Where Did All the Unemployed Go?

Non-standard work in Germany after the Hartz reforms

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The number of unemployed workers in Germany decreased dramatically from its peak in February 2005 at over 5.2 million to 3.6 million by 2008. At the same time, employment increased by 1.2 million. Most theoretical and empirical analyses of this episode assume that a worker leaving unemployment moves into *full* employment. We ask where the unemployed actually went. Using and merging two large micro data sets, we account for the decrease of unemployment by computing inflows and outflows between unemployment and 16 other labour market states. Direct flows between unemployment and *full* employment contributed for only less than 9% to the decline in unemployment. By contrast, more than 37% of the unemployed workers ended up in non-standard work. About 13% participated in labour market policy programmes and 28% retired. Following the unemployment cohort of February 2005 over time confirms the order of magnitude of our findings.

JEL Codes: J21, J62, J64
Keywords: non-standard work, empirical labour market flows with many states Germany, labour market reform, Hartz reforms

1 Introduction

[Motivation and questions] The number of registered unemployed workers decreased dramatically in Germany as of the year 2005. This is the most rapid decline in the German history since the early 1950s when the German labour market recovered from World War II. This reduction in the number of unemployed workers goes hand in hand with the rise in the number of employed workers. This might suggest that for most workers, unemployment was successfully turned into employment. Comparing stocks can be misleading, however, because a simultaneous increase of one stock (the number of employed) and a decrease of another stock (the number of unemployed) does not mean that those unemployed necessarily went into employment.

What did actually happen to all those unemployed workers? Did a majority of them find a standard job, i.e. full-time employment within the social security system, or did they end up in non-standard work (OECD, 2015, ch. 4), which would include part-time jobs, marginal jobs or

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job creation measures?[2] Or are the unemployed "hidden" in some active labour market policy measure or did they even leave the labour force? This paper studies transitions into and out of unemployment to provide answers to these questions.

[Theoretical and policy relevance] The importance of these questions should not be underestimated. January 2005 was the month where Hartz IV, the last part of the so-called Hartz reforms, came into force. Hartz reforms I to III were implemented earlier, starting in 2003. These reforms aimed at reducing the unemployment rate by increasing search effort of workers, improving matching efficiency and fostering job creation.[3] The importance of the above questions stems from the fact that all major theory-based analyses of the effects of the Hartz reforms employ a theoretical structure where workers are either unemployed or in full-time employment (Krause and Uhlig, 2012, Krebs and Scheffel, 2013, Launov and Wälde, 2013, 2016). Hence, by assumption, these analyses take for granted that the effect of a labour market reform can only be visible at the extensive margin, i.e. the effect consist in the unemployed either remaining unemployed or working in a full-time job. Even without looking at data, this can obviously not be true. We therefore ask in this paper where the unemployed actually went.[4]

Interestingly, this dichotomy is not only true for theory-based analyses. Econometric studies of the German labour market also take the standard two-state approach. Studies using empirical matching functions consider only matches between unemployment and employment, even if they distinguish between different occupational groups (Fahr and Sunde, 2009) or between short-term and long-term unemployment (Klinger and Rothe, 2012). Uhlendorff and Zimmermann (2014), who study unemployment dynamics of migrants in Germany and how they differ from natives, also apply two-states models.

[Our setup] We provide an answer to our question of where the unemployed went by looking at employment histories of individual workers. We use *two* data sets to provide a comprehensive view on German labor market flows between 2005 and 2009. The Integrated Employment Biographies (IEB) contains extremely reliable data on registered unemployment, on several types of employment and on measures of active labour market policy. This information is crucial to appropriately measure the importance of non-standard work. On the other hand, IEB-data are not insightful when it comes to self-employment, retirement or other forms of non-employment. We therefore complement our IEB analysis by using the German Socio-Economic Panel (GSOEP). Without this information, the analysis of non-standard employment and transitions out of the labour force would be incomplete.

We perform a flow analysis for all individuals in our data sets that leave unemployment anytime between February 2005, the month with the peak in unemployment numbers in Germany, and the end of our data sets in December 2009.[5] We look at all flows in and out of unemployment and compute 'accumulated net-flows' between February 2005 and the month under consideration. This is the basis of our central measure for "where the unemployed went". As a robustness check, we also look at the cohort of those individuals that were unemployed in February 2005. Where does this group find itself in subsequent months until December 2009?

[2] We define standard work as full-time employment subject to social security. In contrast to OECD (2015, ch. 4), we therefore include temporary contracts into standard employment as well. This difference is due to data availability and does not imply that we do not share the same concerns as the OECD.

[3] See appendix A.1 of Launov and Wälde (2016) for more background and references on the Hartz reforms.

[4] We go beyond the distinction between extensive and intensive margin as there is a lot of heterogeneity within these concepts. It is not only the ratio of full-time vs. part-time work that plays a role when it comes to the intensive margin but also the question what type of (full-time or part-time) job a person has (e.g. self-employed vs. dependent employment, active labour market policy vs. marginal employment and so on). Similarly for the extensive margin: Not only does the distinction between working vs. not-working play a role but also which type of not-working one considers (unemployment, job-searching, school/university, retirement, etc.).

[5] Several studies confirm the positive influence of the Hartz reforms on the labour market outcomes during and after the 'great recession' in 2008/2009, at least partially (see Gartner and Klinger, 2010, Möller, 2010 and Burda and Hunt, 2011).

[Findings] Our findings show that non-standard work conditions have been continuously rising in Germany. Exploiting the mutual advantages of the two data set, the administrative IEB-data shows that only 9.4% went from unemployment into a job with standard work conditions, i.e. into a full-time job paying social security contributions. More than 18% move to part-time or marginal employment while 20% end up in job-creation measures. Adding active labour market policy measures, almost 63% of the unemployed did not go to standard work. We can complement the findings from the administrative data set by looking at the GSOEP, as the latter also contains information on flows out of the labour force. This shows a surprisingly high share of unemployed workers that retired permanently: 33.7%.

When we compute flows from and to unemployment by merging the two data sets, we get the numbers reported in the abstract. This shows that both the analyses of the data sets individually as well as their joint analysis, leading to our "consensus flows", strongly make the point that non-standard work conditions continued to rise after the Hartz reforms. The "German unemployment miracle" might teach us how to reduce unemployment but not how to increase employment under standard conditions.

The cohort analysis shows that after four years some 40% of the unemployment population of February 2005 is still or again unemployed, one quarter is full-time employed and further 10% are part-time or marginally employed or started an apprenticeship. This confirms the broad message of our flow analysis: The Hartz reforms moved only few unemployed workers into standard work, most of the unemployed workers ended up under non-standard work conditions or out of the labour force. We conclude for future research that any labour market analysis based on two or three labour market states would miss important heterogeneity in flows into standard and non-standard working conditions and into various states out of the labour force.[6]

[Related literature] There have always been skeptics that the simultaneous decrease in unemployment and increase in employment actually means that all formerly unemployed workers went into full-time regular jobs. This skepticism was fed by a growing concern in many OECD countries about the rise in non-standard work (OECD, 2015, ch. 4). This increasing importance of non-standard work goes hand in hand with the process of polarization of jobs. Polarization is the process where the share of middle-*skilled* occupations declines relative to both low-skilled and high-skilled occupations (Goos and Manning, 2007). This is a process, caused by skill-biased or routine-biased technological change (Goos et al, 2014), which can be observed for the UK (Goos and Manning, 2007), Germany (Spitz-Oener, 2006) and the US (Autor and Dorn, 2013) and for many other countries (Goos et al, 2014, Michaels et al, 2014). This process moves individuals from jobs with standard work conditions and medium pay both to standard-jobs with low pay and also to non-standard jobs with low pay.

As OECD (2015, ch. 4.3) reports, "nearly all the growth in low-skill <...> jobs was in non-standard employment, while losses in middle-skill <...> jobs were primarily associated with standard employment" (p. 147). The report concludes that skill- or routine-biased technological change can not be the only mechanisms for polarization. Changes in institutions and policy must also play a role. Bentolila et al. (2012) also stress the importance of policy decisions, the use of short-term contracts in Spain and France in their case, for the evolution of unemployment. Boeri (2010) surveys the literature on institutional reforms and their effects on labour markets. He also emphasizes inter alia the increasing importance of temporary contracts as opposed to permanent contracts. We share this view that policy plays a crucial role. We therefore take a more detailed look at the evolution of various employment types after the Hartz reforms and, especially, in which type of employment the unemployed ended up after the reforms.

Empirical analyses which go beyond two states and which cover Germany in our period of

[6] In this sense our work is in the spirit of Choi et al. (2015). They estimate age-specific transition probabilities and stress their heterogeneity which future life-cycle models should take into account. We emphasize the heterogeneity of where workers go when leaving unemployment.

interest were performed by Jung and Kuhn (2014), Hertweck and Sigrist (2015), Nordmeier (2014) and Amable and Françon (2014). Jung and Kuhn (2014) and Hertweck and Sigrist (2015) work out differences in inflows into and outflows from unemployment between Germany and the US. The focus lies on comparing levels of flows, their volatility and the role institutions play to understand these differences. Nordmeier (2014) also studies inflows and outflows with a special focus on time aggregation in the measurement of worker flows. Nordmeier and Jung and Kuhn use data from the IAB while Hertweck and Sigrist works with GSOEP-data. In addition to employment and unemployment, Hertweck and Sigrist (2015) and Jung and Kuhn (2014) allow for inactivity. Nordmeier (2014) distinguishes between employment and unemployment only, using a non-employment proxy developed by Fitzenberger and Wilke (2010) filling gaps up to one year before or after unemployment. Amable and Françon (2014) allow for 5 states to understand the effect of the Hartz reforms on elderly workers.[7] None of these studies undertakes the flow accounting to illustrate what happened to the unemployed after the Hartz reforms as we do. We also generalize these studies by allowing for 9 states using IEB-data, 11 states using GSOEP-data and 16 states in our consensus-analysis, and not only three states.[8]

[Table of contents] The next section looks at stock data illustrating the general wisdom that unemployment decline goes hand in hand with employment growth. It also develops our formal accounting framework and briefly describes the two data sets we use. Section 3 presents our results based on our two net-flow approaches, how we construct "consensus flows" and what they tell us. This section also undertakes a cohort analysis. Section 4 concludes.

2 Macro data, our flow accounting and micro data

To provide some background, we look at the stocks of unemployed and employed workers in Germany as of 2005. We then develop an accounting method that allows us to count 'where all the unemployed went'. Finally, we present the two micro data sources used in our empirical part.

2.1 Stocks of employment and unemployment

Looking at stocks data gives a very positive picture of the labour market development after the implementation of the Hartz reforms. The number of unemployed, be it registered unemployed according to the Federal Employment Agency or unemployed according to ILO, decreased by about 1.5 million from 2005 to 2008 when measured by yearly averages. In parallel to this decrease of unemployment, the left panel of figure 1 also shows the simultaneous increase of the number of employed individuals.

The right panel of this figure shows that there is no historic precedent for the decrease of unemployment in the recent economic past of Germany. It seems that economic circumstances and economic policy did an extremely good job at reducing the number of unemployed in Germany.

[7] When we look beyond Germany, the two-state approach is also frequently used (e.g. Shimer, 2012, or Elsby et al., 2013). Exceptions that do allow for three states are Shimer (2012, sect. 3), Elsby et al. (2011), or Petrongolo and Pissarides (2008, tab. 2 and 5) for the UK, France and Spain and Smith (2011) for the UK. Analysing the ins and outs of unemployment in the Spanish labor market, Silva and Vázquez-Grenno (2013) distinguish between four states, namely unemployment, out of the labour force, permanent and temporary employment. For a more recent analysis of the Spanish labour market, especially on the long-term unemployed workers, see Bentolila et al. (2017).

[8] The literature on 'stepping stones', i.e. on the question whether it helps to find a permanent job to first accept e.g. marginal employment, also looks at employment and unemployment with finer categories (e.g. Caliendo et al., 2016, Cockx and Picchio, 2012, Jahn and Rosholm, 2014). Usually, these analyses focus on one specific category and do not employ a macroeconomic perspective.

It is well-known that behind any change in the stock of employment and unemployment there are much larger flows of workers. It is less obvious, however, what happened to the unemployed workers. Did a huge part of the unemployed really find a job – as matching models with two states would suggest? Or did the unemployed mostly go into non-participation and the increase in employment resulted from an inflow from those out of the labour force, e.g. from individuals leaving school, vocational training or university?

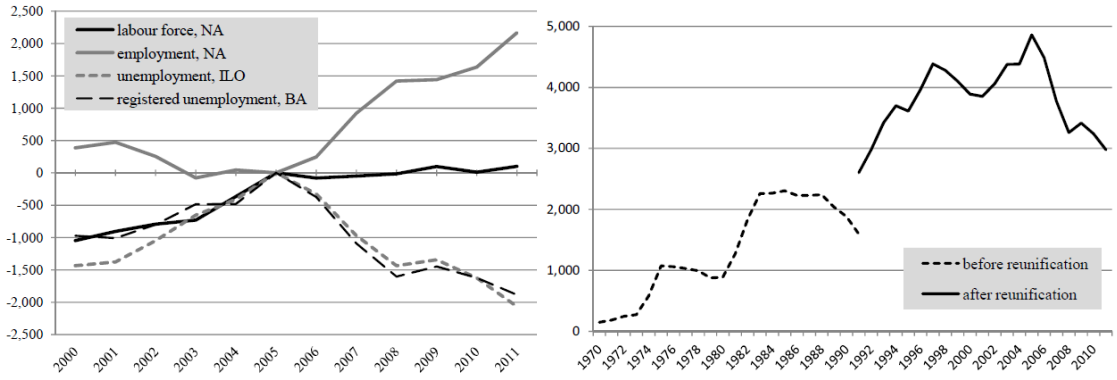

Figure 1 *Employment and unemployment according to national accounts (NA) in 1,000 individuals. Difference from year 2005 in left panel and annual averages of registered unemployment in right panel. NA and ILO-data from Federal Statistical Office, registered unemployment from Federal Employment Agency, own calculations*

Note that understanding this issue is central to understanding the effects of labour market reforms, not only the Hartz reforms but also other reforms that affect the labour market (e.g. the minimum wage introduced in Germany in 2015). If most of the unemployed found a job and assuming that the Hartz reforms helped to reduce unemployment, one could argue that the reforms also increased employment. If the majority of the unemployed left the labour force, the Hartz reforms would only have reduced unemployment, but would not have generated more employment, at least not for unemployed workers. While these are two polar cases, they provide completely opposite implications for the effect of a labour market reform. This is why a more sophisticated setup for a flow-analysis of the labour market with many than two states is needed.

2.2 Accounting for accumulated flows

This section provides a new accounting framework which allows for a better understanding of where the unemployed went. We denote the stock of unemployed workers in period t by U_t. The size of the labour force is denoted by N_t. A worker can be in $j = 1...J$ states. They include the state of employment, training and other (see fig. 1 on the states in the data sets). For our accounting approach, we sort the different states such that the last state J is the state of being unemployed, $J = U$. At each point in time there are flows into and out of unemployment. *Gross flows* from some state j to unemployment in period t are denoted by F_{jUt}. Gross flows out of unemployment are denoted by F_{Ujt}. We start our analysis in some initial month t. The stock of unemployed workers in the next month $t+1$ then amounts to

$$U_{t+1} = U_t + \Sigma_{j=1}^{J-1} F_{jUt+1} - \Sigma_{j=1}^{J-1} F_{Ujt+1}. \tag{1}$$

When we look at changes between the initial month t and some arbitrary future month $T > t$, we add over all inflows and outflows between t and T and get

$$U_T - U_t = \Sigma_{\tau=t+1}^{T} \left[\Sigma_{j=1}^{J-1} F_{jU\tau} - \Sigma_{j=1}^{J-1} F_{Uj\tau} \right]. \tag{2}$$

In order to answer our question 'where did the unemployed go', we need a measure for 'where they went'. In a first step, we change the order of the summation terms such that

$$U_T - U_t = \Sigma_{j=1}^{J-1} F_{jUT} - \Sigma_{j=1}^{J-1} F_{UjT},$$

where we denote the *accumulated* gross-outflows from unemployment to some state j over the period from t to T by

$$F_{UjT} \equiv \Sigma_{\tau=t+1}^{T} F_{Uj\tau}.$$

Accumulated gross-inflows are denoted by

$$F_{jUT} \equiv \Sigma_{\tau=t+1}^{T} F_{jU\tau}.$$

These two measures per se do not reveal a lot of insights as these time series are simply monotonically increasing or decreasing over time T.

In a second step, we define our measures of 'where the unemployed went' and also of 'where the unemployed come from' and compute *accumulated net-flows* from U to each state j and point in time T as

$$F_{jT} \equiv F_{UjT} - F_{jUT}. \tag{3}$$

This allows us to express the accounting identity (2) by

$$U_T - U_t = -\Sigma_{j=1}^{J-1} F_{jT}. \tag{4}$$

An increase in the stock of unemployment between t and T, $U_T - U_t$, is accounted for by minus the sum of all the net-outflows from U to j over all states 1 to $J-1$. For each period T, the *accumulated net-flows* F_{jT} are our $J-1$ measures for 'where the unemployed went' between t and T.

When we distinguish between positive and negative values of F_{jT}, we can identify states to which the unemployed go (positive accumulated net-flows or *accumulated net-outflows*) and states from which the unemployed come (negative accumulated net-flows or *accumulated net-inflows*). We can therefore write

$$U_T - U_t = -\Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F>0} - \Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F<0} \tag{5}$$

where $\Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F>0}$ is the sum over all states j where the accumulated net-flow F_{jT} is positive and where $\Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F<0}$ is the sum over all states j where the flow F_{jT} is negative. We summarize this in our central

Accounting identity *The increase in the stock of unemployment over a certain period in time in (5) is accounted for by the sum of accumulated net-outflows and net-inflows.*

This is our central identity used to describe the data below.

In the figures to come, we will look at two shares. The first one describes the share of accumulated net-outflows from unemployment to state j relative to all accumulated net-outflows from unemployment,

$$\text{share}_{jT}^{\text{outflow}} \equiv \frac{F_{jT}}{\Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F>0}}. \tag{6}$$

The second expression describes the share of accumulated net-inflows to unemployment from (another) state j relative to all accumulated net-inflows into unemployment,

$$\text{share}_{jT}^{\text{inflow}} \equiv \frac{F_{jT}}{\Sigma_{j=1}^{J-1} \left. F_{jT} \right|_{F<0}}. \tag{7}$$

In the first case, the sum in the denominator adds only accumulated outflows which are positive. In the second case, only negative accumulated outflows, i.e. inflows, are added. Hence, any state j at a point in time T is either an outflow or an inflow state. No state j will therefore appear both in (6) and (7) but only in (6) *or* (7). This implies that shares in (6) add up to 100% for all inflows and shares in (7) add up to 100% for all outflows in each month.

2.3 Micro data sets used

We use two micro data sets: The Integrated Employment Biographies (IEB), an administrative data set of the IAB Nuremberg, and the German Socioeconomic Panel (GSOEP), a survey data set by the DIW Berlin.[9] To understand transitions into non-standard work and out of the labour force as precisely as possible, we need to employ both data sets. The IEB provides most reliable data on employment, unemployment and measures of active labour market policy. Especially information on active labour market policy is crucial to understand transitions into subsidized non-standard work, which is not explicitly accounted for in the GSOEP-data. By contrast, the GSOEP contains much more information on transitions into non-employment, like maternity leave, housewife or -husband or (early) retirement.[10]

The commonalities and differences of the data set are highlighted in fig. 1. We split the population of a country into those that are employed and non-employed and add "not-classified" to capture missing data. This is shown in columns one and two. The third column shows the types of employment and unemployment states one would like to observe in an ideal world. We start with dependent full-time employment taking the form of standard work. The forth and fifth column then show one well-known difference between administrative data (IEB) and survey data (GSOEP). Standard work in IEB only captures employment that is subject to social security payments and therefore does not account for 'self-employment' and 'civil service'. We also count 'vocational training' as part of standard work. What is more important for our purposes, however, is the fact that GSOEP includes job creation measures (in addition to self-employment and civil service) into 'full-time employment'.[11] This is the first big advantage for IEB as 'job creation measures' are reported as an independent category – which one would usually count as non-standard work (as we do). When we use GSOEP-data, we add 'military/ civilian service' to 'standard work'.[12]

When we look at 'non-standard work', we again find that IEB data only measures employment that is subject to social security. The GSOEP entry on part-time employment reports all types of part-time employment. This difference between IEB and GSOEP will allow us later, in our construction of "consensus flows", to recover part-time and full-time self-employment.

Two further advantages of the IEB are visible when we consider active labour market policy and unemployment. The IEB explicitly accounts for a multitude of 'other measures of active labour market policy'. They are not accounted for in GSOEP and respondents might sort themselves into various categories like (various types of) employment or training, depending on their subjective categorization. The IEB also accounts for job searchers which are not counted as unemployed (as they are e.g. not entitled to unemployment benefits). It is also unclear in GSOEP where respondents consider themselves to be in.

The big advantage of GSOEP-data is visible when we look at non-employment. Here, IEB-data provides no information as individuals out of the labour force do not pay social security contributions. GSOEP provides various information which allows us to understand flows from education into the labour force and from and to 'staying at home' and 'retirement'.

[9] The data appendix shows, inter alia, that the micro data sets perform well at the aggregate level when compared with the official stock data.

[10] Some of the differences between the GSOEP-data and IEB-data are well known. See e.g. Biewen and Wilke (2005) or Burda and Seele (2016). Their work does not focus on non-standard work and does not derive a consensus prediction.

[11] GSOEP does offer measures of the number of self-employed, but only on an annual and not on a monthly basis that we employ here.

[12] This can be debated of course. Military and civilian service is a temporary employment which was compulsary in our period of observation. Once completed, an individual would not return to this employment state. As it is similar to vocational training (in its temporary but "normal" nature), we kept it in this category. This classification does not have any major quantitative impact on our conclusion.

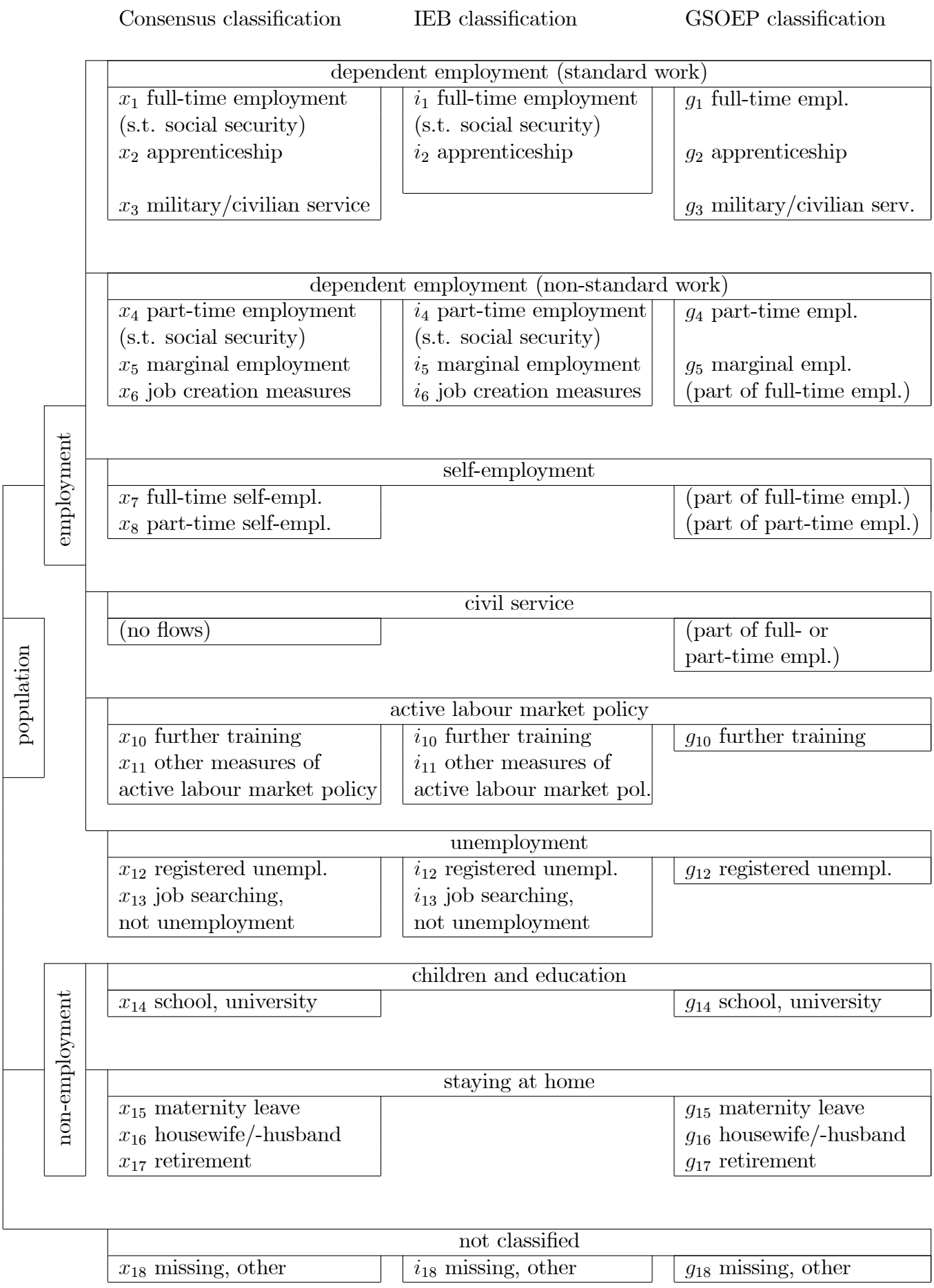

Table 1 *Population and employment: IEB- and GSOEP-classification*

3 Empirical results

3.1 Where did the unemployed go?

We now present our main results. The number of unemployed reaches its peak in February 2005, both according to the data of the Federal Employment Agency as well as in the GSOEP, with around 5.2 million unemployed workers. We therefore fix our initial period t from (1) as "February 2005" for both data sets. All changes are computed with respect to this initial month.

3.1.1 IEB-data

- Results for one point in time

Before we look at the findings for each point in time T as described in (5), let us illustrate our accounting method for one point in time. We choose February 2008, three years after the peak in the number of unemployed workers.

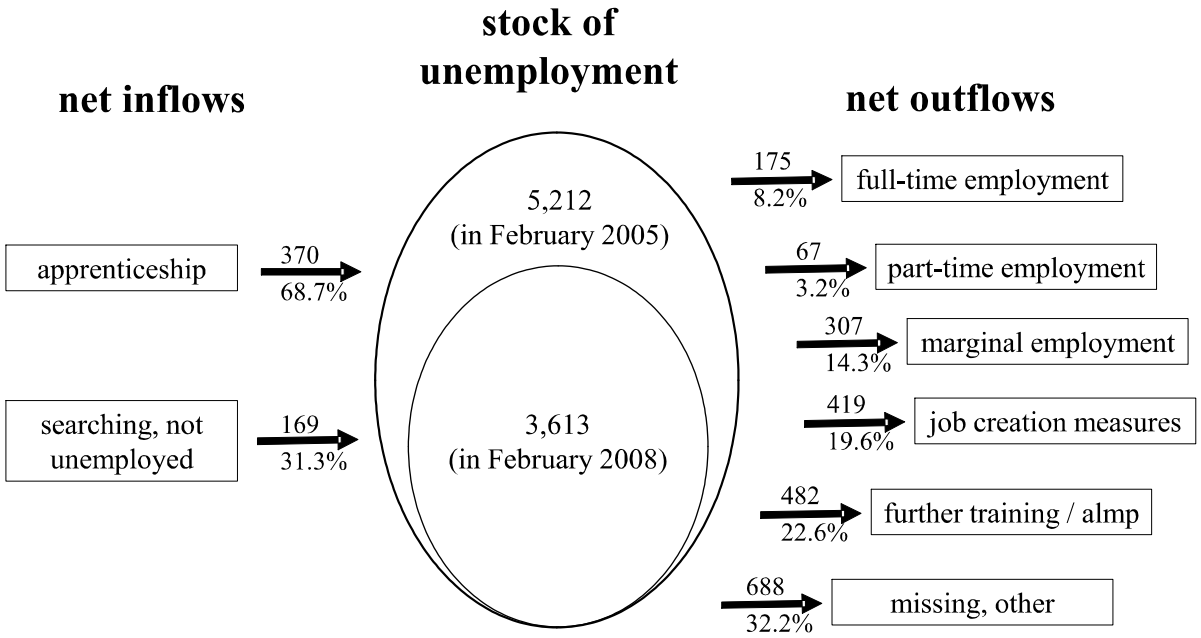

Figure 2 *Accumulated net-inflows, the reduction in the number of unemployed workers and accumulated net-outflows from February 2005 to February 2008 (IEB-data, in 1,000 individuals).*

Let the large circle in figure 2 illustrate the number of unemployed workers in February 2005 and the small one the number in February 2008. There is a reduction of the stock by 1.6 million. This reduction can be accounted for by a set of accumulated net-flows as in (5), which can be split into accumulated net-inflows and accumulated net outflows.

Looking at full-time employment in February 2008, there is an accumulated net-outflow of 175,000 individuals. This means that the difference between the number of individuals that found a job (transition from unemployment to employment) and those that lost a job (transition from employment to unemployment) between February 2005 and February 2008 is 175,000. These outflows into full-time employment accounted for 8.2% of all outflows. There were also net-outflows from unemployment into part-time employment (3.2%), into marginal

employment (14.3%), into job-creation measures (19.6%) and further training and active labour market policy (22.6%). Finally, a third went into an unknown labour market state (32%).

There are also two states with accumulated net inflows. The accumulated net-inflow to unemployment from apprenticeships was 370,000. An apprenticeship usually takes the form of a fixed-term contract, frequently followed by a short unemployment episode before the next job starts. The opposite flows from unemployment to apprenticeship are relatively low as the typical unemployed worker rather moves into active labour market policy measures than into an apprenticeship. The share of all net-inflows into unemployment originating from apprenticeships amounts to 68.7%. Net-inflows from the state of searching (individuals searching for a job and neither being employed nor unemployed), amount to 169,000 or 31.3% of the net-inflows.

- Time series results

We now look at results for all months or points T in time in our data set. Each line in fig. 3 represents the shares of accumulated net-outflows from unemployment into a specific state as a percentage of total outflows from (6) or accumulated net-inflows into unemployment from a specific state as a percentage of total inflows from (7), respectively.[13] All positive percentages add up to 100%, as do all negative percentages.

The solid line for the full-time employees working subject to social security immediately reveals one of our main points: The flows from unemployment into full-time employment are very low. Apart from an initial spike in 2005, were transitions from unemployment to employment played an important role in the reduction of unemployment, the net-flows to full time employment fell to negative values in winter 2005/2006. Afterwards, the accumulated share of net-flows out of unemployment into full-time employment lie at around 20%, displaying seasonal variation. In 2009 the accumulated net outflows from unemployment turn into net-inflows to unemployment.

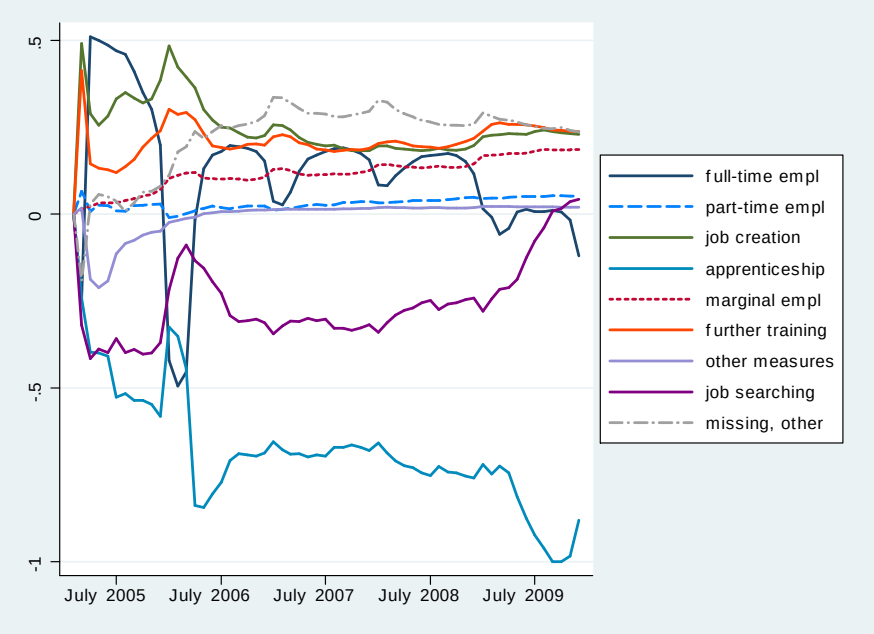

Figure 3 *Share of accumulated flows from unemployment by different states in IEB-data*

Looking at the other outflows in this figure shows that they are 'further training', 'job creation', 'marginal' or 'part-time employment'. Hence, other outflows (apart from 'missing') belong to the categories of non-standard work or active labour market policy.

[13] We opted for colours to make lines as distinct from each other as possible. As a downside, when printed in black and white, lines sometimes look very similar.

Generally speaking, the lines in figure 3 are relatively flat as of 2007 (apart from flows into regular employment on the first labour market). Hence, an answer to our question of 'where did the unemployed go?' would not depend in any crucial sense from the month we consider in 2007 or later.

Figure 2 computes the mean between January 2007 and the end of our observation period. We find that flows to both standard and non-standard work sum up to nearly 50% of all net-outflows. But net-outflows to standard work (9.4%) are much smaller than transitions from unemployment to non-standard work (almost 40% of the outflows) and to active labour market policy measures (more than 20%).

	state	inflows		state	outflows
standard work	apprenticeship	78.0%	i_1	full-time empl. (social sec.)	9.4%
			i_2		
			i_3		
non-standard work			i_4	part-time empl. (social sec.)	3.9%
			i_5	marginal employment	14.7%
			i_6	job creation measures	20.9%
self-empl. and civil service			i_7		
			i_8		
			i_9		
active labour market policy and unemployment			i_{10}	further training	21.7%
			i_{11}	active labour market policy	1.7%
	(reg. unempl.	n.a.)	i_{12}		
	job searching	22.0%	i_{13}		
out of labour force			i_{14}		
			i_{15}		
			i_{16}		
			i_{17}		
			i_{18}	missing	27.7%

Table 2 *Averages of accumulated net-inflows into and net-outflows from unemployment between January 2007 and December 2009 (IEB)*

The overall message of our paper is already clear from this table: standard work disappears after the Hartz reforms.[14] Workers flow into non-standard work (almost 40%) or active labour market policy (more than 20%).

We should be aware, however, that this is not yet a completely satisfactory answer: One important "explanation" are flows from unemployed into "missing" (27.7%). This is a category which could stand for self-employment, civil service, non-employment or measurement error (cmp. fig. 1). As IEB-data is administrative data, one could argue that there is no measurement error for other flows such that the 27.7% are net-outflows into "out of the labour force". As direct evidence is more convincing, we now turn to GSOEP-data.

[14] We do not attempt to identify any causal effect of the Hartz reform. The transformation of standard work into non-standard work might also have a secular component.

3.1.2 GSOEP-data

Figure 4 shows that GSOEP-data seems to be a little more optimistic on flows into full-time employment than IEB-data. The black solid line in figure 4 shows a similar development as the corresponding line in figure 2, but on a higher level. We attribute the latter to the inclusion of self-employment under the heading "full-time employment" in GSOEP-data.

Concerning flows to and from "out of the labour force", the figure shows that "retirement" is the most "attractive" state to which the unemployed flow. Flows to and from "household" are basically zero. By contrast, "maternity leave" and "school/ university" are states from which workers move more often into unemployment than they do in the other direction.

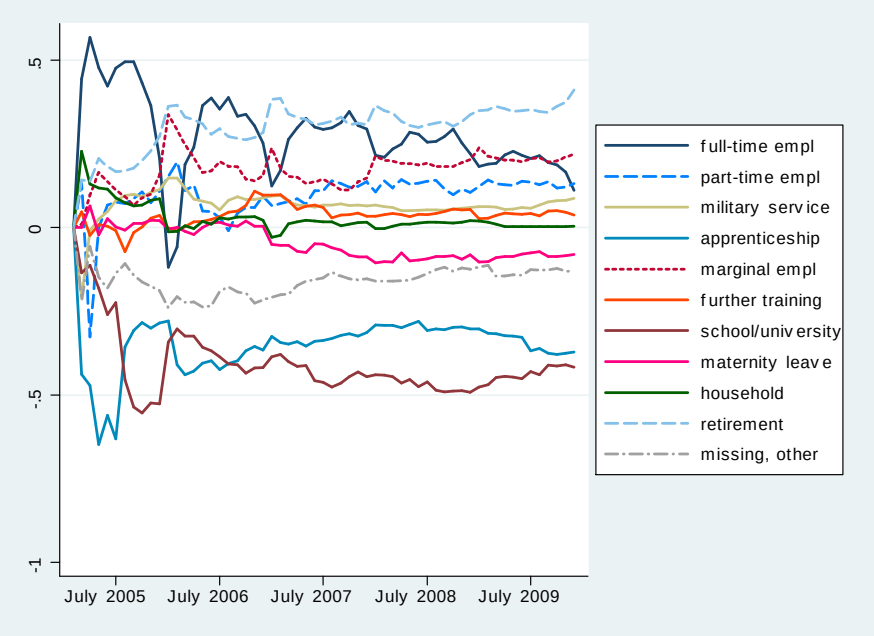

Figure 4 *Share of accumulated net-flows from unemployment by different states in GSOEP-data*

We again provide summary measures for these flows by computing percentages of average flows between January 2007 and the end of our observation period in December 2009. Table 3 shows that flows into standard work are higher than in the IEB table 2 (due to self-employment as just mentioned). Flows into non-standard work are almost as large in GSOEP-data (31%) as in IEB-data (39.5%). The huge role of "retirement" (33.7%) for understanding where the unemployed went is visible in this table as well.

Concerning sources of unemployment, the unemployed on net came from schools, apprenticeships, maternity leave or other.[15] In a way, this is not surprising as the education systems on net creates inflows into unemployment and relatively few unemployed workers return to school, university or apprenticeships.

[15]The interpretation of missing in the GSOEP, a survey data set, is not as obvious as with administrative IEB-data as all states an individual can be in should be covered. Missing (under which we include 'other') can be anything from attrition (going abroad, being sick) via illegal activities to not believing to be appropriatly described by existing categories (e.g. care-taking).

	state	inflows		state	outflows
standard work	apprenticeship	32.7%	g_1	full-time employment	23.8%
			g_2		
			g_3	military/civilian service	6.3%
non-standard work			g_4	part-time employment	12.3%
			g_5	marginal employment	18.7%
			g_6		
self-empl. and civil service			g_7		
			g_8		
			g_9		
active labour market policy and unemployment	(reg. unempl.	n.a.)	g_{10}	further training	4.4%
			g_{11}		
			g_{12}		
			g_{13}		
out of labour force	school/ univ.	44.7%	g_{14}		
	maternity leave	8.3%	g_{15}		
			g_{16}	housewife/ househusband	0.9%
			g_{17}	retirement	33.7%
	missing	14.3%	g_{18}		

Table 3 *Averages of accumulated net-inflows into and net-outflows from unemployment between January 2007 and December 2009 (GSOEP)*

3.1.3 Consensus flows

While two data sets yield more insights than one, it is disturbing that for some flows two estimates exist, rather than just one. We therefore go one step further, look more precisely at the definitions of the various categories and assume that categories are comparable across data sets.

Our point of departure are the categories in the column 'consensus classification' in fig. 1 and the corresponding variables x. Considering the definitions of the categories and variables i and g also from fig. 1, we can postulate the following relationships,

$$\begin{array}{ll} i_1 = x_1, & g_1 = x_1 + x_6 + x_7, \\ i_2 = x_2, & g_2 = x_2, \\ & g_3 = x_3, \\ i_4 = x_4, & g_4 = x_4 + x_8, \\ i_5 = x_5 & g_5 = x_5, \\ i_6 = x_6. & \end{array} \tag{8}$$

We have no (explicit) information on full-time self-employment (x_7) and part-time self-employment (x_8) and we know, for the reasons discussed above, that transitions between unemployment and civil service are basically zero ($x_9 = 0$). We also have similar equations for x_{10} to x_{18}. They read $i_j = x_j$ *and* $g_j = x_j$ for $j \in \{10, 18\}$. They read $i_j = x_j$ *or* $g_j = x_j$ for $j \in \{11, 13, 14, 15, 16, 17\}$.

For flows where we have "too much" information, i.e. flow measures from both IEB and GSOEP, we simply take averages to compute these flows. For the remaining flows, we take the values we get directly from the data. The crucial equations for our consensus classification

from the above system (8) are the one for g_1 and the one for g_4 where x_1, x_4 and x_6 need to be replaced by the observed flows i_1, i_4 and i_6. Solving for

$$x_7 = g_1 - i_1 - i_6 \text{ and } x_8 = g_4 - i_4 \tag{9}$$

allows to compute the net-flows between unemployment and part-time (x_7) and full-time (x_8) self-employment. This seems very surprising at first sight but becomes intuitive when noting that self-employment is included in the GSOEP flows but not in the IEB flows.[16]

Using these flows, we get the following consensus flows, which provide our general answers to the question of where the unemployed went.

	state	inflows		state	outflows
standard work	apprenticeship	30.0%	x_1	full-time empl. (social sec.)	8.7%
			x_2		
			x_3	military/civilian service	5.3%
non-standard work			x_4	part-time empl. (social sec.)	3.6%
			x_5	marginal employment	14.5%
			x_6	job creation measures	19.2%
self-empl. and civil service	full-time self-empl.	16.0%	x_7		
			x_8	part-time self-empl.	6.6%
	civil service	0.0%	x_9		
active labour market policy and unemployment			x_{10}	further training	11.8%
			x_{11}	active labour market policy	1.6%
	(reg. unempl.	n.a.)	x_{12}		
	job searching	9.1%	x_{13}		
out of labour force	school/ univ.	37.9%	x_{14}		
	maternity leave	7.0%	x_{15}		
			x_{16}	housewife/ househusband	0.7%
			x_{17}	retirement	28.0%

Table 4 *Consensus flows using IEB and GSOEP: Averages of accumulated net-inflows into and net-outflows from unemployment between January 2007 and December 2009*

We see that merging the two data sets leads to convincing results: When we use both IEB- and GSOEP-data, we receive plausible transitions between unemployment and 16 other states of employment or non-employment. While the accumulated inflows computed with IEB-data contain only two sources of unemployment, namely apprenticeship and job searching, our consensus approach is much more informative. Transitions from the educational system, e.g. from school or university are the biggest group of unemployment inflows (38%), a further 30%

[16] As self-employment is neither included in IEB nor in GSOEP "calendar data", flows between unemployment and self-employment can not be computed directly. However, GSOEP contains information on self-employment in the „current occupational status" of the individual questionnaire, but no transitions from unemployment to self-employment and vice versa. Taking the information about the number of working hours into account, we can compute the part-time share in the stock of self-employment. This share is rising from 7.8 to 9.5 percent between 2005 and 2009, when marginal self-employment is excluded. Because the flows between unemployment and full-time or part-time self-employment might differ in size, the part-time share of self-employment is not informative for our flow approach.

of inflows can be explained by transitions from apprenticeship. Comparing IEB-inflows with consensus-inflows, it is obvious that apprenticeship and job searching becomes less important, when additional GSOEP-information is used. The inflows from full-time self-employment becomes only visible when both data sets are merged (see equation (9)). Our results suggest that more full-time self-employed became unemployed, than vice versa. Although self-employed workers are not entitled to unemployment benefits in general, they might receive unemployment benefits because of earlier entitlements from jobs subject to social security contribution.[17]

Regarding accumulated outflows, the group of part-time self-employed helped to reduce unemployment because there are more transitions out of unemployment than in the opposite direction. Transitions from unemployment to full-time and part-time employment (subject to social security) are relevant, as they account for 9% and 4% of outflows, respectively. Yet, flows to marginal employment (15%) and to job creation measures (19%) are much more important. The main reason for the great relevance of marginal employment for outflows is the fact that transitions from marginal employment to unemployment are rather rare because marginal workers are not entitled to unemployment benefits. Concerning job creation measures, all transitions from unemployment to job creation measures are counted because unemployment is a legal precondition. The counter-flows from job creation measures to unemployment are much smaller, as we only take direct flows into account and a certain amount of these measures are followed by a (short) period of employment, non-employment or another measure of active labor market policy.

The difference in accumulated outflows between full-time employment in IEB-data and GSOEP-data can be explained because the latter contain transitions to self-employment and, what is more important, also to job creation measures (see equations in (8)). Outflows to further training and other qualification measures seem to be quite important when we compute our flow approach only with IEB-data (see tab. 2). When we apply the consensus approach, taking the smaller value of GSOEP-flows into account, the relevance of further training and other measures of active labor market policy is much lower (13%).[18]

Altogether, we find that standard work, even if we include military and civilian service, account only for 14% of outflows, whereas non-standard work account for 37% of accumulated outflows. Furthermore, transitions into retirement are highly relevant (28% of accumulated outflows), when we want to find out where all the unemployed went.

3.2 The unemployment cohort of February 2005

Our net-flow approach provides information on *direct* transitions into and out of unemployment. This implies that unemployed workers could all have moved e.g. into full employment *via some third state*. If an unemployed person finds a job e.g. after further training or qualification or after a subsidized job on the second labour market, this is not accounted for in our approach.[19] In this sense, our measure of direct flows provides a lower bound to all flows from unemployed to e.g. employment.[20]

[17] Transitions from self-employment to unemployment are possible because entitlement to unemployment benefit in Germany is not a legal precondition for being registered as unemployed.

[18] We exclude the category of "missing, others" in tab. 3. When we include them, they account for 9 percent of accumulated outflows. The effect on the other outflow quantities is minor and the overall picture does not change.

[19] The stepping-stone literature asks whether the job finding rate is higher for an unemployed worker who accepts, for example, temporary employment as a stepping stone towards full employment. As some do indeed find support for this hypothesis (e.g. Jahn and Rosholm, 2014), some workers might choose not to move directly from unemployment to full employment but via some third state.

[20] On the other hand, it is also true that our measure of direct flows into employment does not rule out that, after some time, the formerly unemployed worker leaves employment again and also moves to some third state.

This difficulty is circumvented when we follow the unemployment cohort of February 2005 over time. We ask where the 5.5 million workers that are unemployed in February 2005 are in March, April, May 2005 and so on. This is the most direct answer one can give to the question 'where did the unemployed go?'.[21]

When we look at this cohort, we may indeed just compare stocks as we start from a group – unemployed workers in February 2005 – that does not change over time (apart from the case of death). When we see an increase in the stock of employment, we therefore know that this increase has been caused by a reduction in the number of unemployed. The following figure shows the share of the unemployed in various states from February 2005 to the end of the data sets (see footnote 13).

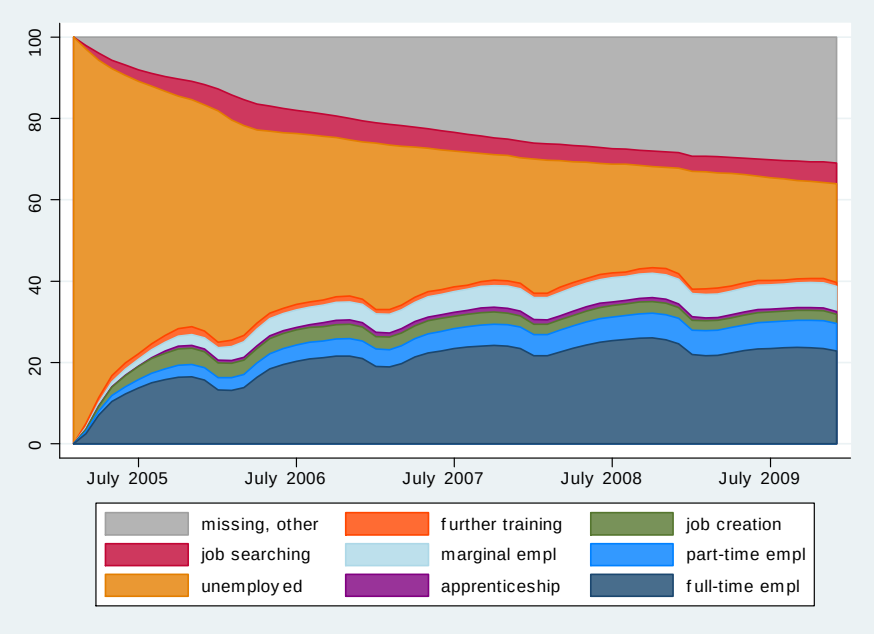

Figure 5 *Where is the unemployment cohort of February 2005? A stock view with IEB-data*

The lines add to 100% for each month on the horizontal axis. By construction, everybody is in the state of unemployment in February 2005. The share of unemployed workers falls over time down to around 30% as of February 2009. This means that out of 5.2 million unemployed workers in February 2005, around 1.8 million were still or are again unemployed in 2009. Another 30% were "out of the labour force" or "missing", around 25% were regularly employed. The rest was in other states.

When we look at fig. 6 for GSOEP-data, 40% of the unemployment cohort of February 2005 stayed unemployed for the whole time or became unemployed again until February 2009. This is 10 percentage points higher than in the IEB-data. A quarter of the unemployment population in February 2005 found a full-time job and a bit more than 10% a part-time or marginal job or started an apprenticeship. Almost 20% left the labour market due to retirement, maternity leave or working in the household. A very small group is still or again in further training, school or university and less than 5% was out of the labour market after four years. The detailed percentages are in the table 5.

[21] Obviously, this is also not the perfect measure of the effect of the Hartz reforms on the labour market in Germany as all workers who became unemployed after February 2005 are neglected. A full analysis would take flows between all states (and not just between unemployment and all other states) into account and undertake a simultaneous analysis of stocks and flows. We leave this for future work.

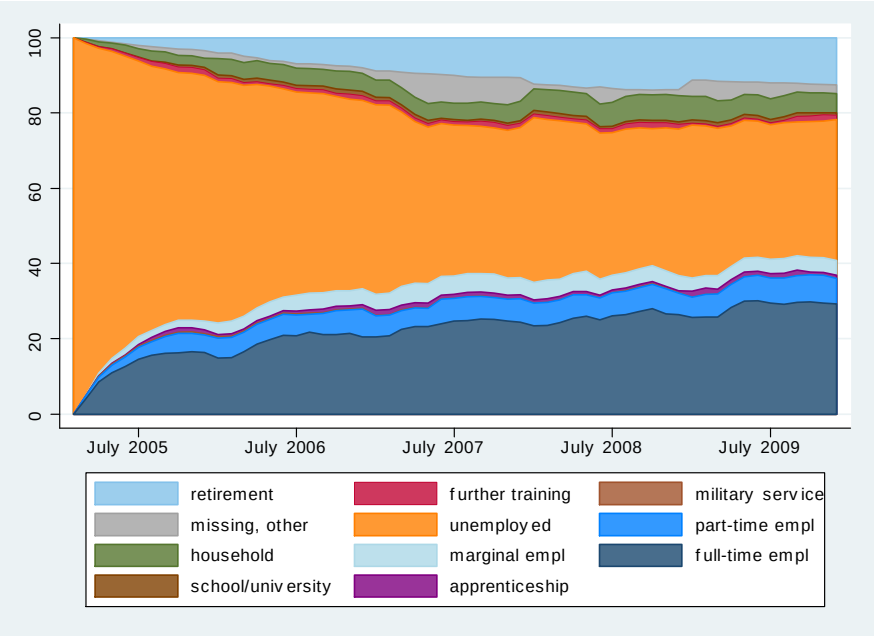

Figure 6 *Where is the unemployment cohort of February 2005? A stock view with GSOEP-data*

	GSOEP-state	share	IEB-state	share
standard work	full-time employment	25.8%	full-time empl. (social sec.)	21.7%
	apprenticeship	1.6%	apprenticeship	0.8%
	military/civilian service	0.0%		
non-standard work	part-time employment	6.0%	part-time empl. (social sec.)	6.1%
	marginal employment	3.3%	marginal employment	5.7%
			job creation measures	2.5%
self-empl. and civil service				
active labour market policy and unemployment	further training	0.5%	further training	1.3%
			active labour market policy	0.0%
	still or again unemployed	39.9%	still or again unemployed	28.7%
			job searching	3.9%
out of labour force	school/ university	0.8%		
	maternity leave	1.5%		
	housewife/ househusband	4.9%		
	retirement	11.3%		
	missing, other	4.4%	missing, other	29.2%

Table 5 *Where is the unemployment cohort of February 2005 in February 2009? (GSOEP-data to the left and IEB-data to the right)*

The cohort analyses, regardless of whether we look at IEB- or GSOEP-data, show a similar picture of the employment states four years after the peak in unemployment, with additional

information on non-employment, when using GSOEP-data. With this cohort view, the share of workers ending up in full-time employment is three times as large (21.7 to 25.8% vs. 8.7%) as compared to the consensus flows. There are various reasons behind these differences. On the one hand, unemployment inflows after February 2005 are not considered in the stock analysis. This suggests that labour market reforms might have had asymmetric effects on workers unemployed at the moment of the reform and those not unemployed or even not yet active on the labour market. Our flow approach comprises more unsteady or young workers, who might be treated differently and might move more often into non-standard work than older workers. On the other hand, and maybe most importantly, workers in the cohort analysis have four years to find a regular job. Workers in the flow analyses have only *one transition* to find a regular job. It is therefore not surprising that the cohort analysis yields much higher numbers for transitions into regular work.[22] We therefore consider these findings to be broadly consistent with our understanding of the flow-findings that standard work disappears and that only a very small number of the unemployed workers went into standard jobs.

4 Conclusion

Germany experienced a tremendously fast decline of its stock of unemployment between 2005 and 2008. This decline in unemployment of more than 1.6 million individuals coincides with an increase of employment of almost the same amount. Basically all analyses of this important period for the German labour market, and the German economy as a whole, work with a framework where workers can be in two states: employed or unemployed.

This paper convincingly shows that more than two states are needed to capture the complexity on the labour market. Not only is a state for "out of the labour force" needed, a credible analysis also needs to distinguish between different types of employment. The most crude distinction between standard work and non-standard work seems a must for future work.

Quantitatively, our consensus flows indicate that less than 10% of unemployed workers move into standard work taking the form of full-time employment. By contrast, almost 40% flow into non-standard work, more than 10% end up in active labour market policy and almost 30% retire. When we restrict our analyses to the cohort of unemployed workers in February 2005, the share of workers who move into standard work is somewhat larger. On the other hand, the cohort analyses also show that one third of the unemployment population of February 2005 remain unemployed, or are again unemployed in February 2009. The quantitative importance of the distinction between standard and non-standard work and of the consideration of retirement is confirmed by the stock analysis.

A quantitative challenge for future work consists in a joint stock and flow analysis. Our stock findings must of course be consistent with a more general analysis of flows. The latter must include flows between all states of the labour market and not just flows between unemployment and all other labour market states. Future work should show to what extent our findings of the stock and the flow analyses contradict each other or whether they are actually consistent. We would expect that both stock and flow findings survive and that all discrepancies are explained by (i) flows of workers that become unemployed after February 2005 and (ii) differences caused by a one-transition and a many-transition perspective (allowing e.g. for stepping stones).

The interest of our analysis also stems from the fact that one of the biggest labour market reforms in Germany, the Hartz-reforms, where implemented from 2003 to 2005. Our findings suggest that the reforms might have contributed to reducing unemployment, but it did not contribute, however, to creating full-time employment of a similar amount. Future research should find out how labour market institutions can be designed such that a larger share of

[22] Our thanks go to the Verena Wondratscheck for discussions of this point.

unemployed workers can find stable full-time employment at "acceptable" net wages. While Germany has achieved a lot, a lot remains to be done.

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A Data appendix

A.1 IEB-data

We use a 2% random sample of the Integrated Employment Biographies (IEB, Version 9.0), provided by the German Institute for Employment Research (IAB). The IEB covers all individuals in Germany which either have been employed subject to social security, have received unemployment benefits, participated in programs of active labour market policies, or have officially been registered as job-seekers at the German Federal Employment Agency (see Jacobebbinghaus and Seth, 2007, for a short description of a former version of the data set in English, or Oberschachtsiek et al., 2009 for a data report in German). Compared with the scientific use file and the weakly anonymous version of the IEB, which are available at the Research Data Centre (FDZ) of the Federal Employment Agency at the Institute for Employment Research, our data set contains the same employment states but is updated until the end of 2009.

For each person in our data set between 15 and 65 years of age, we define the main employment state for the 10th of each month from January 2000 to December 2009. Every change in employment state between these dates can be accounted for as an exit from one state and as an entry into another state.

To model state changes, a non-intersecting data set is required for each person. In the case of parallel spells, only the most important state is examined. The "dominant" state is selected using a priority list. Our ranking criteria are appointed by logical reasons combined with the priority for higher data quality. This implies that accounts associated with employment generally dominate unemployment and non-employment accounts. However, marginal employment ranks behind unemployment since unemployment may be accompanied by marginal employment. This rule ensures that unemployment spells are not interrupted by marginal employment. Accounts relating to the second labour market and further training or qualification have a higher priority than unemployment spells.

Complementary analyses showed an implausible large number of short gaps between spells. We decided to fill these gaps up to 14 days if the state before and after a gap was identical. If a gap up to 14 days occurs before or after an unemployment spell we filled these gap with unemployment.

The persons belonging to the group of non-employed/out of the labour force can also be self-employed, civil servants, students or in (early) retirement, as we do not have any information of these employment states in our IEB-data. We distinguish between nine labour market states as shown in the following list and registered unemployment '*U*'.

1	full-time employment subject to social security
2	part-time employment subject to social security
3	job creation measures
4	marginal employment
5	vocational training, apprenticeship
6	further training and qualification
7	other measures of active labour market policy
8	job searching, not unemployed
9	non-participation, out of the labour force
U	registered unemployment

Table 6 *Labour market states in IEB data*

We observe stocks of registered unemployment and flows into and out of unemployment into any of the states 1 to 9 for each month between January 2000 and December 2009. In the end, we used 1.1 million persons and 16.2 million spells in our data set. The average number of labour market states during our observation period of 10 years was 14.7 per person.

A.2 GSOEP-data

A.2.1 General

The second data set we use is the German Socio-Economic Panel (GSOEP), a household survey repeated annually since 1984 (Wagner et al., 2007). With currently about 21,000 individuals living in 12,000 households, the GSOEP is a representative survey of the population in Germany (Gerstorf and Schupp, 2014).

We use the calender-data (pkal) of persons aged 16 to 65 years, living in private households. In February 2005 about 18,600 persons answered the monthly calender variables on their individual employment state. There are 12 states in the GSOEP-data available for describing monthly individual employment states.

1	full-time employment
2	part-time employment
3	marginal employment (up to 400€)
4	first company training, apprenticeship
5	further training, retraining, further professional education
6	retirement, early retirement
7	maternity leave, child rearing leave
8	in school, at university or "Fachschule"
9	military service, reserve duty training exercise, community service, voluntary social year
10	housewife, houseman
11	other
U	registered unemployment

Table 7 *Labour market states in GSOEP data*

Some other interesting labour market states are only available before the year 2000 (e.g. secondary employment) or since 2009 (e.g. short-time work) but not during our observation period. In case of parallel states, we use the same priority list for GSOEP-data that we employ for IEB data.

A.3 How representative are our micro data sets?

To make sure that the micro data sets we use are representative for the economy as a whole, we compare the stocks of unemployed and employed workers in these two data sets with the stocks as reported by Federal Employment Agency (figure 7).

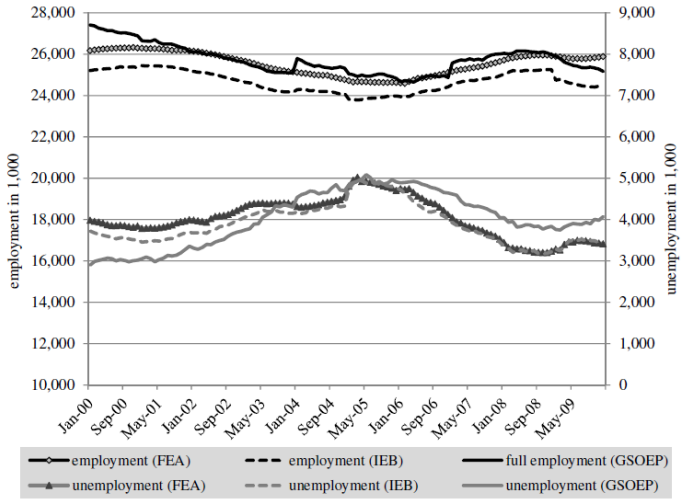

Figure 7 *Stocks in employment and unemployment according to different data sources, in 1,000.*
Source: Federal Employment Agency (FEA), IEB, GSOEP, own calculations, seasonally adjusted.

Both the IEB- and GSOEP-data fully support the development of the national account findings in fig. 1 and fig. 7 – the reduction in the stock of unemployment goes hand in hand with an increase in employment.

Although full-time and part-time employment data had the highest priority in our IEB-data set, the administrative data of the Federal Employment Agency is 0.5 to 1 million higher than the IEB-data (left axis). One reason for this difference might be that we dropped data of persons older than 65 years. GSOEP-data on employment is somewhat higher than national accounts data, because employment in GSOEP definition includes also self-employment and civil service. On the other hand, part-time jobs are excluded in this graph which brings full-time employment according GSOEP-data closer to employment subject to social security as published by the Federal Employment Agency.

The three lines in the lower part of figure 7 show the time series of the stock of registered unemployment taken from administrative data of the Federal Employment Agency and our own calculations based on the IEB- and GSOEP-data (right axis). The progress of these lines is also very similar. As the IEB-data on unemployment are taken from the database of the Federal Employment Agency, comparable results could be expected. Although we close gaps up to 14 days before and after unemployment, which might lead to longer unemployment spells and hence to a higher stock of unemployment, both lines are very close to each other, especially from 2003 onwards.[23] Looking at unemployment calculated with GSOEP-data, we find comparatively low unemployment until 2003 and higher values in 2004 and after 2006. The main reason might be that persons taking part in qualification and job creation measures continue to classify themselves as unemployed, while a period of unemployment is interrupted by such a measure according to the official statistics of the Federal Employment Agency.

Taken as a whole, the micro data sets confirm the stock findings in the aggregate National Accounts data. Hence we can be confident that the flow results we present in this paper are representative of flows at the aggregate level as well.

[23] Before 2003, participants in training measures were still counted as registered unemployed in official statistics. This is not the case in our IEB analysis.