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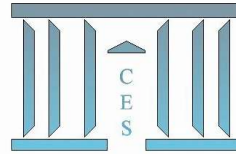
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**The Effect of the Hartz Reform on Unemployment
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A Difference-in-Differences Approach**

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The Effect of the Hartz Reform on Unemployment Duration and Post-Unemployment Outcomes

A Difference-in-Differences Approach

Bruno AMABLE¹ and Baptiste FRANÇON²

March 2014

Abstract: *In this paper, we investigate the microeconomic effects of one major feature of the German Hartz reforms (2003-2005), namely the reduction in compensation duration for older unemployed above 45 years of age. We look at two potential effects of this measure: on job take-up rates, but also on post-unemployment outcomes, through various indicators of matching quality (job stability, skill adequacy) and job quality (type of job contract). Applying difference-in-differences estimators, we show that the effects of this specific feature were rather scant. Regarding unemployment duration, only unemployed within a specific age group (55 to 59 years old) were affected by the reform. Evidence suggests that this is because they previously used unemployment schemes as a bridge to early retirement. In addition, there is some evidence of detrimental effects on job or matching quality.*

Keywords: unemployment benefits, unemployment duration, job matching, job quality, early retirement, difference-in-differences

JEL codes: C41, J64, J26

L'impact des réformes Hartz sur la durée de chômage et la qualité de l'emploi repris

Une approche en différence-de-différences

Résumé: *Dans cet article, nous analysons les effets microéconomiques de l'une des mesures phares des réformes allemandes Hartz (2003-2005), à savoir la réduction de la durée d'indemnisation pour les chômeurs de plus de 45 ans. Nous étudions deux effets potentiels de cette mesure: sur le taux de reprise d'emploi, mais aussi sur le type d'emploi repris à travers un ensemble d'indicateurs de qualité de l'appariement (stabilité de l'emploi, adéquation des compétences) et de l'emploi (type de contrats). A partir d'une estimation en différence-de-différences, nous montrons que les effets de cette mesure ont été relativement limités. En ce qui concerne le taux de reprise d'emploi, seuls les chômeurs d'un certain groupe d'âge (de 55 à 59 ans) ont été significativement affectés par la réforme. Des éléments indiquent que cet effet est lié à l'utilisation antérieure par ce groupe de chômeurs de la filière d'indemnisation chômage comme d'une passerelle vers la retraite anticipée. En complément, nous mettons en évidence certains effets pervers de la réforme sur la qualité de l'emploi et de l'appariement.*

Mots-clés: assurance chômage, durée de chômage, appariement sur le marché du travail, qualité de l'emploi, dispositifs de pré-retraite, différence-de-différences

Codes JEL: C41, J64, J26

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1. Introduction

Against the backdrop of the current Great Recession, Germany is commonly depicted in public debates as an economic ‘success story’ and a potential model for other European countries. Moreover, its current good labour market performances are often ascribed to the set of measures implemented by the Social Democratic-Green coalition from 2003 to 2005, usually referred to as the Hartz reforms (CAE, 2012, p. 5; OECD, 2012, pp. 10-11). These structural reforms have profoundly transformed the German unemployment insurance system and its administration, while they also brought minor changes to the employment protection legislation: they notably led to substantial cuts in unemployment benefits and increased pressures on unemployed.

The conventional view in economics posits that such measures should indeed decrease unemployment, by lowering the reservation wage of workers and by increasing the incentives for the unemployed to take up jobs. In this framework, generous benefits reduce work incentives because they alter the labour/leisure trade-off of unemployed. Moreover, they might lead unemployed to delay re-entry into the labour market as they wait for better job offers, as predicted by standard matching theories (Mortensen, 1987; Pissarides, 2000). Cuts in benefits generosity should therefore decrease the duration of unemployment spells, but at the same time they might have detrimental effects on post-unemployment outcomes. As they would force unemployed to take up jobs where their skills are not optimally exploited, workers productivity might suffer and subsequent employment might be less stable. This mechanism might be especially relevant in the German context, where workers skills have the property of being very specific (Hall and Soskice, 2001): consequently, the amount and availability of jobs that would match their skills appears to be limited (Iversen and Soskice, 2001). Eventually, cuts in benefits might also negatively affect the well-being of workers, by forcing them into jobs of lower quality.

This paper focuses on one of the major feature of the Hartz reforms, namely the strong cuts in unemployment compensation duration for unemployed above 45 years of age. We take advantage of the particular design of this measure to evaluate its causal effect on job take-up rates and post-unemployment outcomes through a difference-in-differences estimation, using the German Socio-Economic Panel (SOEP). Results of duration models first show that this measure only had a limited impact on job take-up rates by the unemployed, and that this effect was concentrated on a specific age group (55 to 59 years old) who previously used

unemployment compensation as a bridge to early retirement. Additional evidence is exhibited in support of this claim.

Furthermore, we analyse the potential impact of this reform on the quality of post-unemployment outcomes, taking into account various measures of matching quality (job stability, skills adequacy) and job quality (type of contract). We also find re-employment duration to have significantly increased for the 55-59 age group specifically. While this comes in contradiction with job matching theories, it corroborates our point that contemporaneous changes in early retirement provisions caused workers to delay labour market exit. Eventually, some detrimental effects of the reform on post-unemployment outcomes are found: skills inadequacy has increased for the oldest unemployed (60-64 years old) while unemployed aged 50 to 54 experienced slightly more exits toward part-time employment.

This paper is organised as follows. The following section presents major features of the Hartz reforms. Section 3 reviews the main results of the literature that focuses on the microeconomic effects of benefits generosity on the job take-up rates by the unemployed. Section 4 details the features of the measure that reduced compensation duration and presents our estimation strategy. Main results of this analysis are presented in Section 5. The final section concludes.

2. The Hartz reforms

The Hartz reforms consisted of four packages of measures (Table 1). They entailed substantial changes in various areas of the unemployment policy, such as the creation of single gateways for the benefit and employment administrations, the development of new training programmes or the introduction of government-sponsored jobs (the infamous *Ein-Euro-Jobs*). In this paper, we focus in particular on the potential effects of the Hartz IV package, implemented in January 2005, as it involved a drastic decrease of the unemployment insurance generosity.

Prior to the reform, the German unemployment insurance system was organised around three schemes; unemployed who were eligible based on their past contributions were entitled to earnings-related benefits from the unemployment insurance (*Arbeitslosengeld I*); once their rights were exhausted, they could still enjoy earnings-related benefits from the unemployment assistance (at a lower replacement rate though), virtually for an unlimited period of time (*Arbeitslosenhilfe*); only unemployed without entitlements to UI benefits had to rely on flat-rate means-tested social assistance (*Sozialhilfe*). With the Hartz IV reform, unemployment

assistance was merged with social assistance into a new flat-rate means-tested benefit (*Arbeitslosengeld II*), which implied significant benefit cuts for about two thirds of the unemployed that formerly depended on these two schemes (Goebel and Richter, 2012). The new scheme was particularly unfavourable to former recipients of the unemployment assistance, who represented about one half of all unemployed with compensation in 2003 (Chagny, 2005, p.14). The benefits of the new scheme were no longer earnings-related. Moreover, criteria of job suitability were strengthened as references to conventional wages or geographical distance were removed. Those who formerly depended on the social assistance generally experienced monetary gains from the reform, but these gains were very marginal in most cases. Furthermore, these recipients also lost from the reform on other fronts. For example, many of these welfare recipients were not exempted from job search anymore and at the same time sanctions in case of job refusals were strengthened.

Finally, introduction of new rules for unemployment insurance compensation also implied less generosity. The necessary contributions for unemployment insurance were now calculated on the 2 years preceding dismissal (3 years before), strengthening the eligibility requirements. The maximum compensation duration for unemployed above 45 years of age

Table 1: Synthetic presentation of Hartz reforms

Law	Main features	Time of implementation
Hartz I (23/12/2002)	<p><i>Reform of public employment service</i> Creation of PSA (Personal-Service-Agentur), private employment placement agencies in charge of placing unemployed people into temporary agency jobs</p> <p><i>Temporary agency work</i> Restrictions in the use of temporary agency work are cancelled (no duration limit (maximum of 2 years before))</p> <p><i>Reform of unemployment benefits system</i> Time duration before the first appointment at the employment agency is shortened. Criteria of acceptance of a job are strengthened for unemployed with no family; the burden of proof is reversed.</p> <p><i>Reform of public employment service</i> Training vouchers are introduced: creation of a new tool for the unemployed.</p>	01/01/2003

<p>Hartz II (23/12/2002)</p>	<p><i>Reform of subsidized jobs: mini and midi jobs</i> The aim is to remove poverty traps and to develop low-paid jobs. <i>Reform of subsidized jobs: Ich AG</i> Supporting schemes for one-man enterprises - targeted at people who receive unemployment benefits (either from insurance or assistance schemes) or who are in subsidized jobs (ABM and SAM) <i>Reform of public employment service</i> <i>Job Centers</i> are created. Regional employment agencies become “one-stop” centers.</p>	<p>01/04/2003</p>
<p>Hartz III (23/12/2003)</p>	<p><i>Reform of public employment service</i> New monitoring tools are created at the federal level; local agencies are given more autonomy. Control and supervision of the unemployed increase. <i>Reform of unemployment benefits system</i> The period of reference used to calculate unemployment benefits is reduced to two years. <i>Reform of subsidized jobs</i> ABM and SAM schemes are merged. The maximum duration for subsidized jobs is reduced.</p>	<p>01/01/2004</p>
<p>Laws on labour market reforms (24/12/2003)</p>	<p><i>Dismissal rules : more flexibility</i> The minimum number of employees required for the application of unfair dismissal procedures increases from 5 to 10 employees. Change in rules governing dismissal of workers in case of dismissal for economic reasons <i>Reform of unemployment benefits system</i> The maximum duration of unemployment benefits is reduced from 32 to 18 months</p>	<p>01/01/2004 01/02/2006</p>
<p>Hartz IV (24/12/2003)</p>	<p><i>Reform of unemployment benefits system</i> Social assistance and unemployment assistance are merged into a single scheme. For people who are able to work, social assistance benefits and unemployment assistance benefits are transformed into a means-tested minimum income scheme that requires active job search.</p>	

Source: Chagny (2005, Table 3 p.8)

was reduced to 18 months, compared to 36 months previously.³ For unemployed without familial ties, reference to geographical distance was also removed from the criteria of job suitability after four months of unemployment and the burden of proof that a job was not-suitable was now on the unemployed. To sum up, opt-out options for workers were severely reduced as a result of the reform. This should increase employment according to conventional views in economics.

3. Benefits generosity, unemployment duration and job matching quality: empirical evidence in the literature

There is a large empirical literature dealing with the microeconomic effects of unemployment benefits generosity. Traditionally, these evaluations focus on the quantitative effects of a variation in the generosity of benefits on the time spent in unemployment. Their basic assumption is that unemployment insurance creates disincentives for job seekers to look actively for a job, leading to longer unemployment spells. Most of them use policy shifts or discontinuities as natural experiments to isolate the causal impact of variation in potential benefit duration or benefit level. They usually find robust evidence in line with theoretical predictions about the detrimental effects of generous benefits.

In a seminal paper, Katz and Meyer (1990) use the differences in potential benefits duration across U.S. states and find significant and substantive disincentives effects. The size of these effects was discussed by follow-up studies. Card and Levine (2000) notably raise the question of policy endogeneity bias, which relates to the fact that benefits are often targeted at individuals who have especially bad employment prospects. Exploiting an exogenous variation in benefit duration in New Jersey, they still find unemployment insurance to significantly enhance the length of the unemployment spell. But the size of this effect is more modest once policy endogeneity is accounted for.⁴

Some studies have specifically dealt with the impact of unemployment insurance in Germany. Hunt (1995) analyses the impact of the extension of potential benefits duration to unemployed

³These two latter features were enacted contemporaneously to the Hartz reforms, but were implemented in February 2006.

⁴ In an analysis of the 1989 unemployment insurance reform in Austria, a country which shares more similarities with Germany than the U.S., the results of Lalive *et al.* (2006, p. 1029) also suggest that the magnitude of these effects, while significant, is not very large. They notably find that an additional week of benefit duration leads to a 0.05 weeks increase in unemployment duration, while an increase by one percentage point of the replacement rate leads to a 0.15 weeks increase in unemployment duration.

older than 42 years of age in the 1980s. Her empirical strategy is very similar to the one used in this section, as it is also based on difference-in-differences estimators applied to the SOEP dataset. She notably finds that longer benefits entitlement had a significant negative impact on job take-up rates by unemployed. In a more recent evaluation of this reform, Fitzenberger and Wilke (2010) provide results in contradiction with Hunt (1995). Using an administrative dataset, they do not find any impact of the extended benefit entitlement on unemployment spells that end with a new job. Besides, they show that this extension was in fact used by firms and older workers as part of early retirement schemes, which is in line with the results presented in this paper.

Beside disincentive effects, theoretical contributions have also emphasized the importance of unemployment benefits to enhance the efficiency of the job matching process. In this framework, more generous benefits give workers the opportunity to wait for jobs that fit their skills better (Jovanovic, 1979; Marimon and Zilibotti, 1999).⁵ Accordingly, this should be reflected in post-unemployment outcomes. More generous benefits should improve job matching quality, thus enhancing productivity (wages) and job stability. The empirical results about such effects are mixed. Addison and Blackburn (2000) find weak effects of generous benefits on re-employment wages in a U.S. dataset, while Card *et al.* (2007) find no effects on re-employment wages or subsequent job stability in an Austrian dataset. Using a panel from eight European countries, Tatsiramos (2009) finds a positive effect of generous benefits on job stability. For Germany, Caliendo *et al.* (2009) use the discontinuity in unemployment benefits around age 45 (prior to the Hartz IV reform, see Table 2) to identify post-unemployment outcomes. They find a positive effect of longer compensation duration on both re-employment wages and job stability. On the contrary, Fitzenberger and Wilke (2010) find that the 1980s reforms improved neither re-employment wages nor job stability.

4. Empirical strategy

In this paper, we investigate more thoroughly the microeconomic effects of one major feature of the Hartz IV package, namely the reduction in compensation duration for older unemployed. We look at two potential effects of this measure: on job take-up rates, but also on post-unemployment outcomes, through various indicators of matching quality (job

⁵ See also Acemoglu and Shimer (2000). In this paper, the authors provide a theoretical framework where benefit generosity raise the incentives for the unemployed to wait for jobs with high wages, which in turn increases the incentives for firms to propose such high-wage jobs.

stability, skill adequacy) and job quality (type of job contract). Applying difference-in-differences estimators, we show that the effects of this specific feature were rather scant. Regarding unemployment duration, only unemployed within a specific age group were affected by the reform. Evidence suggests that this is because they previously used unemployment schemes as a bridge to early retirement. In addition, there is no convincing evidence of detrimental effects on job or matching quality.

4.1. Institutional background

Table 2 depicts the drop in the potential compensation duration induced by the Hartz IV package. This feature was actually implemented in February 2006, and was targeted at unemployed aged 45 or older, who previously enjoyed longer compensation duration. Its impact on benefits generosity was quite dramatic, as maximal benefits duration was more than halved for some age groups (52-54), with duration reductions ranging from 6 to 14 months. Potential benefit duration was eventually re-extended by 3 to 6 months for some age groups by the Grand Coalition in January 2008, but still remained significantly below its original level, with duration reductions (compared to 2005 levels) ranging from 6 to 14 months.

Table 2: Summary of institutional changes in the potential compensation duration

<i>Age group</i>	Maximal duration of benefits in months		
	From January 1, 1997 to January 31, 2006	From February 1, 2006 to December 31, 2007	Since January 1, 2008
<i>Under 45</i>	12	12	12
<i>45-46</i>	18	12	12
<i>47-49</i>	22	12	12
<i>50-51</i>	22	12	15
<i>52-54</i>	26	12	15
<i>55-56</i>	26	18	18
<i>57-57</i>	32	18	18
<i>58 or older</i>	32	18	24

As already mentioned, many older unemployed were actually using the rather long compensation duration implemented in the 1980s as a bridge to early retirement. This strategy was particularly beneficial for firms, as they could more easily negotiate dismissals for older

and less productive workers. Besides, numerous regulations facilitated such early retirement schemes (Müller *et al.*, 2007). In particular, persons who had already experienced one year of unemployment had the opportunity of entering early retirement without pension reductions at age 60, despite the legal retirement age of 65 in Germany. Moreover, unemployed aged 58 or older were exempt from active job search requirements, while nevertheless receiving unemployment benefits. Hence, workers with maximum entitlements could build a bridge to early retirement from the age of 57 years and 5 months, exhausting their 32 months of benefits. They could actually retire on benefits at an even earlier age, as they could still enjoy earnings-related benefits from the unemployment assistance scheme after insurance benefits exhaustion prior to 2005 (at a lower replacement rate though).

These regulations were strengthened, which made early retirement strategy less attractive for workers. First, between 1997 and 2004 pensions were progressively reduced for individuals who retired before the legal age of 65. Eventually, individuals faced a 3.6 percentage points discount on their pensions for each year that separated them from the legal age of 65 years. For instance, persons who entered unemployment at the age of 57 years and 5 months could still enjoy early retirement at age 60 after benefits exhaustion, but with a pension reduction of 18 percent. Despite this lower generosity, Dlugosz *et al.* (2009) suggest that early retirement schemes were still commonly used by older workers until the 2006 unemployment benefits reform (see Figure 1 p. 10). More recently, the minimum age for early retirement was progressively raised over a transition period (2006–2012) from 60 to 63 years. Combined with the reform of unemployment benefit duration and the end of earning-related unemployment assistance, this change has significantly lowered the incentives for older workers to enter early retirement. Indeed, it is now possible to use unemployment benefits as a bridge to retirement only from the age of 61 years onwards, while still facing a pension discount of 7.2 percent.

4.2. Sample and main covariates

This paper assesses the effect of the cuts in benefits duration on the length of the unemployment spell and on post-unemployment outcomes. Our sample consists of 7846 unemployment spells from the SOEP dataset from 1997 to 2009 where we observe the entry into unemployment (i.e. not left-censored).⁶ In this longitudinal panel, respondents answer

⁶ See Table A1 in appendix for descriptive statistics.

questions about various socio-economic characteristics relating to the interview year and also fill in a calendar about their labour force status in each month of the previous year.⁷ Individuals checking the box "registered as unemployed" (that is, at the employment office) are considered unemployed. We first focus on the job take-ups by these unemployed without distinguishing between type of exits to employment, full-time job, part-time job or mini-job. Besides, exits to inactivity and retirement are treated as competing risks. Unemployment spells which end this way are accordingly coded as right-censored.⁸ Similarly, unemployed reaching the legal retirement age of 65 years during their spell are right-censored, while unemployed age 65 or older are dropped.

In a second step, we investigate potential effects of the reform on three different post-unemployment outcomes. We first investigate the reform impact on job stability, measured by the time spent in the first job after the end of the spell. It is a classical measure of job matching quality, as a quick separation possibly indicates that the workers' skills were ill-adapted to his new job. The SOEP yearly interviews also allow us to dispose of a rich variety of information about the type of job that is found. One interesting variable is the one about skill adequacy, where respondents assess whether they are actually working in the occupation they were trained for. This variable is thus particularly relevant to measure job matching quality. The last post-unemployment outcome we investigate is the type of contract (full-time job, part-time job or mini-job). The idea here is to see whether cuts in duration had the effect of fostering atypical employment.

4.3. Estimation strategy

Our estimation strategy relies on a difference-in-differences estimation. This is made possible by the change in the legislation that only affected unemployed aged 45 or older. Difference-in-differences estimation is indeed well-suited to identify the causal impact of policy shifts where only a part of the population is affected by the law change. Basically, unemployed are divided into treatment and control groups using a dummy. The treated are the part of the population to whom the benefit duration cut applied, while the control group remained

⁷ The design of the SOEP dataset makes it difficult to compare wages before and after the unemployment spell, although this is often used as a measure of job matching quality in the literature. Indeed, information on wages is contained within the yearly interviews only. We would lose a too large number of observations in the process of recovering this information from the yearly interviews - especially for long-term unemployed not interviewed before entering unemployment.

⁸ Exits to inactivity and retirement amount to less than one third of total exits (see Table 3). Besides, we do not observe any exits for about 15% of all spells, because of individuals' drop-out of the survey.

unaffected. We then compare outcomes for the treatment and control groups before and after the reform implementation. If the treated experienced a larger variation in one of these outcomes as compared to the control group, the difference is ascribed to the reform effect.

Hence, the identifying assumption behind difference-in-differences estimation is that trends in employment outcomes would have been the same for the treated and the control group in the absence of a change in the law. In particular, it implies that macroeconomic effects or other changes in the legislation had a similar impact on both groups as the reform was implemented.⁹ In order to make this ‘common trends’ assumption more reasonable, we restrict our control group to individuals aged 35 to 44. Indeed, there are concerns that younger unemployed could still be marginally attached to the education system, Germans entering the labour market at a relatively high age.

In our empirical analysis, we first consider the impact of the reform on the job take-up rate by unemployed. In its most parsimonious form, our estimation strategy relies on the following unemployment-to-employment hazard rate (at a given time t of the spell):

$$\lambda(t) = \lambda_0(t) * \exp[\beta_1 * Hartz + \beta_2 * Above44 + \beta_{12} * Hartz * Above44 + \beta' * X]$$

where X is a vector of covariates and $\lambda_0(t)$ the baseline hazard. Formally, the policy effect is given by the interaction term β_{12} between a time dummy ($Hartz$) taking the value one for spells commencing once the policy change was implemented (after February 2006) and a treatment group dummy ($Above44$).¹⁰ Covariates include basic demographic variables (age, sex, marital status, nationality and a dummy for East Germans). They also include categories for the highest obtained degree, the number of spells already experienced by the individual and year dummies to control for economic fluctuations.¹¹

⁹ Important changes in unemployment compensation that concerned both the treatment and the control group include the merging of unemployment and social assistance and the reduction in the period used for entitlements calculation mentioned earlier. We want to emphasise here that our estimation strategy only allows us to assess the microeconomic impact of the cuts in duration, and not the impact of these two other features of the Hartz reforms.

¹⁰ More precisely, the time dummy $Hartz$ takes the value one for unemployment spells beginning in February 2006 or later, because it is the date of entry into unemployment which determines benefit entitlements. Individuals who entered unemployment prior to that date were still subject to the old regulation, even when their spell continued after February 2006.

¹¹ Recall that the Hartz time dummy refers to the calendar time of entering unemployment whereas the year dummies refer to the time of leaving unemployment. Thus identification of both year dummies and the Hartz time dummy is ensured as individuals entering unemployment at different points in time and are subject to the same macroeconomic shocks affecting recruitment out of unemployment. Nevertheless, we re-estimate the main

To assess the precise effects of the cuts in compensation duration, one would ideally want to build distinct treatment group dummies as older age groups were differently affected by the reform. Also, one would want to use distinct treatment period dummies to take into account the fact that the 2008 reform softened the initial cuts induced by Hartz IV for some age groups. This would require estimation of 10 distinct interaction terms (Table 2). This is not the strategy that we follow here because we want to keep a reasonable sample size in each treatment group.¹² Still, we want to account for the fact that the effects of the cuts might differ across age groups, in particular because of early retirement strategies. We thus split the treated unemployed into four age groups of five years each. We end up with the following equation to estimate:

$$\begin{aligned} \lambda(t) = \lambda_0(t) * \exp[& \beta_1 * Hartz + \beta_2 * 45_49 + \beta_3 * 50_54 + \beta_4 * 55_59 + \beta_5 * 60_64 \\ & + \beta_{12} * Hartz * 45_49 + \beta_{13} * Hartz * 50_54 \\ & + \beta_{14} * Hartz * 55_59 + \beta_{15} * Hartz * 60_64 + \beta' * X] \end{aligned}$$

We present our estimation using two specifications, taking into account in different ways the interrelated issues of duration dependency and unobserved heterogeneity. We first present a Partial Likelihood method allowing for flexible duration dependency and then a parametric strategy with flexible specification for unobserved heterogeneity. The issues are related because if unobserved factors cause early exit (there are many frail individuals), the hazard rate will decrease rapidly over time as the frail individuals are removed from the sample.

We first estimate this equation using a Cox duration model. Such a model presents the advantage of being non-parametric with respect to the influence of spell duration, i.e. the model makes no assumption about the functional form of the baseline hazard, as long as it satisfies the proportional hazards assumption (i.e. the baseline hazard is multiplicatively separable).

We now focus on a strategy modelling flexibly the frailty distribution. An alternative to the Cox Partial Likelihood model thus specifies a flexible distribution of unobserved heterogeneity. We use the Gamma distribution, since Abbring and Van Den Berg (2007) show

equations from Tables 4 and 5 without year dummies as a robustness check. Our conclusions remain valid (see table A2 in appendix).

¹² Moreover, the age variable we derive from the SOEP is not very accurate because it is based on the birth year only, whereas benefits entitlements are defined by actual age at entry into unemployment. It thus makes little sense to build narrow age groups with this variable. Note that this also leads us to exclude individuals celebrating their 45th birthday in a given year, as we cannot know for sure if they are treated (aged 45) or not (aged 44).

that under certain conditions, all forms of unobserved heterogeneity converge to a Gamma distribution in the survivor population, providing a justification for this functional form. In a second step we thus estimate our model using an exponential model allowing for gamma-distributed unobserved heterogeneity (frailty).

Finally, we use the same difference-in-differences identifying strategy for post-unemployment outcomes as for the hazard rate of finding a job out of unemployment. The model specifications are different though. For re-employment duration (job stability) we use a simple OLS regression. For skill adequacy and type of job contract we use multinomial logit regressions, as they allow for more than one possible outcome.

5. Results

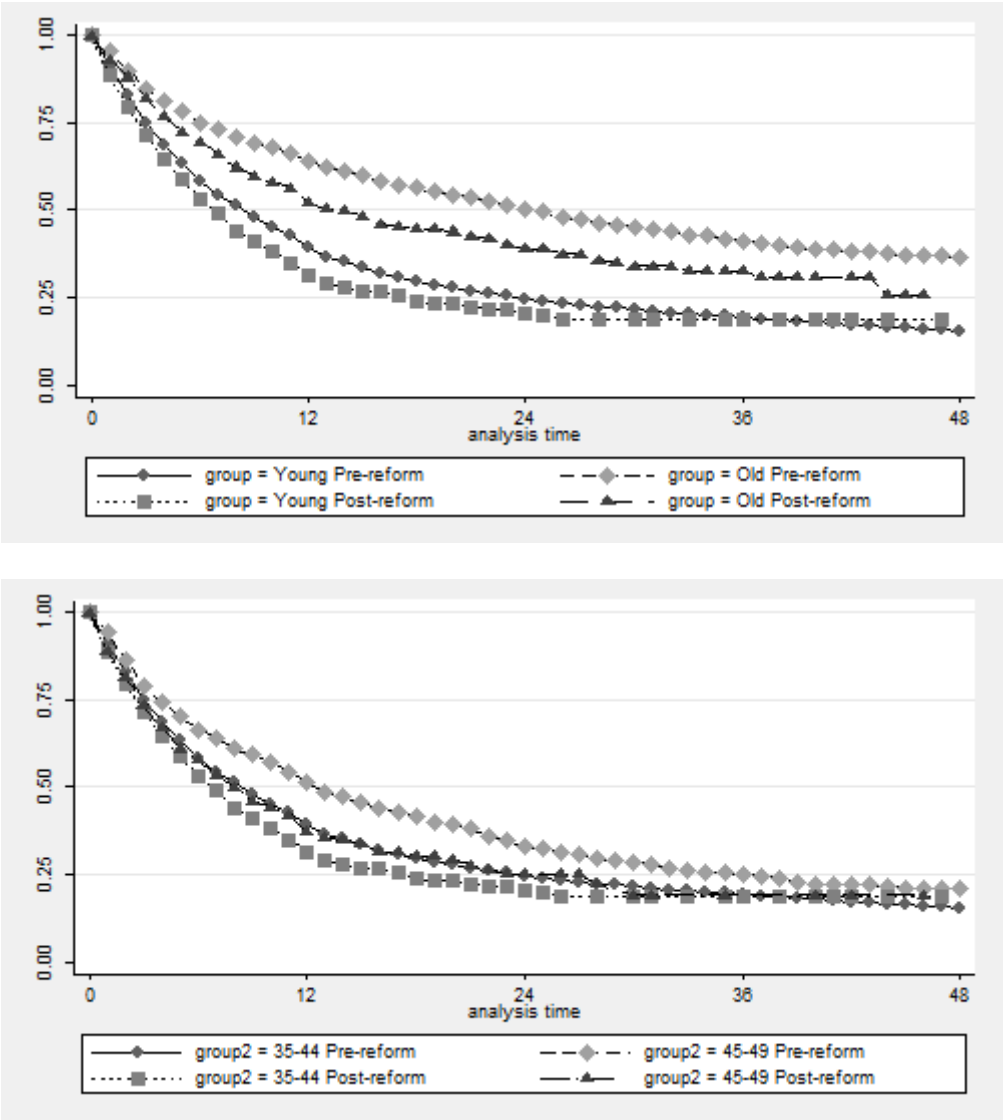
5.1. Descriptive statistics

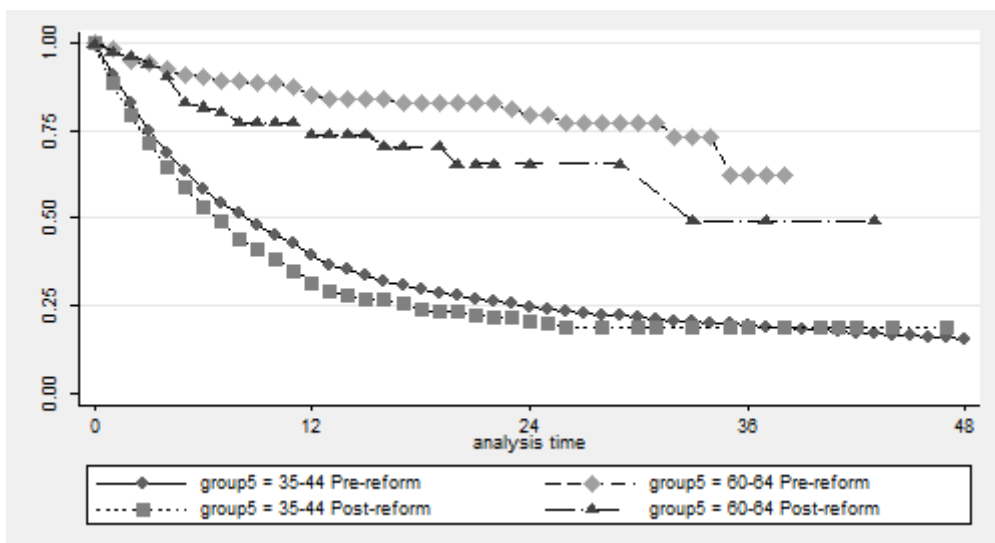
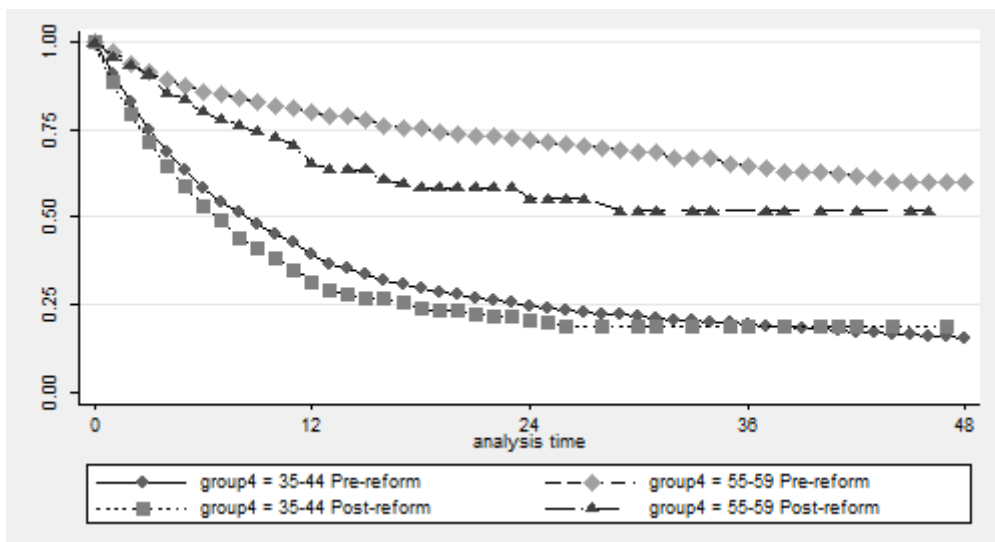
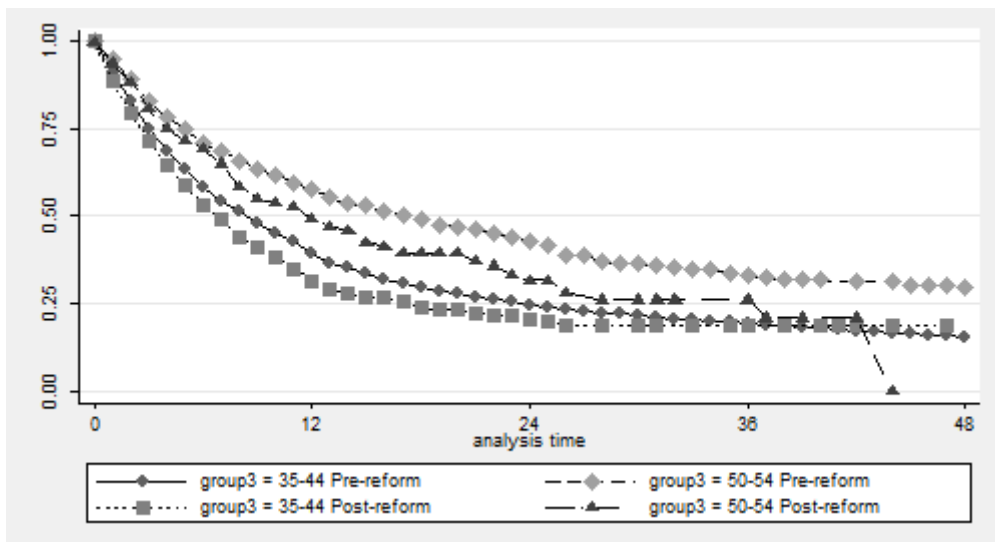
Kaplan-Meier survival curves are displayed in Figure 1. They depict the probability of not having found a job after a given duration of unemployment. Five different figures are displayed: one for each age group (according to the intervals defined previously) and one for these age groups taken together (aged 45-64). In each of these figures we also report the survival curves for the control group (aged 35-44), so that we can get a first idea of the potential reform impact. In the spirit of difference-in-differences, the reform impact is assessed by considering the difference in survival across the treatment and control groups against the backdrop of the reform. For instance, a sharper increase in the slope of the curves of the treated as compared to the control group would indicate faster exit from unemployment.

First, one can see from these figures that the survival curves of the control group are always below those of the treated. Older unemployed typically face more difficulties to find a new job, a feature we control for in subsequent regressions. Moreover, we observe that unemployment duration generally decreased after the reform implementation, as depicted by the increase in the slope or the convexity of the curves. This is true for all groups including the control group. The ‘common trends’ assumption implies that without the reform, survival curves of the treated age groups would have experienced an equivalent evolution as those of the control group. However, we observe a sharper increase in the slope (or convexity) for the treated age groups, which suggests a negative impact of the reform on unemployment duration. This is especially obvious for the 45-49 and 55-59 age groups. To some extent this

could also be true for the 60-64 age group, but the figure lacks precision because data is scarcer for this group.

Figure 1: Probability of remaining unemployed by length of unemployment spell





Source: SOEP, author's calculations. Analysis time is months.

For the older age groups (aged 55-59 or 60-64), we suspect that the reform, combined with contemporaneous changes in early retirement provisions, made early retirement strategies less attractive. This point has also been made by Dlugosz *et al.* (2009). They show that the rate of separation of older workers significantly dropped after the 2006 reform. This suggests that firms and workers became less inclined to negotiate early dismissal. These findings are consistent with the descriptive statistics displayed in Table 3, which depicts the type of exits out of unemployment for different age groups, before and after the reform. We first observe that a significant share of the unemployed aged 55 or older were actually using unemployment benefits as a bridge to retirement before the reform. Furthermore, exits to retirement generally decreased after the reform: their share in total exits was more than halved. This decrease was particularly dramatic for unemployed aged 55-59 and 60-64, with respectively a drop of more than 30 and 20 percentage points in the share of total exits.

This should strongly impact the average unemployment duration of these groups, but in a different way to the one predicted by job search theories. In job search models, cuts in benefits incite the unemployed to increase their job search efforts and/or to accept job offers earlier in their spell. The mechanism we observe here is different. Unemployed following an early retirement strategy were likely to fully exhaust their entitlement rights before entering retirement, in order to avoid future pension discounts. This enhanced average unemployment duration. As early retirement became less attractive with the reform implementation, the composition of the unemployed population changed: fewer workers entered unemployment to benefit from early retirement schemes. In turn, the share of unemployed actively looking for a job mechanically increased, and so did the unemployment-to-employment hazard rate. So the reform effect in this case is not to accelerate job take-up, but to prevent those who are likely to remain unemployed until benefits exhaustion from entering into unemployment.

Table 3: Type of exits out of unemployment (number and percent of observations)*Before February 2006*

Age	Full-time job	Part-time job	Mini-job	Retirement	Inactivity	Total
35-44	1661	406	80	45	520	2712
	61.2%	15.0%	3.0%	1.7%	19.2%	100.0%
45-49	609	139	43	58	217	1066
	57.1%	13.0%	4.0%	5.4%	20.4%	100.0%
50-54	463	97	26	128	143	857
	54.0%	11.3%	3.0%	14.9%	16.7%	100.0%
55-59	216	69	24	600	87	996
	21.7%	6.9%	2.4%	60.2%	8.7%	100.0%
60-64	18	6	6	116	10	156
	11.5%	3.8%	3.8%	74.4%	6.4%	100.0%
Total	2967	717	179	947	977	5787
	51.3%	12.4%	3.1%	16.4%	16.9%	100.0%

From February 2006

Age	Full-time job	Part-time job	Mini-job	Retirement	Inactivity	Total
35-44	297	59	30	2	56	444
	66.9%	13.3%	6.8%	0.5%	12.6%	100.0%
45-49	130	30	14	4	19	197
	66.0%	15.2%	7.1%	2.0%	9.6%	100.0%
50-54	97	28	13	9	24	171
	56.7%	16.4%	7.6%	5.3%	14.0%	100.0%
55-59	49	16	10	33	12	120
	40.8%	13.3%	8.3%	27.5%	10.0%	100.0%
60-64	16	2	5	29	2	54
	29.6%	3.7%	9.3%	53.7%	3.7%	100.0%
Total	589	135	72	77	113	986
	59.7%	13.7%	7.3%	7.8%	11.5%	100.0%

Source: SOEP, author's calculations

5.2. Reform impact on job take-ups

Table 4 presents the results from estimation of the Cox Partial Likelihood model, where we assess the reform impact on job take-ups. Covariates which are typically associated with poor labour market outcomes have the expected signs on their coefficients and are statistically significant: being East German, non-German citizen, female, married, of old age, married and female, having no degree. On the contrary, individuals with good qualifications (in higher

education in particular) tend to exit faster from unemployment. This is also true for the unemployed who have already experienced spells of unemployment before. This can possibly be ascribed to the fact that they work in high turnover occupations, where both dismissal and hiring are frequent.

Looking at the coefficients of the non-interacted age group dummies, we see that the unemployment-to-employment hazard rate is significantly lower for older age groups prior to the reform, even after age is controlled for. The coefficients are especially large for the 55-59 and the 60-64 age groups. This is compatible with our assumption that many unemployed in these groups tended to exhaust their entitlement rights before retiring. As was already observable from the Kaplan-Meier survival curves, we see that the hazard rate generally increased after the implementation of the reform, as evidenced by the positive and significant coefficient for our treatment period dummy (*Hartz*). However, it cannot be ascribed to an effect of cuts in compensation duration as this coefficient also applies to the control group.¹³

The reform impact is given by the interactions of the age group and reform dummies. The results here are broadly consistent with the descriptive statistics. All estimated coefficients are positive, which could suggest a positive effect of the cuts on unemployment duration. However, the interaction terms are only statistically significant for the 55-59 age group, at the 5% threshold. The coefficient for the 60-64 age group is actually positive but not significant, probably because the sample size is relatively small for this group. This is in line with our argument that the reform mainly had the impact of deterring early retirement schemes. On the contrary, we argue that the reform did not have the kind of effect predicted by job search theories, or at least that these effects were not sizeable. Indeed, we do not observe a significant increase in the hazard rate of age groups where early retirement strategies were less prevalent, although they were affected by equivalent cuts in the duration of benefits (see Table 2). Finally, Table 4 provides estimation results for men and women separately. The coefficients for the interaction terms indicate that the reform impact on the 55-59 age group is actually driven by male unemployed. This could be explained by the fact that employers used early retirement as a tool to dismiss workers with long work history within the same firm, in order to avoid too high severance payments. As men typically have more stable careers, this population was more severely affected by the reform.

¹³While this indicates that unemployment duration was generally lower from 2006 onwards, it is out of or scope to ascertain whether this is an effect of the other features of the Hartz reforms mentioned earlier, or whether it is linked to more favourable labour market conditions.

Table 4: Unemployment-to-employment hazard rate analysis (Cox model)

	All	Men	Women
East German	-0.060+	0.031	-0.193***
	[0.032]	[0.042]	[0.050]
Non-German citizen	-0.429***	-0.381***	-0.488***
	[0.057]	[0.069]	[0.100]
Age	-0.019**	-0.031***	-0.006
	[0.006]	[0.008]	[0.009]
Married	0.396***	0.383***	0.187***
	[0.045]	[0.043]	[0.048]
Female	-0.189***		
	[0.051]		
Married* Female	-0.250***		
	[0.062]		
Number of previous spells	0.051***	0.048***	0.063***
	[0.007]	[0.009]	[0.011]
No degree	-0.368***	-0.408***	-0.334***
	[0.056]	[0.072]	[0.088]
General degree	0.062	0.041	0.068
	[0.101]	[0.134]	[0.151]
Upper vocational	0.094*	0.092+	0.101+
	[0.038]	[0.049]	[0.058]
University	0.278***	0.189***	0.397***
	[0.042]	[0.055]	[0.068]
Hartz	0.426**	0.339+	0.492**
	[0.133]	[0.183]	[0.191]
Age 45-49	-0.101	-0.028	-0.185+
	[0.067]	[0.089]	[0.100]
Age 50-54	-0.257**	-0.133	-0.350*
	[0.099]	[0.131]	[0.148]
Age 55-59	-1.081***	-0.809***	-1.382***
	[0.133]	[0.175]	[0.206]
Age 60-64	-1.371***	-1.021***	-2.003**
	[0.232]	[0.272]	[0.630]
Hartz*Age 45-49	0.081	0.053	0.137
	[0.102]	[0.137]	[0.146]
Hartz*Age 50-54	0.059	0.022	0.078
	[0.107]	[0.145]	[0.161]
Hartz*Age 55-59	0.292*	0.468**	-0.067
	[0.143]	[0.171]	[0.263]
Hartz*Age 60-64	0.450	0.372	0.917
	[0.282]	[0.323]	[0.699]
Number of obs.	7846	4217	3629

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups and basic vocational training for education. Year dummies are included. Adjusted robust standard errors in brackets. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table 5 provides estimations of the unemployment-to-employment hazard rate using gamma frailty correction for unobserved heterogeneity. The estimate of the theta parameter indicates that heterogeneity is significant: the share of individuals with poor unobserved characteristics becomes larger as the length of the spell increase. Results from Table 5 are consistent with our previous findings. In particular, the differential effect of the reform for those aged 55-59 remains positive and statistically significant. The effect of the reform for those aged 60-64 is also large and positive, but insignificant. Again, we suspect that small sample size for this age group could potentially blur the results. In any case, this suggests that the reform operated mainly by deterring early retirement strategies, which were especially prevalent for these groups.

Table 5: Unemployment-to-employment hazard rate analysis (exponential distribution of duration dependency, gamma-distributed frailty)

	All	Men	Women
East German	-0.070+	0.077	-0.246***
	[0.042]	[0.058]	[0.062]
Non-German citizen	-0.588***	-0.556***	-0.591***
	[0.077]	[0.097]	[0.124]
Age	-0.025**	-0.041***	-0.009
	[0.008]	[0.011]	[0.011]
Married	0.505***	0.516***	0.232***
	[0.058]	[0.059]	[0.060]
Female	-0.313***		
	[0.068]		
Married* Female	-0.298***		
	[0.082]		
Number of previous spells	0.071***	0.074***	0.076***
	[0.009]	[0.011]	[0.013]
No degree	-0.486***	-0.611***	-0.382***
	[0.076]	[0.103]	[0.111]
General degree	0.108	0.052	0.130
	[0.130]	[0.177]	[0.189]
Upper vocational	0.096*	0.082	0.123+
	[0.049]	[0.066]	[0.073]
University	0.316***	0.184*	0.486***
	[0.055]	[0.075]	[0.084]
Hartz	0.547***	0.436+	0.594**
	[0.165]	[0.235]	[0.230]
Age 45-49	-0.168+	-0.100	-0.232+
	[0.087]	[0.123]	[0.124]
Age 50-54	-0.349**	-0.240	-0.417*
	[0.126]	[0.176]	[0.182]
Age 55-59	-1.361***	-1.112***	-1.562***
	[0.167]	[0.229]	[0.245]
Age 60-64	-1.598***	-1.229***	-2.081**
	[0.276]	[0.339]	[0.678]
Hartz*Age 45-49	0.144	0.107	0.183
	[0.123]	[0.172]	[0.171]
Hartz*Age 50-54	0.071	0.011	0.132
	[0.132]	[0.181]	[0.191]
Hartz*Age 55-59	0.389*	0.643**	-0.046
	[0.172]	[0.220]	[0.289]
Hartz*Age 60-64	0.506	0.440	0.883
	[0.327]	[0.383]	[0.757]
Constant	-1.526***	-0.898*	-2.497***
	[0.325]	[0.448]	[0.471]
Ln(teta)	-0.433***	-0.314***	-0.738***
	[0.050]	[0.059]	[0.103]
Number of obs.	7846	4217	3629

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups and basic vocational training for education. Year dummies are included. Adjusted robust standard errors in brackets. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

5.3. Reform impact on job matching quality

We now turn to the regressions results for the three post-unemployment outcomes we have defined. For presentation purpose, we only display the coefficients for the interaction terms of interest.¹⁴ Table 6 provides the results of the reform impact on job stability, assessed by the duration of the job that directly follows unemployment. According to job matching quality arguments, less generous benefits should increase pressures on unemployed to take up jobs for which they are less qualified: in turn, this should decrease the stability of the match. At first sight, our results are at odds with this prediction. All coefficients for the interacted terms are positive, indicating longer re-employment duration for the treated age groups. This statement should be nuanced, as the estimates are only significant for the 55-59 age group, at the 1% threshold. The coefficient for the 60-64 age group is relatively large also, but not significant. However, we do not interpret these findings as an increase in job matching quality. We argue that this effect should in fact be assigned to the parallel evolution in retirement regulations, when the legal age threshold for early retirement was raised from 60 to 63. Prior to 2006, re-employment duration was shorter because re-employed could retire at a younger age. Postponing the age threshold for early retirement eventually led to a substantial increase in re-employment duration for those individuals closer to this age threshold.

¹⁴ Tables displaying all explanatory variables can be found in appendix (Tables A3 to A9)

Table 6: Re-employment duration (OLS regression)

	All	Men	Women
<i>Hartz*Age 45-49</i>	3.787	5.223	1.938
	[3.056]	[4.166]	[4.493]
<i>Hartz*Age 50-54</i>	4.745	6.807	2.557
	[3.327]	[4.597]	[4.841]
<i>Hartz*Age 55-59</i>	11.612**	13.162*	9.252
	[4.353]	[5.265]	[8.077]
<i>Hartz*Age 60-64</i>	11.287	13.407	10.104
	[8.504]	[9.843]	[20.709]
<i>Number of obs.</i>	4578	2611	1967

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Adjusted robust standard errors in brackets. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

In Table 7, we display the results for our second measure of job matching quality. This variable gives respondents assessment of whether they are working in the occupation they were trained for (the question relates to primary education, not training provided by employment services). Three possible answers are given: ‘working in the occupation trained for’, ‘not working in the occupation trained for’ and ‘no training needed for this occupation’. The third category of outcome is more difficult to interpret. For some respondents it might indicate a mismatch, because they have been trained for an occupation but are working in an occupation that does not necessitate any. But for those who did not receive any training such a match would be considered as normal. The only age group that is significantly affected are those aged 60-64 years old, whose exits to employment are more headed towards occupations they were not trained for. This increase in job mismatches might be ascribed to the increased pressures to take-up jobs induced by the reforms. Nevertheless, this result should be interpreted cautiously, as it does not concern a large number of cases in our sample.

Table 7: Matching between skills and occupation after unemployment (multinomial logit, reference is ‘exit to an occupation matching with skills’)

	Not in the occupation trained for	No training needed for this occupation
Hartz*Age 45-49	-0.134 [0.244]	-0.274 [0.861]
Hartz*Age 50-54	0.123 [0.270]	0.265 [0.786]
Hartz*Age 55-59	-0.010 [0.351]	-0.478 [1.189]
Hartz*Age 60-64	2.328** [0.781]	1.702 [1802.926]
Number of obs.	4578	4578

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Finally, Table 8 provides results about the type of job contracts after exits to employment, distinguishing between part-time job, full-time job and mini-job. The results here are rather scant. Exits to part-time, as compared to full-time, tend to increase for most age groups (45-49, 50-54 and 55-59), but the coefficient is only significant for the 50-54 age group, and only at the 10% threshold. While there was a contemporaneous increase in the total number of atypical jobs in Germany during that period, it does not seem that the duration cuts particularly contributed to enhance this trend. The coefficients of the 60-64 age group for exits toward part-time and mini-jobs are negative, which would suggest that this particular category was more likely to find a full-time job. While the coefficients are pretty large, they are not significant though.

Table 8: Type of first employment contract after unemployment (multinomial logit, reference is ‘exit to full-time employment’)

	Part-time job	Mini-job
<i>Hartz*Age 45-49</i>	0.170 [0.299]	-0.136 [0.417]
<i>Hartz*Age 50-54</i>	0.603+ [0.313]	0.218 [0.444]
<i>Hartz*Age 55-59</i>	0.508 [0.394]	0.099 [0.511]
<i>Hartz*Age 60-64</i>	-0.806 [0.941]	-0.991 [0.784]
<i>Number of obs.</i>	4578	4578

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

6. Conclusion

To sum up, we have shown that the recent cuts in compensation duration induced by the Hartz reforms did not have the kind of sizeable effects on unemployment duration expected by job search theories. Only one specific age group, aged 55 to 59, had significant lower unemployment duration after the reform. But as we argue, this can better be ascribed to the deterring effect the reform had on early retirement strategies, in combination with other changes in early retirement provisions. Besides, we also found evidence that the reform had some effects on post-unemployment outcomes. Again re-employment duration of the 55-59 age group has been substantially and positively affected. While this comes in contradiction with job matching theories, it corroborates our point that the contemporaneous rise in the legal age for early retirement had a substantial impact on workers decisions to delay their exit from the labour market. Eventually, some detrimental effects of the reform on post-unemployment outcomes have been found: skills inadequacy has increased for the oldest unemployed (60-64 years old) while unemployed aged 50 to 54 experienced slightly more exits toward part-time employment.

To conclude, we would also like to acknowledge some limits of our empirical strategy. First, we are only assessing here the average effect of the entitlement cuts for the relatively large

age groups we have defined. Thus we cannot exclude that the reform had a negative effect on unemployment duration for some narrower age groups. Also, we cannot rule out the possibility that the effect would have been larger if the initial stronger cuts in compensation duration of 2006 would have been maintained. While this implies that our results cannot be easily generalised to other reforms where cuts in benefits have been sharper, our point remains that in this case the reform impact on unemployment duration was not very sizeable.

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Appendix

Table A1 : Descriptive statistics on the sample

	Mean	Std. Dev.
<i>East German</i>	0.450	[0.498]
<i>Non-German citizen</i>	0.102	[0.303]
<i>Age</i>	46.943	[8.040]
<i>Married</i>	0.676	[0.468]
<i>Female</i>	0.462	[0.499]
<i>Number of previous spells</i>	2.530	[2.128]
<i>No degree</i>	0.129	[0.335]
<i>Basic vocational training</i>	0.337	[0.473]
<i>General degree</i>	0.024	[0.153]
<i>Upper vocational</i>	0.347	[0.476]
<i>University</i>	0.164	[0.370]

Sample: SOEP, individuals aged 35-64.

Table A2: Unemployment-to-employment hazard rate analysis (no year dummies)

	Cox model	Exponential distribution, Gamma frailty
<i>East German</i>	-0.048 [0.032]	-0.054 [0.041]
<i>Non-German Citizen</i>	-0.409*** [0.057]	-0.567*** [0.076]
<i>Age</i>	-0.020** [0.006]	-0.027*** [0.008]
<i>Married</i>	0.401*** [0.045]	0.509*** [0.058]
<i>Female</i>	-0.195*** [0.051]	-0.321*** [0.069]
<i>Married* Female</i>	-0.238*** [0.062]	-0.283*** [0.082]
<i>Number of previous spells</i>	0.049*** [0.007]	0.070*** [0.009]
<i>No degree</i>	-0.371*** [0.056]	-0.490*** [0.075]
<i>General degree</i>	0.041 [0.101]	0.087 [0.130]
<i>Upper vocational</i>	0.078* [0.037]	0.074 [0.048]
<i>University</i>	0.274*** [0.042]	0.310*** [0.055]
<i>Hartz</i>	0.167** [0.057]	0.233*** [0.068]
<i>Age 45-49</i>	-0.099 [0.067]	-0.159+ [0.087]
<i>Age 50-54</i>	-0.248* [0.098]	-0.327** [0.126]
<i>Age 55-59</i>	-1.065*** [0.132]	-1.328*** [0.166]
<i>Age 60-64</i>	-1.376*** [0.232]	-1.595*** [0.276]
<i>Hartz*Age 45-49</i>	0.076 [0.101]	0.144 [0.122]
<i>Hartz*Age 50-54</i>	0.034 [0.106]	0.044 [0.131]
<i>Hartz*Age 55-59</i>	0.283* [0.142]	0.393* [0.171]
<i>Hartz*Age 60-64</i>	0.442 [0.281]	0.518 [0.324]
<i>Constant</i>		-1.534*** [0.319]
<i>Ln(teta)</i>		-0.415*** [0.049]
<i>Number of obs.</i>	7846	7846

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups and basic vocational training for education. Adjusted robust standard errors in brackets. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A3: Re-employment duration (OLS regression)

	All	Men	Women
East German	-6.039*** [0.999]	-6.757*** [1.336]	-5.874*** [1.537]
Non-German citizen	-3.659* [1.811]	-2.561 [2.266]	-5.854+ [3.049]
Age	-0.204 [0.191]	-0.152 [0.258]	-0.228 [0.285]
Married	4.176** [1.306]	4.654*** [1.336]	0.242 [1.464]
Female	-0.527 [1.581]	-	-
Married* Female	-3.744+ [1.930]	-	-
Nb of previous spells	-1.445*** [0.210]	-1.641*** [0.262]	-1.000** [0.360]
No degree	-0.850 [1.708]	-3.011 [2.325]	2.311 [2.572]
General degree	1.923 [2.956]	2.052 [4.136]	2.148 [4.257]
Upper vocational	5.185*** [1.166]	5.974*** [1.531]	5.093** [1.845]
University	6.852*** [1.343]	6.686*** [1.778]	8.014*** [2.113]
Hartz	-3.137 [4.090]	-4.247 [5.658]	-2.557 [5.931]
Age 45-49	-2.782 [2.060]	-4.195 [2.817]	-1.431 [3.025]
Age 50-54	-3.646 [2.975]	-7.118+ [4.038]	0.323 [4.425]
Age 55-59	-8.469* [3.921]	-11.295* [5.225]	-5.344 [6.075]
Age 60-64	-10.631 [7.013]	-12.065 [8.304]	-12.577 [18.395]
Hartz*Age 45-49	3.787 [3.056]	5.223 [4.166]	1.938 [4.493]
Hartz*Age 50-54	4.745 [3.327]	6.807 [4.597]	2.557 [4.841]
Hartz*Age 55-59	11.612** [4.353]	13.162* [5.265]	9.252 [8.077]
Hartz*Age 60-64	11.287 [8.504]	13.407 [9.843]	10.104 [20.709]
Constant	50.490*** [7.831]	45.860*** [10.525]	52.915*** [11.748]
Number of obs.	4578	2611	1967

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Adjusted robust standard errors in brackets. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A4: Matching between skills and occupation after unemployment (multinomial logit, reference is ‘exit to an occupation matching with skills’)

	Not in the occupation trained for	No training is needed for this occupation
<i>East German</i>	0.522*** [0.080]	-0.725* [0.284]
<i>Non-German citizen</i>	0.047 [0.157]	0.639** [0.234]
<i>Age</i>	0.000 [0.015]	-0.005 [0.037]
<i>Married</i>	-0.324** [0.111]	-1.024*** [0.283]
<i>Female</i>	0.118 [0.134]	-0.187 [0.318]
<i>Married* Female</i>	0.205 [0.161]	1.049** [0.389]
<i>Number of previous spells</i>	0.023 [0.020]	0.081* [0.039]
<i>No degree</i>	0.701*** [0.192]	3.450*** [0.272]
<i>General degree</i>	0.025 [0.259]	2.012*** [0.381]
<i>Upper vocational</i>	-0.481*** [0.094]	-2.034*** [0.497]
<i>University</i>	-0.739*** [0.106]	-1.243** [0.432]
<i>Hartz</i>	-0.473*** [0.139]	-0.586+ [0.325]
<i>Age 45-49</i>	0.201 [0.168]	-0.175 [0.400]
<i>Age 50-54</i>	0.346 [0.244]	-0.239 [0.595]
<i>Age 55-59</i>	0.221 [0.325]	0.221 [0.773]
<i>Age 60-64</i>	-1.305+ [0.671]	-15.229 [1077.858]
<i>Hartz*Age 45-49</i>	-0.134 [0.244]	-0.274 [0.861]
<i>Hartz*Age 50-54</i>	0.123 [0.270]	0.265 [0.786]
<i>Hartz*Age 55-59</i>	-0.010 [0.351]	-0.478 [1.189]
<i>Hartz*Age 60-64</i>	2.328** [0.781]	1.702 [1802.926]
<i>Constant</i>	0.289 [0.619]	-1.895 [1.473]
<i>Number of obs.</i>	4578	4578

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A5: Matching between skills and occupation after unemployment for men (multinomial logit, reference is ‘exit to an occupation matching with skills’)

	Not in the occupation trained for	No training is needed for this occupation
East German	0.454*** [0.109]	-0.760+ [0.394]
Non-German citizen	-0.072 [0.190]	0.469 [0.308]
Age	0.006 [0.021]	-0.004 [0.051]
Married	-0.296** [0.112]	-0.798** [0.281]
Number of previous spells	0.039 [0.025]	0.139** [0.045]
No degree	0.610** [0.236]	2.682*** [0.341]
General degree	0.906* [0.451]	2.947*** [0.559]
Upper vocational	-0.432*** [0.124]	-2.301** [0.756]
University	-0.523*** [0.141]	-0.537 [0.450]
Hartz	-0.236 [0.189]	-0.408 [0.436]
Age 45-49	-0.067 [0.230]	0.158 [0.574]
Age 50-54	0.190 [0.329]	-0.369 [0.868]
Age 55-59	0.193 [0.428]	0.141 [1.086]
Age 60-64	-1.353+ [0.747]	-17.552 [4594.521]
Hartz*Age 45-49	-0.432 [0.334]	-0.586 [1.167]
Hartz*Age 50-54	0.194 [0.387]	0.161 [1.236]
Hartz*Age 55-59	-0.172 [0.425]	-0.022 [1.250]
Hartz*Age 60-64	1.897* [0.887]	1.522 [8396.876]
Constant	-0.001 [0.827]	-2.026 [1.996]
Number of obs.	2611	2611

Sample: SOEP, men aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A6: Matching between skills and occupation after unemployment for women (multinomial logit, reference is ‘exit to an occupation matching with skills’)

	Not in the occupation trained for	No training is needed for this occupation
<i>East German</i>	0.635*** [0.122]	-0.592 [0.425]
<i>Non-German citizen</i>	0.248 [0.294]	1.080** [0.397]
<i>Age</i>	-0.008 [0.023]	-0.025 [0.057]
<i>Married</i>	-0.176 [0.121]	-0.075 [0.299]
<i>Number of previous spells</i>	0.002 [0.033]	0.003 [0.090]
<i>No degree</i>	1.003** [0.354]	4.624*** [0.514]
<i>General degree</i>	-0.646+ [0.339]	1.570* [0.623]
<i>Upper vocational</i>	-0.553*** [0.148]	-1.539* [0.709]
<i>University</i>	-0.995*** [0.166]	-14.372 [430.107]
<i>Hartz</i>	-0.726*** [0.210]	-0.683 [0.510]
<i>Age 45-49</i>	0.500* [0.250]	-0.397 [0.590]
<i>Age 50-54</i>	0.489 [0.367]	-0.191 [0.881]
<i>Age 55-59</i>	0.083 [0.518]	0.324 [1.174]
<i>Age 60-64</i>	-16.238 [2172.122]	-17.845 [5268.529]
<i>Hartz*Age 45-49</i>	0.252 [0.367]	0.209 [1.272]
<i>Hartz*Age 50-54</i>	0.142 [0.386]	0.728 [1.104]
<i>Hartz*Age 55-59</i>	0.075 [0.647]	-14.639 [1657.300]
<i>Hartz*Age 60-64</i>	17.613 [2172.122]	3.260 [5872.795]
<i>Constant</i>	0.843 [0.945]	-1.489 [2.335]
<i>Number of obs.</i>	1967	1967

Sample: SOEP, women aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A7: Employment contract found after unemployment (multinomial logit, reference is ‘exit to full-time employment’)

	Exit to part-time employment	Exit to mini-job
<i>East German</i>	-0.948*** [0.096]	-0.070 [0.163]
<i>Non-German citizen</i>	-0.154 [0.175]	0.078 [0.277]
<i>Age</i>	-0.006 [0.018]	0.004 [0.032]
<i>Married</i>	-0.409* [0.167]	-0.347 [0.263]
<i>Female</i>	1.605*** [0.159]	1.443*** [0.252]
<i>Married* Female</i>	0.802*** [0.198]	0.564+ [0.316]
<i>Number of previous spells</i>	-0.021 [0.022]	-0.045 [0.033]
<i>No degree</i>	-0.086 [0.162]	0.521* [0.234]
<i>General degree</i>	0.009 [0.272]	-0.165 [0.416]
<i>Upper vocational</i>	0.273* [0.111]	-0.226 [0.184]
<i>University</i>	0.260* [0.126]	-0.860*** [0.251]
<i>Hartz</i>	-0.728+ [0.393]	-0.753+ [0.445]
<i>Age 45-49</i>	0.123 [0.193]	0.269 [0.341]
<i>Age 50-54</i>	0.146 [0.281]	0.159 [0.498]
<i>Age 55-59</i>	0.992** [0.364]	1.049+ [0.637]
<i>Age 60-64</i>	1.072+ [0.647]	2.545** [0.886]
<i>Hartz*Age 45-49</i>	0.170 [0.299]	-0.136 [0.417]
<i>Hartz*Age 50-54</i>	0.603+ [0.313]	0.218 [0.444]
<i>Hartz*Age 55-59</i>	0.508 [0.394]	0.099 [0.511]
<i>Hartz*Age 60-64</i>	-0.806 [0.941]	-0.991 [0.784]
<i>Constant</i>	-2.167** [0.740]	-6.353*** [1.626]
<i>Number of obs.</i>	5654	5654

Sample: SOEP, individuals aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A8: Employment contract found after unemployment for men (multinomial logit, reference is ‘exit to full-time employment’)

	Exit to part-time employment	Exit to mini-job
East German	-0.721*** [0.184]	-0.030 [0.293]
Non-German citizen	-0.026 [0.295]	0.677+ [0.383]
Age	-0.052 [0.037]	0.034 [0.058]
Married	-0.461** [0.175]	-0.451 [0.278]
Number of previous spells	0.001 [0.034]	0.026 [0.047]
No degree	0.077 [0.328]	0.308 [0.407]
General degree	0.914* [0.446]	-14.657 [1176.156]
Upper vocational	0.306 [0.220]	-0.864* [0.350]
University	0.829*** [0.215]	-0.193 [0.356]
Hartz	-1.600* [0.725]	-1.242 [0.989]
Age 45-49	0.412 [0.410]	-0.134 [0.627]
Age 50-54	0.799 [0.580]	-0.620 [0.902]
Age 55-59	1.942** [0.726]	0.565 [1.121]
Age 60-64	2.318* [1.028]	1.635 [1.410]
Hartz*Age 45-49	-0.032 [0.886]	-1.119 [1.151]
Hartz*Age 50-54	0.696 [0.797]	0.059 [0.950]
Hartz*Age 55-59	0.705 [0.710]	-0.325 [0.771]
Hartz*Age 60-64	-0.065 [1.301]	-0.680 [0.957]
Constant	-1.363 [1.542]	-21.164 [2202.125]
Number of obs.	2969	2969

Sample: SOEP, men aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table A9: Employment contract found after unemployment for women (multinomial logit, reference is ‘exit to full-time employment’)

	Exit to part-time employment	Exit to mini-job
East German	-1.064*** [0.118]	-0.085 [0.202]
Non-German citizen	-0.331 [0.226]	-0.615 [0.424]
Age	-0.003 [0.021]	-0.019 [0.039]
Married	0.420*** [0.112]	0.239 [0.183]
Number of previous spells	-0.040 [0.028]	-0.113* [0.048]
No degree	-0.156 [0.197]	0.634* [0.298]
General degree	-0.338 [0.337]	0.050 [0.452]
Upper vocational	0.222 [0.137]	-0.053 [0.236]
University	-0.119 [0.158]	-1.392*** [0.357]
Hartz	-0.307 [0.494]	-0.567 [0.529]
Age 45-49	0.116 [0.228]	0.580 [0.414]
Age 50-54	0.061 [0.334]	0.588 [0.610]
Age 55-59	0.767+ [0.452]	1.259 [0.802]
Age 60-64	1.046 [1.329]	-13.668 [6948.662]
Hartz*Age 45-49	0.287 [0.346]	0.067 [0.484]
Hartz*Age 50-54	0.645+ [0.370]	0.220 [0.527]
Hartz*Age 55-59	1.965* [0.834]	1.682+ [0.964]
Hartz*Age 60-64	-1.719 [1.690]	14.767 [6948.662]
Constant	-0.435 [0.876]	-3.724* [1.839]
Number of obs.	2685	2685

Sample: SOEP, women aged 35-64. Notes: reference groups are aged 35-44 for age groups. Year dummies are included. Significance level: +p<0.10, *p<0.05, **p<0.01, ***p<0.001.