

Becker, Sebastian

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Selection into Short-Time Work and Labor Market Outcomes after the Great Recession - Empirical Evidence using German Micro-Level Data

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Selection into Short-time Work and Labor Market Outcomes after the Great Recession
- Empirical Evidence using German Micro-Level Data

Preliminary version. Please do not cite.

Abstract:

Short-time work (STW) was one of the most popular labor market policies during the great recession and is considered a main factor of the German Labor Market Miracle. However, little is known about the labor market outcomes of participants after the crisis. Using a unique dataset on STW linked with IAB's Integrated Employment Biographies, I can observe which workers firms selected into the scheme and also observe their labor market outcomes during and after the crisis. Comparing participants and non-participants within firms I find that workers with higher tenure, age, full time jobs and education are more likely to be chosen for STW. Furthermore, participants have by far a higher probability to keep their job.

Keywords: Short-Time Work, Great Recession, Germany, Active Labor Market Policy

JEL Classification: *JEL-Code:* E24, J08, J63

1. Introduction (Research question, Labor market situation during crisis)

Short-time work (STW) was one of the most popular labor market policies during the great recession and is considered to be a main factor to explain the German Labor Market Miracle. At the recession's peak in spring 2009 more than 1.4 Mio workers participated in the scheme to buffer the temporary lack in demand. According to Hijzen and Venn (2011) about 415.000 Jobs have been saved thanks to this policy, Möller (2010) estimates the number to be around 360.000. Boeri and Brücker (2011) find the number of saved jobs to be about 400.000. Thank to these results the reputation of short-time work in Germany is mostly positive. However, very little is known about the labor market outcomes of participants after the crisis. This is on the one hand caused by data limitations. There has been no administrative dataset that includes STW participation on a worker level. Most studies data that cover STW participation are establishment studies (e.g. Crimmann et al 2012, Cahuc & Carcillo 2011) or use cross-country panels with aggregate data. On the other hand, the interest in crisis policies tends to decrease quickly once a crisis is over (Will 2010). Hence, in the recent years very few studies in the field have been conducted. Nevertheless, ex-post evaluation would be highly appropriate considering the immense costs of 4,57 bn Euro Germany spend for STW only in 2009 (Bundesagentur für Arbeit 2010). Apart from the immense costs, an important concern made by Marx and Eichhorst (2009) is: Was STW a reasonable instrument of resilience or just a costly extension of Unemployment benefits? Therefore this study seeks to show the outcomes of workers after the great recession.

Using a unique dataset on individual short time work usage in the area of Nuremberg, Germany, that can be linked with IAB's Integrated Employment Biographies (IEB) dataset, I am able to observe job stability and labor market outcomes in the years after the crisis. As the IEB are available for a sample period of 1975-2013, I can observe labor market outcomes for the years after the great recession on a daily level. I can furthermore observe which preferences establishments had when they selected workers into STW during the crisis.

The paper tries to provide an explanation to the following questions:

1. Which workers were selected into short-time work?
2. Is participation in STW related to job stability?
3. Did selection about STW and displacements follow the same preferences?

The area of Nuremberg is especially suitable for this purpose as 80% of STW usage took place in manufacturing. Nuremberg is a traditional center of manufacturing in the state of Bavaria. About

27% of the more than 500.000 Jobs subject to social security¹ are in manufacturing, compared to 23% for Germany. Consequently, the share of workers participating in STW of almost 7% was higher than the average share in Germany (about 5%).

2. What is short-time work – Concepts and incentives

Short-time work is a labor market policy in which the employment agency compensates employees for a reduction in working time during recessions. The idea is that employers can reduce the production level without layoffs while employees keep their jobs and are not confronted with high losses in income. In this way, layoffs and a rise in unemployment can be avoided.

In total, there are three different types of STW in Germany. This study only deals with the effectiveness of *konjunkturelle Kurzarbeitergeld* (*short-time work for economic reasons*), which is supposed to preserve employment in times of general economic downturn or sector specific shocks. It can also be used by companies outside of recessions if they prove that their problems are only temporary and due to general circumstances. The maximum duration for usage is 12 months (Hier schon schreiben?).

Basically, *konjunkturelle Kurzarbeit* is an anti-cyclical instrument that is supposed to buffer the effect of a recession on the labor market and reduce volatility in employment. Companies which are affected by the crisis in the sense that they have to reduce their production and thus their employment level, can ask for subsidies by the state. The company has to agree with the employees and/or the work's council about the reduction of working time. In order to compensate the employees for their reduction in salary, the Federal Employment Agency (BA) provides a financial support in the amount of 60% and 67% respectively of the difference between the net usual salary, as arranged in the contract ("Sollentgelt"), and the actual net salary that results from reduced working time ("Istentgelt"). The amount of 67% is provided for employees with at least one child or who have a married partner with children. To apply for STW the employer has to proof that there is a lack of work that (i) is caused by economic reasons or an inevitable event, (ii) is temporary, (iii) is unavoidable and that (iv) affects at least one third of all employees in the company in the way that their net salary is reduced by at least 10%. If this requirement is fulfilled, all employees may apply for STW, not only those with significant loss in

¹ As STW is paid by the employment insurance system only employment subject to social security is eligible for the scheme

working time. Basically, every establishment with at least one employee may apply for STW independent of size and branch.

Especially the necessity to prove that working reduction takes place only on a temporary basis aims to prevent labor hoarding and shall reduce STW to the crisis period (Münstermann et al, 2012). In order to prevent free riding of the scheme, applicants have to prove that working time reduction was unavoidable. Cases of reduced work that are not regarded as unavoidable are the following: (i) sector, company or season specific, (ii) if the reduction could be avoided totally or partially using paid holiday entitlement or neutralization of working time accounts², (iii) cases where STW can be avoided using volatility in working times that are in accordance with existing contracts of employment

In addition to requirements for companies, there are also restrictions for employees. According to these, employees are not eligible to STW if (i) they have reached the legal retirement age, (ii) during a time where they receive a pension by a foreign institution, (iii) they are marginally employed (“Geringfügige Beschäftigung”³), (iv) the job is discontinuous, (v) if they receive sickness benefits or (vi) if they are participating in further vocational training and therefore receive unemployment benefits.

Apart from these requirements, there are further incentives against free riding. In case of reduced working time and thus reduced salaries, employers still have to pay social security contribution, income tax and “solidarity tax” for the East German states, but not in full amount. For the actual working time, contributions in sickness-, care-, unemployment and pension insurance have to be paid as usual, shared among employers and employees. For the difference between usual and de facto gross income, the employer has to pay social security contributions for 80% of the difference, while the employee is exempt from this (§ 232a Abs. 2 SGB V; § 163 Abs. 6 SGB VI). Thus, the higher the spread between usual and de facto working time, the higher the contribution by the employer. This also leads to the result that if working time is reduced, labor costs for the employers are not reduced to the same extent. These costs are called *Remanenzkosten*. Due to these costs, the average costs of one hour of work increases with the amount of STW used, even though total labor costs are reduced.

² A working time account measures the overtime hours worked by employees and gives them possibility to take holidays for their overtime at a later point. Before STW can be admitted, overtime in accounts have set to zero.

³ *Geringfügig Beschäftigung* a.k.a. Mini-jobs or 400 EUR Jobs are jobs in a low payment sector that benefit from special tax rules and partial exemption from social Insurance contributions. This makes them attractive for employers. As no contribution for unemployment Insurance is paid, the employment agency does not provide STW for the employees.

Bach and Spitznagel (2009) estimate the *Remanenzkosten* for all employers to be in an amount between 4.2 and 6.2 billion EUR for the crisis year of 2009. They present calculations using the average hourly net wage for an employee in the manufacturing sector of 28.61 EUR of which 16.46 are the wage and 12.15 being ancillary wage costs. For the basic scheme without refunding of costs, the *Remanenzkosten* for a reduced hour of work would be 9.98 EUR per hour and 8.40 for the case of a 50% refunding of social security contribution. They consider these additional costs as an appropriate method to prevent free riding. Likewise, Deeke (2005) expects that economically weak employers will take into account all other options before they apply for STW.

The maximum duration of STW usage is six months. The German Federal Ministry for Employment and Social Affairs (*BMAS*) can furthermore prolong the duration limit up to 12 months for special circumstances in certain regions or branches and up to 24 months for the case of exceptional circumstances for the entire economy (Bundesagentur für Arbeit, 2012, p.24). After the maximum duration, employees have to wait for 3 months before they can use STW again. During the last crisis, the BMAS made use of this option and increased the STW limit to 12 months for 2008, increased in to 18 on January 1st 2009. In May 2009, the period was prolonged retroactive up to 24 months for the entire year of 2009. The maximum duration for 2010 and 2011 is 18 and 12 months respectively. For 2012 the basic duration of 6 months was reintroduced, after five years of prolonged durations.

Apart from exemption in duration, the federal government made use of further instruments to increase attractiveness of STW during from February 1st 2009 until December 31st 2011. Regarding the *Remanenzkosten* discussed above, the employment refunded 50% of the social security contributions that are to be paid by the employer, for the first six months. If the employee was send to vocational training or if STW was used longer than six months, the agency did refund the entire amount of these contributions (§ 421t Abs. 1 Nr. 1 – 3 SGB III). Contributions for unemployment insurance were refunded in full amount anyway. Bach and Spitznagel (2009) give some examples for the cost effect of *Remanenzkosten* that result from the scheme. If social security contributions are exempt to 100%, *Remanenzkosten* still consist of negotiated extra payments (for Christmas, holidays etc.), but decrease by about 50%. In addition, Companies were allowed to apply even though less than one third of their labor stock faced reduction in income of more than 10%. In this case, STW was only eligible for that small group of employees.

3. Potential risks and benefits

- a) the employer's perspective

A demand shock such as the great recession reduces the output level of establishments which translates into a decline in demand for input factors. As capital is not a flexible factor in the short run, adjustments of the production level are done by reducing labor input. Firms can adjust either by reducing the number of workers (external flexibility) and/or by a reduction of hours per worker (internal flexibility). While displacements affect a relatively small share of displaced workers quite intensively, internal flexibility allows for rather small reductions in working time shared across the workforce.

However, firms will most likely not choose among external and internal flexibility, but apply a mix of both.

The incentive to use instruments of internal or external flexibility crucially depends on other institutional settings, e.g. the level of employment protection (Boeri & Brücker, 2011). If redundancy payments and periods of notice are high, displacements can be costly and therefore unattractive for firms. This might be a reason why STW is more popular in continental European labor markets with high protection legislation such as Germany or Italy, whereas the STW scheme are far less popular in labor markets with low protection such as the US, UK or Denmark.

According to Will (2010) the main purpose of STW is to relieve companies during recessions and to avoid displacements by offering an instrument that makes layoffs the second best solution compared to STW. Considering layoffs, employers face costs that result from long and costly dismissals, especially on highly regulated labor markets, search costs for a new employee and finally contract negotiations. Considering a highly specialized job, a company often faces long-term investments in education of employees and benefits from their expert knowledge. Thus, with increasing skills, a substitution of employees becomes more difficult and costly and employers have higher interest in keeping parts of their labor force with specific knowledge (Arpaia et al, 2010). The scheme also reduces the level of uncertainty for employers when it comes to future investments, e.g. in further education of employees or new technology.

As Crimmann et al (2010) point out STW helps to avoid deskilling and loss of human capital as employees are kept in work. This effect is not only beneficial for employees and employers, but a positive effect for the aggregate human capital stock of the entire economy. One potential drawback of the scheme is to give an incentive for labor hoarding, which can lower the degree of innovation and structural destruction (Schumpeter 1942). To prevent this effect STW is designed such that firms do not have an incentive for labor hoarding. While firms only have to pay the wage for the actual hours worked, the need to pay social security contributions for the entire

contract working hours. Hence the average costs per hour of work increase with the reduction in working time. These costs are called *Remanenzkosten*.

A further unintended side effect is that companies might have problems to find employees as these are kept in their subsidized jobs due to labor hoarding of other firms. Hence the reduction of hiring and separations might reduce the amount of efficient matches on the job market. Furthermore, STW can be a stigma for a company as it is an indicator of economic problems and might thus reduce the company's reputation in investor's and business partner's points of view. In addition, there are transaction costs in case of STW that arise during the application at the employment agency.

b) the employee's perspective

The benefit from a worker's perspective is job stability as main purpose of STW. Not only will the worker keep his job and therefore have a salary that is in any case (except for reduction to zero hours of work) higher than the outside option of receiving UI benefits. A worker will not quite his or her job unless the income reduction are higher than the expected costs of changing the job. As workers will have a harder time finding a job during a crisis as the great recession, there is a high level of uncertainty about the job finding probability. However, workers in occupations that are highly demanded despite the recession might prefer changing the job to accepting income losses through STW.

Thus in many cases STW subsidies give an incentive to not quit one's job when income decreases due to a working time reduction. Additionally, there are huge psychological benefits from having a job compared to being unemployed and facing a social stigma. Instead of dismissing one employee, STW enables to share the burden of the recession among the labor stock, which is a more social approach to overcome the crisis (Crimmann et al, 2010). The fact that the establishment uses STW instead of displacing a worker can also be considered as a positive signal of trust to the worker (Crimmann et al 2010). Considering the utility function of a risk averse employee, the loss in income due to STW can be regarded as the risk premium to keep a job (Bach and Spitznagel, 2009). As Will (2010) points out, STW is a protection against a sudden income loss as it reduces volatility in employment and thus in income. The downside of less volatility is that STW creates advantages for insiders while is making it more difficult for outsiders (Hijzen and Venn, 2011) as the labor market becomes less permeable. Nevertheless, for a risk averse employee with a preference for consumption smoothing, STW can contribute to positive welfare effects. Summarizing, employees make use of STW if the utility from having a job with reduced income is higher than the utility from being unemployed and receiving benefits.

c) Perspective of the federal employment agency/ The labor market in general

Short-time work pays off for the unemployment insurance as long as the costs for the short-time work compensation are lower than the unemployment benefits, if the employee was laid off immediately. Nonetheless, for the short-time work option additional costs for unemployment benefits can occur, in case the job cannot be saved in the long run.

Here the crucial factors are the duration of STW and a subsequent recipience of UI benefits after the usage of STW. In the worst case, STW could have been used in the crisis for a maximum of 24 months. In a case of a displacement after the usage of STW a worker is eligible to receive UI benefits for 12 months or even 24 months, depending on the worker's age and security contributions. But as one the main purpose was to prevent unemployment (Criemmann et al 2010) since the government expected increasing persistence of unemployment due to the crisis, the strong promotion of STW seems to be a reasonable policy.

Furthermore, the employment agency may have a vivid interest in STW as well if expenses are below costs that occur from payments of unemployment benefits, which is supposed to be prevented⁴. Similar to the idea of income smoothing for the consumer, the state can profit from less volatility in employment as this leads to less volatile payments in form of income taxes and social security contributions. Thus, long term planning on a fiscal level becomes easier, even though the costs for STW can as well increase dramatically as in 2009 and can thus have unexpected stress on state budget.

However, there are some more potential benefits but also risks in the form of deadweight loss of the scheme that shall be evaluated as well. Basically, deadweight loss can occur in the two cases that (i) jobs is subsidized by STW but would have been kept anyway or (ii) a lay off is inevitable and occurs after STW was used, so the scheme failed to preserve the job.

In both cases, the employment effect is zero. For the first case, there are unnecessary payments by the state towards free riders. The last case is even worse for the BA as the unemployment agency first pays for STW for the maximum duration, followed by payments of unemployment benefits. In those cases, STW prolongs the duration in which benefits (STW and unemployment benefits) are paid and prolongs unemployment spell, as STW takes some of the incentive to look for a new job. However, this is just one potential outcome as STW has the positive side effect to enables on the job search and further education as working time is reduced, and finding a new job might be possible without a time gap. Further education during STW is

⁴ Section 2.4 illustrates situations when this might occur

therefore subsidized in the German scheme to foster job search for the case that the company might shut down.

One can say that if the free rider problem is not controlled for sufficiently, STW can have huge deadweight loss and have big negative effects on the state budget. Brenke and Zimmermann (2010) note that deadweight loss could have been used especially in those sectors which are not mainly export driven and were thus less affected by foreign demand shock. Due to relaxed eligibility criteria, free riding in STW was easier to achieve during the crisis.

As an additional unintended side effect, labor hoarding might hinder an effective re-allocation of the labor force. The labor force would not change towards places where their marginal productivity is at the optimum. In a wider perspective, companies and sectors, even entire structures that are obsolete and would usually be reformed or removed by market powers, are kept alive via state subsidies. The process of creative destruction during a crisis as described by Schumpeter (1942) would be hindered. Therefore, state policy can have a negative innovation effect by taking the incentive of companies to develop and create new products. But then again, there are two sides of the coin. Companies that do work efficient might face serious troubles from a demand shock. If so, STW might help to save employment and even entire companies, which are basically intact but face a temporary shortfall in demand. Therefore, active labor market policy such as STW can also give long-term perspectives for companies and ease decision for long-term investments in capital and human capital.

4. Literature Review

As short-time work was a very popular scheme during the Great Financial Crisis (GFC) not only in Germany, several papers have tried to quantify the usage and the employment effects in several countries. Two broad strands of literature can be distinguished: Studies on cross-country level and studies on establishment level for single countries.

To quantify the job preserving effect, cross country panel were quite suitable. Hijzen and Venn (2011) as well and Hijzen and Martin (2013) both use panels of OECD member countries and find a significant employment preserving effect of 235.000 and 580.000 workers respectively for Germany. Cahuc and Carcillo (2011) also find a positive employment effect among OECD member states that used STW. Möller (2010) estimates the number of saved jobs in Germany to be about 360.000. Boeri and Brücker (2011) find a value of 320.000 for macro estimations in a cross country panel. Burda and Hunt find that about 1% of employment was saved in Germany

by STW during the crisis. Hence, the literature based cross-country panels mostly finds significant employment effects of several hundred thousands.

Studies on firm-level are more ambiguous in their findings. Kruppe and Scholz (2014) analyze the employment preserving effect of STW on the establishment level using IAB establishment panel and data on STW usage on establishment level. They apply dynamic propensity score matching to compare the number of employees in relation to the first quarter of 2008, thus shortly before the outbreak of the crises, as well as labor turnover. None of the values is significantly different between establishments using STW and those who do not. Therefore, they do not find evidence for a significant treatment effect of STW on an establishment level. Boeri and Brücker (2011) carry out an estimation of saved jobs in Germany and find number of 400.000 saved jobs. other measures of flexibility to protect the core staff and to avoid brain drains during the crisis. Balleer, Gehrke & Merkl (2015) as well use the IAB establishment to calculate demand elasticities for STW. They distinguish between the rule based and discretionary, i.e. the effect due to change in the STW scheme, effect of STW. Applying an SVAR model and a structural model respectively, they find that only the rule based indicator has proven to be a job saver during crisis, while the discretionary part has no insignificant effect on unemployment. Calavrezo et al (2009, 2010) use French data and find that those firms who use STW have a higher probability for displacement as well as plant closures. However, it is difficult to tell if those establishments who used STW might have been in more precarious situations or have been hit harder by the GFC than the control group.

Besides the topic of job preserving effects of STW, the literature using establishment data also tries to answer which firms decide to use STW.

Bellmann et al (2012) identify firm size, sectors as well as usage of other instruments of (internal?) flexibility as good predictors of STW usage. The bigger the firm, the more probable is the usage of STW which stems from the fact that large manufacturing companies suffered the most from the GFC and have a high demand for short-time work. The scheme is most complementary to other policies such as working time accounts or fixed-term contracts. As production in manufacturing is more volatile and sensitive to external demand shocks, the higher demand for measures of flexibility is quite reasonable.

As mentioned in sector 2) either firms or works councils can apply for STW at the Federal employment agency. After having answered the question what kind of establishments are keen on using STW, the question remains how establishment distribute STW among their workforce and if a certain type of employees is more likely to participate in the scheme.

One of the few contributions to this topic is Scholz (2012) who answers the question which workers employers select into STW using the same data source on STW usage in the Nuremberg area used in this paper. After using propensity score matching to compare employees in firms using STW and similar firms that do not use STW, she compares transitions into unemployment or short-time work in a piecewise constant model. The sample period is May 2008 until December 2010. Scholz finds that neither the level of human capital nor seniority are relevant factors for employers with respect to selection into STW. Hence, the quite equal distribution of STW is quite randomly or based on fairness considerations.

However Scholz (2012) compares firms that use STW with firms who do not. This is basically a good idea, but the data used does not fully provide if non-participating firms would have been eligible for STW at all. Thus, there is no certainty if the control group of firm did not participate because they decided not to or because they were not allowed to.

Therefore I add to the literature by focusing only on firms that actually made use of a STW scheme in order to analyze the selection behavior into STW as well as labor market outcomes during and subsequent to the Great financial crisis.

5. Theory: What drives the selection into Short-Time Work?

In case an establishment decides to make use of STW, the question arises which workers are selected into the scheme. The motivation of the establishment is to maintain certain employees and therefore introduced STW as a safeguard. Thus, assignment of workers into STW is not a random process, but is chosen by the employers. Four approaches seem reasonable explain potential selection behavior of establishments.

a) Human Capital Approach

Crimmann et al (2012) provide a model of employer's decision on short-time work participation. Due to heterogeneity in the workforce, it is reasonable to use STW only for a certain share of the workforce. Referring to Becker (1964), it's assumed that there are two types of workers in an establishment of which

- Group A has mostly general human capital and can quickly be integrated into the production process and
- Group B that has mostly firm-specific human capital. This requires educational and occupational investments, therefore this type is more difficult to replace. These workers

should have a higher tenure within in the firm and also a higher level of human capital and can be called “core workers” of an establishment.

In an optimal situation, i.e. without negative shock, the marginal product of labor equals the wage rate, i.e. $MPL = w$. A demand shock decreases the marginal products of labor (MPL) due to a reduction in L . Establishments will in the short term displace workers of group A as $MPL_a < w_a$. For highly specialized jobs, a company faces long-term investment in education of employees and benefits from their expert knowledge. Thus, with increasing skills, a substitution of employees becomes more costly and employers have higher interest in keeping parts of their labor force (Arpaia et al, 2010). Thus the firm retains group B even if $MPL_b < w_b$. As a result given a heterogeneous workforce employers have an incentive to treat workers differently.

The main purpose of STW is to relieve companies during recessions and to avoid displacements by offering an instrument that makes layoffs the second best solution compared to STW (Will, 2010). Due to previous investments, the incentive for firms to protect type B workers is higher. Therefore firms also face different incentives when it comes to the selection of workers into STW.

However, the longer the crisis, the higher become the costs of retaining workers and paying them above their marginal product of labor. Thus, in the long run, establishments displace all workers for which $MPL < w$, independent of the worker's type.

Based on this approach, I expect worker's with high tenure and high educational levels to be more probable to participate in STW.

b) Social Criteria

For displacements for economic reasons the German employment protection legislation specifies social criteria determining the rank order in which workers can be dismissed. Four criteria need to be considered in the layoff process and restrict the employer's decision: (i) job-tenure within the firm, (ii) age, (iii) family responsibilities and (iv) disabilities (§1(3) Dismissal Protection Law). The employer has to rank workers according to these criteria. The worker with the lowest rank must be dismissed first. These rules apply also for individual layoffs if they take place for economic reasons.

The weighting of the four social criteria is decided upon in cooperation with the work's council which has a say in the process of displacements. Therefore it seems reasonable that the work's council will be integrated in the decision process for the selection into short-time work as well as it is a measure to avoid displacements. The relevance of the work's council is emphasized as not only the employer but also the work's council is able to hand in an application for STW at the

federal employment agency. It also seems likely that the work's council demands to select workers into STW based on the social criteria.

c) Fairness or Expectation of a soon end of the crisis

In case establishments expected a short crisis a rational reaction would be to hoard labor and use STW as a subsidy for labor hoarding (Burda & Hunt 2011, Bohachova et al 2011). Under this assumption establishments use STW to buffer labor costs while keeping their entire workforce. The selection into STW should therefore be randomly distributed, as firms do not use the scheme to safeguard certain employees as they don't expect to displace any worker. Hence, STW is distributed equally among the workforce.

As Tortia (2008) finds, fairness perception determine much of worker's well-being at work. Since the selection into STW is a signal that the employer wants to keep a certain group of workers, some employee might be upset about the choice. Therefore, a random selection into STW which is communicated as such can avoid dissatisfaction among the workforce. Of course the perception of fairness can differ between workers. Some might consider the social criteria to be fair; others might find a random selection to be fairer. Given this theory, I should find no significant differences between STW participants and non-participants.

d) Performance

Rationale employers keep their best performing employees and select them into STW. As a proxy of performance, the average increase in wage (compared to the firm's average) can be taken into account.

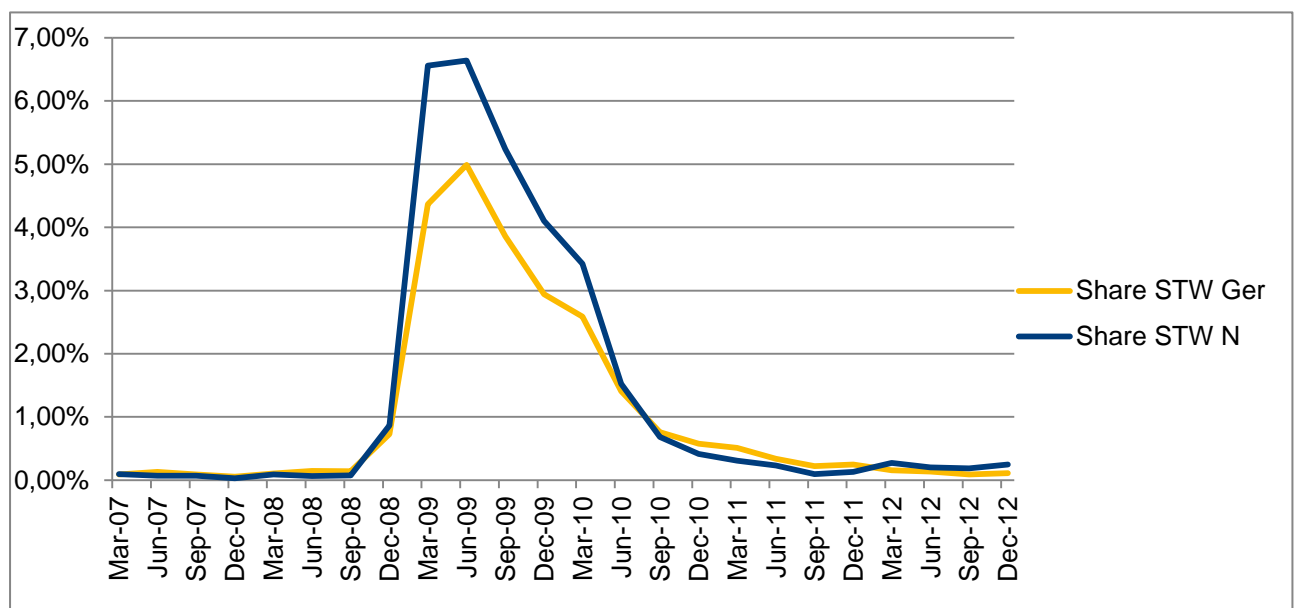
There are other ideas on how to select workers into STW that seem reasonable from an employer's point of view. Unfortunately, not all theories can be tested empirically due to data restrictions but should not be neglected in this section. One of these options is that employers might decide to use STW for certain departments within an establishment that are especially affected by a shock. For instance, client service is a department that suffers disproportionately from a demand shock while Research & Development are only affected indirectly. Thus an establishment could decide to use STW for the client support while workers in R&D keep their contracted working hours. As our data does not cover the organization of an establishment, I am not able to observe which department employees work for.

6. Nuremberg during the great recession

During the Great recession, the German Economy suffered mainly from to a large shock in the export intensive manufacturing sector, which makes up about almost a quarter (23%) of employment subject to social security contributions in the entire economy. The share is even higher in Nuremberg (27%), which is known as one of the traditional centers of manufacturing in the state of Bavaria.

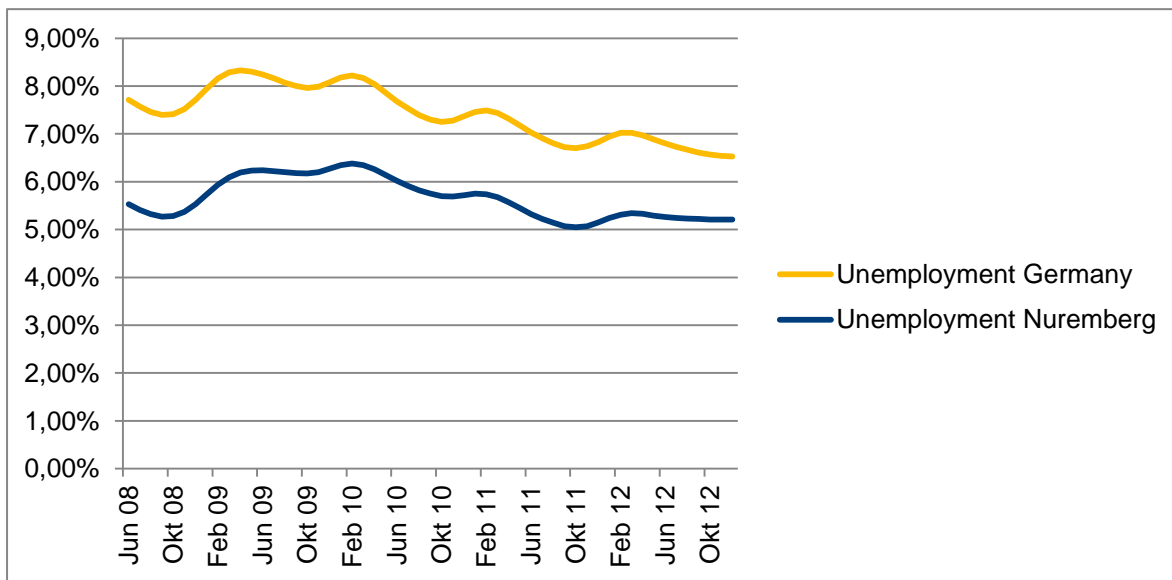
Even though other sectors that were highly affected by the great recession such as Wholesale and retail trade, repair of motor vehicles and motorcycles (14%) and transportation and storage (5%) have large shares on the overall economic activity in Germany, manufacturing accounts for about 80% of the participants in the German short-time work (STW) scheme.

Unsurprisingly, establishments in the area of Nuremberg intensively made use of the short-time work scheme. As Graph I shows, the start of usage was parallel to the overall trend in Germany in the end of 2008.



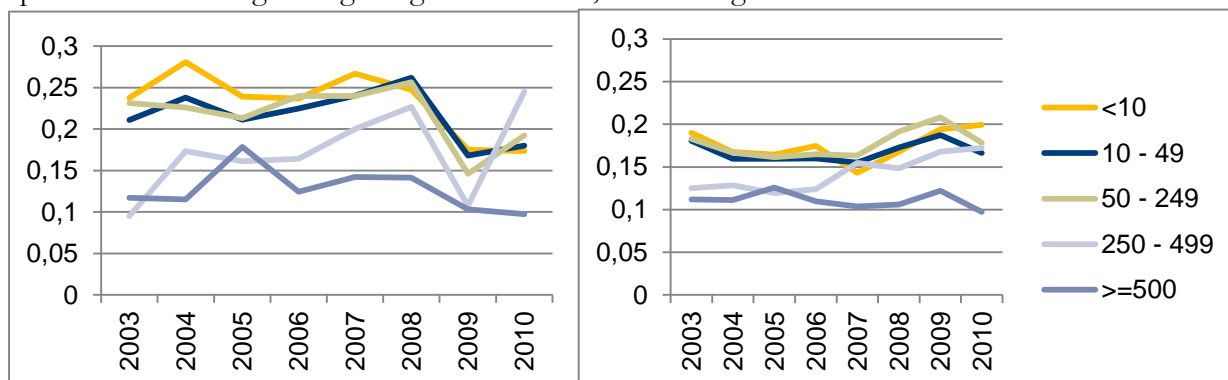
Graph I: Share of Employees subject to social security contributions who participate in STW. Source: Federal Employment Agency

While at the peak of the crises in May 2009 about 1,44 Mio and about 5% of employees respectively participated in the STW scheme the share was even higher in Nuremberg (6.5%) which had an above the average participation rate over the entire crises period until the middle of 2010 when overall participation rates decreases back to pre-crisis levels.



Graph II: Unemployment Rates in Germany and Nuremberg, June 2008-December 2012.
Source: Federal Employment Agency.

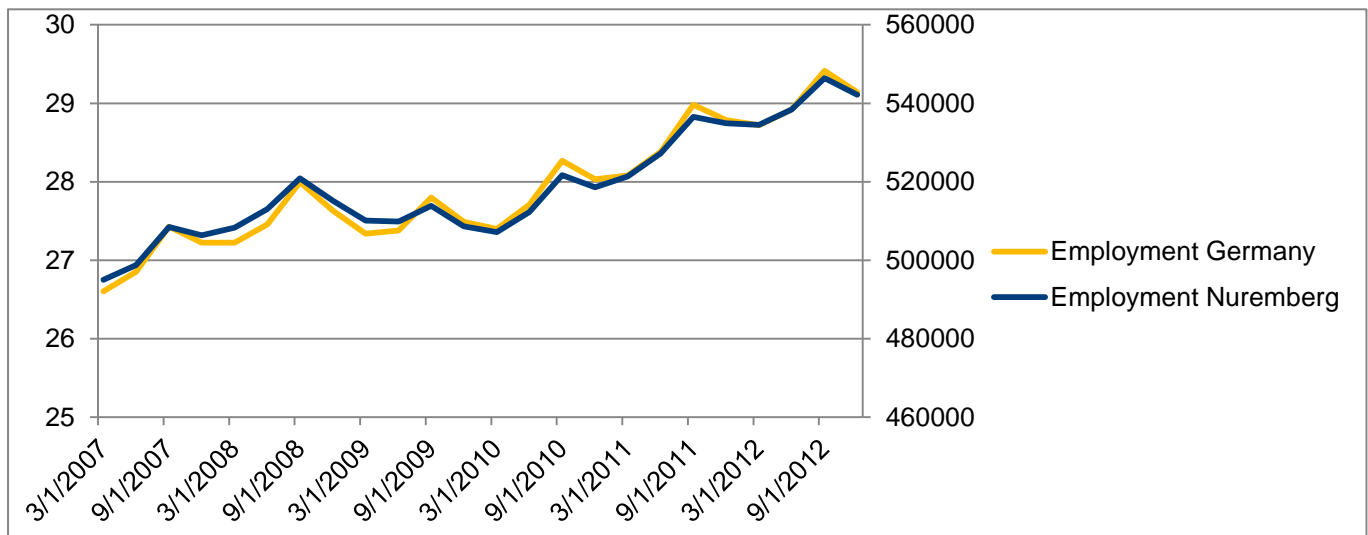
As Graph II shows the local unemployment rates has an upward slope around the crisis. However, the increase only accounts for one percentage point compared to pre-crisis level. Similar to the development in the overall German economy, the increase can be named moderate given the slump in the industrial production and overall economic activity. The question arises if the increase was due to increased separations or decreased hirings. I find that both effects took place in Nuremberg during the great recession, even though not



Graph III: Hirings and Separations as percentage of the firm's workforce, classified by firm size, Sample period 2003-2010, Source: IEB.

simultaneously. While hirings decreased and then stagnated already in the middle of 2007 until the beginning of 2009, separations gained momentum in the autumn of 2008 until the beginning of 2010. Therefore I see an increase of both flows basically during the entire year of 2009. The actual increase in unemployment began by the end of 2008, as can be seen in Graph II. The outflows and inflow from and into unemployment are of similar trend in Nuremberg and Germany, what speaks in favor that Nuremberg seems to be representative for a German manufacturing region in the great recession.

With regard to the development of employment subject to social security contributions in Germany and the area of Nuremberg, Graph IV shows that after the slump in the beginning of the last decade, an overall positive trend started in 2005 that was only interrupted for the short period of the great recession but gained back momentum shortly after the recession.



Graph IV: Employment in total number in Nuremberg and Germany, 2007-2012, Source: Federal Employment Agency

7. Data

Only very little is known about the labor market outcomes of participants after the crisis and this is mostly caused by data limitations. There has been no administrative dataset that includes STW participation on a worker level. In this study I use a unique linked-employer-employee dataset for the labor market region of Nuremberg. The dataset consists of information about short-time work from billing lists of the federal employment agency and covers the period June 2008 until December 2010. Therefore it covers the entire great recession that started by the end of 2008 and lasted until the middle of 2010. The data can be linked with IAB integrated Employment Biographies (IEB) and the Establishment History Panel (BHP).

The IEB contains daily information on individual employment biographies from administrative processes of the Federal Employment Agency (BA). It provides information on wage, gender, school, education, occupation, vocational training, industry, age, region as well as the employing establishment and further variables.

This information is linked with the BHP which provides information about establishments on an annual basis, as of June 30th of each year. This provides us with important information such as the firm size, the share of certain characteristics in the firm's workforce such as gender, age, wage etc.

The dataset includes 55.893 jobs with short-time work participation and 28.491 jobs without STW participation. The sample covers 1854 establishments that used STW in the area of Nuremberg. On the very last day of the STW dataset, December 31st 2010, 1681 persons are on STW and therefore right-censored. I am able to observe employment biographies of people until the end of 2013, but the data contains no information about usage of STW after 2010. However, all right-censored workers are still employed in the same establishment by the end of 2013. Therefore, I do not have to worry about missing data due to right censoring. Furthermore, the amount of short-time workers in Nuremberg in May 2008 was 372, quite small compared to the peak of 36.182 in May 2009. However, as I do not take into account the exact duration of STW usage for econometric analysis, the censoring of data might be negligible.

8. Who was selected into Short-time Work?

a) Differences between participants and non-participants

In order to get an idea about the two groups of participants and non-participants, I compare the two groups in the moment a firm starts to use STW.

Table I confirms findings from the IAB establishment panel on STW, see Bellmann et al. (2013), i.e. that STW was mostly used in the manufacturing sector. About 80% of short-time workers did work in the manufacturing sector. However, only a bit more than half of the share of non-STW workers worked in that sector. Obviously, establishments that used STW in the manufacturing sector had a high share of STW participants, while establishments in other sectors such as Research and Development had a relatively small share of workers in STW. It's notable that temporary work is one of the biggest sectors for non-participants but is of little importance for participants. During the great recession, STW was generally allowed for temporary workers since before it was only eligible for exceptional cases.

Table I: Differences in economic activities between STW participants and non-participants

Economic Activities	STW		Non-STW	
	Freq.	Percent	Freq.	Percent
Agriculture, hunting, forestry	78	0.14	14	0.05
Mining and Quarryng	311	0.56	19	0.07
Manufacturing	44562	80.51	14,889	52.64
Electricity, Gas and Water Supply	9	0.02	-	-
Construction	732	1.32	463	1.64
Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods	3036	5.48	1370	4.84
Hotels and Restaurants	199	0.36	162	0.57
Transport, Storage and Communication	1327	2.40	547	1.93
Financial Intermediation	9	0.02	2	0.01
Real estate and Renting	137	0.25	126	0.45
Computer activities, Research and Development	346	6.25	4486	15.86
Public Administration and Defense, Compulsory social security	49	0.09	90	0.32
Health and social work	77	0.14	99	0.35
Other services	136	0.25	479	1.69
Temporary work	123	2.22	5536	19.57

With respect to occupations, I find that the majority of STW participants worked in simple or qualified manual occupation or as technicians. Non-participants were rather occupied in the service sector and to a lower extend in the technical or manual jobs.

Table II: Occupational differences among STW participants and non-participants

Occupation Blossfeld	STW		Non-STW	
	Freq.	Percent	Freq.	Percent
AGR Agriculture	61	0.11	29	0.10
EMB Simple manual oc	18,172	33.09	4,828	16.14
QMB Qualified manual oc	13,819	25.16	5,216	17.44
TEC Technicans oc	4,099	7.46	2,108	7.05
ING Engineers	3,139	5.72	2,713	9.07
EDI simple service oc	3,778	6.88	4,371	14.61
QDI Qualified service oc	403	0.73	378	1,26

SEMI Semi professional	191	0.35	236	0.79
PROF Professionals	213	0.39	225	0.75
EVb Simple clerks	1,118	2.04	1,14	3.81
QVB Qualified clerks	8,163	14.86	5,549	18.55
MAN Manager	569	1.04	1,027	3.43
SON Other	1,196	2.18	2,093	7.00

Another notable difference between the groups is the higher tenure for STW participants. Even if I compare the age and tenure structure within the firms, I find that those workers that participated in STW are more likely to have spent more time in the establishment. This might speak in favor of the theory that STW was provided to high-tenured workers with high firm-specific human capital. Likewise, it might show the relevance of social criteria.

With regard to education the biggest part of STW participants have a medium education while the non-participants have a higher share of high- and low-qualified workers. One might have expected educational level to be higher for STW participants as maintaining (specific) human capital and fears of a brain drain are one argument for firms on why to use STW.

There is not really a difference in the composition of the groups with respect to gender or nationality. Interestingly STW participants are more likely to have worked full-time before STW was introduced compared to the non-participants.

Table III: Differences between STW participants and non-participants

	STW		Non-STW	
	Average	Std. Dev.	Average	Std. Dev.
Age	41,39	10,51	39,52	12,73
Tenure (days)	3518,09	3401,94	2902,47	3072,06
Wage	101,50	35,59	98,58	57,32
Average monthly increase in wage (per cent)	0,95	0,15	0,98	0,25
High education (per cent)	10,91		19,82	
Medium education (per cent)	73,09		59,49	
Low education (per cent)	16,00		19,82	
Men (per cent)	73,86		70,26	
German (per cent)	86,41		88,08	
Full-time (per cent)	94,29		84,80	

b) Determinants of selection in STW

Obviously, STW participants and non-participants differ in some characteristics. Table IV shows linear probability estimations that show the significance of the differences. As expected, age and tenure have a positive effect on STW participation. More surprising, gender and wage as well are significance, even though the means of the two groups do not differ to a large extent. Compared to the reference group of workers without vocational training, vocational training as well as a university degree increases the probability to use STW. Thus, the theory that human capital is a relevant factor for selection into short-time work cannot be rejected. Notably, the significance of the occupations is quite low. Only three occupations have a significant effect on STW participation. However, as education and occupation might be interacting, there might be a bias in the effects. The results of the estimations give reasons to reject the idea that STW participation was equally assigned to workers within firms. Rather, social criteria such as age and tenure, as well as human capital and performance seemed to be considered by employers.

Table IV: Linear Probability Estimations on Selection into STW

Transition into STW		
	Coefficient	Std. Error
Tenure	0,000***	0,000
Wage	0,001***	0,000
Full time	0,127***	0,005
Age	0,001***	0,000
German	-0,027***	0,004
Male	0,056***	0,003
Wage growths	0,021***	0,006
Vocational training	0,097***	0,004
University degree	0,042***	0,006
Simple manual	0,116**	0,048
Qualified manual	0,049	0,048
Technician	0,010	0,048
Engineer	-0,003	0,048
Simple service	0,055	0,048
Qualified service	0,119**	0,050
Semi professional	0,018	0,052
Professional	-0,106*	0,051
Simple clerk	-0,006	0,048
Qualified clerk	-0,005	0,048
Manager	-0,132***	0,049
Other	-0,104	0,048
# observations	83959	

9. Labor Market Outcomes

After having observed the circumstances of workers in the moment their establishment introduced a STW scheme, I want to go a step further and analyses the labor market outcomes of participants and non-participants during and after STW usage.

Table V: Labor Market Outcomes after the crisis for STW participants and non-participants

	STW				non-STW				Total	
keep	38185	68%			11672	41%			49858	59%
among: partial retirement			1108	3%			1436	12%	2544	
end	17708	32%			16819	59%			34527	41%
among: Direct change			11266	64%			8034	48%	19301	
among: Search Job			4166	24%			6391	38%	10557	
among: never again			2276	13%			2394	14%	4.670	
Total	55893	100%			28491	100%			84385	

Within our Sample about 60% of workers kept their job until the end of the Sample. The difference between STW participants and non-participants is striking: While 68% of previous short-time workers remained in their job only 41% of their counterparts did hold their positions until the end of the sample period. Among those non-participants who kept their job 12% were in an early retirement scheme when their job ended, but only 3% of STW participants. Early retirement schemes were a popular measure during the great recession to reduce labor input in a worker-friendly way. People in early retirement programs are between 55 and 65 years old, with an average of 61 years. Obviously schemes were used for people in an appropriate age for a retirement.

Besides the mere difference in job termination the subsequent labor market outcomes between the two groups differs significantly. While 64% of job endings are followed by direct re-entry, i.e. a new job starts within in a week, this is only the case for 48% of non-STW jobs. The share of workers who are not able to find a job is comparable between the two groups, 13% and 14% respectively. But the share of workers who need some time to find a new employment is larger for non-STW participants. I cannot tell if job changes were initiated by the employee or employer, so it's hard to judge labor market outcomes of this group. But in general short-time

workers seem to have more stable jobs and shorter search durations, hence their labor market outcomes after layoffs are on average superior to those of non-STW workers. In Conclusion, I see that labor market outcomes are considerably better for previous short-time workers with respect to job stability. Also, finding a new job takes on average less time for those who used STW.

Table VI: Amount and Timing of Job termination

Year	# Job ends	Share in Percent
2008	159	0.46
2009	9.451	27.37
2010	11.449	33.16
2011	6.648	19.25
2012	4.044	11.71
2013	2.776	8.04
	34.527	100

Within our Sample of 84.384 jobs in Firms using STW during the crisis, 34.527 were determined the end of the sample period, e.g. December 31st 2013. Most of these layoffs indeed took place during the peak of the recession and 2009 and 2010 when two third of all layoffs occurred. At the beginning of crisis in 2008, only very few jobs losses occurred. While many establishments were hoping for a short crisis of few months, it turned out that an intense and long-lasting lack of demand forced establishments to reduce their workforce in order to adjust their production level. However, among the 1854 establishments in the sample 224 managed to solve the crisis without a single displacement.

The great recession affected the Labor Market in Nuremberg at first in the beginning of 2009 but the highest number of layoffs took place at the peak of the crisis in spring 2009, followed by large layoffs especially in the beginning of 2010. As the head of the Federal Employment Agency, Frank Jürgen Weise pointed out in the beginning of 2010: “It seems that a part of former short-time workers will have to enter unemployment”. After 2010 displacements started to decrease.

As seen in previous downturns, displacements follow business cycle developments with a time lack of several months. I cannot identify if the jobs were determined by employers or by employees. However, since the losses occurred during the crisis it is probable that they did not happen on a voluntary base. But for some jobs that ended after the crises, it seems reasonable

that jobs were quit by employees after the labor market had stabilized and job opportunities began to improve.

Did people still use STW when Jobs ended?

In most cases STW participation had already come to an end when job ended. Only 6% of separations happened when people were still participating in STW. Even though establishments are not allowed to displace workers during STW, cases occurred in which establishments did prove their economic situation had worsened in a way that satisfied layoffs, see Dietz et al (2011). However, among job losers in our sample 51% had used STW during the crisis. Hence, it's very unlikely to lose one's job while using STW, but layoffs could not be avoided at a later stage of the crisis.

Table VII: Status at the end of a job

Status during job termination	# employees	Percent
STW participation	2.080	6.02
STW is still used in the Establishment	12.367	35.82
Establishment is not using STW any more	20.080	58.16
Sum	34.527	100

Among those who did not lose their job until the end of the sample period, 77% used to work in STW. Only 23% of employees, about 11.600, who kept their job never participated in STW. It's difficult to tell if the other 16.819 non-STW workers lost their job or left. Taking a look at subsequent unemployment durations might shed light on what happened. While 29.857 people found a job afterwards, 4670 did not get reemployed afterwards. Among the reemployed 19.300 people found the new job within a week. This is remarkable given that most of the job ended while the crisis was still present at that time. Comparing those who remained unemployed and those who found a job, the gap in age in the moment of the layoffs is striking: While reemployed were on average 38 years old when their job ended, their counterparts who remained out of work had a median age of 52. Even more interesting: Among those who found a new job the unemployment duration does not depend on age. Hence, I can see that labor market success subsequent to a layoff depends largely upon the age of a person.

10. Results (Linear Probability regression)

Determinants of job stability are identified in a linear probability model. I use the same covariates as for the identification of selection into STW. The two estimations in Table VIII differ as I include participation in STW in the second estimation after omitting it in the first one. Again, tenure, age, wage, a full time job as well as wage growths increase the probability to participate in STW. But in contrast to the selection into STW there is no significance for nationality and gender. Furthermore, a university degree seems to have a negative effect on job stability compared to having no vocational training. Again, I find little significance for the occupational dummies. In the second the coefficient for STW participation is strong and positive, pointing to a positive relation between job stability and STW participation.

Table VIII: Linear Probability Estimations on job stability (stay in the job)

	Stay in the Job			
	Coefficient	Std. Error	Coefficient	Std. Error
Short-time work	-	-	0,123***	0,003
Tenure	0,001***	0,000	0,001***	0,000
Wage	0,000***	0,000	0,000***	0,000
Full time	0,048***	0,006	0,030***	0,006
Age	0,002***	0,000	0,001***	0,000
German	-0,009	0,004	-0,005	0,004
Male	0,022	0,003	0,004	0,003
Wage growths	0,014**	0,049	0,011***	0,007
Vocational training	0,017***	0,004	0,05***	0,004
University degree	-0,031**	0,007	-0,037	0,007
Simple manual	-0,022	0,049	-0,036	0,049
Qualified manual	-0,029	0,049	-0,035	0,049
Technician	-0,063	0,049	-0,064	0,049
Engineer	-0,066	0,049	-0,066	0,049
Simple service	-0,048	0,051	-0,075	0,051
Qualified service	-0,056	0,053	-0,071	0,053
Semi professional	-0,103*	0,052	-0,113**	0,052
Professional	-0,203***	0,050	-0,190***	0,050
Simple clerk	-0,083	0,049	-0,082*	0,049
Qualified clerk	-0,075	0,050	-0,075	0,050
Manager	-0,129**	0,050	-0,113**	0,050
Other	-0,109**	0,049	-0,096*	0,049
# observations	83959		83959	
Adjusted R-squared	0,45		0,46	

Summarizing, I find that some factors such as that tenure, age, wage level as well as high wage increases increase the probability to be selected into STW and to maintain one's job. However, other factors are less significant or insignificant. It seems that not all factors of selection into short-time work are equally important when it comes to job stability.

One factor that has to be considered is that I cannot control if employers were willing to keep an employer but had to displace her or him for economic reasons. Therefore our analysis cannot show without a doubt if the determinants between STW participation and job stability differ.

11. Conclusion

This paper is the first that is able to observe labor market outcomes of short-time work participation after the great recession. Using a unique dataset on STW linked with IAB's Integrated Employment Biographies I analyzed the determinants of participation in short-time work as well as labor market outcomes after the great recession. By comparing participants and non-participants within firms I find that STW-participants have a higher probability to maintain their job after the great recession. Non-participants were more likely to change a job and also to spend more time during job search before finding a new job. However, the share of workers that remained unemployed is similar. In conclusion, STW was not simply a costly extension of Unemployment benefits, but is related to higher job stability and better labor market outcomes.

Even though the data is restricted to the area of Nuremberg, which intensively used STW, this paper gives a first idea about effects of STW participation on a micro level. Thus, after a strand of literature emerged to evaluate the effect of STW on the macro-level, I can provide first evidence on individual worker's outcomes on the micro level.

Using linear probability estimations I find that workers with higher tenure, age, full time jobs are more likely to participate in STW as well as to maintain their jobs. There, I reject the idea that STW was equally or randomly assigned within firms. Rather, social criteria, human capital and performances were crucial factors. However, estimation results differ between selection into STW and selection for displacements. Therefore, I conclude that selection into STW and job stability does not follow the same preferences of employers.

So far the paper in the current stat is only able to give descriptive results. The next step is to conduct a propensity score matching between participants and non-participants to gain causal inference.

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