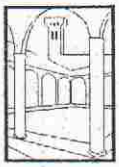

EUROPEAN UNIVERSITY INSTITUTE
Department of Economics

Earnings Inequality in Portugal: the relevance and the dynamics of employer behaviour

Ana Rute Cardoso

Thesis submitted for assessment with a view to obtaining the Degree of Doctor of the European University Institute

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Ana Rute Cardoso

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EARNINGS INEQUALITY IN PORTUGAL:
THE RELEVANCE AND THE DYNAMICS OF EMPLOYER BEHAVIOUR

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1. INTRODUCTION

Expanding research on earnings inequality, mainly in the USA and the UK, has led Levy and Murnane to claim that "within a decade, earnings inequality grew from a lightly studied branch of labor economics to a major research area. The reality of increased inequality was one major reason." [LEVY and MURNANE, 1992: 1334]

Nonetheless, labour market and inequality have been two lines of research basically disassociated in the literature on Portugal, as other topics have drawn the attention of labour economists. Studies relying on macro data have raised a number of interesting issues, such as the impact of productivity, prices, unemployment and the industrial relations system on wages — see BRANCO and MELLO [1992], MODESTO *et al* [1992], MODESTO and NEVES [1993], MODESTO and MONTEIRO [1993] and BELEZA [1980] —, or the impact of wages on the decision to emigrate [PEREIRA, 1994], while data on individuals has enabled the estimation of human capital type of equations, augmented by the inclusion of demand-side variables — see KIKER and SANTOS [1991], VIEIRA and PEREIRA [1993], CASTRO and SANTOS [1991]; FERNANDES [1992] has specifically dealt with the impact of demand-side variables on wages. Research on inequality, on the other hand, has dealt with income, and not labour returns — see GOUVEIA and TAVARES [1995], RODRIGUES [1994], RODRIGUES [1993] and PEREIRINHA [1988]. Using micro data drawn from household surveys conducted in 1980/81 and 1989/90, the three former studies detect an unambiguous decline in income[1] inequality during the 1980's.

Conjectures about the forces driving this decline in *income* inequality often point out labour market trends. The decline in income inequality might have been brought about by the evolution of *earnings*, an expectation embodied namely in a hypothesis explicitly put forth by Gouveia and Tavares. The hypothesis of declining earnings inequality, however, is in contrast with the short references to the issue that can be found in the literature. RODRIGUES [1994], when progressing to the decomposition of the trend in inequality by income sources, finds that the evolution of wages and that of the returns to capital would have generated rising inequality, which was however more than

[1] Gouveia and Tavares also analyse expenditures.

offset by the impact of the earnings of self-employed workers, direct taxes and other contributions, and pensions. Also the *Relatório de Conjuntura*, an annual report by the Ministry of Employment and Social Security (MESS), reports a 10% rise in the Gini index from 1982 to 1989, and an increase, from 37% to 40%, in the share of the total wage bill earned by the top quintile of the distribution [PORTUGAL, MESS, DEP, 1992: 131]. Similarly, the *Employment Outlook* by the OECD [1993] reports a rising trend in labour market inequality in Portugal from 1985 to 1989. Ongoing research by VIEIRA *et al* [1997] also stresses the rise in labour market inequality.

The first goal of the analysis is therefore to clarify this issue, detecting the pattern and the trend of earnings inequality in Portugal, from 1983 to 1992. After chapter 2, where an overview of the Portuguese labour market and its institutional background aims at highlighting the major forces that may have influenced employers' and unions' power in wage setting, chapter 3 provides a description of the rich dataset to be used, whereas chapter 4 initiates the core of the thesis. A wide array of inequality measures, together with international comparisons, sustain the test of the following hypotheses: earnings inequality is in Portugal high, mainly due to the very stretched upper half of the distribution; just like in most other OECD countries, inequality in the Portuguese labour market increased during the 1980's, as the top of the distribution became even more stretched.

An exploratory investigation into the causes of rising earnings inequality concentrates on shifts in the employment structure, relying on a simple supply-demand framework.[2] Linking an index of supply shifts, and index of demand shifts and one of real wage growth for ten different types of labour inputs enables testing three often-presented explanations for the trend in wage inequality. The first explanation points to supply-driven changes in the wage structure, brought about by demographic shifts that would have resulted in a slowdown in the rate of growth of the working population with higher qualifications. In particular, entry into the labour market of the post-war *baby-boom* generation resulted in a sharp rise in the supply of schooled workers, a trend which slowed down as the impact of lower birth rates began to strike the labour market. With technological progress generating a steadily rising demand for skills, wages would have adjusted, favouring the most qualified labour force and thus leading to higher inequality. One second set of explanations highlights demand forces that operate across industries, concentrating on changes in the industrial composition of the workforce. The increased openness of the economies and changes in the pattern of international trade would have led to differential growth rates across economic sectors, and the mix of

[2] Developed by KATZ and MURPHY [1992] and JUHN and MURPHY [1995].

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workers with different levels of qualification would thus have changed (in favour of the most skilled workers in the *Northern* countries; reinforcing the employment share of low-skilled workers in countries in the *South*). Rising inequality would in either case have resulted from the contrasting rates of employment growth across economic sectors. Forces operating within industries, in particular technical progress, which would have biased the demand in favour of the most qualified workers, are the third set of explanations. Data on Portugal for the 1980's categorically dismiss the first two types of explanations, lending support to the relevance of changes that have occurred within industries.

The need to look within industries suggests *the firm* as the unit of analysis. Apart from the previous empirical findings, also theoretical considerations strengthen this choice of the impact of the firm on earnings inequality as a research topic. Indeed, there is growing awareness of the fact that labour economists have disregarded the demand side of the market.[3] Having asked the question: "Does the new generation of labor economists know more than the older generation?" Freeman asserts: "[T]he main conclusion I reach is that while, labor economists are more knowledgeable of labor supply issues, we do not know more about firm behavior, labor demand and the overall functioning of the markets" [FREEMAN, 1989: 319]. Following this concern, the influence of the firm on wage inequality has been addressed by empirical studies dealing mainly with the USA, which have detected that inequality among firms accounts for a major share of the wage dispersion.[4] Furthermore, data considerations reinforce the choice of this topic. Analysis of firm behaviour may be enriched by the availability of a remarkable dataset, which gathers information on every establishment with wage-earners in the Portuguese economy, combining data on the firm, the establishment and each of their workers.

The role of the employer in shaping labour market inequality is analysed in chapter 5 under two perspectives: the contribution of firm attributes to shape the *level* of earnings inequality; their contribution to the *rise* in inequality. A more detailed analysis of the causes of rising inequality is thus undertaken, widening the range of its possible causes that are evaluated in a systematic way — shifts in the employment structure, relative changes in the wages of different groups of workers, and changes in inequality within those groups. The decomposition of the trend in inequality reveals a profile of an economy undergoing modernisation, and supports the hypothesis that rising wage

[3] See HAMERMESH [1993].

[4] See in particular GROSHEN [1986], DAVIS and HALTIWANGER [1991] and LUCIFORA [1993].

inequality has been signalling the lack of an adequate labour force to promote economic change.

The Theil index and its decomposition enable quantification of gross, as well as marginal, contributions to inequality, providing the framework to test the hypothesis that firms account for a major share of the wage dispersion. The situation in a European country is compared to that in the USA. Most of the work quantifying the impact of the firm on earnings inequality has dealt with the USA, a labour market characterised by institutional arrangements quite different from those prevailing in Europe. In fact, the decentralised bargaining mechanisms, the low *safety net* and the traditionally lower unionisation rates characterising the *deregulated* and *flexible* American labour market contrast with the more centralised bargaining system and the relatively higher minimum wage levels enforced in Europe and with its traditionally higher unionisation rates. These differences are likely to influence the degree of autonomy granted to employers' wage setting policies.

The impact of the minimum wage on the economy and in particular on earnings dispersion also deserves attention, to check whether the pattern detected for the USA by CARD and KRUEGER [1995: 288-297] and for the UK by MACHIN and MANNING [1994] holds, that is, whether the minimum wage has a narrowing impact on the wage distribution.

A shift in the emphasis of the analysis, away from the between-firm situation, leads to the most challenging issue — opening the *black-box* to look inside the firm, in chapter 6. Pinpointing the contrasts and the changes in company wage policies can shed some light on the mechanisms that employers have used to cope with the shifts in the demand for labour brought about by the modernisation taking place in the Portuguese economy, which have resulted in rising labour market inequality. Moreover, one drawback of the methodology used so far should be overcome. Inequality decomposition can stress the relevance of firm action and clarify the path one should explore, but nonetheless it does not define any clear routes of causality. Methodological refinements must therefore be introduced by techniques supporting causality statements.

Following a research path initially explored by LESTER [1952], SLICHTER [1950: 83-84, 89-91] or DUNLOP [1957: 14-22] and later abandoned, recent empirical studies have concentrated on employer wage policies (see in particular GROSHEN [1986], LEONARD [1989], KRAMARZ *et al* [1995] and ABOWD *et al* [1995]). The fact that the discussion on the relevance of employer pay policies remains unsettled can be illustrated by confronting Groshen's and Leonard's major conclusions. Groshen's thesis states, in brief,

that "employer wage differences within industry are large, real, persistent [...] the likely sources are efficiency-wages and bargaining over rents" [GROSHEN, 1986: ii]. Leonard, instead, refers to the "relatively small role played by firm effects in explaining wage variation, and the transient nature of these wage differences [...] consistent with a simple market model of homogeneous workers, with low search and mobility costs" [LEONARD, 1989: 261].

The specific aims of chapter 6 and its distinguishing features with regard to previous studies can be summarised as follows:

1. To quantify firm wage effects going beyond the traditional approach of reducing them to an employer-specific *intercept* in the wage regression. This procedure seems too laconic, as it does not take into consideration that employers' wage policies can also be distinguished by the fact that different firms may value differently the human capital of their workers.
2. To take advantage of the appropriateness of multilevel modelling techniques, both from a methodological point of view and given its capability to provide concise answers to relevant empirical questions. In particular, the following topics will be dealt with: worker *versus* employer components of wage inequality; modelling the variance of wages across firms; modelling the firm-specific wage parameters.
3. To detect changes over time in employers' pay policies that can explain the rise in labour market inequality.

Multilevel modelling techniques confirm the relevance of contrasts among company wage policies as a source of wage dispersion, supporting furthermore the hypothesis that such contrasts refer to every parameter of the pay policy (returns to schooling, tenure, labour market experience, as well as the penalty imposed on women and newly-hired workers), being particularly pronounced for workers with higher qualifications. Linking the shifts in employers' pay policies to the mutations occurring in the economy highlights that the need for a more qualified labour force has led to the decline of traditional schemes of wage progression within the firm, in favour of schooling as a more relevant asset in the labour market.

A global conclusion follows the presentation of chapters 4, 5 and 6.

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2. WAGES AND INSTITUTIONS IN THE PORTUGUESE LABOUR MARKET: WHAT SCOPE FOR FIRM ACTION?

2.1. INTRODUCTION

In a period marked by contrasting macroeconomic trends — harsh times from 1983 to 1985 and the economic expansion taking place after 1986 — and by a rapidly changing demand for labour, wage changes in the Portuguese labour market are likely to have been pronounced, supported by a remarkable degree of wage flexibility prevailing in the economy. This evolution was constrained by institutional forces, in particular: the Government's incomes policy and the (implicit and explicit) bounds it placed on minimum and maximum wage levels; the legislation on labour market flexibility and the increasingly weak links between employer and employee; the educational system, and its (in)ability to provide a labour force matching the needs of the productive system; the wage bargaining mechanisms enforced in the economy.

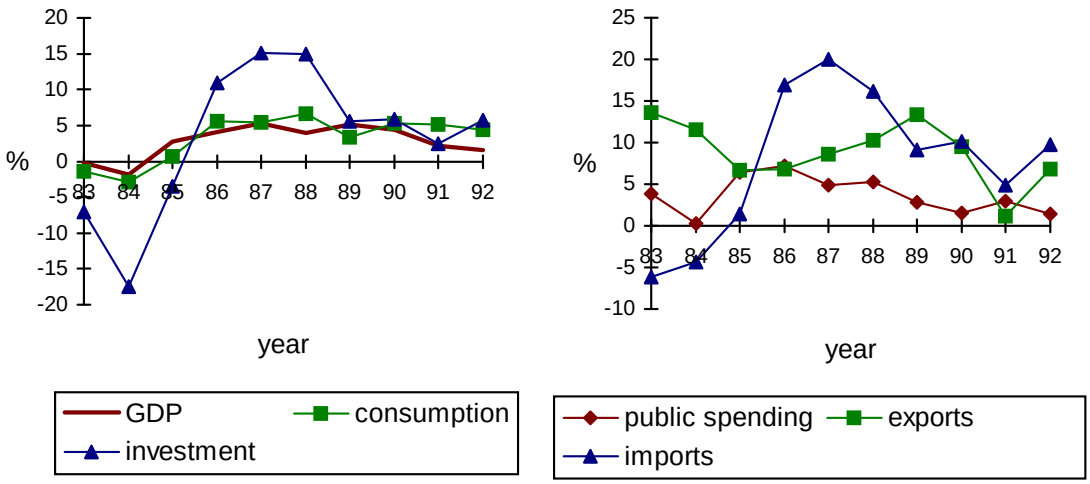
This chapter provides an overview of the evolution of the labour market in Portugal and of the factors more likely to have had an impact on the degree of wage dispersion and on the power held in wage bargaining by employers and trade unions.

2.2. MACROECONOMIC TRENDS AND THE LABOUR MARKET

In the early 'eighties, negative growth rates of the investment component of GDP, reaching -17% in 1984, provided an expressive picture of the economic crisis in the Portuguese economy (see figure 1), still suffering from the impact of the *second oil shock* and the adverse international economic environment it had generated. Moreover, the economic policy followed from 1980 to 1982, under the influence of the political electoral cycle, had failed to promote the economic adjustments that were underway in most other European countries [LOPES, 1996: 31-32], contributing to aggravate the persistent economic problems. Inflation (reaching almost 30%), public deficit

(absorbing 10% of the GDP) and current external deficits led to restrictive policies, under a (second) stabilisation programme accorded in 1983 with the International Monetary Fund (IMF).

Figure 1 – Economic growth in Portugal, 1983-1992



Source: OECD [1994].

Labour market outcomes reflected this framework (table 1). The negative growth rates of the GDP resulted in contraction of the employment level; the active population itself and the activity rate declined, possibly due to a *discouraged worker* effect, according to which labour supply is reduced during slack labour market periods (see OECD [1986: 37]).

Table 1 – Overview of the labour market, Portugal, 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Active population *(1)*	4620	4573	4560	4466	4511	4562	4628	4716	4830	4527.6
Activity rate	48.6	47.7	47.3	46.0	46.2	46.7	47.2	48.1	49.2	48.4
Civilian employment	4214.3	4184.9	4142.6	4064.0	4171.0	4280.0	4376.0	4320.1	4643.0	4625.0
Unemployment rate *(2)*	7.8	8.5	8.7	8.6	7.2	5.8	5.1	4.7	4.1	4.2

Sources: Active population and activity rate (years 1983-91) – NEVES [1993];
Active population and activity rate (year 1992) – PORTUGAL, INE [1993];
Other data – OECD [1994].

Notes: (1) For the computation of the active population, until 1984 unemployment was considered in the broad sense (it included those who are not actively seeking a job); from 1984 onwards, unemployment is considered in the narrow sense.
(2) Unemployment rate in the narrow sense.

The mid-decade was a turning point in the economic cycle, under the combined influence of a favourable international environment and the loosening of the restrictive economic policies, following the good results previously achieved. Incomes policy

further reflected the influence of the political cycle. Moreover, 1986 witnessed the entrance into the EC, with a positive direct impact on exports and investment, and an indirect impact on consumption, through expectations of a rise in permanent income (see OECD [1988, 1989, 1991, 1992] or LOPES [1996] for an overview of the economic policy and trends during this period).

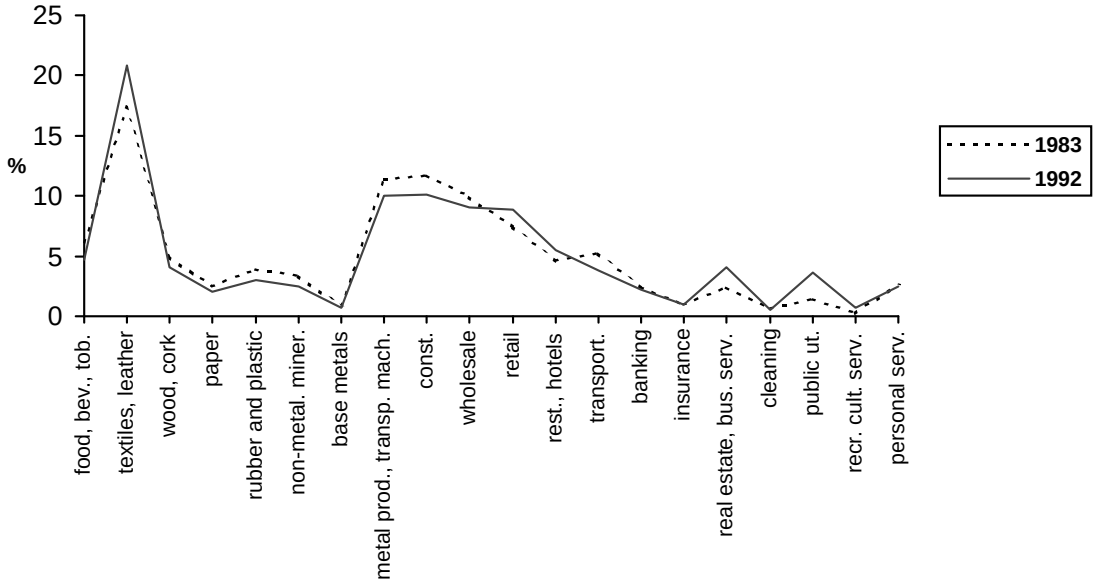
The second half of the 'eighties was also marked by an extensive deregulation programme. Liberalisation began with the financial system[5] — new firms entered the banking and insurance markets, following their opening to the private initiative, administrative controls on interest rates were loosened, new financial instruments were created to bridge the distance between savers and investors and tax incentives were created to stimulate the incipient stock market. In 1989, a large-scale privatisation programme began, but by 1992 its impact on the economy was below the initially proposed. Reform of the tax system took place during this period, approximating it to EC procedures and granting some incentives to investors.

High growth rates and low unemployment levels gave a successful image of the country's economy. Investment and exports, with average annual growth rates of 10.4% and 9.6% respectively, were leading indicators in the 1986-1990 period (even though their behaviour was partly offset by the sharp growth in imports). The following year saw a slowdown in economic activity, with the decline of both exports and investment to be replaced by private consumption as the leading source of economic growth. Consumption grew at the expense of savings.

The unemployment rate, decreasing from 8% in 1983 to 4% in 1992, was substantially below the EC average. The expansion of economic activity, with employment rising at an annual average rate of 2.7% from 1986 to 1991, was a relevant force driving unemployment down. The services sector was partly responsible for this dynamism, reflecting the growing tertiarisation of an economy still lacking behind in the European context. Traditional labour intensive activities, such as the textiles and restaurants and hotels, however, also increased their employment levels sharply. High wage flexibility, on the other hand, has been insistently pointed out as determining the low unemployment levels in Portugal.

[5] See MEXIA and LEITE [1992] for a critical analysis of this process.

Figure 2 – Employment structure by economic activity, 1983 and 1992 *(1)*



Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].
Notes: (1) The employment structure is evaluated in terms of normal hours of work.

2.3. WAGE FLEXIBILITY *VERSUS* EMPLOYMENT RIGIDITY

The very high wage flexibility prevailing in the Portuguese economy has been highlighted as contributing to its low levels of unemployment (see OECD [1992], MODESTO and MONTEIRO [1993], BLANCHARD and JIMENO [1995] and LUZ and PINHEIRO [1994]). Indeed, estimations by the OECD reveal that "long-run wage rigidity [in Portugal] has been possibly lower than anywhere else in the OECD except Japan and Sweden." [OECD, 1992: 20] This "unusually high degree of wage flexibility by international standards [...], until recently, helped keep real-wage increases well below gains in labour productivity" [OECD, 1992: 20]. The remarkable responsiveness of wages to unemployment can be further illustrated by the fact that, during the economic crisis, workers were in some cases willing to keep their job even in situations of *overdue* payment of wages. In fact, estimates point to wages being owed at the beginning of 1984 to 92 000 workers (mainly in the textiles, metallurgy, shipbuilding and transport sectors) [OECD, 1988: 20]. The discussion in the sections below may provide some background to understand this degree of wage flexibility in the Portuguese labour market.

Nevertheless, awareness of this high degree of wage flexibility seems to be scarce within the country, as the idea of wages as *the* main source of inflation is often stressed.

Besides, the country is pointed out as presenting a high degree of *employment* rigidity (see for example OECD [1992: 20]), mainly associated with the firing costs legally imposed. The claims for a more flexible labour market that spread in most economies during the 1980's were therefore amplified in a country where low and decreasing unemployment rates coexisted for a few years with gains in real wages (see table 2). One should nonetheless remark that the increase in employment was basically demand-driven, with supply adjusting and more people entering the labour force as opportunities arose; also, wage increases were partly sustained by increases in productivity (table 2), and part of the wage rigidity claimed to exist was due to rising social security contributions.

Table 2 – Wages in Portugal, 1983-1992

(%)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Change real wages (CPI defl.) *(1)*	-3.2	-5.6	2.5	6.9	7.2	3.1	0.2	3.3	2.7	2.4
Change real wages (GDP defl.) *(1)*	-2.2	-2.7	0.6	0.9	6.0	1.6	0.4	2.6	2.7	1.8
Change in productivity	1.0	-0.4	2.8	7.0	4.8	3.8	3.5	3.5	3.0	3.5
Change in real labour costs per unit produced (GDP defl.) *(1)*	-3.2	-2.4	-2.2	-5.7	1.2	-2.1	-3.0	-0.8	-0.3	-1.7
Share of labour in GDP	51.0	49.3	47.5	45.5	46.1	45.6	44.2	44.9	45.9	45.6

Sources: Change in wages, productivity and labour costs – CEC, DGEFA [1991];
Share of labour in GDP – OECD [1994].

Notes: (1) Data on changes in wages and labour costs from 1990 to 1992 are based on European Commission Services forecasts.

Moreover, when a slowdown hit the economy in 1991, the target of a unique monetary and exchange rate policy within the EC had been embraced by Portugal, and the search for nominal convergence was embodied in precise targets for public finance, inflation and interest rates, which the country had been failing to meet. The argument in favour of a more rapidly adjusting labour market was thus reinforced, and the process of growing labour market flexibility regained impetus.

Legislation was passed during the second half of the 'eighties that loosened the relationship between employer and employee, reducing the employment rigidity claimed to characterise the Portuguese labour market, as it eased layoffs and facilitated the use of short-term contracts. Short-term contracts achieved major relevance in the economy, representing 72% of the admissions in 1987 and almost 20% of the total of wage-earners in 1989. This greater flexibility achieved by employers in managing their workforce may have brought about a more segmented labour force within the firm (the *fringes* versus the *core*), possibly with an impact on wages and their dispersion within the firm.

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2.4. LESS STRINGENT INCOMES POLICY

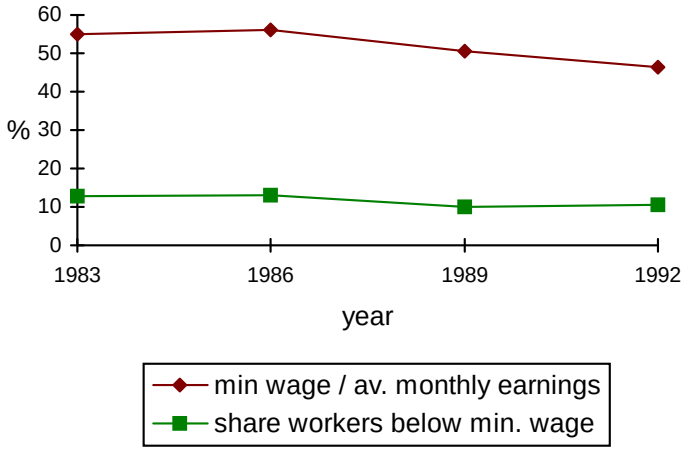
During the economic crisis and in the framework of the program accorded with the IMF, incomes policy formed a crucial part of the austerity plan, having been awarded the task of overcoming some of the negative consequences of a restrictive policy (see OECD [1986] for an overview of the economic policy followed during this period, or LOPES [1996] for the period 1960-95). Indeed, to stimulate exports and fight external imbalances, the currency was depreciated, which generated adverse *imported inflation*; restrictive monetary policies included the control of credit and monetary aggregates and a rise in interest rates, reinforcing inflationary pressures and compromising growth, mainly through its impact on investment; similar consequences were generated by the increase in direct and indirect taxation and by the reduction of subsidies on certain goods, aimed at improving public finance. Incomes policy should overcome some of these negative influences on growth and competitiveness — wage restraint should reduce inflationary tensions and improve external competitiveness, mainly through its impact on investment and exports. As a result, sharp reductions in real wages and in the labour share of GDP characterised this period (table 2).

Two particular aspects of the incomes policy deserve closer attention — legally set maximum and minimum wage levels —, as they have a direct influence on wage dispersion and on employers' pay policies. For the first time since 1977, firms were in 1983 free to set wage increases. Previously, from 1975 to 1978, they had been bound by explicit upper bounds on wage *levels* legally set by the Government[6]; subsequently, maximum wage *increases* were enforced in 1978 and abolished at the end of 1979[7]. From 1979 to 1982, indirect controls were put into operation. The officially expected inflation rate was set as the maximum wage increase that firms could grant to their employees, with wage raises beyond that level leading to an increase in the Social Security contributions paid by the employer. The official abolition of such controls in mid-1983, even if based on the recognition of their practical ineffectiveness[8], released employer's pay policies from a constraint, setting them free to legally promote adjustments in wage levels. The aggregate decline in real wages after 1983 is therefore likely to have resulted from contrasting evolutions at the micro level, reflecting different financial conditions on the part of firms and different bargaining powers on the part of firms and workers.

[6] See the legislation DL 292/75, DL 49B/77 and DL 113/78.
[7] See DL 121/78, DL 34/79 and DL 490/79.
[8] See DL 313/83.

The role of the minimum wage legislation, on the other hand, should not be disregarded, particularly during this crisis period (figure 3). A *safety net* for low wage workers in provided by the minimum wage, which kept from 1983 to 1986 its purchasing power, having slightly increased from 55% to 56% of the economy's average earnings. A certain compression in the bottom part of the wage distribution could have resulted in early 'eighties from this evolution of the minimum wage (following in particular the reasoning by CARD and KRUEGER [1995: 288-297] and by MACHIN and MANNING [1994] on the impact of rises in the minimum wage on overall wage dispersion), a hypothesis that deserves further scrutiny. After 1986, these trends were reversed.

Figure 3 – Impact of the minimum wage on the economy



Sources: Computations based on PORTUGAL, MESS, DE [1992] and regulations enforced in each of the years.

A certain space for firm manoeuvre was nonetheless allowed by the minimum wage legislation during most of the period under analysis. While nowadays minimum wage reductions apply only to youngsters below the age of 18, trainees aged 25 or less and handicapped workers, small firms were until recently allowed to pay wages below the minimum set for their activity[9] — if they employed fewer than 6 workers (a possibility revoked in 1991) or, on request, if they employed fewer than 50 workers (a benchmark gradually lowered until it was revoked, in 1990).

[9] And equal to the agriculture minimum wage.

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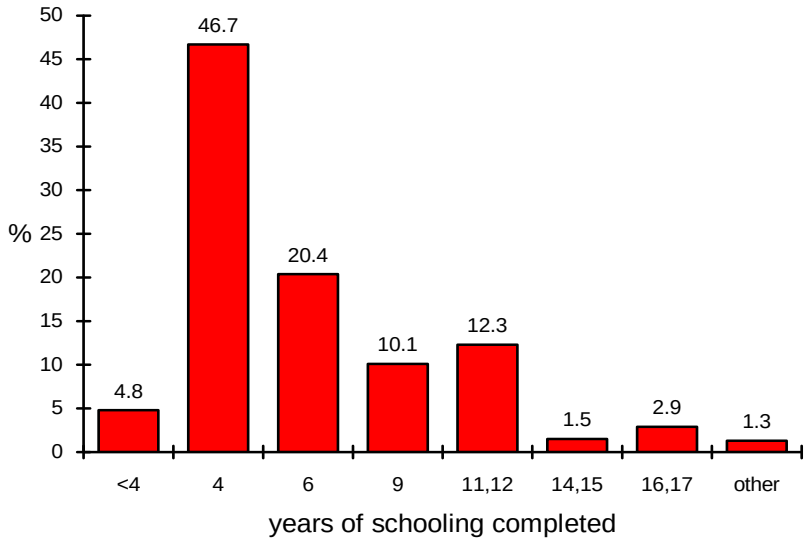
2.5. LINKS BETWEEN THE EDUCATIONAL SYSTEM AND THE LABOUR MARKET: THE WEAK SPOT?

Low educational attainment is a worrying characteristic of the country's labour market.[10] Indeed, 52% of the working population had in 1992 completed at most 4 years of formal education, a situation that is changing slowly, as new cohorts enter the labour market.

Figure 4 – Educational achievement of the working population, Portugal, 1992



Source: PORTUGAL, MESS, DE [1993].

Moreover, the mismatch between workers' qualifications and the needs of the productive system has led to insistent claims for the introduction of reforms in the educational system. The traditionally weak links between the schooling system and the labour market are reflected for example in the low share of blue-collars holding a technical diploma — 20% in Portugal as opposed to 90% in Germany (according to RODRIGUES and LOPES [1993: 17]). This may contribute to allow firms a certain discretionary power when setting wages, as external constraints (e. g. a diploma) are weak.

Note also that the educational system may have a relevant role in sustaining a compressed wage distribution, as expressively stated by NICKELL and BELL [1996] when comparing the USA and the UK with Germany. A *compressed* educational and training

[10] For an interesting discussion on the historical roots of this situation, see REIS [1993].

systems, which provides workers in the bottom half of the qualification ladder with a solid background and flexibility to cope with economic change, helps sustain their productivity and wages in periods of economic mutation, therefore preventing the wage distribution from stretching.

2.6. CENTRALISATION *VERSUS* DECENTRALISATION IN WAGE BARGAINING

Comparing the Portuguese bargaining system with that of other countries can clarify a judgement about its degree of centralisation. That discussion will be preceded by a short description of the model of organisation of employers' and workers' organisations, and the existing collective bargaining mechanisms.

2.6.1. SOCIAL PARTNERS, THEIR MODEL OF ORGANISATION AND WAGE SETTING MECHANISMS

Freedom of union creation and union affiliation (including the choice not to join any union) are recognised in the Portuguese legal system, and have resulted in a fragmented union structure, where overlapping unions often coexist, to a great extent competing and to a less extent cooperating. Base-unions (*sindicatos*) can associate by economic activity, creating a *federação*, or by geographic area, creating an *união*; a national association forms the so-called confederation (*confederação*). This does not, however, correspond to a rigid hierarchical structure. Indeed, whereas *CGTP*, the confederation legalised following the 1974 Revolution, adopts much of the described model of organisation, the *UGT*, created in 1978 with the explicit aim of disrupting union unity, is essentially made up of base-unions, without any intermediate structure.

CGTP gathers 150 base-unions, whereas 49 are affiliated in *UGT* and 160 *independent* unions belong to neither confederation [PINTO, 1990: 46]. The number of workers covered is a well-kept secret, since there is no legal obligation to release such data, but it is estimated that just over one million workers are represented by each confederation, with *CGTP* surpassing *UGT* [PINTO, 1990: 45-46]. Estimated figures point to a sharp reduction in the unionisation rate, which initiated during the economic crisis and never ceased from then on. In fact, while between 1979 and 1984 the unionisation rate averaged 59%, by 1985/86 it had dropped to 51-53%[11] [CERDEIRA and PADILHA, 1990:

[11] Given the very scarce information available about the issue, the data source provides an upper and a lower bound for some of the estimated figures, while relying on average values for a wide period covering over a year (see CERDEIRA and PADILHA [1990]).

40], reaching 32% in 1990 [OECD, 1994a: 184] (for a discussion of the evolution of trade union strategy and action from 1974 to 1990, see LIMA [1991]; RIBEIRO *et al* [1994] analyse the results of an inquiry into workers' and employers' opinions about the trade union movement; CERDEIRA and PADILHA [1988] undertake an exhaustive inventory of the trade unions existing in Portugal in the period 1933 to 1987).

Employers are grouped into three national associations, defined according to economic sector bounds – agriculture, industry and trade.

Regarding the types of bargaining mechanisms, the *conventional* regime should be distinguished from the *mandatory* one. Conventional bargaining results from direct negotiation between employers' and workers' representatives and it can take the following forms (see table 3 for their relevance in the economy):

– *collective bargaining contract* (CCT): signed between one or several unions and one or several employers' *associations*; this often covers an economic sector;

– *collective bargaining agreement* (CBA): signed between one or several unions and one or several *employers* (firms), though not organised into a formal association;

– *firm agreement* (FA): signed between one or several unions and one employer.

A *mandatory regime*, on the other hand, does not result from direct bargaining between workers and employers, being instead dictated by the Government (Ministry of Employment and the Ministry ruling the economic sector). It can extend the applicability of an existing collective agreement to workers initially not covered by it or it can have an original contents, if it is not feasible to extend the application of an existing document. A mandatory regime is applied when workers are not covered by unions, when one of the parties involved refuses to negotiate or bargaining is obstructed in any other way. It ceases to hold when a *conventional* mechanism of collective bargaining is accorded.

Table 3 – Share of the wage-earners covered by each type of collective bargaining mechanism

(%)

year	massive wage setting mechanisms		decentralised wage setting mechanisms		not covered
	collective bargaining contract (CBC)	*mandatory regime* (MR)	*collective bargaining agreement* (CBA)	*firm agreement* (FA)	
1983	78.9	3.4	4.5	10.4	2.7
1986	78.6	4.6	4.5	10.0	2.3
1989	81.3	4.2	4.6	8.4	1.5
1992	82.9	4.5	4.0	7.3	1.3

Source: Computations based on PORTUGAL, MTSS [1985] and PORTUGAL, MESS, DE [1990, 1993].

2.6.2. CENTRALISATION VERSUS DECENTRALISATION

Features of a centralised wage bargaining system can be found in the Portuguese industrial labour relations system as in several other European countries, in contrast with the *American model*. Indeed, trade union confederations, employers' federations and the Government meet at the national level to set each year a guideline for wage increases. Nonetheless, this guideline merely orients the collective bargaining that follows (and private sector agreements often yield agreements above that benchmark). The degree of *social peace* prevailing during the year is nonetheless strongly influenced by the extent of agreement reached, that is, by the number of social partners signing the *Social Pact*.

Also, massive wage bargaining contracts predominate in the economy (see table 3). Furthermore, extension mechanisms are another feature shared by Portugal and many European economies, in sharp contrast with the American practice. Apart from the compulsive extensions that can be applied by the Government (see *mandatory regime* in table 3), voluntary extensions are also found, when one economic partner — workers' representative or employer — decides to subscribe to an agreement which it had initially not signed. Also in contrast to the American practice is the fact that employers who sign an agreement with a trade union(s) usually extend its application to all of their workforce, irrespective of the worker's union membership status. As such, the impact of collective bargaining goes far beyond union membership and the distinction between unionised and non-unionised workers (or firms) becomes meaningless.

Nonetheless, certain aspects of decentralisation can also be highlighted, clearly setting this system apart from the very centralised ones, among which Sweden has deserved most attention in the literature. Employers may choose to negotiate individually with trade union(s) (see decentralised wage setting mechanisms in table 1). Furthermore, the scattered nature of union organisation and the multiplication of collective agreements provides the system with a certain degree of decentralisation.

In fact, the right to collective bargaining is recognised to every level of the union structure and to employers, whether associated or individually. The parties involved may choose the level of negotiation — regional, occupational, industrial or national — and the scope of the two partners negotiating is not necessarily coincident (for example, several unions can enter negotiation for an agreement, separately or together, just as employers can be united to varying extents). The system can thus become extremely diffuse, with negotiation fragmented and agreements multiplied; several agreements can

coexist for the same region, occupation, economic sector or even firm, as several unions can represent the same type of workers, depending on their affiliation.

While no clear-cut predictions can be drawn from the theory regarding the impact of union cooperation on the bargaining outcome, in case of workers who are substitutes in the production process, there is some consensus over the fact that unions would be better-off by bargaining jointly (see ULPH and ULPH [1990]). This fragmentation of the union structure may grant employers more power when bargaining over wages, and contribute to the high wage flexibility in the Portuguese labour market. The practical procedure often adopted in the pay bargaining process, however, may minimise the *losses* to trade unions.

Indeed, legal rules solve the dubious situations that might arise, and a practical procedure is often followed. In practice, one union usually takes the lead negotiating for a type of worker (usually the union which has the strongest bargaining power) and the others follow, either signing the same agreement or signing a separate agreement of similar contents. Legislation prescribes that in case the same group of workers might be covered by different collective bargaining agreements, the most favourable one, according to the judgement of the union that represents the highest number of workers concerned, should prevail; if no decision is reached according to the previous criterion, then the most recent agreement should be applied (see PINTO [1990] for a good overview of the legal framework of industrial relations in Portugal).

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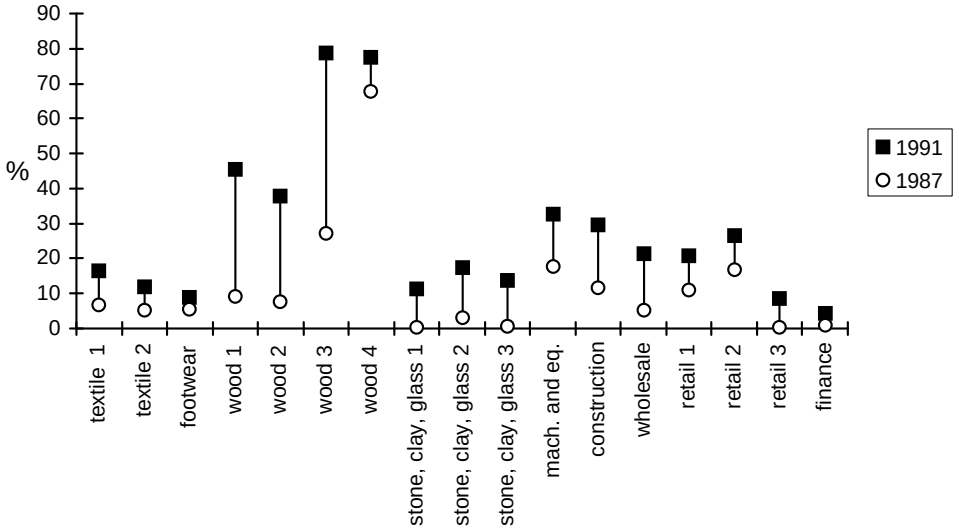
Figure 5 – Wage drift, by economic activity, 1987 and 1991



Source: Data in APERTA *et al* [1994: 12].

Notes: (1) Wage drift is evaluated as *WD=(A/C)-1*, where *A* stands for the actual monthly earnings, including subsidies and overtime pay, and *C* is the monthly earnings laid down by the collective agreement. It should be noticed that the annual growth rate of the GDP and the total number of hours worked per employee were both lower in 1991 than in 1987 (see NEVES [1993:17] and PORTUGAL, Banco de Portugal [1993: 142]), suggesting that a similar pattern was followed by overtime work.

(2) The numbering of the activities on the horizontal axis results from the fact that each of the economic activities was, in the data source, split into more detailed industries or geographical divisions.

(3) One industry in the textiles (carpets) is not reported here, since in March 1987 not all of the industry was already covered by that year's collective contract (and therefore the wages reported – which refer to March – are in some instances below those set in the collective contract, generating a misleading idea of *negative wage drift*).

Further contributing to some flexibility in the system is the fact that wages actually paid by the firms often drift from their contractual levels, especially in periods of unexpected high inflation or changing economic conditions. Wage increases above the collectively bargained levels seem to be a very selective mechanism, achieving highest levels for highly-skilled workers and white-collars. Moreover, wage drift has gradually increased in the Portuguese economy during the 1980s (see figure 5 and the original data in APERTA *et. al.* [1994]). Data for 1987 and 1991 reveal that wage drift by economic sector ranged from 0% to 68% in the earlier period, whereas by 1992 it had risen to 4% to 79%.

Most agreements in fact address specifically the base monthly wage, overtime pay and the normal duration of work. In the sense that no reference to employment levels is usually included in the agreement, the description provided by the right-to-manage type of theories would provide a better approximation to the mechanisms of union influence

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in the Portuguese economy than, for example, efficient-bargaining models. However, hours worked are most often also negotiated, and in that sense the actual bargaining process that takes place seems to escape the parameters defined by either of those theories (see the comments by ULPH and ULPH [1990]).

2.7. CONCLUSION

Several factors may have combined in the Portuguese labour market to facilitate sharp wage mutations and to grant employers a certain discretionary power when bargaining over wages. In particular after 1986, economic growth and a certain modernisation of the economy brought about a sharp rise in the demand for labour, likely to have concerned its quality as well. It is however widely known that the needs of the productive system are not adequately met by the Portuguese educational system. In this framework, in a country pointed out as having a high degree of wage flexibility but nevertheless a high employment rigidity, wages may have provided a crucial adjustment mechanism. Wage changes were moreover facilitated by the less stringent incomes policy followed after 1983, when employers were freed from the controls previously imposed on both wage increases and wage levels. The minimum wage legislation, on the other hand, allowed a certain space for firm manoeuvre, with several exceptions permitted, based on the firm size.

The employment rigidity claimed to characterise the labour market was reduced during the second half of the 'eighties, as legislation was passed that loosened the relationship between employer and employee. This higher employment flexibility may have resulted in growing segmentation within the firm, between workers who belong to the *core* and those on the *fringes* of the firm's labour force.

The industrial relations system presents contrasting features. On one hand, the role of massive wage setting mechanisms and the existence of extension mechanisms point to a centralised bargaining system; moreover, attempts at social concertation initiated in 1984 and consolidated thereafter (especially since CGTP joined the *Social Concertation Council* in 1987) may have operated to reduce employers' discretionary power in wage setting, as it reinforced the coordination at the national level of the bargaining process. The scattered nature of union organisation, the possibility opened to employers of bargaining at the firm level, and the widespread wage drift, on the contrary, highlight aspects of decentralisation that may grant employers some freedom when setting wages.

3. DATA AND THEIR SELECTION

3.1. INTRODUCTION

An extensive dataset is gathered by the Ministry of Employment and Social Security, which matches data on the firm, the establishment and their employees, covering every establishment with wage-earners in the Portuguese economy. This chapter describes the dataset, the procedure used to obtain a sample representative of the economy's manufacturing and services activities which takes into explicit consideration the very high rate of firm entry and exit in the Portuguese economy. For the study of one particular topic — employer wage policies — firm size bounds had to be defined, which aimed at achieving a balance between contradictory constraints (in particular, that of obtaining reliable model estimates, which requires the definition of a high minimum firm size and, on the other hand, the nature of the Portuguese economy, essentially made up of tiny economic units). Each of these aspects is developed in more detail below.

3.2. DESCRIPTION AND CRITIQUE OF THE DATA SOURCE

Quadros de Pessoal (QP) is gathered annually by the Portuguese Ministry of Employment and Social Security (MESS). Every establishment with wage earners has, since 1982, been legally obliged to fill in a questionnaire referring to the month of March. Reported data cover the *establishment* itself (location, economic activity and employment), the *firm* (location, economic activity, employment, sales, legal setting) and, furthermore, each of the *workers* (gender, age, skill, occupation, schooling, tenure, earnings — split into base-wage, tenure-related earnings, other regularly paid subsidies, irregular subsidies and overtime pay —, duration of work — normal and overtime), as well as the mechanism of wage bargaining (see table 4 for a detailed description of the variables covered and the concepts used). Most concepts used meet international standards (see for example BIT [1980]).

Table 4 – Variables covered and concepts used by *Quadros de Pessoal*

UNIT OF OBSERVATION	VARIABLE	UNIT OF MEASUREMENT	EXPLANATION OF THE CONCEPT / OBS.
both the **firm** and the **establishment**	location	*distrito*	Mainland Portugal split into 18 geographical areas
		concelho	Mainland Portugal split into 275 geographical areas
	industry	6-digit Portuguese Classification of Economic Activities	Main activity of the establishment/firm - that which yields the highest sales, or the one involving more workers (if it is not possible to disentangle the volume of sales)
	employment		Total number of employees – includes wage-earners, as well as unpaid workers, engaged in the firm during the whole or part of the last week of March, including those on temporary leave (for example, maternity leave or strike)
only the **firm**	legal setting	public company sole proprietorship partner ship limited partnership joint-stock company cooperative	
	sales volume	PTE (escudo) 1000	Gross yearly sales
worker: characteristics	gender	M / F	
	age	years	
	professional situation	wage earner	Includes those on leave of sickness, maternity, holidays, strike, etc.
		unpaid family member	Family members working at least 1/3 of the normal duration of work in the firm
		owner	When actually engaged in a firm activity
		active member of a production cooperative	
	occupation *(1)*	5-digit Portuguese Classification of Occupations	
	schooling	completed years of schooling	
	tenure	years	Number of years since admission into the firm
	skill *(2)*	TMP MP FOR HS S SS US AP	No description of the concepts (namely requirements for each skill level) is given in *QP*. Reference is made to a legal regulation, which does not either describe each of the skill levels. In most disaggregations, there is a residual category (*other categories*).
worker: earnings	base wage	PTE (escudo) / month	Cash payment associated with the normal duration of work
	tenure-indexed subsidies	PTE (escudo) / month	
	other regular subsidies	PTE (escudo) / month	Allowances *regularly* paid, such as lunch, transportation, lodging, children, or productivity premia
	irregular subsidies	PTE (escudo) / month	Amount *paid in March* relative to Christmas, holiday or other irregular subsidies
	overtime pay	PTE (escudo) / month	

(continues on next page)

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Cont. **Table 4** – Variables covered and concepts used by *Quadros de Pessoal*

UNIT OF OBSERVATION	VARIABLE	UNIT OF MEASUREMENT	EXPLANATION OF THE CONCEPT / OBS.
worker: duration of work	normal hours	hours / month	Normal duration of work laid down by collective bargaining or defined according to firm rules
	overtime work	hours / month	
worker: mechanism of wage bargaining *(3)*	mechanism of wage bargaining	CBC	Signed between union(s) and one or several employers' *associations* (it often covers an economic sector)
		CBA	Signed between union(s) and one or several *employers* (firms)
		FA	Signed between union(s) and one employer
		MR	Government unilateral decision imposed on workers and employers

Notes: (1) Appendix 3.B provides details on the aggregation of occupations to obtain a dual classification into blue and white collars.

(2) Skill categories: TMP – top managers and professionals; MP – other managers and professionals; FOR – foremen and supervisors; HS – highly skilled personnel; S – skilled personnel; SS – semi-skilled personnel; US – unskilled personnel; AP – apprentices. Most categories are disaggregated into: administrative personnel, production personnel and trade personnel, or a combination of these.

(3) Mechanisms of wage bargaining: CBC – collective bargaining contract; CBA – collective bargaining agreement; FA – firm agreement; MR – government regulation.

Comment on the coverage of *Quadros de Pessoal* is twofold. On the one hand, entities ruled by *public law* are excluded from the enquiry, which means elimination of civil servants, including those employed by local authorities.[12] Domestic services are also not reported. In agriculture, the prevailing model of organisation still relies on very small units, a major share of which produces for self-subsistence. Since the survey, by design, only covers firms that have wage earners, the presence of the agricultural sector is almost negligible.

However, practical coverage of the population the inquiry is meant to cover is remarkably good, since filling in QP is a legal requirement. The Ministry of Employment estimates that 85% of the firms that are obliged to hand in QP, do so [SOARES, 1990]. The incidence of non-response according to size of the establishment is however unknown, so that inference about the number of workers not covered is not possible. One can nonetheless remark that the coverage of QP has been improving over the years, with a growing share of very small firms included in the database.

For the manufacturing sector, a more detailed analysis can be made, since a census of manufacturing, the *Recenseamento Industrial* (RI), is available. The search and identification of firms is based on a wide array of complementary sources, and the exhaustive nature of the survey is stressed by the *National Statistical Bureau (INE)*, the organism in charge of gathering the data [PORTUGAL, INE, 1987: VI]. Comparability of

[12] State-owned companies (namely those nationalised) are covered by the database.

both sources is provided by the coincidence of the concepts that will be used, in particular those of firm, main activity of the firm, employee and firm size.

Table 5 – Number of firms and workers covered by *Quadros de Pessoal* and by *Recenseamento Industrial*, 1984

firm size		total	1-2	3-4	5-9	10-19	20-49	50-99	100-199	200-499	500-999	>1000
number firms	QP	23713	12459			4319	3839	1559	830	481	226	
	RI	45065	21889	7485	4873	4236	3704	1464	772	442	142	58
number workers	QP	856959	53799			59608	117862	108646	115622	145242	256180	
	RI	817598	26349	25636	32984	58216	113739	101456	108072	133467	98308	119371

Sources: PORTUGAL, INE [1990], PORTUGAL, MESS, DE [1985].

Table 5 reveals that *Quadros de Pessoal* covers more firms and more workers than the census, in all firm size brackets above 10 employees (for a comment on the size structure of the firms in the Portuguese economy, see section 3.3.2). The census covers more firms with less than 10 people at work, but that difference corresponds approximately to the number of firms it reports as having only one or two persons at work. Since QP is meant to cover only firms that have *wage earners*, one might expect tiny firms with less than three people to be excluded. QP therefore covers, altogether, more workers than the RI, but the RI includes very small firms that are not a part of the population of QP. The legal obligation to report to QP, at the initiative of the firm, therefore leads to a remarkable coverage of the population of firms, not matched by an explicit attempt on the part of the National Statistical Office to cover exhaustively the population of firms when making interviews for the Census.

3.3. SAMPLING STRATEGY

3.3.1. PROCEDURE TO SAMPLE FIRMS

Agriculture, fishery and mining, as well as public administration and international organisations were excluded from the analysis, since these sectors are not adequately covered by the inquiry (they either have a very low share of wage earners in total employment, or they are among the activities explicitly excluded from the obligation to answer the questionnaire); residual categories such as *other manufacturing activities* were also dropped (representing 0.5% of the workers in the database in 1992). *Electricity, gas and steam* and *communications* were excluded from the analysis (in

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1992, these sectors represented 2.8% of the workers), due to the very unrepresentative nature of the sample that had been drawn.[13]

Geographically, the study focuses on mainland Portugal, therefore excluding the islands of Azores and Madeira and the territory currently under Portuguese administration, Macao.

The years of 1983, 1986, 1989 and 1992 were selected for analysis, given that they span over a decade, allowing for the detection and explanation of inequality patterns, while the manageability of the database and the identification of stylised facts would be enhanced by omitting the details of a year-to-year analysis.

The basic sampling procedure consisted on drawing a 20% random sample of firms, stratified according to economic activity (2-digit classification). Sampling firms instead of workers is an obvious procedure once the emphasis of the analysis is to be placed on the behaviour of this economic unit and its impact on earnings dispersion. The stratification procedure, on the other hand, is justified by the fact that the economic activity is a most relevant dimension of heterogeneity among firms. Indeed, reasons such as the type of technology used lead to a certain homogeneity of behaviour and outcomes within economic activities, while generating considerable heterogeneity across activities. The stratification adopted thus aimed at capturing more adequately that heterogeneity existing in the economy. Stratifying the sample according to economic sectors is, furthermore, a way of indirectly stratifying with respect to firm sizes and wage levels as well.

While the diversity of firms existing in the economy would partly be captured by the stratification procedure used, another dimension of heterogeneity among firms appeared to be relevant in an economy known to be characterised by very high rates of firm creation and bankruptcy. Therefore, an initial sample of firms existing in 1983 was drawn; for subsequent years, firms previously sampled were followed and new firms, that had meanwhile joined the database, were sampled according to the principle just

[13] These sectors were made up of one or two large firms (with several thousands of workers) and a reduced number of small firms (with fewer than 50 employees); the random sample picked precisely one or two of the latter type of firms, thus generating a very distorted image of the activity. This procedure of eliminating economic activities for which a small number of observations is available in the sample is found in other works (see namely GREGG and MACHIN [1994: 110], who have eliminated 15 3-digit activities).
The alternative of arbitrarily picking the monopoly or one of the oligopoly firms in the industry would render it unfeasible to report the results by economic activity, as confidentiality constraints would be violated for those firms; furthermore, the dimension of an already-hard-to-manage sample would increase by approximately 15%, and a random sample for some activities would coexist in our selection of data with the population itself for other activities.

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described. Sampling firms according to this procedure enables taking into account firm *birth* and *death* which has been reported to achieve high levels in the Portuguese economy. In fact, according to BRANDÃO ALVES and MADRUGA [1993: 29-30, table 4], 31% of the establishments created in 1982 were out of business one year later (55% if a three-year period is considered); MATA and PORTUGAL [1994: 228] report that 22% of the firms created in 1983 were out of business a year later, and only half of the initial ones survived for four years. MATA [1992: 121-122] makes a good case dismissing the possibility of these facts resulting from fluctuations in the coverage of the data source.

One final comment should be made about *ballerina firms* and how they were handled. Some firms initially met the economic activity and location requirements for selection and were among those sampled, but changes in their activity or location made them fall outside the range of analysis, at a later date. They were therefore dropped from the sample, *whenever they became not eligible*. Their impact on the samples was negligible — altogether, their contribution would have ranged from 193 to 463 workers. Whenever the creation or destruction of the firm had to be taken into account for some computation (of its age, for example), its actual presence in the population dataset was considered.

Table 6 summarises this step of the sampling process, illustrating the very high level of firm entry and exit in the Portuguese economy, as well as the low share of firms not responding to the obligation to fill in *Quadros de Pessoal*, and the negligible impact of excluding firms that changed to economic activities or locations not eligible for sampling.

Table 6 – Sampling firms: basic accounting

year	NUMBER OF FIRMS							
	potential sample transiting from previous period	new	out of business	excluded from sample, due to change activity	excluded from sample, due to change location	non-response	actual sample	potential sample transiting to next period
	(2)	(3)	(4)	(5)	(6)	(7)	(8)= (2)+(3)-(4)-(5)-(6)-(7)	(9)=(2)+(3)-(4)
1983	..	17 827	..	..	..	..	17 827	17 827
1986	17 827	5 840	4 034	17	0	772	18 844	19 633
1989	19 633	9 759	4 290	37	1	812	24 252	25 102
1992	25 102	10 163	7 245	46	3	..	27 971	..

Notes: In 1983, all the firms are registered as *new* ones, though the term is not appropriate.
Firms that did not respond in 1992 were registered as having gone out of business.

Alternative sampling procedures were considered, but they were judged to be less appropriate. Namely, sampling proportional to firm size would drive us away from the

situation of an economy essentially made up of small firms, requiring the introduction of *additional assumptions* (those embodied in a weighting scheme) to enable the representativeness of the sample to be claimed. The procedure was considered superfluous, given that no cost is involved in gathering data about small firms, as opposed to the major constraint usually faced by sample designers. Furthermore, given the emphasis to be placed on the demand side of the market, it was assessed important to preserve the market structure/degree of concentration of the sectors.

3.3.2. CRITERION TO SELECT WORKERS

Only full-time wage earners were retained for analysis. Unpaid family members (representing 0.1% of the workforce in 1992) are obviously excluded from a study of earnings inequality; company owners (5.6% of the workers in 1992) were also excluded, since the distinction between earnings and profits becomes unclear, often being subjective in this situation, and since furthermore problems of misreporting are likely to be more serious for this type of workers. Part-time wage-earners represent a small share of the database (10% of the wage-earners in 1992) and they were excluded from the analysis, since preliminary computations revealed several outliers in their data, suggesting that the accuracy in their data reporting was not comparable to that of full-timers. Full timers are defined in the database according to the duration of work set by collective bargaining, which generally results in working at least 120 to 140 hours a month, depending on the economic activity. Note that restriction of the sample to full-timers resulted in dropping some of the firms initially selected. The structure of the final sample of full-time wage-earners in the economy's manufacturing and services activities is described in the tables below.

Table 7 – Number of firms, by category of firm size

size (full-timers)	1983		1986		1989		1992	
	value	%	value	%	value	%	value	%
<= 9	11 454	75.5	12 399	76.8	16 415	78.2	19 612	79.8
10-19	1 703	11.2	1 700	10.5	2 111	10.0	2 369	9.6
20-49	1 224	8.1	1 236	7.7	1 525	7.3	1 605	6.5
50-99	443	2.9	439	2.7	533	2.5	574	2.3
100-199	194	1.3	198	1.2	248	1.2	236	1.0
200-499	110	0.7	121	0.7	116	0.6	128	0.5
>= 500	52	0.3	45	0.3	52	0.2	43	0.2
total	15 180	100	16 138	100	21 000	100	24 567	100

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Table 8 – Number of full-time wage-earners, by category of firm size

size (full-timers)	1983		1986		1989		1992	
	value	%	value	%	value	%	value	%
<= 9 10-19 20-49 50-99 100-199 200-499 >= 500	36 585 23 333 37 293 30 612 26 065 34 400 64 869	14.5 9.2 14.74 12.1 10.3 13.6 25.6	37 996 23 058 36 998 30 732 26 819 37 591 54 342	15.3 9.3 14.9 12.4 10.8 15.2 22.0	49 962 28 542 45 426 36 327 34 364 36 121 60 637	17.1 9.8 15.6 12.5 11.8 12.4 20.8	58 110 31 969 47 915 39 440 32 295 37 898 47 423	19.7 10.8 16.2 13.4 10.9 12.8 16.1
total	253 157	100	247 536	100	291 379	100	295 050	100

A major remark to be drawn from the data in tables 7 and 8 concerns the tiny firm size structure of the Portuguese economy. Data for the full population of firms indeed reveal that over 99% of the firms had in 1992 less than *200* workers, with 88% having less than *20* workers [PORTUGAL, MESS, DE, 1993: 31]. Table 9 reveals that, not surprisingly, firm size is particularly small in personal and household services, retail trade and restaurants and hotels.

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3.3.3. DEFINITION OF FIRM SIZE REQUIREMENTS

Small firms should be taken into account when dealing with some of the topics of this study. In particular, it has been widely documented that small firms pay lower wages and disregarding them would eliminate part of the bottom of the wage distribution, generating misleading results about the pattern and trend of inequality, as well as about the role of the firm in shaping earnings inequality. This concern is reinforced by the relevance achieved by small firms in the Portuguese economy.

However, another topic that will deserve close study, in chapter 6, concerns the employer pay policies — in particular, the dispersion of wages within the firm and the consistency of the employer behaviour across its labour force and over time. These issues clearly impose further constraints on the selection of firms. The analysis of the firm wage distribution and the computation of firm wage effects are feasible only if a reasonably high number of workers is engaged in each firm. However, the definition of a minimum firm size threshold is not an indisputable issue, as two trade-offs can be identified:

– the Portuguese economy is essentially made up of very small firms. While a minimum firm size threshold should be set reasonably high to guarantee a reliable estimation process, it should be reasonably low to take account of the Portuguese reality;

– the estimation process in chapter 6 involves two levels. While in the first of them the workers within each firm are the unit of analysis, in the second one the firms become the unit of analysis, and the aim is the identification of the determinants of the firms' pay policies. Setting a higher minimum firm size threshold will increase the reliability of the first level estimates, but it will inexorably lead to the selection of less firms, therefore reducing the reliability of the second stage estimates.

Moreover, while the estimation procedure to be used overcomes part of the limitations of having firms with a small number of workers (see discussion in section 6.2), it imposes strict constraints regarding the *maximum* firm size that can be handled. In particular, as larger firms are included in the dataset, estimation becomes remarkably more time-consuming and extremely demanding on hardware requirements (in particular RAM), due to both the aggregate size of the dataset generated and to the maximum firm size itself (relevant once matrices are to be inverted).

A balance between those constraints was achieved by setting the minimum firm size equal to 20 workers and the maximum to 300. Concerning the minimum threshold, note that each firm level regression is expected to include about 7 regressors and therefore *at*

least three times as many observations will be available for estimation. Though low, this threshold is very stringent when considering the firm size structure of the Portuguese economy (remember that 88% of the firms had in 1992 less than 20 employees). The maximum firm size threshold, on the other hand, leads to a dataset that renders feasible the estimation of the model with the available hardware and software, imposing the elimination of only a remarkably low share of the firms in the Portuguese economy (less than 1%). In the sense that the economy is made up of such tiny firms, those excluded can be said to be *outliers* in the economy. Given the size of the firms in the Portuguese economy, and for simplicity, this sample of firms will be referred to as *medium-sized firms*.

The existence of missing values in the dataset can bring about serious problems to the computations to be performed, which were already running on the edge of *feasibility*, and the selection of data without missing values was therefore judged appropriate.

Given the aim of checking the evolution in the pay behaviour of firms over time, only a balanced panel of firms present in 1983, 1986, 1989 and 1992 was kept for this part of the analysis. Table 10 reports the size of the sample of medium-sized firms.

Table 10 – Sample sizes

		1983	1986	1989	1992
sample of medium-sized firms	workers	26 480	36 521	36 02	36 313
	firms	463	463	463	463
sample representative of eco.'s manuf. and services	workers	253 157	247 536	291 379	295 050
	firms	15 180	16 138	21 000	24 567

Even though the minimum firm size threshold imposes a very stringent requirement, which leads to the selection of few firms, their relevance in terms of employment is considerably higher.

The following tables provide additional information on the sample of medium-sized firms.

Table 11 – Number of firms by category of firm size, medium-sized firms

Size	1983		1986		1989		1992	
(full-timers)	value	%	value	%	value	%	value	%
20-40 50-99 100-199 200-300	130	28.1	116	25.1	96	20.7	126	27.2
	192	41.5	197	42.6	208	44.9	199	43.0
	103	22.3	109	23.5	121	26.1	97	21.0
	31	6.7	31	6.7	30	6.5	38	8.2
Total	463	100	463	100	463	100	463	100

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Table 12 – Number of firms by economic activity, medium-sized firms

economic activity	1983		1986		1989		1992	
	value	%	value	%	value	%	value	%
31: food, bev. and tobacco	41	8.9	41	8.9	41	8.9	41	8.9
32: textile, cloth., leather	98	21.2	98	21.2	98	21.2	98	21.2
33: wood, wood products	24	5.2	24	5.2	24	5.2	24	5.2
34: paper and printing	7	1.5	7	1.5	8	1.7	7	1.5
35: chemicals	21	4.5	21	4.5	21	4.5	22	4.8
36: stone, clay and glass	22	4.8	21	4.5	22	4.8	23	5.0
37: basic metals	4	.9	4	.8	4	.9	4	.9
38: fab. metal, mach., equip.	61	13.2	61	13.2	61	13.2	62	13.4
50: construction, pub. works	26	5.6	28	6.1	27	5.8	26	5.6
61: wholesale trade	73	15.8	74	16.0	73	15.8	72	15.6
62: retail trade	27	5.8	27	5.8	26	5.6	24	5.2
63: hotels, restaurants	17	3.7	17	3.7	17	3.7	17	3.7
71: transport, storage	16	3.5	16	3.5	16	3.5	13	3.5
81: financial institutions	1	.2	1	.2	1	.2	1	.2
82: insurance	3	.7	3	.7	3	.7	3	.7
83: real estate, busin. serv.	6	1.3	4	.9	3	.7	3	.7
93: public utilities	5	1.1	5	1.1	5	1.1	5	1.1
94: recreational, cult. serv.	2	.4	2	.4	2	.4	2	.4
95: personal, household serv.	9	1.9	9	1.9	11	2.4	13	2.8
total	463	100	463	100	463	100	463	100

The representativeness of the sample of medium-sized firms was evaluated, for each of the years. Back to the original sample of the economy's manufacturing and services activities, standard χ^2 tests were performed to evaluate whether the distribution of firms according to economic activity and location was significantly different:

a) in the sample of medium-sized firms, when compared to the full sample;

b) in the sample of medium-sized firms, when compared to the full sample of firms with 20 to 300 wage earners. This control evaluates whether the exclusion of firms with missing firm or worker data and those not present throughout the period under analysis introduced any biases in the sample.

As expected, the distribution of medium-sized firms according to economic activity or location is significantly different from the distribution of the full set of firms. Manufacturing (textiles, leather and footwear, in particular, but also machinery, chemicals and food industries) and transportation activities, as well as the regions of Lisbon, Porto and Aveiro, are over-represented among the medium-sized firms, as opposed to services activities (retail trade in particular, but also restaurants and hotels, personal and social services) and areas such as Setúbal and Faro.

Different results are obtained when comparing the set of medium-sized firms in the full sample and in the final selection of data. Indeed, elimination of cases with missing

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values and firms not present in every year does not introduce biases in the analysis concerning the distribution of the firms by economic activity, with the chi-squared statistic that summarises the homogeneity between both distributions being in most cases highly significant. The selected firms are however more concentrated in the region of Lisbon than the firms with 20 to 300 workers in the full sample.

Table 13 – Comparison of the distribution of medium-sized firms according to economic activity and location in the full sample and in the final selection of data *(1)*

	economic activity		location	
	chi-squared (19 deg. freedom)	signific. level	chi-squared (17 deg. freedom)	signific. level
1983	33.33	.022	15.75	.541
1986	36.76	.009	16.02	.522
1989	47.29	.000	20.54	.247
1992	62.86	.000	23.53	.133

Note: (1) The final selection excludes cases with missing values and firms not present throughout the period of analysis.

It should therefore be stressed that the analysis of wage policies at the employer level deals with medium-sized firms (20 to 300 employees) and that it may not be fully representative along *every* dimension of the firm characteristics. The results are expected to illustrate the behaviour of such type of firms and no inferences will be attempted concerning the behaviour of the full population of Portuguese firms.

3.4. CONCEPT OF EARNINGS

Average hourly earnings were computed as $hw = \frac{bw + ts + rs + is}{nh}$, all the right hand side variables referring to monthly reported figures: *bw* stands for base-wage, *ts* is the payment indexed to tenure, *rs* are regularly paid subsidies, *is* are irregular subsidies and *nh* is the normal duration of work, as defined in the collective agreement or by firm regulations. Gross earnings are considered, before the deduction of any taxes or Social Security contributions, and no other labour costs are included. Cash benefits, as well as benefits in kind paid regularly, are reported. Irregularly paid subsidies, such as Christmas or holiday pay, are likely not to be reported, since only the fraction actually *paid* in March is registered.

Hourly rewards are meant to control for the different durations of the working day. The fact that most wage bargaining agreements specify the normal duration of work, together with the monthly wage, strengthens this choice. Comparable hours of work

should be analysed, and therefore overtime pay and work were not taken into consideration.

Nominal wages were deflated using the Consumer Price Index gathered by the Portuguese Statistical Office and reported in OECD [1994]. The computations took 1983 as the base period.

3.5. CONCLUSION

The dataset just described presents remarkable characteristics for the study to be undertaken. In particular, its extremely comprehensive nature should be underlined, as it covers almost virtually the population of firms with wage-earners in the Portuguese economy. Furthermore, it is a matched dataset of employers and their workers. One third characteristic refers to the possibility of following firms over time, thus enabling the direct analysis of changes in the behaviour of employers.

The main drawback that nonetheless can be pointed out refers to the relatively little information available on the firm. For example, data on the financial situation of the firm, its technology, its inputs and outputs, would open up new possibilities to the analysis.

APPENDIX 3.A – PORTUGUESE CLASSIFICATION OF ECONOMIC ACTIVITIES

31 food, beverages and tobacco
32 textiles, clothing and leather
33 wood and cork
34 paper, printing, publications
35 petroleum-based and coal-based chemicals and rubber and plastic
36 non-metallic minerals excepting crude petroleum and coal derivatives
37 base metals
38 metal products, transport machinery and material
50 construction and public works
61 wholesale trade
62 retail trade
63 restaurants and hotels
71 transportation and storage
81 banks and other monetary and financial institutions
82 insurance
83 real estate and business services
92 sanitation and cleaning services
93 public utilities
94 recreational and cultural services
95 personal and household services

Source: PORTUGAL, INE [1973].

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APPENDIX 3.B – CONCEPT OF WHITE / BLUE COLLAR WORKER

Identification of white/blue collar workers was based on their occupation (*Portuguese Classification of Occupations*), according to the following criteria:

– scientific, technical and artistic professions (codes 0-1): white collar

– managers and higher clerical staff (code 2): white collar

– clerical staff and similar workers (code 3): white collar

– commercial staff and salesmen (code 4): white collar

– protection and security personnel, personal and domestic services and similar workers (code 5): blue collar

(codes 50 to 52, corresponding to *directors and other supervisors of hotels*, were the exception, having been coded as white collars)

– farmers, stock-breeders, farm and forestry workers, fishermen and hunters (codes 7-9): blue collar

(code 60, *directors of farms*, were coded as white collars)

– production workers in extraction and manufacturing industries and operators of fixed and transport machinery: blue collar.

Inspection of the 5-digit classification did not reveal inconsistencies in these criteria.

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4. EARNINGS INEQUALITY IN PORTUGAL: HIGH AND RISING?

4.1. INTRODUCTION

Labour market and inequality have been two lines of research to a great extent disassociated in the literature on Portugal. Indeed, most work on inequality has concentrated on income and not on labour returns, generating expectations about the evolution of wage dispersion that are worth testing.[14] Using micro data drawn from household surveys conducted in 1980/81 and 1989/90, GOUVEIA and TAVARES [1995], RODRIGUES [1994] and RODRIGUES [1993] detect an unambiguous decline in income[15] inequality during the decade. Gouveia and Tavares put forth the hypothesis that this trend may have resulted from the evolution of wages, as low-wage employment presumably increased its importance in the economy, under the pressure of international competition that would have contributed to reinforce the Portuguese specialisation in low-skilled activities.

On the contrary, when progressing to the decomposition of the trend in inequality into income sources, RODRIGUES [1994] finds that the evolution of wages and of the returns to capital would have generated rising inequality, which was nonetheless more than offset by the evolution of the earnings of the self-employed, direct taxes and other contributions, and pensions.

This view of rising earnings inequality is shared by the short references that can be found in the literature regarding labour market inequality in Portugal. The *Relatório de Conjuntura*, an annual report by the Ministry of Employment and Social Security (MESS), reported a 10% rise in the Gini index from 1982 to 1989, and an increase, from 37% to 40%, in the share of the total wage bill earned by the top quintile of the distribution[16] [PORTUGAL, MESS, DEP, 1992: 131]. Similarly, the *Employment Outlook* by

[14] See the point by JENKINS [1995: 30-32, 56] on income inequality trends *vs.* wage inequality trends.
[15] Gouveia and Tavares also analyse expenditures.
[16] Having focused on monthly gross earnings, including overtime pay, with data drawn from *Quadros de Pessoal.*

the OECD reports a rising trend in labour market inequality in Portugal from 1985 to 1989.

The first purpose of this study is to investigate the level and the trend of earnings inequality in Portugal, relying on several inequality measures and on international comparisons to generate insight into their patterns. At this stage, three major hypotheses will be tested: i) inequality in the Portuguese labour market achieves high levels, when compared to other countries; ii) inequality increased during the 1980's and early 90's, as in most other OECD countries; iii) the upper part of the earnings distribution played a major role in shaping both the level and the trend of inequality in Portugal. Progressing to an overview of the causes of the trend in inequality, the analysis concentrates on changes in the employment structure, relying on a simple supply-demand framework to evaluate alternative explanations for the rise in earnings dispersion, which are often presented in the literature. The fourth hypothesis under scrutiny is thus: the rise in inequality was mainly generated by shifts in the employment structure that have taken place *within* economic activities, in favour of workers with higher qualifications; supply changes and the differential demand growth across industries should be dismissed as explanations for the trend in labour market inequality in Portugal.

4.2. THE LEVEL OF EARNINGS INEQUALITY AND ITS PATTERN: STRETCHED TOP AND COMPRESSED BOTTOM

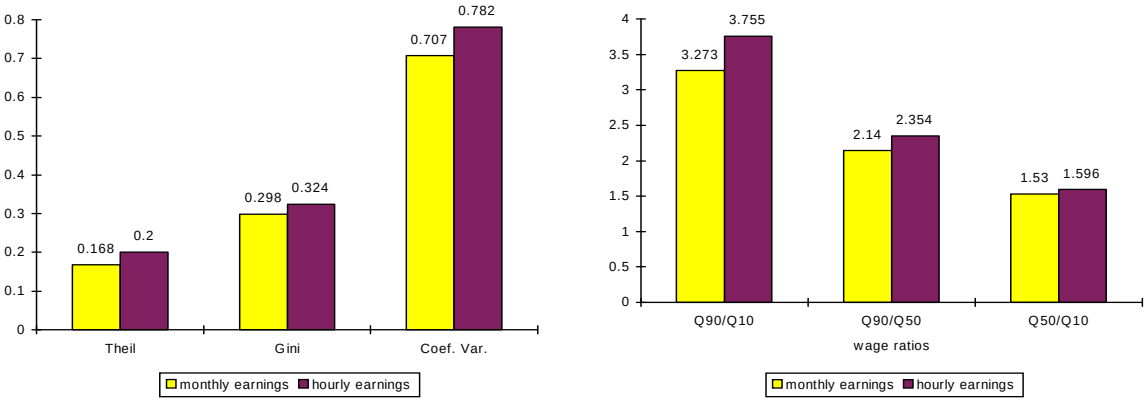
The level of inequality existing in Portugal in 1983 is depicted in figure 6, where the dispersion of hourly earnings is compared to that of monthly earnings. Unless otherwise stated, the earnings distribution refers to full-timers, male and female. Where, for the purpose of international comparisons, other distributions are considered, it will be explicitly acknowledged.

The duration of the working day is seen to have an equalising effect on wages — hourly earnings inequality is higher than monthly earnings inequality. The hourly concept, which is more often used, controls for the different durations of the workday, but it may nonetheless be influenced by the mismatch between the actual duration of work for certain types of workers and their *contractual* workday set by collective bargaining (which is reported by our data source). In fact, while manual workers usually stick to their pre-set duration of work, non-manual workers often extend their workday beyond the contractual level, having more fluid timetables.[17] Following the comparison

[17] See the analysis by ATKINSON *et al* [1988a], who compare overlapping data reported by a household and by an employer survey – the *Family Expenditure Survey* and the *New Earnings Survey*, respectively. They find that while for manual workers there is reasonable agreement on the number of

in figure 6, the robustness of the results on inequality trends to different specifications of the concept of earnings will also be checked, confronting the evolution of hourly and monthly earnings dispersion (see section 4.3).

Figure 6 – Earnings inequality in Portugal, 1983



Source: Computations based on PORTUGAL, MESS, DE [1983].

Meaningful international comparisons of the level of inequality must be restricted to those studies that have measured a comparable variable, for a comparable population, during the 'eighties and, of course, relying on the same inequality measures, which must be independent of the size of the population and the scale of the variable. While our database only reports gross earnings — which therefore becomes a binding constraint —, it allows great flexibility regarding other aspects of the comparison, given its very detailed and extensive nature. The availability of a harmonised international dataset, on which several studies of earnings inequality have been based (The Luxembourg Income Study – LIS) imposes the restriction of our sample, for the purpose of international comparisons, to full time males aged 25 to 54 years.[18]

hours worked, for non-manual workers, either male or female, employees report higher values than employers, suggesting that for staff not paid on an hourly basis, employers tend to report the contractual duration of work, while workers have a different perception of the hours effectively worked.

[18] A remaining discrepancy refers to the annual or monthly nature of earnings. While the data on Portugal refer to monthly earnings, those on the LIS studies refer to annual earnings. If the worker changes job during the year or suffers seasonal variations in the number of hours worked, the comparison might be biased, in a direction not known a-priori.

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Table 14 – Gross earnings*(1)* inequality in several countries, full-time males aged 25-54

	Gini1	Gini2	Theil	St. Theil x 100 *(2)*	wage ratio: percentile 90 / percentile 10
Portugal 86	**.295**		**.168**	**1.45**	**3.17**
USA 86	0.298	0.300	0.149	1.56	4.00
Sweden 87	0.190	0.205	0.071	0.78	2.08
Canada 87	0.253	0.256	0.116	1.25	3.03
Australia 85	0.212	0.202	0.087	0.97	2.42
W. Germany 84	0.204	0.205	0.071	0.83	2.38
UK 86	..	0.296	..	..	..

Sources: Portugal – own computations based on PORTUGAL, MESS, DE [1986]; Gini1 and Theil – GREEN *et al* [1992: 6, 9], using the LIS; Gini2 – BRADBURY [1993: appendix A], using the LIS; Wage ratio and standardised Theil – own computations based on data reported in GREEN *et al* [1992: 6,9,14-15].

Notes: (1) Data on Portugal refer to monthly earnings, whereas for the other countries they refer to annual earnings.
(2) The standardised Theil index is the original index divided by the sample size.
(..) Data not available.

The Gini and the standardised Theil indices[19] indicate that inequality in the Portuguese labour market reaches a level similar to that of the United Kingdom, that is, slightly lower than the USA, usually taken as the paradigm of an unequal labour market, but higher than Canada, and much higher than Australia, the ex-West Germany or Sweden. The ratio of the 90th to the 10th wage percentiles confirms this ranking of the countries.

More interestingly, the detection of the pattern of inequality would enable us to answer the question *Why is inequality high in Portugal – is it mainly due to the situation at the top or at the bottom of the distribution?* Stated differently, *Is it because low wages are very low, because high wages are very high, or due to the situation at the middle of the distribution, that the value for overall inequality is high in Portugal?*

The international comparison of inequality at different points of the earnings distribution relies on studies that have specifically addressed the issue of inter-country comparisons. Since Portugal is not included in these studies, it will be *plugged into* the available rankings, using the concepts of earnings, working population and inequality measures that most closely match the concepts used by each of the studies. According to the criteria used by different authors, alternative distributions will be considered (male in some cases, female in others, with different age brackets). The main features of the procedure used can be summarised as follows: the data on Portugal will never be mixed with more than *one* other data source at a time (understood as one article); the concepts

[19] It should be stressed that the Theil index is not population-size independent, as its upper limit, *log N*, increases with the population size. Comparison of the values of the Theil index would thus overstate inequality in Portugal, due to our large sample size (7 to 20 times larger than that of other countries).

used are similar to those used by each of the studies, to ensure comparability of the distributions; alternative rankings of the countries are considered, and only results that are consistent across the different rankings will be stressed; furthermore, we will not refer to the *size* of the differences in inequality, but instead restrict our conclusions to inequality *rankings*, to keep the comments on the safest grounds possible.

In figure 7, data on Portugal, highlighted in bold, have been plugged into different rankings obtained by previous comparative studies – A, B1, B2 and C. The values reported relate selected percentiles of each of the distributions to its median. A hypothetical wage distribution is drawn at the top, for the sake of visualisation of the pattern that will be described. Note that countries are always ranked in descending order of labour market inequality.

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Figure 7 – Ranking of countries according to inequality at different points of the earnings distribution – descending order

(see the notes to the figure for a description of the distributions considered in panels A, B1, B2 and C)

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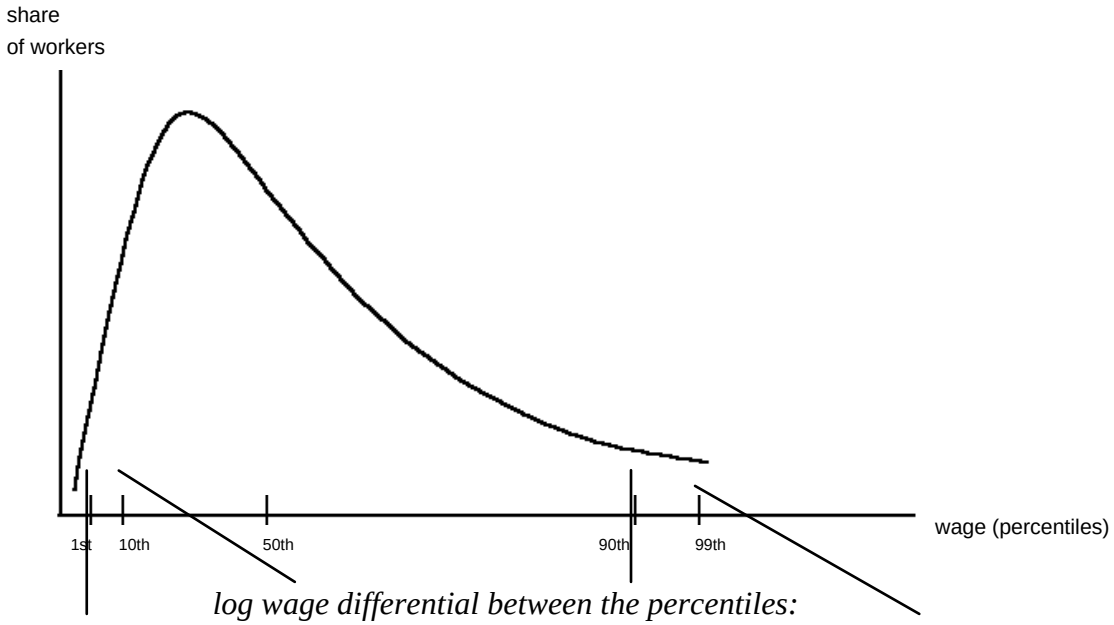

log wage differential between the percentiles:

50 - 1	*50 - 10*	*90 - 50*	*99 - 50*	
USA 1.76 Canada 1.73 Australia 1.55 W.Germany 0.69 **Portugal 0.67** Sweden 0.67	USA 0.77 Canada 0.63 Australia 0.43 **Portugal 0.39** W. Germany 0.35 Sweden 0.27	**Portugal 0.76** USA 0.62 W. Germany 0.52 Canada 0.48 Sweden 0.46 Australia 0.45	**Portugal 1.60** USA 1.28 Canada 1.10 Sweden 1.08 W. Germany 0.93 Australia 0.92	A (1)
	USA 0.70 **Portugal 0.49** France 0.45 UK 0.43	**Portugal 0.87** France 0.73 USA 0.66 UK 0.61		B1 (2)
	USA 0.53 France 0.41 UK 0.41 **Portugal 0.36**	**Portugal 0.77** USA 0.63 UK 0.58 France 0.52		B2 (3)
	USA 1.040 Australia 0.755 UK 0.594 Italy 0.478 Switzerland 0.464 Hungary 0.462 W. Germany 0.456 **Portugal 0.45** Austria 0.391 Sweden 0.382 Norway 0.224	**Portugal 0.92** Switzerland 0.777 UK 0.683 Hungary 0.661 USA 0.552 W. Germany 0.539 Norway 0.525 Austria 0.508 Italy 0.486 Sweden 0.452 Australia 0.439		C (4)

Notes: (see next page).

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Sources: Portugal: computations based on PORTUGAL, MESS, DE [1983, 1986].

Other countries:

Panel A - Own computations based on data reported in GREEN, CODER and RYSCAVAGE [1992:6], who used the Luxembourg Income Study.

Panels B1 and B2 - Data in KATZ, LOVEMAN and BLANCHFLOWER [1993: 37], using data from *Annual Demographic Files, New Earnings Survey* and *Déclarations Annuelles des Salaires*, respectively for the USA, UK and France.

Panel C - Data in BLAU and KAHN [1994: table 1 in appendix], using the *International Social Survey Programme* for every country other than Sweden and Norway (*Class Structure and Class Consciousness)*, Australia (*Income Distribution Survey*) and Italy (*Bank of Italy Survey*).

Notes:

(1) *Working population*: full-time males, aged 25 to 54 years.
Concept of earnings: gross monthly earnings for Portugal and gross annual earnings (full year workers) for the other countries.
Years covered: 1986 for Portugal and the USA, 1987 for Sweden and Canada, 1985 for Australia and 1984 for West Germany.

(2) *Working population*: full-time males, 18 to 64 years old in the USA, older than 21 in the UK, and with no age restrictions in France and Portugal.
Concept of earnings: log hourly earnings (gross).
Years covered: 1983 for Portugal and 1984 for all other countries.

(3) *Working population*: full-time females, 18 to 64 years old in the USA, older than 18 in the UK, and with no age restrictions in France and Portugal.
Concept of earnings: log hourly earnings (gross).
Years covered: 1983 for Portugal and 1984 for all other countries.

(4) *Working population*: full-time males for Portugal; males for the other countries (presumably, full-timers, but the data source does not provide detailed information on this aspect).
Concept of earnings: log hourly earnings for Portugal and log hours-corrected earnings for all the other countries; net earnings are considered in Austria, West Germany and Switzerland, while gross earnings are used for Portugal and the USA (for the remaining countries, information is not provided by the data source - presumably, gross earnings are considered).
Years covered: 1986 for Portugal and Australia; 1987 for Switzerland and Italy; 1980 for Sweden, 1989 for Norway; pooled data referring to 1985-1989 for the USA and the UK, 1985-88 for West Germany, 1986-88 for Hungary and 1985-87 and 1989 for Austria.

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As we climb up the wage distribution, Portugal climbs up the inequality ranking. Such is the characteristic of the Portuguese earnings distribution that consistently emerges from all the comparisons in figure 7. Indeed, at the lowest part of the distribution Portugal ranks among the least unequal countries, with a distance between the 1st and 50th wage deciles similar to that of Sweden. That situation gradually changes as we move towards higher wages. The relation between the 90th or 99th percentiles and the median in fact depicts Portugal as *the most* unequal country, with a wage distribution more stretched than the USA or the UK.[20] A relatively compressed bottom and a stretched top can thus be highlighted as the main characteristics of the Portuguese earnings distribution. The high degree of inequality prevailing in the country's labour market is essentially due to the fact that *high wages are very high*, relative to the rest of the distribution.

It is interesting to note that precisely the opposite pattern had been detected by DAVIS [1992: 250] and by BLAU and KAHN [1994] for the USA. A very stretched bottom of the wage distribution and a degree of inequality at the top similar to most other countries had been identified by these authors.

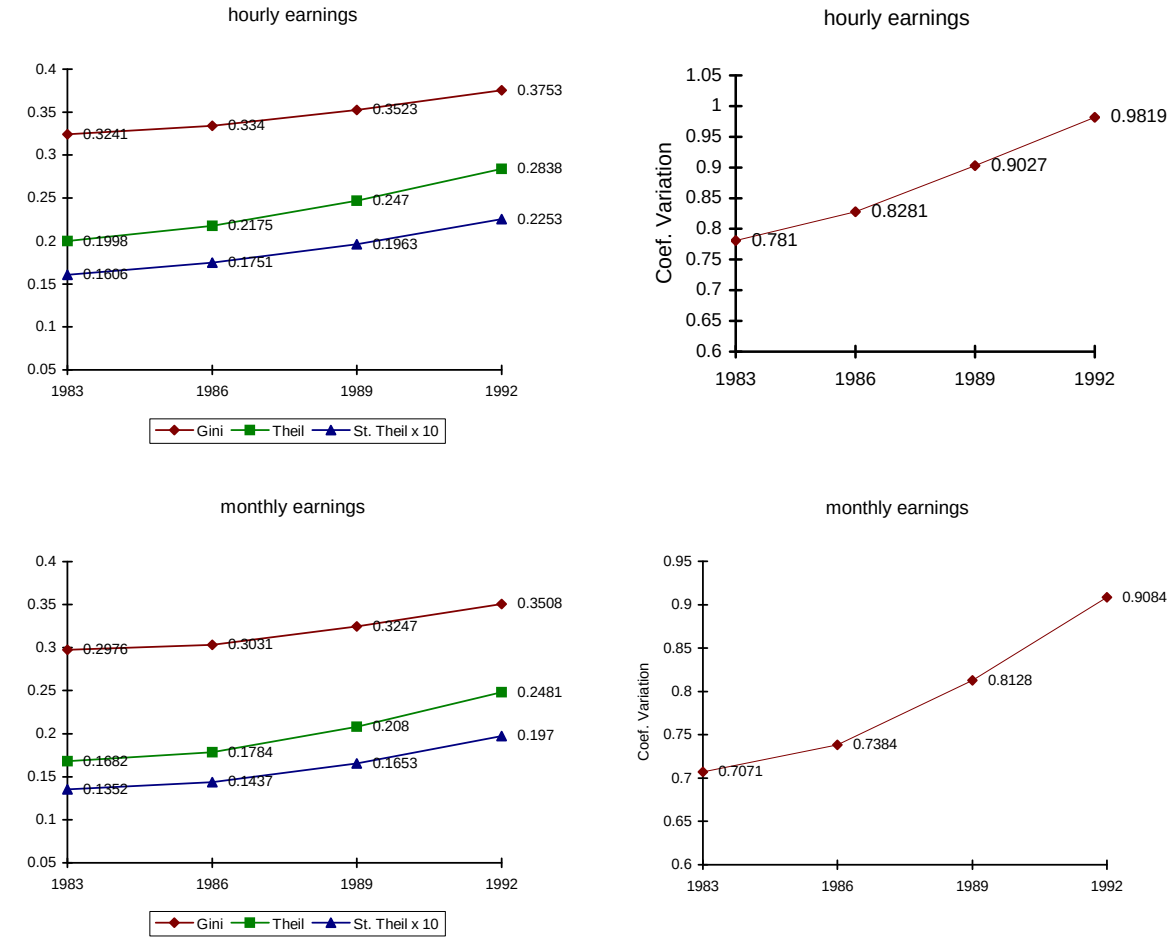
4.3. THE TREND IN LABOUR MARKET INEQUALITY: RISING DISPERSION AT THE TOP

Following a trend by now widely reported for many other OECD countries[21], rising inequality characterised the evolution of labour returns in Portugal during the 80's and early 90's.

[20] Note that this conclusion holds, despite the fact that company owners have not been included in the Portuguese sample.

[21] See for example OECD [1993] for an overview of this trend.

Figure 8 – Earnings inequality in Portugal ,1983-92 (Gini, Theil and coefficient of variation)



Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].

Several inequality measures — Gini, standardised Theil and coefficient of variation — unanimously report a rise in wage dispersion, especially marked after 1986, when the economy began to recover and real wages were rising (see chapter 2). Declining real wages were therefore associated with a slight increase in inequality, whereas the benefits of rising real wages were more unequally distributed. Over the decade, the Gini index for hourly earnings increased by 16%, from 0.32 to 0.38, while the coefficient of variation reported a more pronounced change of 26%. A similar trend is detected for monthly earnings. Such evidence sharply contrasts with the results found by GOUVEIA and TAVARES [1995] and RODRIGUES [1993] when analysing *income* inequality, and thus no support is found for the hypothesis that the evolution of labour returns would have been responsible for the decline in income inequality.

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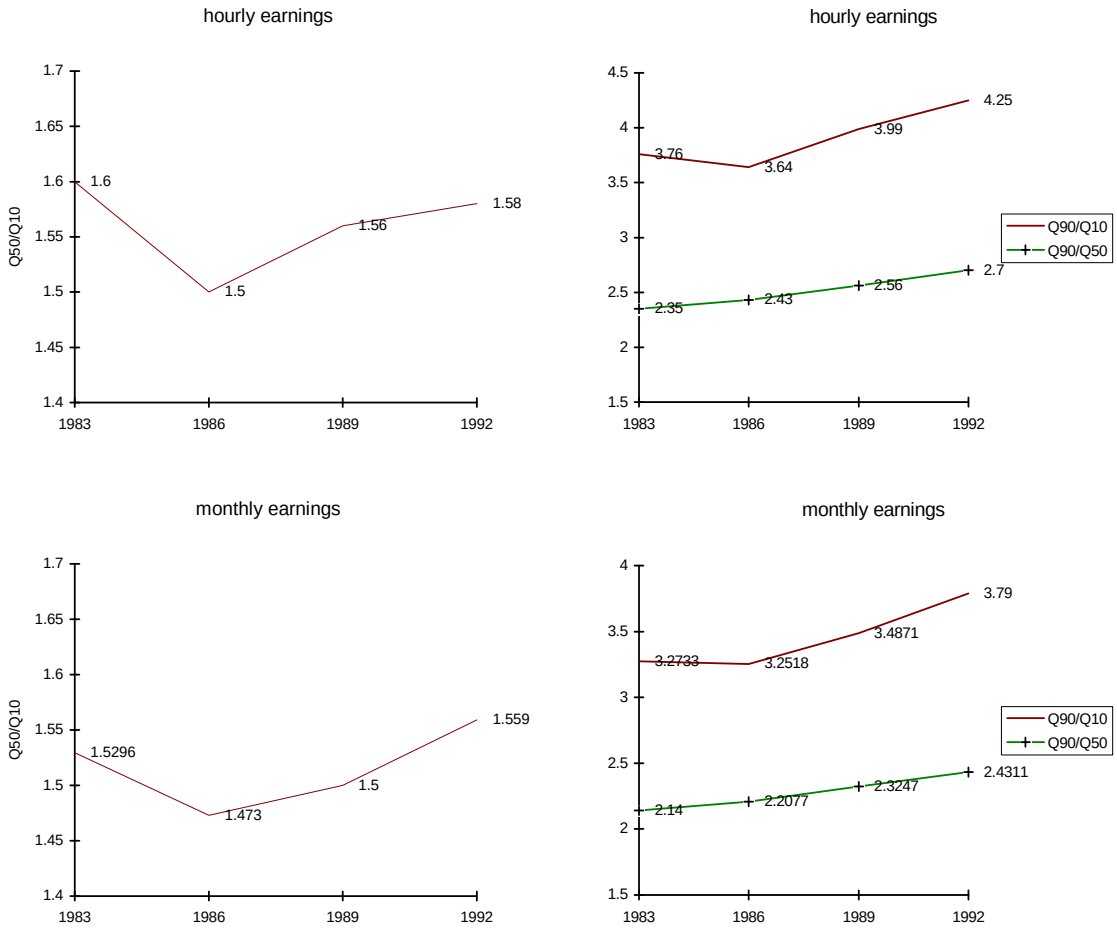
A look at point measures of inequality enables the detection of the pattern of change in inequality. From 1983 to 1986, the bottom of the wage distribution became more compressed, but its upper half, on the contrary, stretched during the whole decade.

Figure 9 – Earnings inequality in Portugal, 1983-92 (wage ratios)



Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].

As a result, the 50/10 percentiles wage ratio in 1992 reached a value similar to that of 1983, while the 90/50 wage ratio increased by about 15%. This preliminary evidence suggests that the rise in inequality during the decade was brought about by the reinforcement of the major characteristic of the distribution that had been highlighted for the beginning of the 'eighties — compressed bottom and stretched top.

Information on the shares of the wage bill earned by each decile in 1983 and 1992 confirms this idea. Some *redistribution* has occurred during the decade, in favour of the 10% lowest wage workers and, to a much higher extent, in favour of the 10% highest wage workers, at the expense of all the other deciles (figure 10).

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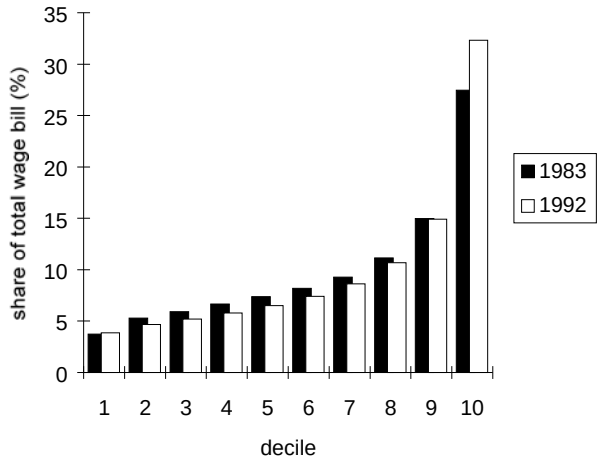
Figure 10 – Shares of the total wage bill earned by each decile, 1983 and 1992



Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Humble progressive transfers have taken place at the bottom of the distribution, while remarkable regressive transfers have occurred at the top. Nonetheless, no straightforward conclusions about dominance can be drawn, since the Lorenz curves for 1992 and 1983 intersect. However, even though the 1992 distribution allocates a higher share of the wage bill to the 10% poorest, it does not exhibit a lower coefficient of variation[22] and indeed, as already pointed out, several inequality measures — Gini, coefficient of variation, Theil and Standardised Theil — all report a remarkable rise in labour market inequality (see namely the rise in the Gini index, from 0.32 to 0.38).

These changes in the earnings distribution can be viewed in an international perspective.

[22] And as such, the result by SHORROCKS and FOSTER [1987] on unanimous inequality rankings by any transfer-sensitive, scale-invariant and population-homogeneous measure, cannot be applied here.

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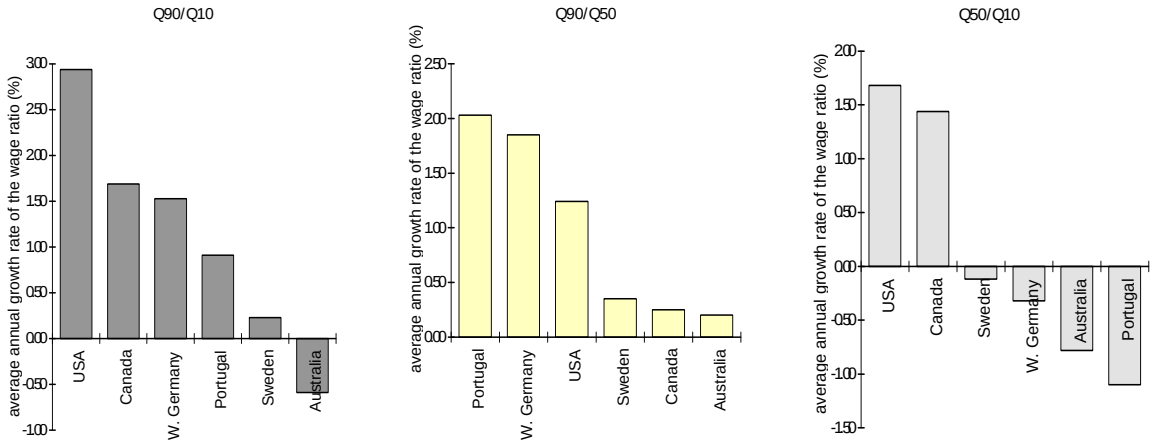
Figure 11 – Changes in inequality at different points of the earnings distribution for several countries, full-time males aged 25-54 years



Sources: Portugal – own computations based on PORTUGAL, MESS, DE [1983, 1989];
Other countries – computations based on data reported in GREEN *et al* [1992: 6], who used the LIS.

Notes: Data refer to monthly earnings for Portugal, while yearly earnings (for full-year workers) were used for the other countries. Average annual growth rates were computed using data for the following years: 1979 and 1986 for the USA, 1981 and 1987 for Sweden and Canada, 1981 and 1985 for Australia, 1981 and 1984 for Germany and 1983 and 1989 for Portugal.

Data referring to male workers indicate an intermediate change in overall earnings inequality in Portugal. Indeed, the ratio of the 90th to the 10th wage percentiles changed in Portugal at an average annual rate lower than that of the USA, Canada or the ex-West Germany, but higher than Sweden or Australia. This intermediate position of the Portuguese labour market results from having had simultaneously *the sharpest increase in inequality at the top of the distribution* and *the sharpest reduction in inequality at the bottom of the distribution*, as reported by the changes in the 90/50 and 50/10 wage percentiles in figure 11. International comparisons thus provide further evidence in favour of the idea that changes taking place in the Portuguese earnings distribution reinforced the pattern of inequality that had been detected for the beginning of the decade, as the lower part of the distribution compressed even more, while its top stretched even more.[23] The evolution in Europe can be contrasted to that in North-America. *Compressing bottom* and *stretching top* was the trend followed by the

[23] Computations over a shorter time period for Portugal, but ending at a date closer to the final period for the other countries (1983-86), which capture precisely the sharp decline in inequality that occurred at the bottom of the distribution, yielded the following results: -3.76%, 0.67% and -3.12%, as the average annual growth rate for the 50/10, 90/50 and 90/10 wage deciles, respectively. According to these figures, the sharpest decrease in inequality at the bottom of the distribution took place in Portugal, associated with the third highest increase in inequality at the top of the distribution (among the countries represented in figure 11).

European countries depicted and by Australia, whereas in the North American countries, the bottom of the distribution in particular became more unequal.

4.4. OVERVIEW OF THE FORCES DRIVING RISING INEQUALITY, FOCUSING ON SHIFTS IN THE EMPLOYMENT STRUCTURE

Changes in the overall earnings distribution consistently reproduce what has taken place regarding the female, male, white collar or blue collar earnings distributions separately. In every case, a modest redistribution has occurred in favour of workers with the lowest wages, while more pronounced regressive transfers have taken place at the top of the distribution.

An implication of this fact should be stressed. To the extent that the overall rise in inequality has been determined by the evolution of labour returns *within* gender and broad occupational groups, understanding of the causes of rising inequality has to be sought among other dimensions of inequality (other variables) — schooling is a major candidate, according to previous studies on other countries; alternatively, the relevance of these two variables has to be proven by a rise in inequality *between* the groups which is more pronounced or comparable to the rise in within-groups inequality. A look at the evolution of relative wages may shed some light on this issue.

To evaluate changes in real relative wages, controlling for the impact of shifts in the employment structure, a fixed demographic distribution is considered. The share of workers in each gender / broad occupation / schooling level is computed as the mean value of its initial and final periods (1983 and 1992). The average wage for each of these detailed groups in 1983 and 1992 is computed from the micro data on individuals, while the average wage for more aggregate groups is calculated as a weighted average of the gender/occupation/schooling wages, with their (fixed) employment shares as the weights.[24] Under this procedure, changes in the average wage of broader groups are straightforward reflections of changes in the average wages of its sub-groups, not being blurred by shifts in the employment structure.[25] Stated differently, the change in the

[24] Since we are referring to hourly earnings, the employment structure is evaluated in hours of work. Given that only full-timers are included in the computations, the structure of employment by gender, broad occupation or schooling level remains almost unchanged, whether evaluated in terms of workers or hours worked.

[25] For clarification, consider an example of what could happen if such a procedure had not been used: assume that the average wage of each educational and occupational group remains unchanged both for men and women, while only the educational structure of female employment improves. In that case, women's average wage would rise and a reduction in the gender wage gap would have been brought about exclusively by shifts in the employment (educational) structure, not reflecting changes in the average wage by occupation or educational level. The procedure used ensures that the evolution of the

economy's overall wage provides a benchmark against which we can measure the growth in earnings for selected groups of workers, enabling the evaluation of *relative* changes in wages (see KATZ and MURPHY [1992] for the original proposal of this procedure).

Table 15 – Wage growth under fixed employment structure, 1983-1992

change in log hourly earnings x 100									
total	gender		broad occupation		schooling				
	men	women	white col.	blue col.	<= 4 yrs.	6 yrs.	9 yrs.	11-12 yrs.	Univ.
27.27	27.78	26.31	29.86	26.16	26.13	27.39	24.21	30.38	44.68

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

If the employment structure by gender, schooling level and broad occupational group had remained fixed at its mean level of the decade, the overall wage of the economy for full-time workers would have increased by 27 points.[26] While this change was rather homogeneous across gender and white/blue collar groups, the wage gap across schooling levels widened substantially. Indeed, the earnings of men increased by only 1% relative to that of women, meaning that the gender gap would have remained roughly unchanged over the decade, if the employment structure by schooling level and broad occupation had remained unchanged; the gap between white and blue collars' earnings increased by 4%; but the returns to University education sharply increased relative to the other schooling levels. The earnings of holders of a University diploma increased by 17 to 19% relative to workers with 6 years of education or less, by 20% relative to those with 9 years of education, and by 14% relative to high school graduates. The wage growth for those with 9 years of education was surprisingly slow when compared to the other schooling levels, breaking the otherwise monotonic (increasing) relationship between growth of real wages and schooling level. This fact is worrying, if one considers that the length of compulsory education has been set at precisely 9 years, for children entering primary school (first year of education) in 1987. While such changes were taking place in the legislation, the mutations occurring in the labour market were not operating to motivate people to reach that level of education — the attractiveness of 9 years of school, relative to 6 or 4, as measured by their relative wages, decreased during the decade. This situation, together with the small difference between the growth of wages for those with 6 years of education and those holding a high school diploma suggests that the traditionally acknowledged mismatch between the

average wage of broad groups of workers reflects the underlying evolution of wages for more detailed groups, not being blurred by changes in the composition of the workforce, which is held fixed.

[26] KATZ and MURPHY [1992: 41] refer to 100 times log changes as percentage changes.

educational and the productive systems in Portugal did not change much over the decade, as judged by the labour market valuation of such schooling levels. On the contrary, finishing University definitely *pays off*, having become a much more attractive option in the 'nineties than it was in the early 'eighties.

Relative changes in real wages therefore confirm the idea that inequality between gender or broad occupational groups was not a major force driving the rise in inequality. Instead, the sources of this trend must be sought elsewhere, namely in the rising returns to education, in particular to University education. The rise in the wage premium for University graduates is common to many other countries, having been particularly studied for the USA. Several explanations have been put forth to justify this trend, and a synthesis is by now possible, distinguishing among four different categories of explanations.

One first line of reasoning relies on demographic factors, stressing that the increase in the relative supply of workers holding a University diploma that was brought about by the *baby boom generation*, was followed by a decline in the rate of growth of the working population with highest schooling levels (against a steadily growing demand for such workers). Also the increased participation of females could have contributed to rising inequality, given their traditional position in lower ranks of the earnings distribution. Either of these formulations highlights supply-driven changes in the wage distribution.

Explanations based on shifts in the pattern of international trade and on the increased openness of the economies, on the other hand, stress the importance of demand factors. Under increased international competition, more developed countries would have shifted their productive structures towards technologically more advanced activities, thus increasing the relative demand for a more schooled and skilled labour force, while the output of traditional activities, often intensive in low-skilled labour, would be increasingly supplied by less developed countries. Shifts in the employment structure across industries are thus the observable link to test this hypothesis. An alternative formulation of this view stresses the gradual switch, in the process of economic development, from high wage / low inequality activities (manufacturing) to low wage / high inequality activities (services).

Another formulation of demand-driven changes in the wage distribution highlights the mutations that have been taking place within economic activities. Technological progress is pointed out as the main force generating the need for a more qualified labour force. Though much effort has recently been put into measuring the impact of

technological progress on the demand for labour and wages, the key proof is often left to the trend in the *residuals*, generating much suspicion of the interpretation of the results (see namely KLITGAARD and POSEN [1995: 33]).[27]

The weakening of institutional forces is stressed by other studies. In particular, the declining unionisation rate and the weakening of the minimum wage legislation would have contributed to rising earnings dispersion.

4.4.1. THE DISMISSAL OF DEMOGRAPHY AND INTERNATIONAL TRADE AS SOURCES OF RISING WAGE DISPERSION

Reliance on the supply-demand framework developed by KATZ and MURPHY [1992], under the formulation applied by JUHN and MURPHY [1995][28], can lead into dismissing for the Portuguese case some of these explanations of the trend in labour market inequality, while lending support to others. The model considers the relative demand for different categories of labour (which depends on their relative prices and on demand shocks, being derived from an aggregate production function) and their relative supply (exogenously determined) and formal framework is provided for the idea that, in the absence of demand shocks, changes in labour supply and changes in wages must be negatively related; otherwise, supply shifts alone cannot account for the changes in real wages, and the operation of demand forces must be investigated (see [KATZ and MURPHY, 1992: 47]).

Following JUHN and MURPHY [1995], consider ten different types of labour inputs, as evaluated by the wage decile into which the worker falls. Different labour inputs would thus be defined as the type of attributes implicitly required to be in a decile of the wage distribution. The real wage growth for each of these types of workers can be linked to a supply index and to a demand index. The supply index evaluates the impact of demographic changes — reflected in the gender and school completion rate mix — on the composition of the working population. On the other hand, changes in the demand for particular types of workers will be proxied by shifts in the industrial composition of employment, under the assumption that the types of workers more intensively used in expanding industries will profit from increased relative demand. It

[27] The work by KRUEGER [1993] on the impact of the adoption of computers on wages is a reference to this issue, relying on alternative tools of analysis, and direct measurement of the phenomenon. Also MACHIN [1995] bases his analysis on direct measurement of the phenomenon. Explicitly taking account of worker (observable and unobservable) heterogeneity, ENTORF and KRAMARZ [1994] present interesting evidence on the impact of new technologies on wages.

[28] Including some extra-variables, while eliminating others, to conform with our data and the aims of the analysis.

should, however, be noted that a demand shift index built on this assumption of fixed-coefficient requirements captures a particular type of demand changes — those that take place across industries. Forces operating within industries and biasing the demand in favour of particular types of workers are not reflected in the index. This measure can be extended to reflect shifts in the industry and occupational structure of the workforce (instead of just changes in the industrial mix).

To compute the relative growth in the supply of workers in a certain category (decile), consider first the distribution of employment in that category (decile) across gender and schooling levels, then multiply those values by the aggregate changes in the gender/schooling distribution[29]:

$$\Delta S_d = \sum_i \frac{E_{di}}{E_d} \cdot \Delta sh_i \qquad (1)$$

with S – supply of workers

E – employment level in 1983

d –worker category/decile d

i – gender/schooling group I

Δsh_i – change in the aggregate share of workers in the gender/schooling group i, 1983-1992.

Changes in the demand for workers in each decile are computed similarly, considering the industry/occupational distribution of employment (instead of the gender/schooling distribution).

[29] KATZ and MURPHY [1992] measure labour in *efficiency units* – value-weighted annual hours of work, where the value of the hours worked by each type of workers is computed as its relative wage, averaged over the whole period under analysis. While using an adapted version of this concept of efficiency units of labour – value-weighted weeks worked – to measure changes in demand, JUHN and MURPHY [1995] evaluate supply shifts in terms of number of workers. Since we are referring to hourly wages, employment is measured in terms of hours. Notice once again that the employment structure according to hours worked or number of workers is quite similar.

Table 16 – Real wage growth, relative growth in the supply and demand of workers, by earnings decile, 1983-1992

decile	1	2	3	4	5	6	7	8	9	10
change in log average real hourly earnings x 100	31.69	16.19	15.79	14.60	15.96	18.53	21.18	24.36	28.28	44.85
relative growth in supply (1)	3.9	-0.07	-6.02	-9.63	-9.62	-8.18	-4.97	0.80	11.33	22.43
relative growth in demand (2)	-4.13	3.62	3.07	0.79	0.88	0.53	0.05	-2.20	-0.07	-1.92

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Notes: (1) The relative change in supply is computed as the decile initial distribution across gender/schooling levels, multiplied by the aggregate change in the share of workers in each gender/schooling group, between 1983 and 1992 (see equation 1).

(2) The relative change in demand is computed as the decile initial distribution across industry/broad occupational levels, multiplied by the aggregate change in the share of workers in each industry/occupational group, between 1983 and 1992 (see equation 1).

Consider first the evolution of average real wages by decile (second line in table 16, which rephrases the result illustrated earlier by figure 10 on the shares of the total wage bill earned by each decile in 1983 and 1992). The rise in the real wage of the last decile was remarkable, when compared to the rest of the distribution; among the categories with the sharpest wage increase, the first decile follows, with the remaining upper deciles — 9th to 6th, in that order — coming next. Comparison of the last and the 4th deciles provides the most expressive picture of the rise in inequality, as the gap between these two categories of workers widened by 30%.

How far can demographic factors lead into the explanation of this pattern of change in real wages? During the decade, an increased female labour force participation was noticeable, driving their employment share up, from 30% in 1983 to 40% in 1992; also the schooling structure of the working population changed, under the influence of the entry into the labour market of younger cohorts. Changes in the relative supply of workers are quantified in table 16. The *pure* supply shifts explanation of the rise in inequality would require changes in factor supplies to be negatively related to changes in wages. Surprisingly though, supply forces completely fail in predicting the direction of changes in real wages for the different categories of workers. Indeed, an upgrading of the quality of the labour force can be noticed, as the relative supply of workers initially in the 10th to 8th deciles increased. The first decile was the only other one to register a rise in relative supply. Note that groups of *workers whose supply increased* are precisely those that exhibited the *sharpest rise in real wages*. Note also that the group of workers who fared worst in terms of wage growth — the 4th decile — registered the sharpest *decline* in relative supply. In brief, supply shifts would, *ceteris paribus*, have led to the opposite result regarding changes in real wages by decile. The hypothesis of stable demand for labour must be rejected, as demographic factors, stressing supply-side explanations, fail to account for the rise in labour market inequality in Portugal.

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The demand shifts that have taken place during the decade should therefore be analysed. In particular, the index built captures changes in the demand that have occurred *across* economic activities (refer once again to table 16). Demand shifts across industries and broad occupational groups (white/blue collar) also fail to predict the direction of changes in relative wages. While the relative demand for higher qualifications was *declining* across industries, their relative wages were *increasing* the most; the same trend is registered by the first decile. It should however be stressed that these demand shifts (and thus their failure to account for the changes in wages) are humble, when compared to the *pure* supply changes. The irrelevance of changes in the employment structure across industries as an explanation for the mutations undergone by the wage distribution could have been foreseen by a comparison of the employment structures in 1983 and 1992 (see figure 2 in chapter 2). In fact, the 1992 employment structure mirrors that of 1983, with the main change being the slight increase in the already dominant position of the textiles, clothing and footwear industry.

The slight changes that occurred in the Portuguese employment structure by industry did not bias the demand for labour in favour of workers with higher qualifications. Another range of explanations for the rise in labour market inequality should thus also be dismissed — the one that stresses the different rates of growth across industries, be them brought about by the increasingly competitive international environment, by changes in the pattern of trade or by the development process itself. While categorically dismissing the possibility of stable relative labour demand, data on Portugal reveal that demand shifts under constant coefficients of labour requirements also fail to account for the changes that have taken place in the earnings distribution. Forces operating within economic activities, and generating an increase in the relative demand for higher qualifications, are therefore required to explain the pattern of wage growth.

4.4.2. THE RELEVANCE OF FORCES OPERATING WITHIN ECONOMIC ACTIVITIES

The relevance of these forces operating within industries can be explicitly addressed by decomposing the changes in the employment structure into its between and within-industry components, according to the formula [MACHIN, 1995: 5] [BERMAN *et al*, 1993: 9]:

$$\Delta P_n = \sum_i \Delta S_i \cdot \overline{P}_{ni} + \sum_i \Delta P_{ni} \cdot \overline{S}_i \qquad (2)$$

where *i* refers to an industry, and *n* stands for a category of workers, defined according to the gender/schooling/broad occupational group; $P_{ni} = E_{ni}/E_i$ is the share of category *n* in industry *i*; $S_i = E_i/E$ is the share of industry *i* in total employment, and P_n represents the share of category *n* in total employment. The first term on the right-hand side quantifies the between-industry employment change, while the second term evaluates the within-industry component.

Table 17 – Changes in the structure of employment, 1983-1992

schooling	occup.	MEN				WOMEN			
		change in the employment share *(1)*				change in the employment share *(1)*			
		total	between-industry component *(2)*	within-industry component *(2)*		total	between-industry component *(2)*	within-industry component *(2)*	
			value	value	*%*		value	value	*%*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
<= 4 yrs.	white	-2.82	-0.08	-2.74	***-97.2***	-0.68	0.37	-1.05	***-154.2***
	blue	-11.82	-2.67	-9.15	***-77.4***	-1.06	0.56	-1.62	***-153.3***
6 yrs.	white	-0.98	0.08	-1.06	***-107.8***	0.04	0.29	-0.25	***-670.9***
	blue	3.09	-0.28	3.38	***109.2***	4.00	0.22	3.78	***94.5***
9 yrs.	white	1.07	0.11	0.96	***89.4***	1.39	0.34	1.05	***75.4***
	blue	1.50	0.02	1.49	***99.0***	1.05	0.08	0.97	***92.3***
11-12 yrs.	white	0.02	0.12	-0.10	***-459.5***	1.65	0.38	1.28	***77.2***
	blue	0.74	-0.01	0.75	***100.9***	0.74	0.08	0.66	***89.0***
Univ.	white	0.32	0.07	0.25	***79.0***	0.51	0.22	0.29	***56.5***
	blue	0.69	0.02	0.67	***97.0***	0.54	0.09	0.45	***83.8***

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Notes: (1) Difference between the employment share in 1992 and that in 1983 (either one evaluated in percentual points).
Note that, since the values refer to absolute changes in the employment shares, they should not be used to evaluate relative changes (as an example, the rise of about 2 percentual points in the share of University graduates meant an extremely pronounced increase, from 2% to 4% of the workforce).
(2) Twenty two-digit industries were considered.

The share of workers with four years of education or less decreased in the Portuguese economy from 1983 to 1992, a trend that was felt throughout gender and broad occupational groups, being particularly pronounced for blue collar men (see columns 3 and 7 in table 17). In every other case (except white collar men with 6 years of education), a general pattern applies — a rise in the employment share of the group was noticeable, mainly driven by changes occurring within industries. The relevance of the within-industry component of employment shifts is overwhelming, as illustrated by the very high absolute values in columns 6 and 10 of table 17. In most cases, the contribution of changes taking place within industries to the total shift in employment is above 75%, and in some instances it more than offsets opposing forces operating across industries. Few exceptions can be pointed out. Only for the case of white collar women

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holding a University diploma does the contribution of the within-industry component drop below 75% (reaching 57%); in two other cases (white-collar males with a high school diploma and white-collar females with 6 years of education) the direction of change of the within-industry component contradicts the overall change. It should however be remarked that the employment shares of those two groups of workers in practice *did not change*, as reported by their very low values in columns 3 and 7.

The between-industry component of shifts in the employment structure, though less important, also deserves a comment. While for males the evolution across industries contributed to raise the *schooling profile* of the workforce (accompanying the trend noted within the industries), for females the situation is characterised by some duality. Indeed, shifts in the industrial structure have created employment opportunities for women throughout the schooling rank. Employment shifts across economic activities created job opportunities for women with very low schooling levels, as opposed to the situation for men (see columns 4 and 8 for workers with 4 years of education or less). The increased role of the clothing, textile and footwear industry may have contributed to this outcome.

Support is therefore found for the hypothesis that changes taking place within industries are a major force driving the rise in inequality. Technological progress is one promising line of research into the causes or rising demand for skilled workers and rising labour market inequality.

4.5. CONCLUSION

Rising inequality characterised the evolution of labour returns in Portugal during the 1980s and early '90s. The decline in *income* inequality over the decade was thus *not* due to the evolution of labour returns. The pattern of change in inequality reinforced the main characteristic detected for the Portuguese earnings distribution at the beginning of the decade — a stretched top, where dispersion increased remarkably.

A simple supply-demand framework can generate interesting insights into the causes of rising labour market inequality. One explanation for this trend, often presented in the literature, relies on demographic factors, stressing the decline in the rate of growth of groups of workers with the highest qualifications. Supply-driven explanations, however, fail to account for the rise in inequality in the Portuguese labour market (and indeed would lead to predictions in sharp contradiction with the changes that have actually occurred in relative wages). Changes brought about by shifts in the employment structure across sectors of activity are also categorically dismissed as

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sources of rising wage dispersion, since no major changes in the industrial composition of the workforce can be detected. Moreover, the slight changes that have occurred were not biased towards sectors requiring workers with higher qualifications, having instead favoured more traditional activities. As such, explanations for the rise in inequality that rely on shifts in the employment structure brought about for example by the increased openness of the economy also have to be dismissed.

Evidence on Portugal lends support to the idea that forces operating within industries have contributed to switch the relative demand in favour of very qualified workers. Technical progress is a major candidate under this set of explanations. Going beyond this supply and demand framework, the decline in union influence and the role of the minimum wage legislation should not be disregarded either.

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5. WORKERS OR EMPLOYERS: WHO IS SHAPING EARNINGS INEQUALITY?

5.1. INTRODUCTION

Evidence on growing wage inequality within industrialised economies began to be reported in the empirical literature in the 1980s, contradicting previous evidence and challenging economic theory. There is now wide consensus over the idea that this trend was widespread, having hit economies with contrasting wage setting institutions. As in most other OECD countries, rising inequality characterised the evolution of labour returns in Portugal (see OECD [1993]) and moreover, inequality in the Portuguese labour market increased very sharply from the already high values of early 1980s.

This chapter looks at both worker *and* employer attributes as sources of wage dispersion and of its rising trend in Portugal during the 1980s and early 1990s, a period initially marked by an economic crisis, and after 1985 characterised by high economic growth, low unemployment and rising activity rate (see chapter 2). Three main reasons contribute to the relevance of this topic, and each will be dealt with separately.

Studies of earnings inequality have concentrated mainly on worker attributes, encouraged by an economic theory dominated by the human capital approach and by the development of household surveys providing detailed data on household attributes and rewards. The growing awareness of the fact that labour economists have disregarded the demand side of the market (see namely HAMERMESH [1993] and FREEMAN [1989]) led to the study of the role of the firm in wage inequality (see GROSHEN [1986] and DAVIS and HALTIWANGER [1991]), having been detected that inequality among firms accounts for a major share of the wage dispersion. Bringing together worker and employer attributes in a study of the determinants of earnings inequality thus seems a fruitful line of research.

However, most of the work quantifying the impact of the firm on earnings inequality has dealt with the USA, a labour market characterised by institutional arrangements quite different from those prevailing in Europe, where firms are thought to be granted less autonomy when bargaining over wages. In fact, the decentralised

bargaining mechanisms, the low *safety net* and the traditionally lower unionisation rates characterising the *deregulated* and *flexible* American labour market contrast with the more centralised bargaining system and the relatively higher minimum wage levels enforced in Europe and its traditionally higher unionisation rates. "I found it inconceivable that European style national collective bargaining or extension of labor contracts from some employers to their competitors would work in the US, outside of a mass mobilisation war environment." [FREEMAN, 1995: 11] In particular this practice of extension of contracts is thought to have a major direct impact on the role of the firm in wage inequality — "[introduction of] [e]extension of contracts [in the USA] would reduce wage inequality among firms." [FREEMAN, 1995: 14] To the extent that Portugal shares with its European counterparts their framework of industrial labour relations, namely the contract extension mechanism, analysis of the country can provide evidence on the relevance of the firm in shaping wage inequality under an institutional setting that diverges from that of the USA (see section 2.6.2 for a highlight on the aspects of centralisation and decentralisation in the Portuguese industrial relations system).

The available dataset is particularly appropriate for the study of this issue, as it matches data on the firm, the establishment, and each of the workers.

Sections 5.2 and 5.3 explain the methodology followed and the results obtained. In particular, they justify the choice of the Theil index and its decomposition as tools of analysis. Presentation of the results distinguishes between the determinants of inequality and of its trend, with a wide range of possible causes evaluated in a systematic way — shifts in the employment structure, relative changes in the wage of different groups of workers, and changes in inequality within those groups, defined according to either worker or firm attributes. Concluding remarks are presented in sections 4.

5.2. WHAT REASONS FOR INEQUALITY? WORKER *VS.* FIRM ATTRIBUTES

International comparisons in chapter 4 suggested that inequality in the Portuguese labour market reaches a high value. The first question to be answered is therefore: What determines earnings inequality in Portugal?

The inequality measure to be used should be additively decomposable, to enable the detection of the contribution of different variables to overall earnings dispersion, yielding some insight into the causes of earnings differentials. This property, together with that of scale invariance and computational burden considerations, generates a certain consensus in the literature regarding the most appropriate measures to be used —

the entropy family, to which the Theil index belongs (see namely SHORROCKS [1984: 1383], BOURGUIGNON [1979: 901] or COWELL [1985: 201]). While beginning by the more common procedure of inequality decomposition, which considers the gross contribution of the variable(s) to total inequality, the analysis proceeds to use Cowell's proposal to compute marginal contributions of firm and worker attributes to total inequality (see COWELL [1985]), in a procedure less often found in the empirical literature.

Taking i to be an income[30] receiver in a population of N individuals, y_i to be the share of income he/she earns, such that $y_i \geq 0$ and $\sum_{i=1}^{N} y_i = 1$, the Theil index can be computed as

$$T(y) = \sum_{i=1}^{N} y_i \; log(N\, y_i) \quad . \tag{3}$$

The measure ranges between *0* (maximum equality) and *log N* (maximum inequality).

Consider now the following notation for inequality decomposition:

– y_i, $i=1 \ldots N$ – income share earned by individual i;

– S_g, $g=1 \ldots G$ – mutually exclusive and exhaustive population subgroups, defined according to some selected attribute(s);

– N_g, $g=1 \ldots G$ – size of each subgroup, with $\sum_{g=1}^{G} N_g = N$;

– $Y_g = \sum_{i \in S_g} y_i$, $g=1 \ldots G$ – share of income earned by the individuals in subgroup g; $\sum_{g=1}^{G} Y_g = 1$.

It can be proven that (see THEIL [1967: 93-96]):

$$T(y) = \underbrace{\sum_{g=1}^{G} Y_g \log\left(\frac{Y_g}{N_g/N}\right)}_{TB} + \underbrace{\sum_{g=1}^{G} Y_g \cdot \sum_{i \in S_g} \frac{y_i}{Y_g} \log\left(\frac{y_i/Y_g}{1/N_g}\right)}_{TW = \sum_{g=1}^{G} Y_g \cdot TW_g} \tag{4}$$

TB captures the inequality *between* the different *G* groups defined, as it considers the income *per capita* of each group. It can be interpreted as the degree of inequality that would exist if the selected attribute(s) were the only determinants of inequality, i.e., if

[30] The word *income* will be used when talking about the Theil index, even though the analysis deals with *earnings*, because the language is somewhat easier and more immediately understandable (for instance, referring to *total income* instead of *total wage bill*).

everyone earned the mean income of his/her group and all the inequality within the groups had thus vanished [THEIL, 1967: 95] [THEIL, 1972: 101]. TW_g expresses the inequality that exists *within* a certain group *g*. Note that y_i/Y_g is the share of income of individual *i* in his/her group, whereas $1/N_g$ expresses his/her weight in the group. Y_g are the weights used to compute overall *within-groups* inequality, *TW*. Following the reasoning used to interpret *TB, TW* is that share of the earnings dispersion *not explained*. Indeed, if *every* attribute determining inequality had been considered, then each group would be made up of homogeneous individuals, and inequality within each of the groups would have vanished.

Decomposition of hourly earnings inequality in the Portuguese labour market yields the results reproduced in table 18.

Table 18 – Gross contribution of worker and employer attributes to earnings inequality, 1992

	TB between-groups inequality		TW within-groups inequality		T total inequality	
	value	%	value	%	value	%
worker attributes						
skill	.0985	34.7	.1853	65.3	.2838	100
schooling	.0765	27.0	.2073	73.0	.2838	100
gender	.0126	4.4	.2712	95.6	.2838	100
age	.0368	13.0	.2470	87.0	.2838	100
tenure	.0220	7.8	.2618	92.2	.2838	100
occupation	.1381	48.7	.1457	51.3	.2838	100
firm	.1770	62.4	.1068	37.6	.2838	100
establishment	.1832	64.6	.1005	35.4	.2838	100
employer attributes						
economic activity (6-digit)	.1209	42.6	.1628	57.4	.2838	100
location	.0494	17.4	.2344	82.6	.2838	100
ownership structure	.0493	17.4	.2345	82.6	.2838	100
size	.1093	38.5	.1745	61.5	.2838	100
type col. barg. mechanism	.0444	15.6	.2394	84.4	.2838	100

Source: Computations based on PORTUGAL, MESS, DE [1992].
Note: See the appendix 5.A for the definition of the groups defined by each variable.

Considering each variable separately, innate worker attributes seem to have little relevance in shaping earnings inequality. In fact, *gender* accounts only for 4% of inequality, while a much more detailed partition of the workforce, according to *age*, is associated with only 13% of total wage dispersion; a major share of inequality thus remains *within* the groups defined by each of these variables. On the contrary, worker

choices[31] concerning the career to follow and the investment in human capital are more relevant determinants of earnings inequality — the *schooling* level, the *skill* and the *occupation* account for 27%, 35% and 49% of inequality, respectively.[32]

Gross contributions to inequality suggest that the demand side imposes strict constraints on wages. Indeed, wage inequality among firms accounts for 62% of total inequality. The fact that the contribution of the establishment is 65% indicates that it adds little to the explanation of inequality, confirming the idea that wage bargaining decisions are mainly taken at the firm level. Considering just the manufacturing sector, the contribution of the establishment to overall inequality reaches 48%, a result slightly lower than that detected by DAVIS and HALTIWANGER [1991: 133-135], who reported a 51% to 58% contribution of the establishment to total earnings inequality in manufacturing in the USA. Such values provide preliminary evidence suggesting that firms may be allowed more freedom when setting wages in the USA than in Portugal. The *economic activity* of the firm and its *size* stand out as the attributes most closely associated with inequality. The *ownership structure*, the *location* (in a country known to be characterised by sharp regional contrasts) and the *institutional setting* have similar impacts on inequality — 16% to 17%.

More interestingly, the analysis should progress to quantify marginal contributions to inequality. Whereas *TB/T* evaluates the impact on inequality due to the attribute selected to define the groups, it disregards the interactions that might exist with other variables, reporting *gross* contributions to inequality. In fact, if we take *j* and *k* to be two variables chosen to partition the population, the conditions $T = TB_j + TW_j$ and $T = TB_k + TW_k$ hold, but most often the *joint* contribution of both variables is not equal to the sum of their individual contributions. Instead,

$$TB_{jk} = TB_j + TB_k + I_{jk} \ , \tag{5}$$

where I_{jk} stands for the interaction existing between the variables *j* and *k*, which, unless the variables were perfectly independent, can be positive or negative. The impact of variable *k*, controlling for variable *j*, can be computed as [COWELL, 1985]:

$$C_k^j = TB_{jk} - TB_j = TB_k + I_{jk} \ .^{33} \tag{6}$$

The decomposition given by equation 4, together with equation 5, enable us to write

[31] Whether constrained or not, a point which is beyond this discussion.

[32] One should however keep in mind that such population partitions differ widely in their fineness – whereas the variable gender defines two groups, schooling defines five, skill eight, and the occupation defines 1207 groups (see the appendix). The latter, much more detailed partition, is likely to capture firm-specific characteristics, and not simply worker attributes.

[33] We would in fact be *deducting* the interaction if, as it is most often the case, it were negative.

$$T = TB_{jk} + TW_{jk} = TB_j + TB_k + I_{jk} + TW_{jk}. \quad (7)$$

Also, it follows from equation 6 that

$$TB_k = C_k^j - I_{jk}. \quad (8)$$

Plugging this result and its equivalent for variable *j* into equation 7 and simplifying yields

$$T = C_j^k + C_k^j - I_{jk} + TW_{jk} \quad . \quad (9)$$

Particularly relevant is that decomposition which highlights the impact on inequality *exclusively* due to the firm (which will be referred to as C_f), plus that exclusive to the worker characteristics (C_w), plus the interaction between the firm and the type of worker (I_{wf}). Total inequality in the Portuguese labour market will thus be decomposed into:

$$T = C_w + C_f - I_{wf} + TW_{wf} \quad (10)$$

The percentage contribution of each term is highlighted in table 19.

Table 19 – Marginal contribution of the firm and worker attributes to earnings inequality

		C_w	C_f	I_{wf}	TW_{wf}	T
		marginal contribution of the worker attributes *(1)*	marginal contribution of the firm	interaction firm / worker attributes	ineq. within groups defined by firm and worker attrib.	total inequality
1983	value	.0664	.0332	-.0937	.0065	.1998
	%	**33.2**	**16.6**	**46.9**	**3.2**	**100**
1992	value	.1039	.0372	-.1399	.0028	.2838
	%	**36.6**	**13.1**	**49.3**	**1.0**	**100**

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].
Notes: (1) Schooling, sex, age, skill and occupation.

Concentrate first on the relative contribution of the firm and the worker attributes to total inequality (leaving to the next section their trends over time). A very fine partition of the population was implemented — each group was defined simultaneously by the firm in which the worker is engaged, his/her gender, age, tenure, skill, schooling level and occupation. With such finely defined groups, we would expect to have captured most sources of wage dispersion, and in fact just 1% to 3% of total inequality remains *unexplained*, in the sense that it remains within these *homogeneous* groups. Once the impact of the firm is controlled for, the contribution of all the worker attributes reported in the first panel of table 18 is 37% of total inequality in 1992 (and 33% in 1983). Economy-wide, human-capital type of variables account for over one third of total

inequality and thus human capital explanations of earnings differentials can by no means be dismissed. However, they provide only a partial picture of the forces shaping earnings inequality. In fact, the contribution exclusive to the firm (firm-wide impact on wages) was 17% in 1983 and 13% in 1992. Moreover, the interaction term accounts for about half the existing inequality, stressing the impact of differences in pay and recruitment policies across firms.

Two different mechanisms may be embodied in the interaction term. On one hand, a *recruitment policy* mechanism — *good firms* recruit *good workers*, who are thus granted an extra-premium for their attributes (reinforcing the inequality that would be exclusively due to the firm plus that exclusively due to worker attributes); on the other hand, a *pay system* mechanism — *some* types of workers may get an extra premium in *some* types of firms, stressing the relevance of differences in internal labour markets across firms. Given the relevance of this term, it is worth identifying the separate interaction between the firm and each worker attribute separately.

Table 20 – Interactions between the firm and each worker attribute

		interaction between the firm and					
		occupation	skill	school	sex	tenure	age
1983	value	-.0598	-.0320	-.0285	-.0035	.0039	-.0163
	share of total inequality (%)	29.9	16.0	14.3	1.7	1.9	8.2
1992	value	-.0767	-.0492	-.0470	-.0035	.0083	.0138
	share of total inequality (%)	27.0	17.3	16.6	1.2	2.9	4.9

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Negative values for the interaction between variables *j* and *k* reveal that the inequality exclusively due to attribute *j*, *plus* that exclusively due to attribute *k* is reinforced once we take both attributes into account (see equation 10), meaning that *high wage j's* are associated with *high wage k's*; positive interactions, instead, mean that the combination of both variables *lowers* the inequality that would be given by summing their marginal contributions. Empirical studies relying on the decomposition of the Theil index have stressed the type of interpretation here named *recruitment policy* (see, though in a different framework, ALTIMIR and PIÑERA [1982] or FISHLOW [1972]). Following them and highlighting the *recruitment policy* argument, one can conclude that the match between (high wage) firms and (high wage) occupations is particularly pronounced, accounting for 27% of total inequality in 1992, which could lend support to the idea that such a detailed occupational classification is likely to capture firm characteristics, and not just worker attributes. Sorting mechanisms also operate with respect to skill and schooling and, to a much lesser extent, with gender. The opposite

happens with tenure and age (in 1992), for which a positive interaction indicates that different age and tenure levels coexist within the firm.

However, the relevance of the *pay policy* mechanism should not be disregarded in the current context, as it highlights that there are firm-specific returns to worker observable characteristics. Workers with high-wage observable attributes may earn a premium in high-paying firms due to explicit pay policies (and not just because they are the type of labour preferably hired by such firms). For instance, the returns to skill or schooling are larger in high-paying firms; on the other hand, the returns to age and tenure are relatively low in these firms, as suggested by their positive interaction, in 1992. An interesting pattern therefore emerges from this analysis, which suggests that high-paying firms value in particular the schooling achievement and the skill of their workforce.

When analysing the marginal contribution of the employer to earnings inequality, one other line of reasoning can still be explored, by comparing the situation in Portugal with that of other countries. Data for further international comparisons are available if the relevance of the employer is evaluated as its impact on inequality after controlling for the economic activity. Within each Portuguese manufacturing industry defined at the 2-digit level[34], the establishment still accounts for 31% of total inequality, compared to 40% to 46% detected by DAVIS and HALTIWANGER [1991: 134-135] in the USA. The impact of the establishment (all activities) on inequality becomes 6% once we control for the 2-digit industry *and* all the worker characteristics, as compared to 7.9% detected by GROSHEN [1986 :70].[35]

Evidence on Portugal therefore lends support to the idea that firms have less autonomy in wage setting in a more regulated and centralised European bargaining system than in the USA, a labour market characterised by a high degree of decentralisation. However, the results are not as far apart as the existence of features such as the mechanism of extension of contracts in Europe, and its absence in the USA, would let us foresee. It is worth stressing here the overview in chapter 2, where the intermediate nature of centralisation in the Portuguese industrial relations system has been described.

[34] To obtain a number of industries comparable to that used by other studies.

[35] Even though the controls used by Groshen are not strictly comparable to the ones used here. In fact, she controlled for the industry, the detailed occupation of the worker, the sex and the pay system. Both studies control for the industry, but while this study explicitly controls for several worker attributes, Groshen used the detailed occupation and the sex as proxies for such characteristics; her study, on the other hand, controls for the pay system, on which no data is available in QP.

Though the Portuguese case may illustrate that a pattern is at work — a slightly lower impact of the firm on wage inequality in Europe than in the USA —, the European diversity should not be disregarded. Indeed, to cite a few examples, the degree of centralisation of the bargaining system varies widely (see the extreme case of Sweden), the links between the educational system and the labour world differ (see the extreme situation of Germany) and the minimum wage achieves contrasting levels in the different countries, covering different shares of the workforce.

5.3. WHAT REASONS FO*R RISING* EARNINGS INEQUALITY?

Another question should be addressed: What drove the rise in labour market inequality in Portugal during the 'eighties and early 'nineties?

5.3.1. SHIFTS IN THE EMPLOYMENT STRUCTURE, CHANGES IN RELATIVE WAGES AND GROWING INEQUALITY WITHIN GROUPS OF WORKERS: THE PROFILE OF AN ECONOMY UNDERGOING MODERNISATION

The trends in employers' pay policies uncovered by the information in table 19 provide some initial clues to the reasons why inequality has been rising. First of all, the share of inequality exclusively due to worker attributes has been increasing (the analysis below should detect which worker attributes saw their valuation change). On the other hand, the marginal impact of the firm on inequality declined slightly, whereas the interaction between the employer and worker attributes increased slightly, possibly reflecting changes in employers' pay policies. Indeed, table 20 reports a particularly sharp rise in the returns to schooling in high-paying firms. On the contrary, the interaction between firm and gender became less relevant as a share of total inequality. This decrease in the premium received by men in high-paying firms, relative to women, suggests that improvements in the application of the existing anti-discrimination legislation may have taken place. Labour market experience, on the other hand, became a less valued asset, in high-paying firms. In fact, the positive interaction (inequality-reducing effect) of tenure increased, meaning that the premium associated with tenure in high-paying firms decreased; moreover, whereas in 1983 high-paying firms granted their workers a relatively high age premium, the situation was reversed a decade later.

This idea of increasing returns to schooling and decreasing returns to age or labour market experience fits the sociological portrait by Rodrigues and Lopes, who analyse the growing dualism of the Portuguese labour market, defined as "une économie et une population 'à deux vitesses'" [RODRIGUES and LOPES, 1993: 28]. An older labour force,

holding specific skills mainly acquired on the workplace and relying on seniority rules to be promoted, coexists with a younger labour force, holding more general skills and a diploma, and relying on economic modernisation and the associated shortage of skills as its allies shaping the wage profile at the beginning of the career (see RODRIGUES and LOPES [1993: 17,20,28]).

Decomposition of the change over time in the Theil index provides a more rigorous framework for detecting the sources of changing inequality, quantifying the impact of changes in inequality within the groups, of changes in the average wage of the groups and of shifts in their employment shares. Changing population shares have implications on both *within*-group inequality (depending on the level of inequality within the groups whose population changes) and *between*-group inequality (depending on whether the average income of the groups whose population changes is close or far apart from the rest of the distribution). Changes in inequality will thus be decomposed into [TSAKLOGLOU, 1993: 55-56,67-68,72]:

$$\Delta T = \sum_{g=1}^{G} Y_g \, \Delta TW_g + \tag{11}$$
$$+ \sum_{g=1}^{G} k_g \left(TW_g + \log(k_g)\right)\Delta \tfrac{N_g}{N} - \sum_{g=1}^{G} Y_g \left(TW_g + \log(k_g) + 1\right)\left(\sum_{g=1}^{G} k_g \Delta \tfrac{N_g}{N}\right) +$$
$$+ \sum_{g=1}^{G} Y_g \left(TW_g + \log(k_g) + 1\right)\left(\Delta \log(\overline{m}_g) - \sum_{g=1}^{G} Y_g \Delta \log(\overline{m}_g)\right),$$

where $k_g = \frac{Y_g}{N_g/N}$ represents the average income of group g relative to the overall average, and $\overline{m}_g$ stands for the average income of the group. On the right-hand side, term 1 measures the impact on T resulting from changes in within-group inequality (ΔTW_g), terms 2 and 3 evaluate the impact of changes in the population shares ($\Delta\left(N_g/N\right)$) while term 4 measures the impact resulting from relative changes in the mean income of the groups ($\Delta\overline{m}_g$).[36] For the weighting variables, the mean values of the initial and final periods were considered, following TSAKLOGLOU [1993: 69] and MOOKHERJEE and SHORROCKS [1982: 894]. The results are described in table 21.

[36] *Relative changes* because if all the groups' mean income changed by the same proportion, term 4 would become zero. Note that it does not evaluate the impact of changes in the *relative income* of the groups: even though the decomposed Theil index may be written as $I = f\left(N_g/N, TW_g, \overline{m}_g/\overline{m}\right)$, a function of the population shares of the groups, their internal inequality and their mean income *relative to the economy*, the impact of $\Delta\overline{m}_g$ is considered (instead of $\Delta\left(\overline{m}_g/\overline{m}\right)$). According to MOOKHERJEE and SHORROCKS [1982: 896], this must be done to avoid ambiguity in the results, since changes in $\overline{m}_g/\overline{m}$ reflect changes in both the mean income of the groups and their population shares, such that it would not be possible to disentangle these two impacts.

Table 21 – Decomposition of the change in aggregate inequality, 1983-92

	changes in inequality due to						total change in inequality	
	change in within-groups inequality		change in population shares		change in mean wage of the groups			
	value x 100	**%**	value x 100	**%**	value x100	**%**	value x 100	**%**
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
worker attributes								
skill	4.8	**57.0**	1.1	**13.0**	2.5	**30.0**	8.4	**100**
schooling	4.6	**54.7**	2.0	**24.4**	1.8	**20.9**	8.4	**100**
gender	8.4	**99.9**	-0.1	**-1.7**	0.1	**1.8**	8.4	**100**
age	8.2	**97.7**	3.4	**40.3**	-3.2	**-38.1**	8.4	**100**
tenure	7.7	**91.7**	0.4	**4.7**	0.3	**3.6**	8.4	**100**
employer attributes								
eco. act. (6-digit)	5.1	**59.8**	0.1	**2.0**	3.2	**38.2**	8.4	**100**
location	7.1	**84.2**	-0.7	**-8.3**	2.0	**24.2**	8.4	**100**
ownership structure	7.9	**93.9**	-1.0	**-11.9**	1.5	**18.0**	8.4	**100**
size (7 categories)	8.7	**104.0**	-0.8	**-10.1**	0.5	**6.1**	8.4	**100**
type col. barg. mech.	5.8	**68.6**	...	**0.2**	2.6	**31.2**	8.4	**100**
firm (1)	3.5	**56.3**	1.3	**21.0**	1.4	**22.7**	6.2	**100**

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Notes: (1) Only those partitions of the population that generated groups present both in 1983 and 1992 were retained for analysis in the worker and employer attribute panels. Otherwise, some groups would not be considered when computing the change in TW_g, N_g/N or $\overline{m}_g$, biasing the computation of the three components, and thus of the aggregate change in inequality (changes affecting those groups of workers would be discarded, but the weights would still reflect their presence, due to the smaller weights attached to the other groups). As an example, many firms were present in just one of the two years, such that the partition of the population into firms would not account for the overall change in inequality; also, some variables included a category *missing*, in just one of the years. The decomposition of the change in inequality among firms considers only those firms present in both of the years.

Consider first the skill and the schooling levels of the workforce. For either variable, all three components revealed a positive contribution to rising earnings inequality. First of all, increasing returns to skill and schooling are confirmed by data in column 7 — changes in the mean wage of the groups are associated with 21% to 30% of the change in inequality. Additional information reveals that the wage increases were particularly pronounced for workers with a University diploma, for top managers and professionals and for highly skilled personnel. Secondly, shifts in the employment structure also operated to increase inequality (see column 5). In fact, groups with high internal inequality increased their shares in employment — in particular, professionals, managers and highly skilled personnel, those with a University diploma and those with 9 years of education — while their average wages (which have an impact on inequality *between* the groups) do not seem to have counteracted the effects that one would expect by looking at their within-group inequality. Finally, rising inequality within groups contributed the most to the trend in overall inequality (57% and 55%). This tendency

was more pronounced among highly skilled personnel and holders of a University diploma.

The *upgrading* of the quality of the labour force noted by looking at its skill and schooling composition should be stressed (see the rising share of University graduates, highly skilled personnel and managers and professionals). Moreover, it is interesting to note the correspondence between groups with rising employment shares, rising wages and rising internal inequality. This increase in the returns to worker qualifications, in the presence of rising relative supply, indicates that sharp demand shifts have favoured qualified workers, with wage adjustments bringing about a rise in inequality.

Turning now to the gender variable, the increasing participation of women would have had, *ceteris paribus*, a slight equalising effect on the wage structure (column 5). Nonetheless, it is noticeable that increasing inequality within gender groups — especially women — had the most relevant role in shaping the inequality trend, while wage inequality between the sexes remained roughly unchanged (compare columns 3 and 7).

Declining inequality among age levels is reported by table 21, as changes in the mean wage of age groups would have led, *ceteris paribus*, to a decline in inequality (38% of its actual change). However, the rise in within-group inequality was sharp, and furthermore young workers, whose employment shares increased, are paid low wages relative to the rest of the economy (and thus their lower within-group inequality level was not sufficient to generate a negative impact of changing population shares on overall inequality).

A particular result emerges from the analysis of firm attributes. As opposed to the situation in the USA, where the displacement of workers from high wage / low inequality activities (manufacturing) to lower wage / higher inequality activities (services) was found to be a major determinant of rising inequality [BLUESTONE, 1990], industrial restructuring was not a major force shaping rising inequality in the 1980s in Portugal (see the very low contribution of changes in the industrial composition of the working population, reported in column 5). Instead, wage increases differed markedly across economic activities, revealing that different activities exhibited contrasting capacities to adapt to the changes taking place. In particular, one finds (for the two-digit level) that wages in finance, cultural services and wholesale, chemicals, machinery and wood, increased sharply, whereas in more traditional activities — textiles and construction —, but also in public utilities and insurance, wage growth was slow. The two-digit activities

where wages rose the most can roughly be identified with those within which inequality increased the most (the correlation between the variables indeed reaching 80%).

During the decade, firms were shifting towards structures usually considered more *flexible* — smaller units, some relocation out of the Lisbon region; under the impact of privatisations, the role of public firms in total employment declined, in favour of partnerships. The changes in the size, location and type of ownership of firms would have, *ceteris paribus*, led to a decline in inequality. However, the wage gap between the groups defined by any of these three variables widened, in particular the gap between locations and ownership types (column 7).

The relevance of the institutional setting is stressed by the rising distance between the average wage of different types of collective bargaining (31% contribution to the rise in total inequality). This has resulted from the fact that decentralised bargaining mechanisms reinforced during the decade their early 1980s position of high wages relative to the rest of the economy, a result strongly influenced by the situation and the evolution of labour returns in the financial sector (see chapter 2 for an overview of the changes in this sector). Indeed, less than 10% of the labour force is covered by decentralised wage bargaining mechanisms (firm agreements or collective bargaining agreements), which are found mainly in the financial sector, where they cover virtually all the workers, in transportation and, to a much lower extent, in the food, paper or glass industries. Developments of the Portuguese financial sector have been associated with rising wage levels. In fact, after 1985 the economy entered an expansion period, especially marked in finance, where a deregulation programme opened the sector to private initiative, but where regulations persisted concerning the definition of interest rates, yielding high profits (that have motivated the entry of national and foreign firms into the market). Part of the high profitability of the sector may have *trickled down* to its workforce, compatible with rent-sharing type of explanations of its high and rising wage levels. The mechanism may have been enhanced by the extremely high unionisation rate prevailing in the sector (98-99% in 1985/86 [CERDEIRA and PADILHA, 1990: 40]).

Disaggregating the analysis to the employer level reveals the importance of changes in firms' pay policies. In fact, most (56%) of the rise in labour market inequality took place within the firm itself, while growing contrasts between different employers' pay standards account for 23% of the rise in inequality. Therefore, changes in firms' pay policies, leading simultaneously to rising inequality within the firm and rising distance between firms' average wages, accounted for almost 80% of the rise in labour market inequality. Just the remaining 20% were associated with recruitment and dismissal policies, reflected in changes in the employment shares held by the different firms.

The previous analysis can be organised into a more coherent explanation of changes in wage inequality. With a record of high rates of economic growth after 1985 (chapter 2), the Portuguese economy motivated a rising share of its population, specially women and youngsters, to join the labour force. The activity rate increased during the decade, while unemployment was declining. This growth process was associated with some modernisation of the productive structure, illustrated for instance by the shift towards more *flexible* firm structures, and the rise in the demand for labour was thus quite selective. The wages for workers with higher skills and schooling levels increased rapidly, despite the increase in their relative supply. Moreover, groups with sharp wage increases were themselves characterised by rising inequality.

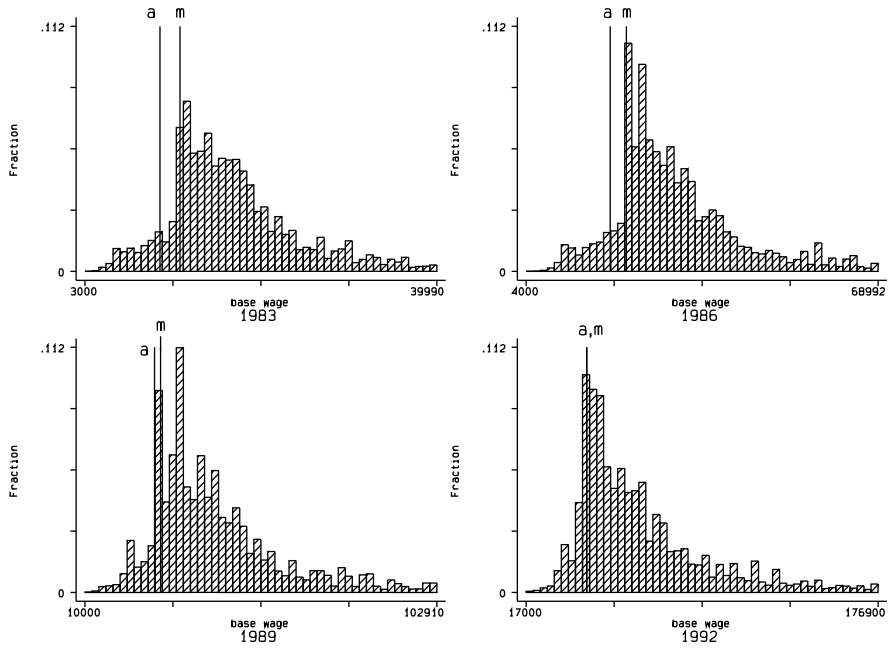
5.3.2. MINIMUM WAGE LEGISLATION: AN EQUALISING IMPACT?

However, especially in the labour market, the mediation provided by institutions should not be disregarded. An equalising impact on the wage structure would be expected in a country where, in particular, minimum wage legislation is enforced (see chapter 2), placing binding constraints on employers' pay policies.

A look at point measures of inequality in chapter 4 showed that the increase in inequality was particularly pronounced at the top of the wage distribution. The bottom of the distribution, on the contrary, became from 1983 to 1986 more compressed, barely reaching in 1992 its dispersion value of early 'eighties. The impact of the minimum wage legislation may have generated this outcome. Indeed, the evolution of inequality at the bottom half of the distribution has a direct counterpart in the evolution of the *toughness* of the minimum wage legislation, evaluated as either the minimum wage relative to the economy's average earnings [MACHIN and MANNING, 1994: 321-323], or as the share of workers earning a base-wage equal to the minimum or less.

Plots of the earnings distribution provide a useful visual description, enabling the detection of spikes at the minimum wage and clarifying the pattern to be described.

Figure 12 – Earnings distribution, 1983-1992



Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].
Notes: The vertical lines drawn refer to: *a* – agricultural minimum wage; *m* – minimum wage of activities other than domestic services and agriculture.
The distributions were truncated at the 90th percentile. Eliminating the long upper tail enables a clearer detection of patterns at the bottom part of the distribution.

In 1983, an economic crisis dominated the Portuguese economy and the minimum wage level set for activities other than domestic work and agriculture was quite stringent. In this framework, the subminimum wage legally allowed achieved a certain importance, illustrated by the spike detected in figure 12, panel 1983. Until 1986, economic hardship endured. The employment level contracted, firm closure reached high levels, in some cases postponed by the existence of *overdue* wages [OECD, 1988: 20]. The minimum wage legislation became *tougher*, in the sense that its level increased relative to the economy's mean (or median) earnings. This had an equalising effect on the distribution, as it *pulled* low wage workers closer to the rest of the distribution — not just those workers that earned *the* minimum wage, but indirectly also those who had wages below that benchmark, were rescued by the relatively pronounced rise in the minimum wage. As a matter of fact, the share of workers earning base-wages below the minimum for manufacturing remained about the same (13% of the workforce); also,

their wages remained as far below the minimum standard in 1986 as in 1983 (the first percentile worker earned 50% of the minimum wage for manufacturing in both years); but the minimum was now closer to the rest of the distribution. A sharp spike at the manufacturing and services minimum wage illustrates its economic impact.

The trend after 1986 supports this idea of a narrowing impact of the minimum wage on the wage distribution once its toughness increases (and vice-versa). From 1986 to 1989, employment was growing sharply and average real earnings were rising at a pace no longer matched by that of the minimum wage. As the minimum became less stringent, the share of workers with wages below the minimum decreased and their wages became closer to the minimum. Nonetheless, inequality at the bottom of the distribution (ratio of the 50/10 percentiles) increased, since the minimum wage had been unable to keep up with the wage increases of the rest of the economy. A sharp spike at the minimum wage can still be noted, but by 1989 it had lost part of its previous relevance. In 1992, subminimum wages were no longer legally allowed. The spike at the new minimum wage level is still pronounced, but the concentration slightly above the minimum level increases.

In synthesis, the relevance of the minimum wage in the Portuguese economy may be visually illustrated by the spikes detected in the distribution and, most relevant, by the fact that the spike moves as the minimum wage is updated. The latter fact in particular underlines the relevance of this institutional force in the labour market since, if it were competitive and workers were paid their marginal product, there would be no reason for the spike of the wage distribution to move with the minimum wage legally enforced [CARD and KRUEGER, 1995: 153-168]. Given this impact of the minimum wage, it would be expected to have a narrowing effect on the distribution. And indeed, the bottom half of the distribution became more compressed as the minimum wage legislation became tougher, *and vice-versa*, a pattern noted for the USA by CARD and KRUEGER [1995: 288-297] and for the UK by MACHIN and MANNING [1994].

5.4. CONCLUSION

Wage inequality among firms accounts for over 60% of total inequality — 13% to 17% as the firm-wide impact on wages, and 47% to 49% resulting from the interaction between firms and types of workers. Evidence on Portugal therefore corroborates the findings by DAVIS and HALTIWANGER [1991] and by GROSHEN [1986], according to which "between-plant wage dispersion is a large component of overall wage dispersion" [DAVIS and HALTIWANGER, 1991: 172].

Nonetheless, support is found for the idea that firms are allowed less autonomy in wage setting in a European labour market, as opposed to the American system, characterised by less regulation and a higher degree of decentralisation.

Mutations occurring at the firm level, concerning in particular their wage setting behaviour, provide a major clue to understand the changes taking place in the wage distribution. Indeed, changes in employers' pay policies have led, not just to rising dispersion between firms' average wages, but moreover to rising inequality within such very detailed economic units (the latter accounting for over half the trend in labour market inequality). A particular economic framework has led employers to change their wage setting behaviour.

During the decade, an upgrading of the *quality* of the labour force could be detected, accompanied by rising returns to worker qualifications, which suggests that sharp shifts in the demand for labour favoured workers with higher qualifications. This selective rise in demand was associated with the modernisation taking place in the Portuguese economy. The mediation provided by institutions with explicit concerns for inequality-reduction (trade unions in particular) was unable to offset the rise in inequality. Nonetheless, tougher minimum wage legislation had, from 1983 to 1986, a narrowing effect on the earnings distribution, through its direct impact on the lower part of the distribution.

To the extent that rising inequality — in particular, increasing returns to schooling and skill — has been signalling the lack of an adequate labour force to promote economic change, investment in schooling and vocational training becomes a crucial issue, not just for equity reasons, but also for growth and economic modernisation imperatives.

APPENDIX 5.A – VARIABLES USED TO DECOMPOSE INEQUALITY AND GROUPS DEFINED

– *Skill*, defined according to the Portuguese Classification of Skills: top managers and professionals; other managers and professionals; foremen and supervisors; highly skilled personnel; skilled personnel; semi-skilled personnel; unskilled personnel; apprentices.

– *Schooling*: primary school or less (<= 4 yrs.); 6 yrs.; 9 yrs.; 11-12 yrs.; university (2 types of bachelor diplomas; university graduation).

– Gender

– *Age*, defined as actual years.

– *Tenure*, defined as actual years.

– *Occupation:* defined according to the 5-digit Portuguese Classification of Occupations, yielding 1207 different occupations in the sample.

– The *firm*

– The establishment

– *Type of collective bargaining mechanism*: collective bargaining contract; collective bargaining agreement; firm agreement; Government mandatory regime.

– *Economic activity*: defined according to the 6-digit Portuguese Classification of Economic Activities, yielding 443 activities; the 2-digit classification yields 20 activities.

– *Location*, defined as one of the 18 *distritos* of mainland Portugal.

– *Ownership structure:* public company; sole proprietorship; partnership; joint-stock company.

– *Firm size*: the actual employment level.

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6. WAGE DIFFERENTIALS ACROSS FIRMS: HOW MULTILEVEL MODELLING REVEALS SO MUCH MORE

6.1. INTRODUCTION

This chapter looks inside a very detailed economic unit — the firm —, to pinpoint and explain contrasts among company wage policies. Two major characteristics of the existing empirical literature on wage policies at the firm level render this issue unsettled: first of all, there is notable disagreement among the results generated by previous studies; moreover, methodological limitations have constrained the scope of the analyses.

Early studies on wage policies at the firm level relied on extensive fieldwork with case studies of American companies, to acknowledge the existence of a remarkable diversity in wage rates across firms (even when located in narrowly defined local labour markets), while detecting a certain intra-firm uniformity (see the overview by KERR [1994] or the original works by LESTER [1948], LESTER [1952], DUNLOP [1957], REYNOLDS [1951] or, setting a novel framework that has influenced much of the current work in this area, REES and SHULTZ [1970], who used econometric analysis on micro data on workers). Search for explanations of these patterns led these authors into interesting reasonings in line with current theories of efficiency wages, rent-sharing or compensating differentials.

More recently, GROSHEN [1986] and LEONARD [1989] also focused on the USA, using similar econometric methodologies to reach surprisingly different results. Indeed, both studies assume that a wide array of detailed occupations adequately controls for the human capital of the worker[37], measuring *employer wage effects* as the coefficient of the regression of wages on establishment dummies, once controls for the occupation have been introduced. Firm effects are thus defined as "wage differentials accruing, on

[37] Groshen further considers the sex, region and the existence of incentive pay mechanisms.

average, to all employees in an establishment" [GROSHEN, 1986: 4]. In either case, analysis of variance (*anova*) is the crucial tool used to quantify the relative importance of the occupation and the employer on wage inequality and to check the stability of employer effects across occupations and over time. The contrast between their results is striking. Groshen's thesis states, in brief, that "employer wage differences within industry are large, real, persistent [...] the likely sources are efficiency-wages and bargaining over rents" [GROSHEN, 1986: ii]. Leonard, instead, refers to the "relatively small role played by firm effects in explaining wage variation, and the transient nature of these wage differences [...] consistent with a simple market model of homogeneous workers, with low search and mobility costs" [LEONARD, 1989: 261].

KRAMARZ *et al* [1995] similarly define the *firm-specific compensation policy* as the coefficient of the firm dummy variable, in a cross-section wage regression where observable worker attributes (sex, skill, age, tenure and nationality) are controlled for. The determinants of the firm wage effect are then searched for, by regressing the coefficients of the firm dummies on the firm attributes. Subsequently, separate wage regressions are estimated for each firm and the results are briefly analysed, by computing the correlation between the estimated coefficients (on seniority, experience and their squares) and the average experience and seniority in the firm. This *dummy-variable approach* to quantify firm wage effects and explain them has been used by other studies (in some cases the firm effects are regressed on firm attributes, while in other cases the firm characteristics are themselves included in the initial wage regression, in place of the firm dummies, to obtain a general reduced form wage equation — see for example LUCIFORA [1993] and KNIGHT and SABOT [1983]).[38]

BINGLEY and WESTERGÅRD-NIELSEN [1996] explicitly take into account the clustered nature of the data, using an error components model that incorporates worker unobservable characteristics, employer unobservables, as well as several interactions (worker, employer, time). However, their results are not extensively explored in that preliminary version of the paper.

A remarkable study of wages at the firm level is that by ABOWD *et al* [1995], which relies on a large panel dataset matching firms and their workers. The main aim of the paper is to determine precisely the separate impact of worker and firm attributes — the observable, as well as the unobservable ones — on wages, progressing to the analysis of

[38] A different type of studies concentrates on a very restricted set of occupations, presenting results for each occupation (see GROSHEN and KRUEGER [1990], MACHIN and MANNING [1995] or REES and SHULTZ [1970]).

the relationship between firm-level compensation measures and firm outcomes (for example, productivity and profitability).

The specific aims of this chapter and its distinguishing features can be spelled out as follows:

1. To quantify firm wage effects going beyond the traditional approach of reducing them to an employer-specific *intercept* in the wage regression. Evaluating company wage policies as a premium/penalty uniformly paid by each firm to all of its workforce, beyond the economy-wide return on observable human capital, has yielded interesting insights into employers' pay policies and facilitated the analysis of its causes, as it provides *one* unambiguous measure of the firm wage effect, which can be regressed on the firm attributes to explain why some firms pay better than others. Nonetheless, this approach seems too laconic, as it does not take into consideration that employers' wage policies can also be distinguished by the fact that *different firms may value differently the human capital of their workers*. Constraining all the firms to follow an economy-wide *rule* to reward observable worker attributes thus seems too restrictive, more so the further the labour market is from a perfectly competitive mechanism. Furthermore, a particular assumption concerning the mechanism of wage bargaining within the firm seems to be implicit in that approach. In fact, it presumes that firm-wide trade unions bargain for every worker in the firm, extracting in the end a uniform premium that holds for every worker. A different situation is instead likely to happen in most countries, and in particular in Portugal, where negotiation is often fragmented (see chapter 2), more so in the services sector, where an occupation-based union structure predominates. Workers with different characteristics are thus likely to be able to gain different shares of the economic rents to be divided. Therefore, employers' wage policies will be modelled as employer-specific intercepts *and slopes* in the wage regression, and tests on the equality of parameters across firms will be performed. Some progress in this direction had been made by KRAMARZ *et al* [1995] when estimating a separate wage regression for each firm. However, this approach presents major limitations and alternative econometric procedures are discussed in section 6.2.
2. To explain a multidimensional set of estimated employer wage effects in an *elegant* framework, where both steps of the estimation process are joined.
3. To take advantage of the appropriateness of multilevel modelling techniques to deal with the following topics: worker *versus* employer components of wage inequality; modelling the variance of wages across firms; modelling the firm-specific wage

parameters. Note in particular that very weak constraints are imposed on the error term, as several levels of random variation are allowed for (the worker *and* the firm, in this case), and the variance of the error terms can be modelled. This means in particular that the error term can be heteroscedastic, and that correlation within the firm is allowed for, as opposed to traditional OLS estimation where one single random term is considered, assumed furthermore to have constant variance.

4. The available dataset is particularly appropriate for the study of this issue (see the discussion in chapter 3), as it matches data on the firm and each of the workers.

After section 6.2, which discusses alternative econometric procedures to estimate employer-specific wage effects, section 6.3 comments on the adequacy of the assumptions of the selected model and the estimation technique for this particular study. Section 6.3 reports the findings on the impact of company wage policies on the level of earnings inequality. After describing preliminary steps in data exploration, it progresses from a very simple model to more complicated ones to answer the questions: What is the relative importance of employers and workers in shaping overall labour market inequality? What parameters of the pay policy (returns to schooling, tenure, experience, penalty imposed on women and on newly-hired workers) differ across firms? How correlated are the pay parameters within the firm, i.e. do firms reveal a consistent pay behaviour throughout the wage dimensions, or instead are there trade-offs into operation? Subsections 6.3.4 and 6.3.5 both search for the causes of contrasts among company wage policies. In the first case, the *random* wage variation across employers is modelled as a function of worker attributes, while in the second case the variability in the *wage parameters* across firms is modelled as a function of the firm characteristics. Section 6.4 concentrates on shifts in employer wage policies over time, to answer questions such as: In a period of economic mutation, along what dimensions have employers changed their pay policies? Which of those changes would have had, *ceteris paribus*, an equalising impact on the overall wage distribution, and which have determined rising inequality in the labour market? Section 6.5 concludes.

6.2. ALTERNATIVE ECONOMETRIC PROCEDURES TO ESTIMATE EMPLOYER-SPECIFIC EFFECTS IN A WAGE REGRESSION

Advantages and disadvantages of several alternative procedures to estimate firm-specific slopes in a wage regression will be discussed (see table 22 for a synthesis). While initially just the estimation of firm-specific parameters deserved attention, increasingly demanding requirements were successively imposed, highlighting in the end that an appropriate and more interesting model should not just estimate a

multivariate set of firm wage effects, but at the same time *explain* these effects, i.e. detect the sources of variability in the wage parameters across firms. The possibilities opened to the analysis by multilevel modelling are pointed out.

6.2.1. DISMISSING LESS APPROPRIATE, THOUGH BETTER KNOWN, APPROACHES

Approach 1. One first possibility, dismissed from the outset, would be to estimate one single wage equation, with pooled data on all the firms and a dummy variable introduced for each firm, fully interacted with every other regressor:

$$y_{ij} = X_{ij} \cdot \beta + D_j \cdot X_{ij} \cdot \alpha_j + e_{ij} \quad ,$$

where *i* refers to the individual, *j* refers to his group/firm, *y* stands for the logarithm of the wage, *X* are worker attributes (for simplicity, it includes the constant, while a subscript *k* for each worker attribute has not been included), *ß* is a column-vector of returns to worker attributes, D_j is a firm dummy-variable and α_j measures firm-specific deviations from *ß*. This procedure is often taken to be quite general, as it renders easy the testing of equality of parameters across firms. However, the implicit assumption of homoscedasticity across firms is unlikely and applying OLS on the pooled sample would thus bias the estimation of the variance of the error terms and render the *t* and *F* tests misleading, as well as the coefficient of determination. Furthermore, the number of regressors involved once hundreds of firms (see section 3.3.3) are to be analysed, with dummy-variables fully interacted with the worker attributes, would render the computations unfeasible in most statistical packages.

Approach 2: Estimation of a separate wage regression for each firm *j*,

$$y_{ij} = X_{ij} \cdot \beta_j + e_{ij} \quad .$$

The following drawbacks can be pointed out to this procedure:

1. Firm-varying *fixed* coefficients are considered. Indeed, to some extent this approach is comparable to the pooled, dummy-variable approach, since the estimated effects are the same, even though the homoscedasticity assumption is now removed, which seems quite sensible in this framework. However, the current situation is not one of exhaustive coverage of the population of firms. Instead, the aim is to quantify a sample of firm wage effects, on which inferences for the population can be drawn. A firm-varying *random* effects model therefore seems a more appropriate procedure.[39]

[39] See its complete specification and the comments made under *approach 3*.

> The situation to which a model applies and the inferences based on it are the deciding factors in determining whether we should treat effects as random or fixed. When individual units in the sample are of interest, the effects are more appropriately considered fixed. When inferences will be made about the characteristics of a population from which those in the data are considered to be a random sample, then the effects should be considered random. [HSIAO, 1985: 132]
>
> If we treat the effects as fixed, we essentially obtain inferences about the particular sample and not about the population as a whole. This becomes very important if we wish to test hypotheses about the extent of variability across the population in behaviour, i.e. about population heterogeneity, or to form predictions about population responses to changes in circumstances. [KEMP: 1991: 15]

2. Testing the equality of coefficients across equations would be a difficult task (see for example AMEMIYA [1985: 35-36]). Besides the theoretical problems involved, the implementation of a solution would be hampered by computational burden considerations, once the number of equations involved reaches the hundreds.

One appealing alternative is provided by models specifically designed to handle several observations belonging to the same group (most often understood as several chronological observations on one cross-sectional unit).

Approach 3: Panel data models. Note first of all a slight change in the notation used so far. Consider a set of observations (workers), belonging to different groups (firms). The firm is the crucial feature at this stage and thus the subscript *i* for each worker will be dropped; the subscript *j* refers to the firm, being understood that the regression deals with the full sample of firms. For each firm *j* there are n_j observations (obviously not constrained to be the same across firms):

$$y_j = X_j \cdot \beta_j + e_j$$

$$\beta_j = \overline{\beta} + \alpha_j \quad ,$$

where $j = 1...J$ groups/firms, y_j is a $(n_j \times 1)$ vector of log wages in the firm, X_j is a $(n_j \times K)$ matrix of worker attributes, β_j is the $(K \times 1)$ vector of firm-specific returns on worker characteristics and e_j is a $(n_j \times 1)$ vector of error terms. The firm-specific wage effects are made up of a common mean $\overline{\beta}$, plus a firm deviation from the common mean, α_j.

Approach 3.1. If the firm effects were modelled as fixed[40], then α_j would be a set of fixed parameters to be estimated. Assuming that the error terms are *contemporaneously* correlated across firms and keeping unchanged the assumption of heteroscedasticity across equations, joint estimation of the full set of equations using

[40] For a clear presentation of these two types of model and their distinction, see JUDGE *et al* [1980: 346-353] or HSIAO [1986: 128-136].

GLS will in general be more efficient than applying OLS to each equation separately, in what became known as Zellner's Seemingly Unrelated Regressions model [ZELLNER, 1962].

However, the assumption of *contemporaneous* correlation of the error terms across equations is meaningless in this framework. To highlight this point, let us recover for a moment the worker subscripts (*l* and *m*, for example) and consider firms *i* and *j*, to write the covariance of the error terms as

$$E[e_j\ e_i^{'}] = \sigma_{ji} \cdot I \quad \Leftrightarrow \quad E[e_{jl}\ e_{im}^{'}] = \begin{cases} \sigma_{ji} & ,\ if\ \ l = m \\ 0 & ,\ otherwise \end{cases} .$$

In fact, it is meaningless to say that the error term for worker 1 (!) in firm *j* is correlated with the error term for worker 1 (!) in firm *i*.

In case the error terms are not correlated across equations, then applying OLS on each firm separately is the appropriate procedure, which would lead us back to the separate regressions approach, subject to the criticism already described.

Approach 3.2. If, on the contrary, firm wage effects are assumed to be random, then the aim is to estimate the mean $\overline{\beta}$, with the model assumptions enabling the prediction of the group-specific coefficients, since they are a random draw from a distribution with overall mean $\overline{\beta}$. The following assumptions hold [SWAMY, 1970][41]: $E[e_j] = 0$ and $Var[e_j] = \sigma_j^2 \cdot I$; $E[\alpha_j] = 0$ and $Var[\alpha_j] = \Gamma$. The reduced form of the model is

$$y_j = X_j \cdot \overline{\beta} + \left(e_j + X_j \cdot \alpha_j\right) = X_j \cdot \overline{\beta} + m_j \ ,$$

with $E[m_j] = 0$ and $Var[m_j] = \sigma_j^2 \cdot I + X_i \Gamma X_j^{'} = \Pi_j$, assuming that X_j is independent of α_j and uncorrelated with e_j and that α_j and e_j are as well uncorrelated. This is a heteroscedastic and correlated (within groups) regression model and GLS would lead to the BLU estimator of the parameters $\overline{\beta}$. However, Γ and σ^2 are unknown and must be replaced by their consistent estimates, obtained through the application of OLS on the initial model [SWAMY, 1974]. An approximation to the BLU estimator of $\overline{\beta}$ is thus obtained, which is consistent and asymptotically efficient [SWAMY, 1970]. The major steps involved in the procedure can therefore be summarised as: 1. OLS estimation of the initial model's equations generates consistent estimators for $\hat{\Gamma}$ and $\hat{\sigma}^2$; 2. GLS are used to generate $\hat{\beta}$; 3. Prediction of $\hat{\alpha}_j$ is obtained as a weighted proportion of the GLS residuals $(y_j - X_j \cdot \hat{\beta})$.

[41] SWAMY [1974] extends this model to allow the error term to be correlated within and across groups (contemporaneously).

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Estimation of a random-coefficients regression model therefore presents the following advantages for the analysis to be undertaken:

1. A-priori reasoning, based on the nature of the dataset on which the analysis will rely, suggests the random effects model as the more adequate choice. In fact, a sample of firms is available and the study aims at drawing inferences for the population.
2. While allowing the coefficients to differ across firms, a remarkable reduction in the number of parameters to be estimated is achieved, when compared to the fixed effects model. This model is therefore an appealing representation of reality, in between the situation where the wage effects are constrained to be equal across firms (competitive benchmark) and the situation where they are considered fixed and different.
3. Heteroscedasticity is allowed by the model, as well as correlation of the errors for different workers within the firm.
4. Testing the equality of effects across firms becomes a more straightforward task than in the separate regressions case. If the null hypothesis of equality were true, then the firm effects would all be equal to $\overline{\beta}$ (no longer random variables) (see SWAMY [1970] or JUDGE *et al* [1980: 351] for the test statistic).

However, these advantages crucially depend on the distributional assumptions of the model. In particular, if the independence between the worker attributes X_{jt} and the firm effects α_j does not hold, the estimation procedure outlined above will lead to biased estimators, as proven by the widely cited analysis by MUNDLAK [1978]. If that were the case, a fixed effect model would be a more adequate strategy (see for instance JUDGE *et al* [1980: 358] or HSIAO [1986: 135-137] for a synthesis), leading back to the separate regressions approach.

Unfortunately, in the current framework this assumption is likely to be a major limitation. Adapting the reasoning by Mundlak, if the levels of the *X* variables (worker characteristics) are determined by the firm, it is unlikely that they will be independent of α_j (pay parameters) — the recruitment and the pay policies of each firm are most likely not independent, as the designers of the pay policy will most certainly also decide upon the worker characteristics that will be preferred in the hiring process.

Mundlak proposes the explicit introduction of the dependence between the coefficients and the explanatory variables into the model, by specifying auxiliary regressions. More generally, a model with random coefficients that are functions of

other exogenous variables could overcome this problem (see HSIAO [1986: 136]), and this possibility is in fact most appealing for the aims of the current study.

Indeed, one final issue that will have to be tackled regards the explanation of the detected firm wage effects. The procedure adopted provides *a set* of firm wage effects, each associated with one worker attribute and therefore the search for the factors distinguishing *good* from *bad* paying firms is not as straightforward as when one univariate ranking of firms was available, as in the work by previous authors. One possible procedure would involve the estimation of a set of *k* equations:

$$\beta_k = G \cdot \eta_k + \alpha_k \quad ,$$

where *k* stands for a worker attribute, β_k is a $(J \times 1)$ vector of firm-specific returns on worker attribute *k* (previously predicted), *G* is a $(J \times l)$ matrix of firm characteristics, η_k is the $(l \times 1)$ vector of the impact of firm characteristics on its pay policy and α_k is an $(J \times 1)$ vector of error terms. However, a regression of regression coefficients presents specific problems[42] and a more elegant model should allow the firm-specific coefficients to be a function of the firm attributes, explicitly joining both steps of the estimation process.

Approach 3.3. A model of random coefficients with systematic components has been proposed by AMEMIYA [1978] and HSIAO [1986: 151-153]:

$$y_j = X_j \beta_j + e_j$$

$$\beta_j = G_j \eta + \alpha_j \quad ,$$

with $E[e_j] = 0$, $Var[e_j] = \sigma_j^2 \cdot I$, $E[\alpha_j] = 0$ and $Var[\alpha_j] = \Gamma$; the firm-specific wage effect, β_j, is explained by the firm attributes G_j. The joint estimation of both levels of the model relies on the adaptation of the procedure described for model 3.2. In particular, an estimate for *ß* and consistent estimates for the covariance matrices are obtained by applying OLS on each firm separately and on the second level equations; these estimates are used to apply GLS on the reduced form model, yielding an approximation to BLU estimators for η.

However, this type of approach has also been subject to criticism, namely:

[42] HANUSHEK [1974] and SAXONHOUSE [1977] have dealt with the case of coefficients that are estimated from different regressions: since the coefficients β_k are *estimated*, they are subject to error; furthermore, if the coefficient for each group is estimated from a separate equation, with between-equations heteroscedasticity, each second stage regression will itself be heteroscedastic, which should be taken into account by the estimation procedure (using the information on the estimated variance of the parameters to apply GLS).

1. Relying on (simply) consistent estimates of the covariance components to apply GLS is judged insufficient by defenders of Maximum Likelihood procedures as a tool to search for more appropriate estimates.
2. Improved estimates for β_j can be obtained if, instead of relying just on the separate data for each firm, all the information were pooled to estimate *firm-specific* parameters, using the procedure described below.

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6.2.2. THE SELECTED APPROACH: GENERAL CHARACTERISTICS

Approach 4. Hierarchical or multilevel models[43] explicitly handle cases where the group-varying parameters estimated in one level are treated as the dependent variables in the next level equations. Moreover, a particular procedure is used to estimate the group-specific parameters.

Taking advantage of the data available for *every* firm, *employer-specific* wage effects are computed as a weighted average of the within-firm OLS estimate and the economy's estimate, with the weights being inversely proportional to the variance of these two estimates. That is to say, coefficients that would be estimated with low precision if OLS on each firm separately were applied (due, for example, to the small employment level of the firm) benefit from the information available for every other firm (see LINDLEY and SMITH [1972: 3, 6-7] or HAITOVSKY [1986: 123]). This idea of group-specific parameters that are estimated with more precision by taking advantage of the data available for the whole economy has been translated into several expressions in the literature. In particular, it is often said that the parameters on each group are *pooled towards the mean*, or that they *borrow strength* from the information on every other group. The appropriateness of this estimation method follows from the assumption that the regression coefficients in the different firms are a random sample from a multivariate Normal distribution (see DEMPSTER *et al* [1981: 341] or HAITOVSKY [1986: 120-121, 123]) or alternatively, and more in line with the Bayesian framework, that *exchangeability* holds (see DEMPSTER *et al* [1977] or MASON *et al* [1983: 76]). Section 6.3 provides details on the interpretation of this assumption, discussing its adequacy for the current study.

The foundations for Linear Hierarchical Models or Multilevel Models have been laid down by LINDLEY and SMITH [1972], who proposed a *Bayes estimator* for hierarchical data models with complex error structures, highlighting its low dispersion, reflected in a low mean squared error. The development to *k*-level hierarchical models is due to HAITOVSKY [1986].

Consider two different levels making up the particular model of this study. In the first level, the unit of observation is the worker:

[43] Also known as *empirical Bayes models*, *mixed effects models*, *covariance components models* or by the general terminology *random coefficients models*.

$$\underbrace{y_j}_{(n_j \times 1)} = \underbrace{X_j}_{(n_j \times K)} \cdot \underbrace{\beta_j}_{(K \times 1)} + \underbrace{e_j}_{(n_j \times 1)} \quad , \tag{12}$$

with *j* referring to the firm, n_j to its employment level and $e_j \approx N\left(0, \quad \sigma_j^2 \cdot I_{n_j}\right)$.

Stacking the model for all the *J* firms leads to the overall model, without subscripts:

$$y = X \cdot \beta + e \quad , \tag{13}$$

where

$$e \approx N\left[0, \quad Diag\left(\sigma_1^2 \cdot I_{n_1}, \ldots, \sigma_J^2 \cdot I_{n_J}\right)\right] ,$$

$$\underbrace{y}_{(N \times 1)} = \left(y_1', \quad y_2', \quad \ldots \quad , \quad y_J'\right)' , \text{ with } N = \sum_{j=1}^{J} n_j \ ,$$

$$\underbrace{X}_{(N \times KJ)} = \begin{bmatrix} X_1 & \cdots & \cdots & 0 \\ \vdots & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_J \end{bmatrix} ,$$

$$\underbrace{\beta}_{(KJ \times 1)} = \left(\beta_1', \beta_2', \ldots, \beta_J'\right)'$$

and $\underbrace{e}_{(N \times 1)} = \left(e_1', \quad e_2', \quad \ldots \quad , \quad e_J'\right)'$.

The level-2 model explains the β_j coefficients estimated in the first level, based on *l* firm-level variables:

$$\underbrace{\beta_j}_{(K \times 1)} = \underbrace{G_j}_{(K \times Kl)} \cdot \underbrace{\eta}_{(Kl \times 1)} + \underbrace{\alpha_j}_{(K \times 1)} \ , \tag{14}$$

where $\alpha_j \approx N\left(0, \quad \Gamma\right)$, Γ being a $K \times K$ matrix, α_j is independent of e_j and

$$\underbrace{G_j}_{(K \times Kl)} = \begin{bmatrix} \left(G_{j1} \ldots G_{jl}\right) & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \left(G_{j1} \ldots G_{jl}\right) \end{bmatrix} ,$$

$$\underbrace{\eta}_{(Kl \times 1)} = \left[\left(\eta_{11} \ldots \eta_{1l}\right) \quad \ldots \quad \left(\eta_{K1} \ldots \eta_{Kl}\right)\right]' \ ,$$

$$\underbrace{\alpha_j}_{(K \times 1)} = \left[\alpha_1 \quad \cdots \quad \alpha_K\right]' \ .$$

β_j is thus made up of a systematic/fixed component ($G_j \cdot \eta$) and a random component (α_j), in a mixed model. The fixed part of the model describes an average wage line for

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all workers in all firms, while α_j describes employer deviations from the economy's standard, and e_{ij} in the first-level equation captures worker deviations from his/her employer average wage line.

Once again stacking all the observations leads to the model

$$\beta = G \cdot \eta + \alpha \quad , \tag{15}$$

where $G = \begin{bmatrix} G_1 \\ \vdots \\ G_J \end{bmatrix}$ is a $(JK \times Kl)$ matrix and ß and α are $(JK \times 1)$ vectors.

Merging models (1) and (2) yields:

$$y = X \cdot G \cdot \eta + X \cdot \alpha + e \quad , \tag{16}$$

with $\alpha \approx N\left[0,\ Diag\left(\Gamma \ldots \Gamma\right)\right]$, $e \approx N\left[0,\ Diag\left(\sigma_1^2 \cdot I_{n_1}, \ldots, \sigma_J^2 \cdot I_{n_J}\right)\right]$. To enable estimation, it is further assumed that $rank\left(X_j\right) = K \leq n_j$, with $j=1...J$, and $rank\left(X \cdot G\right) = Kl \leq N$.

Note that if firm-specific parameters were estimated, without progressing to their explanation based on firm-level variables, then they would be drawn from a distribution with mean $\overline{\beta}$, instead of $G\eta$, and the level-2 model in equation 14 would simplify into:

$$\beta_j = \overline{\beta} + \alpha_j, \tag{14'}$$

and the merged model with all the observations stacked would turn into

$$y = X \cdot \overline{\beta} + X \cdot \alpha + e \quad . \tag{16'}$$

6.2.3. ESTIMATION IN PRACTICE

Practical approaches for the estimation of the model, including the basic model, the likelihood function and an algorithm to maximise it, have been proposed by LONGFORD [1987], GOLDSTEIN [1986], MASON *et al* [1983], RAUDENBUSH and BRYK [1986] and JENNRICH and SCHLUCHTER [1986], synthesising the theoretical background for software packages.[44]

The relative merits of the proposed estimation procedures have by now deserved several comments in the literature. Whereas Longford used the Fisher-scoring algorithm to maximise the likelihood function, Goldstein proposes an iterative generalised least squares procedure and Mason *et al*, as well as Bryk and Raudenbush, rely on the EM (Expectation-Maximisation) algorithm. The *safety* of the EM algorithm is stressed when

[44] Respectively VARCL, MLn, GENMOD, HLM and BMDP-5V.

compared to the other methods, as it involves a low computational burden per iteration, being thus relatively simple to implement, and it exhibits monotone convergence, always staying within the boundaries of the parameter space. Even though it converges from any feasible initial values for the estimates, its very slow speed of convergence is invariably pointed out (see for example LONGFORD [1987: 823] or JENNRICH and SCHLUCHTER [1986: 818] and in particular the synthesis of practical *pros* and *cons* by KREFT *et al* [1994]; for the initial presentation of the algorithm and some of its properties, followed by a discussion, see DEMPSTER *et al* [1977]; for the application to this particular type of models, see DEMPSTER *et al* [1981]).

Initial attempts to program the EM algorithm to estimate the model in this study proved unsuccessful. Indeed, the slowness of the algorithm rendered unfeasible reporting any results within a reasonable time horizon, even though specific precautions had been taken to try to speed up the convergence process. Apart from the strictness of the convergence criterion itself, four particular factors could render the speed of convergence slower: poor starting values for the parameters, a large number of parameters to be estimated, a small sample size and a large number of missing values (see for example the comments by Little [in DEMPSTER *et al*, 1977: 25] or MASON *et al* [1983: 96-97]). A faster convergence was therefore expected to be achieved by careful selection of the sample to be analysed, taking into account the two latter problems; on the other hand, a parsimonious specification of the model was implemented, to reduce the number of parameters under estimation; finally, consistent estimates for the starting values of the parameters were used. The approach proposed by MASON *et al* [1983] was followed, which translated a model initially developed in the Bayesian framework into an iterative maximum likelihood procedure.

To improve on this speed of convergence limitation, the Fisher scoring and iterative generalised least squares procedures have been proposed, and pragmatic reasons led to the choice of the Iterative Generalised Least Squares method.[45] In fact, a thorough inquiry into the characteristics of the available software packages specifically designed to handle multilevel modelling revealed the appropriateness of MLn, mainly due to the fact that: fewer constraints are placed on the size of the dataset to be used; weaker assumptions are imposed on the structure of the error terms in the model; a wider range of tests can be performed. MLn, developed by Harvey Goldstein at the Institute of Education, University of London, uses the Iterative Generalised Least Squares algorithm for model estimation.

[45] GOLDSTEIN [1995: 23] cites unpublished work by Raudenbush, according to which IGLS and Fischer-scoring are formally equivalent procedures.

Equation 14 defines a model with a complex error variance structure — the covariance matrix of the response variable is given by $\sigma_j^2 \cdot I + X_i \Gamma X_j^{'} = \Pi_j$. Once again, if Γ and σ^2 were known, GLS would lead to BLU estimates of the parameters. However, since the covariance matrices are unknown, an iterative procedure is used, which (typically) starts from OLS estimates for the fixed parameters, using the predicted residuals to obtain an estimate of the random parameters (covariance components). Improved estimates of the fixed parameters are then obtained and the procedure goes on alternating between estimation of the fixed and the random parameters, until convergence is reached. The Iterative Generalised Least Squares procedure is described in detail in GOLDSTEIN [1986], and a synthesis is provided in GOLDSTEIN [1995: 21-23].

The estimation was considered to have converged once the proportionate change in each parameter estimate between two successive iterations was lower than 0.01, a benchmark traditionally considered.

6.2.4. THE ASSUMPTIONS OF THE MODEL AND THE ESTIMATION PROCEDURE TRANSLATED INTO STATEMENTS ABOUT COMPANY WAGE POLICIES

This section considers the tenability of the model assumptions in the present study.

Consider first of all the adequacy of the estimation method proposed and its particular implications regarding the stability of the parameters across firms. The idea that the firms are tied together, with their pay policy parameters made up of a fixed/systematic component (in this case, conditional on the firm attributes), plus a random deviation term (with mean zero) is quite appealing from an empirical point of view. The proposed estimation method explicitly considers the relationship among firms imposed by the second-level model, with the hierarchical nature of the model enabling the parameters on each firm to *borrow strength* from the information on every other firm, as the firm-specific effects are said to be *shrinked towards the mean* (which is conditional on the firm characteristics). Explicit consideration of the existence of this *common part* in the firm-specific pay parameters can translate a most obvious fact — there are interactions among the firms' pay policies in the economy (which are disregarded by an estimation practice where each firm is treated as an independent element, as if it defined its pay policy based solely on internal information).

A certain gradation can be identified in this process:

– possibility 1: the interdependence among firms is such that a set of common pay parameters holds for every firm, in which case we would be facing the strictly competitive labour market benchmark;

– possibility 2: demand-side constraints, and thus non-competitive type of factors, come into play once the company wage policy is allowed to vary with the company characteristics. Though diverse, firm wage policies are tied together by a common *rationality* that links the firm attributes to its pay policy. The stage is thus set for the operation of mechanisms such as those described by efficiency wages or rent-sharing theories. For example, variables influencing the degree of union and employer power when bargaining over wages may have an impact on the firm-specific wage parameters (such variables could refer for example to the labour productivity in the firm, its profitability, degree of market concentration or degree of centralisation of the bargaining mechanism);

– possibility 3: a different case would hold if firms' pay policies were strictly independent / arbitrary, with no common element (whether conditional on the firm attributes or unconditional). The error term α_j would in that case achieve major relevance (not) explaining the variability in pay policies across firms.

As mentioned in section 6.2, the appropriateness of the proposed estimation method relies on the assumption that the regression coefficients in the different firms are a random sample from a multivariate Normal distribution or, as an alternative assumption more in line with the Bayesian framework, that *exchangeability* holds. A clear interpretation of this assumption is provided by BRYK and RAUDENBUSH [1992: 80-81] — *conditional exchangeability* means that, once the level-2 predictors have been taken into account, there is no reason to believe that the deviation of any firm's regression line from its predicted value is larger or smaller than that of any other firm. Or, "on the basis of our prior knowledge of contexts [firms] we would not care if the [...] [second-level errors] were permuted within [...] [each second-level equation]" [MASON *et al*, 1983: 76]. There is no reason to believe that these statements would be inaccurate when considering the particular model of this study. If the model is correctly specified, including the relevant variables that account for differences in pay polices across firms, then it should indeed be the case that the level-2 errors are exchangeable.

Moving to the assumptions made on the error terms and their relationship, it has been stated that:

1. $e \approx N\left[0, \quad Diag\left(\sigma_1^2 \cdot I_{n_1}, \ldots, \sigma_J^2 \cdot I_{n_J}\right)\right]$

2. $\alpha \approx N\left[0, \quad Diag\left(\Gamma \ldots \Gamma\right)\right]$

3. e and α are independent.

Assumption 4 concerns the rank of the matrices:

4. $rank\left(X_j\right) = K \leq n_j, \quad j = 1 \ldots J$

$rank\left(X \cdot G\right) = Kl \leq N$.

Conditional on the worker characteristics, the errors in the first level regression are assumed independently distributed within and between firms, with a mean of zero and variances allowed to be unequal across firms (assumption 1). The lack of error correlation between firms can be interpreted as meaning that the worker unobservable quality is uncorrelated across firms and in fact, no reasoning would apparently lead to the opposite expectation. It is further assumed that the worker unobservable quality is not correlated within the firm itself, which excludes the possibility of workers being sorted into firms based on their *unobservable* quality. It can be argued that during the hiring process employers do not have enough information to *systematically* choose workers with certain unobservable attributes, which would vary from firm to firm. However, a word of caution is in order, since decisive statements about this assumption would require further scrutiny.

It should nonetheless be stressed that error correlation within the firm is allowed by the model (see assumption 2). Note that the error term of the reduced form model is $\left(X \cdot a + e\right)$ and the covariance structure of α allows all the parameters of the pay policy to be correlated within the firm. While the fixed part of the model defines an average wage equation for all workers in all firms, after controlling for worker and firm attributes there is still some random variation left in the wage of the worker, made up of two parts:

– the group component, which depends on the worker observable characteristics and is felt in a (cor)related way by every worker in each firm. It can be viewed as the firm-wide *arbitrariness* (that is, deviation from the economy's standard) in the employer pay policy;

– a part which is due to the worker unobservable attributes, being individual-specific, which captures his/her deviation from the average wage line of the firm.

The fact that the random part of the parameters are not allowed to co-vary across firms is not worrying, since their *common features* have already been taken into due account during the estimation of the firm-specific effects. The assumption that the firm unobservable or neglected factors captured in α are not correlated across firms seems plausible. For example, it is very unlikely for the efficiency in management to be correlated across firms.

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The shape of the distribution of the α_j is an assumption that deserves more concern. Indeed, even if particular pay parameters are under consideration, Normality may be a questionable assumption once we are dealing with earnings data.

Assumption 3 states that e_j and α_j, the worker and the firm unobservable quality respectively, are independent. The only study that, to my knowledge, went as far as estimating both types of effects reports the correlation between worker and firm unobservable quality to be as low as 0.08 [ABOWD *et al*, 1995: 20], therefore providing support for the idea that this is a most tenable assumption (the work by BINGLEY and WESTERGÅRD-NIELSEN [1996] relies precisely on such an assumption). This assumption refers only to the *unobservable* quality of workers and firms (and does not exclude the possibility of testing whether high-paying firms attract workers with good observable quality — see for example the comments on table 26 in section 6.3.5).

The last assumption, on the rank conditions on *X* and *XG*, seems straightforward, as it specifies that the explanatory variables included in each level of the model should not convey the same information, i.e. they should not be collinear.

6.3. COMPANY WAGE POLICIES AND THE LEVEL OF LABOUR MARKET INEQUALITY

6.3.1. PRELIMINARY STEPS

Remember from chapter 3 that firm size requirements were imposed before progressing to the analysis of company wage policies. Whereas very small firms should be excluded from a study concentrating on the wage distribution within the firm, the inclusion of large firms, on the other hand, would render computations unfeasible and, moreover, such firms may be considered *outliers* in the Portuguese economy. This chapter therefore deals with firms employing 20 to 300 full-time workers (medium-sized firms, for simplicity). The current section concentrates on the situation in 1992.

Extensive data exploration should precede the actual estimation of the model and lead to the preliminary selection of variables. A useful procedure is recommended [WOODHOUSE *et al*, 1996: 40-41], which relies on estimation of separate wage regressions for each firm. Starting from a general model where a wide array of explanatory variables had been included, the significance of the coefficients for the different firms, as well as their magnitude and sign, were monitored, leading to the estimation of successively more specific models. Also, OLS on the overall economy was

performed. However, the indications of this preliminary analysis were not restrictive, as further experimenting was undertaken within the multilevel modelling framework.

As a result, the following variables were selected for inclusion in the model, with the log of hourly wages as the dependent variable:

– Worker attributes X_{ij} (first-level regression): schooling, tenure, labour market experience, a gender dummy and a dummy for workers holding less than a year of tenure[46];

– Firm attributes G_j (second-level regression): firm size, average schooling level in the firm, average tenure in the firm, gross labour productivity, economic sector (dummy for manufacturing) and region (dummy for Lisbon). This choice of variables was quite wide, as it included every variable judged as significant to explain *at least* one of the wage parameters.[47]

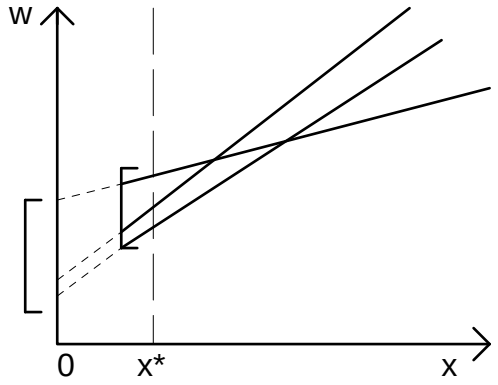
Following the recommendation by WOODHOUSE *et al* [1996: 28-29], and keeping in mind the discussion in KREFT *et al* [1995], the continuous variables schooling, tenure and labour market experience were evaluated as deviations from their overall means, so that the intercept is evaluated at a point that does not fall outside the range of the explanatory variables. However, no major relevance will be attached to the interpretation of the intercept term, since the values it achieves and their dispersion can be strongly influenced (and results even reversed) by the centring criterion used. Indeed, in a model where just the intercept is allowed to vary — therefore leading to the estimation of a series of parallel lines for the different firms — the variance of the intercept is the same irrespective of the criterion adopted (or not) to centre the explanatory variables. This situation changes, once the slopes are allowed to vary as

[46] The inclusion of other variables was tested, namely: powers of schooling (dummy variables were not considered, given the complexity that they would introduce in the estimation of the model aimed at, where each firm-specific random effect is modelled as a function of the firm attributes), powers of tenure, skill levels, a dummy for white-collars. A variable that deserved particular scrutiny was experience – tests were performed on the inclusion of its square, an interaction of experience and its square with a gender dummy variable, the inclusion of previous labour market experience instead of total experience. Such experiments were performed both as OLS on each firm separately, and in the multilevel model. The preferred model specification, however, included just the linear term on labour market experience. A possible argument to justify this specification concerns the existence of a non-linearity in the relationship between wages and experience at the macro level, usually reported by OLS estimations, which could be brought about by aggregation from the firm level.

[47] The inclusion of other variables was tested, namely: average overtime hours in the firm, share of overtime hours, share of blue-collars and share of females, geographical dispersion of the firm, economic diversification, age of the firm, number of establishments making up the firm, degree of market power and market concentration (respectively, the share of sales and employment held by the 4 largest firms in the 4-digit industry) and type of bargaining instrument most represented in the firm (3 dummies). Given the high correlation among some of these variables, not all of them were simultaneously included in the most general model.

well. In that case, the spread of the firm intercepts (as well as their values and ranking) will vary, depending on the centring criterion adopted, as figure 13 helps visualise.

Figure 13 – Impact of different centring criteria on the size and variance of the firm-specific intercepts



In particular, if no centring at all is adopted, the spread of the intercepts is evaluated at *x=0*, being thus overstated with respect to what would happen if the variable were centred at, for example, x^*.

6.3.2. READING THE TABLES OF RESULTS

Equations 13 and 15, merged into equation 16, define the model under estimation. The links between that formalisation of the model and the actual results to be presented should be made clear, to facilitate interpretation of the tables in the section below.

It should be kept in mind that the estimation process will provide estimates for:

– the *fixed parameters*: the average estimated value in the economy for each pay parameter β_k (*k* being the returns to schooling, tenure, experience, penalty imposed on women and newly-hired workers), that is to say, its systematic/fixed component ($G \cdot \eta$).

– the *random parameters*: estimates of the elements of matrix Γ (a $K \times K$ matrix). The elements of the matrix provide the variance of pay parameters across firms, and their covariances within the firm. As such, they provide an answer to questions such as:

"Which pay parameters differ significantly across firms?" (answered by testing whether the variance of the pay parameter is significantly different from zero);

"Do firms that reward well an attribute of their workers (for example, schooling), also do so for other attributes (for example, tenure)?"

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Or instead "Are there trade-off mechanisms at work, such that a firm may reward well the schooling of its workers at the expense of slow tenure-based wage progression?"

Given these estimated variances and covariances between the parameters, it is possible to compute their coefficient of correlation (which will be 1 if referring to the correlation of a pay parameter with itself).

The results of the estimation will therefore be reported as follows. A first panel in each table will report the fixed parameters (average estimates of the pay parameter, for the whole economy). A second panel will report the random parameters, that is to say, the *variance* of each employer-specific pay parameter across firms (referred to as cons/cons, school/school, tenure/tenure, experience/experience, etc), and the *covariance* of different pay parameters within the firm (cons/school, school/tenure, cons/tenure, etc.). Note that random parameters tested as not significantly different from zero will be dropped from the model.

6.3.3. WAGE DISPERSION ACROSS FIRMS: THE RELEVANCE OF EMPLOYER PAY POLICIES IN SHAPING OVERALL LABOUR MARKET INEQUALITY

As a baseline against which more complex models will be evaluated, the simplest variance components model was estimated:

$$y_{ij} = \beta_0 + \alpha_j + e_{ij} \quad , \tag{17}$$

where α_j stands for a firm-specific random effect and e_{ij} is the worker-specific random effect.[48]

Table 23 – Model A: simplest variance components model (firm- and worker-specific random intercept; no other explanatory variables)

fixed parameter	*estimate*	*s. error*
cons	4.986	.01828

level	*random parameter (var./cov.)*	*estimate*	*s. error*	*correlation*
2 - firm	cons/cons	.1522	.01013	1
1 - worker	cons/cons	.1355	.001012	1

likelihood: -2*log(lh) is 32470.7

Source: Computations based on PORTUGAL, MESS, DE [1992].

[48] The most complex model to be reached is that described by equations 13 and 15. In this simplest version of the variance components model, no explanatory variables other than the intercept are considered.

Such a simple model provides preliminary evidence regarding the relevance of employers in shaping overall labour market inequality. Wage variation across employers accounts for a remarkable share of the total wage dispersion — 53%[49] —, while the remaining 47% is associated with the worker. Note that the total variance is equal to the sum of the variances of α and e, given the assumption that the two are uncorrelated. A formal test highlights the significance of the employer wage effects. The likelihood ratio test comparing the models with and without the random component at level 2 leads to a statistic of 29 855.9; under the null hypothesis of no level-2 variation the test statistic would be distributed as a chi-squared with 1 degree of freedom, and the extremely high value it achieves points to the rejection of the null hypothesis — the wage variation across firms should by no means be constrained to be zero.

Sticking to this simple error components structure, the model is developed by including explanatory variables other than just the intercept. Only fixed effects are considered at this stage:

$$y_{ij} = X_{ij} \cdot \beta + \alpha_j + e_{ij} \quad , \tag{18}$$

where *X* refers to schooling, tenure, labour market experience, and dummy variables for women and newly-hired workers, apart from the constant.

Table 24 – Model B: firm- and worker-specific random intercept, fixed slopes

fixed parameter	*estimate*	*s. error*
cons	5.077	.01407
school	.06875	.0007213
tenure	.004901	.0002723
tenure<1 (dummy)	-.07433	.005489
experience	.006722	.0001928
gender (dummy)	-.22	.004215

level	*random parameter (var./cov.)*	*estimate*	*s. error*	*correlation*
2 - firm	cons/cons	.08851	.00594	1
1 -worker	cons/cons	.1001	.0007476	1

likelihood: -2*log(lh) is 21353.6

Source: Computations based on PORTUGAL, MESS, DE [1992].

All the included regressors are highly significant. The average rate of return to one extra year of schooling is 6.8%, a value in line with previous estimates of wage regressions, in particular for the Portuguese case (see for example VIEIRA *et al* [1997]). A point to be remarked is the fact that, while an additional year of seniority with the

[49] Not surprisingly, this value is lower than the one detected in chapter 5, since one important dimension of firm heterogeneity has been mitigated by the imposition of firm size requirements (also, different inequality measures are dealt with – Theil index versus the variance).

firm leads to a wage raise of 0.5%, newcomers into the firm (less than a year of seniority) are subject to a wage penalty of 7.7%.[50] Testing by VIEIRA *et al* [1997] had also pointed to the linearity of the tenure profile, after accounting for the wage differential during the first year with the firm. An extra year of labour market experience is associated with a wage gain of 0.7%. This linearity of the experience profile is an uncommon situation in earnings regressions estimated by other studies at the macro level. Awareness of this situation led to extensive testing, using other model specifications (see footnote 46), both in the framework of OLS on each firm separately and of multilevel modelling. Monitoring the parameters and their significance, however, led to the linear specification on experience as the preferred one. The gender wage gap is captured by the coefficient of -0.22 on the female dummy variable.

The worker-level variance is reduced by 26% once the worker characteristics are included as explanatory variables. The firm-level variance as well is reduced, in this case by 42%. The inclusion of *worker* attributes could indeed lead to a reduction in the *firm*-level wage variances, if the average worker attributes were heterogeneous across firms. Employers who recruit *better workers* pay higher wages, and thus part of the wage dispersion existing across firms is accounted for by the heterogeneity of their labour forces. This influence of the recruitment policy on the pay policy was indeed expected.

After controlling for worker characteristics, the contribution of the employer to total earnings dispersion remains high, suggesting that when modelling wages, it is important to take into explicit account the fact that workers are *clustered* into firms. Indeed, the dispersion among the firm-specific wage lines accounts for 47% of the total wage dispersion, while the dispersion of workers around their employers' average wage accounts for 53% of the wage variance.

Consider now one of the major aims of this study — the variation of wage parameters across firms. The slopes of the wage regression will be allowed to vary randomly across firms, and their variability, as well as their co-variation within the firm, will deserve attention:

$$y_{ij} = X_{ij} \cdot \overline{\beta} + X_{ij} \cdot \alpha_j + e_{ij} \quad , \tag{19}$$

with, remember, $\alpha_j \approx N(0, \quad \Gamma)$, Γ being a $K \times K$ matrix. Equation 19 follows from equations 12 and 14', with the subscript *i* added for clarity.

[50] See HALVORSEN and PALMQUIST [1980], KENNEDY [1981] or GILES [1982] on the interpretation of dummy variables in semilogarithmic equations.

Starting from a general model where every parameter is allowed to vary across firms and no covariance within the firm is constrained to be zero, successive testing led to the choice of the random components to be included in the final model. Once the significance of a *random* parameter is to be checked, a t-statistic test is known to be inadequate, as its distributional assumptions are less likely to be met. Instead, the likelihood-ratio test is the proper procedure (see for instance WOODHOUSE *et al* [1996: 32] or LONGFORD [1993: 26, 35]). Such testing, at the 1% significance level, led to the final version of the level-1 model, reported in table 25. The standard errors of the random parameters are nonetheless reported, as they provide an idea that is roughly consistent with the more accurate test actually used.

Table 25 – Model C: firm-specific random intercept and slopes (worker-specific random intercept)

fixed parameter	*estimate*	*s. error*
cons	5.073	.01442
school	.0607	.001516
tenure	.00605	.0004286
tenure<1 (dummy)	-.05297	.006689
experience	.005952	.0003281
gender (dummy)	-.2098	.006984

level	*random parameter (var./cov.)*	*estimate*	*s. error*	*correlation*
2 - firm	cons/cons	.09178	.006174	1
2 - firm	school/cons	.002386	.0004452	.303
2 - firm	school/school	.0006762	6.709e-5	1
2 - firm	tenure/cons	.0003239	.0001202	.169
2 - firm	tenure/tenure	3.986e-5	5.04e-6	1
2 - firm	tenure<1 / cons	-.009033	.001945	-.442
2 - firm	tenure <1 / tenure<1	.004558	.001087	1
2 - firm	experience/cons	.0005439	9.803e-5	.334
2 - firm	experience/school	8.116e-5	1.121e-5	.58
2 - firm	experience/tenure	-6.252e-6	2.585e-6	-.184
2 - firm	experience/experience	2.893e-5	3.078e-6	1
2 - firm	gender/cons	-.008359	.001991	-.269
2 - firm	gender/gender	.01092	.00136	1
1 -worker	cons/cons	.08984	.0006891	

likelihood: -2*log(lh) is 19252.4

Source: Computations based on PORTUGAL, MESS, DE [1992].

The common elements across firms' pay policies remain highly significant. However, there is significant variability across firms in the way they reward *every* attribute of their workers — schooling, tenure, labour market experience, as well as the penalty imposed on women and newcomers into the firm —, as proved by the level-2 variance of each of the slopes (keeping in mind that just those variances tested as significantly different from zero were kept in the model). The wage slopes can therefore

by no means be considered as economy-wide, since employers do not follow a *universal market rule* to reward the characteristics of their workers. Instead, differences in pay parameters across firms are *real*.

Further exploration of the data in table 25 deals with the correlation of wage parameters within the firm. As the limitation of reducing the company wage policy to one single parameter is overcome, and its multi-dimensional nature is recognised, it is possible to evaluate trade-offs between the different aspects of the wage policy. The covariances between the parameters of the pay policy can indicate the existence of a consistent behaviour throughout the wage dimensions or, on the opposite, the existence of trade-offs in company wage policies.

Whereas most of the associations between parameters of the pay policy within the firm are either non-significant (therefore excluded from model C), or rather small in size, just the link between returns to schooling and labour market experience deserves a comment.[51] Their relatively high correlation (58%) indicates that employers adopt consistent standards to reward the schooling achievement and the labour market experience of their workforce. The interpretation of this pattern is rendered difficult by the fact that the labour market experience of the worker includes both general human-capital acquired on the workplace (previous labour market experience) and specific human-capital (tenure). The evidence presented could indicate that *good firms* engage in a comprehensive effort to recruit a schooled labour force, rewarding well its previous labour market experience and/or promoting tenure.

6.3.4. MODELLING THE VARIANCE OF WAGES ACROSS FIRMS: QUALIFIED WORKERS HAVE MORE TO GAIN FROM BEING *CHOOSY* WHEN LOOKING FOR A JOB

This section concentrates on modelling the random wage variability across firms. Remember that, since the model includes employer-specific slopes, the random wage variation includes a group component (deviations of the firm from the economy's standard to reward observable worker attributes), besides the usual worker component. The group component or random wage variation across firms therefore presents a complex structure, being equal to $x_{ij} \cdot \Gamma \cdot x_{ij}^{'}$, a quadratic function of the independent variables x_{ij}.

[51] The covariance between the intercept and the pay parameters should not be commented upon, for the reasons described in section 6.3.1.

Plotting the between-firm wage variance, $x_{ij} \cdot \Gamma \cdot x_{ij}^{'}$, against each worker attribute can help explore its pattern. The impact of each variable on the variance at level-2 is evaluated *ceteris paribus*, holding every other variable constant at their mean values.

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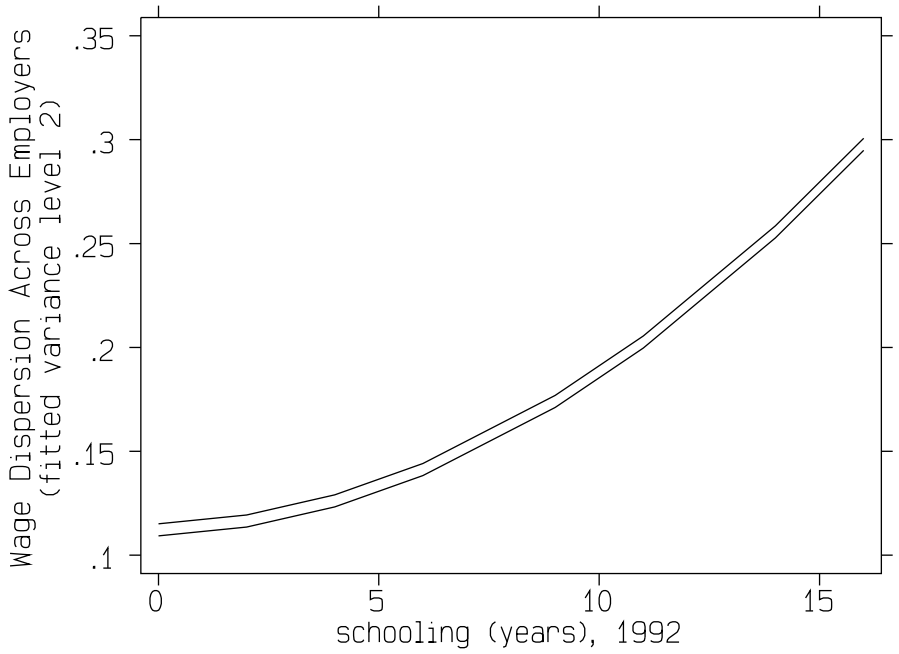
Figure 14 – Wage dispersion across employers as a function of schooling



Note: The upper curve refers to men, while the lower one to women.
Source: Computations based on PORTUGAL, MESS, DE [1992].

Wage dispersion across firms increases sharply as schooling increases. If all the firm-specific wage functions were plotted (with schooling as the explanatory variable, *ceteris paribus*), they would produce a *right-facing megaphone* [LONGFORD, 1993: 100-104], with the lines spreading further apart as the schooling achievement of the worker increases. For the bottom of the schooling ladder, a certain convergence across firms is noticeable and employers pay behaviour is thus closer to following a *market rule*. The contrast among employers rewarding standards is more pronounced for workers holding higher schooling levels.

Though the same pattern of wage variation across firms holds for the human capital acquired by the worker in the market place, its profile is flatter and it never reaches values as high as those generated by schooling.

Figure 15 – Wage dispersion across employers as a function of experience

Note: The upper curve refers to men, while the lower one to women.
Source: Computations based on PORTUGAL, MESS, DE [1992].

In line with the results for schooling, there seems to be a relative consensus among employers regarding the valuation of early labour market experience, with disagreement growing on the rewards paid to more qualified workers. Qualified workers (along the dimensions schooling or experience) thus seem to have more to gain from being *choosy* when searching for a job. This fact could be linked to particular aspects of the wage bargaining process in Portugal, described in chapter 2. Collective bargaining is extensively applied, and therefore the minimum wage levels it sets for different categories of workers could be expected to generate a certain wage uniformity in the economy. However, specially in periods of changing economic conditions, firms with a better financial situation (or employing workers with stronger bargaining power), often set wages above those collectively bargained. Wage drift can therefore be conceived as a relevant mechanism shaping contrasting wages among firms. However, that is a selective mechanism, applied mainly to highly-skilled and white-collar workers.

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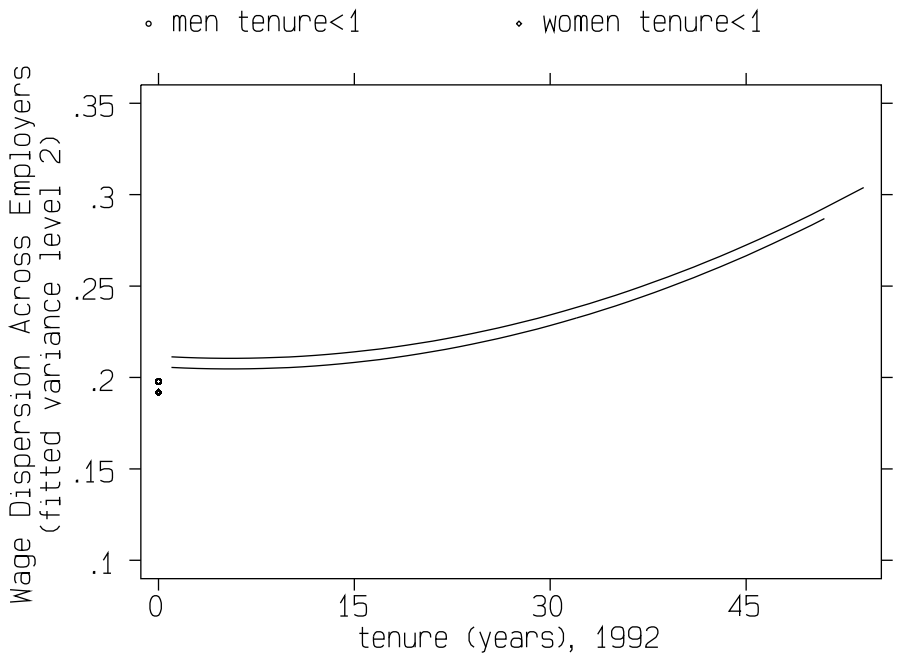
Particular groups of workers, holding higher qualifications, therefore seem to be the ones that benefit the most from this mechanism of wage differentiation between firms.

It is however important to note that high levels of schooling lead to much more pronounced wage contrasts among employers, while the productive advantages of human capital acquired in the market are judged in a more consensual way. This can correspond to the profile of a labour market backed-up by a schooling system known to provide weak technical preparation (see section 2.5), supplying workers with a general background, whose productive use may vary sharply across employers.

Figure 16 – Wage dispersion across employers as a function of tenure



Note: The upper curve refers to men, while the lower one to women.
Source: Computations based on PORTUGAL, MESS, DE [1992].

A different pattern holds for the wage dispersion across employers as a function of tenure. Wage variability across firms decreases extremely slightly from 1 to 6 years of tenure[52], increasing afterwards, at a low rate. The profile of the level-2 variance as a

[52] Though it can hardly be seen in the graph, it can be computed algebraically.

function of tenure is flatter than depicted for schooling or experience, but it departs from a considerably higher starting value. That is to say, the wage enjoyed by newcomers into the firm varies widely across firms, but its dispersion does not increase in a very pronounced way as the tenure of the worker increases. This profile is consistent with a situation where employers apply very dissimilar entry wages, defining afterwards wage progression schemes that are not very dissimilar. In this sense, a worker willing to accept a low entering wage with the expectation of a fast wage progression that would in the future *beat* competing potential employers seems to be bound to disappointment. Indeed, if his/her expectation were true, the convergence of wage levels across firms would have to be more pronounced, and reflected in a pattern of level-2 variance that would be clearly decreasing in tenure (if not monotonically, at least along part of the range of tenure). Nevertheless, from 1 to 6 years of tenure, *corrections* to wage levels are introduced, which yield a very slight approximation of wage levels across firms.

Overall, the idea seems to be that firms agree on wage progression schemes (possibly facilitated by union pressure, since that is a clearly observed dimension of the firms' wage policy), even though the entry wage reveals remarkable disparity, possibly due to the different costs incurred by firms if faced with *moral hazard* problems resulting from the fact that they cannot fully observe the *quality* of a job applicant (in line with certain formulations of efficiency wage theories).

6.3.5. MODELLING THE FIRM-SPECIFIC WAGE PARAMETERS: THE RELEVANCE OF LABOUR PRODUCTIVITY, AVERAGE SCHOOLING IN THE FIRM, FIRM SIZE AND ECONOMIC ACTIVITY IN EXPLAINING THE WAGE VARIABILITY ACROSS EMPLOYERS

Having detected that wage differences across firms are statistically significant and that they affect in particular more qualified workers, it is now important to explain their pattern. The impact of the firm attributes on the way it rewards the characteristics of its workers is reported by the estimated fixed parameters $\hat{\eta}$. The firm-specific wage effects will thus be modelled as random effects *with systematic components*. It is then possible to evaluate how successful the included variables are in accounting for the variability of wage parameters across firms (share of parameter variance explained by the level-2 model). As usual, also the evidence on existence of average or fixed effects in the firm-specific pay parameters will be subject to testing. Chi-squared tests will check the appropriateness of an employer characteristic to explain all the six parameters in the wage regression; a variable judged as significant on those grounds will be kept, interacted with all the pay parameters (even if for some of them it may be insignificant):

$$y_{ij} = X_{ij} \cdot G_j \cdot \eta + X_{ij} \cdot \alpha_j + e_{ij} \quad , \tag{20}$$

Table 26 – Model D: firm-specific random intercept and slopes, with systematic components (worker-specific random intercept)

pay parameter → *explan. variable level-2* ↓	*cons*	*school*	*tenure*	*tenure<1*	*experience*	*gender*
av. school firm	.08331***	.006307***	.0002528	-.005511	.001604***	-.001218
av. tenure firm	.002238	.001328***	-.00041***	-.001964	-5.532e-5	.003203**
firm size (employment)	.0008688***	8.073e-5***	-8.001e-6	-.0001015	1.277e-5***	4.733e-6
gross productivity firm	2.269e-9***	5.749e-11	-2.646e-11	-3.18e-10	3.957e-11**	2.82e-10
manufacturing (dummy)	-.02657	.01036***	-.001491*	.0417***	.001084*	-.03008**
Lisbon (dummy)	.09821***	-.005212*	.0007735	.01728	-.0007183	-.01493
cons	4.434***	-.003847	.01081***	-.02114	-.005244***	-.2157

level	*random parameter (var./cov.)*	*estimate*	*s. error*	*correlation*
2 - firm	cons/cons	.04601	.003254	1
2 - firm	school/cons	.0006145	.0002766	.124
2 - firm	school/school	.0005351	5.669e-5	1
2 - firm	tenure/cons	.0001226	8.16e-5	.0962
2 - firm	tenure/tenure	3.524e-5	4.636e-6	1
2 - firm	tenure<1 / cons	-.005542	.00135	-.443
2 - firm	tenure <1 / tenure<1	.003403	.0009663	1
2 - firm	experience/cons	-1.633e-5	5.839e-5	-.0171
2 - firm	experience/school	5.449e-5	8.714e-6	.529
2 - firm	experience/tenure	-9.229e-6	2.366e-6	-.349
2 - firm	experience/experience	1.984e-5	2.409e-6	1
2 - firm	gender/cons	-.008922	.001553	-.407
2 - firm	gender/gender	.01042	.001309	1
1 - worker	cons/cons	.08985	.0006887	

likelihood: -2*log(lh) is 18731.7

Note: * significant at 10% level; ** significant at 5% level; *** significant at 1% level; otherwise, not significant

Source: Computations based on PORTUGAL, MESS, DE [1992].

Consider first of all the capacity of the model to explain parameter variability across firms. For that purpose, the estimated parameter variance in model C (unconditional variance) will be compared to that in model D (variance conditional on the firm attributes)[53], using the measure[54]:

$$R^{2*} = \frac{\text{var}(\beta_{jk}) - \text{var}(\beta_{jk} \mid G_j)}{\text{var}(\beta_{jk})},$$

[53] RAUDENBUSH and BRYK [1986: 2-3] stress that the observed variance in the slopes can result from two different sources – parameter variance and sampling variance. The latter cannot be captured/explained by the second-stage model, and therefore the model should be judged by comparing the unconditional *parameter* variance with its variance conditional on the explanatory variables included in the level-2 model.

[54] The measure was proposed by RAUDENBUSH and BRYK [1986: 9] (it is originally spelled out with a mistake, though not translated into the authors' computations).

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where *k* stands for one wage parameter and *j* keep its interpretation as referring to the firm. The results are reported in table 27.

Table 27 – Share of parameter variability accounted for by the level-2 model (R^{2*})

(%)

parameter	cons	school	tenure	tenure<1	experience	gender
	49.9	20.9	11.2	25.3	31.4	4.6

Source: Computations based on PORTUGAL, MESS, DE [1992].

The variability across employers in the returns paid to labour market experience, schooling and the penalty imposed on newcomers into the firm are reasonably accounted for by the level-2 model (given the cross-sectional nature of the data and the fact that the variance across employers is reduced by 31% to 21%). The model is however very unsuccessful at explaining the dispersion across employers in the returns to tenure and the penalty imposed on women.

Consider the variables leading to this outcome. The much discussed impact of the firm size on earnings seems to operate through the returns paid to labour market experience and schooling. Indeed, while larger firms value more the human capital acquired by their workers in the educational system and their general labour market experience, they do not seem to provide particularly generous tenure-based progression schemes (note the (in)significance of the estimated coefficients in table 26).

The gross productivity of the firm (sales volume per employee) can proxy the size of the rents to be divided between workers and employers. According to CURRIE and MCCONNELL [1992: 300-301], firms with higher sales are more able to pay, have more to loose once a strike happens, and will therefore have a different *threat point*, being more likely to concede to a higher wage. In particular, they reward better the labour market experience of their workforce. On the other hand, the variable industry concentration (measured either in terms of sales or employment), often taken as a proxy for the profitability in the industry, did not reveal to have a significant impact on the firms' wage parameters.

Firms that need a more schooled labour force present a more selective pay policy towards schooling and labour market experience. That is to say, as the average schooling level in the firm increases, wage dispersion between workers with different schooling and experience levels increases (steeper slope). This pattern would be in line with sorting theories, according to which the *quality* of a worker has an impact on the productivity of his/her co-workers (see for example the nice model by KREMER [1993]). Another interpretation could highlight that good firms attract good workers. Firms that

reward well the schooling achievement of the labour force attract more schooled workers.

The impact of the firm's average tenure on its pay parameters is somewhat surprising. Turnover efficiency wage models predict that firms pay higher wages to prevent quits (which is costly to the firm) and thus motivate longer tenure. However, the association between the average tenure in the firm and its pay policy achieves the expected sense in the case of schooling, but is reversed in the case of tenure. That is to say, firms with higher average tenure reward better the schooling achievement of their workers (and impose a weaker penalty on women), but they reward *worse* the tenure of their workers. This may reveal that some selectivity is involved in motivating long-term attachment to the firm — it is not with workers in general that firms may want to keep long-term links, but with particular groups of workers.[55]

Economic sector bounds are invariably relevant in the explanation of the firm's pay parameters. In fact, manufacturing rewards better than the services the schooling and the experience of the labour force; also, firms in manufacturing do not penalise so much their newly hired workers. On the opposite, tenure wage progression is slower in manufacturing and women earn lower wages than in the services. It should be noted that economic sector differences alone account for a considerable share of the variance across firms in the wage differential paid to newly hired workers.

The lower wages paid to newcomers and the faster tenure-based wage progression in the services sector may reflect the higher labour market flexibility prevailing in that sector, when compared to manufacturing. The labour market in the services is more segmented, between workers on the *fringes* of the firm's labour force (workers newly hired and possibly sooner to be dismissed, earning low wages), and the stable *core*, whose longer attachment to the firm is rewarded/promoted by higher wages (steeper tenure-wage profile than in manufacturing). In manufacturing, instead, the split between *fringe* (newcomers) and *core* is more subtle, as revealed by the lower penalty imposed on newcomers and the flatter tenure progression scheme. Activities requiring lower and less specific qualifications from their workers can afford to impose a higher employment flexibility, as the employer incurs lower costs by having a *fluctuating* workforce. Several jobs in the services indeed correspond to this type of job. Activities requiring higher or more specific skills, on the other hand, cannot, first of all, afford to have such a fluctuating/flexible labour force, and moreover, they attach more relevance to the human capital of the worker, rewarding better his/her schooling and experience.

[55] As it is common when analysing the relationship between tenure and wages, this analysis may be blurred by the existence of a mixed sense of causality.

The impact of the economic sector on the different pay parameters of the firm (schooling, tenure, experience) seems to consistently fit this description.

Apart from the variables that were included in the final model, also the exclusion of other variables, a-priori expected to be relevant, deserves a comment. In particular, institutional forces represented by the type of collective bargaining mechanism revealed not to have a significant impact on wages, after other variables had been taken into consideration. The apparently higher wages paid by decentralised bargaining mechanisms may therefore be a misleading idea, that operates instead through other firm characteristics. A more general comment can link these results to those obtained by previous authors, who failed to detect a significant link between measures of worker unionisation and wage levels [FERNANDES, 1992: 98], or captured an impact with the *wrong* sign [MARTINS, 1992: 19]. Beyond the problem of the quality of the data on union action in Portugal, it could be hypothesised that specific mechanisms operating in the economy render union action less *effective* wagewise — wage drift is widespread, wage flexibility is remarkable (see chapter 2), and thus the strength of the influence of market conditions (firms' financial situation in good times, or the unemployment rate in tough times) could *blur* the impact of certain institutional forces. Also the age of the firm, its degree of vertical integration, its share or average overtime work, as well as the probability of bankruptcy[56] in the industry or region, do not seem to affect the wage level of the firm.

6.3.6. MODEL CHECKING

Whereas the level-2 residuals are interesting on their own, providing indications on the pay policies followed by the different firms, the level-1 residuals are only relevant for model checking. Inspection of these residuals may suggest the existence of violations of the model assumptions. Plotting the level-1 residuals can first of all detect departures from Normality.

[56] Computed as the share of firms going out of business from period *t+1* to period *t+3*, relative to the number of firms existing in period *t*.

Figure 17 – Plot of level-1 residuals

```
      -2.100      1 : *
      -2.000      1 : *
      -1.900      3 : *
      -1.800      0 :
      -1.700      4 : *
      -1.600      2 : *
      -1.500      5 : *
      -1.400      6 : *
      -1.300      9 : *
      -1.200     12 : *
      -1.100     18 : *
      -1.000     31 : *
     -0.9000     61 : *
     -0.8000    104 : *
     -0.7000    193 : **
     -0.6000    393 : ***
     -0.5000    806 : *****
     -0.4000   1599 : **********
     -0.3000   3046 : ******************
     -0.2000   5676 : **********************************
     -0.1000   8694 : ***************************************************
   6.384e-16   6750 : ****************************************
      0.1000   3295 : ********************
      0.2000   1845 : ***********
      0.3000   1148 : *******
      0.4000    754 : *****
      0.5000    573 : ****
      0.6000    376 : ***
      0.7000    258 : **
      0.8000    177 : **
      0.9000     98 : *
       1.000     96 : *
       1.100     54 : *
       1.200     49 : *
       1.300     23 : *
       1.400     17 : *
       1.500     18 : *
       1.600     17 : *
       1.700     14 : *
       1.800     20 : *
       1.900     25 : *
       2.000     16 : *
       2.100      7 : *
       2.200     12 : *
       2.300      5 : *
       2.400      0 :
       2.500      0 :
       2.600      0 :
       2.700      1 : *
       2.800      1 : *
       2.900      0 :
```

The histogram of level-1 residuals does not point to the existence of violation of the Normality assumption.

Another particular aspect deserves concern. The estimated model allows for heteroscedasticity, and indeed section 6.3.4 dealt with modelling the variance. However, whereas the variance at level-2 was modelled, that at level-1 was considered constant. That is to say, the dispersion of each firm's wage line around the economy's average line was modelled, but the dispersion of the workers' wage around their firms' average wage was assumed constant across firms. As Longford phrases it, "when data contain large clusters [firms] the assumption of equal elementary-level variances within the clusters

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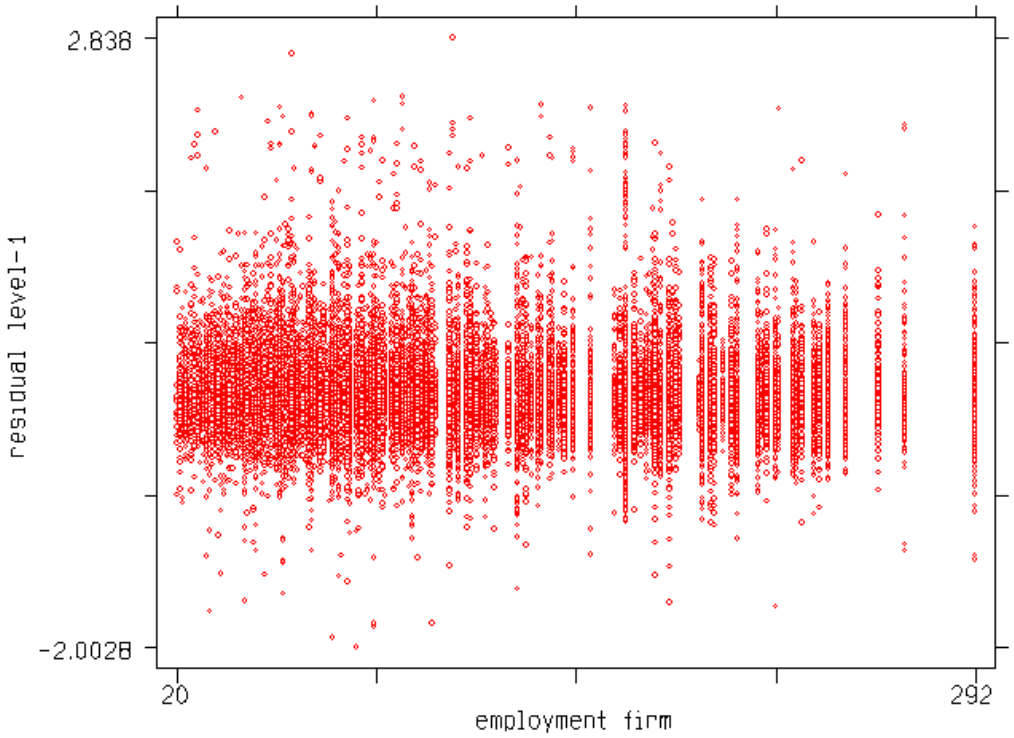
may be challenged. It is rarely meaningful to consider unrelated within-cluster variances σ_j^2 but the elementary-level variances may be modelled as a function of some of the cluster-level variables and/or of the cluster size." [LONGFORD, 1993: 126]

To investigate this possible link between firm size and dispersion of level-1 residuals, these variables were plotted against each other.

Figure 18 – Plot of level-1 residuals against firm size



Source: Computations based on PORTUGAL, MESS, DE [1992].

However, the plot of the residuals against the firm size does not reveal the need to model variance at level 1 as a function of the firm size. Though it has been pointed out that "hierarchical linear models are relatively new and there are few in-depth studies of the consequences of violating model assumptions" [BRYK and RAUDENBUSH, 1992: 198], the checks presented to not reveal reason for concern.

6.4. DO EMPLOYER WAGE EFFECTS ACCOUNT FOR THE RISE IN LABOUR MARKET INEQUALITY?

This section aims at detecting whether shifts in employer wage policies had an impact on overall labour market inequality. A particular framework was used to introduce the temporal dimension into the analysis. Changes over time in the firm-specific parameters were handled by estimating one model for each year separately

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(1983 and 1992). As a result, for each observable worker attribute *k* (schooling, tenure, experience, wage penalty on women and newly-hired workers), a distribution of firm wage effects is available for each of the years. For each worker attribute, the two yearly distributions are compared, to detect whether significant shifts have occurred. Moving from an overall perspective on the whole distribution to consider the position of a particular firm and its changes over time, mobility matrices and their associated indices are built.

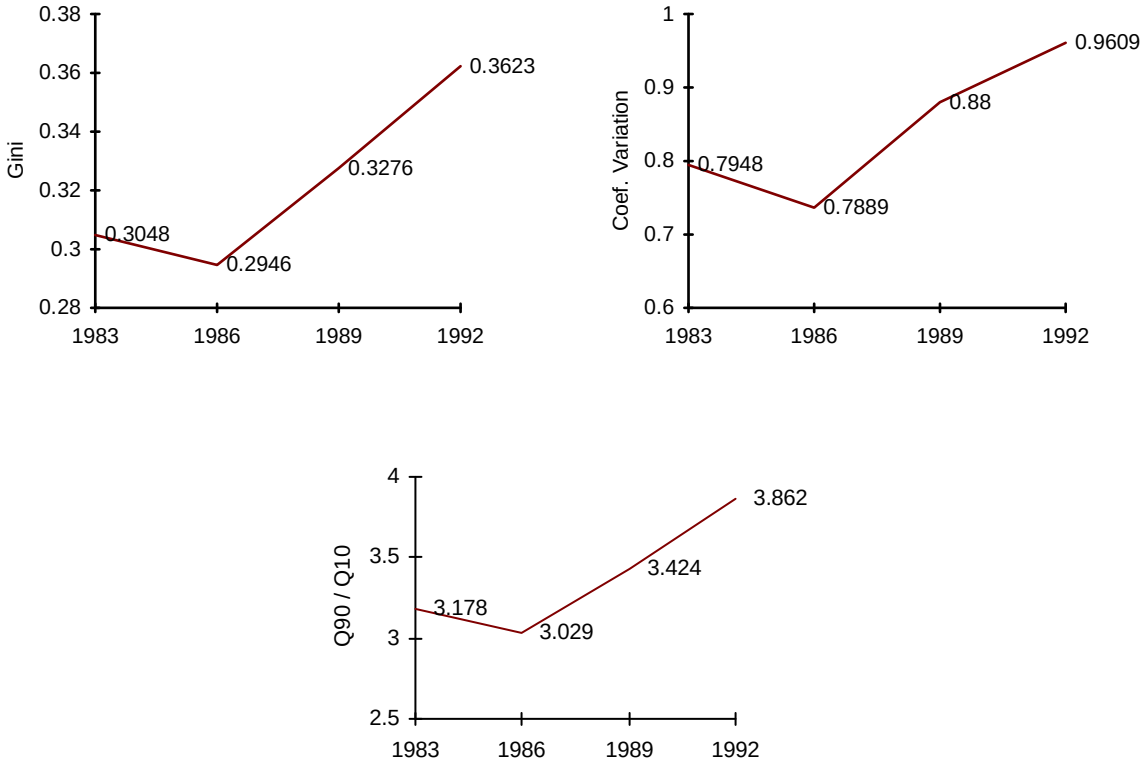
The analysis therefore develops in a framework of comparative static. Particular constraints have led to the choice of this approach, instead of a more ambitious and adequate one, where data on all the firms for the different years would be pooled, to estimate firm-specific time-varying wage parameters, taking furthermore into account the clustered nature of the dataset (multilevel modelling). Indeed, computational limitations have rendered this possibility unfeasible. Even though MLn is the less restrictive software from the point of view of the size of the dataset that can be handled, computations were running on the *edge of feasibility*, given the available hardware.[57] Doubling the size of the dataset handled was just not feasible, and dealing with a dataset half the size for each of the years was judged inappropriate, as it would lead to a too small dataset. Also, the complexity of the model would increase considerably if crossed effects were introduced (as each firm is observed several years, with the structure of the data therefore no longer having the simple hierarchical nature dealt with so far).

6.4.1. EARNINGS INEQUALITY: TRENDS AMONG MEDIUM-SIZED FIRMS

As reported in chapter 4, an outstanding rise in inequality has characterised the evolution of earnings in the Portuguese labour market during the 1980s and early 1990s. Medium-sized firms are representative of this trend, as inequality among workers engaged in firms employing 20 to 300 workers increased by about 20% according to the coefficient of variation, the ratio of the 90th to the 10th wage deciles or the Gini index, the latter having risen from 0.30 to 0.36 between 1983 and 1992.

[57] MLn runs only under DOS or Windows, and 20 of RAM were available on the PC that was used. The alternative of programming the algorithm under Unix led to the problems mentioned in section 6.2.3, and was abandoned.

Figure 19 - Earnings inequality in Portugal, medium-sized firms, 1983-92



Note: Hourly earnings are considered.
Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].

Worker attributes (in particular, gender, age, tenure and skill), as well as firm attributes (economic activity, location, ownership structure, size category or type of collective bargaining) fail to account for this trend, as inequality *within* groups defined by each of these variables revealed a major contribution to the rise in inequality (see chapter 5). Disaggregating the analysis to look inside the firm can shed some light on the mechanisms that have operated at the micro level to bring about rising labour market inequality.

6.4.2. DISPERSION OF WAGES AND WORKER ATTRIBUTES ACROSS FIRMS

Decomposition of the variance of wages into its within and between-firms components can provide a gross measure of the contribution of the firm to overall earnings inequality (an exercise previously done in this work, using the full sample and alternative measures). Indeed, the coefficient of determination of a regression of workers' wages on firm dummies can be interpreted as an upper bound on the employer contribution to wage dispersion. The role of the firm in shaping wage inequality slightly

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increased between 1983 and 1986 (see table 28), but from then on that trend was reversed, as inequality within the firm was the major force shaping the rise in overall labour market inequality. Such trend among medium-sized firms is consistent with the evolution for the overall economy (see chapter 5).

Table 28 – Analysis of variance of log hourly wages (within and between firm components)

year	source of dispersion	sum of the squares (% of total)	degrees freedom	F-statistic	significance level
1983	**between-firms**	**66.1**	462	109.8	0.00
	within-firms	*33.9*	26 017		
1986	**between-firms**	**66.8**	462	156.7	0.00
	within-firms	*33.2*	36 058		
1989	**between-firms**	**61.8**	462	125.0	0.00
	within-firms	*38.2*	35 639		
1992	**between-firms**	**58.9**	462	111.32	0.00
	within-firms	*41.1*	35 850		

Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].

During the 'eighties and early 'nineties, the rise in labour market inequality was remarkable and mainly shaped by the trend occurring within firms. Note in particular the similarity between the trend in overall labour market inequality (figure 19) and the trend in inequality within the firm. The analysis should thus provide an answer to the question: *Along what dimensions has each firm's pay policy become increasingly dispersed?*

A very preliminary answer would deal with the recruitment policy of firms. Rising inequality within the firm may have been simply brought about by growing heterogeneity among co-workers. Briefly looking at the concentration of worker attributes across firms can therefore provide an answer to the question: Is each firm made up of an increasingly heterogeneous labour force, thus contributing to rising inequality within the firm?

The question can be answered by using a simple methodology previously used by MACHIN and MANNING [1995] and by KRAMARZ *et al* [1995], who relied on one-way analysis of variance to provide a measure of the dispersion of worker attributes across firms. The formal model is

$$y_{ij} = \mu + d_j \cdot \zeta_j + e_{ij} \quad , \tag{21}$$

where y_{ij} stands for an attribute (age, tenure, schooling or gender) of worker *i* in firm *j* and d_j is a dummy variable for firm *j*. Some of these attributes are continuous variables (age, tenure, or years of schooling) while others are dummy variables (representing one

occupation, for instance). The interpretation of the coefficient of determination R^2 [58] in each of those cases and its usefulness for the purposes of this study is facilitated by replacing each of the variables in equation 21 by its OLS estimator:

$$y_{ij} = \bar{y} + (\overline{y_j} - \bar{y}) + (y_{ij} - \overline{y_j}).$$

On the right-hand side, term 1 evaluates the overall mean of variable *y*, term 2 measures the deviation of the group *j* mean from the overall mean, while term 3 quantifies the deviation of observation *ij* from its group mean. The total variability of variable *y* in the set of observations can therefore be decomposed into:

$$\sum_i \sum_j \left(y_{ij} - \bar{y}\right)^2 = \sum_j L_j \cdot \left(\overline{y_j} - \bar{y}\right)^2 + \sum_i \sum_j \left(y_{ij} - \overline{y_j}\right)^2 ,$$

where L_j stands for the size of group *j*. On the left-hand side, total variability is referred to as the total sum of the squares (TSS); term 1 on the right-hand side is usually referred to as the regression sum of the squares (RSS), evaluating the dispersion in *y* that is accounted for by the differences in the mean of *y between* the groups; term 2 is the residual sum of the squares or error sum of the squares (ESS), providing an indication of the variability of *y within* the groups defined. The ratio

$$R^2 = \frac{RSS}{TSS} = \frac{\sum_j L_j \cdot \left(\overline{y_j} - \bar{y}\right)^2}{\sum_i \left(y_{ij} - \bar{y}\right)^2}$$

therefore provides an indication as to how much variation in *y* is accounted for by the independent variable.

A particular case happens when the variable *y* is itself a dummy variable (coded 0 or 1). Consider *p* to be the proportion of *ones* in the full sample and *L* to be the full sample size, with the subscript *j* added to denote those variables for each of the firms. In that case,

$$R^2 = \frac{RSS}{TSS} = \frac{\sum_j L_j \left(\overline{y_j} - \bar{y}\right)^2}{\sum_i \left(y_{ij} - \bar{y}\right)^2} = \frac{\sum_j L_j \left(p_j - p\right)^2}{\sum_i \left(y_{ij} - p\right)^2} = \frac{\sum_j L_j \left(p_j - p\right)^2}{L \cdot (1-p) \cdot p^2 + L \cdot p \cdot (1-p)^2} ,$$

since y_{ij} will take the value 1 in *Lp* cases, and the value 0 in the remaining *L(1-p)* cases. After simplification, the measure

[58] Or, more rigorously, the *eta squared*, using analysis of variance terminology.

$$R^2 = \frac{\sum_j L_j \left(p_j - p \right)^2}{L \cdot p \cdot (1 - p)}$$

keeps its interpretation as the share of the variability in *y* that is associated with the independent variable.[59] This measure has been interpreted by KRAMARZ *et al* [1995: 6-7] and by MACHIN and MANNING [1995: 38] as a *specialisation index*, evaluating the concentration of a worker attribute within the firm.

Table 29 – Concentration of worker attributes within the firm *(1)*

year	source of dispersion	schooling	gender	occupation (white-collar)	age	tenure
1983	**between-firms**	**33.8**	**35.1**	**39.9**	**18.9**	**29.4**
	within-firms	*66.2*	*64.9*	*60.1*	*81.1*	*70.6*
1986	**between-firms**	**28.7**	**33.2**	**38.2**	**17.1**	**25.1**
	within-firms	*71.3*	*66.8*	*61.8*	*82.9*	*74.9*
1989	**between-firms**	**30.1**	**32.8**	**37.1**	**16.9**	**21.6**
	within-firms	*69.9*	*67.2*	*62.9*	*83.1*	*78.4*
1992	**between-firms**	**30.7**	**32.1**	**34.9**	**17.0**	**18.1**
	within-firms	*69.3*	*67.9*	*65.1*	*83.0*	*81.9*

Note: (1) The value reported as the between-firms share of dispersion is the coefficient of determination of the regression of each worker attribute on firm dummies (see text); the log of schooling, age and tenure are considered as dependent variables.
Source: Computations based on PORTUGAL, MESS, DE [1983, 1986, 1989, 1992].

One striking feature, first pointed out by MACHIN and MANNING [1995], regards the relative homogeneity of wages within the firm, when compared to the dispersion of worker attributes.[60] Indeed, while 60% to 83% of the dispersion in worker attributes is left within the firm (see table 29), the distribution of wages within the firm is relatively more compressed, accounting for just 33% to 41% of total inequality (table 28). The diversity of worker characteristics recruited by each employer is not matched by comparable wage diversity. This low wage dispersion relative to the worker heterogeneity within the firm suggests the existence of an *employer wage smoothing effect*. Employers' pay policies are not tied to rules which bind the wage distribution to mirror the distribution of workers' attributes, but instead firms seem to choose a particular wage range, within which they *accommodate* workers with diverse characteristics. This in turn suggests that the labour market does not operate according

[59] The formal structure of the model and the computations described are unchanged, irrespective of fixed or random coefficients being considered in the *one-way* analysis of variance (see IVERSEN and NORPOTH [1987: 69-70]).

[60] Which holds even when considering all of the workforce of the firm, as done in table 29, and not just particular occupations.

to competitive rules, with firms having instead a certain discretionary power when setting wages.

According to this interpretation, it would also be the case that Portuguese firms are moving towards more competitive lines of behaviour. As a matter of fact, note that wage inequality within the firm as a share of total inequality is increasing sharply, and in that sense the wage structure within the firm could be said to reflect more closely the dispersion of worker attributes.

Though in a much less pronounced way, also the composition of the workforce within each firm became during the decade more heterogeneous (along any of the dimensions schooling, gender, age, tenure or broad occupation), in contrast with the trend detected for France by KRAMARZ *et al* [1995]. Therefore, changes in both employers' *pay* and *recruitment* policies have contributed to the rising inequality within the firm — co-workers became increasingly heterogeneous and, to a more pronounced extent, their wages became further apart. This section concentrates on the latter topic, changes in wages.

6.4.3. WAGE DISPERSION WITHIN THE FIRM: THE FALL OF SENIORITY-BASED WAGE PROGRESSION SCHEMES AND THE RISE IN THE RETURNS TO SCHOOLING

Estimation of a wage regression with employer-specific coefficients was implemented separately for 1983 and 1992. Equations 12 (level 1), 14' (level 2) and 19 (merged model) are reproduced here for the sake of clarity:

$$y_{ij} = X_{ij} \cdot \beta_j + e_{ij},$$
$$\beta_j = \overline{\beta} + \alpha_j,$$
$$y_{ij} = X_{ij} \cdot \overline{\beta} + X_{ij} \cdot \alpha_j + e_{ij} \quad .$$

Whereas the general results are reported in tables 25 (for 1992) and 6.A in appendix (for 1983), this section aims at confronting the firm-specific parameters β_j in both years. The random terms α_j were therefore recovered from the estimation of the model and for each parameter *k* — schooling, tenure, experience, newly-hired worker or woman —, the employer-specific estimate was computed as:

$$\beta_{kj} = \overline{\beta}_k + \alpha_{kj}.$$

That is to say, each employer-specific wage parameter is computed as the economy's average return on that worker attribute, *plus* an employer deviation from the economy's standard. Comparison of the distribution of employer-specific returns on each worker attribute in 1983 and 1992 was then undertaken.

Therefore, in this section the level-2 residuals α_j are interesting on their own, and will be used according to their *second role* defined by Goldstein:

> These residuals therefore can have two roles. Their basic interpretation is as random variables with a distribution whose parameter values tell us about the variation among the level 2 units, and which provide efficient estimates for the fixed coefficients. A second interpretation is as individual estimates for each level 2 unit where we use the assumption that they belong to a population of units to predict their values. [GOLDSTEIN, 1995: 24-25]

Begin by a perspective on the overall distribution of the pay parameters across firms. While the distribution of the returns to experience did not undergo significant change between 1983 and 1992 (see figure 20), significant shifts in company wage policies regarding the returns to schooling, tenure and the penalty imposed on newly-hired workers and women are already foreseeable by a rough comparison of the two distributions. The Kolmogorov-Smirnov test was used, which relies on the maximum distance between the two cumulative distribution functions, $S_{83}(\beta_k)$ and $S_{92}(\beta_k)$, to test whether they are equal. Under the null hypothesis of equality of both distributions, the distribution of the Kolmogorov-Smirnov statistic

$$KS = \max_{-\infty < \beta_k < +\infty} \left| S_{83}(\beta_k) - S_{92}(\beta_k) \right|$$

is known, and thus the significance of the values it actually achieves can be judged.

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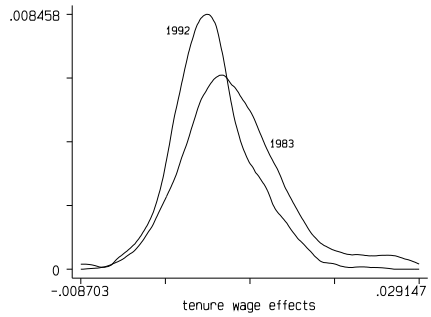
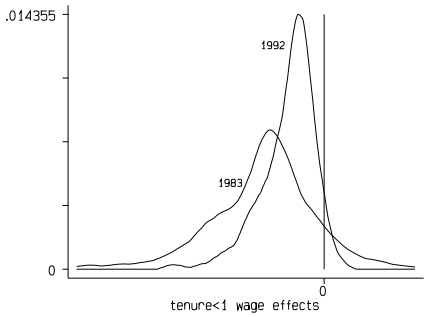
Figure 20 – Distribution of employer-specific wage effects in 1983 and 1992

KS statistic: 0.054
Prob(KS> observed)=0.47

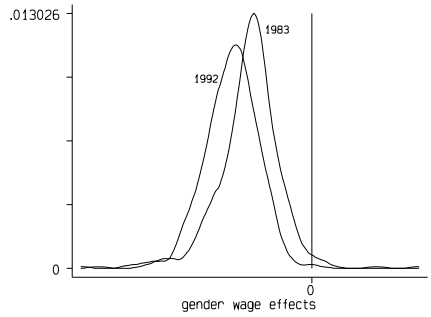
KS statistic: 0.2333
Prob(KS> observed)=0.00



KS statistic: 0.2246
Prob(KS> observed)=0.00



KS statistic: 0.3693
Prob(KS> observed)=0.00



KS statistic: 0.3240
Prob(KS> observed)=0.00

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

It should however be remarked that the non-rejection of the hypothesis of equality of the distributions does not preclude the existence of wage mobility, as firms may have

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swapped positions or, more generally, changed their pay parameters in directions and sizes that compensate each other, leaving the overall distribution unchanged; similarly, rejection of the equality hypothesis does not by itself indicate the degree of mobility that has taken place. Only a more detailed analysis, that shifts the emphasis from the overall distribution to the position of each particular firm, may shed light on the issue.

A very rough exploratory measure that takes into account the *individuals* in the distribution is the coefficient of correlation of the pay parameters over time, which already reveals a slightly different picture. While each firm seems to have promoted relatively small changes in its early 'eighties policy concerning the reward to labour market experience, tenure and the penalty imposed on women (in the sense that the coefficient of correlation between 1983 and 1992 for each of these pay parameters is 42% to 45%), more pronounced adjustments were introduced in the way they rewarded schooling (coefficient of correlation of 39%) and remarkable shifts occurred in the wage policy towards newcomers into the firm (coefficient of correlation as low as 17%).

Table 30 – Coefficient of correlation of firm-specific pay parameters between 1983 and 1992

schooling	tenure	tenure<1	experience	gender (female)
.39	.45	.16	.45	.42

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Mobility matrices provide a more direct evaluation of employers' earnings mobility. To what extent did firms stick to their position in the wage distribution? Do they in fact choose a *general wage level* and behave coherently over time? The mobility tables presented in appendix 6.B compare the pay decile into which a firm falls in 1983 with that of 1992, for each of the pay parameters. A more expressive picture is however provided by synthesis measures, in particular the immobility ratio (share of firms that did not change decile), the upward mobility ratio (share of firms whose decile in 1992 is higher than that of 1983) and downward mobility ratio, as well as the average absolute jump (number of deciles that each firm, on average, *jumped* between the two moments).

Table 31 – Mobility indices

pay parameter	immobility ratio	upward mobility ratio	downward mobility ratio	average absolute jump
schooling	16.4	41.7	41.9	2.45
tenure	17.5	42.3	40.2	2.25
tenure<1	13.4	43.2	43.4	2.84
experience	19.0	40.6	40.4	2.30
gender	21.2	46.2	32.6	2.31

Note: See mobility tables in appendix.
Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

The returns to schooling and the penalty imposed on newcomers are confirmed as those dimensions of the pay policy where the sharpest changes have occurred — from 1983 to 1992, only 16% and 13% of the firms, respectively, have kept their position (decile) in the wage distribution; extending the concept of immobility, 40% and 37% of the firms, respectively, have either kept their position or moved by less than one decile. On the other hand, employer pay policies regarding labour market experience, tenure and the penalty imposed on women were more coherent over time (in the latter case with 21% of the firms sticking to their initial decile in the wage distribution, and 47% either remaining in the same decile or changing by less than one).

The average absolute jump confirms this ranking of the pay parameters with respect to their stability over time. The returns to schooling and the wage penalty on newly-hired workers led to the most unstable ranking of firms, as each firm changed its position in the wage distribution by, on average, 2.5 and 2.8 deciles respectively. All other pay parameters are associated with a slightly more stable ranking of the firms over time, since each firm *jumped* 2.3 deciles between 1983 and 1992.

It can therefore hardly be said that firms have set their wage policies so as to keep a consistent relative position over time. In a period of changing economic conditions, with remarkable changes affecting the labour market (see chapter 2), employers have promoted wage adjustments that led to thorough changes in their relative rankings in the wage distribution. Note however that such wage adjustments were selective, having dealt in particular with the returns to schooling and the penalty on newly-hired workers. The overview in chapter 2 may help understand this pattern of change. Changing returns to schooling are likely to have been brought about by the need for a more qualified labour force, which has resulted from the modernisation taking place in the economy, whereas the growing labour market flexibility legally allowed may have propitiated a changing environment for newcomers into the firm.

Persistent wage inequalities across firms may therefore hide a high degree of mobility in the wage distribution. That is to say, significant and persistent wage inequality across firms is not necessarily brought about by the fact that employers choose a position in the wage distribution, consistently holding on to it as time goes by. Instead, in a period of economic mutation, wage adjustments have led firms to *travel* in the wage distribution, changing their relative positions, regarding in particular the way they reward schooling and newly-hired workers.

A further step leads into the analysis of the *absolute* changes that have occurred in the distribution of wages across employers. A look at such changes may provide

relevant indications as to why inequality within the firm has increased so sharply. Were there worker attributes whose valuation changed markedly at the micro level? What attributes, and in what direction? Along what dimensions have employers increased the *selectivity* of their pay policies?

Note that a rise in the firm-specific returns to schooling, experience or tenure is associated with increasing inequality within the firm, along the particular dimension under consideration. For example, wage differentials among workers holding different schooling levels increases as the firm-specific return to schooling achieves a steeper profile. That can be interpreted as a sign of a more selective wage policy, which favours workers with higher qualifications (schooling, in this case). The interpretation of the firm-specific penalty imposed on women and newcomers is less straightforward. A wage penalty on a particular group of workers, just like a wage premium, yields higher wage dispersion within the firm, and only values around zero will be associated with more equitable wage distributions in the firm. The value zero for those pay parameters is achieved only by firms in the 10th decile, and therefore only shifts towards that decile can be said to have led to a reduction of inequality within the firm.

Define fixed thresholds between the deciles, by setting them at their 1983 level. Fitting the wage effects of 1992 into their 1983 distribution leads to the results in table 32. The values in the table can be interpreted as an answer to the question: a wage range where (by definition) 10% of the firms were falling in 1983, comprises what share of the firms in 1992?

Table 32 – Fitting the 1992 firm-specific wage effects into their 1983 distribution

decile in 83→ pay param.↓	1	2	3	4	5	6	7	8	9	10	total
schooling	5.0	3.9	4.6	5.7	9.4	11.2	9.9	9.0	***16.0***	***25.4***	100
tenure	***14.5***	***18.8***	***12.7***	***13.0***	***13.0***	6.9	7.3	5.6	5.2	3.0	100
tenure<1	0.9	2.1	4.1	6.3	6.5	6.7	7.3	***28.9***	***32.4***	4.8	100
experience	8.9	6.9	13.0	8.9	8.0	11.2	9.9	11.7	10.6	11.0	100
gender	***22.9***	***21.4***	***15.6***	10.4	9.1	4.1	4.3	6.1	4.1	2.2	100

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

A clear and interesting pattern emerges. Company wage policies became more disperse along the dimensions schooling and gender; on the contrary, equity within the firm between workers with different tenure levels increased, whereas the returns to experience underwent only slight mutations. Consider each of these aspects in more detail.

The growing selectivity in employers pay policies regarding the schooling achievement of the labour force can be seen from the massive shift away from the lowest levels of returns to schooling, and towards the upper extreme of the distribution. In particular, the pay range where the 20% highest-paying firms in 1983 fell, comprised in 1992 over 40% of the firms; the relevance of the 4 lowest deciles, on the other hand, had by 1992 been halved.

Rising inequality was also brought about by the remarkable shifts in the penalty imposed on women workers, towards the lowest end of the distribution. Indeed, the three lowest deciles in 1983 define a pay range where an impressive 60% of the firms are concentrated in 1992, at the expense of the share of firms situated in the 5 upper deciles (as defined by the 1983 thresholds). A multivariate analysis of the determinants on inequality therefore provides insight into changes that could not be foreseen by the univariate analysis undertaken in chapter 5, where failure to control for other variables had prevented the detection of this rise in the wage penalty imposed on women.

Tenure, on the other hand, seems to be an asset less valued by firms in 1992 than in 1983. In fact, tenure-based wage progression became flatter, in a remarkable share of firms (see the concentration in the 5 lowest deciles reported in table 32).

The evolution of the returns to schooling and tenure so far described reinforces the idea referred to in chapter 5, and originally highlighted by RODRIGUES and LOPES [1993]. A more schooled labour force, holding general skills acquired in the educational system, was increasingly valued in the market place during a modernisation period, whereas more traditional wage progression mechanisms, based on seniority, seem to be loosing relevance.

Tenure wage progression deserves a further comment. Changes in the wage penalty imposed on newly-hired workers reveal an interesting pattern, though unexpected, as firms tended to concentrate in pay levels closer to a null penalty (see the 8th and 9th deciles, as fixed thresholds are considered), while the very toughest penalty levels loose relevance. The hypothesis of rising contrasts between newly-hired workers and their co-workers (eventually allowed for by the legislation on labour market flexibility), as one source of rising inequality must therefore be dismissed. Legislation weakening the links between employer and employee (see chapter 2), which has led to *employment* penalties (for instance, lower job security and weaker Social Security protection) does not seem to have been associated with tougher wage penalties as well.

Computation of inequality measures under alternative assumptions on the evolution of the pay parameters provides another angle to look at the pattern of change in labour market inequality in Portugal.

Table 33 – Predicted earnings inequality (Gini Index), under alternative assumptions on the evolution of the firm-specific pay parameters

worker characteristics / pay parameters	X_{83}	X_{92}
$\widehat{\beta}_{83}$	.3521	.3575
$\widehat{\beta}_{92}$	.3810	.3839
One single parameter allowed to vary: $X_{k83} \cdot \widehat{\beta}_{k83} + X_{l83} \cdot \widehat{\beta}_{l92}$		
l=schooling	.3673	
l=tenure	.3445	
l=tenure<1	.3509	
l=experience	.3535	
l=gender	.3562	

Source: Computations based on PORTUGAL, MESS, DE [1983, 1992].

Changes in the characteristics of the labour force led to a slight rise in inequality (see the Gini index rising from .352 to .357 if the pay parameters of 1983 were applied on the workers of 1992). However, the major change is brought about by shifts in the pay parameters enforced by employers (with the Gini index rising from .352 to .381 once the pay parameters of 1992 are applied to the working population of 1983). Which pay parameters in particular have changed? Consider allowing one pay parameter at a time to vary, computing:

$$\widehat{Y}_{hip} = X_{k83} \cdot \widehat{\beta}_{k83} + X_{l83} \cdot \widehat{\beta}_{l92} \ ,$$

with *l=1* as the only parameter whose change between 1983 and 1992 is considered, and *k=1,...5* as all the other pay parameters (including the constant).

The previous results are confirmed by table 33. Changes in employers' wage policies regarding the tenure of the worker would, on their own, have led to a more equitable wage distribution (the Gini index going from .352 to .345 or .351 if only the returns to tenure or the penalty on newcomers would have changed, respectively). A slight rise in inequality was brought about by changing returns to labour market experience. A sharper rise in inequality resulted from changing wage policies at the firm level towards female workers, while the most pronounced rise in inequality was associated with the changes in employer standards to reward the schooling of their labour force.

6.5. CONCLUSION

Multilevel modelling techniques allow a concise treatment to the following issues: the role of contrasts among company wage policies in shaping overall labour market inequality; modelling the wage variation across employers; modelling firm-specific parameters of the pay policy. Moreover, these aims of the analysis are accomplished taking into due consideration the random nature of the set of firms on which inference is based, and imposing very weak constraints on the structure of the error terms, as opposed to traditional OLS techniques.

Results reveal that differences across employers' pay policies are significant, and they account for a remarkable share of the wage dispersion. Moreover, they concern *every* parameter of the pay policy. The returns to schooling, tenure, labour market experience, as well as the penalty imposed on women and newly-hired workers present significant variability across firms. Therefore, contrasts among company wage policies can only partially be captured by a procedure where firms are assumed to follow a market rule to reward observable human capital, imposing a uniform premium/penalty on all of their labour force.

Wage divergence across firms rises particularly sharply with the schooling of the workers, reflecting the existence of a certain consensus regarding the productive usefulness of low schooling levels, but widely diverging judgements on the productive advantages of higher levels of schooling. Also for more experienced workers, wage inequality across firms is more pronounced than for workers with low levels of experience. More qualified workers (according to these two dimensions of their human capital) therefore seem to have more to gain from being *choosy* when searching for a job, whereas at the bottom of the qualification ladder a strategy of *take whatever job you're offered* seems to be less detrimental. Firms on the other hand seem to converge on the type of tenure-based wage progression mechanisms they impose, though from remarkably different entry wages.

The productive usefulness of human capital acquired on the market place seems to deserve a more unanimous judgement on the part of employers than does the usefulness of the human capital acquired on the school benches. A comment often heard about the educational system in Portugal, regarding its too general nature and its inability to provide specific skills directly usable in the productive process, may help interpret this situation. While some employers may value the *ability to learn* that high educational levels may provide, others instead seem to consider the productive skills of workers with high schooling levels rather low.

There is a particular logic binding together the pay policies of different firms, as systematic components can be identified in the firm-specific wage parameters. Firms with a more schooled labour force, larger ones, those where gross labour productivity is higher and those in manufacturing reward better their workforce, through higher returns on schooling and experience. The different penalty imposed on newly-hired workers basically reflects economic sector bounds. The existence of contrasting wage practices across economic sectors could reflect the different use of labour market flexibility schemes legally allowed, but it could as well be brought about by the use of different technologies, which can differ in the relevance they attach to firm- or technology-specific training.

An unsatisfactory point should however be pointed out. Tenure wage progression and the penalty imposed on women remain mostly unexplained, as the model can only capture a very small share of the variance of these pay parameters across firms. The latter case could lend support to the idea that there are discrimination mechanisms at work, with the penalty imposed on women being based on factors other than economic forces. It should however be kept in mind that clearly dismissing/supporting any economic theory is an extremely hard task and the empirical model was instead used to provide only a few tentative links to economic theory.

Comparative static analysis of the results for 1983 and 1992 highlight that significant changes have occurred in the distribution of the firm-specific wage parameters (on schooling, tenure, and the penalty imposed on women and newly-hired workers), while only the distribution of the returns to labour market experience did not undergo significant shifts.

Moreover, changes in the different pay parameters of company wage policies had contrasting impacts on overall labour market inequality. While changes in the returns to tenure had an equalising impact on the distribution, the rise in the penalty on women workers, and in particular the sharp rise in the returns to schooling, have determined the rise in overall labour market inequality. The general profile depicted in chapter 5 is therefore reinforced once the analysis progresses to the micro level and achieves a multivariate nature. Changes in company wage policies reflected the modernisation taking place in the Portuguese economy, in the sense that traditional wage progression mechanisms, mainly based on seniority, are loosing their relevance in favour of a much steeper school-based wage progression mechanism. Employers therefore seem to be attaching more relevance to workers who hold general skills and more flexible aptitudes.

APPENDIX 6.A – WAGE REGRESSION WITH FIRM-SPECIFIC EFFECTS, 1983

fixed parameter	*estimate*	*s. error*
cons	4.793	.01318
school	.04952	.001283
tenure	.008575	.000525
tenure<1 (dummy)	-.08964	.008975
experience	.00583	.0003002
gender (dummy)	-.1633	.006981

level	*random parameter (var./cov.)*	*estimate*	*s. error*
2 - firm	cons/cons	.07614	.005211
2 - firm	school/cons	.001455	.0003454
2 - firm	school/school	.0004717	4.761e-5
2 - firm	tenure/cons	.000639	.0001439
2 - firm	tenure/tenure	6.214e-5	7.367e-6
2 - firm	tenure<1 / cons	-.00602	.002348
2 - firm	tenure <1 / tenure<1	.01433	.002056
2 - firm	experience/cons	.000383	8.345e-5
2 - firm	experience/school	5.966e-5	8.951e-6
2 - firm	experience/tenure	7.11e-6	2.787e-6
2 - firm	experience/experience	2.529e-5	2.649e-6
2 - firm	gender/cons	-.005985	.001858
2 - firm	gender/gender	.01167	.001342
1 - worker	cons/cons	.04841	.0004403

likelihood: -2*log(lh) is 19252.4

Source: Computations based on PORTUGAL, MESS, DE [1983].

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APPENDIX 6.B – MOBILITY MATRICES OF FIRM-SPECIFIC WAGE EFFECTS

schooling

decile 83 \ decile 92	1	2	3	4	5	Total
1	1.73	1.51	0.86	1.73	1.73	10.15
2	1.30	1.94	1.08	0.86	1.08	9.94
3	2.38	0.86	1.51	0.65	1.30	9.94
4	1.94	0.65	1.94	1.30	0.65	9.94
5	1.30	0.22	1.08	1.08	1.30	10.15
6	0.22	1.94	0.65	1.08	0.86	9.94
7	0.00	1.73	0.86	0.86	1.30	9.94
8	0.65	0.43	1.08	1.51	0.65	9.94
9	0.22	0.22	0.43	0.65	0.86	9.94
10	0.43	0.43	0.43	0.22	0.43	10.15
Total	10.15	9.94	9.94	9.94	10.15	100.00

decile 83 \ decile 92	6	7	8	9	10	Total
1	1.30	0.43	0.65	0.00	0.22	10.15
2	1.08	0.65	1.51	0.22	0.22	9.94
3	1.08	0.86	0.65	0.22	0.43	9.94
4	0.43	1.08	0.86	0.65	0.43	9.94
5	1.51	1.30	1.08	1.08	0.22	10.15
6	0.65	1.94	0.43	1.51	0.65	9.94
7	1.30	1.51	0.43	1.08	0.86	9.94
8	1.30	0.43	1.51	1.08	1.30	9.94
9	0.43	0.65	1.73	1.94	2.81	9.94
10	0.86	1.08	1.08	2.16	3.02	10.15
Total	9.94	9.94	9.94	9.94	10.15	100.00

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tenure

decile 83	decile 92 1	2	3	4	5	Total
1	4.32	2.38	0.86	0.65	0.43	10.15
2	0.86	1.94	2.81	1.08	1.73	9.94
3	1.73	1.30	1.08	1.30	0.86	9.94
4	0.22	0.22	1.73	1.30	1.73	9.94
5	0.86	0.65	1.08	1.08	1.30	10.15
6	0.65	0.86	1.08	1.30	1.08	9.94
7	0.43	0.86	0.86	1.51	1.08	9.94
8	0.22	0.43	0.22	1.08	0.65	9.94
9	0.22	1.08	0.00	0.22	0.86	9.94
10	0.65	0.22	0.22	0.43	0.43	10.15
Total	10.15	9.94	9.94	9.94	10.15	100.00

decile 83	decile 92 6	7	8	9	10	Total
1	0.00	0.43	0.43	0.00	0.65	10.15
2	1.08	0.43	0.00	0.00	0.00	9.94
3	1.30	0.65	0.43	0.65	0.65	9.94
4	1.08	0.86	0.86	1.08	0.86	9.94
5	1.08	1.51	0.65	0.86	1.08	10.15
6	1.08	1.30	0.65	0.86	1.08	9.94
7	1.08	0.86	1.08	1.51	0.65	9.94
8	0.86	1.30	1.51	2.81	0.86	9.94
9	1.51	1.73	2.38	0.86	1.08	9.94
10	0.86	0.86	1.94	1.30	3.24	10.15
Total	9.94	9.94	9.94	9.94	10.15	100.00

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decile 83	decile 92 1	2	3	4	5	Total
1	1.73	1.51	2.16	0.86	0.43	10.15
2	1.73	1.73	0.65	0.65	1.30	9.94
3	1.08	1.30	0.86	0.86	1.30	9.94
4	1.08	1.08	1.73	1.94	0.65	9.94
5	0.86	0.43	0.86	1.08	1.08	10.15
6	1.08	0.43	1.08	0.43	1.94	9.94
7	0.65	0.43	0.00	1.30	0.65	9.94
8	0.86	1.51	0.22	1.51	1.08	9.94
9	0.43	0.86	1.08	0.43	0.43	9.94
10	0.65	0.65	1.30	0.86	1.30	10.15
Total	10.15	9.94	9.94	9.94	10.15	100.00

decile 83	decile 92 6	7	8	9	10	Total
1	0.86	0.22	0.86	0.65	0.86	10.15
2	0.00	0.65	0.43	1.94	0.86	9.94
3	0.86	1.94	1.08	0.43	0.22	9.94
4	0.43	0.65	0.65	0.65	1.08	9.94
5	2.16	1.51	1.08	0.22	0.86	10.15
6	1.30	0.86	0.86	1.30	0.65	9.94
7	1.51	1.30	1.94	0.86	1.30	9.94
8	0.86	0.43	0.43	1.08	1.94	9.94
9	0.86	1.51	1.94	1.51	0.86	9.94
10	1.08	0.86	0.65	1.30	1.51	10.15
Total	9.94	9.94	9.94	9.94	10.15	100.00

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experience

decile 83	decile 92 1	2	3	4	5	Total
1	1.94	1.73	1.73	1.08	1.73	10.15
2	2.38	1.73	0.86	1.51	0.86	9.94
3	1.73	1.30	1.08	1.30	0.43	9.94
4	1.51	1.94	1.73	1.08	1.08	9.94
5	0.43	0.86	1.08	0.86	1.30	10.15
6	0.65	0.22	1.30	1.08	1.51	9.94
7	0.65	0.65	0.65	0.43	0.86	9.94
8	0.00	0.86	1.08	0.43	1.08	9.94
9	0.65	0.43	0.22	1.51	0.65	9.94
10	0.22	0.22	0.22	0.65	0.65	10.15
Total	10.15	9.94	9.94	9.94	10.15	100.00

decile 83	decile 92 6	7	8	9	10	Total
1	0.43	0.00	0.43	0.86	0.22	10.15
2	0.22	0.43	1.51	0.22	0.22	9.94
3	1.30	1.08	1.30	0.22	0.22	9.94
4	0.86	0.86	0.22	0.22	0.43	9.94
5	1.51	1.30	1.30	0.65	0.86	10.15
6	1.51	1.30	0.86	1.08	0.43	9.94
7	1.30	2.38	1.30	1.51	0.22	9.94
8	0.86	1.08	1.51	1.51	1.51	9.94
9	0.86	0.86	0.86	2.16	1.73	9.94
10	1.08	0.65	0.65	1.51	4.32	10.15
Total	9.94	9.94	9.94	9.94	10.15	100.00

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gender

decile 83	decile 92 1	2	3	4	5	Total
1	3.67	1.73	1.30	1.08	0.65	10.15
2	1.08	2.81	1.30	1.30	0.86	9.94
3	0.43	0.65	2.59	1.08	1.51	9.94
4	0.65	0.43	1.08	1.51	1.30	9.94
5	0.43	1.08	0.86	1.51	1.51	10.15
6	0.65	0.65	0.65	0.86	1.08	9.94
7	1.08	1.08	0.65	0.65	1.51	9.94
8	0.65	0.22	0.43	1.08	0.65	9.94
9	1.30	0.65	0.65	0.43	0.65	9.94
10	0.22	0.65	0.43	0.43	0.43	10.15
Total	10.15	9.94	9.94	9.94	10.15	100.00

decile 83	decile 92 6	7	8	9	10	Total
1	0.43	0.43	0.43	0.43	0.00	10.15
2	0.22	0.00	0.86	0.86	0.65	9.94
3	0.43	1.30	0.86	0.86	0.22	9.94
4	1.08	1.08	1.73	0.86	0.22	9.94
5	2.16	1.08	1.08	0.22	0.22	10.15
6	2.16	0.86	0.86	1.30	0.86	9.94
7	0.86	1.73	1.08	0.86	0.43	9.94
8	0.86	1.73	1.94	0.86	1.51	9.94
9	0.86	1.08	0.86	1.30	2.16	9.94
10	0.86	0.65	0.22	2.38	3.89	10.15
Total	9.94	9.94	9.94	9.94	10.15	100.00

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7. GENERAL CONCLUSION

High and rising inequality has characterised the evolution of labour returns in Portugal during the 1980's and early 1990's, in particular since mid-eighties, a period marked by high economic growth and an employment boom, reflected in low unemployment rates which provided a successful image of the country's economy. While both worker and firm attributes fail to adequately capture the rise in inequality, as it increased mainly within groups of workers and firms with similar attributes, results of the search for the determinants of rising labour market inequality corroborate the statement by Groshen, according to which "many of the most heavily researched wage patterns and inequalities in the labor market are probably manifestations of employer wage differentials." [GROSHEN, 1988: 30] A synthesis of the findings of the thesis clarifies this statement.

International comparisons of the pattern and trends in the wage distribution reveal that:

- A high degree of wage dispersion prevails in Portugal. Following a *European* pattern, as opposed to the American one, inequality in the Portuguese labour market is mainly brought about by a very stretched upper half of the wage distribution, while its bottom half is relatively compressed, under the impact of equalising institutional forces (in particular, the minimum wage legislation, and the widespread collective bargaining system, which lays down minimum wage levels for detailed groups of workers).
- A pronounced rise in labour market inequality took place during the 1980s and early 90s, as the distribution reinforced one of its major characteristics of early eighties – its upper half became even more stretched, with the highest wages increasing sharply.

Investigation into the causes for rising wage inequality progressed along two major lines:

- Exploratory analysis concentrated on shifts in the employment structure, using a simple supply-demand framework. Two types of explanation for the rise in wage

inequality, often found in the literature, should be dismissed for the Portuguese case:

- The demographic shifts that have occurred in the economy fail to account for the detected rise in wage inequality. As a matter of fact, groups of workers whose supply increased the most were precisely those whose relative wages increased the most. Thus, supply-driven explanations for the rise in inequality would lead to predictions that are in contradiction with the changes that have actually taken place.
- Demand shifts operating across industries — be them brought about by an increased openness of the economy or by changes in the pattern of international trade — are as well dismissed as a major source for the rise in labour market inequality. Indeed, no major changes have taken place in the industrial composition of the workforce, and the slight changes that have occurred favoured traditional activities and were thus not biased towards activities relying on a more qualified labour force.
- Economic mutations occurring within industries are therefore left as the major force determining a switch in the demand for labour, in favour of more qualified workers, whose relative wages increased sharply.

- A more detailed analysis of the causes of rising inequality was undertaken, evaluating in a systematic way a range of possible causes — besides shifts in the employment structure, relative changes in the wage of the different groups of workers, and changes in inequality within those groups. One clue from each of these three topics deserves to be stressed. Shifts in the employment structure point to an upgrading in the *quality* of the labour force, as its schooling and skill levels improved. Changes in relative wages indicate that schooling and skill were precisely the worker *assets* whose valuation in the labour market increased the most. Finally, inequality increased most sharply exactly within groups of workers whose employment shares increased the most, and whose wages increased the most. Together, these clues suggest the profile of an economy undergoing modernisation, demanding a more qualified labour force, where wage adjustments and in particular rising wage inequality has signalled the lack of an adequate labour force to promote economic change.

However, achieving a more egalitarian pay structure has insistently been stated as one of the aims of union action in Portugal. Despite the widespread relevance of collective bargaining, which goes much beyond the unionisation rate in the economy,

employers seem to have been able to overcome this trade union goal. Wage drift may have been a relevant tool generating this outcome. In fact, in an era of rising labour market inequality, wage drift has been increasingly used, being a very selective mechanism, applied mainly to groups of workers who have high wages and high inequality. Union action, which seems to have been able to sustain the wages of low-wage workers, was however unable to offset rising wage inequality at the top of the distribution, as employers granted particular groups of workers wages above the (minimum) level bargained with trade unions.

Closer inspection of wage policies at the employer level revealed that:

- Wage inequalities across employers are sharp, accounting for over half the total wage dispersion.
- They are statistically significant.
- Furthermore, contrasts among company wage policies concern *every* parameter of the pay policy – returns to schooling, tenure, experience, as well as the penalty imposed on women and newly-hired workers – and thus they are likely not to be adequately captured by an univariate measure of the employer wage policy.
- The challenge that such results present to the competitive labour market theory is reinforced by the persistence of wage differentials across firms over time.
- However, the enduring relevance of employers in shaping overall labour market inequality does not preclude the existence of a high degree of wage mobility. As Slichter had long ago predicted, "the inter-industry wage structure is stable over time, but this conclusion might change if firms were the unit of observation." [SLICHTER, 1950: 83] As a matter of fact, in a period of economic mutation that has hit in particular the labour market, shifts in employer wage policies brought about considerable changes to their relative positions in the wage ranking. As such, employers do not seem to have chosen a particular position in the wage distribution, to which they would stick over time. Nor have they kept a fixed standard to reward the human capital of their labour force.
- However, shifts in company wage polices were rather selective, reflecting the modernisation taking place in the Portuguese economy. Indeed, traditional wage progression schemes, which valued specific skills acquired in the market place, lost part of their relevance, in particular as employers shifted towards more egalitarian tenure-based wage progression schemes, while general skills and more flexible aptitudes provided by the educational system were increasingly valued.

The space for improvement on these findings should be highlighted. In particular two drawbacks of this study lead the way to future research proposals. First of all, the links to economic theory are sparse. No comprehensive test aimed at dismissing/supporting particular economic theories was attempted, but instead just a few tentative links with economic theory were established. Clearly testing economic theories would be a most difficult task, as expressively stated by Raff and Summers when referring to efficiency wage theories: "If the information needed to test these theories were available, there might be no need to pay efficiency wages." [RAFF and SUMMERS, 1987: S59] The words by Angus Deaton are also reassuring: "Economics has recently been revolutionised by the widespread availability of amounts of data that were previously unimaginable. Research is more empirical and needs less theory." [DEATON, 1996: 13]

Secondly, the analysis should progress to take full advantage of the panel nature of the dataset. In particular, pooling the information on every firm to estimate firm-specific time-varying parameters would provide a more adequate framework to deal with changes in employer wage policies over time. Such improvement should be made in the framework of multilevel modelling, through the introduction of crossed effects (each firm is observed in several years). However, the complexity of the model and specially the hardware requirements would increase beyond feasible at this stage, once the simple hierarchical nature of the data were abandoned to introduce the temporal dimension into the model. This drawback of the present study does not enable a test on the significance of the detected changes over time in the pay parameters of each firm. Alternative angles to look at changes in company wage policies were implemented to try to overcome this drawback, and the agreement among their results was found encouraging.

Still more ambitiously, the analysis could be based on a panel of both firms and workers, which would enable exploration of the firm and worker unobservable heterogeneity (in particular, separating both effects). Building a panel of workers from this dataset is however a time-consuming task with doubtful results, as reported by the failure of researchers who tried to concentrate on that issue.

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