The Fall in German Unemployment: A Flow Analysis*

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Abstract

In this paper we investigate the recent fall in unemployment, and the rise in part-time work, labour market participation, inequality and welfare in Germany. Unemployment fell because the Hartz IV reform induced a large fraction of the long-term unemployed to deregister as jobseekers and appear as non-participants. Yet, labour force participation increased because many unregistered-unemployed workers ended up accepting low-paid part-time work that was offered in quantity in absence of a universal minimum wage. A large part of the rise in part-time work was also due to the tax benefits Hartz II introduced to take up a mini-job as secondary employment. This has provided an easy way to top-up labour income staggering under the pressure of wage moderation. The rise in part-time work led to an increase in inequality at the lower end of income distribution. Overall we find that Germany increased welfare as unemployment fell.

Keywords: Unemployment, part-time work, mini-jobs, non-participation, multiple job holding, income inequality, Germany, Hartz reforms.

JEL: J21, J31, J63, J64

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1 Introduction

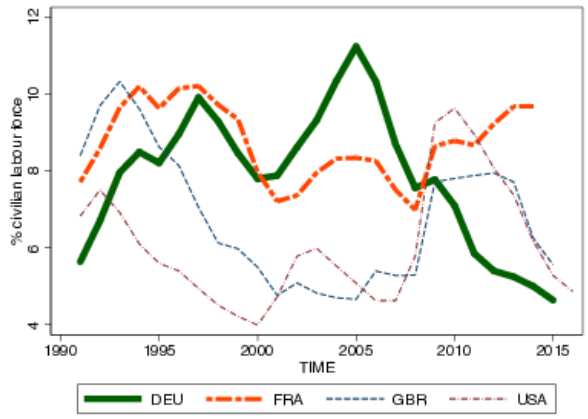
Since the mid-2000s, Germany has experienced one of the largest falls in unemployment seen in recent times. Figure 1 shows that after nearly two decades of persistently high levels, unemployment entered a downward trend in 2006, reaching its lowest level of 3.6% by the end of 2017. This decline started right after the implementation of the Hartz reforms (2003-2005), which aimed to make the labour market more flexible. Many economies with structurally high unemployment, such as France, have been called upon to do the same and adopt labour market deregulation policies. As a result, much work has been undertaken to try to understand the role (if any) the Hartz reforms played in reducing unemployment. Many studies find support for these reforms, but are inconclusive as to their degree of success. Others are less positive and view wage moderation and the increased competitiveness of the German economy as the main drivers of growth and unemployment reduction.[1]

In this paper we develop a simple yet insightful framework for studying the reduction of unemployment in Germany. Our framework takes into account all possible flows in and out of unemployment, non-participation and all forms of employment (full-time, part-time and marginal employment). The parallel between increasing part-time and marginal employment (mini-jobs), and falling unemployment has already been documented elsewhere (Weinkopf, 2009, Burda and Seele, 2016). The key insight from our study is that unemployment reduction did not happen through direct unemployment-employment flows, as is the focus of much of the literature.[2] Unemployment fell only because a greater fraction of unemployed workers did no longer register as jobseekers. This in principle should have increased non-participation. However, labour force participation actually increased due to the take up of low quality part-time employment. This occured because welfare benefits became less generous after the Hartz IV reform (2005), reducing long-term unemployment benefits and imposed tighter conditions on welfare benefit recipients. On the demand side, low quality jobs were offered in sufficient quantities due to the absence of a minimum wage bound and because the Hartz II (2003) reform facilitated their creation.

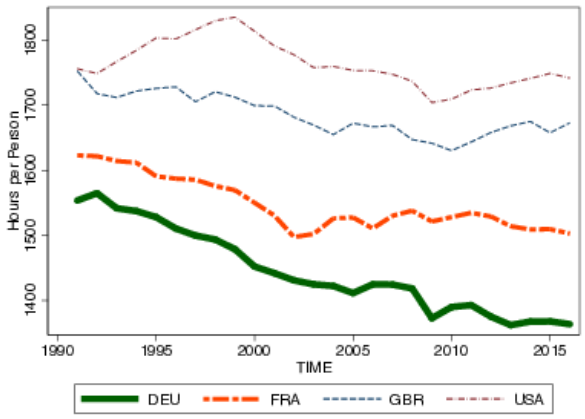
The increased control of unemployed workers by the Federal Employment Agency, the reduced benefits, and the poor quality of available jobs led long-term unemployed workers to cycle between registered unemployment and unregistered unemployment (or non-participation). Many of these non-employed workers were unskilled married women living in

[1]This view is strongly supported by Dustmann et al. (2014). A comparison with France, however, casts some doubts on this interpretation. Wages in Germany have always been higher than in France, while average labour productivity (as measured by GDP per hour) has remained exactly identical in both countries throughout the 1990-2016 period. See OECD statistics.

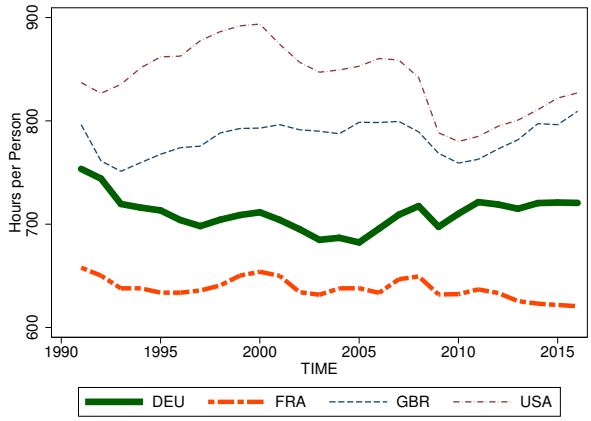
[2]Indeed, a common feature of the literature investigating the role of the Hartz reforms on unemployment reduction is its focus on unemployment-employment worker flows. For example, Fahr and Sunde (2009), Klinger and Rothe (2012) find that the employment-stimulating measures of Hartz I and II as well as reorganization of placement services under Hartz III have reduced unemployment duration and increased matching efficiency. Krause and Uhlig (2012), Krebs and Scheffel (2013), Launov and Wälde (2013, 2016), Hochmuth et al. (2017) design macroeconomic models that interpret the reduction of unemployment as an effect of the cuts in unemployment benefits induced by Hartz IV, which in their proposed search models can only increase search effort and/or job finding rates.



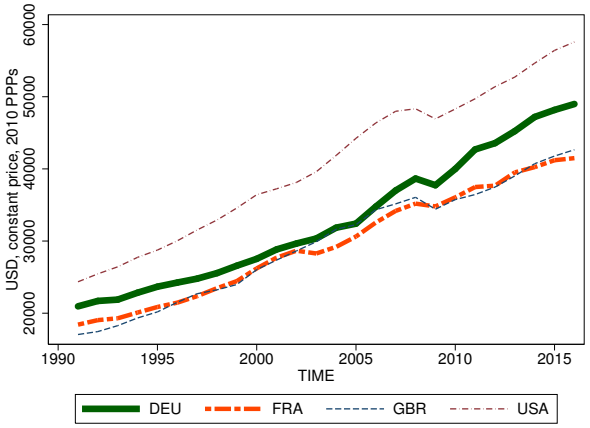
(a) Unemployment rate as % civilian labour force



(b) Average hours worked per person employed(



(c) Labour Utilisation



(d) GDP per capita

Notes: Source: OECD. Working age population (14-65).

Figure 1: Labour Force and Productivity in Germany, France, UK and US

poor households, whose spouse's income was likely affected by staggered wage growth due to wage moderation. Taking up low-pay employment in the form of a mini-job provided an easy and flexible way to complement the household income.

In this context, the number of low-wage, part-time labour contracts soared, while the number of full-time jobs continued its steady decline. The average number of hours worked per employed person has therefore decreased to very low levels. However, after 2005 we also observe a rebound in labour utilisation (hours worked per head of population), which has now returned to the levels observed in 1991 (see Figure 1). The labour force participation rate is now as high in Germany as it is in the UK, and higher than in the US and France.[3]

The dramatic rise in part-time labour contracts, however, cannot be fully accounted for only through the participation margin. We show that mini-jobs as secondary employment

[3]Interestingly, the development of part-time labour echoes the shortening of weekly hours negotiated by German trade unions and employer associations in the mid-1980s. Hunt (1999) documents that this policy did not have any positive effect of unemployment. Workers simply ended up working less for the same salary.

played a critical role behind the rise of part-time work. Mini-jobs during the 2000s accounted for about 48% of the change in the share of all part-time contracts. The Hartz II reform not only facilitated the creation of mini-jobs, but extended the income tax exemptions to workers who took a mini-job in addition to their main job. This particular sort of multiple job-holding, which we call "moonlighting", exploded in 2003. The amount of workers moonlighting with a mini-job rose from 70 thousand in 2002 to about one million in 2004.

We establish a causal relationship between moonlighting with a mini-job and wage moderation and show that workers who decided to moonlight did so because they experienced sluggish growth in their individual wages. By moonlighting, workers managed to compensate for their lower wages in their primary employment. Moonlighting with a mini-job is a form of "Uberisation" of the economy that the Germans invented long before Uber, which helped some workers (more often skilled than not) to compensate for wage moderation, and helped mitigating the increase of inequality in the bottom part of the income distribution.[4]

What are the welfare effects of the Hartz reforms? It is difficult to say as collective bargaining and wage moderation did help improve competitiveness in the tradable sector during the same period. Consider GDP per capita as the best readily available measure of welfare. Figure 1 shows that German real GDP per capita visibly increased its growth rate after 2005, above that of France and the UK, and seems to be a catching up with the US. Subjective welfare measures, such as self-reported job, household income or life satisfaction indices, also reveal an increase in welfare after 2005. This suggests that Germany was successful in reducing unemployment, while boosting employment and welfare at the same time.

Furthermore, although mini-jobs generated modest income, they did serve as stepping stones to contributing employment. Indeed, after 2005 mini-jobbers who found a contributing job were one of the main engines behind the growth of contributing part-time employment. The microeconomic studies of Freier and Steiner (2010), Caliendo et al. (2016), for Germany, and Böheim and Weber (2011) for Austria, are less positive in this respect. However, by focusing on unemployed workers taking up mini-jobs, they may have missed the main role of mini-jobs, which is to lift workers out of non-participation. In addition, we show that although the initial rise in moonlighting was propelled by workers already employed in contributing contracts who added extra hours in the form of a mini-job, the dominant form of multiple job holding gradually became that of workers employed in a mini-job who found a contributing job but did not give up their mini-job.

This narrative may sound a bit stale as the Hartz reforms have been debated in the press many times in similar terms.[5] Yet, surprisingly enough, we are not aware of any

[4]See Katz and Krueger (2017) for a recent study of the development of alternative forms of labour in the US, which they relate to rising inequality and technological changes. Tazhitdinova (2017) also documents the rise of mini-jobs as secondary employment. Like us, she finds a strong response of moonlighting with a mini-job to the tax incentives introduced by Hartz II. In contrast to her work we give a more comprehensive account of the evolution of the German labor market.

[5]For example, the rise in low pay part-time employment has been labeled the "The dark side of Germany's jobs miracle" by Reuters and "Minijobs Lift Employment But Mask

academic work making the point convincingly. Recently, a small academic literature has emerged, presenting a disenchanted view of the successes of the labour market in Germany. In particular, Rothe and Wälde (2017) show that a large number of unemployed stopped participating in the labour market or gain employment in non-standard jobs. Burda and Seele (2016) document the rise in part-time employment and rise in wage inequality among them. Our empirical analysis, although following this vein, remains very different, presenting a more complete picture. Another difference with these papers is that we emphasize the role of mini-jobs as secondary employment in the rise of part-time work. Moonlighting with a mini-job and accepting a mini-job when one is unemployed or non-participant are just two sides of the same coin. This is something that one does when the need for resources becomes dire, and indeed when resources become scarce because of rigid wages. Wage moderation and collective bargaining at the level of the firm were instrumental in improving the competitiveness of the German economy in the tradable sector. However, unemployment was reduced because the Hartz reforms forced many working-age Germans to take up low-paid, part-time jobs in the non-tradable sector. Overall, we believe that our analysis is relevant as there are lessons to learn from the German experience that may help design labour market policies for other similar economies.

The rest of the paper is structured as follows. Section 2 describes the institutional background emphasizing the role of the Hartz reforms and the datasets we use. Sections 3 and 4 investigate the mechanism behind the reduction in unemployment. Section 5 documents the rise in part-time employment and the importance of moonlighting. Section 6 provides an analysis of inequality and welfare, where we focus on the wage and earnings inequality and show the importance of wage moderation in providing the incentives for individuals to take up mini-jobs. Section 7 concludes.

2 Preliminaries

2.1 Institutional background

The main institutional change that occurred during the period of study were the Hartz reforms. These reforms came in four packages. Many detailed descriptions exist in the literature (see for example Jacobi and Kluve, 2006, Fichtl, 2015). We briefly summarize their main content.

The reforms were generally aimed at improving labour supply, labour demand and matching efficiency. Hartz I (1/1/2003) deregulated and enhanced temporary employment, implemented occupational training programmes, introduced subsistence payments on behalf of the employment agency, and introduced new forms of employment for elderly workers. Hartz II (1/1/2003) reformed marginal employment and revised start-up subsidy scheme for the

German Weakness" by the Wall Street Journal. See https://www.reuters.com/article/us-germany-jobs/insight-the-dark-side-of-germanys-jobs-miracle-idUSTRE8170P120120208 and https://www.wsj.com/articles/SB10001424127887324682204578512782697519080.

unemployed workers willing to become self-employed. Hartz III (1/1/2004) reorganized the Federal Employment Agency as an entity improving in particular its efficiency in job offer mediation to unemployed workers. Hartz IV (1/1/2005) reformed the unemployment benefit system completely. Particularly important for our paper are the combination of harsher stance towards unemployed under Hartz IV and more liberal regulation of marginal employment under Hartz II.

The Hartz IV reform, imposed tighter conditions on unemployment benefit recipients. It merged the long-term (i.e. more than 12 months) unemployment assistance benefits with social assistance benefits into *Arbeitslosengeld II* (ALG II) benefits. This has amounted to 345 euros per month (West) and 331 euros per month (East), which is on average lower than the unemployment assistance benefit allowance before the reform.[6] Crucially, ALG II benefits are means-tested at the household level and this affected the eligibility of the long-term unemployed. Launov and Wälde (2013), for example, estimate that only 24% of the long-term unemployed are able to pass the test, leaving about three quarters of the long-term unemployed without benefits. In addition, under Hartz IV benefits can be cut by 30% for 12 weeks if a person who is able to work refuses to enter the activation program or take up a suitable offer of work proposed by the case worker, where Hartz laws explicitly state that about any work is now considered suitable. Repeated refusal leads to further 30% cut for another 12 weeks.

Hartz II reformed marginal employment. Marginal employment was introduced in Germany in the sixties to help non-participants take up work. It is considered a form of low-pay employment with caps on hours and pay.[7] Workers in marginal employment are exempted from income tax and social security contributions, but are not entitled to unemployment benefits and obtain reduced pension payments at retirement. Firms, however, contribute to these worker's health insurance and pensions. In addition, unemployed workers who receive benefits are allowed to work in marginal employment to top up their benefits, as long as their jobs do not pay more than 165 euros per month. The precariousness of marginal jobs also arises from the flexibility these jobs introduced to firm's hiring and firing practices by, for example, allowing them to cover spikes in demand. Moreover, employers reduce the costs by not paying marginally employed workers during holidays and sickness leave, and by paying only for the hours they work (Weinkopf, 2009).

Hartz II defined two types of marginal jobs: mini-jobs and midi-jobs. *Mini-jobs* paid up to 400 euros per month (450 euros in 2013), while *Midi-jobs* paid between 400 and 800 euros per month.[8] We highlight three modifications Hartz II introduced to the legal setup

[6]Within the ALG II scheme, the state covers the health insurance of the unemployed and until 2010 contributed to her pension scheme. It may also provide for rental costs in case of hardship.

[7]Throughout the 1980s and the 1990s this wage cap was set between one-fifth and one-seventh of the average gross national wage in the previous year. In April 1999 the German Federal Employment Agency set the wage cap to 325 euros per month.

[8]As in the pre-Hartz period, workers in mini-jobs paid no income tax and no social security contributions, while firms had to pay an increased contribution of 25% (and 30% in 2006) of an employee's gross earnings for health insurance, pensions and other taxes. Workers in midi-jobs paid reduced social security contributions and a linear income tax that ranged between 4% and 21%, while firms paid the full contribution rates to

that governed the marginal employment sector. (i) It increased the maximal wage for mini-jobs from 325 to 400 euros. (ii) It eliminated the maximum limit of 15 working hours per week.[9] (iii) It extended the income tax and social security exemptions to mini-jobs held as a secondary job.[10]

In addition, Hartz II created the *Minijobzentrale*, a unique legal entity solely responsible for registering marginally employed workers and dealing with all tax and social security matters related to marginal workers and their employers. This made it easier for firms, from an administrative point of view, to set up marginal jobs and to pay the associated taxes and social security contributions. The flexibility that mini-jobs introduced to firm's hiring practices and the low set-up costs needed to create these jobs are important reasons why firms created mini-job opportunities after Hartz II. The *Minijobzentrale* also facilitated the systematic collection of data on marginal employment.

2.2 Data

Our analysis primarily relies on the Sample of Integrated Labour Market Biographies (SIAB) provided by the Institute for Employment Research (IAB). The SIAB is a 2% random sample drawn from the Integrated Employment Biographies (IEB) – an administrative data set which comprises the universe of individuals who are (i) in jobs that are subject to social security (in the data since 1975), (ii) in marginal employment (in the data since 1999), (iii) in benefit receipt according to the German Social Code (since 1975), (iv) officially registered as a job-seeker at the German Federal Employment Agency or (v) participating (plan to participate) in active labour market policies programmes (in the data since 2000). These data provide information on individuals' daily employment status, education, gender, age, gross daily wage/benefit (wages are top-coded) and a unique identifier that allows us to match the individual's information to that of his/her employing establishment.

The establishment information is obtained from the Establishment History Panel (BHP), which collects information from all German establishments with at least one employee contributing to social security since 1975. The BHP provides annual information (on the 30th June of each year) about the number of contributing (full-time and part-time) employees and marginal employees working in the establishment, their 3-digit industry classification, the average gross daily wage of full-time employees and the location of establishment. Since marginal employment has been classified as a separate category since April 1999, we use these data for the period 1999-2014, where 2014 is the last year available.

The German Socio-Economic Panel (GSOEP) is also used to complement the information

health insurance, pensions and income taxes.

[9]This hour limit was not lifted for those unemployed workers who in addition to their benefits received wages from a mini-job. See Caliendo and Wrohlich (2010) and Caliendo et al. (2016).

[10]Bundesgesetzblatt, 2002, Teil I Nr. 87, 4623. Prior to the reform a secondary mini-job increased the tax base of the primary job. However, workers with more than two mini-jobs as secondary employment in conjunction with a mini-job as primary employment were subject to income tax and social security contributions on all except two of the mini-jobs.

derived from the SIAB. In contrast to the SIAB the GSOEP data is a household panel survey. The GSOEP started in 1986 and is updated on an annual basis.[11] This data set is used to extract further information on worker demographic characteristics as well as hours worked and hourly wages.

One restriction is made to the sample of workers in our study. Namely, at any point in time workers need to be between 25 and 54 years old. We label this set as prime-aged workers and note that they represent the vast majority (around 65%) of workers in the German working age population. Although younger and older workers could in principle give further information into the rise of part-time employment, they are excluded for the following reasons. The 15-24 years old group is excluded to avoid considering individuals who are using marginal employment to support their studies, which seems common practice in Germany. The 55-65 years old group is excluded to avoid confounding the potential effects of Hartz II and Hartz I, which were introduced simultaneously. This is important because one objective of Hartz I was to increase the participation rate of older workers, which seems to have been successful.

The registered labour force is defined as the sum of registered employment and registered unemployment. Registered employment consists of the sum of those workers registered in the social security system whose main employment is either a full-time, part-time or a mini- job. Since midi-jobs are taxed, we incorporate them into the contributing part-time employment category. Therefore, we will use the terms mini-jobs and marginal employment interchangeably. Registered unemployment consists of those individuals who are registered with the labour office and have been actively searching for a job within the last 2 weeks irrespectively of their benefit status.[12] Non-participants are those workers who are not in registered unemployment or in any form of registered employment. We will refer to the registered labour force, employment and unemployment simply as labour force, employment and unemployment.

We categorize workers by their type of job contracts. An exclusive full-time (part-time) worker is one whose only employment is in a contributing full-time (part-time) job. An exclusive mini-jobber is one whose only employment is a mini-job or one who holds two mini-jobs simultaneously. We refer as part-time workers those who are either exclusive contributing part-timers or exclusive mini-jobbers. Moonlighters are considered to be those workers who hold a contributing job (full-time or part-time) as their primary employment and simultaneously hold either a contributing part-time job or a mini-job as their secondary employment.

[11]Further information about the SIAB, and GSOEP data can be found in FDZ(2013), `http://www.diw.de/en/diw_02.c.222857.en/documents.htm`, respectively.

[12]Registered unemployment as published by the Federal Employment Agency differs from unemployment calculated from the Labour Force Survey that follows the definition of the International Labour Organization (ILO), i.e. being without work, being available for work and seeking work. In the European Statistical System, the results of the Labour Force Survey are used as a standard basis for calculating unemployment rates. Registered unemployment is however the most commonly used measure for the analysis of labour market policies (Melis and Lüdeke, 2006). Workers taking part in activation programs are not considered registered-unemployed (see Kruppe et al., 2008, for details).

Finally, in our analysis we consider three educational or skill groups. (i) Low skilled workers are those with no vocational training and no high school degree. (ii) Medium skilled workers are those with vocational training (no high school), or high school (no vocational training), or both. (iii) High skilled workers are those with a university degree, either from a university of applied science (*Fachhochschule*), technical college (*technische Hochschule*) or a university. The Data Appendix provides detailed information on how all the series are constructed.

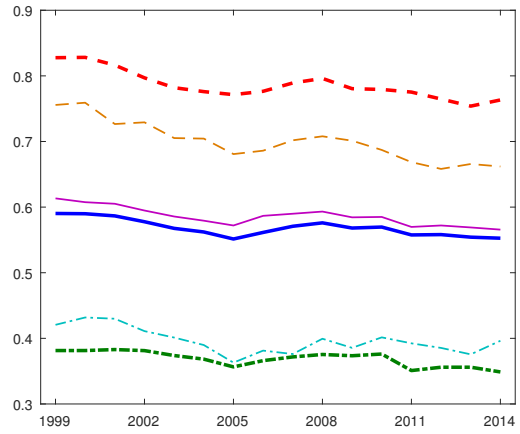
3 The dynamics of stocks

In this section, we document that the increase in the importance of part-time employment occurred together with a reduction of unemployment and non-participation.

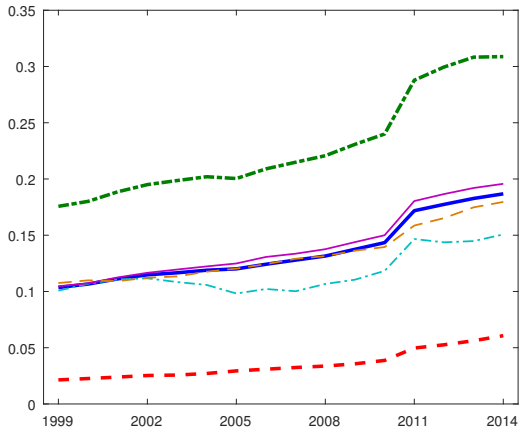
3.1 Trends in the employment stocks

Figure 2 depicts the evolution of the stocks of prime-aged workers in full-time employment, part-time employment, exclusive marginal employment, unemployment and non-participation. These stocks are presented as shares of the population of prime-aged individuals, overall and by gender and education.[13] We highlight the opposing patterns observed in the stocks of full-time employment and unemployment relative to the stocks of part-time employment and labour force participation. Full-time employment decreased from about 60% in 1999 to 55% in 2014, while the share of unemployment decreased from its peak of 10% in 2005 to just below 6% in 2014. In contrast, labour force participation, contributing part-time employment and, to a lesser extent, exclusive marginal employment increased during the 1999-2014 period.[14]

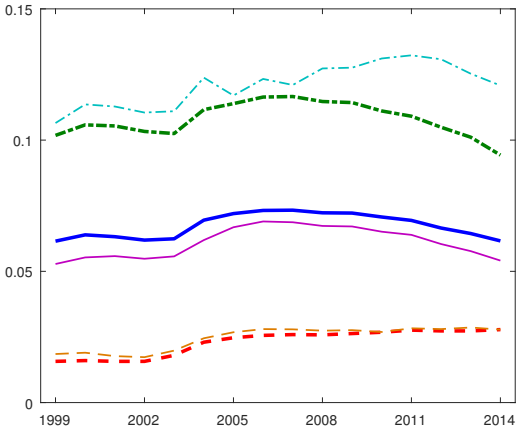
Labor force participation increases over the period because female and less educated individuals supplied more labour. Contributing part-time contracts are predominantly signed by female workers. Education is not a determining factor. However, marginal employment is heavily concentrated among women and low educated workers, while unemployment is more prevalent among the low educated, but is much less gender differentiated than marginal employment. Note also that low educated workers are the only group for which unemployment did not fall after 2005, but remained at a high rate of 15%.



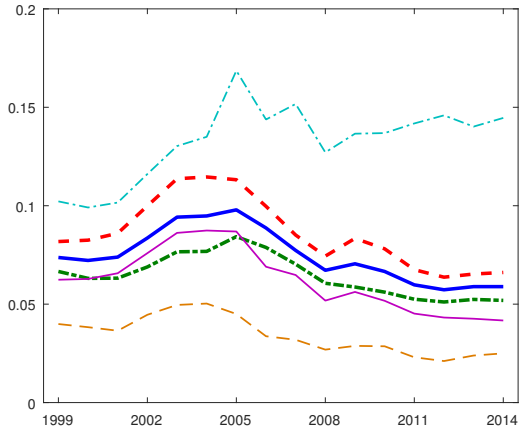
(a) Full-time employment



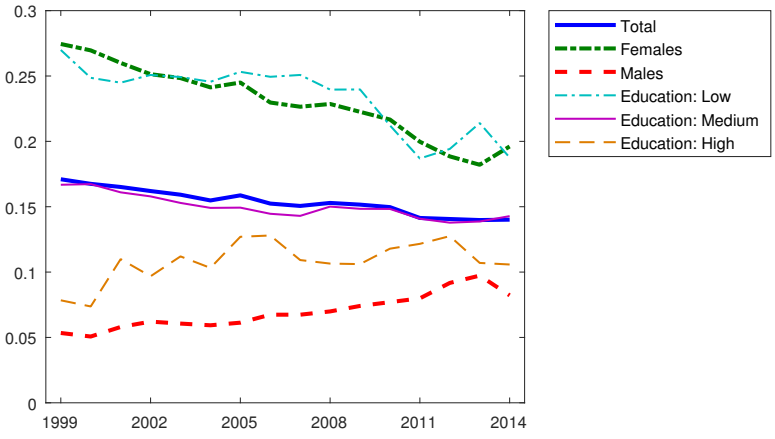
(b) Part-time employment



(c) Marginal employment



(d) Unemployment



(e) Non-participation

Source: OECD, SIAB and GSOEP. The SIAB data allow to calculate aggregate stocks of employed and registered-unemployed workers. The stocks of non participants are obtained from OECD statistics. The shares of these stocks by gender and education are drawn from the GSOEP.

Figure 2: Dynamics of the labour force and participation (% of the entire population)

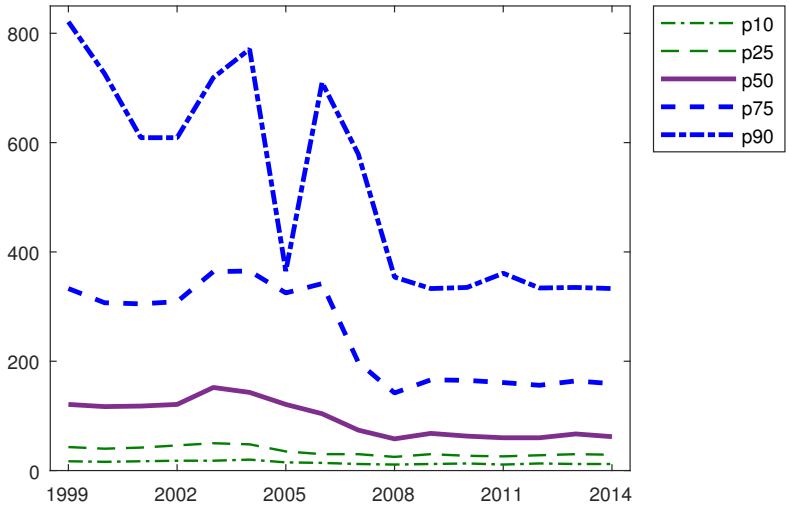


Figure 3: Elapsed duration of unemployment at the end each year (in days; excludes fixed-term contracts. Source SIAB)

3.2 Unemployment duration

Figure 3 shows the evolution of the distribution of elapsed unemployment duration in stock samples on the last day of each year. It shows that accompanying the reduction in the stock of unemployed workers was a striking collapse of the right tail of the unemployment duration distribution. During the 2007-2014 period, the median duration of an unemployment spell was essentially half of that observed during the 1999-2004 period.[15] Stronger reductions can also be observed at the 75th and 90th percentiles of the duration distribution. This implies that the reduction in unemployment after 2005 was obtained by limiting long-term unemployment. The most likely reason for this conversion is Hartz IV, which cut unemployment benefits and reformed the welfare system.

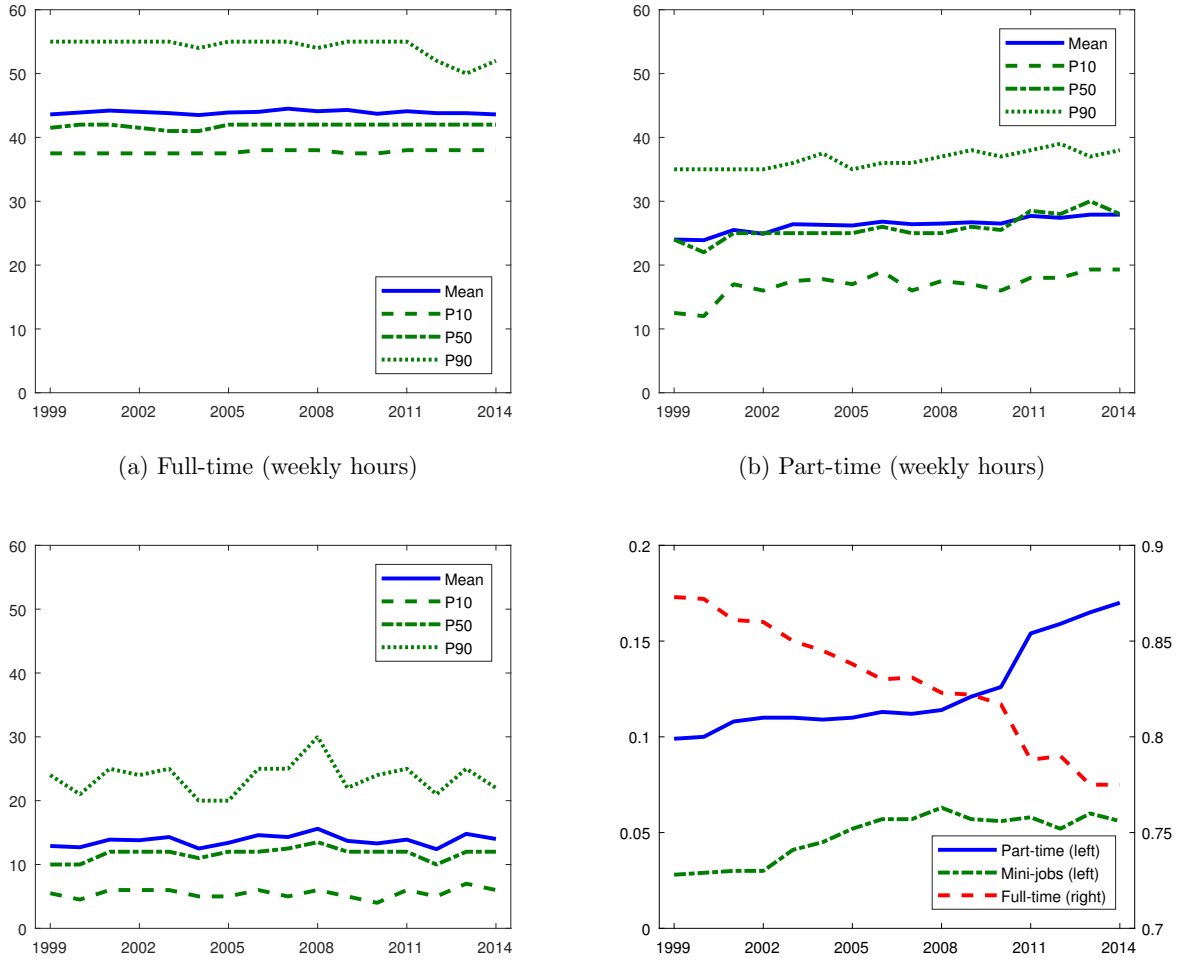
3.3 Number of hours

How did the expansion of the stock of part-time employment, as documented in Figure 2, impacted the total number of hours worked? Given that the SIAB does not report hours worked, we use the GSOEP to tackle this question. Figures 4a, b and c show the

[13]The SIAB allows us to calculate aggregate stocks of employed and registered-unemployed workers. The stocks of non-participants are obtained from OECD statistics. The shares of these stocks by gender and education are drawn from the GSOEP. The jump in the share of part-time employed in 2011 is related to the improved classification of the part-time versus full-time employment by the Federal Employment Agency. The share of full-time employed went down by the same amount in that year. Although the new classification was applied retrospectively for the 1999-2010 period, this did not remove the structural break completely.

[14]By 2014, there were more workers who had a mini-job as primary employment (7.4% of the labour force) than unemployed workers (6.8% of the labour force).

[15]The collapse of the right tail in 2005 and its rebound in 2006 occurred because Hartz IV abolished social assistance, so all former recipients of social assistance had to register as unemployed on the 1st January 2005, partly explaining the rise in unemployment during 2005. This resulted in a 16% mass point in the distribution of the elapsed duration at the end of 2005. At the end of 2006 the mass point has reduced to 4.5%. In 2007 it became negligible.



(a) Full-time (weekly hours)

(b) Part-time (weekly hours)

(c) Mini-jobs (weekly hours)

(d) Total working hours (% share)

Figure 4: Hours worked by type of employment (Source: GSOEP)

mean and the 10th, 50th and 90th percentiles of the distribution of weekly hours worked in full-time, contributing part-time and marginal employment for each year, respectively. It is immediate that individuals work the lowest amount of hours when in a mini-job. Further, the distribution of hours worked by mini-jobbers seems to have been relatively stable throughout the period.[16] In contrast, the distribution of hours worked in contributing part-time jobs has been shifting to the right throughout the period, with a stronger increase in the left tail of the distribution (below the first quartile). Indeed, the P50/P10 ratio decreased from 1.92 in 1999 to 1.45 in 2014, which made the P90/P10 fall from 2.9 in 1999 to 1.97 in 2014.

Figure 4d shows the evolution of the shares of total hours worked (hours × number of contracts) for each type of contract. It shows a constant fall in the share of total hours worked in full-time jobs and a constant rise in the share of total hours worked in contributing part-time and mini-jobs. These patterns then imply that the decreasing trend in labour utilisation

[16]For example, the P90/P10 ratio has been fluctuating closely around a mean of 4.35, but showing a downward trend in the last years. We find a similar feature in the distribution of hours worked by full-time workers, where the P90/P10 ratio has been fluctuating closely around a mean of 1.44 with a slight dip in last few years.

observed during the 1999-2005 period in Figure 1 for Germany is driven by the decrease in the number of total hours worked in full-time employment. The rebound observed after 2005 is driven by the rise in the number of total hours worked in contributing part-time and mini-jobs. Since marginal employment increased primarily on the extensive margin and had a very subdued response on the intensive margin, the increase in total hours worked in the marginal employment sector was mainly due to a larger number of individuals taking mini-jobs rather than an increase in working hours. Contributing part-time employment, however, increased in both the extensive and intensive margins and hence the increase in total hours worked was due to both more workers taking up contributing part-time jobs and working more hours.

4 The dynamics of flows

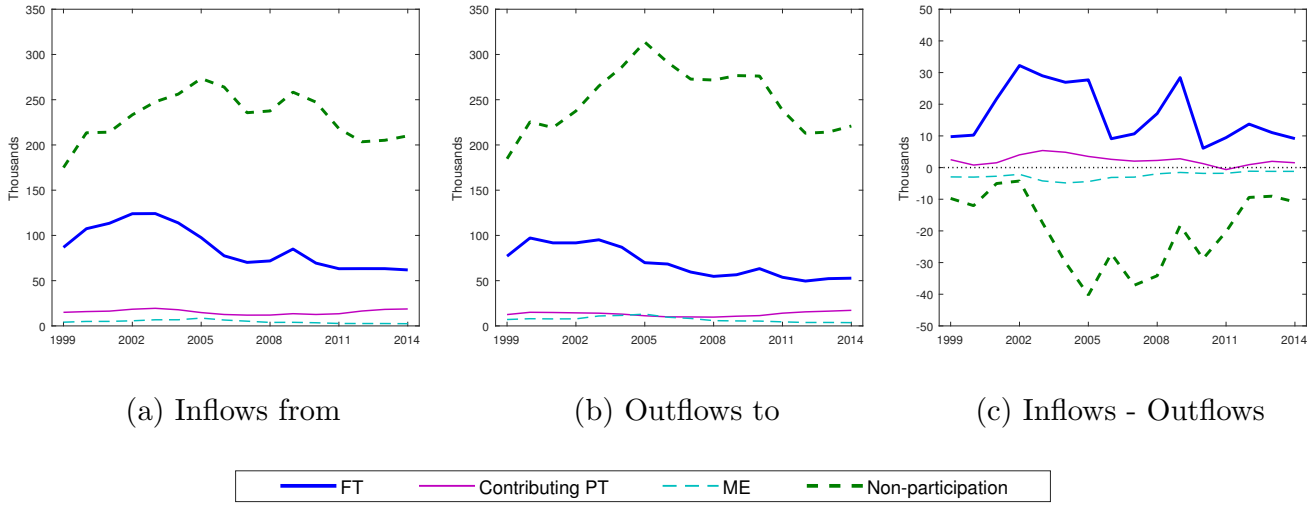
An important contribution of this paper is to explain the evolution of the stocks reported in Section 3.1, highlighting the role of part-time employment. For this purpose we use the SIAB to construct the gross and net flows of each of these employment categories and investigate the dynamic system underlying the stocks. We then derive the stationary distribution of the stocks implied by the flows and check whether we can predict the share of the observed stocks depicted in Figure 2.

4.1 The ins and outs of unemployment

Figure 5 depicts the average monthly inflows to, outflows from and the net flows (inflow minus outflow) of unemployment, measured in thousands of workers. These flows are decomposed by the worker's previous and destination employment category: full-time employment (FT), contributing part-time employment (PT), exclusive marginal employment (ME) and non-participation (NP).

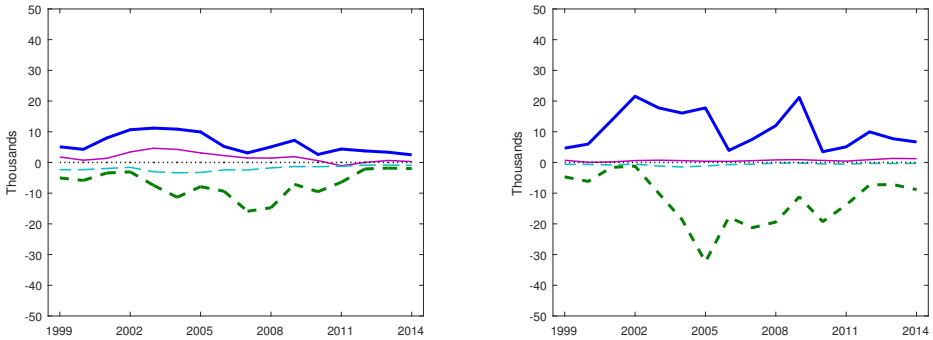
The left panel of Figure 5 depicts the inflows into unemployment and the central panel of Figure 5 depicts the outflows. They show that by far the two main sources and destinations of unemployment are non-participation and full-time employment. That so many individuals churn between unemployment and non-participation indicates that a large fraction of individuals who do not receive unemployment benefit, or are not registered at the German Federal Employment Agency, or do not participate in training programs, and are therefore counted as non-participants, have not, or only temporarily, stopped searching for a job.

The right panel of Figure 5 shows a striking feature. The main reason behind the reduction in German unemployment was not re-employment in a contributing job (either full-time or part-time) or in a marginal job. Instead the unemployment rate decreased because individuals stopped registering as unemployed and became non-participants. About 19,000 more workers went from unemployment into non-participation each month than from non-participation into unemployment. These net outflows peaked in 2005 at about 37,000

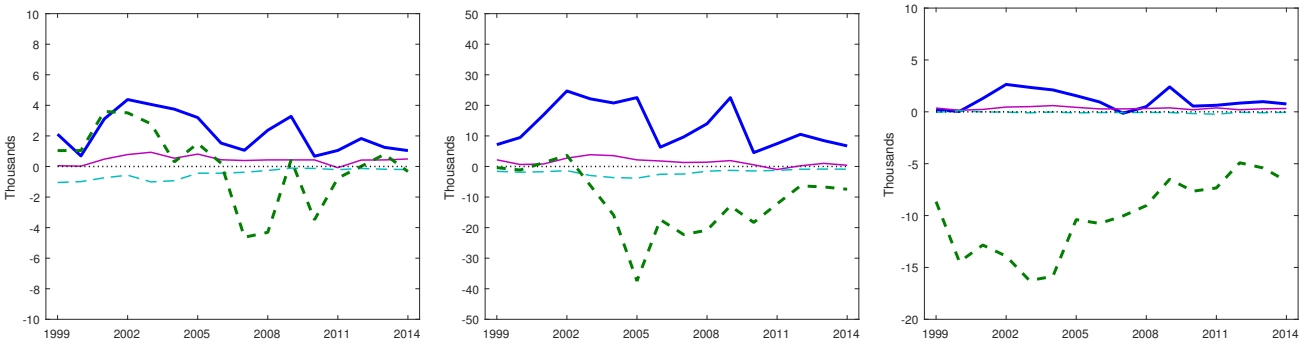


(a) Inflows from (b) Outflows to (c) Inflows - Outflows

Figure 5: Flows into and from unemployment



(a) Female (b) Male



(c) Low Skill (d) Medium skill (e) High skill

Figure 6: Net unemployment inflows by gender and education

workers and exhibited a gradual decline thereafter. This contrasts with the flows associated with full-time employment, from which every month more workers entered unemployment than obtained a full-time job. These monthly net inflows were of about 17,000 workers, although peaking at 32,000 earlier in 2002.

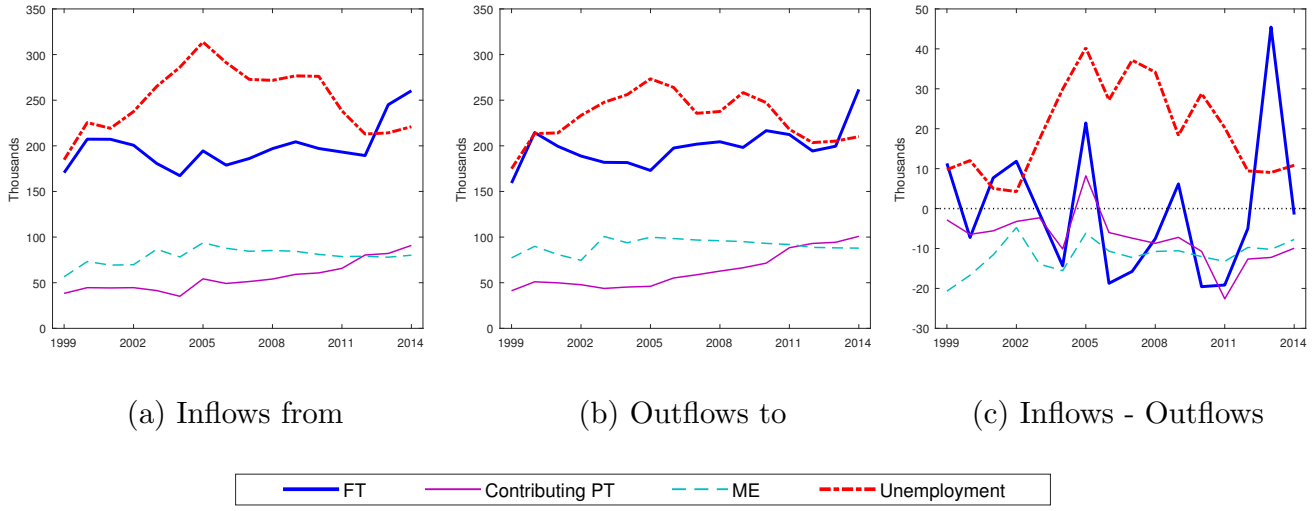
Figure 5c also shows that more unemployed workers took a mini-job than there were mini-jobbers becoming unemployed. Every month there were around 7,000 individuals leaving unemployment to take up a mini-job, while there were around 4,500 mini-jobbers becoming unemployed. The outflows from unemployment to exclusive marginal employment reflect that many individuals (on average 71.3% of the outflow from unemployment to marginal employment) remained unemployed but topped up their unemployment benefits with the earnings from a mini-job. At the same time, every month there were on average around 15,000 workers leaving a contributing part-time job to enter unemployment and on average around 13,000 individuals leaving unemployment to take a contributing part-time job. Pooling together marginal employment and contributing part-time employment, then implies that on average nearly the same amount of workers entered unemployment from the part-time employment sector as there were individuals leaving unemployment to take part-time jobs. Contrary to non-participation, this evidence shows that the effectiveness of part-time employment in *directly* reducing unemployment was negligible.

Figure 6 decomposes the net flows of unemployment by gender and education categories and shows that the above conclusions hold across these demographic groups. In particular, Figures 6a and 6b show that across gender the reason why unemployment exhibited a decreasing trend since the mid 2000s was because the net outflows into non-participation were larger than the net inflows from full-time employment. This decreasing trend, however, started in 2004 for male workers, while it started in 2006 for female workers. Also note that the net outflows into non-participation were typically larger among male workers than among female workers, in particular after the introduction of Hartz IV in 2004.

Figures 6c, 6d and 6e depict the net flows of unemployment by education. These figures show that for medium and high skilled workers unemployment decreases because of the larger net outflows into non-participation. In the case of low skilled workers, however, unemployment continued increasing after 2005 because the net inflows from contributing employment balanced in most years the net outflows into non-participation and marginal employment. Since the vast majority of prime-aged workers in our data have a vocational training (but no high school), the behaviour of low skilled workers does not affect much the aggregate dynamics depicted in Figure 5.

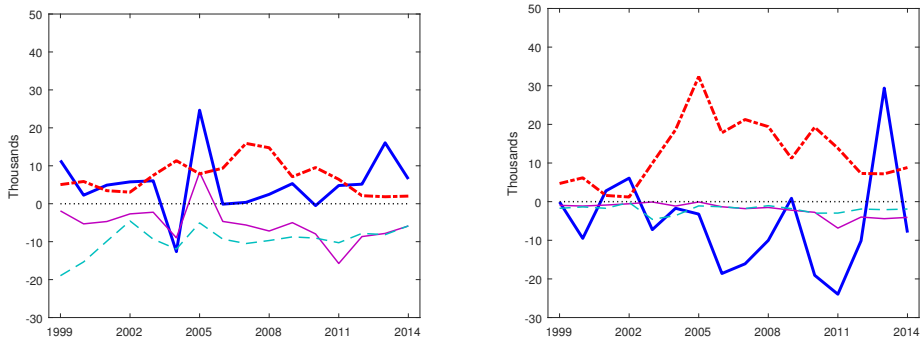
4.2 The ins and outs of non-participation

Given that unemployment decreased because individuals became non-participants, we now investigate whether non-participation acted as a transitional step towards employment. Figure 7 shows the evolution of the average monthly inflows to, outflows from and the net flows of non-participation. The left and centre panels show the large monthly gross flows be-

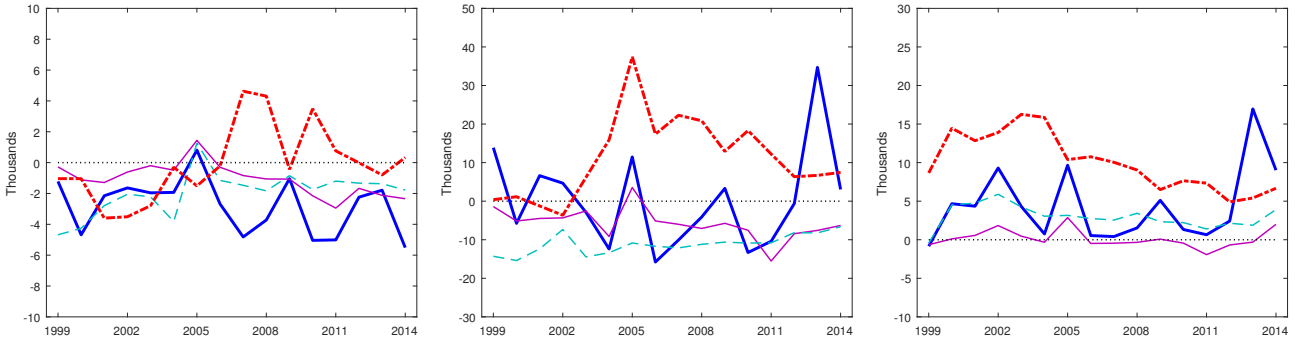


(a) Inflows from (b) Outflows to (c) Inflows - Outflows

Figure 7: Flows into and from non-participation



(a) Female (b) Male



(c) Low Skill (d) Medium skill (e) High skill

Figure 8: Net non-participation inflows by gender and skill groups

tween non-participation and unemployment documented in the last section, as well as large monthly gross flows between non-participation and full-time employment. The right panel of Figure 7, however, shows a second striking feature. The main reason why non-participation decreased among prime-aged workers throughout the 1999-2014 period is that more non-participants found part-time (contributing or marginal) jobs than part-time workers became non-participants. The net outflows into part-time employment averaged around 19,200 workers, nearly matching the net inflows from unemployment. The monthly net outflows into full-time employment, although very volatile, averaged around 500 workers.

Figure 7 shows that exclusive marginal employment was the main mechanism stopping non-participation from increasing following the net inflows from unemployment. In particular, the net outflows from non-participation into marginal employment averaged around 12,000 workers, while the net outflows into contributing part-time employment averaged around 7,200 workers during the 1999-2014 period.[17]

In contrast to the unemployment flows, gender and education groups played different roles in determining the net outflows from non-participation. Figure 8 decomposes the net flows of non-participation (as depicted in Figure 7c) by gender and educational categories. Figures 8a and 8b show that the net outflows from non-participation into part-time employment are largely comprised of female workers, while the net outflows from non-participation into full-time employment are largely comprised of male workers. As documented in Section 3.1, the labour market participation of prime-aged female (male) workers increased (decreased) during the 1999-2014 period. Figures 8a and 8b show that these patterns arise because female non-participants exhibit net outflows into part-time employment that are on average larger than their net inflows from unemployment. In contrast, male non-participants exhibit net outflows into full-time employment that are on average smaller than their net inflows from unemployment.

Figures 8c, 8d and 8e depict the net flows of non-participation by educational groups. Figure 8c implies an increase in labour market participation for low skilled workers. These workers mostly exhibited net outflows from non-participation into all other categories. Figure 8d implies that the participation of medium skilled workers stayed roughly constant throughout the period as the net inflows from unemployment and net outflows to employment pretty much cancelled out. In contrast, Figure 8e shows that the labour market participation of high skilled workers decreased throughout the period as these workers mostly exhibit net inflows from all other categories.

Overall these patterns present clear macroeconomic evidence that one of the main roles

[17]One could worry that part of the increase in the net outflows between non-participation and marginal employment around the introduction of Hartz II was the result of a large amount of existing informal employment being formalised and hence should not be counted as new economic activity. There seems to be a consensus in the literature that this informal activity was mainly done in private households and that Hartz II helped formalise some of this activity. We find that the share of mini-jobs in private households did experience a strong increase with the introduction of Hartz II, but still represented less than 1% of the overall stocks of those workers who relied on a mini-job as primary employment (see also Bundesagentur (2006)).

of part-time employment and in particular of mini-jobs was to help bring non-participants (or the long-term unemployed) back into work, fueling the rise of part-time employment in Germany and containing the net inflows from unemployment into non-participation. The key insight from Figure 7 is that non-participation acted as a siphon that moved unemployed individuals back into employment in the form of contributing part-time jobs and mini-jobs. The key insight from Figure 8 is that the siphoning effect of non-participation to part-time employment was experienced primarily by low and medium skilled, female workers. Moreover, flows changed dramatically after 2004-2005, which is a solid indication, if not a formal proof, that the Hartz IV reform is likely at the origin of the phenomenon.

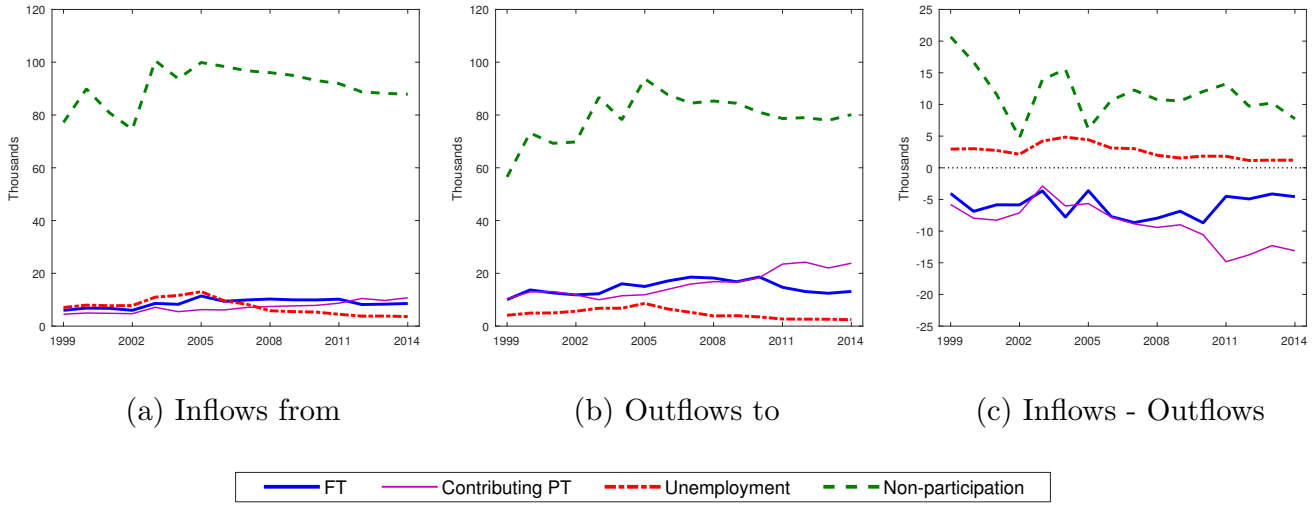
4.3 The ins and outs of exclusive marginal employment

Given the importance of marginal employment in bringing non-participants back to work, we now investigate whether mini-jobs acted as stepping stones towards contributing employment or represented dead-end jobs. For this purpose, Figure 9 shows the gross flows of exclusive marginal employment, as well as its net inflows (inflows minus outflows). It shows that the main source and destination of exclusive marginal employment is by far non-participation. Every month after 2000, on average about 90,000 individuals left non-participation to take a mini-job, and about 80,000 mini-jobbers returned to non-participation. These flows are maximum in 2005-2006. Further, non-participation was also the main source of the net inflows into exclusive marginal employment, around five times larger than the average net inflows from unemployment.

Figure 9c shows that all the net outflows from exclusive marginal employment went to contributing employment (full-time and part-time). We find that on average about 12,000 more workers with a mini-job left for a contributing contract every month than workers with a contributing contract entered the stock of exclusive mini-jobbers.[18] Second, the net outflows from marginal employment into contributing employment are of a similar order of magnitude as the net inflows from non-employment (non-participation and unemployment). This explains the lack of growth in the stocks of exclusive marginal employment documented in Figure 2. Lastly, after 2007, contributing part-time employment became the main destination of marginal employed workers. Although not shown here, we also find that around 40% of those mini-jobbers who found a contributing job retained their mini-job to benefit from the tax exemptions introduced by Hartz II. We will return to this point later in the paper when we discuss the role of mini-jobs as secondary employment.

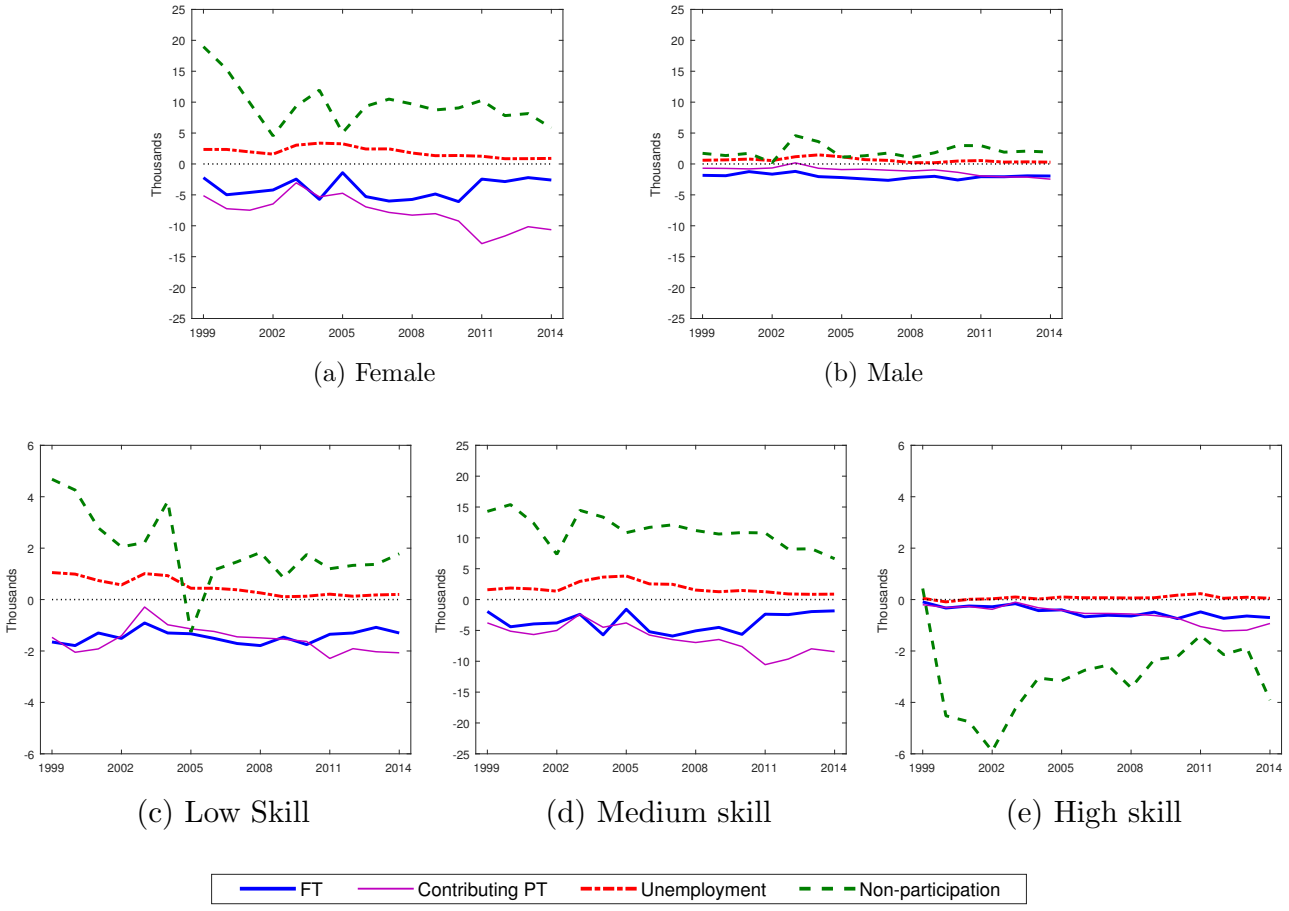
Figure 10a and b show that these net outflows are comprised largely by female workers, while the rest of the panels in this figure add that these workers have either no qualifications (low skilled) or just a vocational/high school qualification (medium skilled).

[18]Note that Hartz II changed the maximal earnings limit to qualify for a mini-job from 325 to 400 euros. This may have encouraged the conversion of contributing jobs into mini-jobs to take advantage of the tax break. However, if there is a one-off increase in the inflows from contributing employment in 2003, it is small.



(a) Inflows from (b) Outflows to (c) Inflows - Outflows

Figure 9: Flows into and from exclusive marginal employment



(a) Female (b) Male

(c) Low Skill (d) Medium skill (e) High skill

Figure 10: Net marginal-employment inflows by gender and skill groups

Overall, our evidence presents a picture in which the vast majority of exclusive mini-jobbers are females with relatively low level qualifications who churn between non participation and marginal employment. Yet, a significant fraction of exclusive mini-jobbers are able to find a contributing job, most likely part-time. This is, we believe, a clear evidence that mini-jobs acted as stepping stones to contributing employment.

4.4 The ins and outs of contributing part-time employment

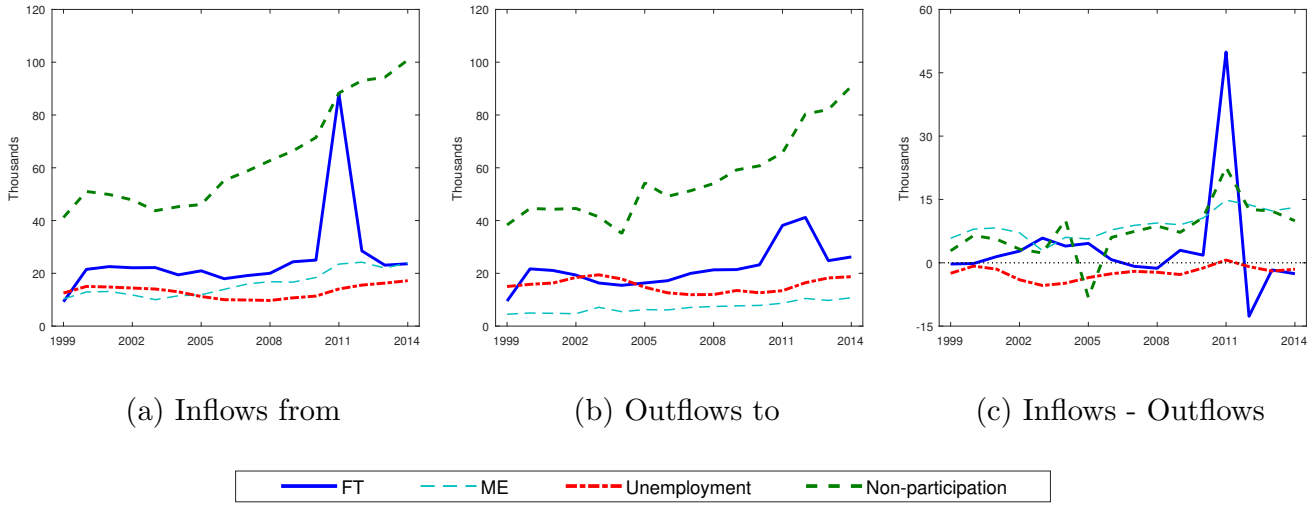
The evidence in Section 4.2 showed that the second most important destination of the net outflows from non-participation was to contributing part-time employment. Figure 11 shows the gross and net flows of this category. As in the case of marginal employment, here we also observe that the main inflows and outflows of contributing part-time employment are with non-participation. The difference is that the gross flows between non-participation and contributing part-time employment started increasing after 2005, while the gross flows between non-participation and exclusive marginal employment exhibited a decreasing trend after 2005. This has led the gross flows between non-participation and contributing part-time employment and the gross flows between non-participation and exclusive marginal employment to become of similar magnitudes after 2010. As in the case of the marginal employment flows, part-time flows are mostly comprised of medium skilled female workers.

The net inflows in Figure 11c show that the stock of contributing part-time employment increased over the period because of the strong net inflows from marginal employment and non-participation, and to a lesser extent from full-time employment. This evidence highlights another important feature in the German labour market dynamics: Mini-jobs were are important driving force behind the growth of contributing part-time employment.

4.5 The ins and outs of full-time employment

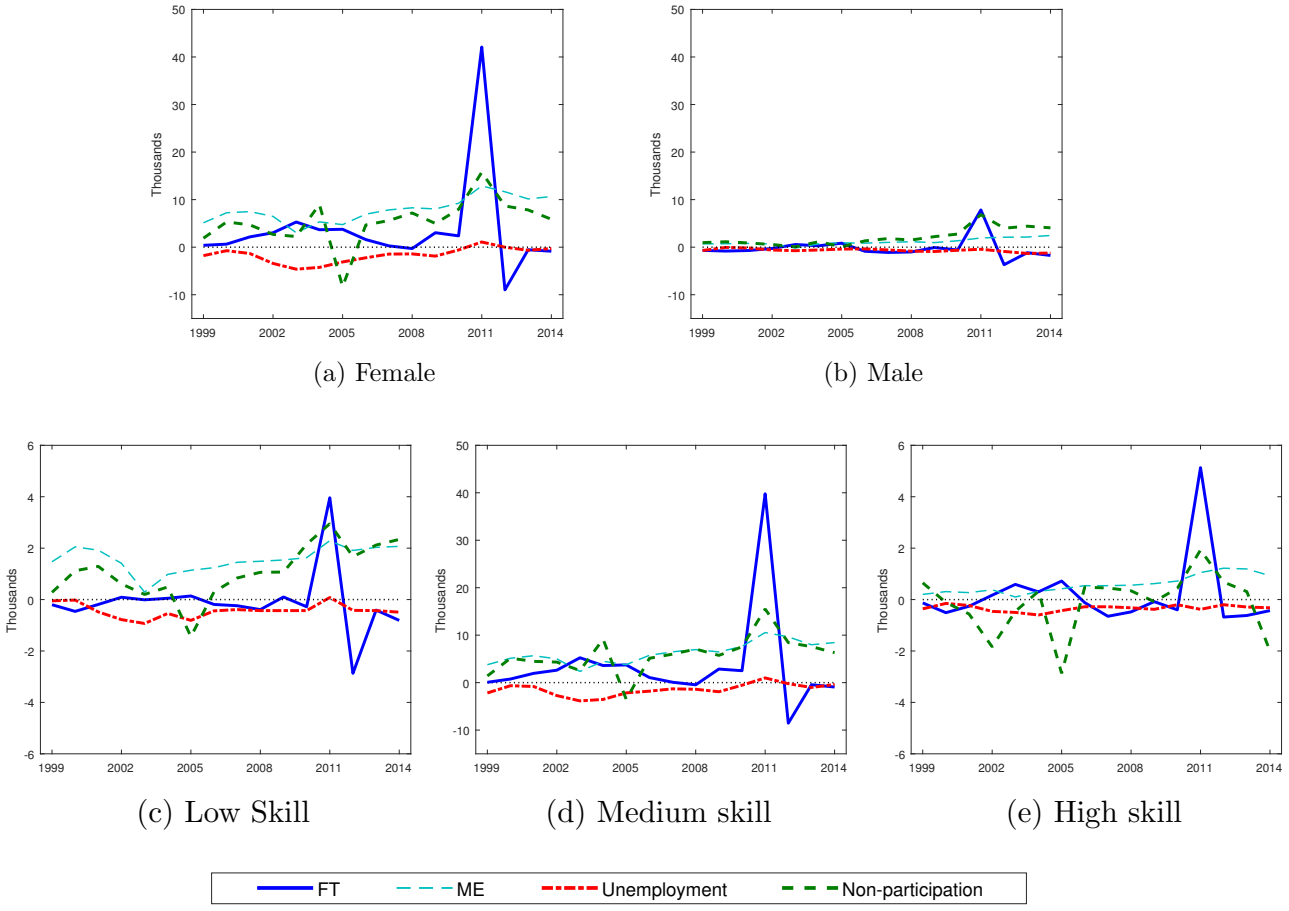
To complete the dynamic system described until now, Figure 13 depicts the average monthly gross and net flows of full-time employment. From these graphs it is clear that the main gross flows of full-time employment arise from non-participation and from unemployment. Consistent with the decrease in unemployment shown in previous sections, we observe that both the inflows and outflows between full-time employment and unemployment started to decrease during the implementation period of the Hartz reforms. By 2014 these gross flows decreased to about half of the size they had in 2003. In contrast, the inflows and outflows between full-time employment and non-participation remained overall constant around 200,000 workers, with a slight decrease up to 2004/2005 and a slow rebound after that.

The right panel of Figure 13 shows that to a large extent the gross flows between non-participation and full-time employment seem to cancel each other. This makes the net flows between full-time employment and non-participation fluctuate around the zero horizontal line. A similar picture emerges when considering the gross flows between contributing part-time employment and full-time employment. This evidence therefore shows that contributing



(a) Inflows from (b) Outflows to (c) Inflows - Outflows

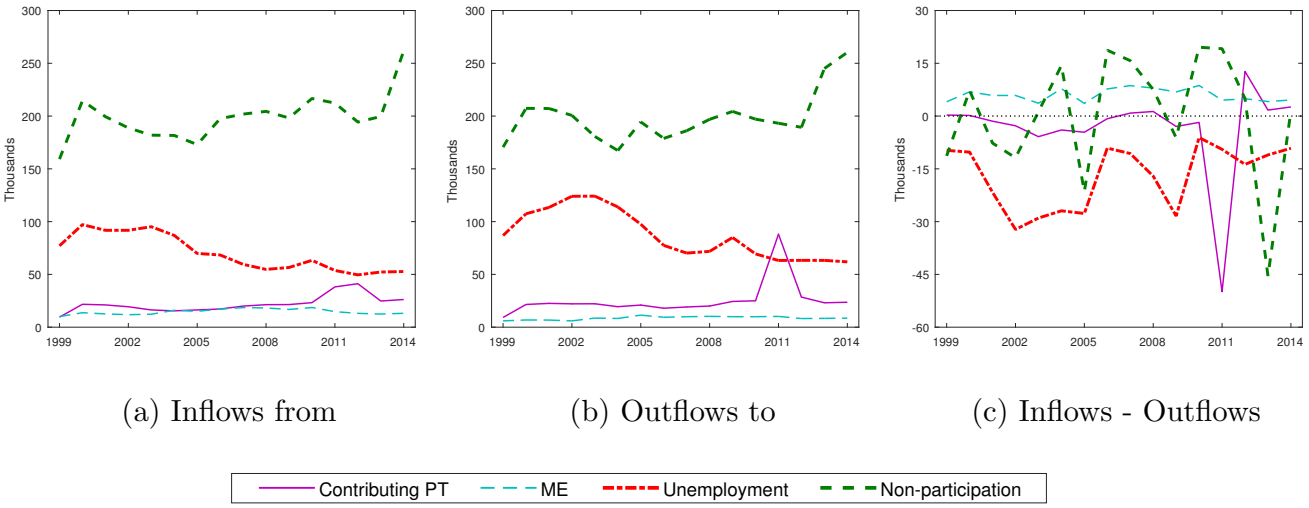
Figure 11: Flows into and from contributing part-time employment



(a) Female (b) Male

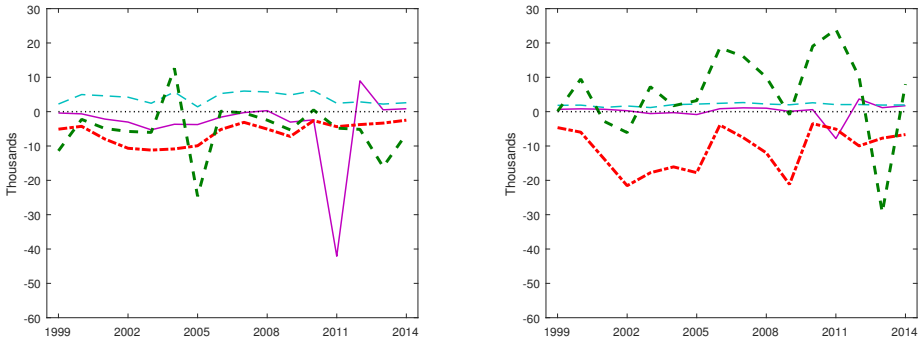
(c) Low Skill (d) Medium skill (e) High skill

Figure 12: Net part-time-employment inflows by gender and skill groups



(a) Inflows from (b) Outflows to (c) Inflows - Outflows

Figure 13: Flows into and from full-time employment



(a) Female (b) Male

(c) Low Skill (d) Medium skill (e) High skill

Figure 14: Net full-time-employment inflows by gender and skill groups

part-time employment does not act as a stepping stone into full-time employment. In contrast, we find that the stepping stone nature of marginal employment is also present in the net flows with full-time employment, where we observe positive net inflows throughout the period. Despite this, full-time employment decreased throughout the 1999-2014 period because the net outflows from full-time employment into unemployment are much larger than the net inflows from marginal employment.

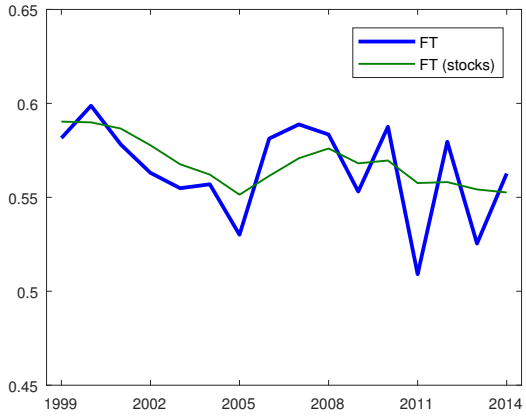
Decomposing the net flows by gender and skill groups shows that the gross and net flows of full-time employment primarily consist of male workers. The stock of full-time, male workers is fattened up by non-participants and thinned by unemployment. Those who flow from marginal jobs and flow out into unemployment tend to be female, low and medium skilled workers. In this case, the net outflow into unemployment dominates the net inflow from marginal employment, which leads to a reduction in full-time employment for these workers. In the case of high skilled workers the reduction in full-time employment arises because of the larger net outflows into non-participation.

4.6 How well do flows determine the evolution of the stocks?

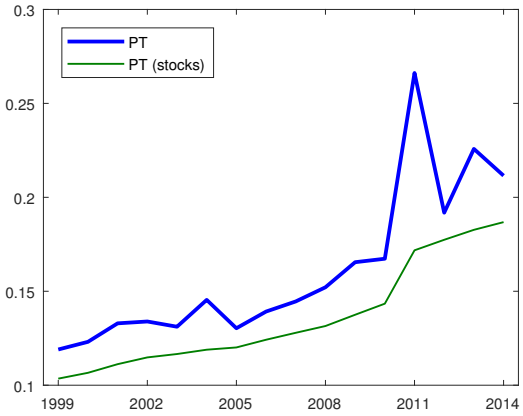
The above gross and net flows reveal that the German labour market can be characterized by a dynamic system which exhibits a clear pattern. In this system full-time employment decreases over time mainly because of net outflows into unemployment. At the same time, unemployment decreases after 2005 because of the net outflows into non-participation. Labour force participation increases because non-participation effectively siphoned (long-term) unemployed workers into part-time, low paying jobs. However, for a considerable number of workers marginal employment represents a steeping stone into contributing part-time and full-time employment.

We now investigate how well do the gross flows and associated net flows predict the observed stock of workers in each of the labour market states considered. In particular, are one-period ahead flows the main determinants of the stocks? Are we missing important channels requiring two lags? A prominent feature of the dynamics that we have just described is (i) that there are very large flows both into and from the different stocks, and (ii) that the net flows are generally an order of magnitude smaller. We now show that this implies that one can approximate the observed stocks quite well by the stationary distributions associated to transition probability matrices estimated from the flows.

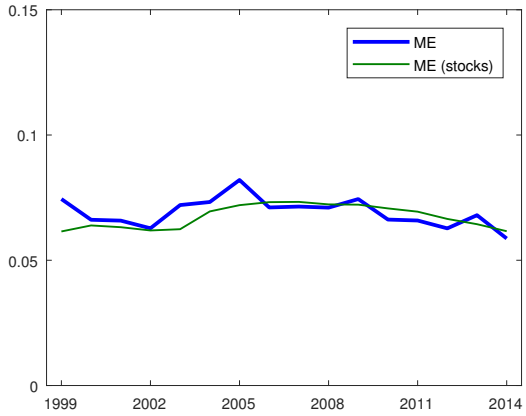
Figure 15 presents the evolution of the stationary distribution of workers across the states of the labour market. This distribution is constructed on the basis of the estimated sequence of monthly transition matrices across all the market states for every year. The procedure is as follows. For any two adjacent months within a given year we consider the change in the stocks sampled at the last date of each month. The change in the stock of individuals in any given state is defined as the sum of the inflows from all other states less the sum of the outflows to all other states within the corresponding month. Hence, each row of the monthly transition matrix is estimated as the number of outflows from a given source



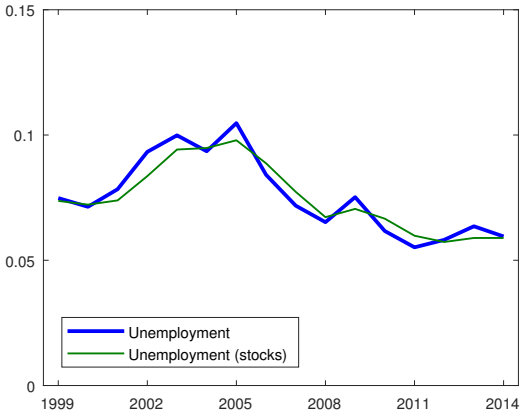
(a) Full-time employment



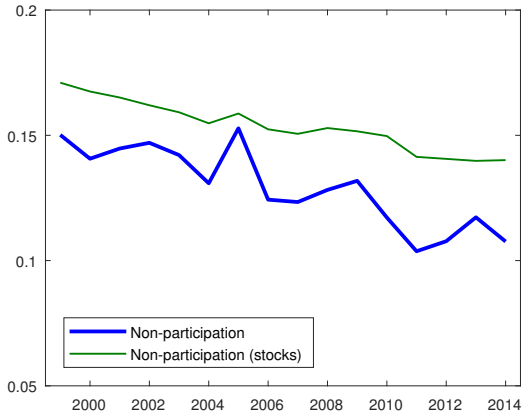
(b) Part-time employment



(c) Marginal employment



(d) Unemployment



(e) Non-participation

Notes: The thick, blue line is the stationary distribution that can be computed from flows. The thin, green line represents the stocks that were already depicted in Figure 2.

Figure 15: Stationary distribution of labour market states

state to any destination state (including staying in the current state). Summing over all months within a year and dividing by the total number of outflows from this source state over all months within a year gives us the non-parametric estimate of the transition matrix expressed in terms of monthly transition probabilities.[19] We then view this estimate as if it was characterizing the long-run transition probability matrix across all labour market states and calculate the corresponding stationary distribution of the labour market states. This stationary distribution is the normalized left eigenvector associated to the eigenvalue 1 of the estimated transition probability matrix.

The top left panel of Figure 15 shows the evolution of the proportions of workers in full-time employment both from actual stocks and predicted from flows. The top right panel refers to workers in contributing part-time employment. The middle left panel refers to workers who are exclusive mini-jobbers. The right middle panel refers to the unemployed and the bottom left panel refers to non-participants, respectively. The proportions based on flow data fluctuate slightly more (despite the yearly averaging of monthly rates) but yet follow very closely the observed stocks in all labour market states. A key implication from this exercises is that in Germany any policy that affects the monthly flows very soon shows up in the stocks. We believe this is remarkable given the common view that the German labour market is not as fluid as the Anglo-Saxon labour markets.

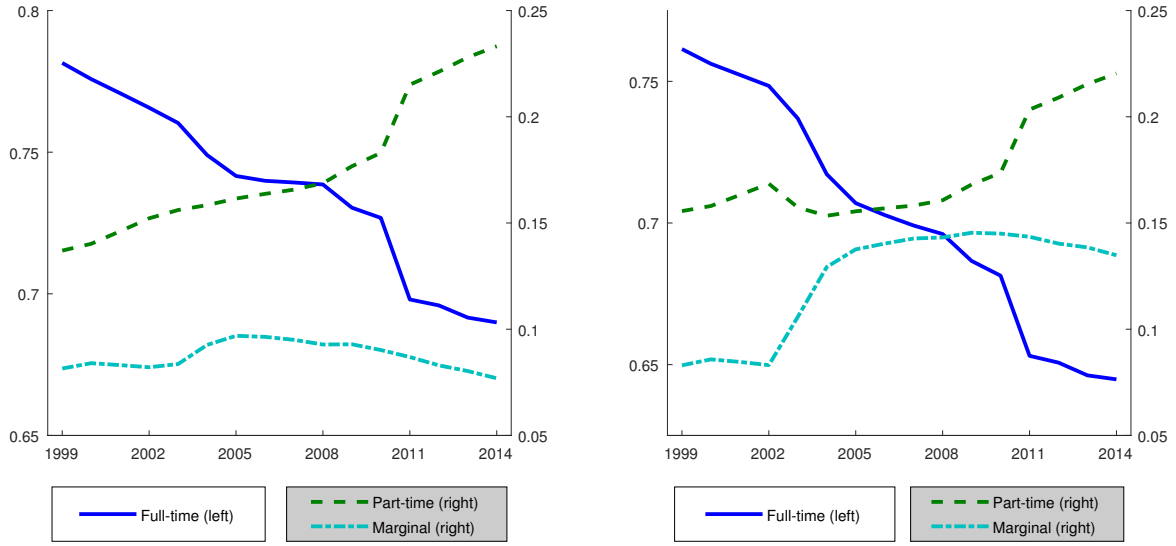
5 The expansion of moonlighting

The previous section has documented the rise of part-time employment both through contributing part-time and marginal employment and its importance in counter-balancing the rise of non-participation that the reduction of unemployment generated. This analysis focused on gross and net flows by classifying workers based on their primary jobs. However, the latter approach only presents a partial picture of why part-time employment increased in Germany. In this section we document that the rise in part-time employment from the perspective of the number of part-time *contracts*. Here we highlight the role of moonlighting (holding two jobs simultaneously) after 2003 as an important force behind the growth in part-time employment.

5.1 The rise in the stock of part-time contracts

Figure 16 shows the evolution of the shares of full-time, contributing part-time and marginal employment during the 1999-2014 period. The left panel is based on the annual stock of primary contracts as analysed in the previous section. The right panel is based on the annual

[19]The SIAB does not measure the stocks of non-participants, but at the same time allows us to determine the outflows from non-participation to any other state and inflows from any other state to non-participation quite precisely. Consequently, only the number of stayers in non-participation between any two adjacent months is missing. We estimate this number using OECD aggregate statistics on non-participation. Data Appendix gives detailed acount of how this is done.



(a) Primary contracts

(b) All contracts

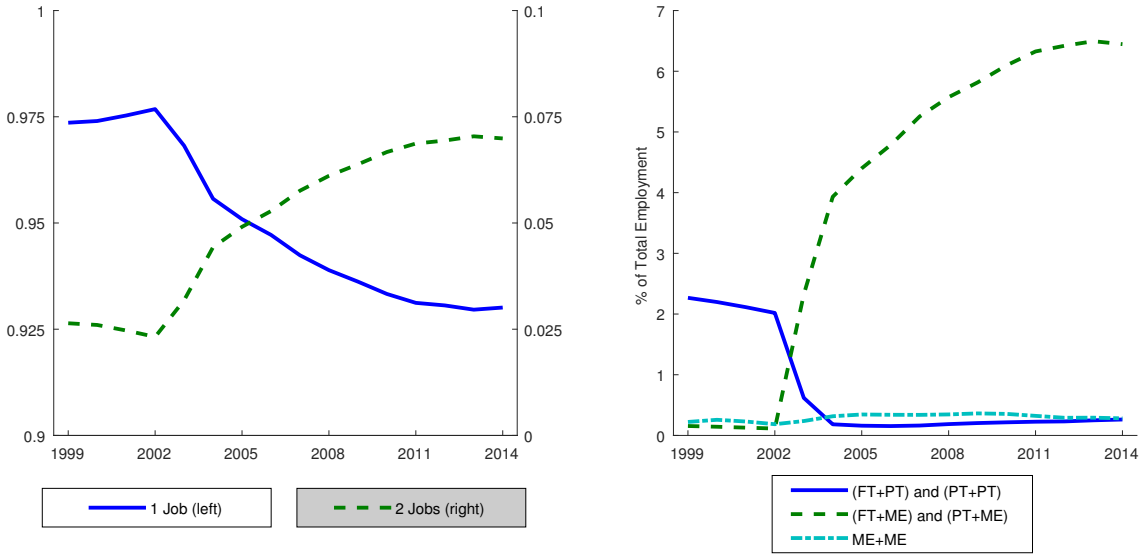
Figure 16: Composition of employment (% shares)

stock of all contracts, primary or secondary. Both panels measure the series as shares of the total labour force and the total number of jobs, respectively.

This figure shows that the share of all forms of part-time employment (contributing part-time and mini-jobs) among all contracts increased from 23.9% to 35.5% between 1999 and 2014. In turn, this increase brought down the share of full-time employment from 76.1% to 64.5% during the same period. A similar pattern arises in terms of the number of total contracts. The total stock of all forms of part-time contracts grew by 61.6%, from 5.6 million to 9 million jobs, between 1999 and 2014. In this context we observe that mini-jobs grew faster than any other type of jobs and have become a very common form of employment. Throughout the period the annual stock of mini-jobs averaged 3.09 million or 12.7% of the annual stock of all jobs. This stock grew by 76.1% between 1999 and 2014, about 22 percentage points more than the growth of contributing part-time contracts and 15 percentage points more than all forms of part-time contracts. Further, it accounted for 46.7% of the increase in the share of all forms of part-time contracts during the same period.

The strong increase in the overall stock of mini-jobs occurred after Hartz II, increasing from 1.98 million in 2002 to 3.14 million in 2004. The large differential increase in the stock of mini-jobs relative to the stock of workers with a mini-job as a primary employment also occurred after Hartz II. By 2014 there were about 3.54 million mini-job contracts in Germany, but only about 2 million workers had a mini-job as primary employment. This suggests that the expansion of the marginal employment sector (and part-time employment sector) was the result of a large increase in moonlighting, where workers used mini-jobs as secondary employment.[20]

[20]Other work has mentioned a rise in moonlighting with a mini-job after 2003, but does not consider this feature in their analysis. See, for example, Caliendo and Wrohlich (2010) and Freier and Steiner (2010),



(a) Share with one or two jobs

(b) Concurrent employment

Figure 17: Workers with one and two jobs

Indeed, Figure 17 shows that the stock of workers moonlighting sharply increased in 2003 and then followed a similar pattern as the stock of jobs in the marginal employment sector (see right panel of Figure 16). The left panel shows the proportion of workers with one and two jobs in the total employment stock. The proportion of workers moonlighting increased from 2.3% in 2002 to 7.2% in 2014, or from 538,000 workers in 2002 to 1.7 million workers in 2014. The right panel decomposes the stock of workers moonlighting by the type of primary and secondary job. One observes that before 2003 workers were moonlighting only using contributing part-time jobs as secondary employment. After the introduction of Hartz II this practice stopped. Instead there was a strong increase in the stock of workers combining a full-time or a part-time job with a mini-job. In 2002 there were 26,400 workers moonlighting with a mini-job (and 468,600 with a part-time job), while in 2004 there were 911,000 workers in this category (resp. 41,800). By 2014, 1.57 million workers were moonlighting with a mini-job.

The large size of the SIAB data allows us to investigate whether the strong increase in the number of workers moonlighting with a mini-job is possibly a result of composition effects due to particular types of workers and firms. We find that it is not. Although not shown here, we observe that the same patterns presented in Figure 17 hold when we restrict attention to (i) firms with less/more than 10 employees; (ii) firms with median gross daily wage below/above the 25^{th} percentile of the distribution of the median gross daily wage; (iii) firms in the service/manufacturing sector; and (iv) firms with workforce comprising only qualified/unqualified workers.[21]

among others. In this paper we show that this form moonlighting is very important to understand the role of marginal employment in shaping the German labour market.

[21]Further, a very similar picture also emerges when estimating a multinomial logistic regression of the employment state on three treatment dummies: Hartz I & II (= 0 before 2003, 1 thereafter), Hartz III (=

Table 1: Demographic characteristics by employment status: Workers

Workers	Women	Skills			Foreign	Age	Poor HH**
		low	medium	high			
	(%)	(%)	(%)	(%)	(%)	(years)	(%)
(1) Full-time employment	33.9	8.0	75.9	16.1	7.0	40.0	4.1
(2) Part-time employment	87.5	9.7	77.0	13.3	6.4	41.7	8.1
(3) Exclusive marginal employment	83.5	22.5	72.2	5.3	10.6	39.9	12.0
(4) Full-time and marginal jobs	39.7	10.6	81.2	8.2	12.1	39.7	4.7
(5) Part-time and marginal jobs	89.1	12.9	78.5	8.6	11.7	42.0	7.1
(6) Two marginal jobs	88.4	24.1	72.1	3.8	11.1	40.3	16.0
(7) Unemployment	44.1	23.4	70.2	6.5	15.2	39.7	37.1
(8) Nonparticipation*	78.6	20.2	66.5	13.4	16.6	38.6	20.2

Source: SIAB, 1999-2014. *Statistics obtained using the GSOEP, 1999-2014. **Statistics obtained using the GSOEP, 2003-2014; poor HH is the HH in the bottom 10% of the distribution of the post-government real per capita household income.

Table 2: Demographic characteristics by employment status: Spouses

Worker	Spouse						
	FT	PT	(FT or PT)+ME	ME or 2ME	U	N	mean wage
	(%)	(%)	(%)	(%)	(%)	(%)	(€/hour, gross)
(1) Full-time employment	42.0	20.1	3.8	9.1	4.8	20.2	14.7
(2) Part-time employment	85.0	2.9	4.1	0.7	4.0	3.3	19.0
(3) Exclusive marginal employment	88.1	1.7	4.7	0.7	3.1	1.6	19.0
(4) Full-time and marginal jobs	39.2	15.5	8.8	10.9	3.5	22.1	15.5
(5) Part-time and marginal jobs	77.3	5.3	9.7	0.3	3.4	4.1	19.2
(6) Two marginal jobs	80.4	1.7	7.9	1.3	4.6	4.0	19.1
(7) Unemployment	43.3	8.4	2.4	3.3	28.6	14.0	13.6
(8) Nonparticipation	78.5	3.0	4.5	0.9	6.1	7.0	19.3

Source: GSOEP, 2003-2014; all workers are HH heads and partners only; 83.2% of these are married.

Table 3: Demographic characteristics by employment status: Employers

	Primary employer				Secondary employer			
	Establish. size		Mean FT-wage	Manufac-	Establish. size		Mean FT-wage	Manufac-
	median	mean	(€/day, gross)	turing (%)	median	mean	(€/day, gross)	turing (%)
(1) Full-time employment	26	86.4	89.1	33.8	-	-	-	-
(2) Part-time employment	37	157.1	95.7	13.9	-	-	-	-
(3) Exclusive marginal employment	13	73.7	73.1	17.2	-	-	-	-
(4) Full-time and marginal jobs	53	277.3	91.0	34.3	13	74.1	71.0	18.1
(5) Part-time and marginal jobs	57	334.5	94.0	12.2	12	101.3	73.3	14.5
(6) Two marginal jobs	16	209.5	75.3	14.9	12	181.0	73.2	14.0

Source: SIAB, 1999-2014.

5.2 Worker and firm characteristics by type of contract

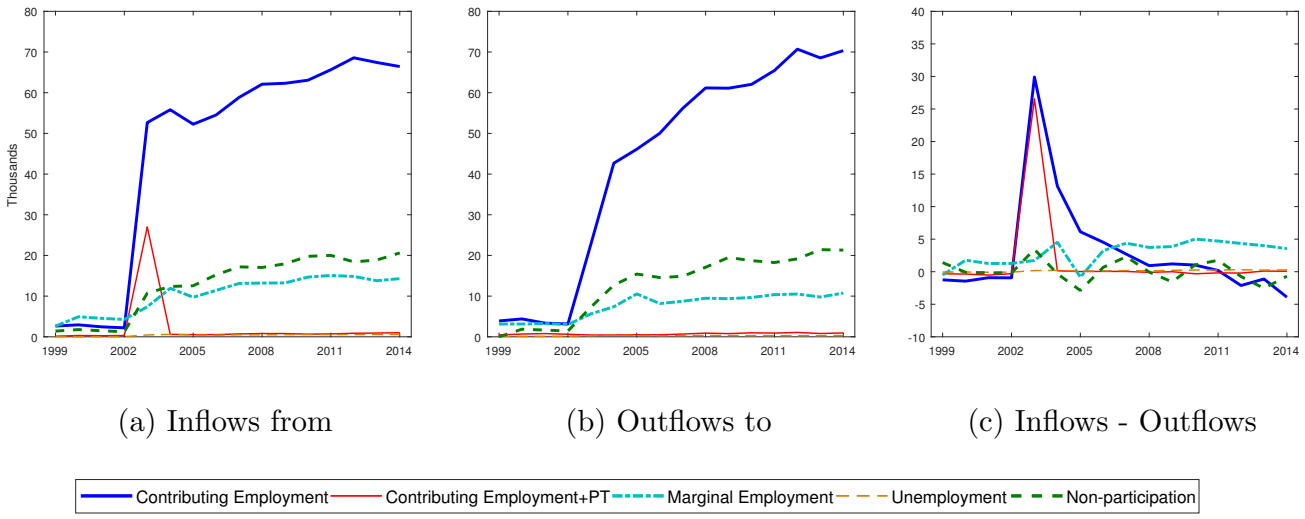
We now provide a brief comparison between exclusive part-time workers and moonlighters in terms of several demographic and job characteristics. The main insight here is that the rise in the number of part-time contracts has been experienced by most demographic groups. Different demographic groups, however, are associated with different types of contracts.

In Section 4 we documented that individuals who only hold one part-time job (either a contributing part-time or marginal job) are much more likely to be females than those workers in exclusive full-time employment. Table 1 further suggests a degree of sorting among part-time female workers in terms of skill levels and household income. A higher proportion of females in the medium skill group and in more wealthy households are more likely to take up exclusive contributing part-time work, while a higher proportion of females in the low skill group and in less wealthy households are more likely to become exclusive mini-jobbers. Although exclusive part-time workers tend to work in the service sector, Table 3 shows that exclusive mini-jobbers tend to work in establishments that are smaller and pay lower gross average daily wages to their full-time employees that the establishments in which exclusive contributing part-time individuals are employed. Although not shown here, we also find that exclusive mini-jobbers face job durations that are on average one year long, which is about half the average duration faced by exclusive contributing part-time workers. We also investigated the characteristics of workers' spouses (Table 2) and could not find any marked difference in spouse's characteristics (participation, employment, wage) between workers with an exclusive, contributing full-time or part-time job, and moonlighters.

In contrast, Table 1 shows that workers who moonlight with a mini-job show demographic characteristics that are much closer to those exhibited by the population in the corresponding contributing job category. Given the large share of moonlighters who hold a full-time job as primary employment, the population of moonlighters tends to be dominated by male and better educated workers than the population of mini-jobbers. Nevertheless, moonlighters are not a random sample of the exclusive full-time or part-time population. Workers moonlighting with a mini-job are less likely to have a university degree and more likely to be female, relative to exclusive full-time or part-time workers.

In terms of establishment characteristics, Table 3 shows that full-time and part-time moonlighters held their primary jobs in establishments which exhibit very similar characteristics as those establishments employing exclusive full-time or part-time workers. Table 3, however, shows that moonlighters held their mini-jobs in establishments that are about 5 times smaller (in terms of the median) than the ones in which they held their primary job. These establishments were also more likely to be in the service sector and pay lower gross average daily wages to their full-time employees than the establishments in which moon-

0 before 2004, 1 thereafter), Hartz IV (= 0 before 2005, 1 thereafter). The coefficients associated with the Hartz I & II dummies come out large strongly significant, even after controlling for worker's gender, age, age squared, education, nationality, level of complexity of the task performed at the previous job; establishment size, average gross daily wage of full-time employees, industry, federal state where establishment is located and time dummies.



(a) Inflows from (b) Outflows to (c) Inflows - Outflows

Figure 18: Flows into and from moonlighting with a mini-job

lighters held their primary job. Although not shown here, we find that the establishments were moonlighters held their mini-job had a much higher proportion of mini-jobbers in their workforce than the establishments in which moonlighters held their primary job. Also the average job duration of a mini-job as secondary employment is very similar to the average job duration of exclusive mini-jobbers.

This evidence then suggests that workers' demographic characteristics do not seem to play a role in determining the type of mini-jobs in which workers moonlight.

5.3 The ins and outs of moonlighting with a mini-job

We now turn to investigate whether the sharp increase in moonlighting documented in Figure 17 occurred because workers who were using a mini-job as primary employment found a contributing job (full-time or part-time), but did not give up their mini-job; or because workers already employed in a contributing job found a mini-job in addition. This distinction is important as it allows us to shed further light on the extent to which mini-jobs have helped create stepping stones to contributing employment (if the former is true) or whether there were additional forces that made it worthwhile for already full-time/part-time workers to take on extra hours in the form of a mini-job.

Figure 18 shows the evolution of the monthly number of workers who flow into (left panel) and flow from (central panel) moonlighting with a mini-job, i.e. with a contributing primary employment (CE, full- and part-time) and a mini-job as secondary employment (ME). The right panel displays the evolution of net flows. The net flows show that, between 2003 and 2006, the main driver of the growth in the stock of workers who were moonlighting using a mini-job was the large increase in the number of workers who took up a mini-job in addition to their existing contributing job. However, since the 2003 peak, the net inflow of these workers kept regressing. In 2012-2014 it even became negative: more workers abandoned

their secondary mini-job than there were contributing workers taking one. By comparison, from 2004 onward there were persistently more exclusive mini-jobbers finding a contributing job than losing one. The main implication of this evidence is that the initial rise in moonlighting occurred because workers already employed in a contributing job took extra hours in the form of a mini-job. However, after this initial period moonlighting continued increasing because mini-jobs acted as a stepping stone into contributing employment: exclusive mini-jobbers found a contributing employment in addition to their mini-jobs.

The flows between non-participation and exclusive marginal employment do not seem to correlate very much with the Hartz reforms. In contrast, moonlighting with a mini-job massively starts after 2003, consistently with the tax incentives introduced by Hartz II. These tax incentives exempted workers from paying income tax and social security contributions on mini-jobs as secondary employment. Figure 18 suggests a large response to these tax incentives, in the form of extra hours worked. On the one hand, we observe that in 2002 the monthly number of contributing employees taking up a mini-job as secondary employment was about 2,000, by 2003 this monthly inflow had increased to almost 53,000. Since these workers held only one contributing job before 2003, it is very likely that the net inflow from contributing employment represented new economic activity.[22]

We also observe, however, that in 2003 there was a large one-off increase in the net inflow of workers who were already moonlighting by combining a contributing job with another (contributing) part-time job (CE+PT). This increase occurred because almost all of the stock of workers who were already moonlighting with a part-time job in 2002 (see Figure 17b), converted their part-time contract into a mini-job contract in 2003 without changing employer. This generated an average monthly inflow of almost 30,000 workers during 2003. Netting out outflows, this implies that in 2003 the number of workers who switched their contributing part-time contract for a mini-job accounted for 55.8% of the stock of workers who combined a full-time job with a mini-job and to 56.2% of the stock of workers who combined their contributing part-time job with a mini-job. That is, over a half of the stock of workers moonlighting with a mini-job during 2003 is explained by re-labeling the old economic activity. Therefore one should be cautious when analysing the impact of the tax incentives introducing by Hartz II on moonlighting as this impact could be overestimated due to contract re-labeling. In Section 6 we investigate further the wage incentives behind the rise in moonlighting.

Summing up, five years after Hartz II a steady-state system of worker flows has taken place. Each and every month, about 65,000 workers with a contributing full- or part-time pri-

[22]Although contributing employees cannot be registered as self-employed, it could be that some of these workers were already performing their mini-job activity in the informal or black market and formalising it after Hartz II was in place to benefit from the tax break. This is very difficult to verify given the lack of data that records black market transactions. However, it seems that most of the black market transactions involve household services (i.e. private house cleaners, gardeners, etc.), which would be performed by low skilled individuals. Above we showed that those who took up a mini-job in addition to their contributing employment were workers who have achieved medium to high levels of education, suggesting that formalisation of black market activities might not have been an important driver that led to combining a contributing job with a mini-job.

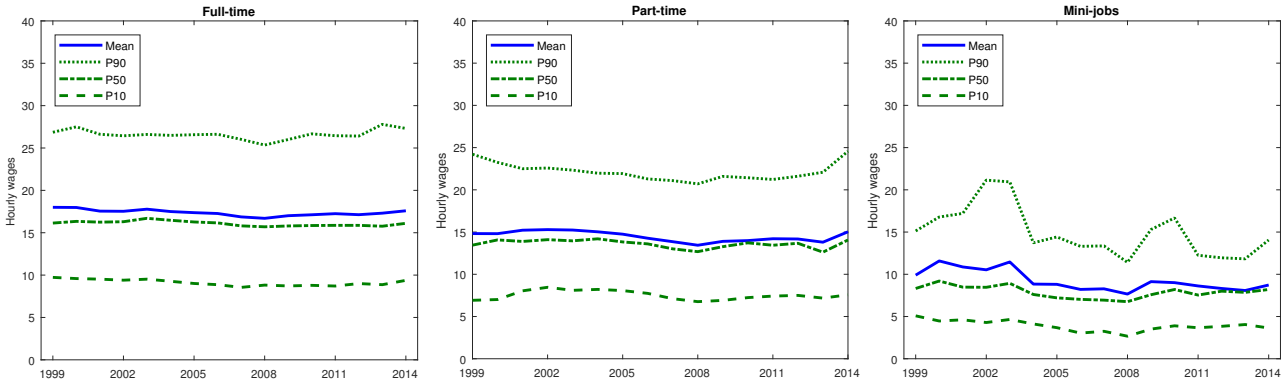


Figure 19: Distribution of gross real hourly wages (Source: GSOEP)

mary contract took a mini-job as a secondary job, and about the same number of these workers stopped moonlighting. At the same time, about 90,000 individuals left non-participation to take a mini-job and around 80,000 mini-jobbers returned to non-participation. Hence around 300,000 workers took or left a mini-job every month, implying that the marginal employment sector exhibited a yearly churning of over 14% of the prime-aged labour force.

6 Earnings inequality and welfare

We now turn to investigate the impact on wages and earnings inequality of the rise in part-time employment. Dustmann et al. (2009), Schmid and Stein (2013), Card et al. (2013), among others, already documented the rise of earnings inequality in the left tail of the distribution that occurred after 1990, highlighting the role of the liberalization of the labour market, the development of part-time employment and changes in the unionization rates. Hence we briefly document how part-time workers and mini-jobbers contributed to the drastic increases in inequality of hourly wages, earnings and household income during the 2000s. It is yet useful to include this part in our study as previous studies either abstract from marginal employment, or focus on full-time work, or neglect secondary employment.

6.1 Hourly wages

Figure 19 depicts the distribution of gross real hourly wages (in 2010 prices) using the GSOEP. Gross real hourly wages are computed as gross real wages earned last month divided by monthly equivalent of weekly hours worked. These distributions show a clear stochastic dominance pattern: the distribution of real hourly wages for full-time workers first order stochastically dominates that of contributing part-time workers and the latter dominates that of exclusive mini-jobbers.

Also these hourly wage distributions show an average fall in wages after 2003/2005 across all types of contracts. Exclusive mini-jobbers, for example, experienced a large fall in their hourly wages after 2003. This fall did not only occur at the mean but across the entire distribution and was most noticeable above the median. As a consequence wage inequality

among mini-jobbers increased, with the P90/P10 increasing from 2.98 in 1999 to 4.38 in 2014. For part-time and full-time workers, however, wages below the median were noticeably lower after 2003/2005. This has also increased wage inequality within these groups of workers, where the P90/P10 ratio increased from 2.68 to 3.25 for part-time workers from 2.79 to 2.91 for full-time workers between 2004 and 2014.

Note that there is a significant overlap among the hourly wage distributions in contributing part-time and marginal employment, suggesting that exclusive mini-jobbers do not seem to be earning very differently from contributing part-time workers. This overlap, however, is much smaller when comparing exclusive mini-jobbers and full-time workers. To explore this further, Table 4 evaluates whether, after controlling for observable characteristics, the hourly wages of full-time and contributing part-time workers are statistically different from that of mini-jobbers. For this purpose we estimate quantile regressions of log-hourly wages on full-time and contributing part-time employment dummies together with further controls. The dependent variable used is the log of the gross real wages earned last month divided by monthly equivalent of weekly hours worked. Our results show that the overlap in the hourly wage distributions is still present after controlling for observable characteristics, but at each quantile (and at the mean) the difference between the hourly wages of a full-time or a contributing part-time worker relative to a mini-jobber is positive and statistically significant.

Table 4 also shows that the differences between the gross hourly wages of a full-time and a contributing part-time workers relative to mini-jobbers are increasing over time. These dynamics are consistent with the large degree of wage moderation experienced in Germany during the period of study. Moreover, wage moderation is particularly apparent in the lower part of the wage distributions, and particularly for mini-jobs. The first decile of mini-jobber's wages was around 4.5 euros before 2003. It went down to below 3.5 euros in 2006-2008, and returned to close to 4 euros after 2009. Table 4 shows that the increase in the differences between the gross hourly wages of contributing employees and mini-jobbers is more pronounced in the lower part of the wage distribution.

Taken together our results show that after 2004 contributing part-time labour contracts specify more hours per week without lifting hourly wages, while mini-job contracts maintained the number of hours relatively constant but specified lower hourly wages (see Figure 4 for the dynamics of hours worked). This suggests that marginal employment impacted earnings inequality, particularly at the bottom of the distribution. To explore this feature we now turn to analyse the relationship between the dynamics of marginal employment and of earnings inequality.

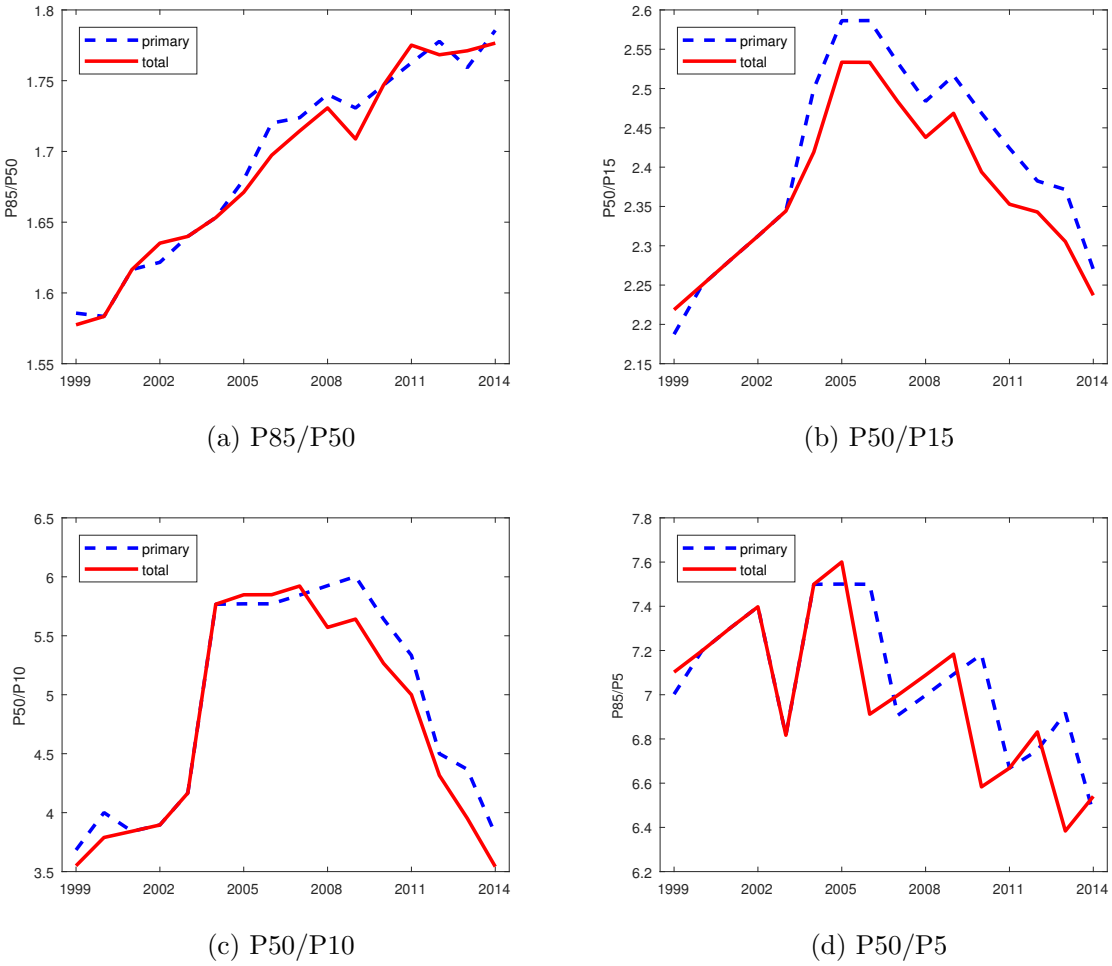
6.2 Average daily earnings

Figure 20 presents four ratios that measure inequality at different points of the earnings distribution using the SIAB, considering only primary earnings or total earnings (primary

Table 4: Wage regressions

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mean																
FT	0.444***	0.419***	0.393***	0.404***	0.388***	0.498***	0.543***	0.584***	0.558***	0.563***	0.491***	0.506***	0.605***	0.454***	0.524***	0.466***
	(0.048)	(0.067)	(0.033)	(0.034)	(0.034)	(0.042)	(0.052)	(0.040)	(0.045)	(0.043)	(0.070)	(0.056)	(0.061)	(0.047)	(0.074)	(0.091)
PT	0.317***	0.310***	0.339***	0.367***	0.301***	0.433***	0.457***	0.472***	0.408***	0.434***	0.392***	0.407***	0.491***	0.370***	0.395***	0.361***
	(0.051)	(0.069)	(0.032)	(0.033)	(0.033)	(0.037)	(0.039)	(0.040)	(0.044)	(0.043)	(0.064)	(0.058)	(0.060)	(0.047)	(0.073)	(0.086)
10th percentile																
FT	0.491***	0.686***	0.587***	0.635***	0.580***	0.621***	0.704***	0.710***	0.766***	0.756***	0.730***	0.503***	0.889***	0.609***	0.868***	0.537***
	(0.032)	(0.027)	(0.031)	(0.031)	(0.023)	(0.039)	(0.028)	(0.029)	(0.040)	(0.012)	(0.058)	(0.031)	(0.014)	(0.014)	(0.078)	(0.021)
PT	0.305***	0.456***	0.492***	0.561***	0.470***	0.521***	0.604***	0.588***	0.622***	0.656***	0.617***	0.392***	0.764***	0.477***	0.704***	0.365***
	(0.036)	(0.028)	(0.031)	(0.031)	(0.023)	(0.037)	(0.029)	(0.029)	(0.036)	(0.012)	(0.056)	(0.032)	(0.014)	(0.013)	(0.079)	(0.021)
25th percentile																
FT	0.484***	0.473***	0.491***	0.487***	0.462***	0.559***	0.489***	0.613***	0.591***	0.624***	0.545***	0.539***	0.605***	0.395***	0.611***	0.559***
	(0.038)	(0.030)	(0.021)	(0.020)	(0.026)	(0.025)	(0.026)	(0.021)	(0.031)	(0.017)	(0.026)	(0.005)	(0.022)	(0.022)	(0.025)	(0.020)
PT	0.354***	0.338***	0.417***	0.445***	0.398***	0.501***	0.441***	0.535***	0.455***	0.492***	0.451***	0.450***	0.492***	0.338***	0.443***	0.440***
	(0.041)	(0.031)	(0.022)	(0.020)	(0.026)	(0.025)	(0.027)	(0.021)	(0.032)	(0.018)	(0.025)	(0.005)	(0.023)	(0.023)	(0.025)	(0.021)
50th percentile																
FT	0.407***	0.428***	0.448***	0.430***	0.427***	0.500***	0.494***	0.570***	0.524***	0.547***	0.417***	0.410***	0.482***	0.438***	0.452***	0.374***
	(0.030)	(0.022)	(0.018)	(0.018)	(0.018)	(0.021)	(0.026)	(0.019)	(0.016)	(0.006)	(0.019)	(0.021)	(0.016)	(0.020)	(0.002)	(0.018)
PT	0.315***	0.399***	0.406***	0.376***	0.336***	0.425***	0.421***	0.479***	0.424***	0.415***	0.351***	0.339***	0.406***	0.390***	0.352***	0.276***
	(0.031)	(0.023)	(0.018)	(0.018)	(0.018)	(0.022)	(0.027)	(0.020)	(0.017)	(0.006)	(0.019)	(0.021)	(0.016)	(0.021)	(0.002)	(0.018)
75th percentile																
FT	0.334***	0.373***	0.371***	0.365***	0.282***	0.429***	0.440***	0.481***	0.441***	0.476***	0.368***	0.433***	0.549***	0.512***	0.317**	0.263**
	(0.029)	(0.022)	(0.020)	(0.023)	(0.021)	(0.015)	(0.019)	(0.019)	(0.017)	(0.024)	(0.022)	(0.017)	(0.011)	(0.029)	(0.013)	(0.028)
PT	0.270***	0.344***	0.327***	0.334***	0.204***	0.376***	0.372***	0.388***	0.336***	0.394***	0.283**	0.328***	0.453***	0.451**	0.233***	0.220***
	(0.029)	(0.022)	(0.021)	(0.023)	(0.022)	(0.016)	(0.022)	(0.020)	(0.017)	(0.025)	(0.023)	(0.017)	(0.011)	(0.030)	(0.014)	(0.029)
90th percentile																
FT	0.370***	0.207***	0.145***	0.160***	0.170***	0.312***	0.382***	0.497***	0.375***	0.364**	0.202**	0.399**	0.578***	0.504***	0.324***	0.250***
	(0.055)	(0.042)	(0.034)	(0.034)	(0.030)	(0.036)	(0.033)	(0.027)	(0.026)	(0.024)	(0.031)	(0.029)	(0.032)	(0.024)	(0.013)	(0.026)
PT	0.329***	0.172***	0.117***	0.150***	0.137***	0.279***	0.289***	0.370***	0.269***	0.260***	0.095***	0.316***	0.492***	0.432***	0.268***	0.213***
	(0.057)	(0.042)	(0.034)	(0.033)	(0.028)	(0.036)	(0.032)	(0.027)	(0.025)	(0.025)	(0.028)	(0.031)	(0.030)	(0.025)	(0.013)	(0.027)
Sample size	4,838	5,104	7,478	7,087	6,421	6,487	5,915	5,440	5,666	5,203	4,980	4,270	4,185	3,494	3,246	2,888

Notes: Source: GSOEP, 25-54 years old. Standard errors in parenthesis. *** significant at a 1% level. Standard errors for mean regression are robust to heteroskedasticity of an unknown form. Controls: gender, age, age squared, number of years of education, family status, number of children in household, household size, nationality, type of employer, whether the employment contract is permanent, whether the current profession corresponds to an acquired profession, employer size, industry (1st digit) and federal state.



(a) P85/P50

(b) P50/P15

(c) P50/P10

(d) P50/P5

Figure 20: Daily earnings inequality, primary and total, all workers (Source: SIAB)

and secondary).[23] As a measure of earnings, the SIAB reports the average gross daily wage of a worker. This is constructed by dividing total gross earnings by the number of days employed in that job.[24]

The top half of the earnings distribution has steadily become more unequal over time as evidenced by the P85/P50 ratio.[25] This increase arises because the 85th percentile of the earnings distribution has been increasing, while the median has been decreasing. The upward trend in the 85th percentile can be observed since 1999 and this has very little to do with the rise of marginal employment. However, the downward trend in the median did start in 2003. Note that there is no difference between primary and total earnings.

Then we consider the dynamics of earnings inequality at the bottom half of the distribution. Figure 20 also shows the P50/P15, P50/P10 and P50/P5 ratios. They all increase in the first half of the 2000-10 decade, and particularly between 2003 and 2005. This is very

[23]The GSOEP also reveals a similar pattern as the one depicted in Figure 20 when considering the individual's gross and net monthly earnings.

[24]If a worker did not leave the employer during a given year, the average gross daily wage in a job is computed annually. If the worker changed employers during the year, the gross average daily wage is computed for each employer using the time spend with the employer during that year.

[25]We use the 85th percentile instead of the 90th percentile as in the SIAB wages are top-coded.

much the same dynamics that the number of exclusive mini-jobbers experienced throughout the period as data behind Figures 16 suggest. These dynamics are driven to a large extent by the behaviour of the lowest percentiles of the earnings distribution, which experienced a significant drop between 2002 and 2004 and then a slow decrease until 2008. It is for the 10th percentile that one can observe the largest impact of mini-jobs on the earnings distribution. All this suggests that the dynamics of exclusive marginal employment had a strong positive correlation with the dynamics of inequality at the bottom of the earnings distribution.

Lastly, there is an interesting difference between primary or total earnings in the P50/P* series. Moonlighting clearly goes against the rise of earnings inequality in the lower part of the distribution, as the corresponding inequality ratios for total earnings are below those for primary earnings after 2003.

6.3 Household income

Many exclusive mini-jobbers are low skilled married women who live in households where the spouse or partner is employed in a full-time job.[26] Given that these spouses also tend to be low skilled workers, Figure 19 suggests that the spouse's wages are likely to be affected by wage moderation. In this context it is reasonable to conjecture that low skilled female workers took up mini-jobs to help counter-balance the effects of wage moderation on the household income. It is therefore instructive to analyse whether inequality also increased at the household level. Further, since in Germany taxes and transfers are based on household earnings and many mini-jobbers live in poor households, it is also important to analyse whether the tax-free nature of mini-jobs and other redistribution policies have helped reduce inequality.[27]

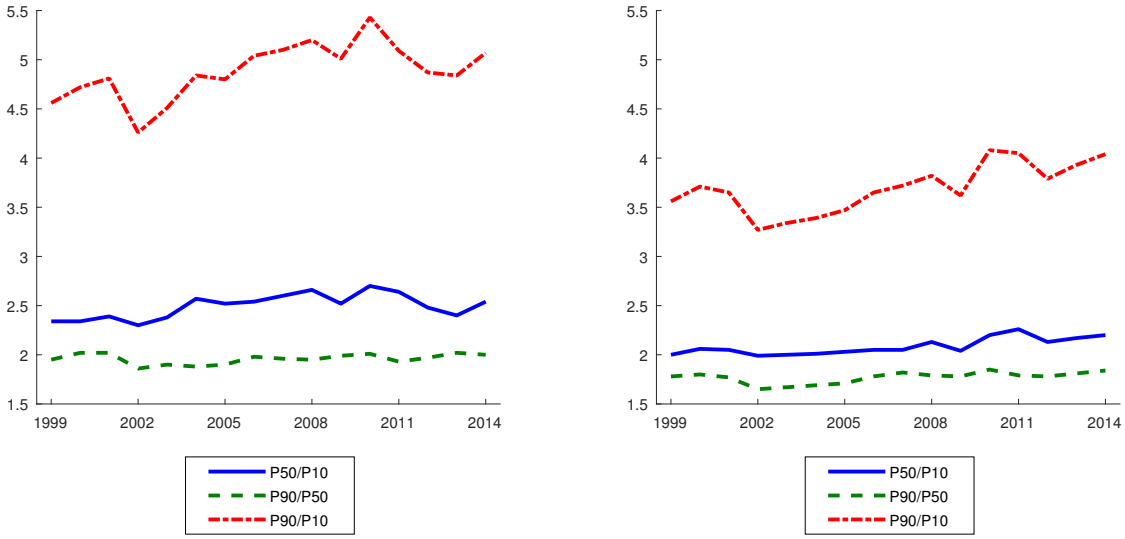
To investigate these issues we use the post- and pre-government monthly household income reported by the cross-national equivalence files of the GSOEP, as SIAB does not report household income. Pre-government income combines household income derived from labour earnings, asset flows, private retirement income and private transfers before taxes and government transfers. Post-government income combines pre-government income with public transfers, and social security pensions minus total family taxes.[28]

When computing the evolution of the distributions of monthly household income we observe that post-government household income is typically higher than pre-government

[26] Using the GSOEP for the period 2003-2014, we find that 88.1% of the spouses of exclusive mini-jobbers in our data are employed in a full-time job. For those holding only a contributing part-time job, this proportion decreases slightly to 85%.

[27] IZA (2012) reports that 60% of mini-jobs are in households with total net household income below 3,000 euros per year and 30% are in households with total net income below 2,000 euros. See also Table 1, last column.

[28] The GSOEP household files do not report gross household income, they only report net household income as a direct measure. However, the GSOEP cross-national equivalence files report the "pre-" and "post" government income variables for each household. Both variables are predicted rather than measured and are meant to provide the information comparable to the information reported in the Panel Study of Income Dynamics for the US. "Post-" government household income is close to net household income reported in household-files. The discrepancy is around 400 euros.



(a) Gross Income

(b) Net Income

Figure 21: Household income inequality, all workers (Source: GSOEP)

household income only at the very bottom of the distribution, reflecting the positive net transfers these households receive from the government. Above the 5th percentile households typically contribute more in taxes than what they receive as transfers.

Figure 21 presents similar ratios that measure inequality as in Figure 20. The left panel depicts the evolution of household income inequality before taxes and transfers, while the right panel presents it after taxes and transfers are applied. In both cases we observe a rise in inequality throughout the period, exhibiting a dip in 2002 and then a rise after 2003. Once again the rise in inequality comes from the bottom of the distribution. These figures show that the P50/P10 ratio increased, while the P90/P50 ratio hardly changed throughout the period. Although not shown here, a similar picture emerges when considering the P50/P5 or the P50/P15 ratios instead of the P50/P10 ratio. There is a fair amount of income redistribution in Germany but many transfers also go to middle- and high-income households (see Bach et al., 2015).

Taking it together, the evidence presented up to now shows a picture in which exclusive mini-jobbers and other low income part-time workers not only face growing within-group inequality (as implied by Figure 19), but they also face growing inequality when considering individual and household gross and net earnings.

6.4 The moonlighting decision

We have shown that a large group of low skilled female workers from relatively poorer households took up mini-jobs, contributing to increase overall household income in an environment of wage moderation and growing inequality. We have also shown that another large group of higher skilled workers who already had contributing jobs took up mini-jobs to increase their

earnings. This group has been the main engine behind the expansion of the marginal employment sector. We now investigate the conditions which favour moonlighting and whether moonlighters were successful in using their mini-jobs to top-up their earnings from contributing employment. For this exercise we use the SIAB as it provides a much more accurate picture of moonlighting activities than the GSOEP.

We are primarily interested in how worker's moonlighting decisions relate to their gross daily wages. For this purpose we estimate a linear probability model that relates the decision to moonlight to the worker's log-wage, including worker and time fixed effects as well as age, education level, nationality (becoming German), the complexity of the task performed in their primary jobs (unskilled, skilled, complex, highly complex) and the current two-digit occupation. In addition we control for the size, two-digit industry and location (federal land) of the establishments in which respective workers are employed.

Since the wage is endogenous to worker's moonlighting decisions we instrument it using establishment-level information. To instrument the individual log wage we use the log mean wage of full-time employees at the worker's establishment, excluding the worker's own wage if he/she is also a full-time employee. We take the mean wage of full-time workers of a given establishment as an indicator of this establishment's labour productivity.[29]

The pooled OLS estimator and the fixed-effects estimator without instrumentation of individual log-wages (first two of columns in Table 5) show a positive significant association between the moonlighting decision and the wage in the primary job. However, instrumenting wage by the average wage of co-workers, we find that the effect of the wage from primary employment on the moonlighting decision becomes negative and significant (last column in Table 5). This means that those employees who decide to moonlight are the employees who suffer decreasing wages in their primary job. Consequently, those individuals who are strongly affected by wage moderation are more likely to become moonlighters.

Otherwise, higher incidence of moonlighting characterizes individuals who are on average higher educated, perform skilled (yet not complex or too complex) tasks, are not likely to be foreign and work in larger establishments. The estimates for education and nationality might seem counterintuitive at the first glance, but in fact they are not, because non-moonlighters contain a large number of exclusive mini-jobbers, who are much less educated and more likely to be foreign.

6.5 Topping up wages

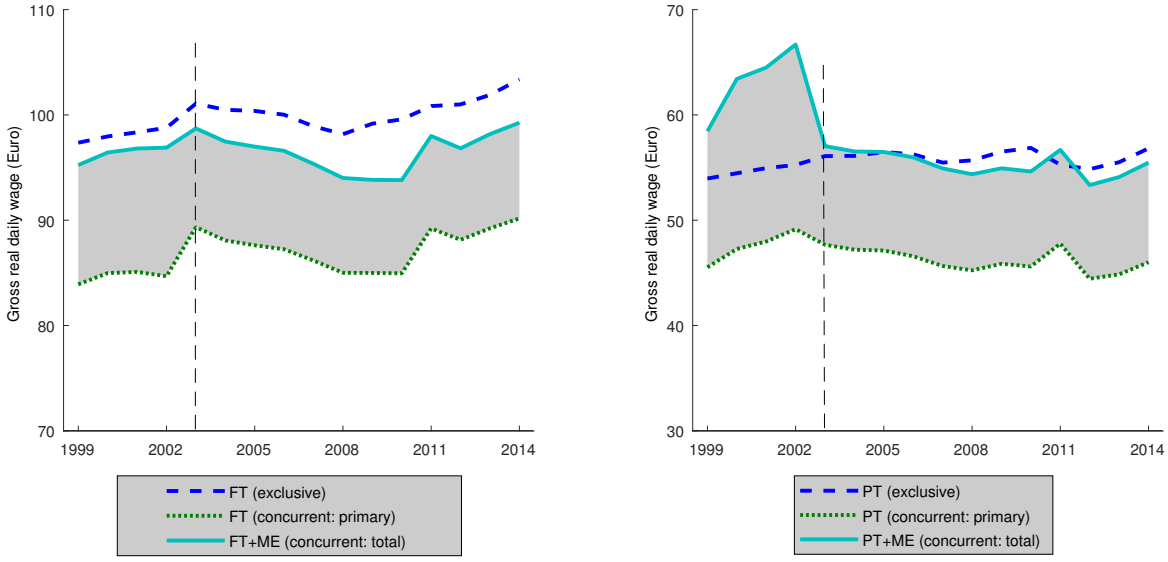
We now investigate to what extent moonlighters were successful in topping-up their earnings by taking up extra hours in the form of a secondary employment. Using the SIAB, Figure 22 depicts the gross daily wage of workers moonlighting, decomposing total wages by their source: primary or secondary employment. Before 2003, the secondary employment in this figure was a part-time job, while after 2003 it was a mini-job. The left panel presents this

[29]First stage of this IV regression confirms that the chosen instrument is not weak.

Table 5: Decision to moonlight

	OLS	FE	FE+IV
log-wage	0.0065	0.0200	-0.0075
	(0.0002)	(0.0004)	(0.0019)
age	-0.0001	0.0026	0.0027
	(2.0e-05)	(3.5e-05)	(4.0e-05)
education: low	0.0127	-0.0147	-0.0325
	(0.0008)	(0.0018)	(0.0022)
education: medium	0.0159	0.0061	-0.0041
	(0.0006)	(0.0014)	(0.0016)
complexity level: skilled task	-0.0048	-0.0001	0.0026
	(0.0008)	(0.0009)	(0.0009)
complexity level: complex task	-0.0128	-0.0067	-0.0024
	(0.0009)	(0.0011)	(0.0012)
complexity level: highly complex task	-0.0186	-0.0073	-0.0020
	(0.0010)	(0.0011)	(0.0012)
foreign	0.0282	-0.0059	-0.0110
	(0.0009)	(0.0015)	(0.0016)
establishment size: $[10, 50)$	-0.0011	0.0012	0.0037
	(0.0005)	(0.0006)	(0.0006)
establishment size: $[50, 250)$	-0.0053	0.0033	0.0073
	(0.0006)	(0.0007)	(0.0007)
establishment size: > 250	-0.0100	0.0025	0.0077
	(0.0006)	(0.0008)	(0.0009)
Number of "individual" $\times$ "time" obs.	6,387,939	6,387,939	6,057,089
Number of individuals		779,696	758,773

Notes: Standard errors clustered at individual level. Additional controls: location (federal land), industry (2digit), occupation (2digit), time dummies.



(a) Primary job full-time

(b) Primary job part-time

Figure 22: Gross real daily wages in exclusive and concurrent employment

decomposition for workers whose primary employment was a full-time job and the right panel does the same for workers whose primary employment was a part-time job. In addition, the two panels present the gross daily wage of those workers who were exclusively employed in either a full-time or a part-time job.

Figure 22 shows a large difference between the gross daily wages earned in the exclusive contributing employment and those earned by moonlighters in their primary jobs. For example, workers who held a full-time (part-time) job together with a mini-job experienced a gross daily wage in their full-time (part-time) job that was 13% (17%) lower than the gross daily wage of those workers who only held a full-time (part-time) job. These differences persists if we condition on all available characteristics. In this case the wage differential is much smaller: 2.5% for full-time jobs and 4.2% for part-time jobs.[30] These differences are consistent with the importance of individual wage levels in inducing moonlighting as reported in Table 5.

Figure 22 also shows that the wage differentials between the primary jobs of those who moonlight and those who do not moonlight are largely covered by the earnings of the secondary job. Until 2002 the total gross daily wage for the moonlighting full-time workers was 2% smaller than the gross daily wage of exclusive full-time workers, while after 2002 this difference was 4%. Note, however, that after Hartz II the earnings from a mini-job became tax free and hence the 4% difference after 2002 in net rather than gross terms must be lower. The right panel of Figure 22 presents a very similar picture for part-time workers.

Next we explore in more details to what extent the top-up provided by mini-jobs helps

[30]These results are based on a fixed effect regression with the same demographic and employer controls as in Table 5 and a dummy variable that takes the value of one if the worker was moonlighting and zero otherwise. The differentials reported above refer to the estimated coefficients of this dummy variable.

Table 6: The effect of moonlighting on total earnings

	Full-time		Part-time	
	OLS	FE	OLS	FE
moonlighting	0.0489	0.0895	0.1378	0.1971
	(0.0014)	(0.0009)	(0.0028)	(0.0021)
age	0.0058	0.0077	0.0057	0.0135
	(4.1e-05)	(4.6e-05)	(0.0001)	(0.0002)
education: low	-0.2903	-0.1582	-0.2146	-0.1973
	(0.0020)	(0.0032)	(0.0052)	(0.0109)
education: medium	-0.1834	-0.1049	-0.1564	-0.1407
	(0.0013)	(0.0023)	(0.0039)	(0.0088)
complexity level: skilled task	0.1791	0.0493	0.1848	0.0621
	(0.0018)	(0.0013)	(0.0035)	(0.0034)
complexity level: complex task	0.3672	0.0985	0.2620	0.0854
	(0.0022)	(0.0015)	(0.0055)	(0.0054)
complexity level: highly complex task	0.4172	0.1003	0.3641	0.1187
	(0.0022)	(0.0016)	(0.0053)	(0.0056)
foreign	-0.0394	0.0009	0.0040	0.0187
	(0.0015)	(0.0018)	(0.0041)	(0.0057)
establishment size: $[10, 50)$	0.2035	0.0711	0.2801	0.0974
	(0.0015)	(0.0010)	(0.0034)	(0.0030)
establishment size: $[50, 250)$	0.2998	0.1077	0.3640	0.1427
	(0.0016)	(0.0012)	(0.0035)	(0.0037)
establishment size: > 250	0.4047	0.1452	0.4343	0.1702
	(0.0016)	(0.0013)	(0.0036)	(0.0043)
Number of "individual" $\times$ "time" obs.	4,761,198	4,761,198	1,121,826	1,121,826
Number of individuals		632,719		228,835

Notes: Standard errors clustered at individual level. Additional controls: location (federal land), industry (2digit), occupation (2digit), time dummies.

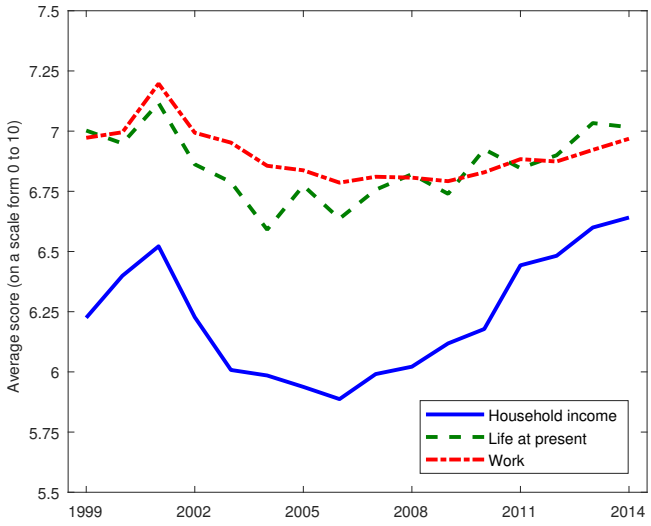


Figure 23: Satisfaction Indicators (Source: GSOEP)

cover the gap in earnings faced by moonlighters. Table 6 shows the results from regressing the log of gross total daily wages on a moonlighting dummy variable which takes the value of one if the worker moonlights and zero otherwise. We estimate these regressions separately by the type of contract in worker's primary employment. For those in a full-time job, we find that moonlighting is associated with a wage increase of 4.9% in a pooled OLS regression. The wage benefit from moonlighting increases to 9% when we take into account individual fixed effects (Difference-in-Difference). The wage benefits of moonlighting are even stronger when we consider workers whose primary employment is a part-time job, consistent with Figure 22. These results suggest that workers who face real wage decreases in their primary jobs, if compared to similar workers in exclusive contributing employment, are more than able to cover the wage gap by moonlighting.[31]

6.6 Welfare measures

We end our analysis by investigating welfare measures in order to assess whether Germany was worse or better off after the Hartz reforms. Figure 1 in the introduction shows a readily available welfare measure: GDP per capita. By this measure, welfare has been increasing in Germany since its re-unification and has been pretty much at par with France, the UK and other similar sized economies. The key feature of this graph, however, is that as from 2006 the rate of growth of GDP per capita has visibly increased. The average growth rate of GDP per capita for the period 2006-2016 was 1.41%, while for the 1995-2005 period it was of 1.27%.

As an alternative we investigate self-reported subjective welfare measures obtained from the GSOEP. Figure 23 shows the dynamics of the averages of three of these measures: (i)

[31] Almost identical results are obtained if instead of a fixed-effects linear regression we estimate a random effects Tobit to account for top-coding. These results are not reported here for brevity.

satisfaction with job, (ii) satisfaction with household income, and (iii) overall (present) live satisfaction. In all three measures we observe a decline in satisfaction until 2005 and a remarkable increase since 2006. This is entirely driven by the bottom of the distribution as the distribution above the median of satisfaction indices barely changed over the whole period. These patterns are not driven by composition effects across gender and skill groups. Although not shown here, we observe very similar patterns among low, medium and high skilled workers and across male and females. The main differences arise in the levels, where high skilled workers a typically more satisfied in all three measures than their medium and low skilled counterparts.

Although all these indicators are imperfect measures of welfare, they all point in the same direction. After 2006 aggregate and individual welfare seems to have improved in Germany, suggesting that the reduction in unemployment and the increase in low-paid, part-time work came together with an increase in living standards.

7 Conclusion

In this paper, we show that unemployment in Germany fell largely because the Hartz IV reform induced a greater fraction of unemployed workers to no longer register as jobseekers. This in principle should have increased non-participation. However, labour force participation actually increased because many unregistered-unemployed workers ended up accepting low-paid, part-time work, all kinds of low-quality jobs that were offered in quantity in absence of a minimum wage bound. Taking up low-pay employment in the form of a mini-job provided an easy and flexible way to complement the household income. Firms created many such jobs to match the demand despite higher payroll taxes because the Hartz II made mini-jobs easy to create and to terminate. The Hartz II reform also facilitated holding mini-jobs as secondary jobs.

Our main point is very simple. Since the Hartz reforms, the rate of unemployment in Germany has gradually decreased, and the employment rate is now at its highest in post-war history. We argue in this paper that looking only at the number of registered-unemployed workers and the unemployment-employment flows is misleading. Many of the formerly unemployed workers simply disappear from the statistics because they stop showing up at the job centres for reduced, means-tested benefits and poor-quality jobs that they can easily obtain by themselves. Adding non-participation to unemployment, the non-employment rate is still decreasing, but only because of a fast increase in the number of low-paid, part-time, regular or marginal labour contracts.

It has been a recurrent claim mainly in the left of the political spectrum that Hartz IV was an inhumane policy, unnecessarily harsh and stingy toward unemployed workers. Surprisingly, and as much as we are aware, there is no academic work dispassionately trying to address this reform in a way as comprehensive as we are trying to do in this paper.

Our analysis presents three lessons. The first one is that in presence of large unskilled un-

employment, low-productivity, part-time jobs coupled with reduced unemployment benefits, increased labour market flexibility and wage moderation, is a solution to reduce unemployment without raising non-participation. As a consequence income inequality increases until the economy generates enough high-quality jobs, unless income redistribution is operated, for example in the form of in-work benefits or earned-income tax credits aiming at reducing income inequality at the bottom of the distribution (Blundell et al., 2016). The second lesson is that multiple job-holding might be a good way to earn more by working more. This seems trivial to say, but if labour contracts tend to stipulate fewer working hours (like in many OECD countries), then it might be a good idea to encourage workers to take secondary jobs. The third lesson is that it takes time for wage moderation, outsourcing, decentralization and labour market deregulation to bear fruits. Just before the financial crisis the German unemployment rate was still around 7% and income inequality in the lower part of the distribution increased until 2010. By 2016, these have decreased considerably.

Overall we find that the reforms were effective and increased welfare. Indeed they could yet be the only effective policy to bring back to work prime-aged individuals who have been hit hard by skilled-biased technical progress. Education and training policies take time to change the distribution of skills. In the mean time, it is likely worthwhile targeting redistribution toward poor households via earned-income tax credits, in order to allow workers to make a decent living on fewer working hours.

A Data Appendix

This appendix provides further details on construction of stocks, flows and transition matrices.

A.1 Stocks

Stocks comprise only individuals with simultaneous presence in at most two states of the labour market at the date of sampling. For every year the reported stocks are the averages of the twelve stock samples drawn at the last date of each month. The SIAB does not contain civil servants in government employment (*Beamte*) since this category of workers is exempt form paying contributions to unemployment insurance by German law. We also drop apprentices (or give priority to another category in case apprenticeship is concurrent with any other reported state of the labour market). Given that our ultimate focus is on the prime-aged population, information loss due to dropping apprentices is negligible. The SIAB does not keep any record of non-participation by construction. The stock of prime-aged non-participants is created with the help of labour force participation rates reported in the OECD Labour Force Statistics.

Conditional stocks, split by gender and education, are constructed using the gender and education variables reported in the SIAB. Since the original records of education in the SIAB

are known to be of poor quality, we use the imputation procedure (*ip2a*) of Fitzenberger et al. (2006) to improve these. For constructing conditional stocks of non-participants, we use the gender-specific labour force participation rates available in the OECD data for the prime-aged population. As the relevant OECD data do not contain information about education, we resort to sampling the stock of prime-age nonparticipants form the GSOEP and take the distribution of education form that stock. The definition of education categories in the GSOEP and SIAB is identical and relies on the ISCED97 classification.

Establishment information in the SIAB is always reported at the June 30 of each year. Therefore, the stocks that we use for all the regressions are the stocks sampled on that date.

A.2 Flows

For any month within a year we consider stock samples at the last day of the month and at the last day of the preceding month. For any individual who changes state between the last days of the two adjacent months we record a transition to the new state. If an individual is absent in the stock of the preceding month but present in the stock of the current month, we record a transition form non-participation. Likewise, if an individual is present in the stock of the preceding month but absent in the stock of the current month, we record a transition to non-participation. Averaging over all months within a year gives us the flow statistic for that particular year.

Since the SIAB does not have any record of non-participation, we cannot observe stayers in non-participation. While unimportant for the discussion of Sections 4.1-4.5, identification of the stock of stayers will be necessary to construct transition matrices. We discuss this identification in Section A.3 below.

As a robustness we also constructed the non-participation flows considering an alternative in which one verifies transition to non-participation with the help of the variable that indicates the reason why the individual file is closed. This variable is called "grund" in the SIAB. Whenever an individual is present in the stock of the preceding month and absent in the stock of the current month, this variable must indicate the transition to the state that is neither employment of any form nor unemployment. If it does not, we record the new state (any form of employment or unemployment, as suggested by "grund") and look at the next month to verify that an individual is present in the stock. If yes, the destination state is kept. If still absent, the transition is recorded back as a transition to non-participation. Similar procedure can be used to construct flows from non-participation. We discover that in doing so we only marginally adjust the flows to and form non-participation. For example, "Unemployment to Non-participation" and "Non-participation to Unemployment" flows are reduced by about 1/16 of their presently reported size, which bears no consequence for the argument we develop in the paper. Given that our original approach is fully consistent with the way we construct stocks and given that it is not ruled out that "grund" may indicate the closure of the spell which is still in progress (e.g. transition to employment at a foreign company), we present the analysis using our original approach.

Conditional flows are constructed using the gender and education variables reported in the SIAB. These variables have been already discussed in Section A.1.

A.3 Transition matrices

The construction of the transition matrices is outlined in Section 4.6. Here we only explain how the number of stayers in non-participation (i.e. the count of monthly transitions form non-participation to non-participation) is imputed.

By definition, the change in stocks between the two adjacent months is equal to the sum of all inflows less the sum of all outflows. Therefore, observing the stocks and subtracting (i) outflows from the stock of the preceding month, and (ii) inflows from the stock of the current month, we should get the number of stayers in non-participation in the current month. In practice the numbers we get form (i) and (ii) despite being very close to each other are never identical. As a result we take the average of the two. Finally, since the information on non-participants available form the OECD is reported only on the annual basis, whereas we need monthly frequency, we calculate our monthly stocks of non-participants under the assumption that the ratio of non-participants to full-time employed in the monthly samples is the same as the ratio of non-participants to full-time employed in the annual statistics.

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