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French Database**

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JEL Codes: D31, D63, I30, J28, J31

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Wage Comparisons in and out of the Firm. Evidence from a Matched Employer-Employee French Database.

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This paper looks at the association between wage satisfaction and different notions of reference wage, based on a matched employer-employee dataset. It shows that workers' satisfaction depends on other-people's income in different ways. Relative income concerns are important, but we also find robust evidence of signal effects. For instance, workers are happier the higher the median wage in their firm, holding their own wage constant. This is true of all employees, whatever their relative position in the firm. This signal effect is stronger for young people and for women. These findings are based on objective measures of earnings as well as subjective declarations about wage satisfaction, awareness of other people's wage and reported income comparisons.

Key-words: Income comparisons, income distribution, job satisfaction, wage satisfaction, signal effect, matched employer-employee survey data.

JEL codes: D31, D63, I30, J28, J31

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1. Introduction

Since the early work by Cappelli and Sherer (1988), the extent to which workers make income comparisons has been shown to influence their pay satisfaction. Relative income concerns have also been shown to influence workers' choices, such as their supply of work-hours (working longer hours to "keep up with the Jones") or their choice of consumption versus savings (under-saving to "keep up with the Jones"). If workers' motivation and engagement depend on their relative wage, taking care of distributional concerns should be an integral part of human resources management inside firms. Relative income concerns are also bound to change the view social scientists take on the sources of individual well-being, in particular well-being at work.

Essentially, three types of channels have been shown to relate firms' wage grids to workers' satisfaction: (i) General aversion to inequality, i.e. workers prefer narrow wage grids and they both dislike to earn more and to earn less than their reference group; (ii) Aversion to relative deprivation (Stouffer, 1949; Runciman, 1966), also called status effect: workers dislike earning less than their reference group and may enjoy earning more; (iii) Signal effects (Hirschman and Rothschild, 1973): workers use other people's wage as a signal of their own future prospects, hence they like to work in organizations where other people's wages are high.

Thanks to the increasing availability of large datasets that include subjective satisfaction judgments, a voluminous literature has endeavored to show empirical evidence of these effects. Using self-declared satisfaction as the outcome, the idea is to estimate a satisfaction equation depending on a Reference income. But what is the relevant notion of Reference income? To find out, researchers have typically constructed different measures of what they thought could be the typical income one's reference group, and tested for their relevance. For example, for each respondent in a survey, they calculate the average pay of professional *alter egos*, injected this notion of Reference income in the estimate of job satisfaction, life satisfaction or pay satisfaction, controlling for individual circumstances, and looked at the coefficient associated with Reference income to check whether it was statistically significant and what its sign was.

However, the information on the actual social environment of individuals is most often unavailable. Clark et al. (2009) is one of the rare exceptions, as they were able to merge the Danish sample of the European Community Household Panel (ECHP) with administrative records. The British Workplace Employee Relations Survey is also a matched employer-employee dataset, but it is not exhaustive (see Brown et al.

2008). A recent randomized experiment was set up by Card et al. (2010), showing evidence of relative concerns among employees of the public universities of California when they had access to internet information about the wage of their actual colleagues. This paper is thus one of the first attempts to match a survey of employees that includes a great number of subjective attitudes with an exhaustive administrative database about employees of all private firms and organizations.

We match a French survey of wage earners (SALSA, 2009) with a file of the social insurance organization (DADS) that contains the work hours and wages for all employees of the private sector as well as local administration and hospital civil servants, as declared by their employer. For each surveyed individual, SALSA elicited a series of opinions and satisfaction statements, notably wage satisfaction as well as the direction and intensity of income comparisons. Using the DADS 2008 file, for each individual, we construct a number of objective measures that are candidates to act as Reference income benchmarks, within each respondents' firm and in general. We then explore the association between wage satisfaction and these notions of Reference income. We are interested in two main questions: (i) How do employees appreciate the distribution of wages inside their firm or establishment, e.g. how does their wage satisfaction vary with the lowest, highest and medium wage in their firm? (ii) What is the most relevant notion of Reference income? Within firms, both signal and status effects are at work. Employees' wage satisfaction increases with the medium level of wage in their establishment, and with the pay level of the top quartile, but decrease when the wage of the top 1% best paid employees rises. Signal effects are stronger for younger people below 35 and weaker for elder workers over 50. Finally, employees' wage satisfaction rises with their rank in the wage distribution of their firm. Concerning wage comparisons, the most relevant Reference group is made of one's co-workers in the same broad category of occupation, in the same age group, in the same region and establishment. Both relative income concerns and signal effects are compounded by employees' knowledge about other people's pay and the importance that they declare they attach to comparisons.

The next section briefly reviews the literature on income-based social interactions. Section 3 presents the data, Section 4 the identification strategy, Section 5 the results, and Section 6 concludes.

2. Literature

A large part of the "happiness" literature has tried to elicit relative income concerns by estimating subjective well-being regressions in which the explained variable is self-declared satisfaction, and where both each individual's own income and her comparison income level appear. This literature has appealed to different datasets (in terms of countries and years), different measures of wellbeing (job and life satisfaction being the most predominant) and various measures of comparison income. In terms of Reference groups, researchers have mainly investigated the relevance of professional peers and local fellows with whom individuals interact on a regular basis, i.e. co-citizens and neighbors.

In their seminal paper on professional Reference income, Clark and Oswald (1996) used the British Household Panel Survey, calculated the income of ‘people like me’ from a wage equation, and showed that this is negatively correlated with individual job satisfaction, controlling for own income (which attracts a positive coefficient). Following this route, others have uncovered similar status effects in Great-Britain (Sloane and Williams 2000) and in other countries, such as Sweden (Bygren 2004), Canada (Lévy-Garboua and Montmarquette 2004), Germany (Ferrer-i-Carbonell 2005), Europe (Senik 2008) and China (Gao and Smyth 2010; Clark and Senik 2012); see Warr (2007), for a survey.

Other work has explored the local dimension of Reference income, in the United States (McBride 2001, Blanchflower and Oswald 2004, Luttmer 2005), Canada (Helliwell and Huang, 200), Germany (Ferrer-i-Carbonell, 2005), Europe (Caporale, et al. 2009; Mishra et al. 2010), Latin America (Graham and Felton 2006), Nepal (Fafchamps and Shilpi 2008), India (Fontaine-Carrion and Yamada 2012), China (Knight and Gunatilaka 2010a and 2010b), South-Africa (Kingdon and Knight 2007); Ethiopia (Akay and Martinson, 2011); Malawi (Ravallion and Lokshin 2010). All find evidence of relative income concerns, i.e. a negative association between satisfaction and local reference income.

Some authors have included subjective comparison questions in surveys. It generally appears that subjectively elicited comparisons work in the sense of relative income concerns rather than signal effect. Such surveys have been run in the Netherlands (Melenberg 1992), the USA (McBride 2001), Germany (Mayraz et al. 2010), Transition countries (Senik 2009), Europe (Clark and Senik 2010) and China (Knight and Gunatilaka 2011; Knight and Song 2006).

One of the findings of this literature is the difference between within-firm and outside-firm benchmarks. In the above-mentioned paper, Cappelli and Sherer (1988) studied job satisfaction in a major American airline company, and found that the equivalent outside market wage, calculated for each of the 19 different jobs and seniority levels at the carrier, has a negative effect on pay satisfaction, controlling for individual wage and other job characteristics. In the same vein, Bygren (2004) combined several Swedish data sources to construct several notions of Reference income, and found that workers’ satisfaction depends negatively on the typical income of others in the same occupation and others in the labor market at large, rather than other co-workers in the same firm. In his seminal work, Runciman (1966) had already underlined the importance to distinguish relative deprivation within one’s group, versus on behalf of one’s group.

In spite of the evidence about “others as negatives” (Luttmer, 2005), some researchers have considered the possibility that other people’s income may exert a positive influence on individual well-being if they play the role of a signal, as underlined by Hirschman and Rothschild (1973). Senik (2004 and 2008) has provided evidence of Hirschman-type information effects in high mobility/uncertainty countries such as Russia, the new Europe (Hungary, Poland, the Baltic states) and the United States. She showed that in these countries, individual life satisfaction is positively related to the income of others with the same

professional characteristics. This contrasts with a negative impact of reference income defined in the same way in 15 countries of the “Old Europe”. Using linked employer-employee Danish panel data, Clark et al. (2009) provided evidence of signal effects outweighing status effects within firms: Job satisfaction rises with co-workers’ wages. Clark and Senik (2010) also find evidence of signal effects in Europe. Studies that uncovered signal effects also found that the latter are particularly strong for young people. Obviously, the professional future of the young is both more uncertain and longer, and young people in their early career may have more reasons to expect a promotion than senior employees: for these reasons, the signal is likely to be of higher value to their eyes. Accordingly, other papers have underlined the life cycle variation in the intensity of status and signal effects (FitzRoy et al. 2011, Akay and Martinsson 2012).

Beyond the impact of relative income, a few studies have shown evidence that self-reported wellbeing depends upon the objective ordinal rank of an individual’s wage within a comparison group, such as her firm. Brown et al. (2008), for instance, showed that the normalized rank of an employee in the firm’s wage distribution was a powerful predictor of her satisfaction. Fafchamps and Shilpi (2008) also showed that the objective rank of an individual in the ward where she lives (in Nepal) has a statistically significant positive impact on her satisfaction concerning the adequacy of her consumption level. The difference between rank concerns and relative income concerns is that the former is a comparison with the entire distribution of wages in one’s establishment. It is likely that the rank occupied by an individual is associated with a symbolic value, and possibly power and prestige.

In this paper, we test for the relevance and importance of all these different effects, i.e. status, signal, rank effects, and life-cycle effects. We use both constructed measures of reference income based on objective information and subjective attitudes elicited in our survey.

3. Data

We use two French datasets that we match. The first one comes from a survey that was ran in 2009 among 3000 French employees, with a special interest in the way they perceive their wage (SALSA, *Les salaires vus par les salariés*). The survey was funded by the *Corpus* program of the French National Research Agency (ANR). It was ran by the French statistical office (INSEE). Interviews were made by telephone if possible and in face to face otherwise.

In order to constitute the Salsa sample, INSEE randomly extracted a first sample of 10 000 employees out of the 2006 DADS-Panel, *Déclarations Annuelles de Données Sociales*. The DADS is an administrative file devoted to the calculation of social contributions. It contains the wages of every wage-earner working in the private sector, in public hospitals and local administrations. One twelfth of the dataset (i.e. people born in October) is panelized. Social contributions paid by national civil servants are collected through a different system, and therefore the latter are not in the database. In order to overcome the under-

representation of the public sector, the designers of the survey decided to oversample employees of public hospitals and local administrations. Therefore 20% of the initial sample was selected in these two groups. Similarly 10% of the sample was selected in the top decile of the private sector's wage distribution. In order to limit the cost of the survey, the sample was drawn amongst employees living in the following regions: Alsace, Auvergne, Centre, Languedoc-Roussillon, Lorraine, Midi-Pyrénées, Basse-Normandie, Pays de Loire, Picardie and Rhône-Alpes as well as in the Essonne department (which is part of Ile-de-France (Paris) Region). The final sample is constituted of 3117 interviews. [Table A1](#) compares the hourly wage rate in the sub-sample of the DADS drawn for the SALSA survey (12.47€, first row of [Table A1](#)), in the entire 2008 DADS sample (12.33€ in general (second row of [Table A1](#)), and in regions where the SALSA sample was drawn from (11.82€, third row of [Table A1](#)). It must be underlined that in the SALSA survey, the wage is declared by employees (*“what is your monthly net wage, including complements and bonuses”*), whereas in the DADS, the wage is declared by the employer. The former (10.74€) is lower than the latter (12.47€) for a similar sample of employees. This discrepancy owes to two reasons. First employees may slightly underestimate their wages, especially yearly premiums. Second, and more importantly, employees and employers may use different notions of working hours: employees are likely to declare the effective number of hours during an ordinary week (including non-paid extra hours), while employers provide the official number of contractual hours during the year that have been paid for.

We matched each individual of SALSA with his own records in the DADS as of 2008 (2009 is not available yet) as well as with the records of all his co-workers, i.e. employees working in the same establishment or firm, in the DADS in 2008, i.e. 33,149,444 jobs (we count jobs rather than individuals, as one individual can occupy several jobs, hence appear several times in the DADS in a given year). We use this large dataset to calculate the relevant income distribution and Reference wage indicators for each employee of SALSA. Our regression sample (non missing observations) includes 2842 individuals surveyed by SALSA, aged 19 to 65 and equally balanced in terms of gender.

Another caveat is that the SALSA survey has only been run in a subset of French regions and is thus potentially not perfectly representative of the French labor market. In particular, SALSA does not include the metropole surrounding Paris, the region Ile-de France, except the Essonne, that include most of the public administration and higher services sector, i.e. educated people, working in managerial positions and earning higher wages. However, it turns out that the structure of the labor force is about the same in Salsa as in the DADS in general. This is because the SALSA sample was oversampled with civil servants working in the local administration and public hospitals (17% as opposed to 10.6% in the DADS); which also explains the higher proportion of intermediate occupations in SALSA.

	White collar managers	Intermediate occupations	Employees	Blue collar workers
SALSA (n = 2842)	12.3%	25.6%	33.8%	28.2%
Panel DADS 2008 (n = 2 101 101)	13.7%	22.3%	33.0%	31.0%

The SALSA survey includes subjective questions that ask employees whether they are aware about the wage of their colleagues, managers and top-management (CEOs), whether they actually compare their own wage to that of co-workers, friends or family members, whether they consider quitting their current job, etc. We use the questions that are listed in [Table A3](#) and [A4](#). [Table 3](#) shows that about half of the respondents are satisfied with their wage; only 37% are rather unsatisfied and 9.5% are very unsatisfied. However, 19% estimate that their wage is insufficient to make ends meet; 58% that their wage is low given their productivity; 61% that it is low given their experience; 33% that it is low given their education.

Only 3.2% of employees say they do not like their job. 16.5% consider quitting their job, and half of the latter would do so for a higher wage. Only 45% of employees have already asked for a wage rise. 22% have participated in a collective action on the job place.

Turning to wage comparisons, 66% of respondents declare that they know the wage of some of their colleagues; 30% know the wage of their direct manager; 19% know the wage of their boss (CEO); 41% are aware of the wage of people working in the same profession in other firms; 50% declare that they do compare their wage to that of their colleagues in the same establishment; 48% that they compare their wage to family members; 21% to former schoolmates; 44% to friends, and 41% to the minimum wage level (SMIC).

4. Identification

Matching SALSA with the DADS creates the opportunity to study wage-based social interactions, using information about workers' actual social environment. This allows identifying groups of workers which constitute more “natural” and realistic Reference groups for each worker, i.e. the average (or typical) wage by establishment, by firm, by occupation, by region, etc. The information contained in subjective questions also allows confirming the relevance of these constructed measures of Reference wage, as we are able to know whether respondents are actually aware about the wage of their colleagues and whether they actually compare to such benchmarks.

The objective of this paper is to identify the type of social interactions that influence wage satisfaction. Essentially, modeling these interactions implies introducing the income of some relevant group of people (y_{it}^*) in the individual utility function: $U_{it} = U(y_{it}, y_{it}^*, C \dots)$. Assuming convexity and separability:

- $$U_{it} = a_0 \ln(y_{it}) + \mathbf{a}_1 \ln(y_{it}^*) + \nu C + \dots \quad (1)$$

Or, equivalently,

- $$U_{it} = b_0 \ln(y_{it}) + \mathbf{b}_1 \ln(y_{it}/y_{it}^*) + \dots = b_0 \ln(y_{it}) + \mathbf{b}_1 (\ln y_{it} - \ln y_{it}^*) + \nu C + \dots \quad (2)$$

In the absence of any social interactions, we expect the estimated parameter \mathbf{a}_1 (or \mathbf{b}_1) to be equal to zero, i.e. once the employee's own wage is taken into account, the gap between his pay and some other people's pay does not matter. However, relative concerns imply that the well-being of individual i at time t rises both with his own income, y_{it} (conformingly with the indirect utility function) and with the distance to a comparison benchmark: hence $\mathbf{a}_1 < 0$ (or $\mathbf{b}_1 > 0$).

More subtle approaches of relative income concerns lead to slightly different predictions. Firstly, comparisons may not be symmetric, in the sense that, as assumed by Duesenberry (1949), upward comparisons matter more than downward ones. To test for this hypothesis, one must reformulate the wage satisfaction equation in the following way:

- $$U_{it} = U(y_{it}, y_{it}^* \dots)$$

$$= c_0 \ln(y_{it}) + \mathbf{c}_1 \cdot [\ln(y_{it}) - \ln(y_{it}^*)] \cdot (y_{it} \leq y_{it}^*) + \mathbf{c}_2 \cdot [\ln(y_{it}) - \ln(y_{it}^*)] \cdot (y_{it} > y_{it}^*) + \dots \quad (3)$$
- Duesenberry's conjecture predicts that: $\mathbf{c}_1 > \mathbf{c}_2 \geq 0$

It can also be the case that individuals have a general aversion for wage gaps and dislike earning more than their reference group as much as earning less. This can be because they are subject to feelings of guilt (in the first case) as well as relative deprivation (in the second case) or because they have a pure preference for equal outcomes. Other motivations, such as fairness and reciprocity can lead to the same result (in favorable cases). In this case, the prediction is that estimates of equation (3) should lead to: $\mathbf{c}_1 > 0$ and $\mathbf{c}_2 < 0$.

Finally, it is also possible that in certain situations, the income of some relevant others is interpreted as a signal of one's own future prospects. In that case, we expect that the estimated coefficient $\mathbf{a}_1 > 0$ (or $\mathbf{b}_1 < 0$ in equation 2), and in estimates of equation (3), both \mathbf{b}_1 and \mathbf{b}_2 should be negative; it is also likely that signal effect are more powerful for those whose wage is below their reference wage, hence that $\mathbf{c}_1 < \mathbf{c}_2 < 0$.

We consider different possible notions of Reference wage. First, we use **within-establishment indicators**, such as the median level of wage, the lower wage decile, the top quartile and the top centile within establishment (following the specification of equation 1).

Second, we estimate several notions of Reference wage on the larger sample of the **entire population of employees** (DADS), running a sort of horse race between these different notions. More precisely, we run a first-stage estimate of the hourly wage rate of all employees in the DADS. The objective is to compute the typical income of co-workers or co-citizens sharing the same relevant productive characteristics as a given worker in SALSA. We then predict the typical Reference wage of each employee of SALSA; and, in a second-stage regression, we inject this notion of Reference wage in the estimate of the wage satisfaction equation (that is run amongst SALSA employees).

In order to elicit the best notion of Reference wage, we vary the controls that are included in the first-stage regression. We start with a minimal set of characteristics that we progressively expand. The arguments of the wage equation are part the following equation (4), were the α_i are successively turned on and off in the different versions of the estimates.

$$w_i = \alpha_0 + \alpha_1.\text{occupation} + \alpha_2.\text{age} + \alpha_3.\text{age}^2 + \alpha_4.\text{occupation}*\text{age} + \alpha_5.\text{occupation}*\text{age}^2 + \alpha_6.\text{region (French } \textit{département})} + \alpha_7.\text{gender} + \alpha_8.\text{age}*\text{gender} + \alpha_9.\text{age}^2*\text{gender} + \alpha_{10}.\text{collective bargaining} + \alpha_{11}.\text{industry} + \alpha_{12}.\text{establishment dummy} + \alpha_{13}.\text{occupation}*\text{establishment} + \alpha_{14}.\text{firm dummy} + \alpha_{15}.\text{age}*\text{firm} + \varepsilon_i \quad (4)$$

The interaction terms are meant to take into account the fact that occupation and gender do not have a monotonic impact along the different stages of the life cycle. Of course, we do not introduce all the elements of equation (4) in the same time: we start with a basic specification with only occupation dummies, and we introduce additional controls progressively, in order to run a sort of horse race between the different notions of reference wage that correspond to each specification. We select the first-stage regression that leads to the greater magnitude and statistical significance of the coefficient on Reference wage in the second-stage regression.

Our preferred specification of the first-stage regression is displayed in [Table A6](#) in the Appendix. It only includes professional characteristics, which are thought to influence satisfaction only via Reference wage, i.e. age, occupation, and the interactions between these categories. [Table 7](#) shows the results of the horse race between different notions of Reference wage.

Based on the first-stage regression, we predict the Reference wage of each employee (depending on his characteristics) and inject this measure in the estimate of the wage satisfaction equation (following specifications 1, 2 or 3). In principle, because Reference wage is estimated in the first stage, it must be treated as stochastic in the second stage estimate. However, this is not necessary in our case: we estimate Reference wage on an exhaustive sample that includes all the French employees in 2008, so that the measure can be seen as certain rather than stochastic.

Because Reference wage is the prediction from a first-stage estimate, we must make sure that it is not perfectly collinear with the other controls in the regression of wage satisfaction, as represented by vector C in equations (1) and (2): All the (second-stage) estimates that we run include age, age square, gender, nationality (native or not), education, tenure, tenure square, private sector *versus* hospital and local administration. Concerning wages, in order to minimize the measurement errors that are often suspected to affect wage declarations in surveys, we include two measures of hourly wage in all our estimates: the (ln) hourly wage declared by employees in SALSA and the (ln) hourly wage declared their employer in the DADS. Hence, our exclusion restrictions here concern education, gender, nationality, tenure in the firm and firm's size, which are not included in the first-stage regression, and are thought to condition wage satisfaction without influencing the determination of the wage.

In order to confirm the relevance of these constructed notions of Reference wage, we also use the subjective declarations of respondents in the survey. We interact the constructed categories of reference wage with the intensity of knowledge of other people's income or the importance of comparisons as declared by respondents. Hence, using each of the subjective questions presented in section 2, we estimate equation (1) or (2), in which we include an interaction term between the notion of Reference wage and the subjective attitude X:

- $U_{it} = a_0 \cdot \ln(y_i) + \mathbf{a}_1 \ln(y_i^*) + \beta \cdot X_i + \gamma \cdot \ln(y_i^*) \cdot X_i + \dots$ (1')

- $U_{it} = a_0 \cdot \ln(y_{it}) + \mathbf{b}_1 \cdot [\ln(y_{it}) - \ln(y_{it}^*)] + \beta X_i + \gamma [\ln(y_{it}) - \ln(y_{it}^*)] \cdot X_i + \dots$ (2')

We expect that the correlation between reference wage and wage satisfaction be reinforced when respondents are aware and self-declaredly interested in the wage of other people, i.e. that the coefficient on the interaction term γ be statistically significant.

Finally, we look at the heterogeneity of the relation between reference wage and wage satisfaction. In particular, as suggested by Senik (2004) and Akay and Martinsson (2012), it is likely that wage interactions are more of a signal type for young people, and more of a status type for elder workers. Indeed, young workers have more uncertainty about their future wages, and can more legitimately nourish positive expectations of progression than older workers who are further down in their career and have less to learn about their future prospects. In order to test for this effect, we introduce interaction terms involving demographic categories and measures of income distribution (median wage and reference wage), following the specification of equations (1') and (2').

Beyond the effect of reference wage, it could also be that workers' utility depends on the general distribution of wage instead of the wage of some specific persons. A test of this hypothesis consists in including a measure of income distribution, such as the Gini index of income inequality, the standard deviation or the inter-quartile range of wage distribution inside the considered group (firm, industry, region, etc.). Accordingly, we include aggregate measures of this type in the estimate of wage satisfaction.

We use OLS estimates of wage satisfaction and other subjective attitudes, the result of which are readily interpretable in terms of elasticity. We refer, classically, to Ferrer-i-Carbonell and Frijters (2004) for a justification of this linear approximation. For robustness, we ran equivalent estimates using an ordered probit model; which are available to interested readers. The magnitude and sign of the coefficients are similar in both specifications.

5. Results

Within-Establishment Signal Effects

We start with within-firm indicators of wage distribution. We estimate equation (1) in order to look at the impact of the level of median, high and low deciles of intra-firm wage distribution on workers' wage satisfaction, controlling for their own wage.

My co-workers are rich

Table 1 shows that for a given level of own wage, workers are all the more satisfied as the median level of wage in their firm or their establishment rises! They are also more satisfied when the income level of the top quartile (Q3) in their establishment increases (the coefficient on the wage level of the higher quartile q_3 is 0.085* with a standard error of (0.049). Hence, with the considered measures of y_i^* , parameter a_1 of equation (1) is estimated to be positive, suggesting that the signal effect is predominant: workers interpret the high wages earned by the median or the top tier workers as a good sign for their own prospects.

This could also reflect the fact that in firms where wages are higher, employees enjoy a greater sense of job stability. Indeed, firms who distribute higher wages may also be also those whose profits and outlook are good, hence where the risk of losing one's job is low. To disentangle the two phenomena, we introduce a measure of the dynamic evolution of the firm over the last three years, i.e. the evolution of the number of employees, of the hourly wage rate, and of the total wage bill, by establishment, using the panel dimension of the DADS. As shown by Table 2, it turns out that these measures are not statistically significantly correlated with wage satisfaction and do not affect the association between the median pay and satisfaction.

Does the positive correlation of the median wage and satisfaction hold independently of the position of workers in the firm's wage-grid? Table 3 addresses this question. The coefficient on the establishment's medium wage remains positive and statistically significant, controlling for the position of the respondent in the wage distribution of his firm (rows 2-4), and none of the interaction terms between the two variables is statistically significant (rows 5-7). We checked that the coefficient on the median level of wage inside one's firm is robust to whether the respondent's wage is above or below the median: the coefficient on the median wage was 0.248 *** (0.068) for those who stand below the median wage and 0.303 *** (0.075) for those who were above.

The top 1% earns too much

Table 4 offers a more complete picture of the effect of within-firm wage distribution on satisfaction. It displays "reversal thresholds". Each cell represents a separate estimate of wage satisfaction that includes the usual controls. The first cell presents the coefficient on the lowest wage in the firm; it is not

statistically significant. The second cell represents the coefficient on the lowest 10% wages in the firm, etc. It is only starting with the medium decile (P50) and until the level of the highest quartile (P75) that signal effects are playing. Then, the association between the level of the top wages and employees' satisfaction becomes negative starting with the level of the top 5% (P95) and become statistically significantly so with the top 1% (P99), or the maximum level of wages (Max). Hence, both signal and status concerns are at play inside the firm. As illustrated by [Table 5](#), controlling for the median wage, workers' satisfaction increases with their rank in the wage distribution inside their firm. This effect only becomes statistically significant when the median level of wage within establishment is controlled for. This is certainly because of the interplay between absolute and relative concerns: Belonging in the top best-paid employees of a low-wage firm may be a source of positive utility from the point of view of status, but from the point of view of purchasing power, may not be preferable to earning the average wage in a high-wage firm. The specification of column 2 allows disentangling absolute income concerns (captured by the medium wage) from relative wage concerns (rank). It reveals that the higher the wage level of the top percentile in their firm, the less satisfied are employees. We also included indices of within-firm wage inequality in the estimate of wage satisfaction. Controlling for the usual covariates, the coefficient on the Gini index of wage inequality within establishment was -0.300^* (0.148); the coefficient on the normalized standard deviation of hourly wage was -0.0390^{**} (0.019); the coefficient on the ratio of extreme deciles P90/P10 was -0.001 (0.004) and the coefficient on the interquartile range Q3/Q1: -0.014 (0.030). All these measures of inequality were introduced successively and separately. Hence, employees seem to be less satisfied with their wage when they work in more unequal firms.

Firms versus towns

Of course, we expect the strength of the signal effect to be all the stronger as the wage category vehicles an important information content for the employee, i.e. that it refers to a group in which the considered employee could potentially belong. To verify this, we run a "placebo regression" of wage satisfaction over the medium income in employees' town (*communes* in general, and *arrondissements* for Paris, Lyon, and Marseille). The usual expectation is that professional categories of Reference Income are more likely to play the role of a signal than non-professional. Unless there is residential segregation, whereby people exerting the same occupation live in the same area, there is no reason why the typical income of a person's neighbors should carry any information about that person's income prospects. On the other hand, it is likely that daily interactions create opportunities for income comparisons between neighbors. As discussed in Section 2, it is usually found that people's satisfaction declines with the average income of their neighbors, because of relative income concerns. However, there are also certainly positive aspects in living in a wealthy neighborhood, such as of local public goods (parks, schools, security, etc.).

As shown by [Table 6](#), all these expectations are correct: the coefficient on firm's medium wage is statistically significant and positive whereas the coefficient on town's medium wage is negative and not significant. But the last column of [Table 6](#) shows the negative association between satisfaction and the

local average income and the positive association between satisfaction and the level of income of the 1% richest inhabitants in the area. Obviously, people enjoy living in an area where there are some very rich people, but suffer from the comparison with their neighbors.

Wider orbits of comparisons: a horse-race

We now turn to wider-orbits of comparison benchmarks. We use the exhaustive DADS dataset in order to estimate, for each employee surveyed in SALSA, the typical income of people sharing some of his characteristics in the entire population of employees in the private sector, hospitals and the public administration. As explained in Section 3, we search for the best specification of this wage equation. Table 7 reports the results of this horse-race. The first column of Table 7 displays the coefficient a_1 on the natural logarithm of Reference wage y_{it}^* , as in equation (1), i.e. the predicted income for individual i , based on the first-stage regression that includes the controls indicated in column 1. For instance, it shows that when Reference wage y_{it}^* is estimated on the sole basis of occupation dummies (first row, first column), the estimated coefficient a_1 is statistically significant. The second column shows the same coefficient a_1 when the second-stage estimate of wage satisfaction includes, as an additional control, the median level of wage per establishment. The third column displays the coefficient on the same \ln Reference wage, when the second-stage estimate of wage satisfaction includes the medium level of wage in the establishment as well as the level of wage of the 1% best-paid employees. Note that using the specification of equation (2) leads to the exact same results but with the opposite sign.

It is not true that people compare to same-gender colleagues

Each row of Table 7 presents one of the main specifications of Reference wage as found in the literature. We start (row 1) with a very simple reference wage depending only on occupation (managers, intermediate, clerks, workers). Adding age, square age (line 2), the interaction between age and occupation (line 3), and a regional fixed-effect (*French Départements*) increases the magnitude of the coefficient on Reference wage. Adding gender (rows 5 and 6) reduced its size as well as its statistical significance (compared to row 3). Hence, as opposed to a widespread belief, it does not seem that people compare predominantly to same-gender co-workers. Other controls such as industry¹, firm fixed-effects, town fixed-effects, did not add any statistical significance either. They even sometimes killed the statistical significance (city fixed-effects).

The most powerful specifications are the one presented in row 4, where Reference wage is estimated on occupation dummies, age, age square and the interaction between the two series of factors, and a regional

¹ We use the classification of the “*conventions collectives*”, i.e. the level at which collective bargaining between employers and trade-unions take place in France concerning wage-grids and working conditions. This grouping is similar to a branch-wise classification, but it is more relevant for our study.

(French *départements*) fixed-effect that captures the local dimension of the labor market, or row 8 that includes establishment fixed-effects. In summary, people seem to compare their wage to colleagues in the same age, occupation, region and establishment.

Signal and status effects together

Rows (11 and 12) of [Table 7](#) show respectively the regression of wage satisfaction on Reference wage defined as the typical wage of people working in the same establishment (1,754,639 employees working in 2765 establishments, with an average of 635 employees per establishment) and in the same firm (5,653,337 employees working in 2502 firms with an average of 2260 employees per firms). In these specifications, the wage equation is estimated within each establishment or within each firm, instead of including an establishment fixed-effect as in specification 8, or a firm fixed-effect as in specification 9. The coefficient a_1 is statistically insignificant unless the median level of wage in the establishment (or firm) is introduced in the regression. We interpret this as another sign that both signal and status effects play inside firms: workers enjoy working in high-wage firms and also experience relative income concerns. So when only income gaps are introduced in the estimate, the two effects play in opposite direction and the net effect is too weak to be statistically significant; but once the medium level of wage is introduced, the two effects can be disentangled and relative income gaps attract a statistically significant coefficient. Therefore, once we control for signal effects by including the establishment median wage, the first stage regression that has the strongest negative impact on wage satisfaction is given by row 8: $-0.197^*(0.080)$. It is based on occupation, age, age squared, the interaction of age and occupation and an establishment fixed effect. We will use this notion of reference wage in the following tables.

Wage comparisons are upwards

We also ran estimates of wage satisfaction following specification (3), and found that the wage gap $[\ln(y_{it}) - \ln(y_{it}^*)]$ attracts a statistically significant positive coefficient only for employees who stand below their Reference wage ($y_{it} < y_{it}^*$): the coefficient is then equal to $0.529^{***}(0.126)$ whereas it is of $-0.071 (0.112)$ for employees whose wage is above the level of y_{it}^* (based on the specification of row 8 in [Table 7](#)). This confirms the usual intuition that relative income concerns are more powerful when they act as relative deprivation than as overlook.

Robustness

[Table 8](#) presents estimates of alternative measures of satisfaction. Each line corresponds to a separate regression. The first column presents the coefficient on the medium level of wage in the establishment; the second column the coefficient on the top 1% wage and the third column the coefficient on Relative income defined as in row 8 of [Table 7](#). The three measures are included in each regression.

Explicit inter-firm comparisons

The first row of Table 8 reproduces the results of row 8 (third column) in Table 7. The second row shows that, controlling for the actual wage of an employee, the higher the level of his establishment's medium wage, the lower the level of wage that he deems "normal", i.e. the lower the additional wage that he is aspiring to. This non-trivial effect suggests that employees evaluate their wage satisfaction with respect to their establishment: if people are well-paid in the establishment, they are satisfied with their own wage. Then, the higher the Reference wage of a respondent, the higher the wage he aspires to. Identically, the higher the level of pay of the top 1% best-paid employees in the establishment, the higher the level of wage that employees judge they ought to be paid "normally". This is consistent with the relative deprivation effects mentioned above.

In the same spirit, row 3 of Table 8 shows that the higher the medium level of wages in the establishment, the more likely it is that employees declare that that their firm pays well as compared to other firms in the same sector, and the less likely it is that they declare that they consider quitting their job (row 4) and that this is in order to find a better paid job (row 5).

Placebo

The other estimates presented in Table 8, in rows 7-11, play the role of placebo regressions, as they display the association between Reference wage, top 1% wage and Medium wage on the one hand, and the way employees judge their wage level with regards to their needs, education, tenure and effort, on the other hand. Apart for diploma, which may be related to a notion of reference group, such as schoolmates (row 11), most of these correlations are not statistically significant. In the same way (7th row of Table 8), neither of the three income distribution measures (medium wage, reference wage and top 1% wage) attracts a statistically significant coefficient in the estimate of "*I like my work*", i.e. the question whether employees like what they do during their work. This shows that the association between other people's wage and individual satisfaction is not just due to some unobserved omitted variable that would jointly influence them: if it were the case, the omitted variable would also influence other dimensions of satisfaction and attitudes.

Interactions between constructed Reference wage and knowledge of other people's wage

The constructed notions of reference wage should be all the more strongly associated with wage satisfaction as employees are aware of the income of their peers and attach importance to comparisons. They should also be associated with "voice" or "exit" intentions (Hirschman, 1970), i.e. with behavioral reactions of employees depending on the degree of their wage satisfaction. We thus expect the interaction of Reference wage variables with such subjective perceptions to be associated with wage satisfaction. Table 9 displays the results of these tests. Each cell corresponds to a separate regression.

Column 1 of Table 9 presents the coefficient on each of these subjective perceptions (main effect), controlling for median wage and the usual controls. It shows (rows 1-4) that wage satisfaction is lower for people who are aware about the wage of their colleagues and manager (but not their CEOs or other people in the same profession, where the coefficients are not statistically significant). Wage satisfaction is also lower for those who attach more importance to comparisons (rows 5-10). It is higher for people who think they earn more than their reference group and, symmetrically, lower for those who think that they earn less. Acknowledging any comparison benchmark (row 10) amongst the ones that are proposed, i.e. colleagues in the same firm, in the same profession, former schoolmates, family members, friends or the minimum wage), attracts a negative coefficient whose magnitude is equivalent to a fall in own wage by 40% (in terms of the 2008 wage declared by the firm in DADS).

Column 2 of Table 9 presents the interactions of subjective comparisons (in rows) with the median level of wage in one's establishment. For instance, the intersection of row 1 and column 2 shows that controlling for one's own wage, being aware of the wage of some of my colleagues amplifies the positive association between the level of medium wage in my firm and my satisfaction (by 0.231). Declaring that the comparison with one's colleagues is important raises the effect of medium wage (by 0.164). The two last rows show that the association between the median level of within-establishment wage and satisfaction is higher for those who earn less than the colleagues with whom they compare, and lower for those who think they earn more. All these results are consistent with a signal effect whereby the medium level of wage in one's establishment is a source of greater satisfaction, especially for those who are more likely to be aware of it (because they are interested in other people's wage) and for those who look forward to filling the gap with their Reference wage group.

Column 3 of Table 9 displays the interaction between subjective perceptions and the top 1% wage within the establishment. Unsurprisingly, the negative effect of the level of the top wage is amplified for employees who declare that they know the wage of their top-managers, as well as for people who compare to colleagues who earn less (that we could plausibly interpret as a shared feeling of relative deprivation).

Column 4 of Table 9 shows the interaction between subjective perceptions and the gap between one's own wage and one's Reference wage, controlling for the usual controls as well as medium establishment income. Here, the coefficient on the interaction is positive and statistically significant for employees who acknowledge that compare to their colleagues in their firm. It is also negative and statistically significant for those who declare that they earn less than their Reference group, but not significant for those who earn more than their reference group. As expected, the coefficients on the interaction terms are not statistically significant for those who declare that they compare to their family members, friends, former schoolmates or to the minimum wage. This is in line with the fact that Reference income is a professional category: there is no reason why the wage gap between employees and their professional group should be related to satisfaction via comparisons to non-professional groups.

Overall, these interactions confirm the existence of both relative income concerns and signal effects within-establishment. These two types of income interactions are reinforced by the awareness of employees about the wage of their colleagues, and importance that they grant to this information.

Heterogeneity

As explained in Section 3, we expect the social interactions that we uncovered to be more or less strong depending on the groups of the population. Table 10 shows the coefficients on interactions of a series of socio-demographic variables (in rows) and comparison benchmarks (in columns), controlling for the main effects of these variables, as well as the usual controls. The first column suggests that, as expected, signal effects are more powerful -and status effects less powerful- for the young. This is consistent with the idea that young people have more to learn about other people's wages than elder workers, whose career is already partly behind them and whose future prospects are less uncertain. Both status and signal effect seem to be stronger for women than for men, suggesting that women pay more attention to the pay of their colleagues. Finally, status effects are weaker for managers and civil servants whose careers are probably less uncertain.

6. Conclusions

Based on a matched employer-employee dataset, this study provides evidence of the association between other people's wage and individuals' satisfaction with their pay. Within establishment, we uncover two types of effect: signal effects and status effects. On the one hand, for a given level of their own pay, employees are more satisfied with their wage when they work in a well-paying firm. On the other hand, they also display relative income concerns: their satisfaction depends on the gap between their own wage and some Reference wage. It also decreases with the level of the top 1% wage in their firm. Signal effects are more widespread amongst the young. The two types of effects are magnified by the fact that people are aware of the wage of their colleagues in their establishment and by the self-declared importance of comparisons with their colleagues. The association between relative income gaps and wage-satisfaction is asymmetric: people who compare to higher benchmarks are less happy than those who compare to colleagues who earn less or as much as them. Then, the association between wage satisfaction and relative income gap is only statistically significant for those who declare that they stand below their Reference wage.

This paper contributes to the discussion about transparency of pay within firms. It shows that awareness of other people's job exert a negative effect on wage satisfaction and other dimensions of wellbeing at work and engagement, via the channel of relative deprivation. However, signal effects are also powerful, and working with well-paid colleagues exerts a positive motivation effect. The limit of such signal effects seems to be reached by the extreme high-end of wage distribution: the level of pay of the top 1% of the

payroll. In view of this result, it seems that the optimal route for a firm is to allow transparency and limit the skewness of the wage distribution.

This new result echoes recent discussions about the rise in inequality. During the last 15 years, France, like many developed countries (Atkinson et al., 2011) has been confronted with a sharp rise of its highest wages, among the top 1% and even more so among the top 0.1%, especially within the financial sector (Landais, 2009; Godechot, 2012). This global trend seems to be a source of wage dissatisfaction, another component of the “price of inequality”(Stiglitz, 2012).

6. References

Akay, A. and Martinsson, P. (2011). “Does Relative Income Matter for the Very Poor? Evidence from Rural Ethiopia”, *Economics Letters*, 110: 213-215.

Akay, A. and Martinsson, P. (2012). “Positional Concerns through the Life Cycle: Evidence from Subjective Well-Being Data and Survey Experiments” IZA DP n°6342.

Akay, A., Bargain, O. and K.F. Zimmermann (2011). “Relative Concerns of Rural-to-Urban Migrants in China”, *Journal of Economic Behavior and Organization*, 81(2): 421-441.

Artz, B. (2008), “Firm Size, Performance Pay and Job Satisfaction”, *Labour*, 2(2): 315-343.

Atkinson, A.B., Piketty, T., and Saez, E. (2011). “Top Incomes in the Long Run of History”, *Journal of Economic Literature*, 49: 3-71.

Blanchflower, D.G. and Oswald, A.J. (2004). “Well-Being over time in Britain and the USA”, *Journal of Public Economics*, 88(7-8): 1359-1386.

Brown G., Gordon D., Gardner J., Oswald A. and Qian J. (2008). “Does Wage Rank Affect Employees’ Wellbeing?” *Industrial Relations*, 47(3): 355-389.

Bygren, M. (2004). “Pay Reference Standards and Pay Satisfaction: What do Workers Evaluate their Pay Against?” *Social Science Research*, 33(2): 206-224.

Cappelli, P. and P. Sherer (1988). “Satisfaction, Market Wages and Labour Relations: An Airline Study”, *Industrial Relations*, 27(1): 56-73.

Card D., Mas A., Moretti E. and Saez E. (2010). "Inequality at Work: The Effect of Peer Salaries on Job Satisfaction", *American Economic Review*, 102(6), 2012, 2981–3003.

Clark, A.E. and A.J. Oswald (1996). "Satisfaction and Comparison Income", *Journal of Public Economics*, 61(3): 359-81.

Clark, A.E. and Senik C. (2010). "Who compares to whom? The anatomy of income comparisons in Europe", *Economic Journal*, 120(544): 573-594.

Clark, A.E. and Senik C. (2012). "Income Comparisons and Financial satisfaction in China". PSE Working Paper.

Clark, A.E., Frijters, P. and Shields, M.A., (2008). "Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles", *Journal of Economic Literature*, 46(1): 95-144.

Clark, A.E., N. Kristensen and N. Westergård-Nielsen (2009). "Job Satisfaction and Co-worker Wages: Status or Signal?" *Economic Journal*, 119(536): 430-447.

Fafchamps, M. and F. Shilpi (2008). "Subjective Welfare, Isolation and Relative Consumption", *Economic Development and Cultural Change*, 88(1): 83-60.

Ferrer-i-Carbonell, A. (2005). "Income and well-being: an empirical analysis of the comparison income effect", *Journal of Public Economics*, 89(5-6): 997-1019.

Ferrer-i-Carbonell, A. and Fritjers, P. (2004). "How important is methodology for the estimates of the determinants of happiness?", *Economic Journal*, 114(497): 641-659.

FitzRoy, F. R., Nolan, M., and Steinhardt, M. F. (2011). "Age, Life-Satisfaction, and Relative Income: Insights from the UK and Germany", *IZA Discussion Papers*, No: 6045.

Godechot, O. (2012). "Is finance responsible for the rise in wage inequality in France?", *Socio-Economic Review*, 10(2): 1-24.

Hirschman, A. (1970). *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Cambridge, MA: Harvard University Press.

Hirschman, A. and M. Rothschild (1973), "The Changing Tolerance for Income Inequality in the Course of Economic Development", *Quarterly Journal of Economics*, 87(4): 544-566.

Kingdon G. and Knight J. (2006). "Subjective Well-being Poverty versus Income Poverty and Capabilities Poverty?" *Journal of Development Studies*, 42 (7): 1199-224

Kingdon G. and Knight J. (2007). "Community, Comparisons and Subjective Well-being in a Divided Society", *Journal of Economic Behavior and Organization*, 64(1): 69-90.

- Knight J. and Gunatilaka R. (2010b). “Great Expectations? The Subjective Well-being of Rural-urban Migrants in China”, Department of Economics, University of Oxford, Discussion Paper 322,
- Knight, J. and L. Song (2006). “Subjective Well-being and its Determinants in Rural China”, University of Nottingham, mimeo.
- Knight, J. and R. Gunatilaka (2011). “Income, Aspirations and the Hedonic Treadmill in a Poor Society”, *Journal of Economic Behavior and Organization*, 82(1): 67-81.
- Landais, C. (2009). “Top incomes in France (1998-2006): Booming inequalities?” , PSE Working Paper 2009.
- Luttmer, E. (2005). “Neighbors as Negatives: Relative Earnings and Well-Being”, *Quarterly Journal of Economics*, 120(3): 963-1002.
- McBride, M. (2001). “Relative-Income Effects on Subjective Well-being in the Cross-section”, *Journal of Economic Behavior and Organization*, 45(3):251-278.
- Melenberg, B. (1992). *Micro-Economic Models of Consumer Behaviour and Welfare*. PhD Thesis, Tilburg University.
- Ravallion M. and Lokshin M. (2010). “Who cares about relative deprivation?”, *Journal of Economic Behavior & Organization*, 73(2), 171-185
- Runciman W. G., (1966). *Relative deprivation and social justice : a study of attitudes to social inequality in twentieth-century England*, University of California Press.
- Senik, C. (2004). “When Information Dominates Comparison. Learning from Russian Subjective Panel Data”, *Journal of Public Economics*, 88(9-10): 2099-2133.
- Senik, C. (2008). “Ambition and Jealousy. Income Interactions in the “Old Europe” versus the “New Europe” and the United States”, *Economica*, 75(299): 495-513.
- Senik, C. (2009). “Direct Evidence on Income Comparisons and their Welfare Effects”, *Journal of Economic Behavior and Organization*, 72(1): 408-424.
- Stiglitz, J. (2012). *The price of inequality. How Today's Divided Society Endangers Our Future*, W. W. Norton & Company.
- Stouffer, A., E. A. Suchman, L. C. DeVinney, S. A. Star, and R. M. Williams, Jr., (1949). *The American Soldier: Adjustment during Army Life*, Princeton, J.: Princeton University Press, 1949.
- Warr P., (1999). “Well-Being and the Workplace”, in Kahneman D., Diener E. and Schwartz N. eds. *Well-Being. The Foundations of Hedonic Psychology*, Russell Sage Foundation, Chapter 20, 392-412.

Tables

Estimates

Table 1. Signal Effects. OLS Estimates of Wage Satisfaction

Wage Satisfaction	
Median wage level inside the firm (log)	0.152 * (0.064)
Median wage level inside the establishment (log)	0.147 * (0.062)
Q3 inside the establishment (log)	0.085 * (0.049)

*** p<0.001, ** p<0.01, * p<0.1.

Other controls: all controls of [Table A5](#), i.e. gender, nationality, age, age square, education, tenure, tenure square, public/private sector, log of firm size, log of hourly wage declared by employer in DADS, log of hourly wage declared by employee in SALSA.

Each cell corresponds to a separate regression.

Table 2. Impact of the Median Wage Level Controlling for the 2006-2008 Evolution Inside each Firm. OLS Estimates of Wage Satisfaction

	Wage Satisfaction			
Median wage level inside the firm (log)	0.131 * (0.064)	0.145 * (0.065)	0.131 * (0.065)	0.131 * (0.065)
Evolution of the average hourly wage of the firm		-0.093 (0.058)		
Evolution of the headcount of the firm			0.003 (0.004)	
Evolution of the total wage bill of the firm				0.00005 (0.0001)

*** p<0.001, ** p<0.01, * p<0.1.

n=2744 (the population is restricted to employees in firms where evolutions are computable).

Other controls: all controls of [Table A5](#), i.e. gender, nationality, age, age square, education, tenure, tenure square, public/private sector, log of firm size, log of hourly wage declared by employer in DADS, log of hourly wage declared by employee in SALSA.

Each column corresponds to a separate regression.

Table 3. Wage Satisfaction and the Median Wage Level Depending on the Position of the Respondent inside the Establishment. OLS Estimates of Wage Satisfaction

Wage Satisfaction	
Median wage level inside the establishment (log)	0.223* (0.132)
Respondent belongs to Q2 (log)	-0.553 (0.375)
Respondent belongs to Q3 (log)	-0.302 (0.376)
Respondent belongs to Q4 (log)	0.006 (0.362)
Respondent belongs to Q2*MEDIAN (log)	0.240 (0.158)
Respondent belongs to Q3*MEDIAN (log)	0.184 (0.161)
Respondent belongs to Q4*MEDIAN (log)	0.091 (0.158)
R2	15%
Number observations	2842

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$. Other controls: all controls of Table A5, i.e. gender, nationality, age, age square, education, tenure, tenure square, public/private sector, log of firm size, log of hourly wage declared by employer in DADS, log of hourly wage declared by employee in SALSA.

Table 4. Reversal Threshold. OLS Estimates of Wage Satisfaction over Alternative Measures of Wage Distribution inside Each Establishment

Wage Satisfaction	
Smallest wage in the establishment (log)	0.0001 (0.012)
P1 in the establishment (log)	-0.001 (0.018)
P5 in the establishment (log)	0.024 (0.023)
P10 in the establishment (log)	0.018 (0.036)
P25 in the establishment (log)	0.164* (0.069)
P50 in the establishment (log)	0.147 * (0.060)
P75 in the establishment (log)	0.085 * (0.050)
P90 in the establishment (log)	0.013 (0.040)
P95 in the establishment (log)	-0.004 (0.033)
P99 in the establishment (log)	-0.052* (0.025)
Highest wage in the establishment (log)	-0.040 ** (0.015)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$. Other controls: all controls of Table A5.

Each cell corresponds to a separate regression of wage satisfaction over the indicated measure.

**Table 5. Relative Concerns inside Establishments.
OLS Estimates of Wage Satisfaction**

Wage Satisfaction		
Median Wage Level inside Establishment (log)		0.356*** (0.082)
Salary Rank in Establishment	0.088 (0.059)	0.307*** (0.078)

*** p<0.001, ** p<0.01, * p<0.1.

Other controls: all controls of [Table A5](#).

Each column corresponds to a separate regression of wage satisfaction over measures of the wage distribution in the establishment (geographic definition).

Table 6. Wage Satisfaction and the Effect of the Median Level of Wage within Establishment versus Town. OLS Estimates of Wage Satisfaction

Wage Satisfaction				
	Inside one's Firm		Inside one's Town	
Median Wage Level inside Firm or Town (log)	0.152* (0.064)	0.278*** (0.072)	-0.194 (0.165)	-0.364* (0.189)
P99 Wage Level inside Firm or Town (log)		-0.109*** (0.029)		0.102* (0.056)
N	2842	2842	2840	2840
R2	14%	15%	14%	14%

*** p<0.001, ** p<0.01, * p<0.1.

Other controls: all controls of [Table A5](#).

Each column corresponds to a separate regression of wage satisfaction.

**Table 7. A Horse Race between Different Notions of Reference Group
OLS Estimates of Wage Satisfaction**

Wage Satisfaction				
		Coefficient on $\ln(y_i^*)$ as in equation (2)		
	Specification of the First-Stage Estimate List of included controls:	Classical controls	Classical controls and controlling for establishment wage median	Classical controls and controlling for establishment wage median and P99
1	Occupation	-0.131* (0.069)	-0.120* (0.069)	-0.115* (0.069)
2	Occupation + age + age2	-0.141* (0.073)	-0.129* (0.074)	-0.123* (0.074)
3	Occupation + age + age2 + Occupation *age + Occupation*age2	-0.174 * (0.068)	-0.162 * (0.068)	-0.157* (0.069)
4	Occupation + age + age2 + Occupation *age + Occupation*age2 + Region (département)	-0.188** (0.069)	-0.181** (0.069)	-0.175* (0.069)
5	Occupation + age + age2 + Occupation*age + Occupation*age2 + sex	-0.163 * (0.069)	-0.150 * (0.069)	-0.146* (0.069)
6	Occupation + age + age2 + Occupation*age + Occupation*age2 + sex + sex*age + sex*age2	-0.163 * (0.069)	-0.151 * (0.069)	-0.147* (0.069)
7	Occupation + age + age2 + Occupation *age + Occupation*age2 + industry	-0.134* (0.069)	-0.143* (0.069)	-0.132* (0.069)
8	Occupation + age + age2 + Occupation*age + Occupation*age2 + Establishment	-0.080 (0.071)	-0.197* (0.080)	-0.166 * (0.080)
9	Occupation + age + age2 + Occupation*age + Occupation*age2 + firm fixed-effect	-0.059 (0.070)	-0.148* (0.076)	-0.123 (0.076)
10	Age + age2 + city fixed-effect	-0.110 (0.167)	-0.170 (0.169)	-0.161 (0.169)
11	Occupation + $\ln(\text{age})$ by establishment (##)	-0.080 (0.071)	-0.151 * (0.075)	-0.130* (0.076)
12	Occupation + $\ln(\text{age})$ + $\ln(\text{age})$ * Occupation by establishment (##)	-0.091 (0.073)	-0.157 * (0.077)	-0.134* (0.077)
13	Occupation + $\ln(\text{age})$ by firm (###)	-0.102 (0.070)	-0.154 * (0.073)	-0.137* (0.073)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.1$. Other controls: all controls of Table A5.

This table displays the coefficient on Reference Income y^* in the estimate of wage satisfaction, as in equation (1), depending on the definition of Reference income.

Each cell corresponds to a separate regression.

First-stage regressions are estimated on the entire population of employees in the DADS (2008); $n=33,149,444$ unless otherwise specified.

In rows 11 and 12 (##), first-stage estimates of Reference income are run by establishment (i.e. people working in the same local unit). The number of observation is thus restricted to the sample of workers in the same establishment as SALSA's respondents ($n=1,754,639$).

In row 13 (###) first-stage estimates of Reference income are run by legal firm (i.e. people working in the same firm, but possibly in different locations). The number of observation is thus restricted to the sample of workers in the same firm as SALSA's respondents ($n=5,653,337$).

Table 8. Robustness. OLS Estimates of Other Work Attitudes

Explained variable	Establishment Median (log)	Establishment P99 (log)	Reference Wage y* (log)	N	R2
1. Wage satisfaction	0.310* * * (0.075)	-0.088*** (0.027)	-0.166 * (0.080)	2842	0.15
2. Level of wage considered “normal” for this type of job	-0.110** (0.036)	0.048*** (0.013)	0.160*** (0.039)	2638	0.60
3. My firm pays better than other firms	0.292*** (0.076)	-0.102*** (0.028)	0.006 (0.083)	2580	0.10
4. I considers quitting my firm	-0.086* (0.042)	-0.004 (0.015)	0.084* (0.044)	2781	0.05
5. I want to quit for a better wage	-0.055 * (0.031)	0.007 (0.011)	0.013 (0.033)	2759	0.04
6. Asked supervisor for a pay rise	-0.053 (0.054)	0.052** (0.020)	0.055 (0.058)	2801	0.06
7. I Like my work	-0.082 (0.083)	-0.012 (0.031)	0.026 (0.090)	2839	0.04
8. My wage is enough to cover needs	-0.112 (0.091)	0.030 (0.033)	-0.027 (0.097)	2815	0.23
9. My wage corresponds to my productivity	0.104 (0.054)	-0.011 (0.024)	0.040 (0.071)	2733	0.05
10. My wage corresponds to my experience	0.059 (0.056)	-0.018 (0.021)	0.059 (0.060)	2777	0.12
11. My wage corresponds to my diploma	0.071 (0.065)	-0.037 (0.024)	0.168* (0.071)	2586	0.24

*** p<0.001, ** p<0.01, * p<0.1. Other controls: all controls of [Table A5](#).

All variables reordered in the direction of increasing satisfaction.

The number of observations varies slightly due to different non-response to subjective satisfaction questions.

One row per regression.

**Table 9. Interactions between Within-Establishment Wage Distribution and Subjective Importance of Comparisons.
OLS Estimates of Wage Satisfaction**

Wage Satisfaction				
	Main effect	Interaction with Establishment Median (log)	Interaction with Establishment P99 (median controlled) (log)	Interaction with Deviation to Reference Wage (median controlled) (log)
Subjective perception (Q)	Q	Q*Median	Q * P99	Q*(yi-y*)
I know (approximately) the wage of:				
1. - some of my colleagues in my firm	-0.100*** (0.029)	0.185* (0.108)	0.005 (0.048)	0.116 (0.138)
2. - my managers (supervisors)	-0.043 (0.028)	-0.056 (0.103)	-0.045 (0.051)	0.044 (0.124)
3. - the top-managers of my firm	0.019 (0.033)	-0.376** (0.114)	-0.177** (0.059)	-0.041 (0.140)
4. - persons holding same job in other firms	-0.086 (0.026)	0.093 (0.097)	-0.185 (0.043)	-0.131 (0.118)
It is important to compare my wage to:				
5. - colleagues in same job	-0.171*** (0.026)	0.164* (0.099)	-0.005 (0.043)	0.260* (0.119)
6. - family members	-0.093*** (0.025)	0.348*** (0.096)	0.129** (0.042)	0.050 (0.117)
7. - former schoolmates	-0.137*** (0.034)	0.009 (0.119)	-0.072 (0.056)	-0.046 (0.140)
8. - friends	-0.137*** (0.026)	0.258** (0.097)	0.010 (0.043)	0.152 (0.117)
9. - the French minimum wage (SMIC)	-0.167*** (0.025)	0.057 (0.098)	0.031 (0.043)	0.172 (0.119)
10. - any group amongst colleagues, family, schoolmates or friends	-0.161*** (0.028)	0.330** (0.106)	0.074 (0.048)	0.227* (0.129)
11. I compare to colleagues who earn more	-0.356*** (0.032)	0.238* (0.122)	0.111* (0.050)	0.058 (0.148)
12. I compare to colleagues who earn less	0.416*** (0.039)	-0.440*** (0.127)	-0.137* (0.058)	-0.511** (0.164)

*** p<0.001, ** p<0.01, * p<0.1. Other controls: all controls of Table A5.

Each cell corresponds to a separate regression.

**Table 10. Heterogeneity in the Relationship between Within-Establishment Wage Distribution and Satisfaction.
OLS Estimates of Wage Satisfaction**

Wage Satisfaction			
	Interaction with Establishment Median (log)	Interaction with Establishment P99 (median controlled) (log)	Interaction with deviation to Reference Wage (median controlled) (log)
Social characteristics (S)	S * Median	S * P99	S * (y _i -y*)
Female	0.169* (0.099)	0.072* (0.043)	0.196* (0.118)
Young (<35)	0.330** (0.113)	0.105* (0.046)	-0.088 (0.139)
Old (>50)	-0.356** (0.108)	-0.151** (0.050)	0.012 (0.127)
Small firm (<20)	-0.129 (0.105)	-0.016 (0.046)	-0.059 (0.125)
Manager	-0.135 (0.123)	-0.067 (0.070)	-0.279* (0.137)
Civil Servant (local or hospital)	-0.097 (0.178)	-0.036 (0.069)	-0.246* (0.138)

*** p<0.001, ** p<0.01, * p<0.1. Other controls: all controls of [Table A5](#).

Each cell corresponds to a separate regression.

Appendix

Descriptive Statistics

Salsa sample was randomly extracted in 2008 from the DADS Panel (all wage-earners working in the private sector or as civil servants in local administration and hospital) in 2006. People living in ten French regions of France were selected. Civil servants and people belonging to the upper decile of the national wage distribution were oversampled. The survey took place in 2009.

Table A1. Wage Levels in the (unweighted) Regression Sample of the SALSA Survey

	Mean	SD	P10	P25	P50	P75	P90	P99	N
Hourly wages									
Hourly wage in SALSA subsample (declared by employers)	12.47	6.89	7.62	8.65	10.51	13.86	19.49	37.54	2842
Hourly wage in the entire DADS (declared by employers)	12.33	88.56	7.10	8.05	9.73	13.13	19.27	43.24	2 146 689
Hourly wage in the entire DADS restricted to regions investigated (declared by employers)	11.82	112.48	7.10	8.02	9.54	12.56	17.71	37.40	826 323
Salsa 2009 Hourly wage (declared by the worker)	10.74	6.60	6.83	7.68	9.28	12.00	15.80	30.72	2842
Monthly wages									
Salsa 2009 monthly wage (declared by the worker)	1693	1062	914	1200	1472.8	2000	2700	5500	2842
Salsa 2008 monthly wage (firm declared) (calculated on the basis of yearly wage/12)	1693.5	1167	634.3	1132.4	1498.1	2007.2	2806	5916.3	2842
Yearly wages									
Yearly wage: country average	16597	21586	1413	5934	14823	21560	31079	74807	2 146 689
Yearly wage: average in regions of SALSA survey	15743	17304	1444	66003	14693	20941	29249	65318	826 323

Table A2. Descriptive Statistics (Regression Sample). SALSA (2009)

Variable	N	Mean	Standard deviation	Min	Max
Wage Satisfaction	2842	2.48	0.72	1	4
Female	2842	0.49	0.50	0	1
French	2842	0.97	0.18	0	1
Diploma: CE or less	2842	0.12	0.33	0	1
Diploma: CAP, BEP, BEPC	2842	0.37	0.48	0	1
Diploma: BAC (<i>i.e.</i> end of high school diploma)	2842	0.18	0.38	0	1
Diploma: BAC+2	2842	0.17	0.38	0	1
Diploma: BAC+3 and 4	2842	0.07	0.26	0	1
Diploma: BAC+5 and more	2842	0.08	0.27	0	1
Civil servant	2842	0.22	0.41	0	1
Age	2842	42.05	10.42	19	65
Age ²	2842	1876.57	873.10	361	4225
Tenure within the firm	2842	12.25	9.84	0	43
Seniority ²	2842	246.80	338.58	0	1849
Log of Size of the firm	2842	4.91	2.39	0	8.52
2009 self declared Hourly wage	2842	10.74	6.60	0.54	195.85
2008 DADS hourly wage	2842	12.47	6.88	3.43	115.56
Self-declared hourly wage 2009 (log)	2842	2.29	0.38	-0.62	5.28
Firm-declared hourly wage 2008 (log)	2842	2.43	0.39	1.23	4.75
Establishment Median Hourly Wage (log)	2842	2.35	0.26	1.27	4.36
Establishment P99 Hourly Wage (log)	2842	3.32	0.60	1.79	7.20
Predicted Reference Wage = Occupation +age+age2 + Occupation*age + Occupation*age2	2842	2.41	0.32	1.99	3.64
Predicted Reference Wage = Occupation + age + age2 + Occupation*age + Occupation*age2 + Department FE	2842	2.40	0.31	1.98	3.62
Predicted Reference Wage = Occupation+age+age2 + Occupation *age + Occupation *age2 + Establishment FE	2842	2.41	0.34	1.44	4.75
Log of Wage considered as 'Normal'	2638	7.48	0.48	4.09	10.13
I like my work	2839	3.47	0.75	1	4
My wage covers my needs	2815	2.46	0.91	1	4
My wage corresponds to my contribution	2733	1.45	0.58	1	3
My firm pays well	2580	2.05	0.68	1	3
My wage corresponds to my experience	2777	1.40	0.53	1	3
My wage corresponds to my diploma	2586	1.75	0.64	1	3
Wants to quit his job	2842	0.16	0.37	0	1
Wants to quit in order to get higher wage	2842	0.08	0.27	0	1
Asked supervisor for a wage rise	2842	0.45	0.50	0	1

Table A3. Subjective Questions in SALSA (2009)

Concerning your wage, would you say that you are:	
Very satisfied	4.2%
Rather satisfied	49.3%
Rather unsatisfied	37.2%
Very unsatisfied	9.4%
Do you like what you do during your work?	
Yes, almost always	58.6%
Yes, most of the time	31.2%
Yes, sometimes	6.9%
In general, no	3.2%
Refuse to answer or don't know	0.1%
Is your wage sufficient to cover your needs?	
No, your wage is not sufficient	18.7%
You just have enough to pay for your house, your food and your clothes	25.6%
You can live on it and even afford some expenditure for leisure	44.7%
You are comfortable with your income	10.1%
Refuse or don't know	1.0%
In your opinion, does your wage correspond to what you bring to your employer?	
Yes	34.2%
No, it is insufficient with regards to what I contribute to my employer	57.6%
No, my contribution to my employer is lower than my wage (only if spontaneous answer)	4.4%
Refuse or don't know	3.8%
Would you say that, as compared to other firms in your industry, wages in your own firm:	
Are good	23.4%
Are is in the average	48.2%
Are rather low	19.1%
Refuse or don't know	9.2%
Do you consider that your wage:	
Is rather high, given your professional experience	2.0%
Is correct, given your professional experience	35.0%
Is rather low, your professional experience	60.7%
Refuse or don't know	2.3%
Do you consider that your wage:	
Is rather high given your level of education	10.0%
Is correct given your level of education	47.9%
Is rather low given your level of education	33.1%
Refuse or don't know	9.0%
During the last 5 years, did you take a personal action with one of your managers in order to ask for a pay rise, a promotion, or to ask him to help you to obtain one?	
Yes	44.7%
No	53.9%
Refuse or don't know	1.4%
Today, do you plan to quit your job voluntarily?	
Yes	16.4%
No	81.5%
Refuse or don't know	2.2%
If so, why? (n=466) #	
Essentially to obtain a higher pay	49.4%
It is not for the wage	46.1%
Refuse or don't know	4.5%
Do people to which you compare your wage generally earn: (n=2044) ##	
More than you	37.9%
As much as you	29.5%
Less than you	18.8%
Refuse or don't know	13.8%

Note : n=2842, except for # and ##.

Table A4. Subjective Questions (continued) in SALSA

	Yes	No	Refuse or don't know or without object
Amongst the following groups of persons in your professional surrounding, are there any about whom you know, approximately, how much they earn (including premium and bonuses)?			
- Some colleagues exerting the same function as you do inside your firm? (with a margin of 5%)	66.1%	28.2%	5.8%
- Some of your own direct managers (with a margin of error of 15%)	29.6%	70.0%	0.4%
- The top managers of your firm (with a margin of 30%)	19.3%	80.3%	0.4%
- Persons doing the same job in other firms	41.4%	56.3%	2.3%
When you think about your wage, do you also compare it to what other people earn, for example:			
- Current colleagues exerting the same occupation as yourself?	49.6%	47.4%	3.0%
- Friends of yours?	44.3%	54.8%	0.9%
- Former schoolmates?	20.8%	66.9%	12.3%
- Family members?	47.8%	51.4%	0.8%
- At least one of these (Comp1)	71.9%	28.1%	.
Have you recently (over the last 6 months) compared your wage to the minimum wage (SMIC)?	40.9%	56.1%	3.0%

Note : n=2842.

Basic regressions

Table A5. Basic satisfaction model OLS Estimate of Wage Satisfaction

Wage Satisfaction	
Female	-0.005 (0.027)
French	0.005 (0.069)
Diploma: CAP, BEP, BEPC	0.004 (0.043)
Diploma: BAC	-0.0066 (0.050)
Diploma: BAC+2	-0.053 (0.052)
Diploma: BAC+3/4	-0.131* (0.065)
Diploma: BAC+5&+	-0.249*** (0.066)
Hospital or local civil servant	-0.020 (0.032)
Age	-0.040** (0.010)
Age ²	0.0004*** (0.0001)
Tenure	-0.017*** (0.005)
Tenure ²	0.0004** (0.0001)
Log of firm size	-0.038 *** (0.005)
Log of 2009 hourly wage (declared by employee)	0.528*** (0.053)
Log of 2008 hourly wage (declared by firm)	0.3192*** (0.055)
Intercept	1.789*** (0.224)
R2	0.14
Number observations	2842

*** p<0.001, ** p<0.01, * p<0.1.

Table A6. Our Preferred Wage Equation OLS Estimate using DADS

Wage Equation	
Age	0.019 (0.00004)
Age ²	-.00017 (0.0000006)
<i>Omitted occupation: Clerks</i>	
Entrepreneur	0.355 (0.0014)
Manager	-.783 (0.002)
Intermediate	-.380 (0.002)
Blue Collar Worker	-.139 (0.001)
Age*Entrepreneur	0.025 (0.006)
Age*Manager	0.057 (0.0001)
Age*Intermediate	0.026 (0.00008)
Age*Worker	0.008 (0.00007)
Age ² *Entrepreneur	-.0002 (0.000006)
Age ² *Manager	-.0005 (0.000001)
Age ² *Intermediate	-.0002 (0.000001)
Age ² *Worker	-.0001 (0.000009)
N	33 149 444

*** p<0.001, ** p<0.01, * p<0.1.

Establishment fixed-effects included.

Sources : DADS exhaustive files (2008)