

Labor demand response to labor supply incentives: Evidence from a German Labor Market Reform

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– PRELIMINARY AND INCOMPLETE –

Abstract

Tax benefits for low-earnings workers are part of many welfare-to-work policies. Whereas existing studies have mainly focused on labor supply responses to such policies, the theory of tax incidence predicts that employers can appropriate at least part of the tax benefits targeted at workers. This paper analyzes the labor demand response by exploring firm-level outcomes around the Mini-Job Reform in Germany in 2003, which entailed a significant expansion of tax benefits for marginal employment. Theoretically, as the reform implies a lower labor cost on low-wage workers, there might be a scale and a substitution effect, with opposite effects on total employment. Using a differences-in-differences estimation approach I document that production units with a high intensity of low-wage workers prior to the reform expand relative to low intensity firms. Interestingly, this expansion is not biased towards the type of workers targeted by the tax benefits. On the other hand, production units that were initially less exposed to the reform because they had a lower intensity of low-paid workers seem to substitute employment towards more marginal workers without expanding at the same pace. An analysis of changes in the distribution of earnings confirms these results. Furthermore, using ex-ante variation in the fraction of workers with low-wage suggests that overall substitution away from regular employees and towards mini-jobbers, more attractive by virtue of lower tax burden, is modest.

JEL Classification: H20, H24, H32, E24, E64, I38, J23, J38

Keywords: tax benefit, low-earnings' workers, firm outcomes

1 Introduction

Tax benefits for low-earnings workers have become popular policy measures in the last decades. Such “in-work benefits” have the dual goal of providing incentives to work while redistributing income towards workers with lower earnings. Whereas these policies have generally proven effective for stimulating labor supply of low-earnings workers (see for example Eissa and Liebman 1996 for the US or Blundell 2006 for UK), very little is known about their effects on firms. There is some evidence that tax credits generate downward pressure on wages of low-wage workers (Leigh 2010, Rothstein 2010, Azmat 2014). In such cases, the theory of tax incidence predicts that employers share part of the benefits provided to workers. Firm outcomes are potentially affected both by the implied decrease in total labor costs, and the change in the relative costs of tax-advantaged versus non-tax-advantaged workers. Similar to consumers faced with a lower price of a particular consumption good, the response of firms can thus be understood in terms of a scale (income) effect resulting from lower overall labor costs, and a substitution effect resulting from changes in the relative costs of different types of labor.

To study these effects, I investigate the labor demand response to in-work benefits using firm-level outcomes for the case of the Mini-Job Reform in Germany, which entailed a significant expansion of tax benefits for low-income earners. Since 2003, the so-called “mini” and “midi” jobs receive exemptions and subsidies to Social Security Contributions (SSC) for workers earning below €400 per month (mini-jobs) or between €400 and €800 (midi-jobs). Mini and midi-jobs are often referred to “marginal” employment, as opposed to “regular” employment, defined by higher earnings and full SSC. Today, about one out of every four workers in the private sector in Germany holds a marginal job, leading to rising concerns among policy makers and pundits that the Mini-Job Reform increased the risk of labor precariousness at the cost of firms. Assessing such claims requires of course an understanding of the firms’ reactions to the reform.

The results presented in this paper indicate that the reform had a strong scale effect, leading firms to expand not only in marginal employment, but also in regular employment and physical capital. In contrast, there is only mixed or weak evidence that firms substituted regular employment with marginal employment.

My analysis uses linked employer-employee data to characterize firms’ responses to in-work benefits, in terms of a scale effect due to reduced labor costs on existing workforce, and a substitution effect induced by the change in relative prices of heterogeneous labor. Motivated by the significant expansion of tax benefits implied by the Mini-Job Reform, I use a variety of differences-in-differences estimators to identify these effects. The firm outcomes are total employment, employment flows and composition, investment and revenues.

In the first part of the analysis I compare the evolution of outcomes in establishments highly exposed to low-wage employment before the reform to those less exposed. Intuitively, firms which are more intensive in low-wage workers ex-ante experience a stronger reduction on labor costs on their stock of workers as a consequence of the reform, which allows to identify the scale effect. The findings suggest that highly exposed establishments expand employment compared to less exposed establishments in the years after the reform.

The increase in employment results from a large increase in new hires which more than compensates a simultaneous increase in layoffs. Interestingly, the labor expansion in these establishments is not biased towards the type of workers particularly affected by the reform, such as low-paid, marginal, part-time or unqualified workers. Instead, employees with medium qualifications gain importance in the total workforce. There is also evidence for higher investment in physical capital in highly exposed establishments compared to those less exposed. Taken together, establishments faced by a higher cost-reduction effect through a high intensity of low-earnings workers tended to expand faster, both in terms of labor and physical capital. At the same time, less-exposed establishments become increasingly more intensive in low-wage employment, pointing towards a potential substitution of regular with marginal employment.

The second part of my analysis sheds further light on the substitution effect by exploiting differences in the intensity of the reform across local labor markets. I first use social security records on workers to compare after-reform employment probabilities and gross wages of low and high-wage workers in areas with a higher share (and variation) in low-wage employment. Intuitively, both a relatively lower probability of employment for individuals who do not hold a mini-job and a relatively lower wage for mini-jobbers in high intensity areas should be indicative substitution of regular with marginal employment. The empirical results of this exercise are somewhat mixed. The employment probabilities outside the low-wage sector are not lower in areas containing more low-wage workers ex-ante, though they are lower in areas with a higher increase in the proportion of these workers after the reform. Wages of mini-jobbers do not seem to be different across areas with different ex-ante shares of low-wage workers.

Second, I compare outcomes of firms in areas with different pre-reform shares of low-wage employment. Intuitively, the substitution effect should lead to fewer new regular jobs compared to low-wage jobs in areas with higher intensity of low-wage workers. Empirically, I find that the changes in employment in firms by type or area are not different. I also document a decrease in the intensity in part-time workers in areas with a higher ex-ante share of low-wage workers, which points to the absence of a strong substitution effect.

A different way of measuring the scale and substitution effects is to analyze the wage distribution across different regional labor markets and firms. Intuitively, the mass change in the wage distribution around the earnings threshold defining mini-jobs should be indicative for the importance of the reform. This allows me to estimate heterogeneity effects for sub-groups of workers which are more affected by the substitution (in particular young, uneducated and male workers) and the type of firms where the substitution is concentrated (in particular those with lower ex-ante intensity in low-wage workers). [TO BE COMPLETED] Also highlighting an important scale effect, I find that only 15% of workers with earning around or below the mini-job threshold of €400 had previously had higher gross earnings. This proportion is higher (36%) if I only consider employees who changed job. This indicates that instead of adjusting the wages and employment patterns of the existing workforce, firms created mini-jobs for new employees.

The rest of the paper is organized as follows. The next section discusses the contribution to the existing literature; section 3 provides details on the institutional context of the Mini-Job

Reform; section 4 describes the data and empirical methodology; section 5 presents the results; and section 6 concludes.

2 Related literature

The existing literature about tax benefits for low-earnings' workers in general and the Mini-Job Reform in particular has focused on the effect on labor supply and employment, as it is one of the main objectives to affect these variables. The evidence regarding demand side response is still scarce, and this paper aims at contributing to it.

A related strand of literature provides evidence that firms share at least partially the wedge reduction implied by tax credits. Azmat (2014) shows for the WFTC that when the benefit increases and becomes salient in 1999, gross wages of eligible workers are reduced compared to similar non-eligible workers. Employers appropriate 38% of the tax credit by reducing wages according to her calculations. Leigh (2010) exploits the state level variation in amount of EITC in the US in 1989-2002, and estimates that when the generosity of the tax credit increases by 10%, hourly wages fall by 5% for high school dropouts and 2% for high school graduates. Rothstein (2010) simulates the effects induced by the mid-1990s expansions of the EITC and, assuming labor demand is not perfectly elastic, he shows that 55% of the benefits given to low-skilled women are appropriated by employers. All these findings are consistent with the theory of tax incidence, by which employer and employee share the economic incidence of a tax reduction. Whereas Leigh (2010) and Rothstein (2010) interpret the results as a consequence of downwards pressures on equilibrium wage induced by an outwards shift in labor supply as a consequence of the policy, Azmat (2014) claims the main mechanism is direct wage cuts possible by the change in the salience of the benefit.

In contrast to findings for the US and UK, several studies suggest the effect on total labor supply are more moderate in the Mini-Job case, concentrated in changes in the composition of workers (Akyol, Neugart, and Pichler 2013, Jacobi and Kluge 2007, and Eichhorst and Zimmermann 2007 for surveys, Fertig and Kluge 2006, Caliendo and Wrohlich 2010, Bargain, Caliendo, Haan, and Orsini 2010 and Steiner and Wrohlich 2005). Downwards pressure on wages due to labor supply expansion are potentially lower. However, the benefit is salient, employers know who the beneficiaries are. Indirect evidence on firms response comes from labor supply elasticity estimates using bunching estimators. In particular, for the Mini-Job case, Tazhitdinova (2016) extends the traditional framework for estimating labor supply elasticity using bunching at tax notches and kinks to the case of large changes in marginal and average tax rates. Elasticities estimates using administrative data on social security records for Germany between 1999 and 2010 are substantially larger than findings for US in similar contexts and applying similar methods. Acknowledging that singularities of labor supply incentives in the German setting and potential optimization frictions are not enough to explain the difference entirely, the author provides evidence of an alternative explanation according to which firms are inclined to offer mini-jobs as opposed to regular employment because of the possibility to offer lower fringe benefits in the former, and their higher "de facto" flexibility at the extensive and intensive margins. Similar approach and findings are documented by Gudgeon and Trenkle (2016) and Haywood and Neumann

(2015), also hinting on the direction of firm responding to tax benefits allocated to workers. All these studies make the point that in the presence of tax benefits for workers, firms' incentives are also affected. This paper aims at contributing to this literature by providing a direct analysis of establishment-level outcomes.

With a different approach, there are few studies which have estimated the parameters of the labor demand for heterogeneous labor using a flexible cost function framework (Freier and Steiner 2007, Addison, Bellmann, Schank, and Teixeira 2008, Jacobi and Schaffner 2008). In particular, Jacobi and Schaffner (2008) study the evolution of the estimated elasticity of substitution between unskilled and skilled labor using the industry level data from the LIAB, finding no changes after the reform. Although the focus of this paper is labor demand side as well, the main conceptual difference is that I do not restrict mini-jobs to be unskilled jobs necessarily, as it is not explicitly implied by the institutional design or supported by evidence.

3 Institutional Context

The Mini-Job Reform was part of a wider set of policies, the so-called "Hartz reform", which were gradually implemented between 2003 and 2005. The main goal was to increase labor market participation, by providing incentives to both the labor supply and demand. The objective explicitly stated in the legislation is to reduce unemployment and increase competitiveness as well.

In this paper I focus on Hartz II or Mini-Job Reform, one of the most controversial components. Introduced as of April 2003, it involves of an expansion of exemptions and subsidies in social security contributions (SSC) paid by workers with low-earnings ("marginal" workers as the literature has referred to). Although mini-jobs already existed in Germany before the reform, they were restricted to employment with a maximum of 15 hours a week and a gross monthly wage of €325 or less, provided it was the only source of income for the worker. Mini-jobbers were exempted from SSC and income tax, while the employer paid 22% tax on gross wages. Earnings from several mini-jobs were added up and the resulting amount was subject to SSC. Above the threshold, regular SSC (21% for both workers and employers) plus income tax kicked in.

After the reform, the wage limit was extended to €400 and the hour limit was eliminated. Employers' SSC were raised to 25%.¹ A phase out category (midi-job) was introduced for monthly gross wage between €400 and €800, where the SSC increase linearly for the worker while employers are subject to the normal rate, and income tax applies normally. Secondary jobs were allowed to qualify as mini or midi-jobs if complying with the earnings' limits, benefiting from a lower tax burden. The change in the definition of mini-jobs led to a significant expansion of the number of mini-jobs, from approximately 4 million in 2003 to more than 7 million in 2007. Adding up midi-jobs, they are 8.5 million jobs or 25% of total private employment.

While workers in midi-jobs are entitled to the same benefits as the rest of employees in Germany, workers in mini-jobs have health insurance, paid holidays and other benefits such

¹There is a new raise to 30% in employers' SSC starting in July 1, 2006.

as maternity leave, but they do not have full pension entitlements.² Regarding income taxation, the amount coming from mini-jobs is exempted on an individual basis, which generates differential labor supply incentives for married couples and single individuals given the joint taxation of income for couples. Finally, mini-jobbers earning up to €165 are also entitled to unemployment insurance and social assistance.

The institutional design provides a strong incentive for jobs to locate at the mini-job threshold (figure (27) in the Appendix).³ There is not a comparable consequence on hours or hourly wage distributions (figure (28) in the Appendix), i.e. mini-jobs are heterogeneous, comprising jobs with a low amount of hours and a fairly high hourly wage and others with a high number of hours and a low hourly pay.⁴

The changes introduced by the Mini-Job Reform imply a lower tax wedge, defined as the sum of employee and employer-paid taxes, for workers with low monthly wages. The left panel of figure (1) shows the difference in the tax wedge between the pre and post-reform schedule. The gap is 17 percentage points when the monthly gross salary is between the thresholds before and after the reform (€325 and €400 respectively). The introduction of the midi-jobs, for which the SSC increase gradually, yields a similarly high difference until €500, which decays in a stepwise fashion until reaching 0 for €800.

According to the theory of tax incidence and the literature on tax credits, employers appropriate at least partially the lower tax burden introduced by the reform. Figure (1), right panel, shows potential cost savings, considering only payroll taxes, for plausible values of the share of the tax incidence, “*s*”.⁵ The potential cost savings peaks when the wage is €499 and it amounts to €50 (10% of the gross wage) if the employer appropriates half the benefit approximately.

It is worth noting that these calculations exclude income taxation, from which mini-jobs are exempted. To consider this tax, family information is required, as married couples can file income jointly for tax purposes. A change in the income tax schedule occurred as part of the German Tax Reform between 2003 and 2004 which may affect the labor supply incentives of the target group.⁶ The modification also results in a lower tax burden for low-wage earners, magnifying the effect of the Mini-Job reform in terms of incentives for firms. However, income tax is at the family level and hence, less salient for employers. Another institutional change that might confound the effect of the Mini-Job reform is Hartz IV, which basically reduced unemployment benefit and assistance entitlement affecting the labor supply incentives of low earnings’ workers. However, this reform was introduced two years later, in 2005. By reducing reservation wage of workers, its effect would amplify

²Retirement insurance is proportional to the wage which is low; however, employees can opt to pay an additional 7.5% and gain full pension entitlement. A low proportion (10%) of mini-jobbers have made use of this option.

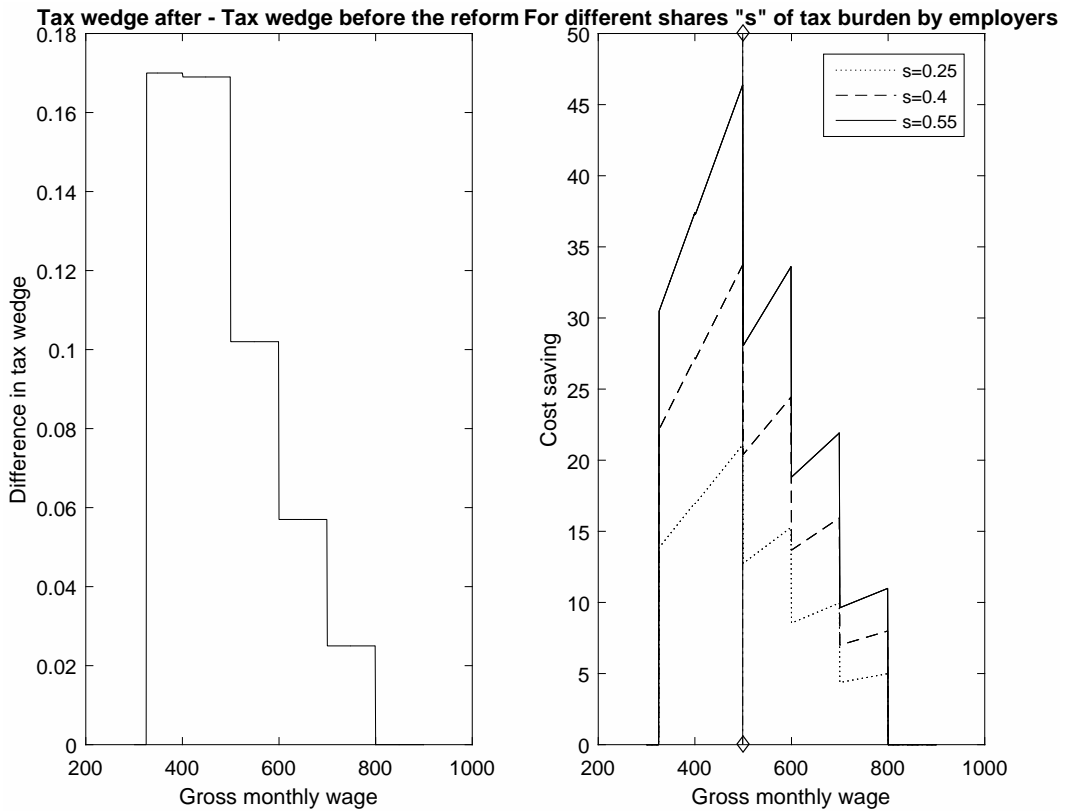
³There is not excess bunching though at the midi-job threshold.

⁴Table (7) in the Appendix shows that even though mini-jobs are comparable to regular part-time in average working hours (14 and 13 a week respectively), the dispersion of hours in mini-jobs doubles that of regular part-time employment; a similar picture emerges from the comparison of hourly earnings.

⁵Azmat (2014) estimates employer appropriate 0.38 of the tax reduction, and Rothstein (2010), 0.55.

⁶The Tax Reform increased the annual disregard level from €7,235 to €7,664, decreased the tax rate on the first bracket from 19.9% to 16%, and increased the top rate from 48.5% to 45%.

Figure 1: Tax wedge changes (left) and labor cost savings (right) by the Mini-job reform (comparison before and after)



Note: The left panel shows the lower tax wedge in SSC implied by the reform, by level of monthly gross earnings. The right panel shows the labor cost savings for different values of the fraction (s) of the tax benefit appropriated by the employers.

the incentives for firms by the Mini-Job reform through further downward pressures on the wage of workers in the bottom of the distribution.

As a consequence of the institutional design, the German labor market is divided in what the literature refers as “regular” and “atypical” employment (see for eg. Eichhorst and Tobsch 2013, Keller and Seifert 2012). Whereas regular employment is identified by characteristics such as full-time, high wage, permanent contract, and integration into the social security system, atypical employment involves features such as part-time, mini-jobs and midi-jobs, temporary and agency employment. In this paper, I will consider a particular type of atypical employment, the mini and midi-jobs, referred as “marginal” employment, one of the main components of “atypical” forms of employment. The rest of the employment will be referred as “regular” in the rest of the paper, even though some forms of atypical employment are also included in it (temporary work with earnings above €800 a month, for example).

Marginal employment is characterized by a higher incidence of women, secondary earners, unskilled workers and individuals with lower labor market attachment or more difficulties of labor insertion. The expansion implied by the reform led to both unemployed and regular workers to flow into mini-jobs, which became the destination of almost half of the outflows from non-employment, one third from regular employment. Marginal employment appears to be a new step in the job ladder in Germany. The gap between marginal and regular jobs in terms of job duration seemingly closed during the time of the reform. Simultaneously, transitions from unemployment to mini-jobs increase and to regular employment decrease, without changing the transitions from regular employment to unemployment. Besides, workers who flow from unemployment to marginal jobs have a lower probability to return to unemployment than those who transit directly to regular employment. Further details in the composition of marginal employment and transitions are in tables (8), (9), (10) and (11) in the Appendix.

4 Empirical Strategy

4.1 Data

The data used in this paper is from the social security records collected by the Institute for Employment Research of the German Federal Employment Agency (IAB). Two datasets are used: the Sample of Integrated Labor Market Biographies (SIAB) and the Linked Employer-Employee (LIAB), both of which are accessed on-site and remotely at the Research Data Centre (FDZ) of the IAB.

The weakly anonymous version of the SIAB provides information on employment, job search and unemployment benefit reception for a 2% sample of workers (excluding civil servants, self-employed and family workers) in Germany, comprised in the Integrated Employment Biographies (IEB). The data include official information on employment subject to social security (since 1975), marginal employment (since 1999), unemployment (since 1975), social benefits (since 1975), registered jobseekers (since 2000), and participants in employment or training programs (since 2000). It provides labor market biographies of more than 1.5 individuals from 1975 to 2010, representing more than 80% of all employed

persons in Germany. Employment histories consist of notifications to the social security system done by employers in the event of hirings, terminations, switches in the contribution group or health insurance company of the employee, or changes in the payroll system of the employer. Worker information includes age, gender, education (only for employment spells), marital status (only for spells of benefit reception or job search), daily wages and benefits, occupation and whether employment is part-time or full-time. Workplace information is registered in the Establishment History Panel (BHP), which aggregates information from individual social security records by establishment ID. The resulting sample of establishments is a cross-section and contains information on more than 300,000 establishments, in West Germany since 1975 and East Germany since 1992. Information in the BHP includes the industry branch and the location of the establishment, the employment structure by gender, age, occupational status, qualification and nationality, median wages for full-time employees, gross worker flows and establishments creation and closure.

The LIAB combines official social security data on individuals from the IEB with establishment data from the IAB Establishment Panel/Betriebspanel, merged through an establishment identifier available in both datasets. The IAB Establishment panel begins in 1993 in West Germany and is extended to East Germany in 1996. The sample comprises approximately 11,000 establishments and is periodically refreshed to account for establishment death and birth. It is stratified by establishment size, industry and region, it oversamples large establishments and excludes unipersonal and informal firms. The (weighted) sample is representative of the population of establishments with employees liable for social security contributions (and marginal part-time workers since 1999). The participating establishments are surveyed on a large number of employment policy-related subjects, including standard topics covered every year, as well as wave-specific topics. Information includes employment development, business policy and performance, investment, collective bargaining, personnel structure and recruitment, remuneration, and working time. The selection probabilities and response rate (higher than 80%) are relatively stable over the years. The composition of panel though shifts slightly in time towards smaller establishments, as the bigger units which die are difficult to be replaced by establishment of comparable size due to their original oversampling. This feature results naturally in an increase in the number of establishments for a given number of workers in the sample.

I use information on firm size, number of hires, separations, wage levels from the employment registries and BHP, whereas variables related to balance sheet (investment, sales, labor costs) come from the Establishment Panel.

Data preparation involves corrections of the education variables (following Fitzenberger, Osikominu, and Volter 2005), elimination of parallel spells keeping data on secondary jobs, imputation of wages above the contribution limit (Gartner 2005) and transformation of spell data in the SIAB into regular frequency data (annual or quarterly).

4.2 Firm-level variation

I use the panel of establishments in 2000-2007 from the LIAB to estimate the effect of the expansion in tax benefits for mini-jobs on firm-level outcomes. Mini-jobs are included only since 1999, when a previous modification to the mini-job legislation took place, and

I choose 2007 as the final year to avoid confounding the analysis with the major economic crisis of 2008.⁷ Regressions are at the establishment level, and I use the corresponding extrapolation factors. This analysis is inspired on the minimum wage literature which analyzes the effect on employment and other outcomes (Harasztosi and Lindner 2016, Machin, Manning, and Rahman 2003).

Using the variation in the pre-reform intensity in low-paid employment, I compare highly exposed to non-exposed establishments. The intuition is that highly exposed firms are mechanically more affected by the reform, in the sense that the tax burden on the total payroll is reduced entailing a potential labor cost reduction. It captures hence a “profit effect”. The econometric model is:

$$y_{jt} = \alpha_j + \lambda_t + \beta_t FA_j^{03} + \varepsilon_{jt} \quad (1)$$

where y_{jt} stands for the outcome of establishment j in period t , α_j is establishment fixed effect, λ_t is year fixed effect, and FA_j^{03} is the fraction of workers below the 2003 mini-job threshold at establishment j as of 2002 (before the reform).⁸ The regressions do not include establishment level controls due to collinearity when introducing fixed effects, particularly because of lack of enough time-variation.

Establishment outcomes include employment in total and composition (fraction of low-paid, marginal and part-time, unqualified and female workers, and of employees by different wage level in quintiles and brackets), vacancies, total and average labor costs, job churning in total and the composition by wage level, investment in physical capital and sales.

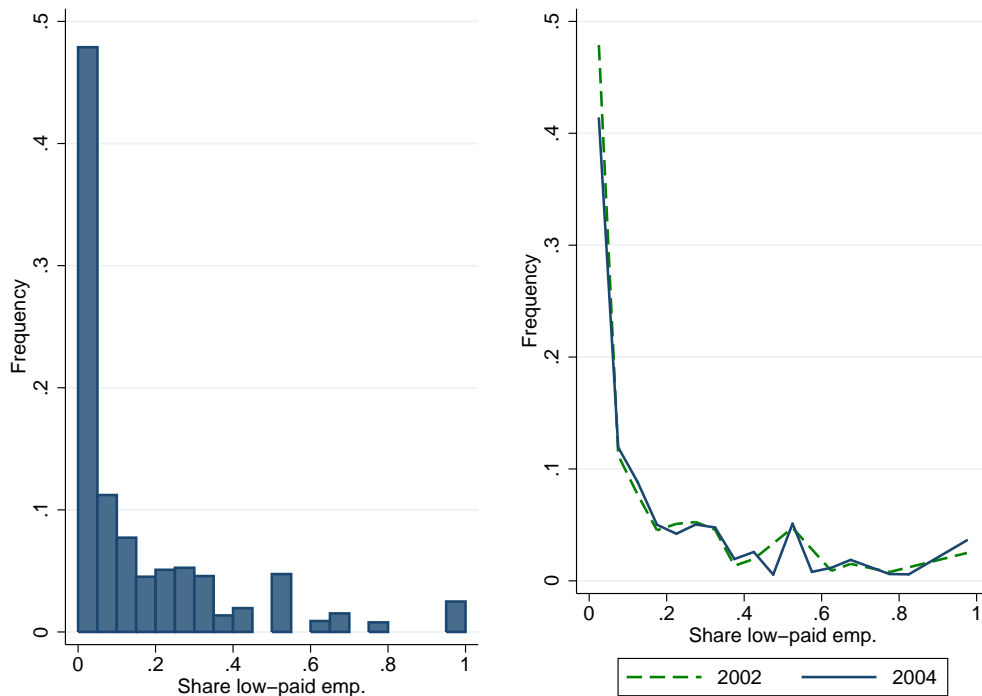
The coefficient of interest is β_t , which is computed for each year (the baseline is 2003, the year of the reform for which the value is 0). It measures differences in outcomes in highly exposed establishments ($FA_i^{03} = 1$) relative to non-exposed units ($FA_i^{03} = 0$). The assumption is that after controlling for heterogeneity at the establishment level and common macroeconomic shocks (year fixed effects), β_t captures the effect of the Mini-Job Reform through lower labor costs implied by lower tax burden on employees that highly exposed firms enjoy compared to non-exposed firms.

The identified effect corresponds to outcomes in highly exposed establishments on top of non-exposed establishments. This clarification is relevant to the extent that it is not possible to guarantee that non-exposed units are not affected by the reform, i.e. the stable unit treatment value assumption (SUTVA) potentially does not hold. For example, non-exposed firms might change their labor composition towards low-wage workers, and the effect hence would be underestimated. However, these changes might take time, and hence estimates closer to the reform are more informative on the aforementioned profit effect. It is possible interpret estimates of β_t as the effect of the cost savings through the tax benefits only when

⁷I do not apply some exclusions sometimes used in the literature to avoid sample reduction. I conjecture they do not represent a big variation in the results, given the small proportion of establishments in the sample in this situation. For example, establishments with fewer than 3 employees amount to 10% of the sample, in the agricultural sector, 3% and in the public administration, 9%. As for establishments born after 2002 FA_j^{03} is not observable, I exclude firm birth in 2000-2002 as well. The panel does not include firms that died during the observation window, but some establishments have censored observations. I perform the analysis on the balanced panel as a robustness check.

⁸The threshold effectively used in the estimation is €506.33, which equalizes the gross wage under the mini-job and regular employment regimes: $400 = 506.33(1 - 0.21)$.

Figure 2: Proportion of low-wage employment in 2002 (left) and 2002 vs. 2004 (right)



Note: LIAB Cross-Sectional Model (weighted).

the common trend assumption holds. This happens in the cases when the estimates of β_t are not significantly different from 0 for the pre-reform period, between 2000 and 2002.

Table (1) shows the summary statistics of the sample used for the estimations. There are 3,772 establishments in the sample in 2002, from which 2,739 have a share of low-wage workers below the (weighted) median, and 1,033 above. Tables (12) and (13) in the Appendix show further descriptives.

The estimation strategy relies in the existence of enough variation in the pre-reform intensity in low-wage employment. Figure (2) shows that there even though almost half of establishments have a very low share of low-wage employment in 2002 (0-5%), the remaining 50% are distributed among higher intensities. For example, more than 5% have between 20 and 25%, and 25 and 30% of their workers below the mini-job threshold, and 4% have around half of their employees in this situation. Besides, the distribution barely changed for the year immediately after the reform, suggesting pre-reform intensity is suitable for capturing potential labor costs savings.

In order to check robustness, I also estimate the model by defining FA_i^{03} in the previous period for every year, and not only in 2002, which prevents the presence of a mean-reversion bias. I also provide estimations for the balanced panel of establishments in 2000-2007 to assess the effect of censored observations. The estimations are included in the robustness section.

Table 1: Characteristics of establishments in LIAB by median share of workers below the mini-job threshold, 2002

	Below median	Above median	Total
Age	39.83	41.18	40.51
Migrant	0.0731	0.0537	0.0633
Secondary or less	0.875	0.919	0.897
Apprenticeship	0.0762	0.0562	0.0662
Higher education	0.0483	0.0247	0.0365
Establishment age	15.61	12.87	14.23
Share below 2003 MJ threshold	0.0475	0.539	0.295
Employment	28.51	8.536	18.45
Share of marg. PT	0.0351	0.371	0.204
Share part-time	0.164	0.475	0.321
Share temporary	0.0331	0.0279	0.0305
Share unqualif.	0.107	0.123	0.115
Share med. qualif.	0.646	0.516	0.580
Share high qualif.	0.0618	0.0243	0.0429
Share female	0.466	0.666	0.567
Vacancies/employment	0.0247	0.0105	0.0175
Mean labor cost	1715.4	1081.0	1396.0
Mean gross wage	1831.5	928.3	1376.4
Inflows/employment	0.157	0.225	0.191
Pc. inflows 0-400	0.107	0.530	0.317
Pc. inflows 400-800	0.142	0.192	0.167
Pc. inflows 800-1200	0.141	0.0678	0.104
Pc. inflows 1200-1600	0.142	0.0666	0.105
Pc. inflows 1600-2000	0.130	0.0522	0.0913
Pc. inflows 2000+	0.339	0.0918	0.216
Outflows/employment	0.254	0.271	0.263
Pc. outflows 0-400	0.110	0.247	0.179
Pc. outflows 400-800	0.0536	0.0734	0.0636
Pc. outflows 800-1200	0.0657	0.0432	0.0543
Pc. outflows 1200-1600	0.0921	0.0651	0.0785
Pc. outflows 1600-2000	0.0947	0.0341	0.0642
Pc. outflows 2000+	0.182	0.0641	0.122
Work council	0.164	0.0357	0.0993
Collective agreement	0.493	0.399	0.446
Sales	5394121.8	678551.9	2996678.5
Percentage exports	5.520	2.769	4.134
Investment (amount)	224028.7	37468.1	129269.4
Labor cost ratio	0.0225	0.0204	0.0215
Sales ratio	1.018	1.008	1.013
Observations	2,739	1,033	3,772

4.3 Local labor market variation

As previously noted, the differences-in-differences strategies provides evidence on the difference in outcomes for highly-exposed establishments compared to non-exposed units. However, the latter are potentially affected by the reform. Independent of their initial intensity in low-paid employment, firms are potentially inclined to substitute regular employment with marginal workers provided the latter have a lower tax wedge after the reform.

In order to analyze the potential substitution of regular employment by mini-jobs, I exploit variations in the intensity of low-wage employment across local labor markets, using elements of the methodology of Crepon, Duflo, Gurgand, Rathelot, and Zamora (2013) and Cahuc, Carcillo, and Le Barbanchon (2016). I perform a set of regressions both at the individual and the establishment level.

Local labor markets are defined according to the standard approach of commuting zones, which amount to 141 in Germany (Kosfeld and Werner 2012), that correspond to the geographic area where most workers reside and work, and from where companies hire.

At the individual level, I use SIAB data annualized to spells around June 30 each year, for the period after the reform (2003-2007). The estimated model is:

$$y_{ict} = \alpha_i + \lambda_t + \beta_x Dmini_{ict} P_{c,x} + \delta_x P_{c,x} + \pi Dmini_{ict} + X_{ict} \gamma + u_{ict} \quad (2)$$

where y_{ict} is an outcome (dummy for employment, part-time employment and gross and net earnings in main job) for individual i in period t and commuting zone c . α_i and λ_t stand for individual and year fixed-effects, X_{ict} comprises time-varying covariates (education and a quadratic polynomial on work experience), $Dmini$ is an indicator of whether the worker is in mini-job. I define P_c in either two ways. On the one hand, I compute the pre-reform proportion of low-wage workers (below the mini-job threshold after the reform) out of the total workforce (employed and unemployed) at the local labor market level. On the other hand, I compute the variation between each year and the pre-reform (2002) share of low-wage employment. Using both definitions of P_c , I define $P_{c,x}$ as a dummy which takes the value 1 if P_c is in the x quintile of its distribution.

In this specification, β_x measures the correlation between the mini-job status and the outcome in an area in the x quintile of the distribution of pre-reform low-wage share (or of variation in low-wage share with respect to the pre-reform level), compared to holding a mini-job in an area with no low-wage workers (or null variation). δ_x in turn measures the differential effect of being in an area in the x quintile of low-wage share or variation, compared to an area without low-wage workers, for non mini-jobbers. It is this last coefficient which informs about potential substitution or displacement effects of the reform on regular workers. Signs of displacement arise if there is a lower probability of employment for workers other than mini-jobbers in areas with a higher low-wage sector, either in level or variation.

Establishment level regressions exploit the fact that employment structure by local labor markets may differ by supply side factors, i.e. by the composition of workers residing in the area. The empirical model is:

$$y_{jct} = \alpha_j + \lambda_t + \beta S_{ct} + X'_{jct} \gamma + u_{jct} \quad (3)$$

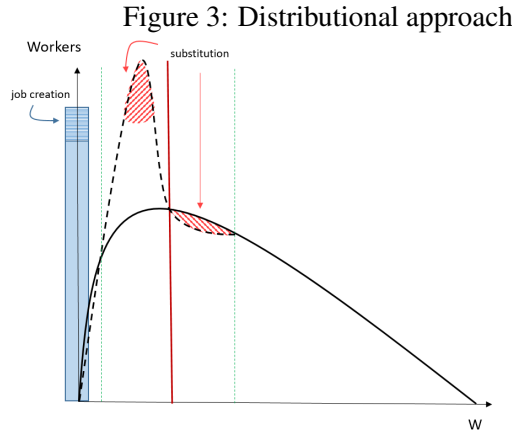
where y_{jct} is an outcome for firm j in area c in period t (employment, average wages,

share of part-time workers and of mini-jobbers). α_j and λ_t are firm and year fixed-effects, X_{jct} include time varying covariates at the establishment level, and S_{ct} is the share of low-wage employment at the area level after the reform. Since S_{ct} is naturally endogenous, I instrument it by supply-side factors, such as the demographic composition of the work force at the area level (age and gender composition, marriage rates, etc.), or the share of low-wage employment in the pre-reform period.

TO BE COMPLETED

4.4 Distributional approach

I propose an approach based on the earnings distributions of workers in order to assess the employment effect, which is inspired on the literature of the minimum wage. The expansion of mini-jobs affects the population of inactive or unemployed workers who may move into new employment, jobs below the new mini-job threshold which might remain at the going wage or be pushed upwards in the earnings distribution, and jobs above the threshold which may be pulled down. The change in the earnings distribution below the threshold imposed by the reform captures hence both jobs created or upgraded in terms of earnings, and jobs substituted belonging to upper segments of the earnings distribution. Figure (3) explains the main ideas to be used in the distributional approach.



Let's denote the change in the mass of workers below the mini-job threshold as follows:

$$\Delta Emp(MJ) \equiv \frac{Emp_1(MJ) - Emp_0(MJ)}{Emp_0(MJ)} \quad (4)$$

where $Emp_t(w)$ denotes employment below wage w at time t (0 for before and 1 for after the reform), and MJ is the threshold introduced by the reform (€400). The mass is normalized by the employment level before the reform. I focus only on mini-jobs and not midi-jobs because the bunching locates clearly at the mini-job threshold, consistent with the higher benefits entailed by these jobs (not only exemption from SSC but also from income tax, besides other expenditures such as fringe benefits).

The mass under the mini-job threshold after the reform comprises both workers which retain their job (potentially improving earnings), or transit from non-employment to employment, which I denote by $Emp_1^+(MJ)$, and jobs pulled from above the earnings distribution,

$Emp_0^-(MJ)$. Decomposing $Emp_1(MJ)$ into the sum of $Emp_1^+(MJ)$ and $Emp_1^-(MJ)$

$$\Delta Emp(MJ) = \frac{Emp_1^+(MJ) + Emp_1^-(MJ) - Emp_0(MJ)}{Emp_0(MJ)} \quad (5)$$

Solving for the fraction of workers pushed up:

$$\Delta Emp_{MJ}^+ \equiv \frac{Emp_1^+(MJ) - Emp_0(MJ)}{Emp_0(MJ)} = \Delta Emp(MJ) - \frac{Emp_1^-(MJ)}{Emp_0(MJ)} \quad (6)$$

which is the total change in the mass of workers below the threshold netted out from the proportion pulled down. It is possible to recover the latter using the change in the distribution above the threshold:

$$Emp^-(MJ) \equiv emp_0(w > MJ) - emp_1(w > MJ) \quad (7)$$

where $emp_t(w > MJ)$ denotes the number of workers with wages above the mini-job threshold. In sum, the number of workers retained or incorporated into employment is possible to be estimated by calculating the change in the distribution below the mini-job threshold minus the part which comes from above the threshold, obtained by evaluating the change above the threshold.

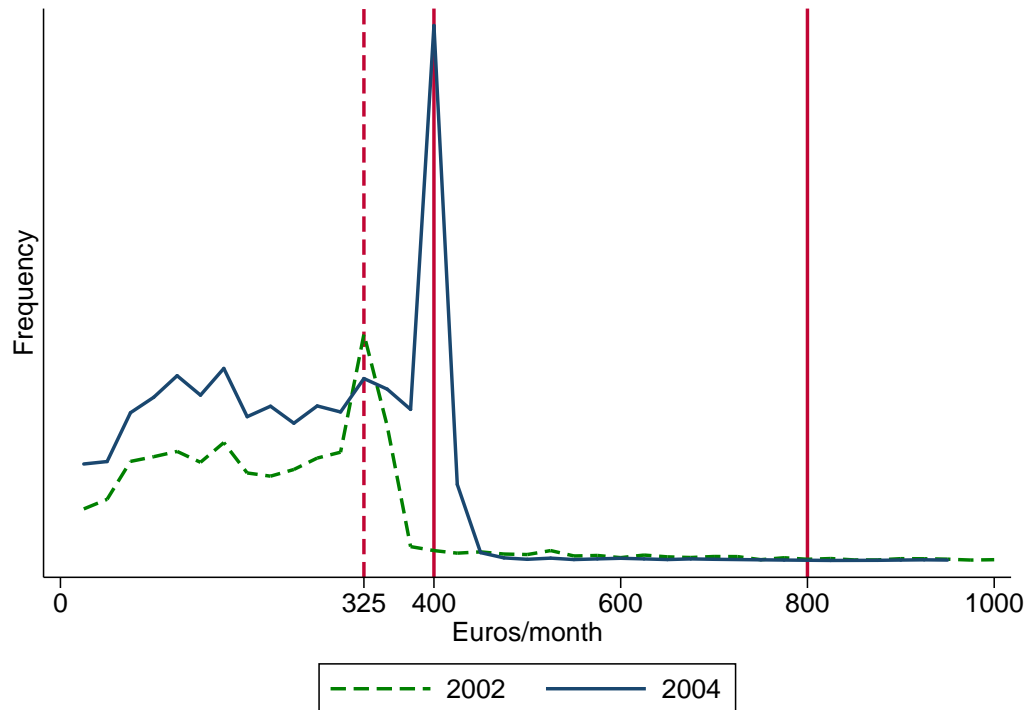
The empirical implementation relies in the comparison of the earnings distribution both in time (before and after the reform), and between the observed distribution and a “counterfactual” one which aims at predicting the shape of the distribution in absence of the discontinuity in the budget set induced by the reform. The latter follows the ideas in the bunching literature, and the main advantage consists in abstracting from aggregate shocks that may affect the earnings distribution in time. To minimize the heterogeneity in workers’ characteristics including in the calculations, the analysis is performed for a region close to the threshold, i.e. earnings between a lower bound W_l and an upper bound W_u .

There are two caveats in the analysis of the distribution of earnings. First, the composition of workers, particularly near the threshold, may change. To assess the consequent modifications in the distribution of earnings due to this, I follow Harasztosi and Lindner (2016). I compare the predicted distribution of earnings before and after the reform, maintaining constant the pre-reform characteristics of workers (age, education, gender and region).

A second limitation is that even if changes in distributions are informative about the employment effects of the reform, they are equilibrium outcomes, i.e. both result of changes in supply and demand. In order to isolate changes driven by firm responses, I apply a grouping estimator inspired in the methodology by Blundell, Duncan, and Meghir (1998) on the matched employer-employee data. Groups are defined in function of local-sector specific labor markets. The goal is to address the simultaneity in labor demand decisions (hiring, firing and composition of workforce) and wage determination. It is possible to obtain an evaluation of labor demand effects by comparing groups of firms affected differentially by tax reforms.

TO BE COMPLETED.

Figure 4: Monthly gross earnings in secondary job (26-59 years old)



Note: SIAB data, daily wage converted to monthly, employment spells parallel to main job. Excluded: trainees, employees in partial retirement, interns, students in trainship and casual workers.

5 Results

5.1 Firm bunching

As noted earlier, the amount of bunching at the mini-job threshold of €400 is not only a product of workers, but also firms' responses, as pointed out by Tazhitdinova (2016). Figure (4) hints in the direction of firms facing incentives to locate at the threshold. It shows a bunching at the mini-job threshold in the distribution of gross wage in secondary employment. As explained before, after the reform multiple job holders are entitled to the tax benefits for each job in an individual base and hence, bunching at the threshold is to be expected. Under the previous legislation in 2002 though, there were no tax benefits for workers with multiple jobs. The bunching at the €325 level reflects hence firms incentives to locate at the mini-job threshold by creating marginal employment.

The first column of table (2) shows workers at the mini-job threshold (between €250 and €325 of gross monthly earnings) before the reform by their earnings after the reform, using data from SIAB.⁹ Two thirds of workers at the threshold in 2002 remain below the new threshold of €400, but half of them obtain an upgrade in their wage. For only 11% of the

⁹Only workers in prime-age (26-59 years old) and excluding trainees, employees in partial retirement, interns, student trainees and casual workers.

workers near the threshold before the reform, the gross wage afterwards is above the cutoff, being this proportion substantially higher among workers who change establishment (35% for movers compared to 8% for stayers in the same establishments).

Considering workers who are close to the mini-job threshold in 2004, after the reform (between €325 and €400), 13% had a higher gross wage in the pre-reform period, and this proportion is also higher for job changers (35%). In sum, even if firms have strong incentives to locate jobs at or below the mini-job threshold, it does not seem that they do it by cutting gross wages of their workers when the cutoff moves with the reform, but new jobs seem to bunch disproportionately as informed by the numbers corresponding to workers who change establishment.

Table 2: Workers “close” to the mini-job monthly gross earnings’ threshold

<i>Earnings’ bracket</i>	Mini-jobs in 2002, by earnings in 2004	Mini-jobs in 2004, by earnings in 2002
Total	25,731	19,911
Inactive	21.9	28.8
Unemployed	2.7	4.9
(0, 325]	32.0	48.6
(325, 400]	32.4	4.4
(400, 800]	3.4	5.8
more than 800	7.7	7.5
<i>Not changed establishment</i>		
out of total	75.8	73.1
of these		
(0, 325]	44.4	77.2
(325, 400]	46.8	7.3
(400, 800]	3.2	8.7
more than 800	5.0	5.6
<i>Changed establishment</i>		
out of total	24.2	26.9
of these		
(0, 325]	35.2	59.3
(325, 400]	29.7	4.4
(400, 800]	8.3	8.6
more than 800	26.3	26.1

Note: SIAB data. “Close” to the mini-job threshold x means in $(x - 75, x]$ for $x \in \{325, 400\}$ for 2002 and 2004 respectively. Workers present in the data in 2002 (2004) and not in 2004 (2002) are “inactive” according to 2004 (2002) earnings’ classification.

Table (3) shows that 11% out of the workers who remain in employment and are at the threshold, have reduced the hours worked compared to before the reform (full-time to part-time), and 22% are observed in a different occupation. These transitions are stronger among workers who change establishment.

While workers who stay in the same establishment concentrate in medium size firms (between 20 and 200 employees), as shown in table (4), the adjustment downwards in terms of gross wage is stronger for small (21%) and large (23%) workplaces, than in the medium size ones (14%).

Among movers, there is a substantial fraction who end up working in a different industry (70%) or occupation (79%), as table table (5) shows.

Table 3: Workers “close” to the mini-job monthly gross earnings’ threshold in 2004 (€400)

<i>Changes with respect to 2002</i>	Full-time to Part-time	Different occupation
<i>Total</i>	11.5	22.2
Of those who do not change establishment	6.4	7.3
Of those who change establishment	25.3	62.5

Note: SIAB data. “Close” to the mini-job threshold €400 means in (325,400] for 2004.

Table 4: Workers “close” to the mini-job monthly gross earnings’ threshold in 2004 (€400)

<i>Out of those who do not change establishment</i>	Small	Medium	Large
Out of total	7.7	83.5	8.9
(0, 325]	32.4	53.7	61.8
(325, 400]	17.6	7.4	8.6
(400, 800]	17.3	8.2	14.1
more than 800	3.7	6.0	9.3

Note: SIAB data. “Close” to the mini-job threshold €400 means in (325,400] for 2004.

Overall, the information is suggestive of firms not favoring direct gross wage cuts as a way of taking advantage of the lower labor costs entailed by the mini-jobs, particularly in establishments where jobs close to the threshold are predominant. Firms instead seem to create new jobs close to the threshold. Workers take these jobs either by reducing hours worked compared to their previous job, or switching the type for which they already have experience.

5.2 Effect of lower labor cost

Results in this section are based in the differences-in-differences approach comparing highly exposed and non-exposed establishments to low-wage employment. As table (1) shows, establishments with different intensity in low-wage workers differ in their characteristics, as expected. However the estimates compare the evolution of their outcomes, and it is important then to check if they were moving together before the reform (common trends assumption). Standard errors are clustered at the establishment level to correct for heteroscedasticity produced by autocorrelation.

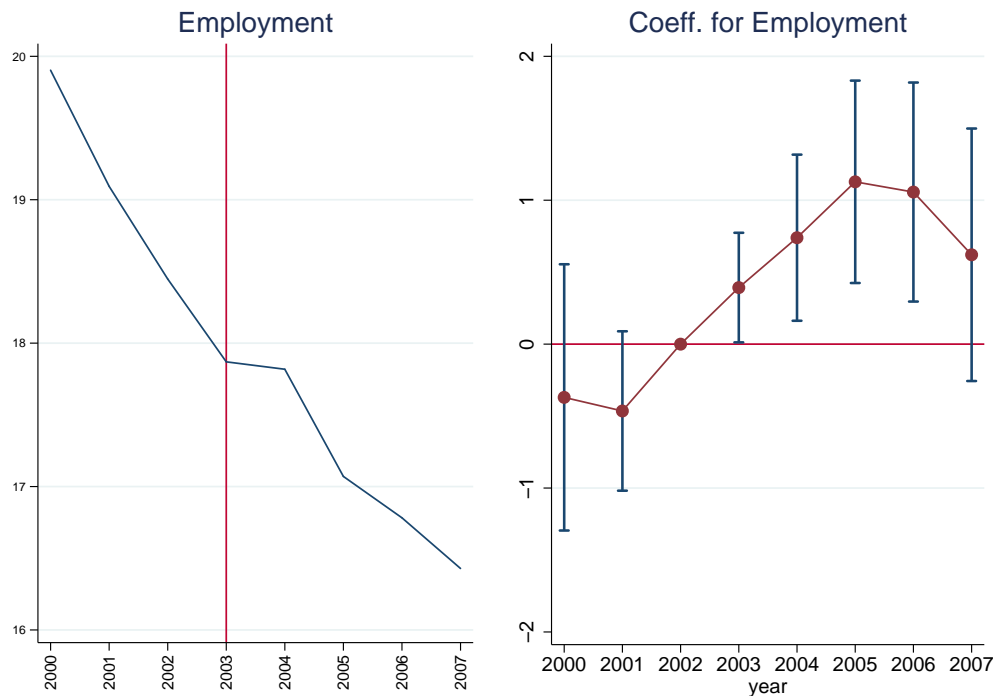
The right panel of figure (5) shows the estimates of the difference in the evolution of employment in highly exposed establishments compared to non-exposed. Highly exposed units, for which the growth rate of total employment was the same as in non-exposed firms before 2003, expand relatively since 2003 (the coefficient is significant until 2006). It is worth noting that the expansion is in relative terms, as in the left panel of the figure it is

Table 5: Workers “close” to the mini-job monthly gross earnings’ threshold in 2004 (€400)

<i>Of those who change establishment</i>	Change industry	Change ind. or occup.
Out of total	70.1	79.0
of those who increased earnings	65.9	75.0
of those who do not increased earnings	76.4	85.1

Note: SIAB data. “Close” to the mini-job threshold €400 means in (325,400] for 2004.

Figure 5: Employment: evolution (left) and coefficient (right)



Note: LIAB Cross-Sectional Model (weighted).

shown that average employment by establishment is falling all over the period.¹⁰

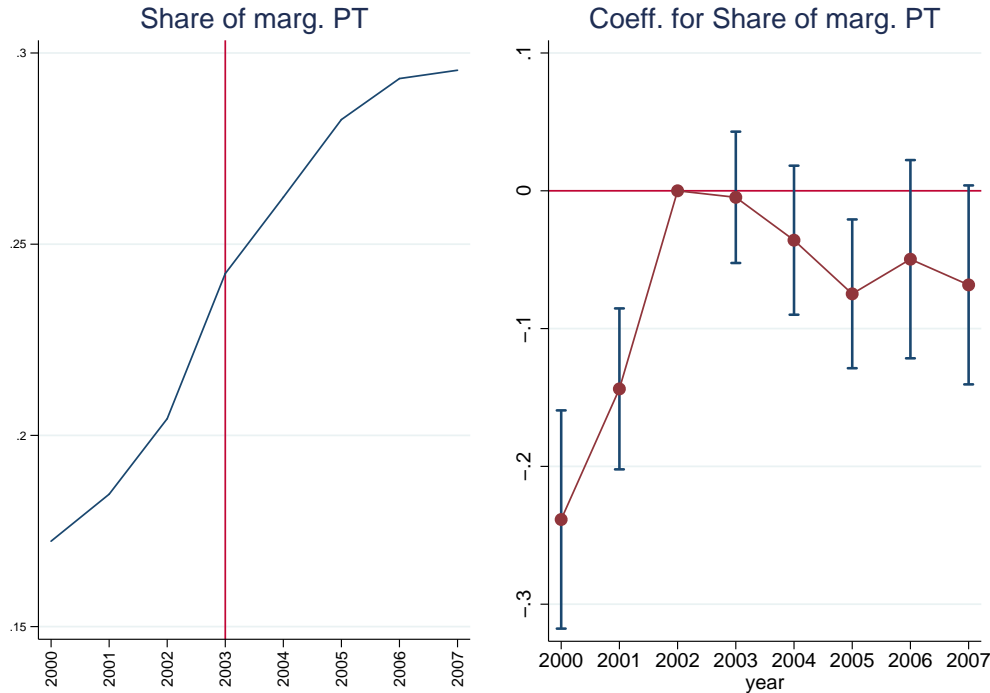
The relative labor expansion of highly exposed firms is not exclusive on low-wage workers, marginal or part-time employment, or the type of individuals more prone to take up mini-jobs, such as women or unqualified workers. This is apparent from figures (6)-(13). Estimations in these cases cannot be interpreted as an effect of the reform however, since the parallel trends assumption is not generally fulfilled. An exception is the case of employment by qualification. It is enlightening that highly exposed firms after the reform decrease their intensity in low qualification employment (figure (11)). The coefficient is insignificant before the reform, and it is negative after, statistically significant for 2003. The opposite post-reform trend occurs with the share of medium qualification employment.

After the reform, the fall in firings in highly exposed establishments is stronger than in non-exposed units (figure (14)). A stronger hiring intensity in highly exposed establishments is observed not particularly in low level of earnings (figures (15)-(20)). Data on the intent to grow (vacancies/employment) suggests a higher vacancy creation in highly exposed units (figure (21)).

Highly exposed units experience a reversal in the relative trend of their labor costs, which were growing faster than in non-exposed workplaces before 2003 and start growing slower

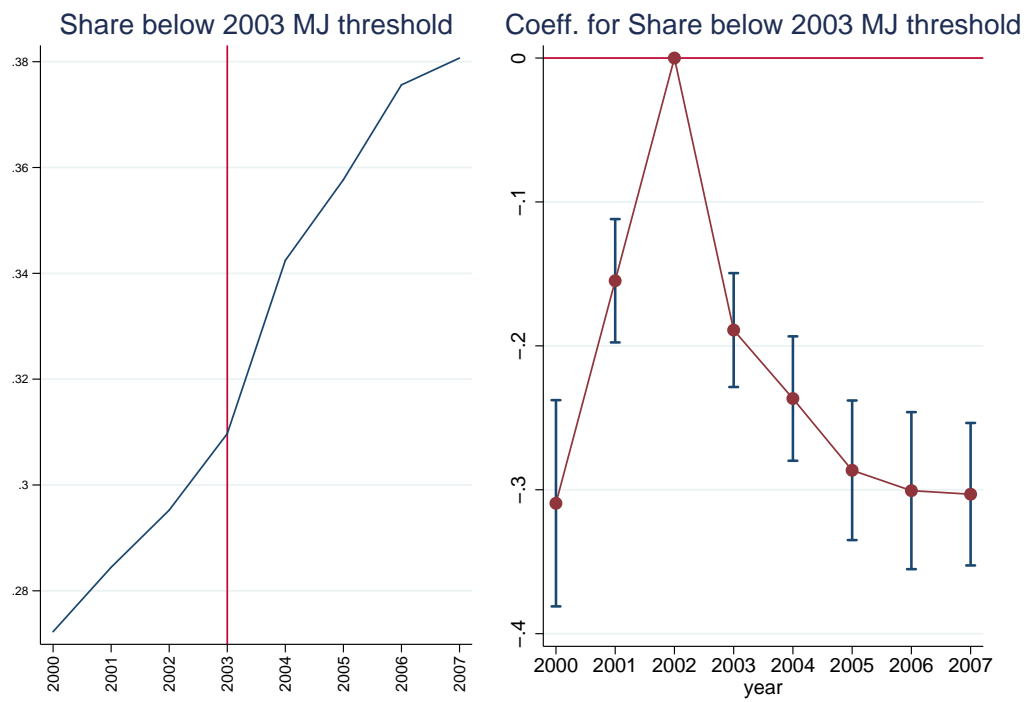
¹⁰Remember that this is also an effect of the composition of the panel changing in favor of smaller establishments, as previously mentioned. However, this should not affect the results which use the weights.

Figure 6: Share marginal employment: evolution (left) and coefficient (right)



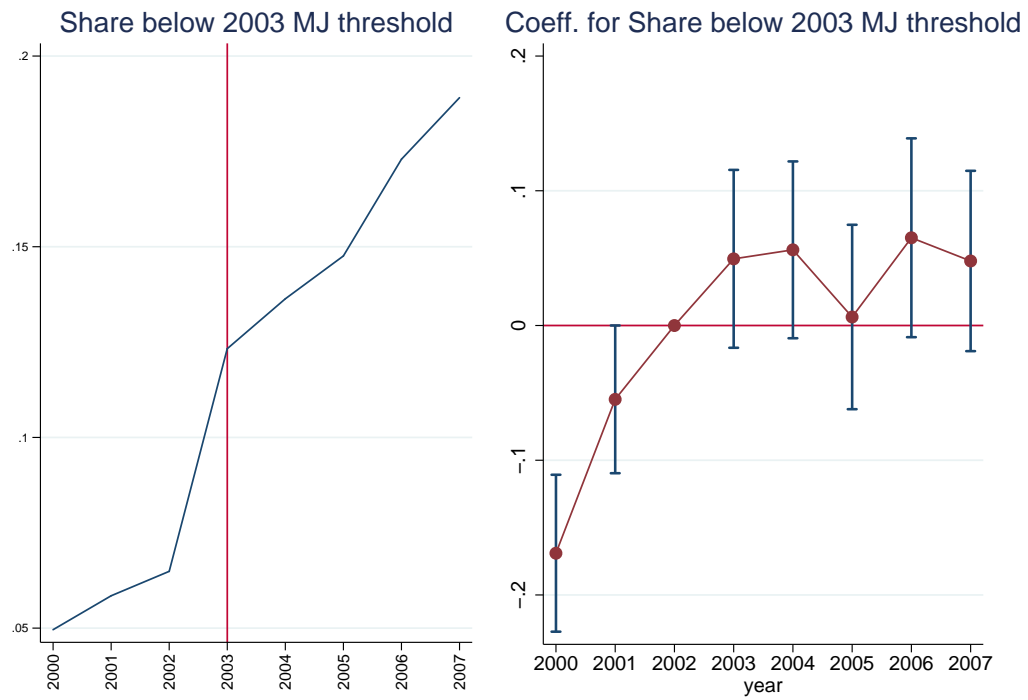
Note: LIAB Cross-Sectional Model (weighted).

Figure 7: Share of low-wage employment (below 506): evolution (left) and coefficient (right)



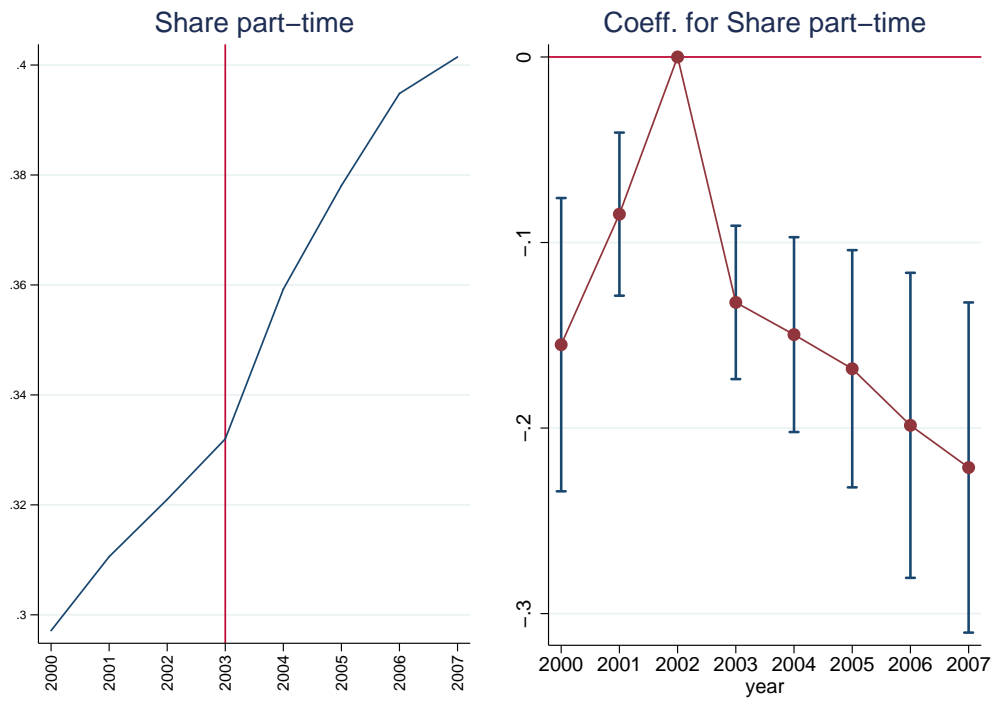
Note: LIAB Cross-Sectional Model (weighted).

Figure 8: Share of low-wage employment (between 325 and 506): evolution (left) and coefficient (right)



Note: LIAB Cross-Sectional Model (weighted).

Figure 9: Share part-time employment: evolution (left) and coefficient (right)



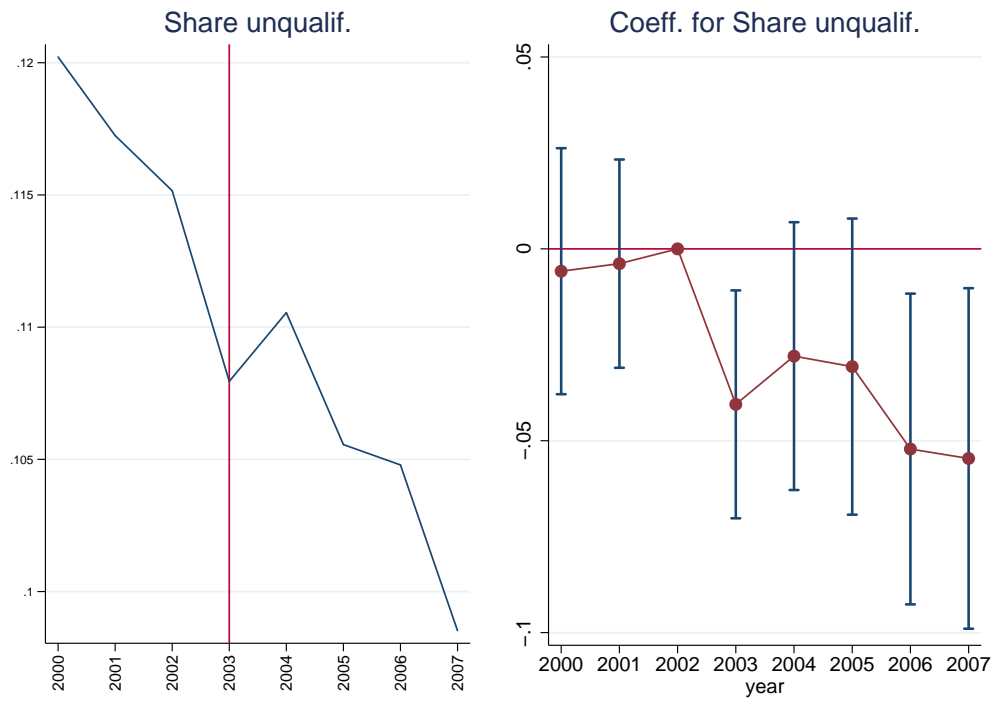
Note: LIAB Cross-Sectional Model (weighted).

Figure 10: Share female employment: evolution (left) and coefficient (right)



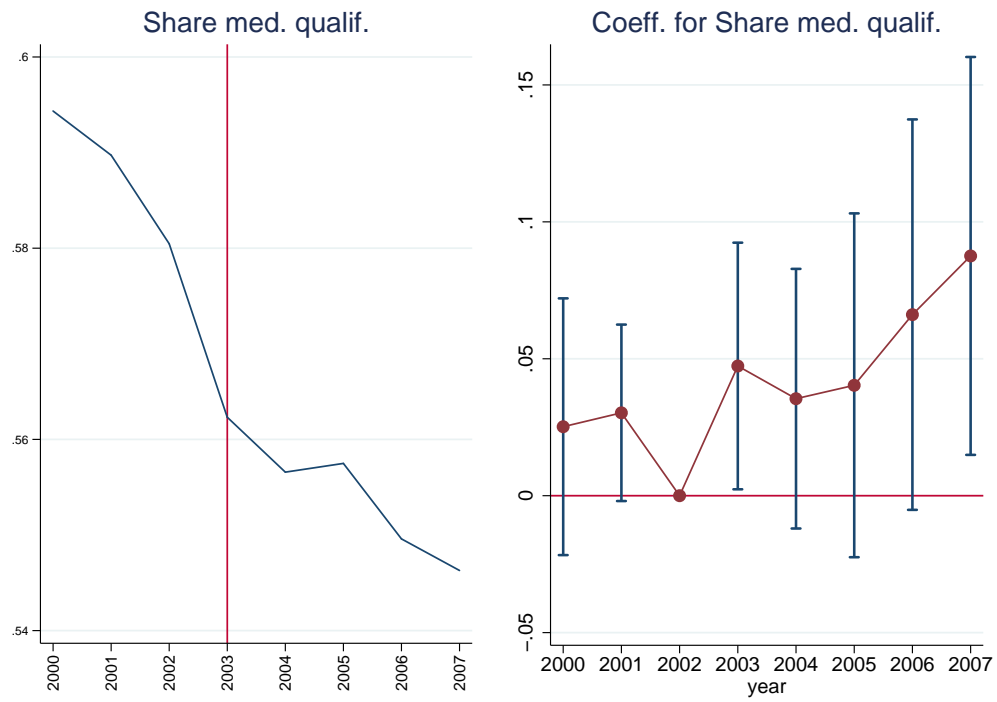
Note: LIAB Cross-Sectional Model (weighted).

Figure 11: Share unqualified employment: evolution (left) and coefficient (right)



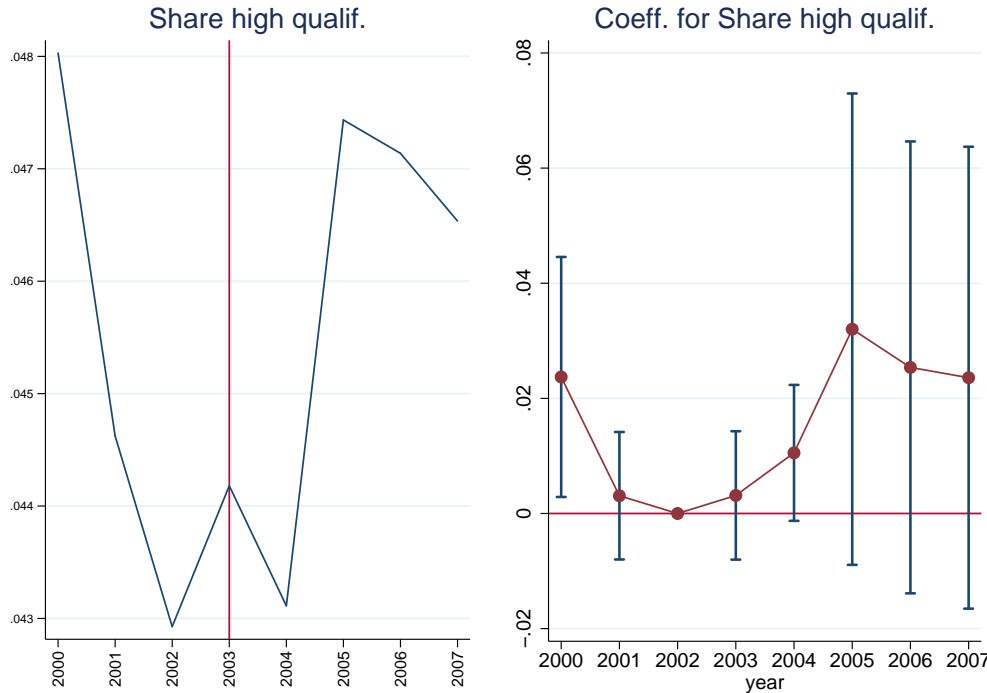
Note: LIAB Cross-Sectional Model (weighted).

Figure 12: Share medium qualification employment: evolution (left) and coefficient (right)



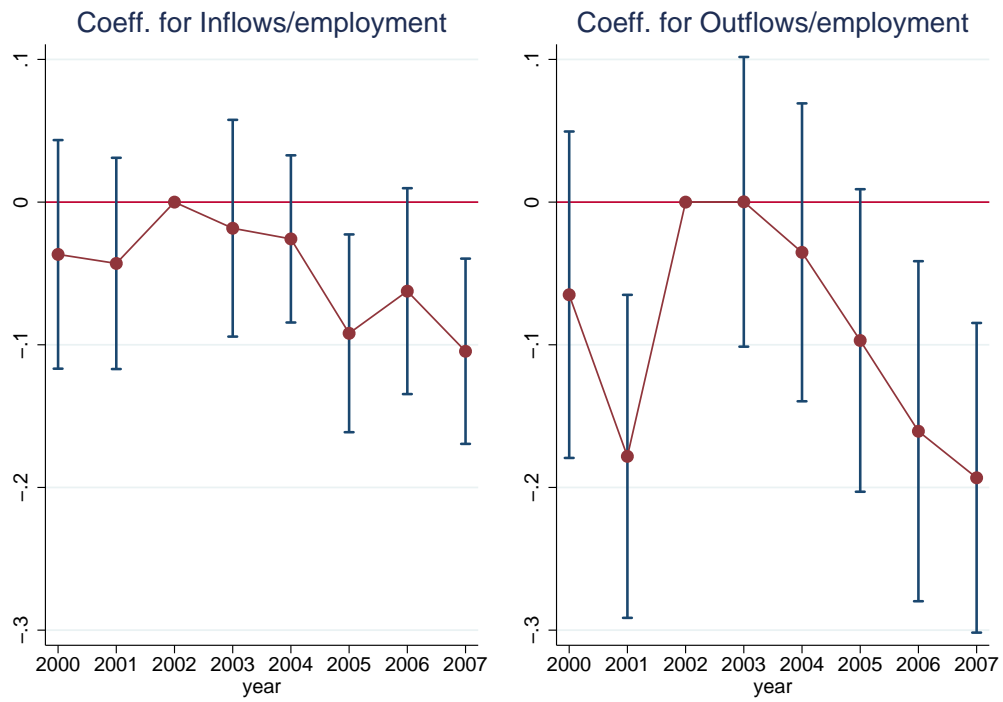
Note: LIAB Cross-Sectional Model (weighted).

Figure 13: Share high qualification employment: evolution (left) and coefficient (right)



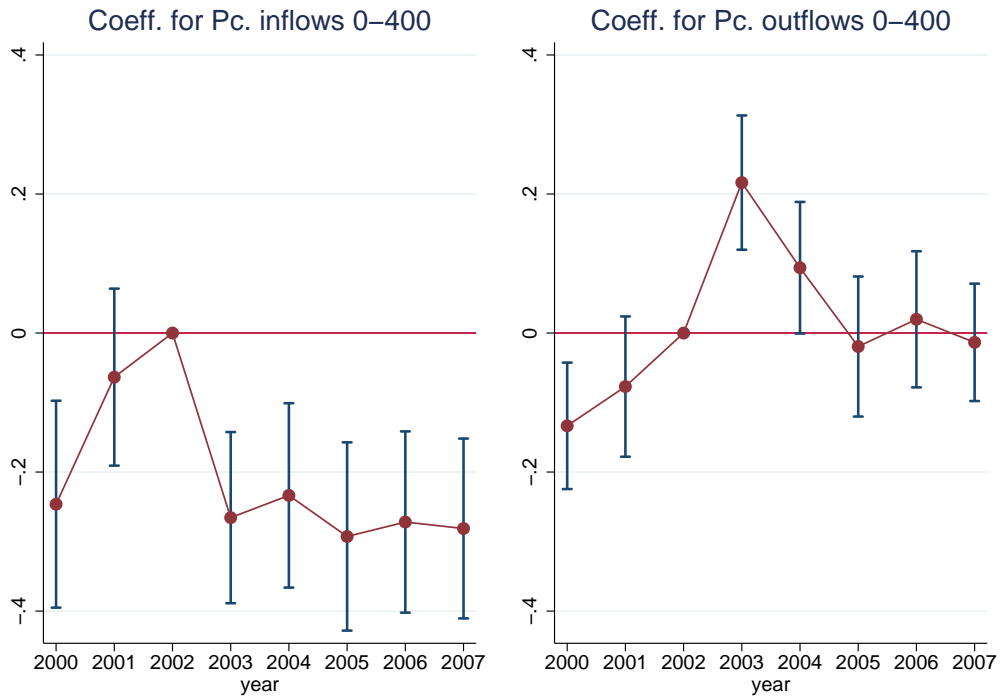
Note: LIAB Cross-Sectional Model (weighted).

Figure 14: Employment flows: hirings (left) and separations (right)



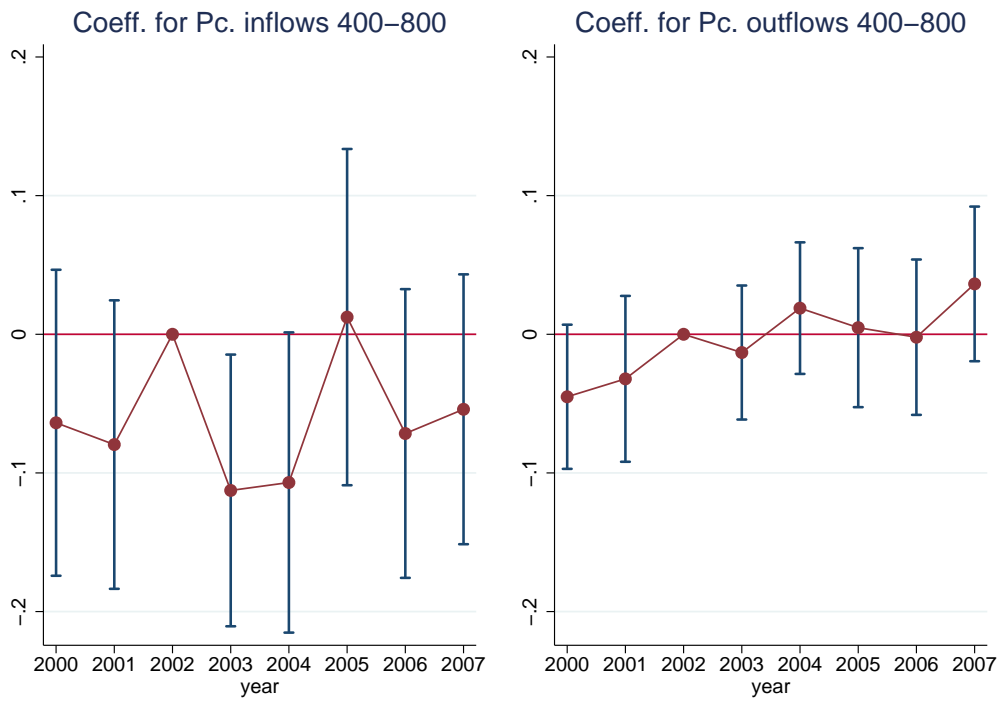
Note: LIAB Cross-Sectional Model (weighted).

Figure 15: Employment flows: hirings (left) and separations (right) in 0-400



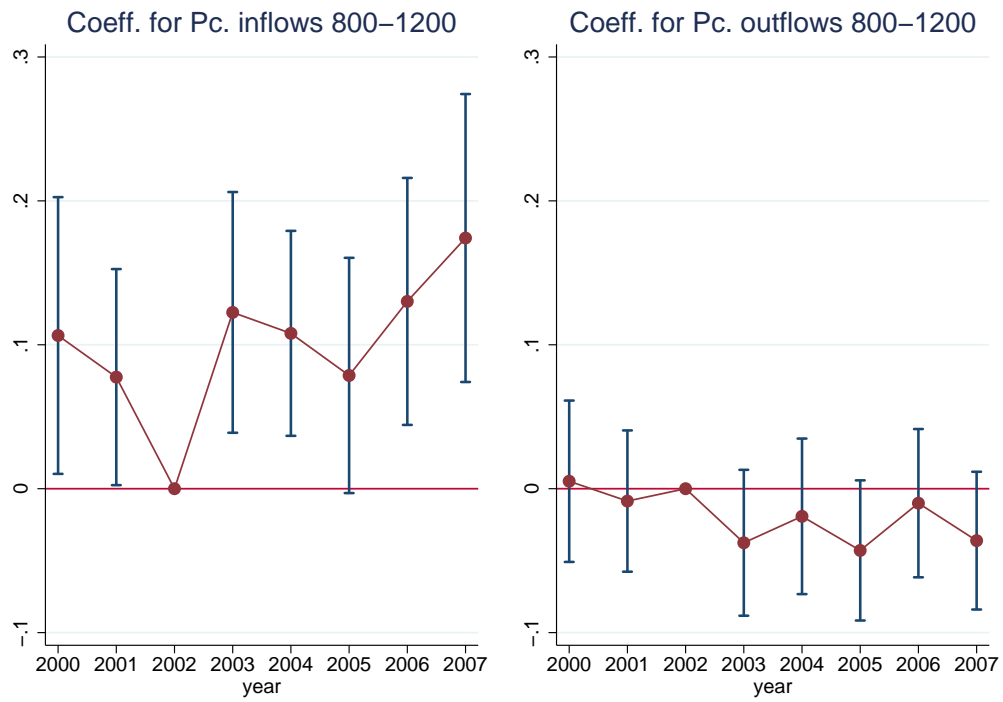
Note: LIAB Cross-Sectional Model (weighted).

Figure 16: Employment flows: hirings (left) and separations (right) in 400-800



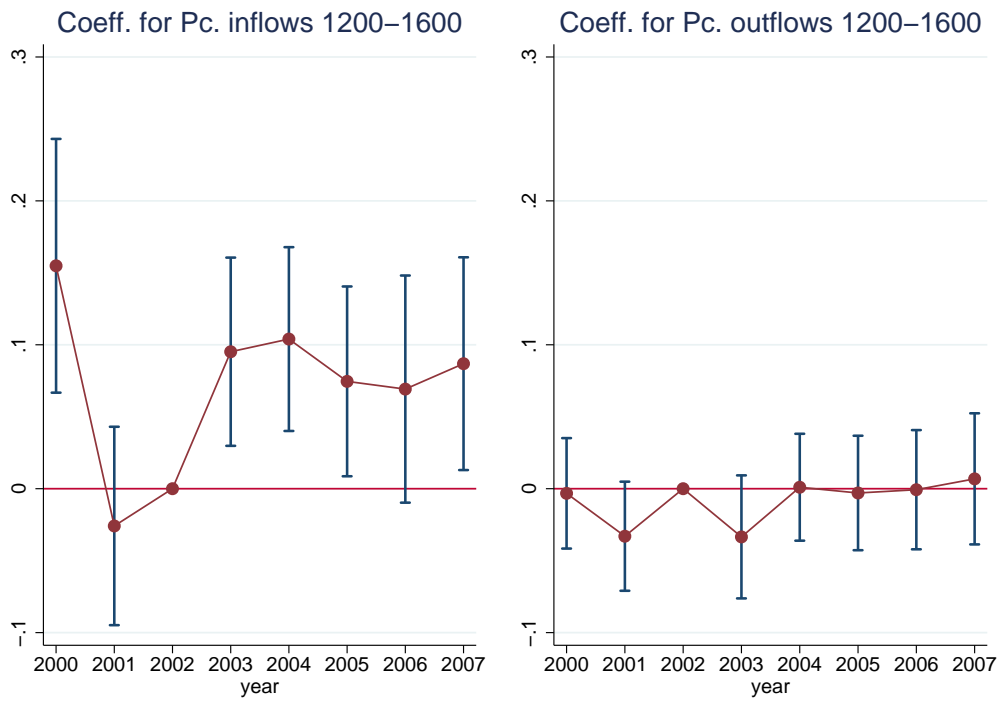
Note: LIAB Cross-Sectional Model (weighted).

Figure 17: Employment flows: hirings (left) and separations (right) in 800-1200



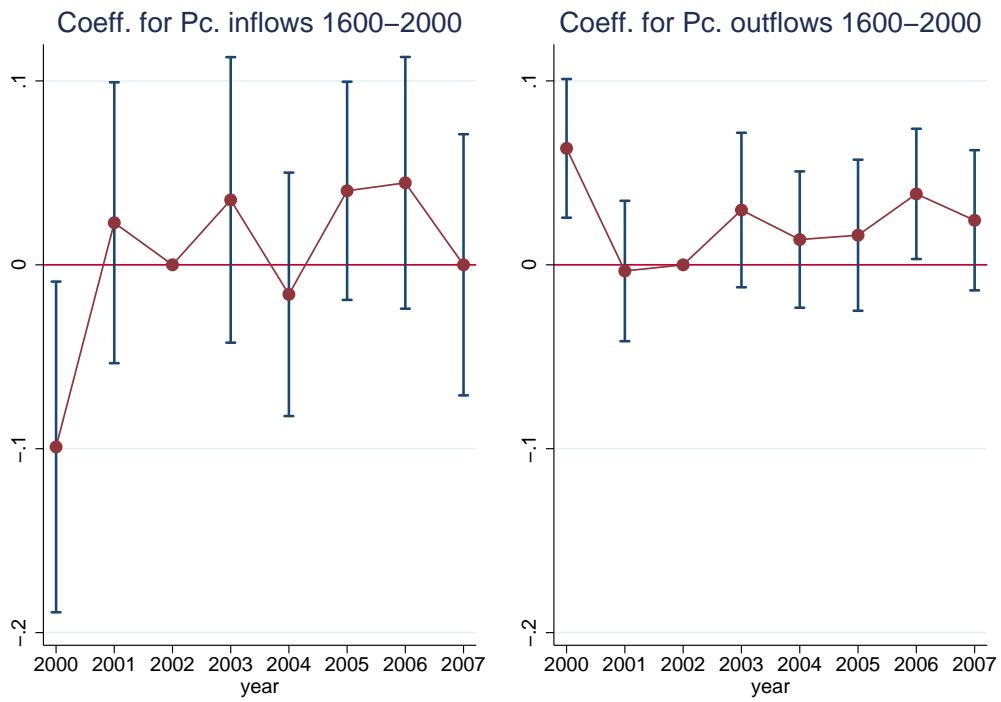
Note: LIAB Cross-Sectional Model (weighted).

Figure 18: Employment flows: hirings (left) and separations (right) in 1200-1600



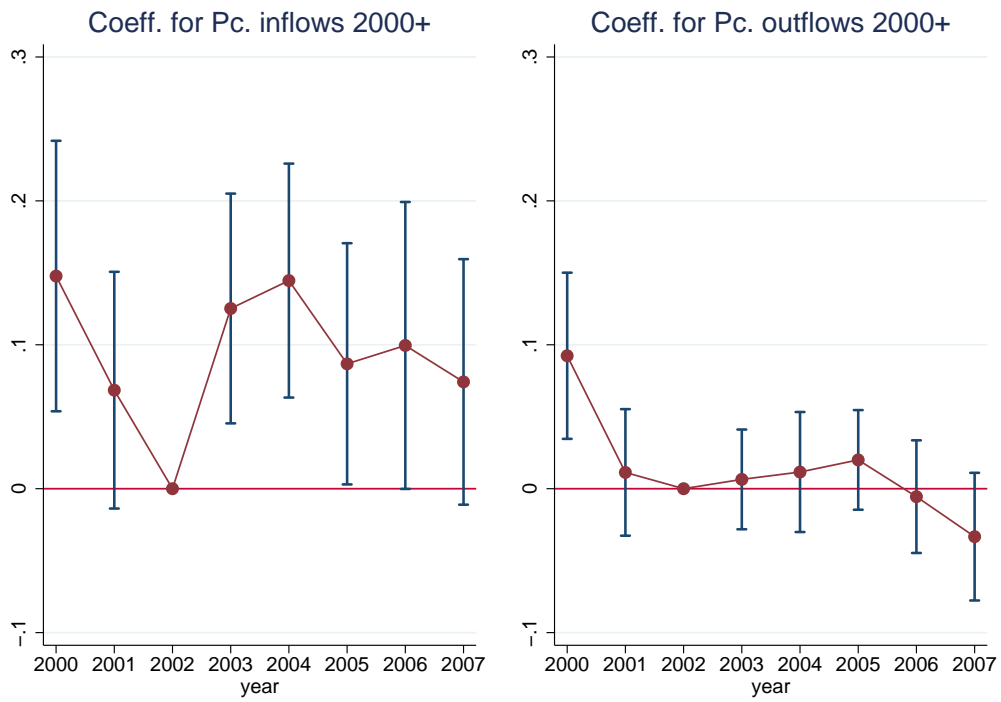
Note: LIAB Cross-Sectional Model (weighted).

Figure 19: Employment flows: hirings (left) and separations (right) in 1600-2000



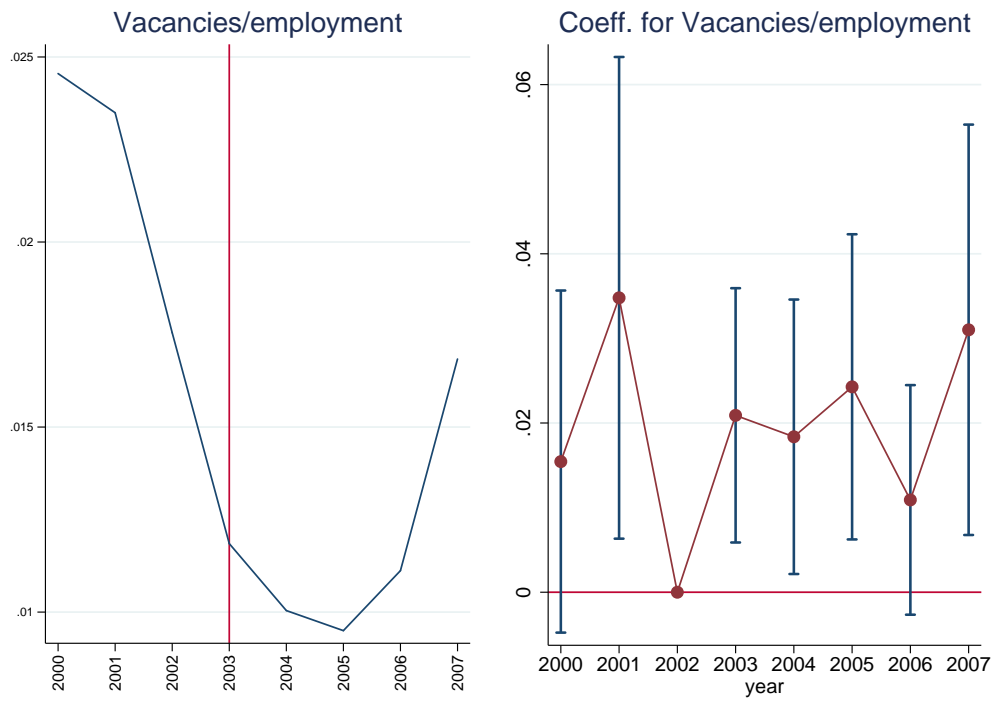
Note: LIAB Cross-Sectional Model (weighted).

Figure 20: Employment flows: hirings (left) and separations (right) in 2000+



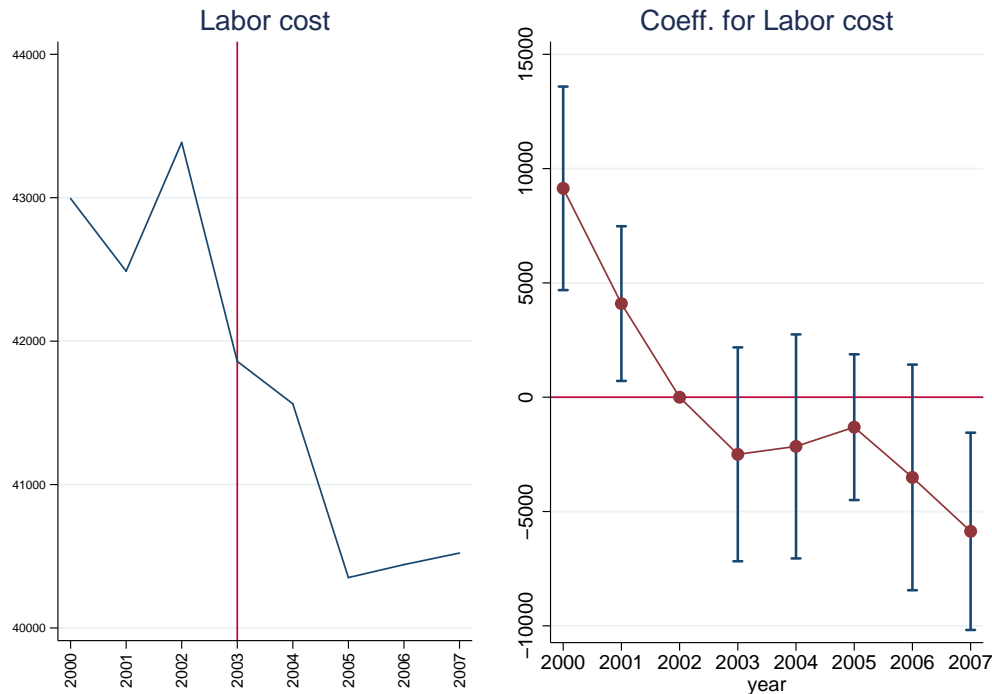
Note: LIAB Cross-Sectional Model (weighted).

Figure 21: Vacancies/employment: evolution (left) and coefficient (right)



Note: LIAB Cross-Sectional Model (weighted).

Figure 22: Labor costs: evolution (left) and coefficient (right)



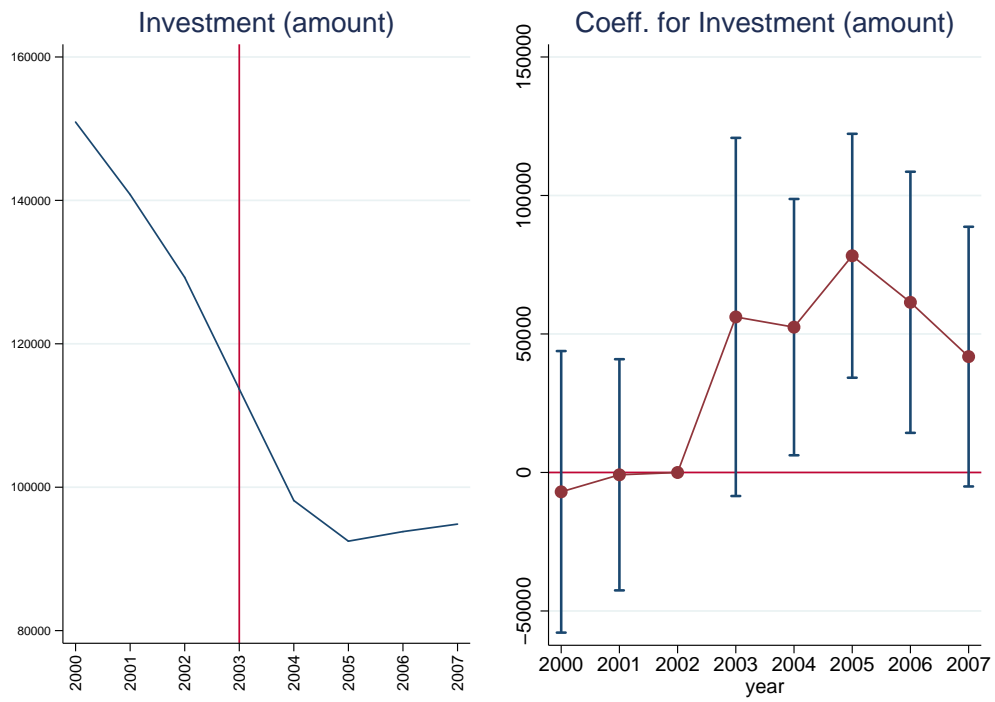
Note: LIAB Cross-Sectional Model (weighted).

after (though the coefficients are not statistically significant), as shown in figure (22). This result is not trivial, since highly exposed establishments can profit from lower unit labor costs on their workforce due to lower taxation, but they are expanding in employment at the same time. The coefficients cannot be interpreted as causal though, as the trends for different firm-types were not parallel in the pre-reform period.

The behavior of investment also speaks in favor of an expansion of highly exposed firms (the coefficient is significantly positive for 2004-2006, whereas it is insignificant before the reform), as shown in figure (23). It is interesting though that even if highly exposed establishments are expanding as compared to non-exposed units, there is not a clear positive effect in their amount of sales (figure (24)). This might raise a concern in terms of their productivity, or the type of firm profiting from the labor costs.

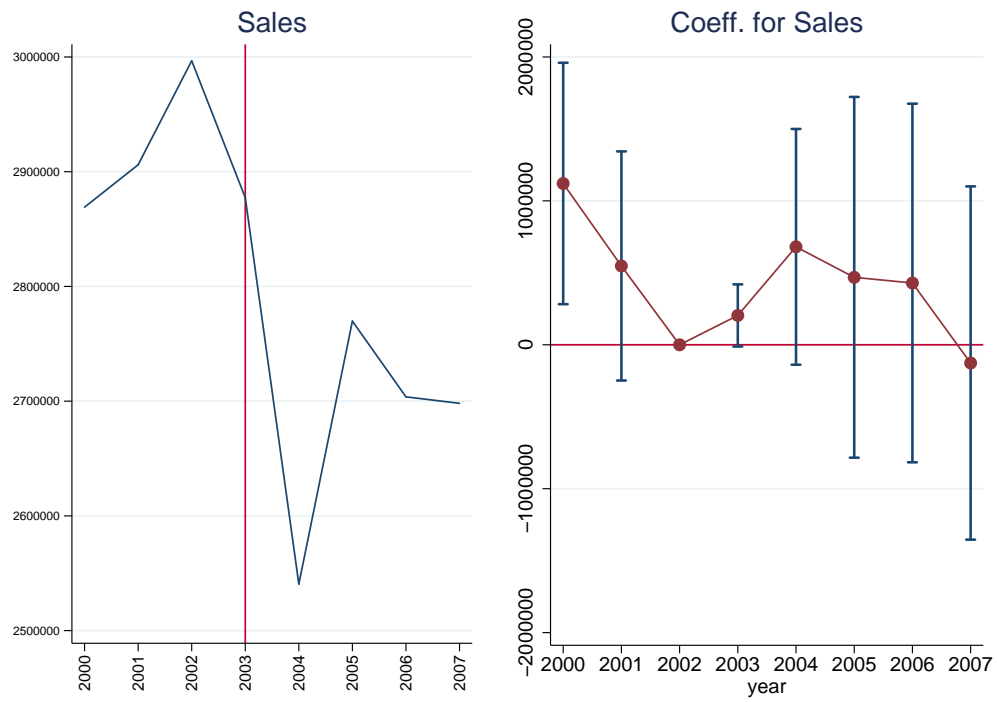
Overall, evidence from the establishment panel points in the direction of a relative scale increase in workplaces with a high pre-reform intensity in low-paid employment, made possible by costs savings potentially coming from the lower tax wedge on the workforce. Particularly interesting is the fact that this expansion is not disproportionately achieved through marginal, low skilled or part-time employment, typically associated to mini-jobs. On the other hand, non-exposed firms become more intensive in these forms of employment, potentially displacing regular employees given their employment is decreasing as compared to highly-exposed workplaces.

Figure 23: Investment: evolution (left) and coefficient (right)



Note: LIAB Cross-Sectional Model (weighted).

Figure 24: Sales: evolution (left) and coefficient (right)



Note: LIAB Cross-Sectional Model (weighted).

The fact that in many outcomes analyzed the trends are parallel until the year of the reform, 2003, rules out the possibility that there is an anticipation in firm behavior. Intuitively, even if the reform was anticipated by agents, and both workers and firm potentially had started the search process before April 2003, there were no incentives particularly for workers to take up a mini-job before the reform.¹¹ Figure (29) in the Appendix shows the evolution of the bunching at the mini-job threshold. The fact that the bunching shifts from €325 in 2002 to €400 in 2003 confirms the intuition of lack of anticipation.

5.3 Employment and substitution effect

Table (6) shows the total number of workers in the SIAB¹², for before (2002) and after (2004) the reform, below and above the threshold. The last three columns present the elements described in equations (4)-(7). I show the numbers for the aggregate of workers (in prime age, 26 to 59 years old), and disaggregated by age groups, education and gender.

Overall, there is evidence of a small disemployment effect, corresponding to 4% of the initial low-wage mass. However, this is very heterogeneous across worker types. Young workers (below 35 years old) suffer the most with a negative employment change of 90% of the initial mass of low-wage employees, whereas a positive employment change is concentrated for workers above 45 years old (51% for 45-54 years old and 31% for 55-59). As per education group, the disemployment only accrues to low educated workers (-14%), while there is a positive employment change (higher than 100%) among apprentices and professionals. Finally, whereas for women the net employment change is positive (+8%), it is negative and strong for men (-55%).

Figure (25) shows the distribution of earnings by type of establishment, in terms of pre-reform intensity in low-paid employment. A visual inspection of the changes between before and after the reform shows that the establishments which were less intensive are those which bunch the most after the reform at the €400 threshold. Distribution of earnings within establishments with higher intensity on the other hand do not change seemingly. This heterogeneity in the changes by type of establishment highlights the possibility to gain understanding by analyzing the earnings distribution grouping productive units by characteristics. It is also a hint that establishments with a lower pre-reform intensity in low-paid jobs are the ones responding the strongest, potentially substituting regular employment with tax-advantaged jobs.

6 Robustness Checks

In this section, I show that the results are robust to different definitions of highly exposed and non-exposed firms. First, noticing that part-time occupations have a higher incidence among mini-jobs (68% compared to 16% in regular employment in prime-age population in 2005), I use the pre-reform proportion of part-time workers in an establishment to define its degree of exposition. The idea is that units with a production function more intensive

¹¹This argument is used as part of the identification of the effect of the Mini-Job reform in Caliendo and Wrohlich (2010). The authors use the precise date of the reform, comparing responses of individuals before and after that date in the G-SOEP.

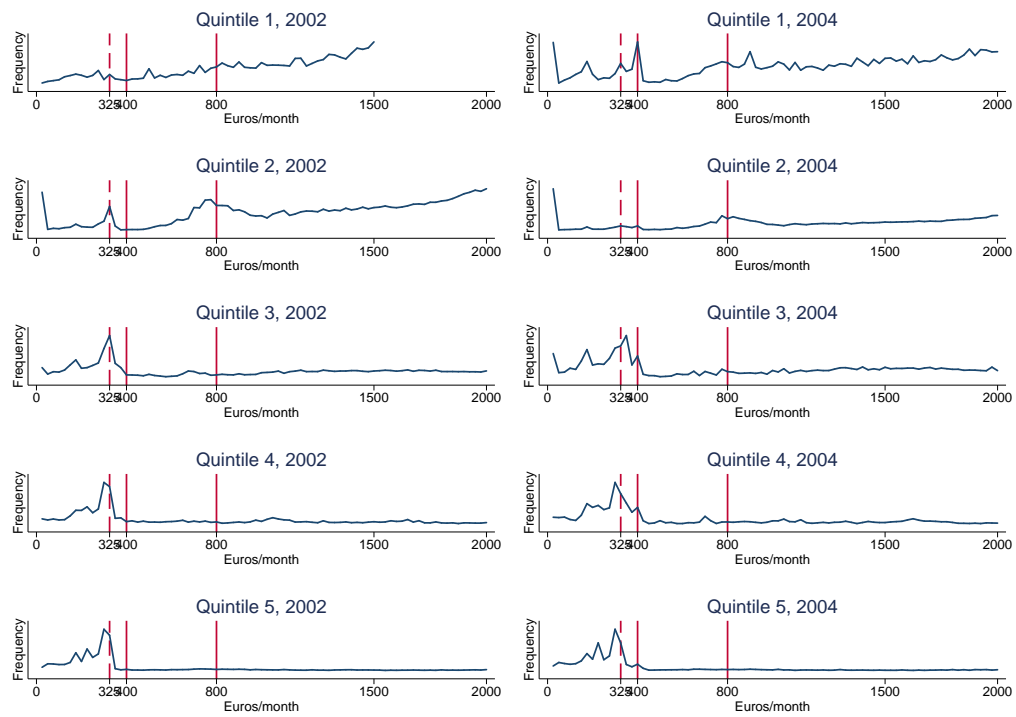
¹²Number of workers are not weighted because the SIAB is a random sample of the population.

Table 6: Employment below and above the mini-job threshold

	2002	2004	Diff	Net	$\frac{Emp_1(MJ) - Emp_0(MJ)}{Emp_0(MJ)}$	$-\frac{Emp^-(MJ)}{Emp_0(MJ)}$	$\Delta Emp^+(MJ)$
<i>All (26-59 years old)</i>							
Below	42,542	54,485	11,943	-1,532	0.28	-0.32	-0.04
Above	442,652	429,177	-13,475				
<i>26-34 years old</i>							
Below	10,286	13,915	3,629	-9,381	0.35	-1.26	-0.91
Above	111,660	98,650	-13,010				
<i>35-44 years old</i>							
Below	15,289	19,905	4,616	252	0.30	-0.29	0.02
Above	165,773	161,409	-4,364				
<i>45-54 years old</i>							
Below	11,733	14,500	2,767	5,963	0.24	0.27	0.51
Above	126,373	129,569	3,196				
<i>54-59 years old</i>							
Below	5,234	6,165	931	1,634	0.18	0.13	0.31
Above	38,846	39,549	703				
<i>High school graduates and drop-outs</i>							
Below	38,907	48,555	9,648	-5,607	0.25	-0.39	-0.14
Above	354,922	339,667	-15,255				
<i>Apprentices</i>							
Below	2,702	4,384	1,682	3,111	0.62	0.53	1.15
Above	51,691	53,120	1,429				
<i>Professionals</i>							
Below	933	1,546	613	964	0.66	0.38	1.03
Above	36,039	36,390	351				
<i>Male</i>							
Below	7,573	10,455	2,882	-4,184	0.38	-0.93	-0.55
Above	246,193	239,127	-7,066				
<i>Female</i>							
Below	34,969	44,030	9,061	2,652	0.26	-0.18	0.08
Above	196,459	190,050	-6,409				

Note: SIAB.

Figure 25: Distribution of earnings of workers by type of establishment (pre-reform intensity in low-paid employment)



Note: LIAB Cross-Sectional Model.

in part-time occupations find it easier to expand the proportion of mini-jobs given their tax advantage.

Secondly, I use the proportion of marginal part-time workers at the establishment level as reported in the Establishment History Panel (BHP). This is different to the definition used previously, where the earnings of the worker is used to define her as mini-job or not.

Another robustness check consists of considering the proportion of workers between the old threshold (€325) and the new threshold (€400) for the definition of the degree of exposure to the Mini-Job Reform.

7 Conclusions

This paper provides an empirical analysis of firm responses to in-work benefit in the form of tax reductions to low-earnings workers. Unlike the existing literature, which has focused mainly on *labor supply* responses to such interventions, I provide an analysis of the *labor demand* response. I analyze this response in the context of the German mini-job reform of 2003, which had a dramatic impact on the German labor market. Today, about 25% of all private sector workers hold “marginal” jobs that qualify for the tax benefits.

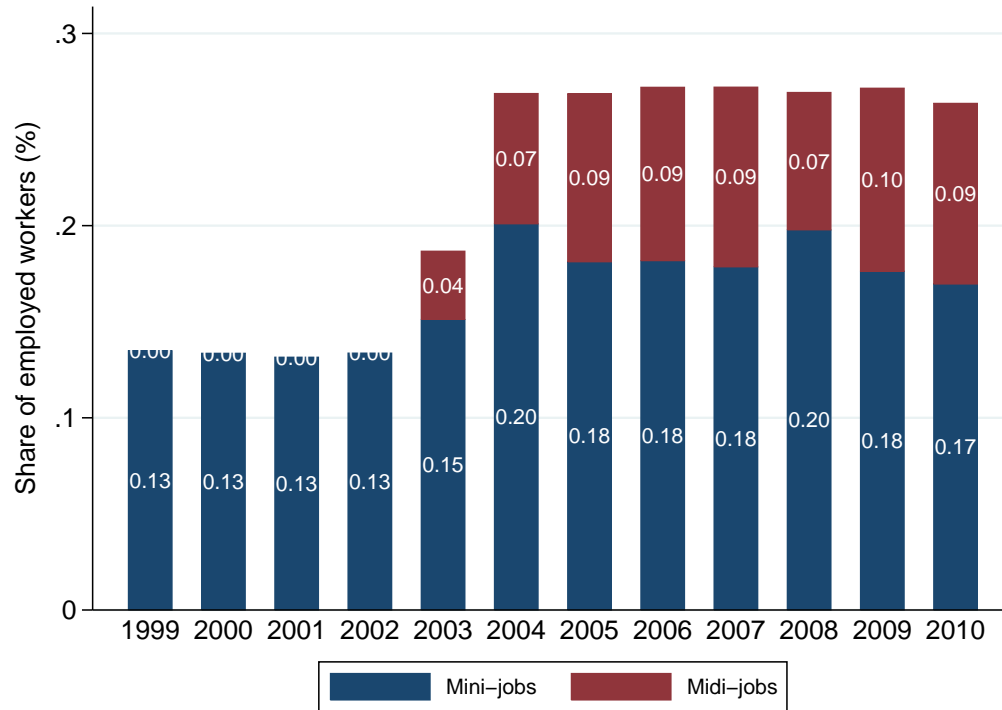
The theory of tax incidence predicts that employers might share part of the tax benefits provided to workers. Firm outcomes and responses are affected both by the implied decrease in total labor costs (and thus a “scale effect”), and the change in the relative costs of tax-advantaged versus non-tax-advantaged workers (and thus a “substitution effect”). In this study, I use administrative social security and linked employer-employee data that allows me to characterize firm responses in these terms.

A descriptive analysis of workers flows around the earnings threshold for the tax benefits suggest that firms do not cut wages directly, but create over-proportional new employment in the low wage sector through new hires. Similar to existing identification strategies in the minimum wage literature, I exploit differences in the exposure to the mini-job reform across different firms and regions to estimate the reforms’ effect on unit-level firm outcomes.

The results indicate a relative expansion in terms of labor and capital in highly-exposed production units, potentially possible thanks to the labor costs savings derived from the reform. Interestingly, the expansion does not seem biased towards the type of workers (low skilled, part-time, women) targeted by the tax benefits. At the same time, less-exposed units exhibit relative increases in marginal employment. Given these firms are contracting relatively, this result hints on the direction of a substitution of regular employment in these units. Further indication of such a substitution effect is provided by a change in the wage distribution around the time of the reform.

This project is work-in-progress, which is currently focused on a suitable theoretical framework to explain these results, as well as a refined identification strategy for measuring the substitution effects. The findings presented so far are interesting on their own because they suggest that incentives targeted at workers can have strong labor demand effects. They also help to shed light on the ongoing public debate regarding the pervasive effect of the mini-job reform, often cited as a major cause of the increase in precarious employment in

Figure 26: Share mini and midi-jobs in total private wage-employment



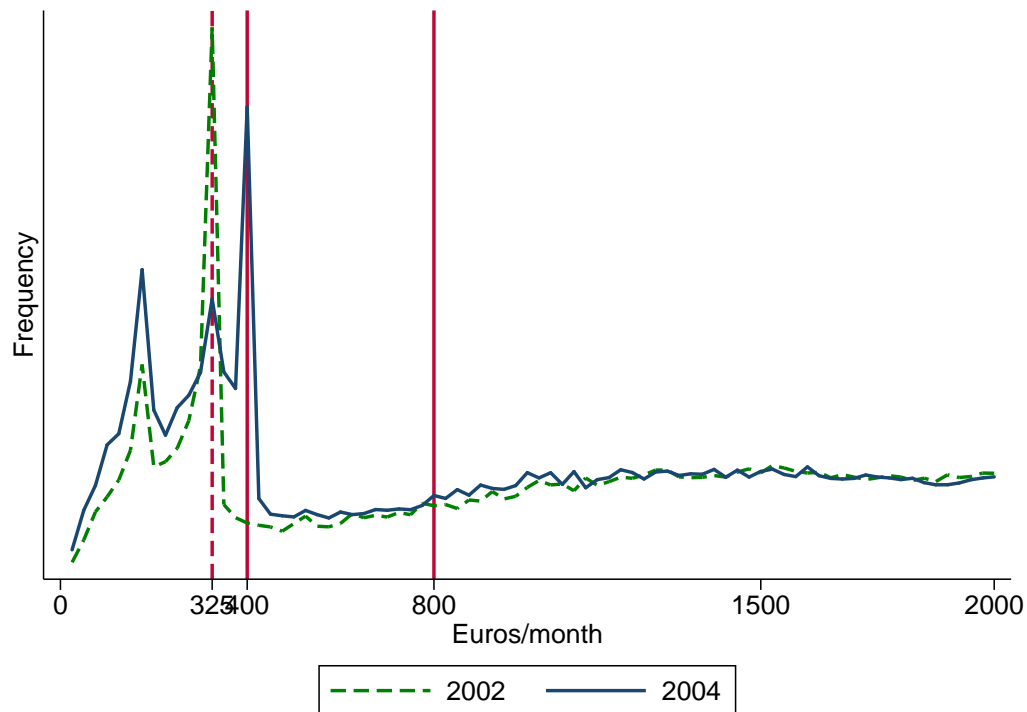
Note: SIAB, using definitions before and after the reform (main and secondary jobs). Workers 17-65 years old. Germany.

8 Appendix

8.1 General descriptives

8.2 Descriptives LIAB

Figure 27: Monthly gross earnings in main job



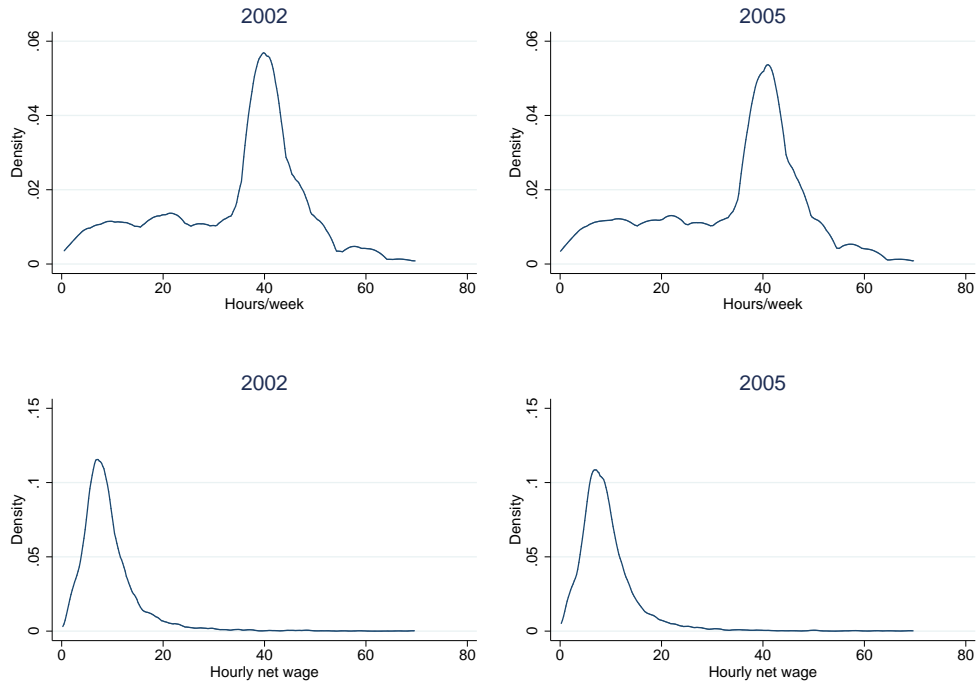
Note: SIAB, daily wage converted to monthly, workers 26-59 years old (prime-age population), excluding trainees, employees in partial retirement, interns, student interns and casual workers.

Table 7: Composition of working age population in Germany, 2005

	Prop. (%)	Hours/ week	Hr. wage	Month. gross earn.
Inactive	15.1			
Studying	3.4			
Unemployed	5.0			
Irregularly employed	2.4			
Part-time	6.7	13 (5.68)	19 (21.20)	1,640 (1114.38)
Full-time	49.1	41 (9.50)	9 (4.16)	2,634 (1564.93)
Mini-job (main)	10.4	14 (12.00)	10 (25.59)	267 (161.51)
Mini-job (secondary)	1.9	40 (13.97)	9 (6.59)	2,456 (1214.64)
Midi-job (main)	5.8	26 (13.86)	8 (16.41)	626 (166.63)
Midi-job (secondary)	0.3	36 (16.96)	15 (12.38)	3,123 (1101.77)
Total	100.0	34 (15.21)	10 (11.94)	2,021 (1625.73)

Note: G-SOEP. Hours worked, hourly net earnings and monthly gross earnings are reported only for those who have a positive declaration. Workers 17-65 years old.

Figure 28: Weekly hours of work and hourly net earnings in all occupations



Note: G-SOEP (social security records do not have information on hours worked).

Table 8: Transitions between 2002 and 2005

<i>Row totals</i>	Unemployed	Mini-job	Midi-job	Regular PT	Regular FT	Regular other	Total
Unemployed	60%	10%	2%	5%	22%	0%	100%
Mini-job	13%	60%	5%	9%	13%	1%	100%
Regular PT	7%	9%	7%	66%	11%	0%	100%
Regular FT	7%	2%	1%	3%	87%	0%	100%
Regular other	12%	5%	2%	11%	64%	6%	100%
Total	12%	8%	2%	13%	64%	0%	100%
<i>Column totals</i>	Unemployed	Mini-job	Midi-job	Regular PT	Regular FT	Regular other	Total
Unemployed	48%	13%	10%	4%	3%	18%	10%
Mini-job	7%	51%	14%	5%	1%	17%	7%
Regular PT	8%	17%	40%	74%	3%	19%	14%
Regular FT	36%	19%	35%	17%	92%	33%	68%
Regular other	0%	0%	0%	0%	0%	14%	0%
Total	100%	100%	100%	100%	100%	100%	100%

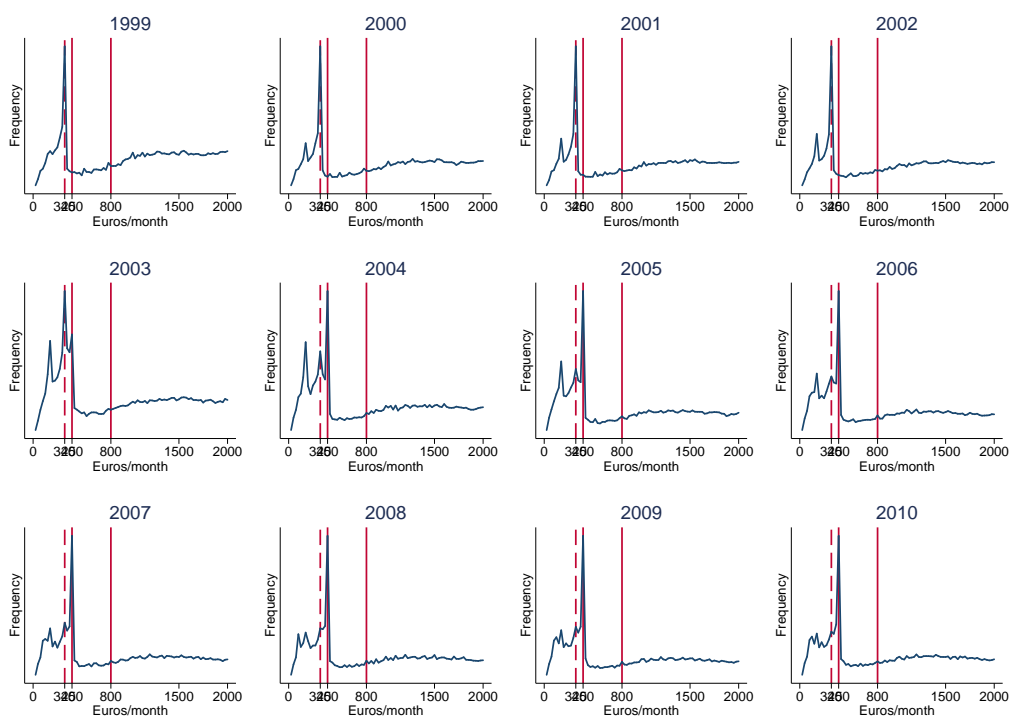
Note: SIAB. 25-55 years old (prime-age population).

Table 9: Transitions and duration of spells, before and after the Mini-Job Reform

	1Jan2002-31Mar2003	1Apr2003-31Dec2004
<i>Transitions</i>		
Non-employment to employment	0.620 (0.485)	0.602 (0.489)
Employment to non-employment	0.177 (0.381)	0.202 (0.401)
Employment to employment	0.0701 (0.255)	0.106 (0.307)
Non-employment to mini-job	0.193 (0.395)	0.252 (0.434)
Non-employment to midi-job		0.0654 (0.247)
Non-employment to regular employment	0.427 (0.495)	0.285 (0.451)
Mini-job to non-employment	0.330 (0.470)	0.296 (0.457)
Midi-job to non-employment		0.248 (0.432)
Regular employment to non-employment	0.151 (0.358)	0.156 (0.363)
Mini-job to midi-job		0.0521 (0.222)
Mini-job to regular employment	0.197 (0.397)	0.0819 (0.274)
Midi-job to mini-job		0.138 (0.345)
Midi-job to regular employment		0.186 (0.389)
Regular employment to mini-job	0.0175 (0.131)	0.0508 (0.220)
Regular employment to midi-job		0.0373 (0.189)
<i>Durations</i>		
Duration mini-job	188.9 (227.6)	196.6 (162.6)
Duration midi-job		177.1 (133.0)
Duration regular employment	284.1 (177.0)	247.1 (135.6)

Note: SIAB spell data. Job-to-job transitions correspond to adjacent employment spells, separated by less than 15 days. Non-employment state comes both from registers of benefit reception or job seeking, and gaps in registries of 15 days or more.

Figure 29: Monthly gross earnings in main job



Note: SIAB, daily wage converted to monthly, workers 26-59 years old (prime-age population), excluding trainees, employees in partial retirement, interns, student interns and casual workers.

Table 10: Characteristics of unemployed, mini and midi-jobbers, and regular workers

	Unemployed	Mini-job	Midi-job	Regular employment
<i>Demographics and socio-economics</i>				
Women	0.43	0.79	0.84	0.42
Age	39	39	39	39
Secondary or less	0.91	0.91	0.88	0.79
Apprenticeship	0.06	0.07	0.09	0.13
Higher education	0.03	0.02	0.03	0.08
Married	0.44	0.60	0.63	0.51
Single parent	0.24	0.19	0.20	0.20
Head of HH*	0.43	0.48	0.44	0.68
Per capita annual HH income*	9,764	9,911	10,665	14,247
<i>In 2002</i>				
Employment experience	7.5	8	8.9	12.6
Tenure in job	3.0	2.7	3.4	6.4
Part-time	0.14	0.58	0.57	0.16
Full-time	0.37	0.29	0.33	0.80
Weekly working hours*	7	15	21	38
<i>In 2005</i>				
Part-time		0.83	0.68	0.16
Full-time		0.16	0.31	0.84
Hourly net wage*		9.3	8.7	10.0
Weekly working hours*		11	18	40

Note: SIAB, except for marked with “*” which are from G-SOEP. Classification in unemployed, mini, midi and regular workers corresponds to 2005.

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Table 11: Characteristics of unemployed in first quarter of 2003, according to their first transition during the year (mini-job, midi-job, regular worker) or if they remained unemployed (25-55 years old)

	Unemployed	Mini-job	Midi-job	Regular employment
<i>Demographics and socio-economics</i>				
Women	0.447 (0.497)	0.557 (0.497)	0.623 (0.485)	0.306 (0.461)
Age	40.92 (8.699)	39.59 (8.486)	37.75 (8.533)	38.37 (8.515)
Migrant	0.128 (0.334)	0.126 (0.332)	0.148 (0.355)	0.0988 (0.298)
Secondary or less	0.901 (0.299)	0.926 (0.261)	0.915 (0.279)	0.895 (0.307)
Apprenticeship	0.0628 (0.243)	0.0529 (0.224)	0.0632 (0.243)	0.0674 (0.251)
Higher education	0.0362 (0.187)	0.0208 (0.143)	0.0217 (0.146)	0.0381 (0.191)
Married	0.492 (0.500)	0.547 (0.498)	0.530 (0.499)	0.503 (0.500)
In couple	0.500 (0.500)	0.554 (0.497)	0.543 (0.498)	0.509 (0.500)
Single parent	0.214 (0.410)	0.221 (0.415)	0.243 (0.429)	0.186 (0.389)
Children	0.520 (0.500)	0.603 (0.489)	0.590 (0.492)	0.514 (0.500)
<i>Work history</i>				
Employment experience	2556.6 (2405.1)	2655.0 (2130.0)	2325.9 (2092.0)	2994.4 (2234.8)
Spells of benefit receipt	4.163 (3.588)	4.032 (3.252)	3.771 (3.622)	4.604 (4.030)
Duration benefit receipt	1457.5 (1376.1)	1215.7 (1124.1)	933.3 (956.7)	911.3 (889.4)
Unemployment duration	1365.3 (1783.3)	415.4 (683.0)	377.6 (770.8)	417.6 (806.0)
Remaining UB claim	27.90 (87.88)	34.86 (95.18)	61.94 (118.9)	117.1 (149.9)
Worker	0.531 (0.499)	0.577 (0.494)	0.552 (0.498)	0.608 (0.488)
Student	0.272 (0.445)	0.259 (0.438)	0.277 (0.448)	0.266 (0.442)
Others not employed	0.125 (0.330)	0.0960 (0.295)	0.131 (0.338)	0.0875 (0.283)
Incapacity to work	0.0728 (0.260)	0.0686 (0.253)	0.0393 (0.195)	0.0385 (0.192)
Monthly earnings main job	633.7 (276.4)	600.3 (249.4)	523.2 (229.5)	746.9 (274.1)
Monthly earnings, total	494.4 (359.9)	474.4 (330.6)	369.1 (307.5)	647.0 (361.3)
<i>Work outcomes (31/12/2003)</i>				
Unemployed	1 (0)	0.190 (0.392)	0.192 (0.394)	0.237 (0.425)
Mini-job	0 (0)	0.695 (0.460)	0.0484 (0.215)	0.0186 (0.135)
Midi-job	0 (0)	0.0185 (0.135)	0.702 (0.457)	0.00354 (0.0594)
Regular employment	0 (0)	0.0965 (0.295)	0.0579 (0.234)	0.741 (0.438)
Monthly earnings main job	603.6 (242.6)	406.3 (439.6)	630.6 (279.4)	1515.8 (2536.2)
Monthly earnings, total	483.9 (329.9)	654.7 (444.6)	660.1 (337.2)	1498.7 (2526.1)

Note: SIAB, quarterly data. Job-to-job transitions correspond to adjacent employment spells, separated by less than 15 days. Non-employment state comes both from registers of benefit reception or job seeking, and gaps in registries of 15 days or more.

Table 12: Characteristics of establishments in LIAB, 2002, weighted vs. unweighted

	Unweighted	Weighted
Age	41.00	40.51
Migrant	0.0403	0.0633
Secondary or less	0.873	0.897
Apprenticeship	0.0775	0.0662
Higher education	0.0495	0.0365
Establishment age	14.49	14.23
Share below 2003 MJ threshold	0.165	0.295
	(0.230)	(0.307)
Employment	161.6	18.45
Share of marg. PT	0.105	0.204
Share part-time (BHP)	0.229	0.321
Share temporary	0.0533	0.0305
Share unqualif.	0.126	0.115
Share med. qualif. (BHP)	0.659	0.580
Share high qualif. (BHP)	0.0748	0.0429
	(0.147)	(0.138)
Share female	0.464	0.567
Vacancies/employment	0.0137	0.0175
	(0.0780)	(0.0719)
Mean labor cost	1747.8	1396.0
Mean gross wage (Workers file)	1757.4	1376.4
	(779.8)	(758.9)
Inflows/employment	0.169	0.191
	(0.185)	(0.228)
Pc. inflows 0-400	0.227	0.317
Pc. inflows 400-800	0.162	0.167
Pc. inflows 800-1200	0.114	0.104
Pc. inflows 1200-1600	0.141	0.105
Pc. inflows 1600-2000	0.112	0.0913
Pc. inflows 2000+	0.245	0.216
Outflows/employment	0.254	0.263
Pc. outflows 0-400	0.180	0.179
Pc. outflows 400-800	0.0716	0.0636
Pc. outflows 800-1200	0.0921	0.0543
Pc. outflows 1200-1600	0.115	0.0785
Pc. outflows 1600-2000	0.0989	0.0642
Pc. outflows 2000+	0.231	0.122
Work council	0.387	0.0993
Collective agreement	0.572	0.446
Sales	31215526.3	2996678.5
Percentage exports	10.51	4.134
Investment (amount)	2285994.5	129269.4
Labor cost ratio	0.0226	0.0215
Sales ratio	1.014	1.013
Observations	3,772	3,772

Table 13: Characteristics of establishments in LIAB, 2002, by quintiles of intensity in low-wage employment

	1	2	3	4	5	Total
Age	39.61	40.43	39.36	40.33	43.80	40.51
Migrant	0.0817	0.0694	0.0492	0.0524	0.0594	0.0633
Secondary or less	0.890	0.835	0.887	0.898	0.967	0.897
Apprenticeship	0.0656	0.0917	0.0803	0.0754	0.0186	0.0662
Higher education	0.0441	0.0730	0.0325	0.0265	0.0149	0.0365
Establishment age	14.47	18.03	14.72	13.09	11.93	14.23
Share below 2003 MJ threshold	0	0.0597	0.217	0.410	0.710	0.257
Employment	6.693	93.18	14.77	9.078	6.271	18.45
Share of marg. PT (BHP)	0.00305	0.0467	0.170	0.332	0.559	0.204
Share part-time	0.129	0.175	0.290	0.421	0.674	0.321
Share temporary	0.0236	0.0486	0.0327	0.0153	0.0420	0.0305
Share unqualif.	0.0889	0.135	0.125	0.132	0.117	0.115
Share med. qualif. (BHP)	0.655	0.649	0.614	0.510	0.436	0.580
Share high qualif. (BHP)	0.0549	0.104	0.0401	0.0283	0.00365	0.0429
Share female	0.458	0.429	0.605	0.631	0.715	0.567
Vacancies/employment	0.0305	0.0140	0.0126	0.0152	0.00751	0.0175
Mean labor cost	1518.0	2164.7	1545.7	1089.4	783.6	1396.0
Mean gross wage	1777.5	2161.7	1457.1	997.6	484.2	1376.4
Inflows/employment (BHP)	0.141	0.179	0.188	0.250	0.231	0.191
Pc. inflows 0-400	0	0.116	0.321	0.465	0.797	0.317
Pc. inflows 400-800	0.0904	0.162	0.230	0.172	0.132	0.167
Pc. inflows 800-1200	0.221	0.0990	0.0822	0.0897	0.0216	0.104
Pc. inflows 1200-1600	0.136	0.130	0.106	0.0965	0.0396	0.105
Pc. inflows 1600-2000	0.153	0.133	0.0863	0.0596	0.00601	0.0913
Pc. inflows 2000+	0.399	0.359	0.174	0.117	0.00353	0.216
Outflows/employment (BHP)	0.302	0.188	0.205	0.257	0.330	0.263
Pc. outflows 0-400	0.0684	0.139	0.228	0.235	0.265	0.179
Pc. outflows 400-800	0.0401	0.0597	0.0959	0.0420	0.0796	0.0636
Pc. outflows 800-1200	0.0520	0.0900	0.0608	0.0434	0.0377	0.0543
Pc. outflows 1200-1600	0.0640	0.133	0.0814	0.0995	0.0451	0.0785
Pc. outflows 1600-2000	0.0938	0.117	0.0603	0.0324	0.0188	0.0642
Pc. outflows 2000+	0.123	0.344	0.147	0.0664	0.00409	0.122
Work council	0.0908	0.385	0.0848	0.0429	0.0135	0.0993
Collective agreement	0.457	0.585	0.508	0.402	0.295	0.446
Sales	1118757.1	20753438.0	1626087.7	522275.6	355139.9	2996678.5
Percentage exports	3.542	12.45	2.524	3.340	3.047	4.134
Investment (amount)	44052.7	807067.0	76649.8	41062.4	15642.8	129269.4
Labor cost ratio	0.0186	0.0269	0.0236	0.0231	0.0180	0.0215
Sales ratio	1.016	1.034	1.004	1.004	1.019	1.013

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