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Choice of colleagues as reference group for wage comparison: does group composition matter?¹

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June 2017

Abstract:

Social comparison is an important issue in the context of subjective well-being. Subjective well-being is not only affected by individual salary but also by the salary of a reference group. However, in the literature the question of the choice of reference group is rarely addressed. In most studies, the reference group is considered an exogenous variable which is imposed by the analyst and is the same for all individuals. This paper assesses, in the framework of wage comparison, variables that influence the choice of colleagues as the reference group. In particular, we focus on the link between the choice of this group and the demographic characteristics of the potential reference group itself. To our knowledge, this question has not been studied in the literature. Utilizing a recent survey on working conditions and quality of working life in Luxembourg, we estimate a model of the choice of colleagues as the reference group rather than other alternatives. Due to the diversity of its labor force, Luxembourg provides an interesting context for studying the link between reference group and the demographic makeup of the firm. Our results show that the demographic characteristics of the potential reference group matter in the choice of reference group.

Keywords: subjective well-being; reference group; wage comparison; demographic makeup

JEL code: J28

¹ This work is supported by the visiting scholar scheme at the Luxembourg Institute of Socio-Economic Research. The authors are grateful to Ludivine Martin and Nicolas Poussing for their helpful comments.

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1. Introduction

The psychological literature provides a consensus that individuals tend to assess their situations by using a benchmark. This benchmark can be internal, for example the individual's past situation, or can be external through social comparison. Empirical studies in the economics literature have shown that relative income, income compared with some benchmark, is an important determinant of subjective well-being (Clark and Oswald, 1996; Luttmer, 2005; Clark and Senik, 2010). According to some studies, relative variables are even more important than absolute ones (Groot and Maassen Van den Brink, 1999). This relative aspect of subjective well-being helps to explain some paradoxes like Easterlin's paradox, that increasing the standard of living of a Nation does not lead to increased citizen satisfaction (Easterlin, 1974), or the paradox that women have higher levels of job satisfaction than men despite lower wages (Clark and Oswald, 1996). It challenges also the classical economic model and can have potential implications on policy, for example, on redistributive policy or on wage policy inside the firm.

While the thesis that social comparison is important to take into account is not new in the literature (Smith, 1776; Marx, 1847), a central question remains: what is the appropriate choice of the benchmark reference group? There are very few economic studies that adequately explain the formation or choice of the reference group. In most studies on the effects of relative income on satisfaction, the reference group is considered as an exogenous variable which is imposed by the analyst and is the same for all individuals. Moreover, most of the time, the analyst assumes that individuals have perfect information on the reference group's income. These approaches lead Senik (2009, p.409) to suggest that the assumption that the proxy used by the analyst for reference group's income "*is capturing a comparison benchmark remains an interpretation.*"

In this paper, we allow the reference group to vary over individuals and study the factors that influence an employee's choice of reference group. While previous work has described the factors that influence an individual's choice of reference group in terms of his or her personal characteristics, no studies in the economic literature to our knowledge have considered the impact of the characteristics of the potential reference group itself. In particular, previous work has ignored the impact that the demographic makeup of a group might have on its probability of serving as a reference group. However, according to social comparison theory, and more particularly to Wheeler's hypothesis (1966), individuals tend to choose people whose characteristics are close to him to assess their situation.

Several potential reference groups have been studied in previous work, including co-workers, workers at other firms, and friends and neighbors. In line with social comparison theory, we hypothesize that the probability of choosing co-workers as a reference group depends on the demographic makeup of the group. More precisely, we hypothesize that relational demography, *ie.* dissimilarity between an individual and the other group members regarding a given attribute, and the group's variety, *i.e.*, heterogeneity within the group, are negatively related to the probability of choosing the group as reference. Dissimilarity can reduce the relevance for using a group as a reference group. According to social comparison theory, a group of people with characteristics different from oneself doesn't give relevant information to judge one's situation. The difference in situation can arise from differences in performance as well as differences in characteristics. Variety can make the identification process more difficult. We focus especially on the effects of gender, nationality, and age in these regard. The paper uses a question regarding the individual's choice of reference group for income comparisons included in a recent survey on working conditions and quality of working life in Luxembourg. The diversity of its labor force makes Luxembourg an interesting context for studying the link between reference group and the demographic makeup of the firm. Moreover, given the unique situation of Luxembourg, with an extensive mix of nationalities, on the one hand, and choice of residence, on the other, we also extend the set of potential reference groups to include those both in and outside the country of employment, which has rarely been done in previous work (Gokdemir and Dumludag, 2012).

The results indicate that the demographic characteristics of the potential reference group matter in the choice of reference group. Consistent with social comparison theory, the likelihood of choosing colleagues as the reference group is negatively related with the proportion of colleagues with a different gender or a different nationality as the respondent. We find a positive relationship between the likelihood of choosing colleagues as a reference group, however, and the proportion of colleagues who don't belong to the respondent's age group. We provide evidence that the result depends on whether the workers are younger or older than the colleagues. The "variety" measures used here provide mixed results depending on whether we are interested in nationality, gender or age.

The paper is organized as follows. We first provide a review of the literature. This is followed in section 3 by a description of the data. Empirical results are presented in section 4, with conclusions and topics for further research in section 5.

2. Literature review

The term reference group appears first in Hyman (1942). This term, in its comparative meaning, represents the group to which an individual compares himself to make judgments. It constitutes a benchmark on which an individual assesses his own situation. Festinger (1954), in his theory of social comparison, highlights that the aim of social comparison is to have relevant knowledge to improve self-evaluation. Individuals use a reference group for self-assessment because it's easier, more feasible and less costly than collecting all objective information to be able to judge their own performance. Therefore, in economic terms, a reference group can be viewed as a consequence of bounded rationality or imperfect information.

According to Merton and Rossi (1949), the number of reference groups is unlimited and a reference group can be a group in which the individual belongs or not, and a group with which the individual shares the same status or not. Social comparison theory leads to three hypotheses on the way that individuals determine their comparison group. First, Festinger (1954) suggests that people compare themselves to others who are close to themselves on the dimension assessed: "the tendency to compare oneself with some other specific person decreases as the difference between his opinion or ability and one's own increases" (in Corcoran et al., 2011, p.120). To illustrate this idea, Corcoran et al. (2011, p.124) write "for example, if you are detected to be more athletic than a very unathletic person such a result says little about your athletic ability. Thus, a comparison with a dissimilar standard offers little helpful information for an accurate self-evaluation." Second, according to Wheeler (1966), it is more the similarity on the characteristics linked to the dimension assessed rather than the similarity on this dimension that matters. For example, people can judge their wage appropriately if they compare it to the wages of others whose characteristics are similar to their own. Corcoran et al. (2011, p.124) illustrate this hypothesis by writing "if you, for example, compare yourself to a much older person and outperform this person in an athletic competition, this does not necessarily speak for your excellent athletic ability, because the age difference readily explains the performance difference. However, if your competitor is the same age as yourself, your victory clearly indicates your superior athletic ability." The importance of similarity, and in particular demographic similarity, in the formation of the reference group is shown also by social identity theory (Tajfel, 1972) and self-categorization theory (Turner, 1982). According to Tsui et al. (1992, p.553), "the self-categorization process thus may define groups whose attractiveness and importance are not based on intergroup interaction but on the demographic characteristics of its members." Third, relationship closeness may matter in the formation of a comparison group (see Garcia et al., 2013). According to this hypothesis, individuals construct their reference group with individuals they know.

If individuals can be neutral when they choose their comparison group, they can also orient their comparison. According to self-comparison theory, people can pursue a goal of self-enhancement or self-improvement when they choose their reference group. Self-enhancement is comparing with people who are in a worse situation (Wills, 1981) whereas self-improvement is comparing with others who are in a better situation (Bandura, 1986). People trade off these two goals when they determine their reference group. Falk and Knell (2004) show that self-improvement is more developed for higher-ability individuals, who have been found to choose higher-income reference groups.

Hyman (1960, p.390) highlights the difficulties for identifying the reference group of an individual and “argues in favor of empirically determining the reference group that people are likely to employ” (in Akay et al., p.8). In the economic literature, most work in which relative comparisons may be important, regarding life satisfaction, job satisfaction, or satisfaction with wages or working conditions, for example, take the reference group as given, sometimes as a result of data limitations. Therefore, generally in the literature, authors impose a given reference group which is the same for each person studied. For example, Clark et al. (2009) assume that the reference group is composed of co-workers. Luttmer (2005) considers neighbors as the reference group. They then construct measures of relative income based on these assumptions. As shown in Brown et al. (2015), the group chosen by the analyst as the reference group may affect the results obtained.

Still, there are some studies that examine the choice of reference group. Knight et al. (2009), using a national household survey for 2002, study the determinants of subjective well-being in rural China. They show that rural Chinese inhabitants are happy despite their relative low income, particularly in comparison to those of people in the township, because they use narrow reference groups. Indeed, 68% of rural Chinese compare their income to those of their neighbors or to those of people in their village. Only 4% use people in the township as their reference group. According to these authors, these groups reflect information sets and social interactions.

Carlsson and Qin (2010) use also Chinese data to study the importance of relative standing in developing countries. In the household survey they conducted, they ask Chinese farmers if they agree or not with the fact that they always compare their income with a given reference group. The groups studied are: relatives, neighbors, people in the village, people in the township, people in the city, party members and off-farm migrants in the city (from the village). They find that, on average, the respondents say they compare their income more often with those of people in the village, neighbors and off-farm migrants in the city. They are less inclined to compare to people in city.

Clark and Senik (2010) analyze the determinants of the choice of reference group among workers in Europe. Using data from Wave 3 of the European Social Survey, they allow the reference group to vary in a study of the impact of reference group on happiness. They find that 35.9% of people answer that they don’t compare their income with others⁴; it’s the second most common response after colleagues. They further analyze the choice of the reference group with a multinomial logit regression, finding that some socio-demographic characteristics are relevant determinants. For example, they find that men, employees (as opposed to self-employed) and individuals aged over 25 years are more likely to compare their wages with their colleagues. Women, married workers and individuals with children are more likely to compare their wage to the wage of family members. Individuals who participate often in social activities are more likely to compare their income to friends and less likely to colleagues. According to Clark and Senik, these links show the effect of social interactions. They conclude that “people compare to the groups with whom they interact more frequently” (p.585). However, in industrial and organizational psychology, some theories, such as self-categorization theory (Turner, 1982, 1985), suggest that social interactions are not necessary for defining the group. According to this theory, individuals can create psychological groups based on the demographic characteristics of its members.

⁴ This proportion is larger than that found in Knight et al. (2009) for rural Chinese population.

Clark et al. (2013) do not study the variables that are linked to the choice of a given reference group. But, using Japanese data to study the relationship between relative income and satisfaction, they find that contrary to Europeans, the Japanese more often report their neighbors as the reference group. The authors show also that individuals who compare their incomes to those of their colleagues are less satisfied with their standard of living than those who compare with the incomes of family or friends.

While previous empirical work has described the factors that influence an individual's choice of reference group in terms of his or her personal characteristics, it has ignored the impact that the demographic makeup of a group might have on its probability of serving as a reference group when an individual is making relative wage income comparisons in particular. The current paper extends the literature by estimating the impact that dissimilarity and variety inside the workplace have on the probability of choosing colleagues as the reference group when making comparisons of relative income. More precisely, the paper seeks to test the following hypotheses:

H1: Dissimilarity with colleagues is negatively related to the likelihood that colleagues will be selected as the reference group.

H2: Workplace's variety is negatively related to the likelihood that colleagues will be selected as the reference group.

3. Data and Methodology

3.1. Data

The data used in this analysis are from a survey on working conditions and quality of working life in Luxembourg, conducted by the Luxembourg Institute of Socio-Economic Research (LISER) on behalf of the Luxembourg Ministry of Social Security. The survey was conducted online between March and June 2013 with a representative sample of workers in Luxembourg who work in the private sector (temporary workers excluded) and who have at least six months of seniority in their firm. In total there were 17,488 responses to the survey. Of these, 3,606 were Luxembourgish natives, 4,642 were immigrants (i.e. people living in Luxembourg who do not have Luxembourg nationality), and 9,240 were "cross-border" workers who live in the neighboring countries of Belgium, France, and Germany. Observations are weighted to match the workforce's makeup in Luxembourg. The survey includes numerous questions on working conditions and allows us to study the determinants of the choice of reference group.

The question regarding the reference group asks, "With whom do you most tend to compare your salary? (exclusive answer)" The possible answers are:

- colleagues,
- employees practicing the same profession as myself in other firms in Luxembourg,
- employees practicing the same profession as myself in a country other than Luxembourg,
- family members, friends, neighbors, and
- "I do not compare my salary with that of others."

This question differs from the reference group question in the European Social Survey used by Clark and Senik (2010) in terms of two responses. First, we have added the people who work outside of Luxembourg, to account for the fact that in Luxembourg the workforce is composed in majority of immigrants and cross-border workers. Second, we add the possibility of employees in the same profession in Luxembourg as a reference group, following Bygren (2004), who found that individuals compare themselves more with employees in general than with their colleagues.

Using administrative data, we are able to construct indicators to describe the demographic composition of the firm. These indicators fall into two approaches. The first one is relational demography. It measures the dissimilarity between an individual and other individual in regards to some demographic attribute. Following Leonard and Levine (2006), we construct three indicators of relational demography defined as the proportion of colleagues who don't have the same gender of the respondent, who don't have the same nationality, and who don't belong to the same age category. The second approach is group variety. It measures the heterogeneity inside a group. We talk about variety and not diversity because, due to the data, we use discrete or categorical attributes (Ilmakunnas and Ilmakunnas, 2011). Indicators of variety inside the firm relative to gender, nationality, and age are computed through Blau's index. Indeed, according to Harrison and Klein (2007), this index is the most used to measure variety. This index is equal to 1 minus the Herfindahl index:

$$1 - \sum p_k^2$$

where p measures the proportion of individuals belonging to the k th category.

For gender, the indicator ranges from 0 (perfect homogeneity) to 0.50. We have six categories for nationality (Belgian, French, German, Luxembourgish, Portuguese and others) so that the variety indicator for nationality ranges from 0 to 0.83. For age, we have three groups (less than 30 years, 30-49 years, 50 years and more) and the indicator of variety ranges from 0 to 0.66.

In addition, the questionnaire provides information on standard socioeconomic and personal characteristics, as well as information about the jobs and working conditions. These include a measure of work climate which proxies for social interactions within the firm. We also include measures of work experience. The survey does not include the salaries of the respondents, but information used for the stratification of the survey allows us to identify the salary of each individual in broad intervals.

The sample is restricted to individuals who work in a workplace with at least 15 employees to be able to compute relevant means for workplaces. Missing values have been imputed using median values for all variables. The sample on which our analysis is based consists of 14,150 observations. Descriptive statistics for all of the variables used in the study are presented in Appendix 1. Descriptive statistics for variables related to dissimilarity and the variety of the workforce are presented in Table 2.

3.2. Methodology

We use logistic regression to model the probability of choosing colleagues as a reference group rather than another alternatives. Robust standard errors are clustered at the workplace level to correct for the fact that some employees work in the same firm. The coefficients are estimated using the logit command in STATA.

The parameters of the following model are estimated:

$$\begin{aligned} \text{logit}(p) &= \log\left(\frac{p}{(1-p)}\right) = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k \\ p &= \exp\left(\frac{\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k}{(1 + \exp(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k))}\right) \end{aligned}$$

where p is the probability that the reference group chosen is "colleagues" ($p = \text{prob}(\text{colleagues}=1)$), and

⁵ Estimates based on multinomial logit specifications with "colleagues" as the base group are available on request from the authors. The results are qualitatively the same. We present the logit specification here for the simplicity in interpreting the results focusing on the choice of colleagues.

x_i are covariates. The other possible responses to the survey question are collapsed into a single alternative. We estimate the model using two alternative samples, first when those who make “no comparison” are included and second when those who make no comparison are excluded from the sample. In the latter case, the alternative to choosing “colleagues” as a reference group is to choose one of the remaining options: employees in the same profession in Luxembourg, employees in the same profession outside Luxembourg, and family, friends and neighbors.

The vector of covariates includes our variables of interest (variety index and measure of demographic dissimilarity) and sets of control variables related to socio-demographic characteristics (age, gender, education, ...), occupation (full-time job, permanent contract, seniority in the firm, ...) and firm (size, sector, ...).

One potential problem with this method is that some workers may sort themselves across firms according to the demographic characteristics of the workforce, perhaps according to some unobserved characteristic Z (such as a desire to work with similar individuals). This would bias downward the estimate of the correlation between the choice of colleagues and the demographic makeup of the group, however, thereby strengthening our test of significance of the relationship. In any case we think it is highly unlikely that the choice of reference group for income comparisons would also be correlated with the characteristics Z . Unfortunately, data limitations and the fact that the survey is cross-sectional preclude our addressing the selection issue in this analysis.

4. Results

4.1. Descriptive Results

Table 1 shows the responses for the reference group questions. The most common response among workers in this sample is that they do not compare their wage to the wage of others (36.7%). The other responses, in order of frequency, are that they compare their wage to workers in the same occupation but at other firms in Luxembourg (27.4%), to colleagues (22.7%), to relatives (9.4%) and to workers outside Luxembourg (3.8%). This ordering is consistent with the work of Bygren (2004), which suggests that workers compare more to broader social categories than to closer social groups, although the difference between the percent choosing workers at other firms in Luxembourg and that choosing colleagues is small.

TABLE 1: Distribution of responses to reference group question

Reference group	Percentage	Standard Error
Colleagues	22.7	0.41
Workers in same occupation in Luxembourg	27.4***	0.44
Workers outside Luxembourg	3.8***	0.19
Friends and Relatives	9.4***	0.29
No Comparison	36.7***	0.48

***indicates statistically significant difference from “Colleagues” at $p < .01$ level

We see in Table 2 that variety inside the firm where the respondent works is relatively high regardless of the characteristic studied. On average, respondents work in firms with a nationality variety indicator of 0.56 on a scale from 0 to 0.83, with a gender variety indicator of 0.31 on a scale from 0 to 0.5 and with an age variety indicator (based on age category) of 0.48 on a scale from 0 to 0.66. Regarding the relational demography variables, on average the proportion of colleagues with a different nationality

from the respondent is 57.5 percent. The proportions belonging to another age or gender group are lower (50 percent and 32 percent, respectively). Small minorities of respondents work in firms in which all the workers have the same nationality (0.9%), the same gender (1.6%) or belong to the same age category (0.01%).

TABLE 2: Descriptive statistics on demographic variety inside the firm and dissimilarity

Variable	Mean	Std.Dev.	Min	Max
Nationality dissimilarity	0.57	0.27	0.000	1.000
Gender dissimilarity	0.32	0.24	0.000	1.000
Age dissimilarity	0.50	0.23	0.000	1.000
Nationality variety	0.56	0.18	0.000	0.816
Gender variety	0.31	0.16	0.000	0.500
Age variety	0.48	0.08	0.000	0.664

4.2. Choice of reference group

The results of the logit model for choosing colleagues as a reference group are presented in Table 3 for the full sample and the sample without employees who say that they do not compare⁶. Two specifications are given for each sample. The first includes only the variety and dissimilarity variables and excludes other covariates, while the second includes all the control variables described in the Appendix Table 1. As measured by the chi-square statistics, the models are highly significant overall for both specifications and both samples. The pseudo-R²s are relatively low, but close to the pseudo-R² found in Clark and Senik (2010), at least for the models with covariates (0.02). The coefficients for all the variables in the full models are presented in Appendix Table 2.

⁶ In the frame of the restricted sample, we tested the existence of a selection bias through a Heckman model. To do that, we used two instrumental variables in the selection equation (the probability that the employee compare his salary rather than no comparing it): (i) the fact that the employee in the last 12 months have to cope with financial difficulties and (ii) the fact that remuneration has a great importance in the employee's decision to get involved in his work. The IMR is, however, no significant.

TABLE 3: Choice of colleagues as reference group, Logit regression

	Entire sample	Entire sample	Sample without employees who say that they don't compare	Sample without employees who say that they don't compare
Variable	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Nationality dissimilarity	-0.57*** (0.12)	-0.39*** (0.13)	-0.59*** (0.13)	-0.45*** (0.13)
Gender dissimilarity	-0.21* (0.11)	-0.13 (0.14)	-0.25** (0.13)	-0.23 (0.15)
Age dissimilarity	0.17* (0.09)	0.59** (0.23)	0.07 (0.11)	0.62** (0.26)
Nationality variety	0.79*** (0.19)	0.66*** (0.19)	1.000*** (0.21)	0.88*** (0.21)
Gender variety	-0.01 (0.21)	0.07 (0.26)	-0.33 (0.23)	-0.02 (0.28)
Class of age variety	-0.47 (0.31)	-0.57 (0.36)	0.28 (0.34)	-0.33 (0.38)
Controls	No	Yes	No	Yes
	N=14,150 Prob>Chi2=0.000 Log Pseudolikelihood=-7560 Area under ROC curve=0.54 Pseudo R2=0.003	N=14,150 Prob>Chi2=0.000 Log Pseudolikelihood=-7418 Area under ROC curve=0.60 Pseudo R2=0.021	N=9,038 Prob>Chi2=0.000 Log Pseudolikelihood=-5817 Area under ROC curve=0.55 Pseudo R2=0.005	N=9,038 Prob>Chi2=0.000 Log Pseudolikelihood=-5713 Area under ROC curve=0.60 Pseudo R2=0.02

***p<0.01, **p<0.05, *p<0.10.

Robust standard errors adjusted for clusters (working in the same workplace) in parentheses.
Weighted estimations.

The results show that the demographic characteristics of the “colleagues” reference group matter in the choice of reference group. Demographic dissimilarity and variety inside the firm are significantly related to the likelihood of choosing colleagues as a reference group, although the results are stronger for the dissimilarity variables. The results are similar for both the full and restricted samples.

Referring first to the dissimilarity measures, the estimated coefficients indicate a negative relationship between dissimilarity according to nationality and the likelihood of choosing colleagues as a reference group. That is, respondents are less likely to compare their wage with colleagues when the colleagues have a higher proportion of members with a nationality different from his or her own. In the case of gender, a negative relationship with dissimilarity is also found, but the coefficient is statistically significant only when the covariates are excluded. The coefficient is of similar magnitude in both specifications, however. These results are consistent with Wheeler’s hypothesis (1966) according to which “the need for accurate self-evaluation leads predominantly to the selection of similar standards” (Corcoran et al., 2011, p.124).

The results for dissimilarity according to age are not as predicted by this theory, however. The likelihood of choosing colleagues as a reference group increases with the proportion of the co-workers who do not belong to the same age-class category as the respondent. To examine this result further, we estimate the model with a variable that indicates whether the coworkers are younger or older than the respondent (see Table 4). The estimated coefficients indicate that the choice of colleagues as the reference group is more likely when the proportion of colleagues older than the respondent is greater. This might be because older co-workers’ wages provide a signal about their future prospects, consistent with the findings of Clark et al. (2009). This result can be also interpreted in the framework of forward comparison (self-improvement). The coefficient for the variable measuring the proportion of colleagues younger than the respondent is small and not statistically significant.

TABLE 4: Choice of colleagues as reference group by taking into account the age of coworkers, Logit regression

	Entire sample	Entire sample	Sample without employees who say that they don't compare	Sample without employees who say that they don't compare
Variable	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Nationality dissimilarity	-0.55*** (0.12)	-0.38*** (0.13)	-0.59*** (0.13)	-0.45*** (0.13)
Gender dissimilarity	-0.23** (0.11)	-0.13 (0.13)	-0.26** (0.13)	-0.23 (0.15)
Part of colleagues older than the respondent	0.42*** (0.11)	0.55** (0.26)	0.12 (0.12)	0.68** (0.31)
Part of colleagues younger than the respondent	-0.09 (0.10)	0.04 (0.13)	0.00 (0.12)	0.11 (0.15)
Nationality variety	0.78*** (0.19)	0.66*** (0.19)	1.00*** (0.21)	0.87*** (0.21)
Gender variety	-0.00 (0.21)	0.15 (0.26)	-0.32 (0.23)	0.05 (0.28)
Class of age variety	-0.45 (0.31)	-0.44 (0.35)	0.29 (0.34)	-0.24 (0.37)
Controls	No	Yes	No	Yes
	N=14,150 Prob>Chi2=0.000 Log Pseudolikelihood=-7540 Area under ROC curve=0.55 Pseudo R2=0.005	N=14,150 Prob>Chi2=0.000 Log Pseudolikelihood=-7420 Area under ROC curve=0.60 Pseudo R2=0.0218	N=9,038 Prob>Chi2=0.000 Log Pseudolikelihood=-5816 Area under ROC curve=0.55 Pseudo R2=0.005	N=9,038 Prob>Chi2=0.000 Log Pseudolikelihood=-5714 Area under ROC curve=0.60 Pseudo R2=0.0230

***p<0.01, **p<0.05, *p<0.10.

Robust standard errors adjusted for clusters (working in the same workplace) in parentheses.

Weighted estimations.

Referring again to Table 3, we see that the measures of variety inside the firm do not perform as well as the dissimilarity measures. While the variable measuring the nationality variety is positively and significantly related to the likelihood of choosing colleagues as a reference group, the gender and age variety coefficients are statistically insignificant. The result for national variety is counter to the theory that heterogeneity makes the identification process more difficult and leads people to neglect the group. Rather it suggests that workers value national diversity among co-workers (holding constant the degree of dissimilarity).

Referring to the work-climate in the firm (variable in Appendix Table 2), used as a proxy of social interaction inside the firm, we find it is negatively related to the probability of choosing colleagues as a reference group. Indeed, when the employee strongly agrees with the fact that the general atmosphere within his company is good, his likelihood of choosing colleagues as the reference group decreases. This result tends to suggest that social interaction within the company is not linked to the choice of reference group, contrary to Clark and Senik (2010).

Our final analysis explores the question of whether the impacts of dissimilarity and/or variety depend on whether the respondent is in the majority group. For example, does the relationship of gender dissimilarity or diversity differ according to whether the respondent is male or female? We estimate the effect of gender on the relationship using an interaction of the gender variety and isolation variables with a dummy variable indicating the respondent is female. The results are shown in Table 5 below. For men, gender dissimilarity decreases the probability that men choose colleagues as reference group. For

women, gender dissimilarity increases the probability that they choose colleagues as reference group. This result is, however, statistically significant only for the restricted sample (without employees who say that they don't compare).

TABLE 5: Choice of colleagues as reference group with gender interaction, Logit regression

	Entire sample	Sample without employees who say that they don't compare
Variable	Coefficient (SE)	Coefficient (SE)
Female	-0.20 (0.19)	-0.17 (0.22)
Gender dissimilarity	-0.54 (0.33)	-0.70** (0.35)
Gender dissimilarity * Gender	0.63 (0.41)	0.73* (0.44)
Gender variety	0.44 (0.29)	0.38 (0.46)
Gender variety * Gender	-0.30 (0.49)	-0.27 (0.54)
Controls	Yes	Yes
	N=14,150 Prob>Chi2=0.000 Log Pseudolikelihood=-7416 Area under ROC curve=0.60 Pseudo R2=0.021	N=9,038 Prob>Chi2=0.000 Log Pseudolikelihood=-5711 Area under ROC curve=0.60 Pseudo R2=0.023

***p<0.01, **p<0.05, *p<0.10.

Robust standard errors adjusted for clusters (working in the same workplace) in parentheses. Weighted estimations.

5. Summary and conclusions

This paper has provided further evidence regarding the choice of reference group for making salary comparisons, utilizing a unique survey of workers in Luxembourg. This question is rarely addressed in the relative income literature while empirical studies have shown that relative income is an important determinant of subjective well-being. An exception is Clark and Senik (2010), who study the choice of reference group and conclude that this choice reflects social interactions. Social comparison theories emphasize that similarity matters on the formation of reference group. According to these theories, to assess their situation individuals compare their situation to those of similar others.

This paper integrates information on demographic makeup of a particular reference group, namely colleagues, to study the likelihood that it would be chosen as a reference group; this integration, to our knowledge has not been done before. To do that, we use two measures of the workplace's characteristics: the proportion of colleagues with a different gender, age or nationality as the respondent (relational demography) and a measure of variety. We find that the demographic characteristics of the group matter on the choice of reference group. Consistent with self-categorization theory, we find a negative relationship between the proportion of colleagues with a different gender or a different nationality as the respondent and the likelihood to choose colleagues as reference group. The results for age dissimilarity are inconsistent with these. We find a positive relationship between the proportion of colleagues who don't belong to the respondent's age group and the likelihood of choosing colleagues as a reference group. Further analysis shows that the choice of colleagues as the reference group is more likely when the proportion of colleagues older than the respondent increases. The variety measure used provides mixed results depending on whether we are interested in nationality, gender or age.

Further work allowing reference groups to vary across workers should study the extent to which it is important to control for the choice of reference group when estimating the relationship between relative wage and satisfaction with pay.

Appendix. Table 1 Descriptive statistics

	Entire sample	Sample without employees who say that they don't compare
	Proportion (%)	Proportion (%)
Women	32.4	31.4
Nationality		
Belgium	15.2	14.8
French	31.4	33.4
German	13.1	14.0
Portuguese	14.2	13.2
Luxembourgish	17.6	15.8
Other	8.3	8.8
Age		
Less than 30 years	17.2	20.1
30-49 years	63.2	62.9
50 years and more	19.6	17.0
Level of education		
Secondary inferior or less	18.0	16.6
Secondary superior	44.5	41.9
Post secondary	37.5	41.5
Couple	79.1	78.2
Whether there is a child	58.7	56.5
Health problem	33.0	33.4
Union member	31.3	29.6
Seniority on the Luxembourgish labor market	mean 13.4 (std.dev. 9.4)	mean 12.3 (std.dev. 8.8)
Work full-time	88.4	89.7
Log of hourly wage	mean 2.97 (std.dev. 0.4)	mean 2.97 (std. dev. 0.4)
Permanent contract	93.4	93.4
Work climate		
Bad work climate	30.9	31.8
Good work climate	58.3	58.0
Very good work climate	10.8	10.2
Sector		
Industry	14.2	13.7
Construction	14.8	15.1
Commerce and catering	19.1	18.7
Transport	8.60	8.5
Informatics and communication	5.9	6.3
Finance	18.9	20.3
Specialised activities, scientific and technical	9.4	9.9
Administrative tasks	7.1	5.7
Others sectors	1.8	1.9
Firm's size		
15-49 employees	25.2	24.7
50-299 employees	38.00	38.8
300 employees and more	36.8	36.5
Seniority in the firm		
Less than 3 years	18.6	19.7
3-6 years	26.3	28.0
7-9 years	12.1	12.0
10-19 years	26.2	25.2
more than 20 years	13.6	11.5

Appendix. Table 2. Logit model: Choose colleagues as reference group

	<i>Entire sample</i>	<i>Sample without employees who say that they don't compare</i>
	Coefficient (SE)	Coefficient (SE)
Women	-0.06 (0.06)	0.032 (0.07)
Nationality		
Belgium	0.15* (0.08)	0.22** (0.09)
French	0.33*** (0.08)	0.29*** (0.08)
German	0.14 (0.09)	0.11 (0.09)
Portuguese	0.01 (0.11)	0.02 (0.11)
Other	0.29*** (0.10)	0.28*** (0.10)
Luxembourgish	<i>Ref.</i>	<i>Ref.</i>
Age		
Less than 30 years	0.26*** (0.10)	0.09 (0.11)
30-49 years	0.39*** (0.12)	0.37*** (0.13)
More than 50 years	<i>Ref.</i>	<i>Ref.</i>
Level of education		
Secondary inferior or less	0.03 (0.09)	0.23** (0.09)
Secondary superior	0.02 (0.06)	0.23*** (0.07)
Post secondary	<i>Ref.</i>	<i>Ref.</i>
Couple	0.03 (0.06)	0.03 (0.06)
Whether there is a child	-0.06 (0.06)	-0.04 (0.06)
Health problem	0.07 (0.05)	0.00 (0.05)
Union member	-0.01 (0.05)	-0.01 (0.06)
Seniority on the Luxembourgish labor market	-0.03*** (0.01)	-0.02* (0.01)
Square of seniority on the Luxembourgish labor market	0.00 (0.00)	0.00 (0.00)
Work full-time	0.13* (0.08)	0.05 (0.09)
Log of hourly wage	-0.53*** (0.09)	-0.50*** (0.09)
Permanent contract	-0.09 (0.09)	-0.07 (0.10)
Work climate		
Bad work climate	<i>Ref.</i>	<i>Ref.</i>
Good work climate	-0.09 (0.05)	-0.05 (0.05)
Very good work climate	-0.21** (0.09)	-0.08 (0.09)
Sector		
Industry	-0.08 (0.11)	0.03 (0.12)
Construction	-0.13 (0.13)	-0.15 (0.14)
Commerce and catering	-0.38*** (0.10)	-0.32*** (0.10)

Transport	-0.20 (0.13)	-0.18 (0.13)
Informatics and communication	0.02 (0.10)	0.11 (0.11)
Specialised activities, scientifics and technical	-0.19** (0.09)	-0.14 (0.09)
Administrative tasks	-0.68*** (0.15)	-0.40** (0.15)
Others sectors	0.20 (0.18)	0.28 (0.20)
Finance	<i>Ref.</i>	<i>Ref.</i>
Firm's size		
15-49 employees	-0.32*** (0.07)	-0.34*** (0.07)
50-299 employees	-0.14** (0.06)	-0.19*** (0.06)
300 employees or more	<i>Ref.</i>	<i>Ref.</i>
Seniority in the firm		
Less than 3 years	<i>Ref.</i>	<i>Ref.</i>
3-6 years	0.23*** (0.07)	0.21*** (0.07)
7-9 years	0.36*** (0.09)	0.40*** (0.09)
10-19 years	0.41*** (0.09)	0.42*** (0.09)
more than 20 years	0.58*** (0.11)	0.60*** (0.12)
Gender dissimilarity	-0.13 (0.14)	-0.23 (0.15)
Nationality dissimilarity	-0.39*** (0.13)	-0.45*** (0.13)
Age dissimilarity	0.59** (0.23)	0.62** (0.26)
Nationality variety	0.66*** (0.19)	0.88*** (0.21)
Gender variety	0.07 (0.26)	-0.02 (0.28)
Age variety	-0.57 (0.36)	-0.33 (0.38)
Constant	0.05 (0.41)	0.23 (0.46)
Observations	14,150	9,038

***p<0.01, **p<0.05, *p<0.10.

Robust standard errors adjusted for clusters (working in the same workplace) in parentheses.

Weighted estimations.

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