6	0.207
	After matching	11	0.157
2010	**Before matching**	15.1	0.17
	After matching	10.9	0.171

Table C2: Matching quality

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