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University Graduates: Why a Rising Unemployment
Rate Can Be Misleading**

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ABSTRACT

The Dynamics of Job Creation and Destruction for University Graduates: Why a Rising Unemployment Rate Can Be Misleading*

This study uses a matched employer-employee data set on the Portuguese economy to analyze systematic information on job creation and job destruction for university graduates, compared to other groups of workers. We find that the unemployment rate can provide a misleading idea of the dynamics in labor demand and of the employment prospects for university graduates. The pessimistic view that seems to be popular nowadays, stating that the expansion of higher education may have gone too far and that investment in a higher education degree has become a too risky business, possibly not worthwhile, as employers are no longer keen on recruiting newly graduate workers, does not find support in the empirical evidence for the Portuguese economy.

JEL Classification: J21, J60, J63

Keywords: gross job flows, unemployment

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1 Introduction

Higher education has been expanding in most countries, with enrollment rates and the number of students rising sharply. To cite a few examples, between 1990 and 1996 total enrollment in tertiary education more than doubled in Poland and Portugal, having increased by over 80 percent in the UK and Hungary (OECD 1999). Several reasons have combined for this outcome. Changes in the funding system for higher education, steered to rely increasingly on market mechanisms, have led institutions into intense competition to attract students. Moreover, rising private returns to higher education, pointed out in studies of wage dispersion for several countries, may have played a role motivating the continuation of studies beyond high school. The widespread perception of the impact of higher education on development has pushed other countries, in particular developing ones, into expanding their higher education systems.

However, as higher education degrees became more widespread and less exclusive, fears started spreading concerning the capacity of the labor market to absorb the newly-graduates. Throughout, employers have been claiming that the higher education system is not providing the necessary skills and it is often advocated that the external efficiency of universities should be evaluated, monitoring the jobs and earnings of graduates. Most often, the unemployment rate has been implicitly set as the criterion to assess employment prospects for graduate workers. As the unemployment rate for that group of workers increased in several countries, the high expectations of the 80's gave place to concern in the 90's. An extreme view seems to be popular nowadays, stating that the expansion of higher education may have gone too far and that investment in a higher education degree has become a too risky business, possibly not worthwhile, as employers are no longer keen on recruiting newly graduate workers (Teichler (1999) provides a clear analysis of these trends).

Nevertheless, such statements are usually not backed up by the analysis of sound empirical evidence, and in this paper we argue that a more balance view is

called for. Relying on systematic information on job creation and job destruction for university graduates compared to other groups of workers, we find that the unemployment rate can provide a misleading idea of the dynamics in labor demand and of the employment prospects for university graduates. What has indeed been the pace of job creation and job destruction for university graduates hiding behind their unemployment rate? Which have been the most dynamic industries? What type of companies has been expanding their graduate labor force { the low paying or the high paying ones? How does the graduate labor market compare to that of undergraduates? The study uses a very rich longitudinal data set matching workers and employers in the Portuguese economy.

Section 2 briefly describes the expansion of the higher education system and the evolution of the employment prospects for university graduates when compared to other groups of workers in Portugal, as traditionally captured by their unemployment rates and by the job offers advertised nationally over two decades. Section 3 describes the data set and explains the statistical measures to be used. In section 4, the results on job creation and job destruction from 1987 to 1997 for different types of workers and companies are presented. Concluding comments are the subject of the last section.

2 Higher education and the labor market in Portugal

The integration of university graduates into the labor market started to be an issue of concern in Portugal in the early 90's. Until then, their unemployment rate was negligible and the wage premium for university graduates had been rising sharply. However, the university system had meanwhile expanded at an amazing pace. By the early 90's the claim that employers were no longer interested in hiring university graduates, in particular young ones, and were demanding instead experienced workers, was widely believed upon.

2.1 Enrollment in higher education: international perspective

Portugal presented the highest growth in tertiary education enrollment among the countries reported by OECD in table 1, as the number of students increased by 144% from 1990 to 1996. This change was almost exclusively due to rising enrollment rates. Such growth rate compares to 37% in neighboring Spain, 123% in Poland, 85% in Hungary, 81% in the UK, close to 50% in Belgium and the Czech Republic and 41% in New Zealand. During that period, the number of students increased the least in the USA (6%), Germany (7%) and The Netherlands (10%).

	Index of change (base=100 in 1990)			Attributable to:	
	1985	1990	1996	Change in size of youth cohort	Change in enrollment rates
Australia	m	100	129	100	130
Austria	80	100	120	97	126
Belgium	89	100	148	m	m
Canada	90	100	118	m	m
Czech Republic	m	100	149	115	130
Denmark	87	100	121	100	123
Finland	77	100	130	91	142
France	84	100	132	m	m
Germany	90	100	107	m	m
Hungary	m	100	185	m	m
Iceland	m	100	126	m	m
Ireland	79	100	151	107	142
Italy	86	100	127	m	m
Japan	m	100	121	m	m
Korea	m	100	122	m	m
Mexico	m	100	122	113	108
Netherlands	93	100	110	91	123
New Zealand	86	100	141	97	145
Norway	71	100	139	m	m
Poland	m	100	223	m	m
Portugal	m	100	244	105	234
Spain 73	100	137	101	137	
Sweden	97	100	141	99	143
Switzerland	80	100	112	98	116
Turkey	m	100	171	m	m
United Kingdom	85	100	181	93	192
United States	91	100	106	95	111

Table 1: Index of change in total enrollment in tertiary education (1990=100).
Source: OECD (1999). Note: m { missing data.

In the age bracket 18-21 years, the enrollment rate in tertiary education is now 19% in Portugal, which compares to around 40% in Korea, Belgium, Canada or Greece, 36% in France, 35% in the USA, 31% in Australia, 27% in Spain and, on the other extreme, 6% in Brazil, 7% in Mexico, 8% in Switzerland, Indonesia and Iceland and 9% in Denmark (OECD 1999).

2.2 Evolution of unemployment rates

A decline in overall unemployment rate took place in Portugal during the 80's and 90's. However, that trend was not common across schooling categories, as the unemployment rate for university graduates increased from around 1% in 1981 to 4% two decades later.

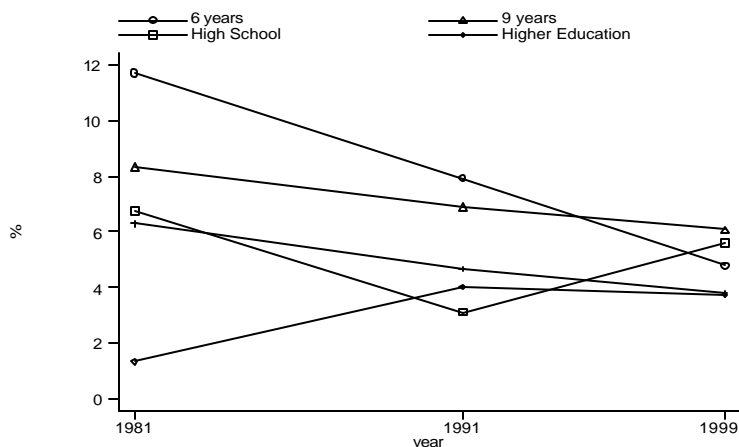


Figure 1: Unemployment rate by schooling level. Sources: INE (1981, 1991, 1999). Note: Data on workers with no formal education was not included, since methodological changes in 1991 render comparisons unfeasible.

In fact, the convergence of unemployment rates across schooling levels stands out as the most prominent feature of Figure 1. Whereas in the lowest schooling levels the unemployment rate was halved between 1981 and 1999, for university graduates it increased in the 80's, to remain almost stable in the 90's. This convergence of the unemployment rates to very similar values irrespective of the worker schooling achievement led to the idea that a university diploma was no longer a safe passport out of unemployment and raised doubts about the capacity of the

labor market to absorb the newly-graduates.

The culprit for this trend, according to public opinion, was a slack labor demand, as employers would now no longer be willing to hire new graduates, preferring instead workers with experience. The analysis of job offers announced in the national press would lend support to this claim.

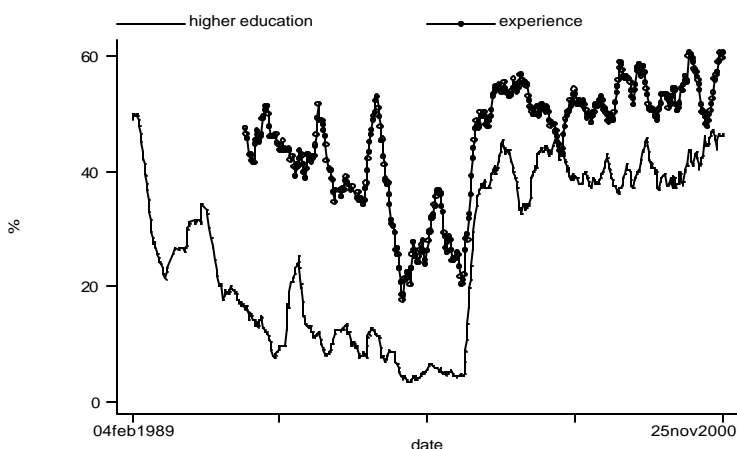


Figure 2: Requirements imposed by job offers advertised at the national level, 1989-2001. Source: Data provided by the newspaper Espresso. Notes: This newspaper is the major means for advertising job offers at the national level for qualified workers. The graph reports moving averages, with a smoothing window of 13 weeks (approximately one trimester).

Between 1989 and 1995, the share of job ads requiring a university diploma (licenciatura) declined sharply, from around 50% to 5%. On the other hand, the share of ads requiring previous labor market experience remained high, though declining from 50% to 20%. By mid 90's, a higher education diploma was back in high demand, and the number of employers advertising jobs for graduates was close to the number of those requiring previous experience. However, the trend in late 90's was not enough to overcome the concerns that meanwhile had grown, especially as the graduates unemployment rate failed to decline. Quotations from the national press could illustrate the changing mood in the public opinion.

A higher education diploma is an almost systematic demand by employers [...]. (Espresso 15/7/89) [our translation]

Access to new occupations is becoming more selective, as the majority of

employers are only accepting workers with a higher education diploma. (Expresso, 13/10/90) [our translation]

The 90's, however, witnessed rising apprehension.

A higher education diploma has definitely lost part of its traditional value. At least that is what the majority of employers think. What really counts is the previous labor market experience of the worker. (Andrade in Expresso, 1991) [our translation]

Higher education is no longer what it used to be a few years ago. Having a diploma no longer guarantees a job. Graduates, one can find thousands of them, all over the country, not knowing exactly what to do with their lives. (Andrade in Expresso, 1993) [our translation]

To what extent has the Portuguese economy indeed reduced its pace of job creation for graduate workers? Which were the most and the least dynamic sectors?

3 Methodology

The expansion or contraction of employment levels results from gross flows taking place at the firm level, which cannot be captured by aggregate employment figures, and certainly not by the trend in unemployment figures, which combine the influence of demand and supply. The study of gross job flows has therefore deserved increasing attention in the literature, as it provides a more accurate picture of the dynamics in the labor market (see for example Davis et al (1996) or Garibaldi and Mauro (2000) for a highlight of its advantages).

Data set

This study relies on Quadros de Pessoal, a longitudinal data set matching workers and their employers in the Portuguese private sector, from 1986 to 1997. The data are gathered annually by the Ministry of Employment, with information on approximately 2.5 million workers and 200 thousand companies each year (see

the appendix for more information). Jobs filled by full-time wage earners were considered in the analysis. The unit of observation for the computation of gross flows is the firm. The analysis has concentrated on higher education graduates, compared to the rest of the labor force. The methodology and the concepts used follow Davis et al (1996), as synthesized below.

Job creation and job destruction

Gross job creation and destruction are computed at the firm level as the change in employment from period $t - 1$ to period t :

$$\Phi X_{e;t} = X_{e;t} - X_{e;t-1}$$

where X stands for the employment level, e refers to the firm and t to the moment in time (year). If employment increases ($\Phi X_{e;t} > 0$), job creation is said to have taken place, while job destruction occurs when employment in the firm decreases ($\Phi X_{e;t} < 0$). Aggregating from the firm to the sector level (an industry or region, for example), gross job creation equals the sum of employment changes over all firms that expanded its employment or were set up during the period, and similarly, job destruction is the sum of employment changes over all firms that contracted or shut down. Companies with a stable employment level contribute neither to job creation nor job destruction.

$$C_{s;t} = \sum_{+} \Phi X_{e;t} \quad \text{and} \quad D_{s;t} = \sum_{-} \Phi X_{e;t}$$

where $C_{s;t}$ is job creation in sector s and $D_{s;t}$ is job destruction in sector s in period t . Net job creation is the difference between gross job creation and gross job destruction.

Job reallocation

Gross job reallocation is the sum of job creation and job destruction over a certain period for sector s :

$$R_{s;t} = C_{s;t} + D_{s;t}$$

Gross reallocation is the maximum amount of worker reallocation required to accommodate the change in employment opportunities across firms. Note that, if no worker switched from a contracting to an expanding company, then the amount of worker reallocation would correspond to R , as C workers would move from out of employment into employment, while D workers would move in the opposite direction. This measure therefore provides an indication of the overall degree of rotation in the labor force resulting from changing job opportunities across firms. However, certain workers may be counted twice in the gross reallocation measure, if they switched from a contracting to an expanding company.

Minimum worker reallocation

The measure of minimum worker reallocation aims precisely at eliminating the problem of double counting involved in summing gross job creation and gross job destruction. It is computed as the larger of gross job creation and gross job destruction:

$$R_{\min_{s,t}} = \max(C_{s,t}; D_{s,t})$$

This measure reports the minimum worker reallocation that is required to account for the changes in job opportunities across firms.

Excess job reallocation

Finally, excess job reallocation is computed as the difference between gross reallocation and the absolute value of net employment change.

$$R_{\text{ex}_{s,t}} = R_{s,t} - |C_{s,t} - D_{s,t}|$$

It evaluates the amount of job reallocation that took place beyond what would be strictly necessary to accommodate the net job change that occurred. It is therefore considered the best indicator of simultaneous job creation and job destruction in the sector, capturing the heterogeneity among firms { whereas some are expanding their level of employment, others are contracting it.

Job flows are usually expressed as rates, dividing through by a measure of firm size, the average employment in two periods:

$$Z_{e;t} = \frac{X_{e;t} + X_{e;t-1}}{2}$$

The rate of employment growth in the firm is thus computed as:

$$f_e = \frac{\Delta X_{e;t}}{Z_{e;t}}$$

The use of this size measure to compute the rate of change in employment is preferred over the traditional size measure (employment in the base period), as the rate of employment change f ranges over a bounded and symmetrical interval, -2 to $+2$.¹ One can similarly compute the different rates for a particular sector s .

The following section analyzes these indicators for graduate workers and workers with lower schooling levels separately.

4 Coexistence of high rates of job creation and job destruction

High rates of job creation coexisted with high rates of job destruction for university graduates, with a net positive impact on overall employment. Indeed, out of 100 jobs existing in the economy performed by university graduates, 25 new ones were created on average each year between 1986 and 1997, whereas 17 were destroyed (table 2). These values suggest that a high job rotation prevails in the Portuguese economy, strictly due to heterogeneity in the firms' recruitment behavior.

High job creation and simultaneous job destruction is also a characteristic of the labor market for workers with lower levels of schooling, but the rates are lower. In fact, out of 100 existing jobs performed by undergraduates, 15 were created and 13 were destroyed on average each year during the period under analysis.

The trends in net job creation rates for graduate workers and for those not holding a university diploma were similar until 1989, diverging markedly afterwards

¹It is therefore possible to compute this measure for new firms and for those going out of business (achieving the values $+2$ and -2 , respectively). The traditional measure of employment change would be positive infinite for a new firm and -1 for a firm going out of business. Since firm creation and destruction are symmetrical situations, it is adequate to have a measure of employment change achieving symmetrical values. Values of f between -1 and 1 correspond approximately to the traditional percent increase in employment.

year	higher education graduates		schooling below higher education	
	creation	destruction	creation	destruction
1986	0.218	0.187	0.139	0.116
1987	0.211	0.177	0.142	0.100
1988	0.236	0.188	0.149	0.115
1989	0.303	0.214	0.171	0.120
1990	0.214	0.098	0.117	0.092
1991	0.214	0.098	0.117	0.092
1992	0.248	0.163	0.146	0.131
1993	0.256	0.194	0.136	0.152
1994	0.357	0.284	0.205	0.194
1995	0.232	0.150	0.139	0.126
1996	0.248	0.144	0.133	0.136
1997	0.298	0.180	0.159	0.154
mean	0.253	0.173	0.146	0.127

Table 2: Rates of gross job creation and destruction by schooling level, 1986-1997. Source: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997. Note: In 1990, no worker data were gathered and therefore the flows indicated for 1990 and 1991 result from averaging the flow that took place between 1989 and 1991. Note however that firms that were set up and closed down within that period are not captured, and therefore the flows for 1990 and 1991 may be underestimated. On the other hand, from 1994 onwards the data refer to the month of October, whereas until 1993 they referred to March. As such, the values for 1994 refer to a wider period, therefore overestimating the yearly flow.

(Figure 3). Indeed, during the second half of the 80's, the Portuguese economy has grown sharply, and employment expanded at a fast pace. Such rate of net job creation, around 3% a year, was similar for both groups of workers. By 1989, however, net job creation for workers holding a university diploma was already taking place at a faster pace than for workers with lower schooling levels. The contrast became more pronounced in the 90's, when employment opportunities for graduates were expanding much faster than for non-graduates. In 1993, negative rates of job creation for undergraduates contrasted with a positive 6% net job creation for graduates. Since 1993, employment for undergraduates has remained at a stable level, whereas for university graduates it has been expanding strongly, reaching 10% a year since 1996.

Concerns about the employment prospects of university graduates therefore begun spreading in Portugal precisely when their employment opportunities were expanding the most and in sharpest contrast with the employment prospects for

undergraduates. Thus, the rising unemployment rate did not result from a slack labor demand by employers no longer trusting the higher education system and the skills it provides. Instead, demand kept expanding, though it did not match the steady rise in supply brought about by the expansion of higher education. The employment prospects for university graduates should be compared to those for undergraduates in the same period, and not to those of graduates who left the educational system a decade before.

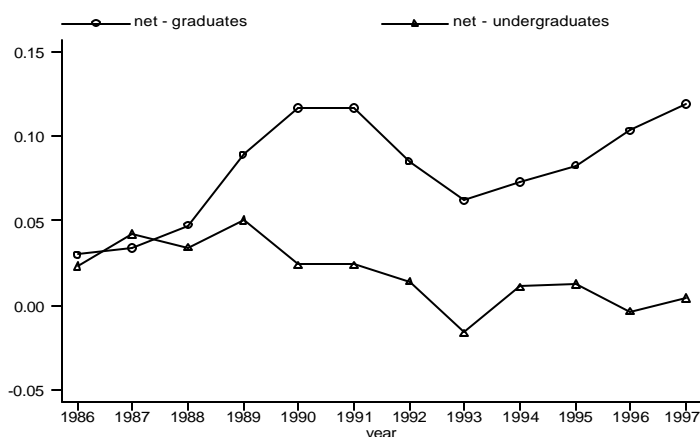


Figure 3: Rate of net job creation by schooling level, 1986-1997. Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997.

Figure 4 presents other measures of rotation of job opportunities among companies, revealing that the pace of change in the labor market for university graduates is faster than for other workers.

In fact, approximately 40% of the existing jobs for higher education graduates are either created or destroyed each year, whereas for undergraduates that value is around 25-30%. The reallocation beyond what would be strictly necessary to accommodate the net employment change reveals a similar pattern. Such turbulence results from the contrasting behavior of the different companies, which is more pronounced for jobs held by university graduates than for the rest of the labor force. For undergraduates, the economy is closer to a situation where all the companies either contract or expand their employment level.²

²Part of the detected homogeneity in firm behavior when it comes to job changes for the undergraduates

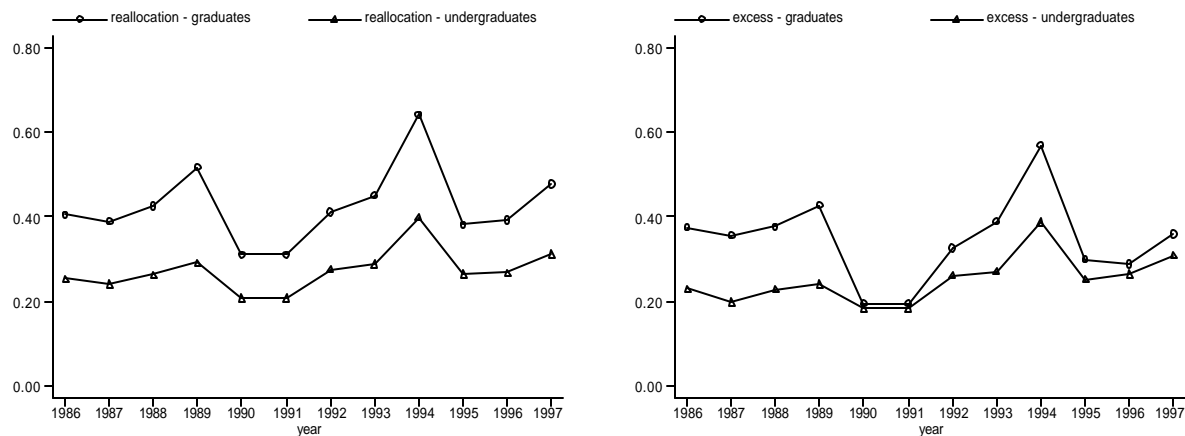


Figure 4: Rate of gross job reallocation and excess job reallocation by schooling level, 1986-1997 Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997.

4.1 Job flows by industry: expansion of job opportunities for university graduates took place in finance without worker reallocation, and in services to companies and social services with high worker reallocation

Which were the most dynamic industries in terms of job creation for university graduates? Figure 5 reports, for each industry, the average yearly rate of job creation and job destruction for university graduates.

In each of the graphs below, industries located on the diagonal did not change their overall employment level for that category of workers, since the rate of job creation was offset by an equal rate of job destruction. Industries located above the diagonal were net job creators and, symmetrically, industries below the diagonal were net job destructors. On the other hand, industries closer to the origin had lower rates of job reallocation, as both job creation and job destruction were low. On the contrary, the farther away from the origin, the higher the rate of gross job reallocation in the industry.

Expansion of employment for university graduates took place across industries, may result from the fact that we are dealing with a broader group of workers, and therefore mechanisms of compensation within the firm may operate. Note the example of a firm that may contract its employment level for workers holding 4 years of education, while expanding it for workers with 9 years of education. In such a case, overall employment for undergraduates could remain stable, and neither job creation nor destruction would be captured.

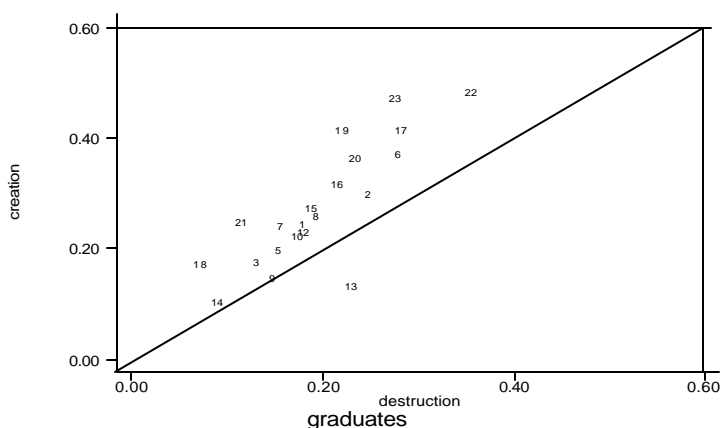


Figure 5: Gross job flows by industry, higher education graduates. Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997. Codes: 1: Food, beverages, tobacco; 2: Textiles, clothing, leather; 3: Communications; 5: Transportation; 6: Wood, cork; 7: Paper; 8: Non-metallic mineral prod; 9: Chemicals; 10: Metal prod; 12: Mining; 13: Base metals; 14: Elect., gas, water; 15: Building; 16: Trade; 17: Restaur., hotels; 18: Banking, insurance; 19: Serv. to companies; 20: Social services; 21: Recreat. and cult. serv; 22: Personal services; 23: Other activities.

with the exception of base metals, where it declined, and chemicals, where it remained roughly stable. The services have shown the largest expansion of graduate jobs, in particular services to companies, banking and insurance, recreational and cultural services. Note however that, whereas in banking and insurance the expansion of employment took place with low reallocation of jobs across firms, in services to companies, on the contrary, high job creation rates coexisted with high job destruction rates. This has therefore been a more turbulent industry when it comes to simultaneous job expansion and contraction across firms, with the associated worker flows.

The most stable industries, in the sense that they present low rates of gross worker reallocation, were, besides banking and insurance, electricity, gas and water, communications, recreational and cultural services and transportation. On the contrary, the industries with higher job rotation are, apart from services to companies, social services, personal services, restaurants and hotels and the wood and cork industries.

The comparison with gross job flows for undergraduates is presented in figure 6, where the contrasts stand out.

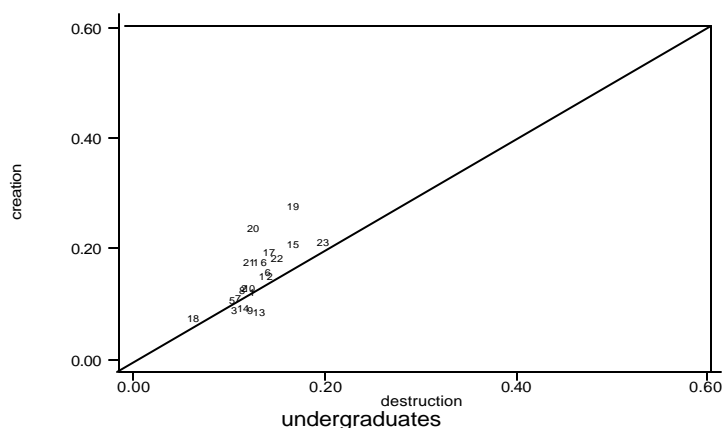


Figure 6: Gross job flows by industry, undergraduates. Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997. Codes: Codes: 1: Food, beverages, tobacco; 2: Textiles, clothing, leather; 3: Communications; 5: Transportation; 6: Wood, cork; 7: Paper; 8: Non-metallic mineral prod; 9: Chemicals; 10: Metal prod; 12: Mining; 13: Base metals; 14: Elect., gas, water; 15: Building; 16: Trade; 17: Restaur., hotels; 18: Banking, insurance; 19: Serv. to companies; 20: Social services; 21: Recreat. and cult. serv; 22: Personal services; 23: Other activities.

Note first of all the higher concentration of industries close to the diagonal, indicating low rates of net job creation for undergraduate workers. In base metals, electricity, gas, water, chemicals and communications, job destruction has surpassed job creation. On the contrary, in services to companies and in social services, job creation took place at a fast pace, just like for graduate workers.

Job reallocation was considerably lower for workers with lower levels of schooling, indicating that net job expansion or contraction tended to result from a more uniform trend across firms than it has been the case for university graduates.

4.2 Job flows according to the average wage level of the firm: more turbulence among firms paying lower wages

This section groups companies according to their average wage level, to identify the most dynamic ones at job creation (and job destruction). Firms have been grouped into five quintiles of their average wage. The lowest quintile groups the bottom 20% of the firms in the economy whereas, similarly, the top quintile includes the 20% best paying firms in the economy.

Firms with lower average wages reveal high turbulence in terms of job creation

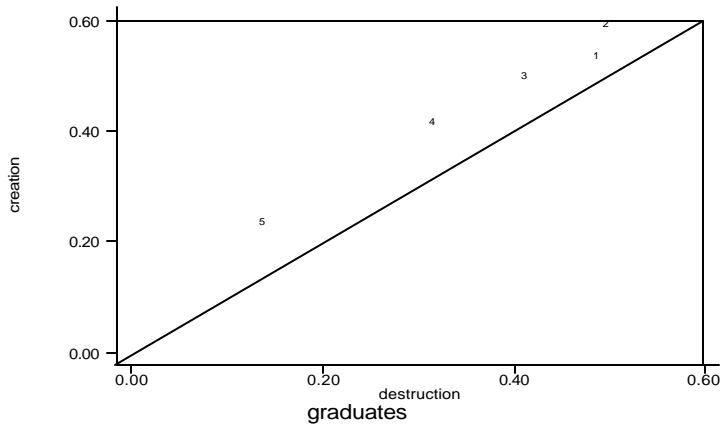


Figure 7: Gross job flows according to the average wage level in the firm, higher education graduates. Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997. Codes: 1: Quintile 1; 2: Quintile 2; 3: Quintile 3; 4: Quintile 4; 5: Quintile 5.

and job destruction, for both graduate and undergraduate workers. On the opposite, both job creation and job destruction are lower among good paying firms, thus indicating a more stable volume of employment in the company. Better paying jobs tend to last longer.

Note, on the other hand, that net employment creation for university graduates took place for firms in every wage quintile, though in the group of the best paying firms it required less worker reallocation.

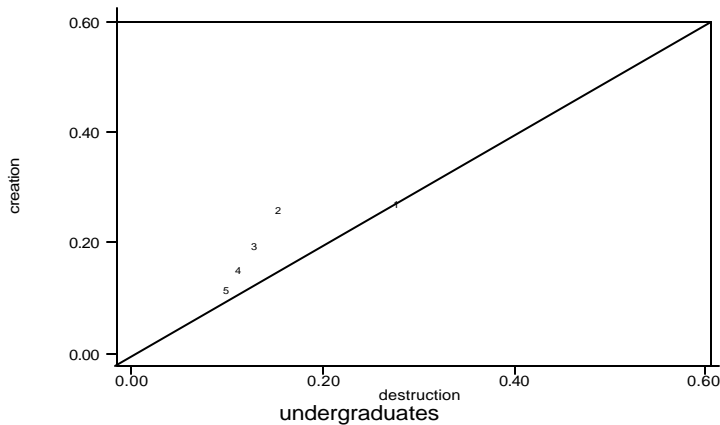


Figure 8: Gross job flows according to the average wage level in the firm, undergraduates. Sources: Computations based on Portugal, MTS, DETEFP, Quadros de Pessoal, 1985-1997. Codes: 1: Quintile 1; 2: Quintile 2; 3: Quintile 3; 4: Quintile 4; 5: Quintile 5.

For undergraduate workers, job reallocation is generally lower than for graduates. Employment decreased slightly in the worst paying firms, with high gross job reallocation. The next group of low-paying firms presented the largest rate of net job creation for undergraduates, whereas the best paying firms, on the contrary, increased only slightly their level of employment, with low job reallocation.

5 Conclusion

Analysis of gross job creation and destruction at the firm level provides systematic information on job dynamics that cannot be captured by the evolution of aggregate employment or unemployment rates.

It is interesting to note that the rising unemployment rate for university graduates and its decline for undergraduates over the 80's and 90's provide a misleading idea of the dynamics of job creation in the Portuguese economy, as the net job creation rates point precisely in the opposite direction. Indeed, net job creation took place at a much faster pace for higher education graduates than for the rest of the labor force. Since 1993, in particular, employment for graduates has been expanding sharply, whereas for undergraduates it has stagnated.

The rise in the unemployment rate for graduate workers did not therefore result from declining demand for that group of workers and support is thus not found for the simplistic view that seems to be widespread nowadays, according to which employers would no longer be willing to recruit university graduates, given the inability of the system to provide workers with adequate skills. The employment prospects for a student nowadays leaving university should be compared to those for an undergraduate in the same period, and not to those of a graduate who left university a decade ago.

The labor market for graduate workers is more flexible and fluid than that for workers with lower schooling levels. On average, one in four graduate workers will have to switch employer or employment status each year, just to respond to the reallocation of job opportunities across firms. That ratio is one in seven workers for the undergraduate labor force. Irrespective of the type of contract the worker

holds, individuals holding a higher education diploma are asked to switch jobs more frequently just as a result of the reshuffling of employment opportunities across firms and will thus have to adapt more frequently to a changing work environment.

An analysis by industry reveals that the expansion of job opportunities for graduates was common across industries, with the exception of chemicals and base metals, and that it was particularly sharp in services to companies, banking and insurance and cultural and recreational services. However, whereas in banking the simultaneous job creation and job destruction were low, in services to companies, high rates of job creation coexisted with high rates of job destruction. Better paying firms reveal relatively more stable employment levels, presenting lower rates of both job creation and destruction, whereas more turbulence prevails in lower paying firms. Net job creation for graduates took place across all the groups of firms, from the best to the worst paying in the economy.

Appendix: Data set

The database Quadros de Pessoal gathers longitudinal information on every firm with wage earners in the Portuguese private sector. Public administration and domestic work are excluded. The coverage of agriculture is low and therefore we have excluded it from the analysis.

The Ministry assigns a unique identification number to each company when it first reports to the database, and it is therefore possible to track firms. Extensive data control procedures are implemented to guarantee that a firm is not assigned a different number later on. Such procedures are based in particular on the location of the firm and on its official identification codes.

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