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Abstract

We consider the determinants of the evolution of wage inequality in the context of the literature on entry and exit of establishments. Using several measures of wage inequality (overall, within-group, and between-groups), we conclude that shutdowns reduce overall and within-group inequality because they eliminate low-pay jobs. Startups increase wage-inequality between age and, especially, education groups, because newly-created establishments make staffing choices that are different from those made by continuously-operating establishments and establishments that shut down.

KEYWORDS: Wage Inequality, Labor Demand, Establishment Turnover.

JEL CODES: J23, J31.

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1 Introduction

Evidence on the evolution of earnings in the industrialized world unequivocally indicates a rise in inequality since the 1980s that has been much more pronounced in the United States and the United Kingdom than in Continental Europe. Although market forces and institutional factors are jointly responsible for changing earnings inequality everywhere, the more limited rise in inequality in Europe has been widely attributed to the fact that wage changes are bindingly constrained by the wage setting institutions in place there (Blau and Kahn, 1996). However, comparing trends in inequality in eight OECD countries, Gottschalk and Joyce (1998) concluded that much of the variation observed can be explained by market forces. They found that large offsetting supply and demand shifts are sufficient to explain the smaller increase in earnings inequality even in countries where institutions are usually thought of as binding.[1]

The focus on market forces revealed the role played not only by changes in relative factor supplies, but also by shifts in labor demand. The importance of such demand factors as international trade (Borjas and Ramey, 1994), skill-biased technological change (Berman *et al.*, 1994; Juhn, 1999), or the changing nature of firm-level wage-policies (Cardoso, 1999) has been pointed out. Despite the difficulty of singling out one dominant reason for the observed shifts in labor demand (Baldwin and Cain, 2000), there is general agreement that changes in wage inequality reflect an increase in relative demand for skilled workers (Autor *et al.*, 2008). Moreover, Katz and Murphy (1992) show that changes in the allocation of labor between industries and occupations were the driving force behind changes in U.S. wage distribution between 1963 and 1987.

[1] The importance of demand and supply forces in shapping between-group wage inequality has been earlier documented for Portugal by Centeno and Novo (2009).

Furthermore, we know from a large literature on the turnover and mobility of firms that similar firms in narrowly defined industries, even when facing similar market conditions, make different (and persistent) choices in terms of the (skill) composition of their workforce (Haltiwanger *et al.*, 1999).[2] Whereas heterogeneity in productivity and earnings of incumbent firms at any point in time may be accounted for by vintage effects (Lambson, 1991), more heterogeneous outcomes for new businesses could be the result of the complementary choices entrepreneurs make with regard to technology, organization, or managerial ability as part of the experimentation process of creating and running a business (Haltiwanger *et al.*, 2007). Allowing for the presence of labor adjustment costs further explains why incumbent firms - because they have more constraints to maintaining their worker-mix - may respond more slowly (if at all) to changes in their business environment and, for this reason, become a source of the observed persistence of workforce composition and stability of the earnings distribution.[3]

This article focuses on the determinants of changes in the wage distribution. We acknowledge the importance of demand factors and frame the problem in the context of the literature on the turnover of establishments. Although previously unexplored in this context, this is an appropriate setting considering how important the reallocation of labor across industries and occupations is known to be in terms of the evolution of wages. Our aim is to identify the role that establishment turnover plays in explaining changes in wage differences within and between groups of workers. Using a rich, longitudinally matched employer-employee dataset, we explore cross-regional variations to identify the causal effects of the turnover of establishments on earnings inequality. The focus on regional variations has the advantage

[2]For a survey of this literature and of its main results, see Caves (1998).

[3]In extreme cases, labor adjustment costs may bias firms' response to exogenous shocks toward the entry-exit margin, as is the case in Portugal (Varejão, 2003).

of guaranteeing a common institutional support, which allows us to concentrate on the role of market forces alone. Moreover, because we use data from a single source, full comparability of results across regions is assured. The analysis spans a 22-year period, from 1986 to 2007, and covers the universe of Portuguese establishments with wage-earners.[4]

The article is divided into five parts. Section 2 describes the dataset that we use to measure earnings inequality and the corresponding changes. Section 3 describes the evolution of wage inequality in Portugal over the years analyzed. In Section 4 we present the empirical strategy and analyze the relationship between changes in labor demand as manifested by flows of entry and exit of establishments and wage inequality. The final section concludes.

2 Data Description

The dataset of this study was constructed using the data from *Quadros de Pessoal* (*QP*). *QP* is an annual mandatory employment survey collected by the Portuguese Ministry of Labor that covers all establishments with wage earners. Every year, all employers with wage earners are legally obliged to fill in a standardized questionnaire.[5] Currently, the dataset contains yearly information on about 350,000 firms, 400,000 establishments and 3 million employees.

Data are available on each establishment (location, economic activity, and employment), the firm with which it is affiliated (location, economic activity, employment, sales, and legal framework) and each and every one of its workers (gender, age, education, skill, occupation, tenure, earnings, and duration of work). The information on earnings is very detailed and complete. It includes the base wage (gross pay for normal hours of work), regular benefits, irregular benefits, and

[4] Public Administration and non-market services are excluded.
[5] From 1986 to 1993 information is reported as of March, and as of October from 1994 on.

overtime pay, as well as the underlying mechanism of wage bargaining. Information on standard and overtime hours of work is also available.

The dataset is longitudinal in nature. Each firm/establishment entering the database is assigned a unique identifying number and the Ministry implements several checks to ensure that a unit that has previously reported to the database is not assigned a different identification number.

In this study we use *QP* data for the 24-year period from 1985 to 2008. Notwithstanding, the analysis is restricted to the years 1986 to 2007, for reasons that are detailed below. During this period, the Portuguese economy went through three complete business cycles.

Given the focus of this study, we construct a dataset at the level of the region, which is our unit of observation. We consider the Portuguese territory divided into 30 regions (28 on Portugal's mainland plus the isles of the Azores and Madeira), which correspond to the NUTS classification at the 3-digit level.[6]

Our final dataset is obtained from two separate building blocks. The first contains information on wage inequality and the characteristics of the workforce at the level of the region. It is obtained from *QP* worker-level files. Because these files do not exist for the years 1990 and 2001, we have 22 yearly observations for each region. Present in this block are four distinct measures of overall and within-group wage inequality: the coefficient of variation of hourly wages (CV), and the ratios between the 90^{th} and the 10^{th} (P90/P10), the 90^{th} and the 50^{th} (P90/P50), and the 50^{th} and the 10^{th} (P50/P10) percentiles of the hourly wage distribution.[7] All these measures of wage inequality are computed for the entire employed population of each region (overall inequality within

[6] NUTS - Nomenclature of Territorial Units for Statistics - classification is a hierarchical system for dividing up the economic territory of the EU for the purpose of data collection and framing regional policies. The 3-digit level is the lowest and corresponds to the smallest European regions.

[7] Hourly wages are defined as the ratio between the monthly base wage (gross pay for normal hours of work) and the total number of hours worked in the corresponding month. In order to avoid wage outliers, the top and bottom 1 percent observations were dropped from the data.

the region) and within groups in each region (within-group regional wage inequality). For this purpose, groups are defined according to gender, age (under 25, 25 to 34, 35 to 54, and above 54 years of age), and education (less than 9 years of schooling, 9 - the mandatory level of schooling, 12 complete years of schooling, and college education).

Measures of regional wage inequality between groups are also part of the first data block. They correspond to the estimates of the coefficients of the corresponding group variables in a Mincerian-type wage equation estimated separately for each year and each region. The dependent variable in all these equations is the log of hourly wages. The set of regressors includes controls for the workers' age, gender, tenure (and tenure squared), skill categories, and educational levels.[8] Worker attributes are assumed to be exogenous to the region. This would be a problem if there were spatial selection in the unobservables, the most likely candidate being ability. However, given our focus on the dynamics of earnings inequality, the problem is relevant only if spatial biases undergo important changes over the period (Duranton and Monastiriotis, 2002).[9] All wage equations were estimated by ordinary least squares (OLS) using *QP* worker data.

The characteristics of the workforce also included in this first data block are the gender, age, and education composition of those employed in each region's private sector.

The second building block of our final dataset contains information for each region and year on job turnover and the shares of employment creation and destruction accounted for by the entry and exit of establishments. All these variables were computed from *QP* establishment-

[8] For each of the workers' characteristics, the same categories as described above were considered. The categories omitted were: men (gender), under 25 years (age), less than mandatory schooling (education). For skills, we considered five categories: top and mid-level executives, supervisors, highly-skilled and skilled professionals, semi-skilled and unskilled professionals, and apprentices (omitted).

[9] We believe the problem is not as serious as in other national cases, given the notoriously low intensity of internal migration in Portugal (Tavares *et al.*, 2010). Besides, controlling for qualifications should control, at least partially, for ability.

level files. For each spell of the data, we identify an establishment entry whenever information for that establishment is reported to *QP* for the first time in the corresponding spell, *i.e.*, if the establishment is not present in any of the preceeding waves of the data.[10] Similarly, we identify an establishment exit in one year whenever information for the establishment is absent for that year and for all subsequent years, *i.e.*, if the establishment is not present in any of the subsequent waves of the data until 2008.[11] After identifying establishment entries and exits in every year, we computed the corresponding number of jobs created and destroyed by new and exiting establishments (see Davis *et al.*, 1996).Because we need at least one previous and two subsequent spells of the data to identify entries and exits, respectively, we cannot compute the rates of establishment turnover for 1985 and 2008. Furthermore, due to changes in the identification number of the establishments introduced in 1991 and to changes in the timing of data collection in 1994, we cannot correctly or consistently compute establishment turnover in these two years. For that reason, we dropped the corresponding information from our final dataset. As result, the second block of data has 20 yearly observations on the same 30 regions.

Merging these two data blocks, we obtain a panel on the 30 Portuguese regions with 18 years of complete data, which we use in the empirical work.

[10] For each year, we use all previous spells of the data to identify an entry. Entries in 1986 correspond to establishments reporting data for that year but not for 1985, whereas entries in 2008 correspond to establishments reporting data for that year but not for any of the previous 23 years. Due to the mandatory nature of *Quadros de Pessoal*, this procedure is not likely to influence the results and it has the advantage over the alternative procedure - use of a fixed number of previous spells to identify entries - of minimizing the loss of information.

[11] For each year, we use all subsequent spells of the data to identify an exit. Exits in 2007 correspond to establishments reporting data for 2006 but not for 2007 and 2008, whereas exits in 1986 correspond to establishments reporting data for 1985 but not for any of the subsequent 23 years. Again for the same reasons as for entries, and considering the alternatives available, this is our preferred procedure.

3 Trends in Wage Inequality

Figures 1 and 2 document the increase in wage inequality that occurred in the Portuguese economy between 1986 and 2007. These figures show that at the beginning of the period (between 1986 and 1994), there was a sharp increase in wage inequality, which was partially offset in the 5-year sub-period that followed, only to revive from the year 2000 on and stabilize around the year 2005. From Figure 2, we can see that all the changes in the wage distribution during this period occurred at its top, wage inequality remaining stable at the lower-tail (see the evolution of the ratios between percentiles 90 and 50, and 50 and 10 in Figure 2).

In order to understand how changes in overall wage inequality in Portugal were generated, it is instructive to see whether they mirror similar changes within and between groups of workers or whether, on the contrary, they are the result of partially offsetting changes between and within groups.

In Figures 3 to 8, we plot the evolution of the coefficient of variation of hourly wages for each sub-group considered (within-group inequality) and the estimates of the coefficients of the corresponding variables in the (log) wage equations, estimated according to the procedure described in the previous section (between-group inequality).

Wage inequality within gender groups is in line with the overall trend - there is an increase in wage inequality for both men and women and the timing of the variations we observe coincides with that of the overall economy (Figure 3). Still, wage inequality among female workers rose faster and was, at the end of the period, greater than among male workers. This increase in the variation of wages among women was accompanied by a rise in the difference between men and women's conditional wages (Figure 4) - between 1988 and 1995, in absolute value, the gender wage gap increased from 11.9 to 15.8 percent. Although

this trend was interrupted in the years that followed, by 2007 women's wages were 13.6 percent less than those of men's with similar observable characteristics.

Until 1994, the coefficient of variation of wages also increased within all age groups considered - Figure 5. However, from that year on the most significant change is the marked decline in the differences of wages earned by workers below the age of 25. Between age groups - Figure 6 - the most noticeable facts are the decline in the difference between conditional wages of the two youngest worker cohorts (the estimated coefficient of the $25-34$ age group dummy dropped by around one-half from 1986 to 2007) and the rise of the conditional wage differential between workers aged 55 and over and the reference category (the estimated coefficient of the 55 and over age group dummy more than doubled between 1986 and 2007).

Turning now to wage inequality within groups with different levels of education (Figure 7), we see that all groups considered, except college graduates, follow the overall trend: within-group inequality increases until 1994 and declines or stabilizes thereafter. For college graduates, there is a steady rise in within-group wage inequality after 1991. The increase in wage inequality within the group of the most highly educated may be explained by a variety of factors, such as over-education, ability-schooling interactions, school quality and diversity of fields of specialization (Martins and Pereira, 2004). During this period, there was also a decline in the school premium for workers at all levels of education, though especially so for those with a college degree, which was noted earlier by Cardoso (2007) - Figure 8. The decline in the premium for college education after 1993 is consistent with the rapid increase in the supply of this type of labor since the mid-1990s (Centeno and Novo, 2009).

From the evidence reported, we may conclude that between 1986 and

2007, the evolution of wage inequality in Portugal was driven by changes in within-group wage differences that were common to all groups considered. This within-group evolution was reinforced, in the case of college graduates, in the first years of this period, by a sharp increase in the returns to college education.

4 Establishment Turnover and Wage Inequality

4.1 Empirical approach

Thus far, we have documented the evolution of wage inequality in Portugal over a period of more than 20 years. Our analysis was carried out at the national level. In this section, we shift attention to the role that the turnover of establishments may have played in shaping the observed evolution of wage inequality.

Over this period, establishment turnover accounts for 49 percent of the total job turnover, which is on average equal to 30 percent per year. Both establishment flows account for a large share of total job turnover - the exit of establishments represents 44 percent of all jobs destroyed and establishment start-ups account for 52 percent of all newly-created jobs.[12]

To identify the effect of establishment turnover on wage inequality we rely on variations across Portuguese regions and over time. We use the panel dataset described in Section 2 to estimate, by fixed-effects (FE), a regression equation of the form:

$$Ineq_{i,t} = \beta_0 + \beta_1 Startup_{i,t-1} + \beta_2 Shutdown_{i,t-1} + \beta_3 \mathbf{X}_{i,t-1} + v_{i,t} \quad (1)$$

[12] The importance of the intensive (expansion and contraction) and the extensive (entry and exit) margins of employment adjustment as sources of job turnover varies considerably across countries. Hamermesh's (1993) reading of the existing literature implies that, on average, establishment turnover accounts for one-third of total job turnover. Blanchard and Portugal (2001), using the same data as we do but for a different period, found that in Portugal, annual job flows produced by both establishment startups and establishment shutdowns account for almost half of total gross employment flows.

where, the error term is written as:

$$v_{i,t} = e_{i,t} + u_i. \tag{2}$$

$Ineq_{i,t}$ denotes one of several alternative measures of wage inequality in region i and year t that will be used sequentially. $Startup_{i,t-1}$ is the proportion of all jobs created in region i at time $t-1$ by expanding units (including those newly-opened) that is accounted for by business startups. $Shutdown_{i,t-1}$ is the proportion of all jobs destroyed in region i at time $t-1$ by declining units (including those that closed) that is accounted for by establishment shutdowns, and $\mathbf{X}_{i,t-1}$ is a matrix of other regressors, evaluated at time $t-1$, that includes the proportion of women, youth (under 25 years old), and workers with a college degree in the workforce of the region, as well as the net annual employment growth rate in the region. We include these regressors in order to control for the characteristics of local labor supply and the state of the regional economy.[13] We also control for the state of the national economy by adding a dummy variable to the regressor's set that takes on the value one if the observation refers to an expansionary year. The error term $v_{i,t}$ includes a regional time-invariant component u_i and a region-specific time-variant component $e_{i,t}$.

Because some independent variables are lagged by one year, the total number of observations per region is reduced to 15, as we also cannot use observations for the years 1986, 1992, and 1995.[14]

[13] We would have liked to control for local unemployment, but information on unemployment rates at the level of the region does not exist. However, we used the information on job applications and registered unemployment released by the Portuguese Employment Agency to compute a proxy for the unemployment rate at the regional level. This was possible only for the years 1993 on. Adding this variable to our estimating equations does not qualitatively modify the results of interest, which are not reported.

[14] Table A in Appendix A reports the descriptive statistics of the explanatory variables included in the regression model.

4.2 Results

Overall inequality

Equation 1 was first estimated taking the four overall inequality measures (*i.e.* the coefficient of variation and the ratios between percentiles 90, 50, and 10) computed at the level of the region as dependent variables. Results are reported in Table 1.

The startup of new establishments has no significant effect on overall wage inequality, regardless of how the latter is measured.[15] On the contrary, the shutdown of existing establishments has a sizeable negative effect on inequality. If we consider wage inequality as measured by the coefficient of variation of hourly wages (first data column in Table 1), we see that a one percentage point increase in the proportion of jobs destroyed due to shutdowns reduces the coefficient of variation by 17.4, which is aproximately 0.3 percent of its mean value. The effect is of the same magnitude when we consider wage inequality as measured by the ratio between wages at percentiles 90 and 10 and 90 and 50, and smaller at the bottom of the wage distribution - the ratio between percentiles 50 and 10 is reduced by approximately 0.07 percent of its mean value for each additional percentage point increase in the proportion of jobs destroyed due to establishment shutdowns.

TABLE 1: OVERALL WAGE INEQUALITY
Region FE estimates (N=450)

	CV	P90/P10	P90/P50	P50/P10
$Startup_{t-1}$	-3.720	-0.270	-0.138	-0.050
	(-1.1)	(-1.5)	(-1.2)	(-1.4)
$Shutdown_{t-1}$	-17.379*	-0.938*	-0.593*	-0.093*
	(-6.7)	(-6.8)	(-6.7)	(-3.3)

t-statistics in parentheses.
*, **, *** denote significant at 1, 5, and 10 percent level, respectively.

[15] For readability, we report only the estimates of the coefficients of the two variables of interest. The full set of results corresponding to Table 1, as well as to Tables 2 and 3, is available from the authors upon request.

Within-group inequality

To identify the effects of establishment turnover on within-group inequality, we re-estimated equation 1 using as dependent variables the same measures of wage inequality used to produce the results in Table 1, now computed within each gender, age, and education sub-group considered.

The results we obtained - Table 2 - still indicate that the turnover of establishments influences wage inequality (*i.e.*, within-group inequality), through the exit margin. With the exception of the group of college graduates, for whom no significant effect was obtained, the greater the share of job destruction accounted for by the demise of existing establishments, the smaller wage inequality is within all demographic and education groups considered. The effect is also greater at the top than at the bottom of the wage distribution. As before, startups have no significant effect on within-group inequality, the only exceptions being the groups of the most highly-educated workers (12 years of education or with a college degree). For these two groups, establishment startups decrease within-group wage inequality, but only at the top of the distribution.

TABLE 2: WAGE INEQUALITY WITHIN GROUPS - Region FE estimates (N=450)

	CV	P90/P10	P90/P50	P50/P10
Gender groups				
		Men		
$Startup_{t-1}$	-2.66	-0.328	-0.153	-0.066***
	(-0.9)	(-1.6)	(-1.3)	(-1.7)
$Shutdown_{t-1}$	-11.747*	-1.059*	-0.564*	-0.139*
	(-5.1)	(-6.5)	(-5.9)	(-4.6)
		Women		
$Startup_{t-1}$	-6.257	-0.162	-0.084	-0.035
	(-1.3)	(-1.2)	(-0.9)	(-0.9)
$Shutdown_{t-1}$	-26.956*	-0.580*	-0.475*	0.032
	(-7.2)	(-5.6)	(-6.6)	(1.0)
Age groups				
		<25		
$Startup_{t-1}$	-2.614	-0.066	0.008	-0.05
	(-0.6)	(-0.7)	(0.1)	(-1.2)
$Shutdown_{t-1}$	-27.123*	-0.192*	-0.209*	0.055***
	(-7.1)	(-2.7)	(-4.6)	(1.7)
		25-34		
$Startup_{t-1}$	-5.672	-0.191	-0.116	-0.025
	(-1.4)	(-1.2)	(-1.3)	(-0.7)
$Shutdown_{t-1}$	-21.127*	-0.669*	-0.321*	-0.123*
	(-6.6)	(-5.4)	(-4.6)	(-4.3)
		35-54		
$Startup_{t-1}$	-1.393	-0.121	-0.014	-0.038
	(-0.5)	(-0.5)	(-0.1)	(-0.7)
$Shutdown_{t-1}$	-11.402*	-1.395*	-0.657*	-0.243*
	(-4.8)	(-7.2)	(-5.9)	(-5.9)
		>54		
$Startup_{t-1}$	-1.803	-0.122	-0.054	-0.027
	(-0.5)	(-0.6)	(-0.4)	(-0.7)
$Shutdown_{t-1}$	-12.303*	-0.442*	-0.307*	-0.008
	(-4.5)	(-2.8)	(-3.1)	(-0.3)
Education groups				
		<9 years		
$Startup_{t-1}$	-3.27	-0.107	-0.055	-0.026
	(-1.1)	(-1.0)	(-0.9)	(-0.8)
$Shutdown_{t-1}$	-13.369*	-0.411*	-0.288*	-0.023
	(-5.6)	(-4.9)	(-5.7)	(-0.9)
		9 years		
$Startup_{t-1}$	-1.79	0.131	-0.051	0.132***
	(-0.6)	(0.5)	(-0.3)	(1.7)
$Shutdown_{t-1}$	-11.145*	-1.891*	-0.853*	-0.321*
	(-4.7)	(-8.2)	(-6.0)	(-5.0)
		12 years		
$Startup_{t-1}$	-5.610**	-0.138	-0.235**	0.111
	(-2.0)	(-0.7)	(-2.2)	(1.6)
$Shutdown_{t-1}$	-5.181**	-1.136*	-0.336*	-0.303*
	(-2.3)	(-6.9)	(-4.0)	(-5.4)
		College		
$Startup_{t-1}$	-10.465*	-0.689	-0.454*	0.146
	(-2.8)	(-1.4)	(-2.6)	(0.7)
$Shutdown_{t-1}$	2.662	0.356	0.129	0.097
	(0.9)	(0.9)	(0.9)	(0.6)

t-statistics in parentheses.
*, **, *** denote significant at 1, 5, and 10 percent level, respectively.

Between-group inequality

Consider now the effect of establishment turnover on wage inequality between different sub-groups defined along the demographic variables considered before. In Table 3 we report the estimates of the coefficients of variables *Startup* and *Shutdown* in equation 1 that are obtained using the OLS estimates of the coefficients of the corresponding gender, age, and education groups as dependent variables in that same equation.[16] The results indicate that more jobs being created by newly-born establishments cause more wage inequality between workers aged $25-34$ and the omitted category (below 25 years of age) and between all groups of educational attainment and the reference group (less than 9 years of schooling).

[16]The procedure used to obtain such estimates is described in Section 2. We used the one-year lag of variables *Startup* and *Shutdown*

TABLE 3: WAGE INEQUALITY BETWEEN SUB-GROUPS
Region FE estimates (N=450)

	Between gender sub-groups (omitted: Men)		
	Women		
$Startup_{t-1}$	0.007		
	(0.4)		
$Shutdown_{t-1}$	0.057*		
	(4.1)		
	Between age sub-groups (omitted: <25 years)		
	25-34	**35-54**	**>54**
$Startup_{t-1}$	0.035*	0.018	-0.004
	(2.6)	(1.2)	(-0.2)
$Shutdown_{t-1}$	-0.018***	-0.031**	0.001
	(-1.7)	(-2.5)	(0.1)
	Between education sub-groups (omitted: <9 years)		
	9 years	**12 years**	**College**
$Startup_{t-1}$	0.106*	0.085*	0.186**
	(3.9)	(3.0)	(2.4)
$Shutdown_{t-1}$	0.004	0.041***	-0.169*
	(0.2)	(1.8)	(-2.8)

t-statistics in parentheses.
*, **, *** denote significant at 1, 5, and 10 percent, respectively.

To rationalize the results in Table 3, we should start by noting that the composition of the workforce of establishments that start up, shut down, and continue in activity are different, especially in terms of age and schooling achievement (Table 4). As expected in a country where average schooling achievement is low but increasing very rapidly, startups employ younger and more educated workers. The share of workers below the age of 25 is, for these establishments, 18.8 percent, and 24.3 percent of all their workers have completed at least 12 years of schooling (the corresponding figures for pre-existing establishments are 14.1 percent and 21.2 percent, respectively). The composition of the workforce of the establishments that shut down is also different from that of surviving establishments, especially because they employ fewer college graduates and more young people.

TABLE 4: WORKFORCE COMPOSITION BY TYPE OF ESTABLISHMENT

	Startups	Shutdowns	Continuing
Hourly wage (constant 1986 Euros)	1.222	1.227	1.285
Proportion of minimum wage earners	10.6%	9.0%	6.0%
Proportion of women	41.7%	41.5%	40.1%
Proportion of workers aged			
< 25 years	18.8%	15.2%	14.1%
$25 - 34$ years	33.5%	31.2%	30.7%
$35 - 54$ years	38.5%	42.7%	44.1%
> 54 years	9.2%	10.9%	11.1%
Proportion of education groups			
< 9 years of schooling	54.9%	59.1%	60.8%
9 years of schooling	17.5%	16.7%	16.2%
12 years of schooling	16.7%	14.9%	14.1%
College graduates	7.6%	6.7%	7.1%
Non-defined	3.3%	2.7%	1.8%

Compositional effects alone could explain the estimated effect of startups on between-group wage inequality, but not those of shutdowns. A clearer understanding of the link between establishment turnover and between-group wage inequality can be obtained if we consider how establishments in different stages of their life-cycle - *i.e.*, startups, shutdowns and continuing - reward their workforce according to the characteristics we examine. To do that, we estimated standard Mincerian wage equations on pooled worker-level data spanning the entire period under study. These equations were estimated separately on data for workers (i) employed in establishments that were either newly-created or continuing in each year, and (ii) employed in establishments that either exited the market or survived in activity in each year. The set of regressors include controls for gender, age and schooling. Also included was an indicator of being employed in a startup/shutdown establishment (equal to one if that is the case) as opposed to a continuing-surviving establishment, plus all cross-products of the dummy variable and each one of the other regressors in these equations. The estimates of the coefficients of the multiplicative terms are direct evidence on the relative magnitude of the wage premia paid for each of the worker characteristics by startups/shutdowns and continuing-surviving units.

No causal interpretation of these results is intended.

Results in Table 5 show that pay policies, as summarized by the prices paid for each characteristic of the labor input, vary across the three types of establishments. As compared to continuing establishments, startups pay higher wages to workers aged 25 to 34 relative to workers below the age of 25 (+0.3 percent) and to women relative to men (the gender wage gap is smaller by 1.9 percent). However, the same establishments pay lower wages to workers above the age of 35 relative to workers below the age of 25 and to all groups of schooling achievement relative to workers with less than 9 years of schooling (the differential between the returns paid by new and continuously operating units are −4.6 percent, −5.1 percent, and −3.7 percent for 9 years, 12 years, and college education, respectively). We should note, however, that newly-created units also employ a considerably smaller share of workers with less than 9 years of education (Table 4), which is the current mandatory minimum level of schooling. Hence, even though these units pay lower returns to education than the continuously operating units, returns to schooling increase with the share of job creation accounted for by new establishments, because these units reduce the relative demand for the least educated workers and this is the effect that dominates.

TABLE 5: OLS WORKER-LEVEL WAGE EQUATIONS

Dependent variable: log hourly wage

	Startups and Continuing	Shutdowns and Continuing
Gender (Female=1)	-0.1504*	-0.1503*
	(-488.80)	(-488.83)
Age		
25-34	0.1041*	0.1042*
	(394.84)	(395.10)
35-54	0.1962*	0.1963*
	(592.84)	(593.37)
> 54	0.1691*	0.1692*
	(306.50)	(306.71)
Education		
9 years	0.2303*	0.2304*
	(574.91)	(575.31)
12 years	0.3692*	0.3693*
	(738.13)	(738.09)
College	0.7741*	0.7742*
	(820.94)	(821.13)
Startup/Shutdown	-0.0549*	-0.0221*
	(-26.79)	(-9.41)
Incremental wage premia for gender, age, and education		
Gender	0.0193*	-0.0002
	(32.47)	(-0.33)
Age		
25-34	0.0031*	-0.0088*
	(4.12)	(-9.96)
35-54	-0.0031*	-0.0044*
	(-3.74)	(-4.75)
> 54	-0.0299*	-0.0227*
	(-21.89)	(-16.00)
Education		
9 years	-0.0461*	-0.0183*
	(-61.02)	(-21.73)
12 years	-0.0509*	-0.0158*
	(-54.08)	(-15.22)
College	-0.0372*	-0.0061*
	(-18.72)	(2.83)
Nr. Observations	26,183,581	25,901,463
R2	0.5405	0.5395

The regressor set also includes controls for skill categories and tenure.
t-statistics in parentheses.
*, **, *** denote significant at 1, 5, and 10 percent, respectively.

As compared to surviving units, establishments that shut down pay lower unconditional and conditional wages and lower returns to all worker observable characteristics (see also Carneiro and Portugal,

2008, for a similar result). The combination of these two differences is sufficient to explain why shutdowns reduce both within and between-group inequality. Both types of inequality decrease because of different employment composition (more low-paid workers) and different pay-policies (low returns to all worker characteristics).

5 Conclusions

By framing the analysis of the importance of demand factors in terms of the turnover of establishments we are able to describe how those factors shape the evolution of wage inequality. Our findings show that both startups and shutdowns of new and old establishments influence the evolution of wage inequality, although in different ways.

Shutdowns reduce overall and within-group inequality because they eliminate jobs at the bottom of the wage distribution in the aggregate as well as within each group. Shutdowns also reduce inequality between different sub-groups again because they eliminate more jobs in the bottom sub-groups. It is by eliminating the lowest wages in the bottom sub-group of each category that shutdowns raise the average wage in that sub-group, thereby reducing the average premium paid to workers in all other sub-groups, even if they eliminate the lowest wages in these sub-groups as well.

Startups increase wage-inequality between age and, especially, education groups, because newly-created establishments make staffing choices that are different from those made by continuously-operating establishments and establishments that shut down, and biased towards younger and more educated workers.

By facilating worker mobility, establishment turnover speeds up the rate at which changes in the demand for different types of workers translate into actual employment changes, thereby providing the means through which demand and supply forces work their way into changing

the wage distribution. We note, however, that the more difficult it is for continuing establishments to make changes to their workforce - the higher are the adjustment costs - the more important will be the role of establishment turnover as a source of change of the wage distribution.

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Appendix

DESCRIPTIVE STATISTICS

Variable	N	Mean	Std. Dev.	Min	Max
Startup	450	.511	.063	.296	.717
Shutdown	450	.438	.071	.241	.748
Share of women	450	.390	.062	.179	.492
Share of youth	450	.184	.059	.088	.394
Share of college graduates	450	.040	.029	.003	.178
Annual employment growth (net)	450	.027	.036	-.107	.200
Year of expansion	450	.467	.499	0	1

Figures

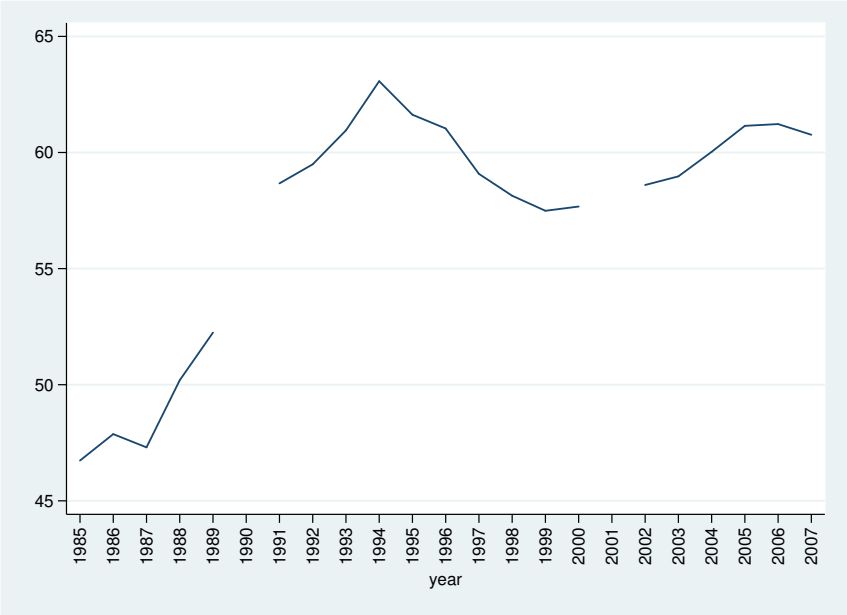

Figure 1: Overall inequality - Coefficient of Variation.

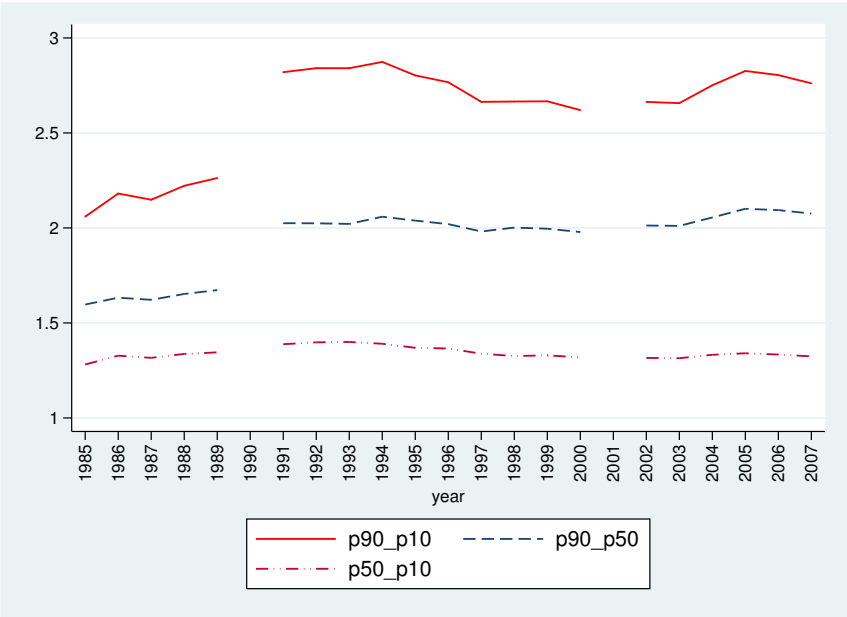

Figure 2: Overall inequality - Ratios between percentiles 90, 50, and 10.

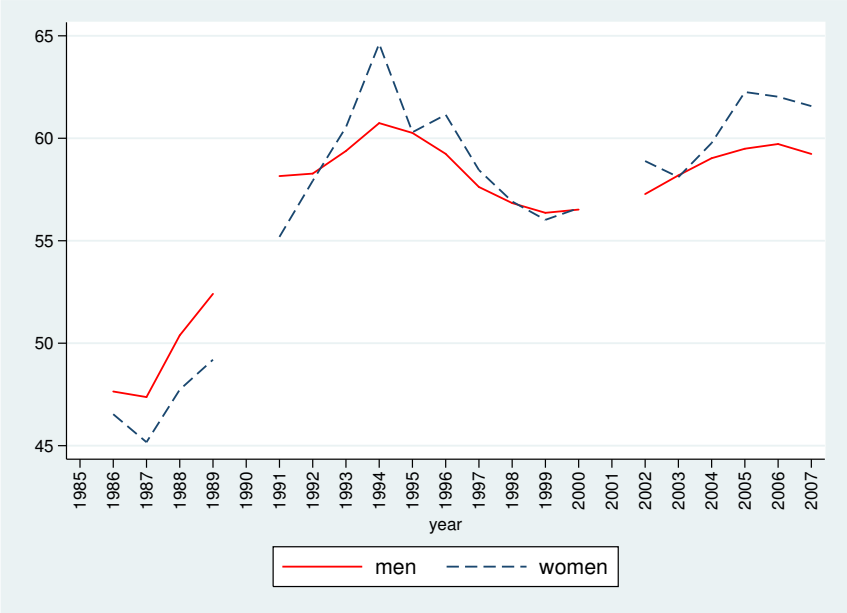

Figure 3: Inequality within gender groups - Coefficient of Variation.

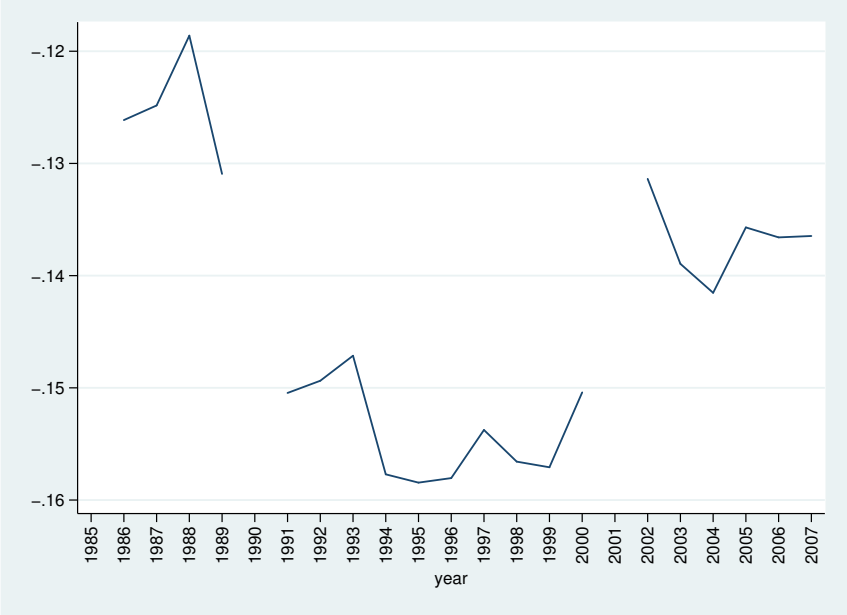

Figure 4: Inequality between gender groups - Estimates of the coefficient of the gender variable in wage equations.

Figure 5: Inequality within age groups - Coefficient of Variation.

Figure 6: Inequality between age groups - Estimates of the coefficient of age groups in wage equations.

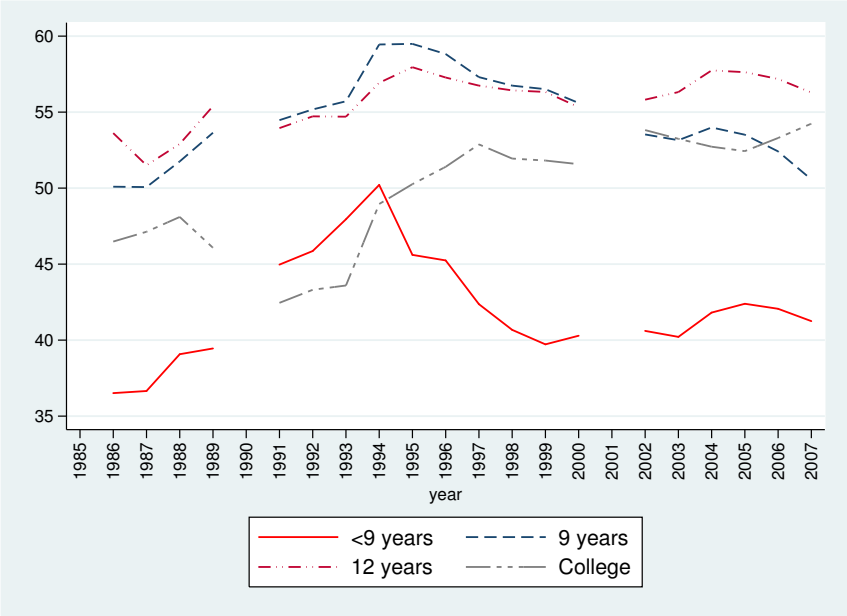

Figure 7: Inequality within education groups - Coefficient of Variation.

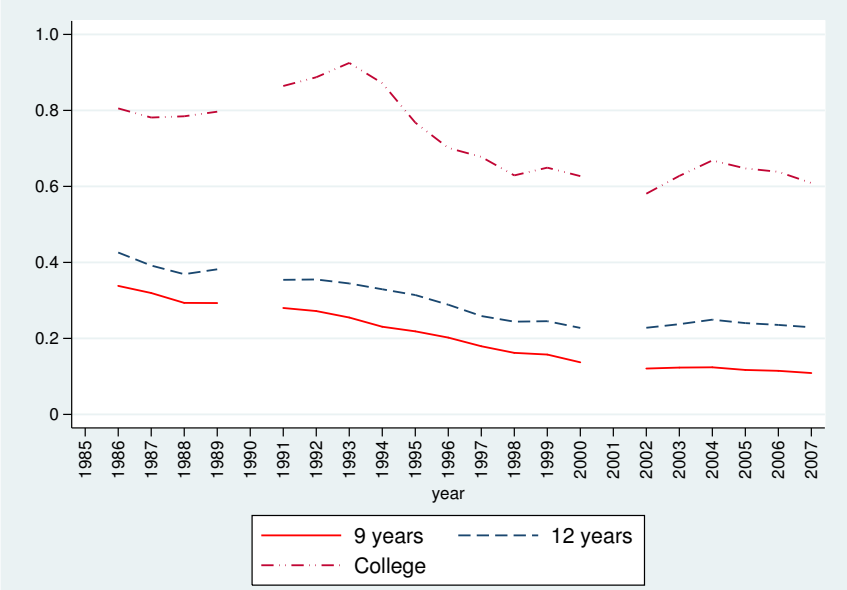

Figure 8: Inequality between education groups - Estimates of the coefficient of education groups in wage equations.