A META-ANALYSIS OF THE UNION-JOB SATISFACTION RELATIONSHIP[1]

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Abstract

The purpose of this study is to provide a systematic and quantitative review of the existing empirical evidence on the effects of unionization on job satisfaction. We conducted a Meta-Regression Analysis (MRA) with results from a pool of 224 estimates from 60 studies published between 1978 and 2015. The accumulated evidence indicates that unionization is negatively related to job satisfaction, especially in the UK. However, when primary studies control for endogeneity of union membership and/or use time-series datasets, the results of the MRA indicate that the difference in job satisfaction between unionized and non-unionized workers disappears. These results suggest that reverse causation and time-varying endogenous effects such as anticipation and adaptation effects play a key role in explaining the relationship between unionization and overall job satisfaction.

INTRODUCTION

As the nature of work has been changing over the last decades, researchers in the fields of human resources management and employment relations have closely examined the set of feelings that workers hold toward their job and its relationship to a variety of important individual and organizational characteristics. Particularly, there are many studies that explore the effects of unionization on job satisfaction. In his seminal work, Freeman (1978) showed that unionized workers tend to report lower job satisfaction compared to nonunionized

[1] Preliminary working draft – Please do not quote without author's permission.

workers while at the same time showing less intention to quit. He suggested that this apparent paradox might reflect the role of unions as a 'voice' institution, encouraging workers to express their discontent rather than to quit. The voice explanation of the dissatisfaction paradox is still disputed vigorously nowadays among scholars. In order to confirm that a difference in job satisfaction persists after controlling for other factors such as working conditions, a sizeable number of empirical studies have explored the effects of unionization on overall job satisfaction. However, these studies have reported numerous conflicting results regarding whether or not union membership affect job satisfaction. Hence, despite this rich empirical literature, there are still quite a number of issues that have yet to be seriously scrutinized in a more systematic way.

The aim of this paper is to apply meta-analysis to explore the effects of union membership on overall job satisfaction[i]. Meta-analysis is particularly useful for identifying and quantifying patterns, for drawing inferences from a diversity of results and for generalizing from results derived from numerous singular studies (Hunter & Schmidt, 2004; Stanley & Doucouliagos, 2012). This research assesses the relationship between unionization and job satisfaction by providing a comprehensive review of the extant econometric estimates using Meta-Regression Analysis (MRA). We employ MRA to (1) quantify the effect of unionization on job satisfaction, and (2) identify the main factors underlying the diversity in the results reported in existing empirical studies.

Meta-analysis of the relationship between union membership and job satisfaction is important for a least two main reasons. First, despite a voluminous literature, controversy continues regarding the paradox of unionized worker dissatisfaction. It is thus instructive to explore the extent to which the differences in the empirical literature are due to how the studies have been constructed rather than due to differences in the underlying relationship between unionism and job satisfaction. Second, although unions have declined in importance, they continue to

be an important force in many industries and often are key players at the heart of organizational change, which may in turn affect worker's well-being and consequently organizational performance (Tett & Meyer, 1993; Warr, 1999).

The article is set out as follows. Section 1 presents a brief discussion of the competing theoretical arguments. Section 2 describes the data used in the meta-analysis and section 3 presents the methodology of the MRA approach. Section 4 discusses the MRA results. Finally, section 5 concludes the article and considers some of the policy implications.

1. THEORETICAL CONSIDERATIONS

There is now a sizeable literature exploring the relationship between unionization and job satisfaction (see Hammer and Avgar, 2005 for a review). As early as the 1970s, Freeman (1978) notes that unionized workers were less satisfied than were non-union workers – but that the former were also less inclined to quit their jobs. Drawing on Hirschman's (1970) exit/voice theory, Freeman (1978) argues that unionized work environments protect employees, who are thus more willing to express their discontent with working conditions. In such a context, union members have a voice mechanism to express dissatisfaction with current terms and conditions, and this mechanism may lead them to identify an increasing number of job characteristics that should be improved. A number of other authors have provided alternative explanations for the negative association between unionization and job satisfaction. For example, neither Pfeffer and Davis-Blake (1990) nor Gordon and Denisi (1995) are convinced by the arguments advanced by Freeman (1978) that union voice affects job satisfaction. Pfeffer and Davis-Blake (1990) show that union jobs are, above all, less attractive than comparable non-union jobs in certain facets such as the nature of tasks or working conditions (see also Gordon and Denisi, 1995; Bender and Sloane, 1998). That is,

unpleasant jobs are more likely to lead to unionization (in the mining industry, chemical industry, and so on). In addition, jobs may also become less attractive after unionization if management reacts to higher labour costs by decreasing allocations to the physical work environment or putting pressure on employees (Hammer & Avgar, 2005). Another research stream insists on the fact that the individual worker who joins a union has different personal characteristics from those who prefer not to be unionized (Bryson et al. 2010). That is, dissatisfied workers have more incentive to join a union; therefore, it is job dissatisfaction that influence union membership. In any case, it would be necessary to distinguish between characteristics of union jobs and characteristics of union workers. All these arguments refers to the "sorting hypothesis" (or reverse causation), which postulates that the characteristics of individuals who join the union or the features of the workplace are likely to influence the discontent of union members and the fact that individuals tend to unionize (Bryson et al. 2010).

Conversely, Berger, Olson and Boudreau (1983) consider that union membership has a direct effect on job outcomes workers receive (for example, pay and job security). If this were so, one would expect job satisfaction to be highest where unions are present in the workplace or where there is a collective agreement. This means that it would be also necessary to distinguish between union membership and union coverage (or collective bargaining coverage). Indeed, in some European countries, the proportion of workers covered by a collective agreement is far more important than the proportion of unionized workers. An extreme case is France where union density is relatively low since the 1970s (below 8 percent of the workers belong to a union) whereas bargaining coverage is one of the highest of all industrialized countries (more than 95 percent). In France, for example, there is a legal mechanism that extends collective agreement to all workers whether or not they are unionized. In such a situation, workers can act as free riders and take advantage of union

action without joining a union (Laroche, 2015). In theory, union membership should have no causal effect on job satisfaction in such industrial relations context since working conditions should be similar for members and non-members. Garcia-Serrano (2009) suggests that job satisfaction could differ between union members and non-members because the former may have access to union private goods such as grievance procedure (in the case of Spain) or protected status (in the case of France)[ii]. Taking all these aspects into account, the interaction between union (or bargaining) coverage and union membership would suggest (1) that workers in workplaces with local agreement will report the highest levels of job satisfaction and (2) that non-unionized workers in workplaces with a local agreement will exhibit higher levels of job satisfaction. However, Garcia-Serrano (2009) emphasizes the importance of controlling reverse causality in the sense that dissatisfied workers who initiate local bargaining have a higher propensity than others for job dissatisfaction. Whatever the industrial relations context, it appears that endogeneity is one of the key issue in this literature.

More recently, Powdthavee (2011) goes further and states that most of the empirical studies failed to take into account the levels of worker's job satisfaction in the periods before and after joining a union. According to him, it is essential to use panel datasets in order to control for unobserved heterogeneity due to time-varying endogenous effects. He points out the importance of the anticipation effects as workers' perception about work conditions decline over time that lead them to join a union in the future. Powdthavee (2011) stresses the consequence of the adaptation process which lead workers to become accustomed to improvements in their working conditions and increase their expectation level (Stutzer, 2004).

Given these differing theoretical arguments, it is instructive to undertake a quantitative evaluation of the available evidence. A number of empirical studies have explored the link between unionization and job satisfaction. Although most have found a negative association,

many of these do not produce statistically significant results, implying the possibility that unions have no effect on job satisfaction at all. To complicate matters further, a number of studies established a positive association between unionization and job satisfaction (Kalleberg and Loscocco, 1983; Pfeffer & Davis-Blake, 1990; Powdthavee, 2011). Most of these failed to establish statistically significant results, and hence imply no effect on job satisfaction. Given the conflicting theoretical arguments and empirical results, we do not offer formal hypotheses. However, in this research, we address the following research questions: (1) is union membership related to overall job satisfaction? (2) are there observable differences between countries and at different time? More broadly, (3) what other factors might explain the heterogeneity in the reported unionization/job satisfaction effects? We use meta-regression analysis to assess the existing evidence and to draw inference from it.

2. DATA

The starting point for meta-analysis is the compilation of all published econometric studies that explore the relationship between unionization and job satisfaction. In creating the sample of studies, we commenced with a database search for relevant studies in EconLit, ISI Web of Science, Business Source Premier, Ebsco and Google scholar, using the following broad keywords: "union", "unionization", "unionism", "labor relations", "employment relations", "industrial relations", "satisfaction at work", "job satisfaction", "dissatisfaction", "happiness", and "well-being". We also searched manually all the academic journals that have published studies on job satisfaction, i.e., *Academy of Management Journal*, *Industrial Relations*, *Industrial and Labor Relations Review*, and *British Journal of Industrial Relations*. Our search also included examination of references in empirical studies to other studies that might report unionization/job satisfaction effects. The search was completed in July 2015.

2.1. Selection criteria for inclusion

It is essential to adopt an explicit set of selection criteria to create a dataset suitable for meta-analysis. The studies included in the meta-analysis should be so comparable that their differences can be coded. The coding procedure serves as the basis for the transparency and replicability of the meta-analysis[iii]. In order to be included in the meta-dataset, studies had to have met two criteria. First, they have to report an estimate that can be statistically analysed. That is, studies need to report regression coefficients, sample size, standard errors and/or *t*-statistics. Second, overall job satisfaction must be the dependent variable and union membership must be one of the independent variables (Table A1 in Appendix lists the studies excluded from the meta-analysis)[iv]. Following Doucouliagos and Laroche (2003), we made the choice to collect only published studies. The main reason is that published studies have gone through the refereeing process and, hence, should be of higher quality than unpublished works. Moreover, the risk of omitting unpublished papers is certainly minimal in this large and mature literature (see Stanley and Doucouliagos, 2012, for a discussion of this issue). Our data include both estimates from studies that take endogeneity into consideration with those that do not. This allows us to compare results from OLS with those from estimators that address endogeneity such as IV models. Indeed, Bryson et al. (2010) argue that certain union members could join a union because they are genuinely unsatisfied with their work. The consequence of this is that simultaneity might be a severe issue in this literature. Hence, it is judicious to include all estimates and then conduct tests for differences between estimators.

2.1.1. Measures of the dependent variable

The dependent variable in the primary studies is either union membership or union coverage.

Indeed, some studies consider that job satisfaction among union members is a product of different treatment of workers in workplaces where there is a high level of union density or where employees are covered by a collective agreement (or 'recognized' by the employer in the case of UK) (see for example, Clark, 2001; Garcia-Serrano, 2009; Guest and Conway, 2004; Powdthavee, 2011). Hence, we have extended the variable measuring union membership in the meta-analysis by selecting also studies using a measure of union coverage (or collective bargaining coverage) and/or union density. In our dataset, only 17% of the estimates used union coverage (percentage of workers covered by a collective agreement or covered by a trade union), and the remainder used union membership (whether a worker is unionized or not).

2.1.2. Measures of overall job satisfaction

We did not impose any limitations on the measures of overall job satisfaction. We obviously excluded studies using measures of satisfaction with distinct aspects of work such as pay, job security, or the work itself. However, studies were included even if they use different measures of overall job satisfaction with item scored on various Likert scale (4-point scale, 5-point scale, 7-point scale, 10-point scale). Studies using binary outcome variable (dummy variable equal to 1 if the worker is satisfied and 0 otherwise) were all included in the dataset. We use the MRA to examine the extent to which these distinct measures make a difference.

From this process of literature elimination, we found 60 studies that contained 224 estimates of the relationship between unionization and job satisfaction. All these studies are listed in Table 1, together with the sample size, the country investigated, the period of the data and the method of analysis.

TABLE 1
Studies included in the Meta-Analysis (*n*=224; *k* = 60)

Authors/year of publication	*Country analysed*	*No of estimates*	*Period*	*Method of Analysis*
Artz (2012)	USA	4	1979-2004	Probit
Artz (2010)	USA	4	1979-2004	Probit
Artz (2008)	UK	3	2000	Probit
Artz & Kaya (2014)	USA	4	2008	Probit
Bartel (1981)	USA	4	1969-1971	OLS/probit
Belfield & Harris (2002)	UK	6	1985-1990	Probit
Bender, Donahue & Heywood (2005)	USA	3	1997	Probit
Bender & Sloane (1998)	UK	12	1986-1987	Probit
Berg (1999)	USA	3	1996-1997	Logit
Blanchflower & Oswald (1999)	USA/Various	11	1972-1996	Probit
Bockerman & Ilmakuna (2006)	Finland	1	1997	Probit
Borjas (1979)	USA	15	1971	OLS, Probit
Bryson, Cappellari & Lucifora (2004)	UK	5	1998	Probit/IV
Cappellari, Lucifora & Piccirilli (2004)	UK	2	1998	Probit
Clark (1997)	UK	4	1991	Probit
Clark, Oswald & Warr (1996)	UK	3	1991	Probit
Cotti, Haley & Miller (2014)	USA	2	2008	Probit
Donohue & Heywood (2004)	USA	12	1979	Probit
Drago, Estrin & Wooden (1993)	Australia	1	1988	Probit
Drakopoulos & Theodossiou (1997)	UK	2	1986	Probit
Evans & Ondrack (1990)	Canada	2	1980	OLS
Fiorillo & Nappo (2014)	Italy	1	1993-2000	Probit
Flemming & Kler (2011)	Australia	2	2001	Probit
Freeman (1978)	USA	3	1969-1972	OLS
Garcia-Serrano (2009)	Spain	5	2000-2003	Probit
Garcia-Serrano (2011)	Spain	4	2001-2004	Probit
Gius (2012)	USA	1	2007	Logit/IV
Gordon & Denisi (1995)	USA	4	1980-1986	OLS/Logit
Green & Heywood (2008)	UK	1	1998-2004	Probit
Green & Heywood (2010, 2015)	UK	4	1996-2007	POLS
Guest & Conway (2004)	UK	5	1996-1998	OLS
Hersch & Stone (1990)	USA	3	1986	OLS
Heywood, Siebert, Wei (2002)	UK	4	1991-1994	Logit/OLS
Heywood & Wei (2006)	USA	2	1988-1990	Probit
Holland, Pyman, Cooper & Teicher (2011)	Australia	3	2007	Probit
Idson (1990)	USA	2	1977	Probit
Jones & Sloane (2009)	UK	2	2002	Probit
Kalleberg & Loscocco (1983)	USA	2	1972-1973	OLS
Kim & Kim (2004)	Korea	1	2000	OLS
Kosteas (2011)	USA	6	1996-2006	OLS/Probit
Lillydahl & Singell (1993)	USA	3	1988	Probit
Lincoln & Boothe (1993)	USA/Japan	4	1982-1983	OLS
Long (2005)	Australia	4	2001	Probit
Meng (1990)	Canada	1	1988	OLS
Miller (1990)	Australia	4	1985	OLS/Probit
Mohr & Zoghi (2008)	Canada	1	1999-2002	Probit
Pfeffer & Davis-Blake (1990)	USA	6	1977	OLS
Pohler & Luchak (2014)	Canada	2	2003-2004	OLS
Pouliakas & Theodossoriou (2009)	UK	4	1998-2005	POLS
Powdthavee (2011)	UK	6	1991-2000	OLS
Renaud (2002)	Canada	2	1989	Probit
Rose (2003)	UK	1	1999	OLS
Sloane & Williams (2000)	UK	6	1986	Probit
Smerek & Peterson (2007)	USA	1	2004	OLS
Sousa-Poza & Sousa-Poza (2003)	UK	3	1991-2000	Probit
Theodossiou & Vasileiou (2007)	Europe	6	1996	OLS
Theodossiou & Zangelidis (2009)	UK	2	1991-2004	Probit
Uppal (2005)	Canada	2	1991	Probit
Wooden & Warren (2004)	Australia	4	2001	Probit
Zeytinoglu et al. (2013)	Turkey	4	2008	OLS

Notes: *n* is the number of estimates and *k* is the number of individual studies.

2.2. Effect Size

It is important that the measure of the effect of unionization on job satisfaction be comparable within and between studies. Some of the empirical studies use a logit or probit model to estimate the relationship, whereas others use linear regression estimates. Following Doucouliagos and Laroche (2003, 2009), we converted the linear regression coefficient into partial correlations, which measure the strength of the effects of union membership on job satisfaction after controlling for other covariates.

However, 43 of the 60 studies that examine the effects of union membership on job satisfaction treat the dependent variable as binary or ordinal. Some studies dichotomize the outcome variable (job satisfaction) so that it takes the value of 1 if the worker is satisfied or highly satisfied with his job and 0 otherwise. Others created alternative measure of job satisfaction by asking respondents how satisfied or dissatisfied they are with their job, using a scale ranging from 1 to 4 or 1 to 7 for example. These studies use estimators such as logistic and ordered probit regression.

To combine the results of all existing studies, we investigated two alternate approaches. First, we conducted the meta-analysis by converting all estimates into partial correlations ignoring the distinction between the two groups of studies. Second, following Askarov and Doucouliagos (2013), we calculated the tetrachoric correlation for the ordinal outcome studies and combined these correlations with the partial correlation wherein the dependent variable is continuous. That is, we converted the reported logit/probit results into odds ratios and then we transformed odds ratios into product-moment correlations, using the Pearson (1900) procedure (see Bonett 2007 for details). We obtained tetrachoric correlations that are comparable to other correlations. Finally, it occurs that the results are rather robust to the approach taken. In our meta-analysis, we present the results using partial correlations for the

full sample of 224 estimates and compare these to the results from the combined partial and tetrachoric correlations.

For sensitivity and additional analyses, we also report the results from a meta-analysis ordered probit model using the direction and statistical significance of the estimates. In this meta-analysis, we distinguish between negative, insignificant and significantly positive study results (see Koetze et al. 2009).

2.3. Descriptive Analysis

The table 2 shows that 67% of the estimates are negative. When a distinction is made between statistically significant and insignificant results, the number of insignificant negative results is of the same order of magnitude as the number of insignificant positive results. However, a significantly negative relationship is observed frequently (39%), whereas very few observations find a significantly positive relationship between unionization and job satisfaction (8%). Hence, a majority of studies suggest a negative effect of union membership on job satisfaction, but the evidence for statistical significance of a negative effect is not so robust. Meta-regression analysis is well suited to datasets with such conflicting results.

One possible explanation for the absence of an overall effect is that existing studies does not adequately account for the potential endogeneity of union membership and job satisfaction. Perhaps, workers tend to join a union only when they are dissatisfied with their job. If the level of unionization is affected by job satisfaction, then OLS regression estimates of the unionization-job satisfaction effect might be biased. Table 2 also reports the distribution of estimates that address endogeneity. At first glance, there is no evidence within this subset of studies of a less negative union membership effect, with 33% of estimates indicating a negative and significant effect.

TABLE 2
Descriptive statistics of estimated effects of union on job satisfaction

Statistics	Number	%	Number	%
	All studies		Studies that address endogeneity	
Number of studies	60		9	
Number of estimates	224	100	24	100
Negative and statistically significant	87	39	8	33
Negative insignificant	63	28	7	29
Positive insignificant	55	25	6	25
Positive and statistically significant	19	8	3	13
Partial correlations				
Un-weighted average	-0.017 (-0.023 to -0.011)		-0.016 (-0.040 to +0.009)	
Weighted average	-0.012 (-0.015 to -0.009)		-0.010 (-0.024 to +0.004)	
Partial & tetrachoric correlations				
Un-weighted average	-0.024 (-0.036 to -0.012)		-0.033 (-0.073 to +0.007)	
Weighted average	-0.018 (-0.022 to -0.014)		-0.022 (-0.045 to +0.000)	

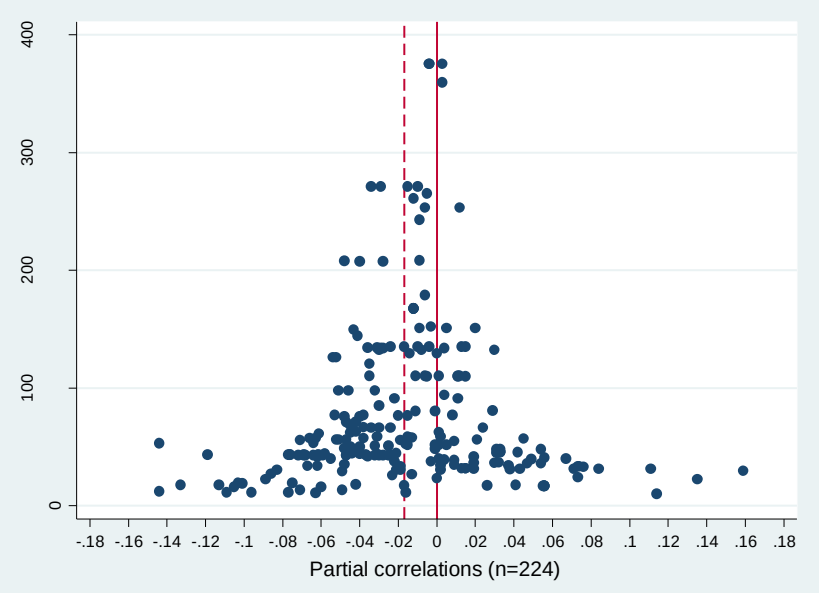
Notes: The unweighted average is the simple average of observations. The weighted average is calculated by using the inverse of variance as weights.

2.3.1. Funnel Plots

An interesting way of illustrating the distribution of the reported estimates is to construct a funnel plot. A funnel plot is a scatter diagram of all empirical estimates of a given phenomenon in which the size of the estimated effect is plotted on the *x*-axis against a measure of the estimate's precision (i.e. the inverse of the estimates' standard errors, 1/SE) plotted on the *y*-axis. The funnel plot also provides a simple tool for visualizing possible publication bias (Stanley and Doucouliagos, 2010). Publication bias is a subtle form of bias in empirical research arising when the selection of studies for publication is made based on the statistical significance of results and/or on whether the results satisfy preconceived theoretical expectations (Doucouliagos et al., 2005). In the absence of publication bias, the effect size should be symmetrically distributed around the 'true' value of the effect. Empirical estimates

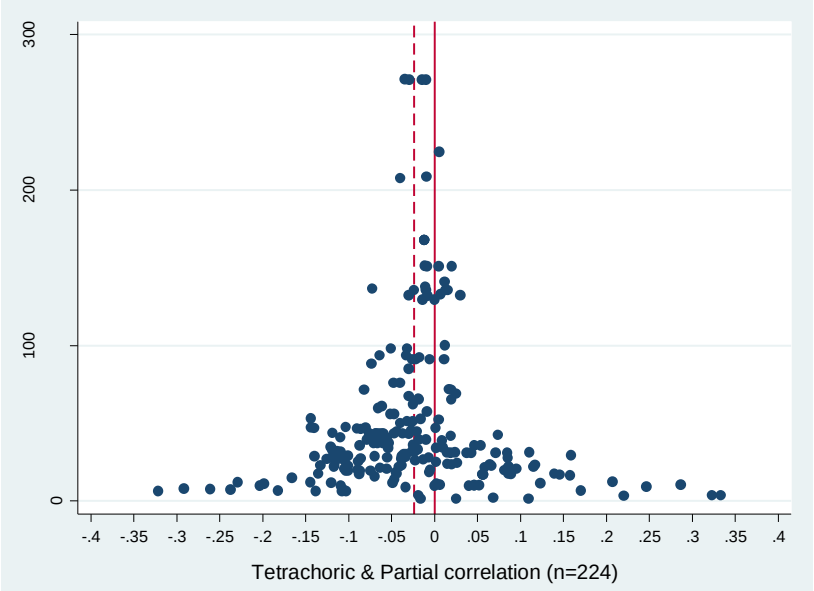
with less precision are more widely spread at the bottom of the graph, while more precise estimates are found at the top of the funnel.

FIGURE 1 – Funnel Plot of Estimates of Union membership on Job Satisfaction



Notes: the vertical solid line shows a zero effect size. The vertical dash line indicates the location of the uncorrected and unweighted average partial correlation (r = -0.017).

FIGURE 2 – Funnel Plot of Estimates of Union membership on Job Satisfaction

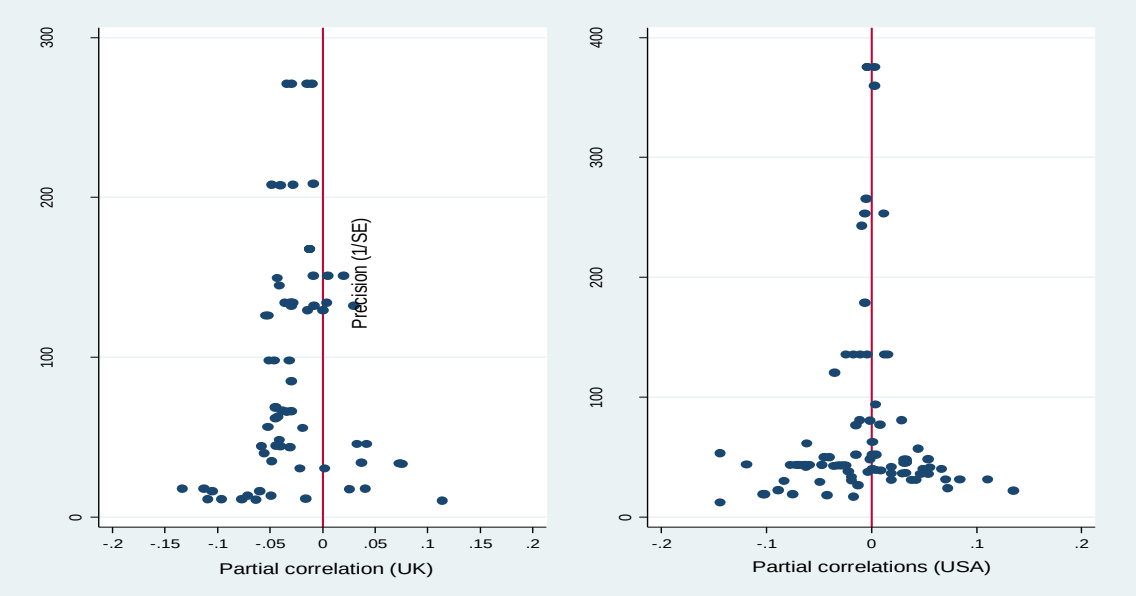


Notes: the vertical solid line shows a zero effect size. The vertical dash line indicates the location of the uncorrected and unweighted average partial correlation (r = -0.024).

Figure 1 is a funnel plot of 224 partial correlations of the effects of unionization on overall job satisfaction. The funnel plot illustrates the distribution of the results. While the funnel graph appears to be symmetrical, suggesting the absence of publication bias, there is some negative skewness in the distribution (the skewness coefficient for Fig.1 is -0.38). Figure 2 presents the funnel graph for the tetrachoric and partial correlations of the effect of union membership on job satisfaction. This distribution has the expected symmetrical funnel shape. However, there is also a left skewness (the skewness coefficient is -0.59) suggesting a preference for reporting negative effects in the existing literature.

Figure 3 presents the funnel plots of the partial correlations of the effects of unions on job satisfaction in the USA and in the UK. While the funnel plot for the USA appears to be symmetrical, suggesting no publication bias, there is some negative skewness in the distribution of the partial correlations in the UK, indicating a preference for reporting negative union/job satisfaction effects.

FIGURE 3 – Funnel Plots of Estimates of Union membership on Job Satisfaction for USA and UK



Note: the vertical solid line shows a zero effect size.

Although funnel plots are illustrative, they may be used to identify heterogeneity. In the case of Figures 1, 2 and 3, we can see that there is much variation in the existing empirical results. Hence, it will be useful to adopt a MRA approach to address heterogeneity (Stanley and Doucouliagos, 2012).

2.3.2. Chronological ordering of the data

The graphical representation of meta-data using chronological ordering may provide additional insights, as it can capture the evolution of the literature.

FIGURE 4 – Chronological ordering of the data (*n*=224)

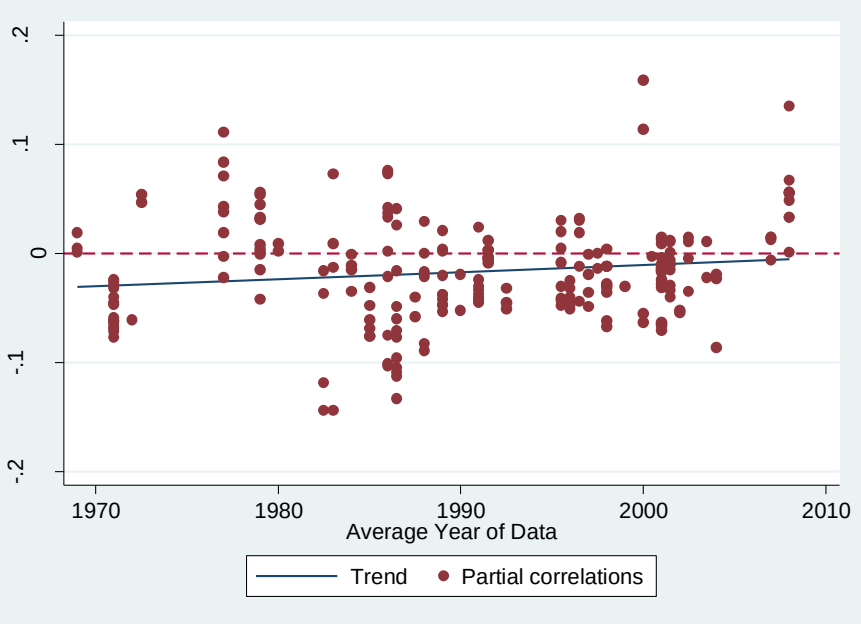


Figure 4 presents the evolution of the effects of union membership on job satisfaction. The horizontal axis indicates the reported effects in chronological order. A simple linear trend line can be fitted to this area of research and shows a rise in the reported partial correlations of unionization on job satisfaction. This upward trend potentially has an important economic interpretation. One can argue that union membership has less and less impact on job satisfaction over time. However, these results may be also due to studies and data improving

over the years. The publication trend may mimic unobservable changes in the research design, the data and/or econometric techniques over years. For instance, studies accounting for the endogenous selection induced by the sorting of workers into unionized job are rather recent. Although this chronological graph help us to identify trends and path dependencies among empirical findings, such effects can also be captured through the MRA (see section 4 below).

3. META-REGRESSION ANALYSIS (MRA) METHODOLOGY

The MRA was performed in two steps. First, the data were tested for the presence of publication selection bias. When publication selection is present, there is a positive association between the reported effect and its standard error; otherwise, estimates and their standard errors will be independent (see Stanley and Doucouliagos, 2012 for more details). Hence, we explored the presence of publication bias by estimating the following model:

$$Effect_{ij} = \beta_0 + \beta_1 SE_{ij} + \varepsilon_{ij} \qquad (1)$$

Where *Effect* is the correlation between union membership and job satisfaction, *SE* is the standard error of the correlations, β_0 and β_1 are parameters to be estimated, *i* and *j* denote the *i*th estimate from the *j*th study, and ε are the residuals. Equation (1) is known as the Funnel Asymmetry-Precision Effect Test, or FAT-PET (Stanley, 2005, 2008), which provides a test of funnel asymmetry that is consistent with publication selection bias. If β_1 is statistically different from zero then we can consider that there is no publication bias. Estimates of β_0 provide an unconditional measure of the genuine empirical effect of unionization on job satisfaction corrected for any publication selection bias (Stanley, 2008; Stanley and Doucouliagos, 2012).

The second step was to estimate a MRA model to investigate the heterogeneity and selection of reported research results:

$$Effect_{ij} = \beta_0 + \beta_1 SE_{ij} + \sum \beta_k Z_{ki} + \varepsilon_{ij} \qquad (2)$$

where *Effect* denotes the correlation between unionization and job satisfaction, *SE* is the standard error of the correlations, *Z* is a vector of moderator variables and ε is the disturbance term. Equation (2) is used to identify the factors that create heterogeneity in reported estimates. Some of this heterogeneity will reflect real moderators, but some will be created by research design choices. Heterogeneity can be identified and quantified by the *Z* vector in Equation (2). The moderator variables used to explore genuine heterogeneity and heterogeneity introduced by research design choices are listed in Table 3. Different types of moderator variables are hypothesized to influence the estimated effect of unionization on job satisfaction: variables capturing measurement and definitions, variables capturing model specification and estimation, and study-specific variables.

TABLE 3
Variable Definitions and Summary Measures

Moderator variables		*Mean*	*s.d*
SE	Standard error of the correlation	0.023	0.018
COVERAGE	=1 if study takes into account whether workers are covered by a union or collective bargaining at the workplace level	0.174	0.380
Group 1: Measures of job satisfaction			
JS 1-4	= 1 if JS measured using a 4-point Likert scale	0.281	0.450
JS 1-5	= 1 if JS measured using a 5-point Likert scale	0.125	0.331
JS 1-7	= 1 if JS measured using a 7-point Likert scale	0.210	0.408
JS 1-10	= 1 if JS measured using a 10-point Likert scale	0.125	0.331
JS DUMMY	= 1 if JS measured as a binary outcome variable (used as the base)	0.188	0.391
Group 2: Data characteristics			
SERVICE	=1 if estimates are for the service industry	0.058	0.234
VARIOUS	=1 if estimates are for various industries (used as the base)	0.884	0.321
PANEL	=1 if estimate relates to panel data	0.045	0.207
POOLED	=1 if estimate relates to pooled cross sectional data	0.143	0.351
CROSS	=1 if estimate relates to cross sectional data (used as the base)	0.821	0.384
DF	=1 if degrees of freedom < 2,562 (median)	0.500	0.501
Group 3: Spatial, temporal and econometric issues			
1970	= 1 if the study used observations prior 1980	0.196	0.398
1980	= 1 if the study used observations between 1980 and 1989	0.272	0.446

1990	= 1 if the study used observations between 1990 and 1999 (used as the base)	0.326	0.470
2000	= 1 if the study used observations after 2000	0.259	0.439
USA	= 1 if the study used US data	0.402	0.491
UK	= 1 if the study used UK data (used as the base)	0.317	0.466
OTHERS	= 1 if the study used data from other countries	0.254	0.437
ECOJOURN	= 1 if the estimates come from a publication in an Econom. Journal	0.420	0.495
IRJOURN	= 1 if the estimates come from a publication in an Ind. Rel. Journal	0.393	0.489
MANAG	= 1 if the estimates come from a publication in a management journal (used as the base)	0.121	0.326
OLS	= 1 if used ordinary least square (used as the base)	0.281	0.451
ENDOG	= 1 if used 2SLS or IV Probit estimations	0.107	0.310
PROBIT	= 1 if used Logit or probit estimations	0.603	0.490
Group 4: Control Variables in primary studies			
FIRMSIZE	= 1 if the study used firm/organization size as a control variable	0.603	0.490
PROMOTION	= 1 if the study used promotion opportunities as a control variable	0.232	0.423
WAGES	= 1 if the study used wage or pay level as a control variable	0.821	0.384
GENDER	= 1 if the study used gender as a control variable	0.598	0.491
MALESUBGROUP	= 1 if the estimates come from a male subgroup	0.246	0.431
FEMALESUBGROUP	= 1 if the estimates come from a female subgroup	0.125	0.331
RACE	= 1 if the study used race as a control variable	0.459	0.499
HOURS	= 1 if the study used working hours as a control variable	0.603	0.490
AGE	= 1 if the study used age as a control variable	0.799	0.402
EDUCATION	= 1 if the study used education as a control variable	0.915	0.279
MARRIED	= 1 if the study used marital status as a control variable	0.638	0.482
TRAINING	= 1 if the study used training opportunities as a control variable	0.821	0.383
IRCLIMATE	= 1 if the study used good IR climate as a control variable	0.754	0.431
OCCUPATION	= 1 if the study used occupation as a control variable	0.821	0.384

4. RESULTS

In this section, we present the results from the MRA using partial correlations (and eventually partial and tetrachoric correlations) followed by a series of robustness checks using both meta-averages and a meta-analysis that focusses on the direction and significance of the results.

4.1. FAT-PET analysis

Table 4 provides the estimates of Equation (1). Panel A reports the results when all estimates are converted into partial correlations. Column 1 presents the results using OLS with robust standard errors. However, since we have multiple estimates from each study, data dependence might be an issue. Hence, column 2 reports the results after correcting for data dependence using clustered standard errors. In column 3, we utilize weighted least squares (WLS) using inverse of variance as the weight as suggested by Hedges and Olkin (1985). WLS gives more

weight to estimates that are more precise. In panel A, the coefficient for standard error (SE) is non-significant in all three columns. Hence, we can conclude that there is no significant selection bias in this literature. Panel B reports FAT-PET analysis for meta-data using partial correlation and tetrachoric correlations as a measure of the effect size. The coefficients for standard error are also non-statistically significant, except for the OLS estimation without correction for dependency. The conclusions drawn from this panel are finally the same as those in panel A.

TABLE 4 – FAT-PET, union membership and job satisfaction, unconditional estimates

	OLS Robust	OLS clustered	WLS & Clustered
	(1)	(2)	(3)
A. Partial correlations			
SE	-0.193	-0.193	-0.470
	(-1.15)	(-0.51)	(-1.10)
Constant	-0.012**	-0.012	-0.009*
	(-2.43)	(-1.53)	(-1.72)
Observations	224	224	224
Adj. R-squared	0.001	0.001	0.022
B. Partial and tetrachoric correlations			
SE	0.173***	0.173	-0.493
	(2.60)	(1.33)	(-1.48)
Constant	-0.034***	-0.034***	-0.014***
	(-4.79)	(-3.29)	(-2.68)
Observations	224	224	224
Adj. R-squared	0.025	0.025	0.031

Notes: All columns report estimates of equation (1). Figures in brackets are t statistics. ***p<0.01; **p<0.05

The small distortion of the appearance of the funnel plot is not confirmed by this formal statistical test. In other words, we find no evidence of a negative publication bias even if the funnel plot in Figure 2 is a little bit distorted in the left-hand side.[v]

As estimates of β_0 serve as correction for publication bias (see Stanley and Doucouliagos, 2012: 60-61), column 3 of Table 4 reports the weighted meta-average correlation between unionization and job satisfaction corrected for publication selection bias. The FAT-PET

weighted averages suggests a negative and slightly statistically significant correlation between unionization and job satisfaction (r=-0.009*, p<0.10). This negative relationship is very consistent across various estimators (Fixed Effect-WLS, Random-Effect-WLS, PEESE) and across different samples (one study-one estimate sample *vs* all estimates). However, it is worth noting that this negative relationship does not hold for US studies whereas UK studies report a stronger negative correlation between unionization and job satisfaction (see Table A2 in Appendix)[vi].

4.2. Union-Job Satisfaction Correlations and Heterogeneity

The MRA results are presented in Table 5. We use cluster data analysis to adjust standard errors for data dependence arising from multiple estimates reporting within studies. All observations are weighted by precision. That is, all models are estimated by weighted least square (WLS). Columns 1 to 7 present the estimation results when partial correlations are used, abstracting from the distinction between continuous and binary measures of job satisfaction. Column 8 reports the results using partial correlations for the continuous outcomes studies and tetrachoric approximations for the binary outcome studies. Column 9 reports the results of estimating equation (2) for the one study-one estimate dataset[vii]. We present these results only for the sake of assessing robustness.

Columns 1 and 2 present the results of applying a general to specific modelling strategy whereby we started with the complete pool of explanatory variables and then sequentially eliminated any that were not statistically significant at the 10 percent level of significance. In column 3, we use a 'random-effects' MRA, including an additional term to the MRA model that allows for any between-study random variation. WLS Random-effects models are one

method of addressing within-study dependence (Stanley and Doucouliagos, 2012). An alternative means of dealing with any data dependence is to estimate a multi-level, linear hierarchical model, estimated using restricted maximum likelihood (REML). These results are reported in column 4. Finally, for comparison purposes only, column 5 reports the baseline OLS results, column 6 presents the results of a sub-sample of studies using only union membership as an explanatory variable and column 7 reports results from a regression model that uses sample size as weight instead of precision.

The discussion below addresses the preferred results in columns 1 and 2. In these models, the constant is an estimate of the relationship between union membership and job satisfaction in the USA, using cross-sectional data, using OLS, using data covering the 1990s and without any of the controls included in the MRA. The MRA captures reasonably well the heterogeneity in reported estimates. The MRA explains about 57 percent of the variation of the estimates (see the adjusted R-squared, Column 1, Table 5).

Table 5 shows that the MRA coefficients are for the most part rather consistent across the various models. First, the constant has a negative sign and is not significant in most MRA models, indicating that, *ceteris paribus,* unionization does not significantly affect job satisfaction in the USA. The standard error variable (*SE*) is positive, although not statistically significant in all models, suggesting that there is no publication selection bias in this literature. This confirms the absence of a publication selection bias in this literature, even if this pool of studies tend to report more negative effects of unionization on job satisfaction.

The MRA models also indicate that several variables are important in explaining the heterogeneity of the reported estimates. It appears that the measure of unionization, the type of data used and the estimator applied are important.

TABLE 5
Unionization and Job Satisfaction, Meta-Regression Analysis

	General FEE-WLS	Specific FEE-WLS	REE-WLS	Multi-Level	OLS robust	FEE-WLS Membership subsample	N weights FFE-WLS	Y = partial & tetrachoric	One study-one estimate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SE	0.259		-0.032	-0.265	-0.427	0.105	0.229	-0.305	
	(0.53)		(-0.09)	(-1.05)	(-0.91)	(0.19)	(0.47)	(-0.77)	
JS 1-4	0.005		0.014**	0.021**	0.024**	0.001	0.005	-0.001	
	(1.20)		(2.01)	(2.08)	(2.15)	(0.22)	(1.22)	(-0.77)	
JS 1-5	0.003		0.003	0.011	0.008	-0.012	0.003	-0.017	
	(0.26)		(0.34)	(0.77)	(0.59)	(-1.15)	(0.27)	(-0.76)	
JS 1-7	0.003		0.013	0.010	0.022	-0.011	0.004	-0.013	-0.024***
	(0.31)		(1.20)	(0.61)	(1.38)	(-1.03)	(0.32)	(-0.73)	(-6.33)
JS 1-10	0.015		0.018*	0.022	0.030*	0.013	0.015	0.008	
	(1.02)		(1.68)	(1.49)	(1.93)	(1.01)	(1.03)	(0.39)	
COVERAGE	0.017***	0.017***	0.013**	0.004	0.007	-	0.018***	0.019***	
	(4.38)	(4.25)	(2.07)	(0.41)	(0.94)		(4.40)	(3.82)	
SERVICES	0.013		0.022*	0.039***	0.033**	0.012	0.014	0.038	
	(0.93)		(1.69)	(2.79)	(2.46)	(0.93)	(0.94)	(1.29)	
PANEL	0.017**	0.013***	0.004	-0.006	-0.005	0.013**	0.017**	0.034**	
	(2.58)	(3.01)	(0.40)	(-0.33)	(-0.36)	(2.03)	(2.56)	(2.40)	
POOLED	0.016***	0.013***	0.017**	0.014	0.012	0.013**	0.016***	0.031***	
	(2.85)	(3.54)	(2.56)	(1.29)	(1.52)	(2.23)	(2.81)	(4.16)	
DF	0.018*	0.021**	0.025***	0.019**	0.033***	0.021*	0.018*	0.031**	
	(1.69)	(2.70)	(3.19)	(2.20)	(3.17)	(1.89)	(1.72)	(1.98)	
1970	-0.007	-0.015**	0.008	0.036**	0.021	0.002	-0.007	-0.001	
	(-0.64)	(-2.28)	(0.74)	(2.14)	(1.49)	(0.22)	(-0.63)	(-0.07)	
1980	-0.021**	-0.023**	-0.016*	-0.015	-0.020*	-0.017*	-0.021**	-0.022	
	(-2.09)	(-2.91)	(-1.96)	(-1.33)	(-1.88)	(-1.96)	(-2.19)	(-1.44)	
2000	-0.005		0.005	0.020*	0.018**	-0.006	-0.005	-0.019*	
	(-1.01)		(0.76)	(1.75)	(2.20)	(-1.23)	(-1.04)	(-1.96)	
UK	-0.020**	-0.027***	-0.015*	0.005	-0.006	-0.012	-0.021**	-0.039***	-0.009**
	(-2.07)	(-7.83)	(-1.74)	(0.36)	(-0.46)	(-1.37)	(-2.10)	(-2.68)	(-2.20)
OTHERS	0.008		0.001	0.006	-0.002	0.016*	0.008	0.004	
	(1.07)		(0.06)	(0.42)	(-0.17)	(1.79)	(1.06)	(0.45)	

ECOJOURN	-0.010	-0.017***	-0.024**	-0.032**	-0.027*	-0.004	-0.010	-0.033*	-0.015***
	(-1.05)	(-3.67)	(-2.39)	(-2.28)	(-1.93)	(-0.44)	(-1.04)	(-1.98)	(-3.20)
IRJOURN	0.011		0.001	-0.004	-0.002	0.016*	0.011	-0.019	
	(1.05)		(0.07)	(-0.29)	(-0.16)	(1.89)	(1.05)	(-1.21)	
ENDOG	0.016	0.011*	0.014	0.032***	0.023*	0.010	0.016	0.008	
	(1.40)	(1.69)	(1.28)	(2.90)	(1.75)	(0.83)	(1.39)	(0.48)	
PROBIT	0.002		0.008	0.014*	0.013	-0.002	0.002	-0.014	
	(0.41)		(1.33)	(1.79)	(1.53)	(-0.35)	(0.42)	(-1.36)	
FIRMSIZE	-0.002		-0.001	-0.005	-0.010	-0.001	-0.002	0.031*	
	(-0.21)		(-0.10)	(-0.48)	(-1.06)	(-0.10)	(-0.20)	(2.41)	
PROMOTION	0.014**	0.011***	0.006	0.005	0.007	0.015**	0.014**	0.003	0.011**
	(2.62)	(3.90)	(0.86)	(0.45)	(0.65)	(2.36)	(2.62)	(0.32)	(2.61)
WAGES	0.017	0.019***	-0.000	0.004	-0.007	0.012	0.017	0.011	
	(1.43)	(3.92)	(-0.02)	(0.26)	(-0.58)	(1.26)	(1.44)	(0.59)	
GENDER	-0.033***	-0.032***	-0.044***	-0.043***	-0.051***	-0.033***	-0.034***	-0.038***	-0.010**
	(-4.39)	(-6.11)	(-4.08)	(-2.64)	(-2.96)	(-4.38)	(-4.49)	(-3.75)	(-2.45)
MSUBGROUP	-0.034***	-0.027***	-0.044***	-0.035**	-0.053***	-0.030***	-0.034***	-0.041***	
	(-4.52)	(-4.99)	(-3.78)	(-1.97)	(-3.04)	(-3.61)	(-4.51)	(-3.15)	
FSUBGROUP	-0.045***	-0.037***	-0.061***	-0.054***	-0.071***	-0.042***	-0.045***	-0.051***	
	(-5.69)	(-6.84)	(-4.75)	(-2.94)	(-3.61)	(-4.85)	(-5.68)	(-3.66)	
RACE	0.005		-0.001	-0.008	-0.010	0.008	0.005	-0.002	
	(0.78)		(-0.12)	(-0.79)	(-1.12)	(1.26)	(0.77)	(-0.19)	
HOURS	0.000		0.009	0.013	0.013	-0.016*	0.000	0.016	
	(0.02)		(0.99)	(1.04)	(1.02)	(-1.85)	(0.01)	(0.83)	
AGE	0.025**	0.023***	0.029***	0.023*	0.036***	0.047***	0.025**	0.014	0.025***
	(2.18)	(3.53)	(3.00)	(1.74)	(2.92)	(4.18)	(2.19)	(0.68)	(3.59)
EDUCATION	0.003		-0.002	-0.009	-0.002	-0.002	0.003	-0.018	
	(0.26)		(-0.15)	(-0.57)	(-0.16)	(-0.17)	(0.27)	(-0.92)	
MARRIED	-0.015*	-0.015***	-0.008	0.002	-0.002	-0.009	-0.015*	-0.001	
	(-1.94)	(-3.55)	(-1.22)	(0.24)	(-0.29)	(-1.40)	(-1.94)	(-0.56)	
TRAINING	0.001		-0.002	0.008	0.001	0.007	0.001	-0.002	
	(0.15)		(-0.21)	(0.68)	(0.12)	(1.07)	(0.15)	(-0.22)	
IRCLIMATE	0.019*	0.027***	0.037***	0.023**	0.038***	0.014*	0.019*	0.032**	0.020***
	(1.75)	(3.12)	(3.72)	(2.08)	(2.66)	(1.72)	(1.75)	(2.58)	(3.57)
OCCUPATION	0.001		-0.004	-0.032***	-0.018**	-0.002	0.001	0.011	
	(0.11)		(-0.58)	(-2.67)	(-2.01)	(-0.23)	(0.10)	(0.66)	
Constant	-0.035	-0.009	-0.014	0.002	-0.000	-0.034	-0.035	0.010	-0.016**
	(-1.19)	(-1.06)	(-0.50)	(0.05)	(-0.01)	(-1.11)	(-1.18)	(0.22)	(-2.42)
N	224	224	224	224	224	200	224	224	60

Adjusted R^2	0.57	0.55	0.59	-	0.43	0.64	0.56	0.48	0.63

Notes: See Table 3 for variable definitions and summary statistics. Dependent variable is partial correlation of unions and overall job satisfaction, except for model (8) where DV is partial and tetrachoric correlations. Figures in brackets are t-statistics using standard errors adjusted for clustering. Columns 1 and 2 use weighted least squares using inverse variance weights ($w = 1/se^2$). Column 1 is the general WLS model, including the full set of controls. Column 2 reports the specific WLS MRA after removing all statistically insignificant variables. Column 3 is the random effects weighted least squares using weights = $(1 / se^2 + \tau^2)$, where τ^2 is the estimate of random effects variance (the between-study or heterogeneity variance). Column 4 reports the multi-level (REML) estimates and Column 5 presents the baseline OLS estimates. Column 6 is the general WLS model based on a subsample of studies using only union membership (and excluding union coverage). Column 7 uses WLS using sample size as weights. Column 9 presents the results of the specific WLS model for the one study-one estimate dataset.

Studies that take into account whether workers are covered by a union or collective bargaining at the workplace level report smaller negative effects of union membership on job satisfaction. This result suggests that, on average, job satisfaction is higher for workers in workplace with local bargaining or with union presence whether they are union member or not. In order to examine this relationship further, we will display the partial correlations obtained in estimations controlling for the interaction between union coverage and union membership (see Table 6 below).

The MRA also suggests that there is a difference in estimates between cross-sectional and panel or pooled cross sectional data. That is, studies using pooled cross sectional or panel data find, on average, a greater positive correlation between unionization and job satisfaction than do those that use cross-sectional data. This finding suggests that using panel data to hold constant workers' characteristics are more likely to obtain smaller negative effects of unions on job satisfaction. The degree of freedom (DF) is coded so that we can have information on the moderating effect of studies using small sample (See Table 3). DF has a positive coefficient in the MRA, indicating that studies using less observation tend to report smaller negative effects (or larger positive effects). Endogeneity can be a serious issue in this literature. While the studies included in our dataset examine the effect of unionization on job satisfaction, it clearly is possible that job satisfaction or rather job dissatisfaction leads to unionization. If this is the case, then OLS will produce biased estimates. Studies have dealt with this issue by using instrumental variables estimators (2SLS or bivariate probit). The MRA indicates that, on average, these estimators (ENDOG) produce smaller negative effects of unionization on job satisfaction compared to OLS. That is, OLS exaggerates the negative impact of union membership on job satisfaction. It seems that a large part of the reported estimates in the existing literature is spurious. However, providing an estimate for

endogeneity correction *per se* does not give information on the ways that these econometric methods may affect the estimated relationship. Indeed, some studies using 2SLS indicate that once endogeneity is control for, the coefficient estimate between unionization and job satisfaction becomes larger whereas others find that it becomes smaller. To deal with this issue, we re-estimated our MRAs models with three dummy variables which have been coded to represent three different outcomes (estimates become larger, smaller and do not change after endogeneity corrections, see Table A3 in Appendix). Results indicate that studies reporting smaller negative coefficients after taking into account endogeneity are more frequent (68%) and explain why endogeneity corrections lead to a smaller negative effect on average (see also the distribution of the reported coefficients in Figure A4 in Appendix).

The geographical location is also an important factor. The variable UK has a negative coefficient and it is statistically significant. This means that compared to studies that use data from the USA, studies that use data from UK (i.e. Clark, 1996) tend to report larger negative effects. If we did not find a publication selection bias, it appears that studies published in economic journals tend to report results that indicate more often a negative relationship between unions and job satisfaction compared to management journal.

Specification of the econometric model appears to be important. Promotion, wages, age and industrial relations climate all have positive and statistically significant coefficients. Thus, studies that control for these variables find that unionization has a smaller negative impact on job satisfaction. In contrast, the inclusion of a control for gender and marriage in the econometric specification produces a larger adverse effect of unionization on job satisfaction. Most of these results hold when we switch from partial correlations to partial and tetrachoric correlations in column 8. Finally, another finding is that the effects of unionization on job satisfaction appear to be time varying as suggested previously by Figure 4. The negative coefficients on the different periods indicate that the correlation between unionization and job

satisfaction seems to be more negative in the 80's compared to the 1990s. In other words, studies using data from the 1990s have a higher propensity to exhibit an insignificant or positive relationship between unionization and job satisfaction. This means that, on average, the effect of union membership on job satisfaction is becoming more positive over time.

The MRA coefficients can be used to calculate a meta-average effect of unionization on job satisfaction. The meta-average is the best estimate of the effect that emerges from the existing literature (Askarov and Doucouliagos, 2013). We made two assumptions in order to construct the meta-average. First, we presume that the MRA variables are able to capture the effect of misspecification bias. Second, we need to select which MRA variables to include into the MRA estimation.

There are consistent theoretical reasons for believing that all of the variables identified by the MRA as significant should be introduced in a well-specified econometric model. For example, many researchers argue that good industrial relations climate is important for job satisfaction (Garcia-Serrano, 2009; Pfeffer and Davis-Blake, 1990; Bender and Sloane, 1998). Bender and Sloane (1998) showed that workers tend to value good industrial relations climate more than representation by a union. That is, the inclusion of industrial relations variables in the regression models is especially important to obtain an accurate evaluation of the effect of union on job satisfaction. Gender has been found to have significant effect on job satisfaction (e.g. Clark, 1996; Clark, 1997; Sousa-Poza and Sousa-Poza, 2000, 2003; Sloane and Williams, 2000; Donohue and Heywood, 2004; Artz, 2012). Clark (1997) indicates that women report significantly higher levels of job satisfaction than do men. According to him, women's higher job satisfaction does reflect that women have different work values and lower expectations than men. Another explanation is that men's and women's have different job characteristics. In particular, union membership can be correlated with gender and it is

important to compare individuals who are as close as possible in an analysis of job satisfaction. Thus, the inclusion of measure of gender into job satisfaction regressions is essential to understand the effects of unionization on overall job satisfaction. Age can also affect job satisfaction (Kalleberg and Loscocco, 1983; Clark, 1996). There is even some evidence of a U-shaped relationship between age and job satisfaction (Clark et al., 1996). Age should also be entered as a control variable in a job satisfaction regression. Similarly, race and marital status are strongly correlated with job satisfaction. For example, Clark (1997) indicates that white workers report higher level of job satisfaction compared to black workers and that married workers tend to be more satisfied than single workers. However, regarding race, Bartel (1981:302) has shown that "*the sign of the racial differential in job satisfaction cannot be predicted* a priori". Indeed, Bartel (1981) concludes that blacks in the NLS Mature Men sample are more satisfied with their jobs than whites. According to him, although blacks do earn lower pay than white and should therefore be less satisfied, discrimination may have also caused blacks to be satisfied with less (Bartel, 1981:302). The relationship between education and job satisfaction is also ambiguous but it appears that educated workers report less satisfaction at work than others (Clark and Oswald, 1996; Belfield and Harris, 2002; Fleming and Kler, 2008). One possible explanation is that better educated workers have more expectations of what kind of job they should have even though they have better jobs than others. With regard to income, Clark (1997: 201) notes that "*pay has a relatively weak effect on overall job satisfaction. (…) If one of the functions of pay is to compensate workers for the difficulty of their job, then higher-paid workers may be doing harder jobs, and therefore will not necessarily be more satisfied*". Another explanation is that income is quite often evaluated relative to some comparison level. Clark and Oswald (1996) have shown that comparison income measures are negatively associated with job satisfaction. Nevertheless, pay – relative or not – is an important determinant of workers' job satisfaction. *A fortiori*, if employers

provide incentive bonuses or profit-related pay. Clark (1996) also notes that the availability of opportunities for promotion has a positive impact on overall job satisfaction. Hours of work are also a very important determinant of worker's reported well-being. Empirical research showed that hours of work are negatively associated with overall job satisfaction.

In the same vein, Clark (1997) notes that the literature on "job satisfaction" suggests that the most satisfied workers tend to be found in smaller establishments (see Idson, 1990). Clark (1997) also pointed out that industry and occupation are correlated with job satisfaction. For example, managers and professionals, report more often higher satisfaction with their work. Accordingly, we suggest that, by omitting these important control variables that are likely to be correlated with job satisfaction, primary studies misspecified models of job satisfaction and produced erroneous estimates of the net effect of unionization on overall job satisfaction. Hence, we consider that a well specified model explaining the determinants of job satisfaction should include variables for promotion opportunities, pay level, gender, age, race, education, hours worked, industrial relations climate, firm size, industry, occupations, marital status, and training opportunities. We also assume that potential endogeneity is captured by using either 2SLS or IV probit, and we assess the effect of unionization at the average year of the samples. We also assume that job satisfaction is measured either as a binary variable or a categorical variable. Last but not least, union or collective bargaining coverage must be considered to offer a better understanding of the effects of union membership on job satisfaction.

The meta-averages are calculated using a linear combination of the MRA coefficients. We also computed the 95% confidence intervals. These results are reported in Table 6.

When all countries are taken into consideration, the effect of union membership on job satisfaction is negative and statistically significant (raw 1). Our best estimate of the partial correlation between unionization and job satisfaction is -0.04 with a confidence interval of -0.07 to 0.00. That is, taking all the evidence together, it appears that union membership has a

weak negative effect on job satisfaction, on average. However, it seems that the effect of unionization is not statistically different from zero when we keep only the most important factors affecting job satisfaction along with union membership (raw 2) and when the primary studies use fixed effects models (raw 3). Moreover, a conclusion of no effect emerges from the panel and pooled cross sectional model (row 4) for all countries whereas a significant negative effect appears for cross-sectional data (raw 5).

TABLE 6
MRA, estimated effect of unionization on job satisfaction

	Estimated and corrected partial correlations
(1) All countries	**-0.04** (-0.07 to -0.00)**
(2) All countries, G-t-S model	-0.03 (-0.08 to 0.02)
(3) All countries, fixed effects	-0.03 (-0.07 to 0.01)
(4) All countries, panel & pooled cross data	-0.01 (-0.05 to 0.03)
(5) All countries, cross sectional data	**-0.04*** (-0.07 to -0.01)**
(6) All countries, union coverage & union member	**-0.05** (-0.11 to -0.00)**
(7) All countries, union coverage & non-union member	-0.03 (-0.08 to 0.01)
(8) UK	**-0.03* (-0.06 to 0.00)**
(9) UK, panel & pooled cross data	0.00 (-0.04 to 0.04)
(10) UK, cross sectional data	**-0.03** (-0.06 to -0.00)**
(11) USA	-0.03 (-0.06 to 0.01)
(12) USA, cross sectional data	**-0.03* (-0.06 to 0.00)**
(13) USA, panel & pooled cross data	-0.01 (-0.05 to 0.03)

Notes: Cells report estimated partial correlations of the effects of unionization on job satisfaction. Rows 1 to 4 use MRA estimates from column 1 of Table 5. Row 5 uses the coefficients from the general to specific model, column 2 of Table 5. Rows 6 to 8 use only UK data. Bold cells denote statistically significant effects. Figures in brackets are 95% confidence intervals.

Similarly, unionization appears to have no effect on deterring job satisfaction in UK and in the USA, once the type of data used by the primary studies is taken into account (raw 8 to 13). Thus, it seems that the estimated effects of union membership provided by cross-sectional studies suffer from unobserved heterogeneity. Most of the studies that account for the endogenous selection induced by the sorting of workers into unionized job indicate a non-significant effect of union membership on overall job satisfaction. The difference in job satisfaction between union members and non-members is partially explained by a selection effect rather than a causal effect. Moreover, the estimated effects of unionization on job

satisfaction seem to be biased due to misperceiving time-varying endogenous effects. Powthavee (2011) indicates that there may be an anticipation effect to joining or forming a union in the future. A worker may have been dissatisfied with his job for some years before he decides to join a union. This type of effect on job satisfaction is not identified in cross-sectional studies. In addition, fixed-effects panel models can test adaptation processes of self-reported job satisfaction, which could lead to an underestimation of the union effect in the cross-sectional studies.

4.3. Robustness check

Table 6 also reports the estimated effect of union membership on job satisfaction under alternative estimators. In row 1, MRA predicts a negative effect on job satisfaction if unionized workers are covered by a collective agreement at the workplace level. These results are consistent with those obtained by Green and Heywood (2015) from a panel dataset. They conclude that the paradox of the dissatisfied union members remains complete. In order to examine this further, we estimated the interaction effect of unionization and union coverage on job satisfaction (see rows 6 and 7, Table 6). It appears that compared with non-union members in firms with union coverage (or workplace collective bargaining), the group of workers with significantly lower levels of job satisfaction is that of union members in firms with such a union coverage (or local collective bargaining). These results confirm that covered union members are less satisfied than their counterparts even when accounting for endogeneity. Controlling for both individual and organizational heterogeneity and explicitly modelling the effect of the interaction between union coverage and union membership, we find that there is a little difference in job satisfaction between union members and non-members, suggesting a causal effect. Indeed, free-riders seems to be more satisfied than union member, confirming Powdthavee (2011)'s findings. However, we must bear in mind that

these reported estimates come from 4 studies (Garcia-Serrano, 2009; Green & Heywood, 2015; Heywood et al. 2002 and Powdthavee, 2011) reporting 9 estimates on a total of 224 estimates. Moreover, three of these studies use data from the BHPS conducted in UK but covered different time periods. It is then hazardous to draw general conclusions on the basis of these studies and it would be useful to provide more research dealing with this issue. As additional robustness checks, we also considered several other variables, none of which added to the explanatory power of the MRA models reported herein. For example, we also considered using more detailed country sample composition dummies (see Table A3 in Appendix). The other results are available from the author[viii].

For sensitivity and additional analyses, we also run a separate meta-analysis that focusses on the direction and significance of the results. Even if Stanley and Doucouliagos (2012) note that a meta-analysis using a dichotomization such as significant/non-significant must be undertaken with caution, it seems interesting to consider this approach given the number of *logit/probit* studies in our sample.[ix] Accordingly, an alternative strategy is to change the focus of the meta-analysis away from an analysis of partial correlations to an analysis of a certain type of results found. Given the focus on direction and significance of estimated effects, the meta-analysis uses a limited dependent variable model. Ordered probit models are chosen because the three effect categories imply a natural ordering based on the *t*-statistic. We distinguish between significantly negative, insignificant and significantly positive estimates using a categorical effect size estimator as the dependent variable. The categories are labelled 0, 1 and 2, using a 5% critical significance level[x]. The ordered probit estimates and associated marginal effects are presented in Table 7. These estimations yield essentially the same results as the MRA. The results show that model specification and estimation are the primary sources of variation among the estimated effects. For example, studies that use pooled cross-sectional data produce more non-significant estimates than studies that use cross-sectional data.

However, the effects of different econometric estimators appear to be trivial. Probit studies display the same probability of producing negative, insignificant and positive results. A similar effect is found for studies that control for firm size, hours worked, and education. In contrast, focusing on the role of wages and promotion as additional covariates is of particular importance as well as dealing with endogeneity. Adding a wage level variable favours insignificant or positive effects of unionization on job satisfaction. This finding alludes to potential model misspecifications due to the inherent endogeneity of wage level. Regarding control for promotion, the analysis suggests that including a control for promotion is more likely to yield positive effects than models without a control for promotion. Studies that deal with endogeneity report a higher probability of producing more insignificant results, confirming the MRA results. However, this meta-analysis reveals that specification of the dependent variable has significant effect on the probabilities of the three effect categories, showing a difference with MRA results. The relationship between union membership and job satisfaction also appears to have been non-constant over the years. The review suggests that the probabilities of finding non-significant estimates are higher for the 2000s compared with the 1990s. These results are consistent with the results obtained with the MRA. Similar to the temporal effect, existing empirical studies suggest that spatial context matters. For UK studies, the probability of positive results is significantly lower than that probability elsewhere. This is an interesting result because it suggests that unionization operates differently in the UK than in other countries. Thus, the negative effect of unionization on job satisfaction cannot be generalized to all industrialized countries. In certain European countries, for instance, the potential free-rider problem must be addressed (Garcia-Serrano, 2009; Powdthavee, 2011).

TABLE 7
Unionization and Job Satisfaction, Meta-Analysis Ordered Probit Model

	Model 1: Unweighted				Model 2: Weighted [a]			
	Ordered Probit Model	Marginal Effects Models			Ordered Probit Model	Marginal Effects Models		
		Significantly Negative	Insignificant	Significantly Positive		Significantly Negative	Insignificant	Significantly Positive
	(6)	(7)	(8)	(9)	(6)	(7)	(8)	(9)
JS 1-4	0.503	-0.175*	0.140*	0.035	-0.215	0.085	-0.083	-0.002
	(1.59)	(-1.71)	(1.82)	(1.23)	(-0.46)	(0.46)	(-0.46)	(-0.48)
JS 1-5	0.085	-0.031	0.026	0.005	0.624	-0.227	0.215	0.012
	(0.20)	(-0.20)	(0.21)	(0.19)	(0.96)	(-1.10)	(1.17)	(0.50)
JS 1-7	0.573	-0.193	0.148	0.045	1.615**	-0.541***	0.494***	0.047
	(1.16)	(-1.31)	(1.52)	(0.85)	(2.20)	(-2.92)	(3.51)	(0.87)
JS 1-10	0.744*	-0.233**	0.161***	0.071	1.123*	-0.352***	0.309***	0.043
	(1.83)	(-2.28)	(3.22)	(1.18)	(1.71)	(-2.59)	(3.76)	(0.68)
COVERAGE	0.350	-0.122	0.098	0.024	0.945***	-0.335***	0.314***	0.021
	(1.14)	(-1.22)	(1.31)	(0.90)	(2.91)	(-3.41)	(3.57)	(1.20)
SERVICES	1.060**	-0.289***	0.150	0.139	1.425**	-0.394***	0.312***	0.083
	(2.14)	(-3.37)	(3.05)	(1.20)	(2.24)	(-4.45)	(5.87)	(0.80)
PANEL	-0.816	0.317	-0.295	-0.022**	0.857	-0.307*	0.289*	0.018
	(-1.19)	(1.24)	(-1.19)	(-2.08)	(1.45)	(-1.74)	(1.88)	(0.70)
POOLED	0.806**	-0.250***	0.171***	0.079	1.234**	-0.459***	0.444***	0.015
	(2.48)	(-3.13)	(4.10)	(1.54)	(2.47)	(-2.79)	(2.85)	(1.07)
DF	0.818***	-0.294***	0.246***	0.049**	1.147***	-0.361***	0.317***	0.043
	(2.99)	(-3.16)	(3.11)	(2.21)	(2.74)	(-4.01)	(5.01)	(1.09)
1970	0.425	-0.147	0.116	0.030	0.006	-0.002	0.002	0.000
	(0.91)	(-0.98)	(1.08)	(0.71)	(0.01)	(-0.01)	(0.01)	(0.01)
1980	0.012	-0.005	0.004	0.000	0.011	-0.004	0.004	0.001
	(0.04)	(-0.04)	(0.04)	(0.80)	(0.02)	(-0.02)	(0.02)	(0.02)
2000	0.409	-0.143	0.116	0.028	-1.000**	0.383***	-0.376***	-0.07
	(1.21)	(-1.28)	(1.36)	(0.98)	(-2.38)	(2.60)	(-2.60)	(-1.12)
UK	-1.431***	0.522***	-0.461***	-0.061**	-3.080***	0.872***	-0.808***	-0.064*
	(-3.60)	(4.11)	(-3.99)	(-2.55)	(-5.14)	(11.89)	(-12.14)	(-1.64)
OTHERS	-0.085	0.031	-0.027	-0.004	1.519**	-0.454***	0.382***	0.072
	(-0.18)	(0.18)	(-0.18)	(-0.19)	(2.60)	(-4.20)	(6.62)	(0.92)
ECOJOURN	-0.343	0.127	-0.109	-0.018	0.719	-0.265	0.253	0.012

	(-0.41)	(0.81)	(-0.80)	(-0.81)	(1.09)	(-1.22)	(1.27)	(0.61)
IRJOURN	0.642	-0.226	0.184	0.042	1.881***	-0.638***	0.624***	0.013
	(1.44)	(0.53)	(1.61)	(1.14)	(2.75)	(-3.99)	(4.01)	(1.22)
ENDOG	0.334	-0.115	0.092	0.024	1.178*	-0.361***	0.311***	0.049
	(0.79)	(-0.85)	(0.94)	(0.61)	(1.68)	(-2.73)	(4.54)	(0.75)
PROBIT	0.405	-0.150	0.130	0.021	0.064	-0.025	0.025	0.001
	(1.58)	(-1.58)	(1.55)	(1.49)	(0.15)	(-0.15)	(0.15)	(0.15)
FIRMSIZE	0.334	-0.124	0.107	0.017	0.946*	-0.363*	0.354*	0.009
	(1.02)	(-1.02)	(1.00)	(1.02)	(1.76)	(-1.88)	(1.89)	(1.01)
PROMOTION	0.312	-0.110	0.090	0.020	1.194**	-0.414***	0.384***	0.030
	(0.96)	(-1.01)	(1.06)	(0.80)	(2.52)	(-3.34)	(3.83)	(0.94)
WAGES	0.567	-0.218	0.196	0.022	2.222***	-0.602***	0.587***	0.005
	(1.28)	(-1.27)	(1.22)	(1.56)	(3.48)	(-7.25)	(7.14)	(1.19)
GENDER	-1.910***	0.594***	-0.413***	-0.182**	-2.578***	0.689***	-0.500***	-0.189
	(-3.66)	(4.87)	(-6.01)	(-2.17)	(-4.15)	(8.00)	(-6.11)	(-1.50)
MSUBGROUP	-0.958*	0.364*	-0.328*	-0.036**	-1.179*	0.426**	-0.422**	-0.004
	(-1.71)	(1.78)	(-1.72)	(-1.84)	(-1.87)	(2.43)	(-2.41)	(-1.19)
FSUBGROUP	-1.832***	0.621***	-0.582***	-0.039**	-3.106***	0.663***	-0.656***	-0.007
	(-3.00)	(4.77)	(-4.59)	(-2.65)	(-3.38)	(10.30)	(-6.11)	(-1.31)
RACE	0.096	-0.035	0.030	0.005	1.591***	-0.570***	0.547***	0.028
	(0.29)	(-0.19)	(0.29)	(0.29)	(3.72)	(-4.59)	(4.67)	(1.34)
HOURS	-0.081	0.030	-0.025	-0.005	-0.570	0.212	-0.202	-0.009
	(-0.20)	(0.20)	(-0.20)	(-0.20)	(-1.06)	(1.18)	(-1.22)	(-0.58)
AGE	1.510***	-0.549***	0.504***	0.045***	1.448**	-0.483***	0.479***	0.004
	(3.76)	(-4.66)	(4.41)	(2.87)	(2.26)	(-3.36)	(3.32)	(1.18)
EDUCATION	-0.063	0.023	-0.019	-0.004	0.868	-0.324	0.321	0.003
	(-0.13)	0.13	(-0.13)	(-0.12)	(0.99)	(-1.18)	(1.17)	(1.09)
MARRIED	-0.185	0.067	-0.057	-0.011	-0.970*	0.311**	-0.293**	-0.018
	(-0.66)	(0.67)	(0.58)	(-0.80)	(-1.87)	(2.24)	(-2.41)	(-0.83)
TRAINING	0.350	-0.123	0.100	0.023	-0.450	0.178	-0.175	-0.003
	(1.05)	(-1.11)	(1.16)	(0.86)	(-1.00)	(1.02)	(-1.01)	(-0.94)
IRCLIMATE	0.942***	-0.279***	0.176***	0.103	0.901*	-0.305**	0.280**	0.025
	(2.58)	(-3.48)	(4.79)	(1.53)	(1.66)	(-2.18)	(2.53)	(0.73)
OCCUPATION	-0.523	0.176*	-0.136*	-0.045	0.011	-0.004	0.004	0.000
	(-1.48)	(1.65)	(-1.88)	(-1.47)	(0.02)	(-0.2)	(0.02)	(0.02)
N	224	224	224	224	224	224	224	224

Notes: [a] The weight is proportional to inverse variance ($1/se^2$).

In France, for example, the costs of unionization outweigh the benefits because all employees can benefit from collective bargaining although not all are unionized. In such a context, distinguishing between members and non-covered members is not sufficient and considering union coverage through the existence of a workplace collective agreement is very important if one wants to build an accurate model of job satisfaction (Laroche, 2015).

Overall, these findings are quite consistent with those obtained with the meta-regression aanlysis. In sum, from the ordered probit meta-analysis results, we can draw three robust conclusions. First, on average, there is no correlation between unionization and job satisfaction in the US. Second, the coefficients for the UK are negative and statistically significant, indicating that unionization is negatively associated with job satisfaction in the UK. Third, some evidence was found that the heterogeneity of the effect of union membership on job satisfaction could be explained through differences in data, measures, estimation procedures and specification of the model. In particular, endogeneity issue must be addressed to obtain an accurate estimation of the effect of union membership on overall job satisfaction.

CONCLUSIONS

The paradox of the unsatisfied union member is still widely debated among scholars and the issue remains explaining how union member can be simultaneously unsatisfied with their job and less likely to quit this job. In this paper, meta-regression analysis (MRA) was applied systematically to the empirical literature to explore the association between unionization and job satisfaction.

The main conclusion that can be drawn from this body of literature is that taking all the studies together and for all periods, the overall association between unionization and job satisfaction is negative. However, the accumulated evidence indicates that unionization is negatively related to job satisfaction in the UK, although not in the rest of the world. Our results show that the effects of union membership on job satisfaction will likely not be uniform from country to country and suggest, therefore, that future research must take these country-specific responses into consideration. The findings of the primary studies could certainly be strengthened by incorporating the cultural dimension of job satisfaction to gain a more comprehensive understanding of the country-specific issues suggested by our meta-analysis.[xi] Aside from cultural dimensions, industrial relations institutions have different meanings across countries. Being a union member may have different meaning in France or Spain, where only the activists are members, than it does in Sweden where union membership is closely linked with benefits. More research is urgently needed in other developing countries such as France where strikes are often a mean of expressing dissatisfaction whether or not workers are unionized. This line of research will enable comparisons to be made of the influence of unionization on job satisfaction and will assist in reaching conclusions about the overall effect of union membership.

The results from the meta-analysis presented in this paper also indicate the importance of paying particular attention to how explanatory variables are chosen because this does systematically influence estimates of the relationships under investigation. There are several remaining issues. One neglected issue in this area concerns the possibility of selectivity. For example, workers dissatisfied with their working conditions may choose to join a union (see Bryson et al., 2010). The issue of causality has not received the attention it deserves in this literature. Only 9 on 60 existing studies deal with the endogeneity issue. The treatment of simultaneity is particularly crucial. Compared to OLS, studies that address endogeneity report

that unionization has no effect on job satisfaction. In addition, studies that use panel or pooled-cross-sectional data report less negative effects of union membership on job satisfaction. This result suggests that cross-sectional studies suffer not only from unobserved heterogeneity but may also be biased due to time-varying endogenous effects such as anticipation and adaptation effects. It would be interesting to further investigate the relationship between union membership and job satisfaction using panel dataset and controlling for these time-varying effects. To date, only two empirical studies have examined these important issues in this literature. Thus, a worthwhile direction for future research would be taking a longitudinal approach to exploring the dynamic of the relationship between union membership and job satisfaction. Such research would provide a more complete understanding of the causal relationship between unionization and job satisfaction.

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APPENDIX

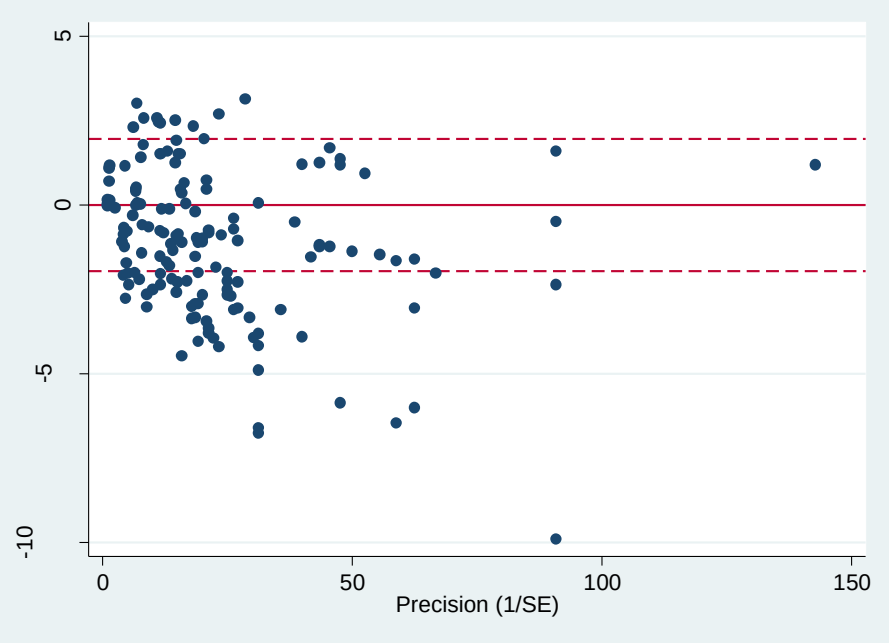
TABLE A1
Studies Excluded from the Meta-Analysis Organized by the nine Reasons for Exclusion

Articles	*Country*	*Journals*	*Remarks/Comments*
Reviews and essays excluded			
Hammer & Avgar (2005)	USA	Journal of Labor Research	A literature review on the impact of unions on JS, OC, and turnover
Fiorito, Gallagher & Greer (1986)	USA	Research in personnel and human resources management	A literature review on the determinants of unionism
Premack (1984)	USA	Academy of Management Proceedings	Prediction of Employee Unionization from knowledge of Job Satisfaction: A Meta-Analytic Investigation
Premack & Hunter (1988)	USA	Psychological Bulletin	Presentation of a process model of the individual unionization decision
Newton & Shore (1992)	USA	Academy of Management Review	A theoretical model of the eight member types was used to synthesize the literature on union membership.
No quantifiable effect size available			
Abraham, Friedman & Thomas (2008)	USA	Employee Responsibilities & Rights Journal	Intent to leave regressed on facets of work satisfaction and control variables for non-union and union employees
Clark (2001)	UK	Labour Economics	No estimates provided for union membership (only an interaction term with job satisfaction)
Savery (1991)	Australia	Journal of Managerial Psychology	No *t*-statistics provided. Union m'ship <-> JS (r=+.08, n=143)
Petrescu & Simmons (2008)	UK	International Journal of Manpower	Union vs non-union differences in the impact of HRM practices on JS
Odewahn & Petty (1980)	USA	Academy of Management Journal	Comparison of levels of JS for union members and non-members
Ratna & Kaur (2012)	India	International Journal of Management and Social Sc. Res	Simple correlations between various parameters of unions and JS
Unionization as dependent variable			
Fiorito & Greer (1986)	USA	Journal of Labor Research	Satisfaction with work itself -> union membership
Gordon, Beauvais & Ladd (1984)	USA	Industrial and Labor Relations Review	Job satisfaction -> union commitment
Guest & Dewe (1988)	UK	British Journal of Industrial Relations	Job dissatisfaction -> union membership
Leigh (1986)	USA	Industrial Relations: A Journal of Economy and Society	JS -> desire for unionism, by union status
Peetz (1998)	Australia	The Economic and Labour Relations Review	JS -> union density in open jobs (β=-.225*, n=266)
Schriesheim (1978)	USA	Journal of Applied Psychology	Total satis. -> pro-union voting (r=-.64*, n=62)
Overall Job Satisfaction not DV			
Berger, Olson & Boudreau (1983)	USA	Organizational behaviour and human performance	Satisfaction with pay, co-workers, supervision, promotion, work interest, resource adequacy and promotion
Bryson, Cappellari & Lucifora (2010)	UK	Oxford Bulletin of Economics and Statistics	Satisfaction with pay, influence over work, respect from manager and sense of achievement
Cappelli & Sherer (1988)	USA	Industrial Relations: A journal of Economy and Society	Satisfaction with pay and with work itself

Gazioglu & Tanzel (2006)	UK	Applied Economics	Satisfaction with influence over job, with amount of pay, with sense of achievement and with respect received from supervisors
Schwochau (1987)	USA	Industrial and Labor Relations Review	Satisfaction with supervision, co-workers, job content, resource adequacy and pay.
Overall Job Satisfaction not clearly measured/manipulated			
Katzell, Barrett & Parker (1961)	USA	Journal of Applied Psychology	Job satisfaction, job performance, and situational characteristics
Kochan (1979), Kochan & Helfman (1981)	USA	Monthly Labor Review / Working paper	JS (nature of work) ->Worker's propensity to join unions
Union membership not clearly measured/manipulated			
Allen & Keaveny (1981)	USA	Journal of Applied Psychology	Perceived need for a union -> JS (r=-.27***, n=220)
Bass & Mitchell (1976)	USA	Journal of Applied Psychology	JS ->Felt need for CB (r=-.34***, n=64)
Bigoness (1978)	USA	Journal of Applied Psychology	Attitude towards CB -> Satisfaction with work (r=-.35***, n=222)
Gius (2012)	USA	The Economic and Labour Relations Review	District is unionized -> Teacher satisfaction
Hammer (1979)	USA	Academy of Management Journal	Union density <-> JS at work (r=+.12, n=17)
Sarkar (2012)	India	Journal of World Business	Union attitudes -> work dissatisfaction (r=+.24, n=252)
Sinha & Sarma (1962)	India	Journal of Applied Psychology	Attitude towards unions -> JS (r=-.47***, n=100)
Krieg, Wassel, Hedrick and Henson (2013)	USA	Industrial Relations: A Journal of Economy and Society	Collective bargaining and JS
Sample of macro-data			
Donegani & McKay (2012)	Transnat.	Transfer	Average rates of job satisfaction by density of trade union membership (at country level)
Pichler & Wallace (2009)	Transnat.	European Sociological Review	Structural indicators and their covariation across 27 European countries
Methodological problems			
Terpstra & Honoree (2004)	USA	Education	Union membership <-> JS (r=-.01, n=490)
Data included through other study			
Clark (1996)	UK	British Journal of Industrial Relations	Union membership -> JS (β=-.13***, n=4,277)

Note: Full references may be obtained from the author upon request. n= number of observations. r= Pearson correlation coefficient. β= reported coefficient in Probit regression estimates.

FIGURE A1 – Galbraith Plot of Estimates of Unionization on Job Satisfaction (n=224)



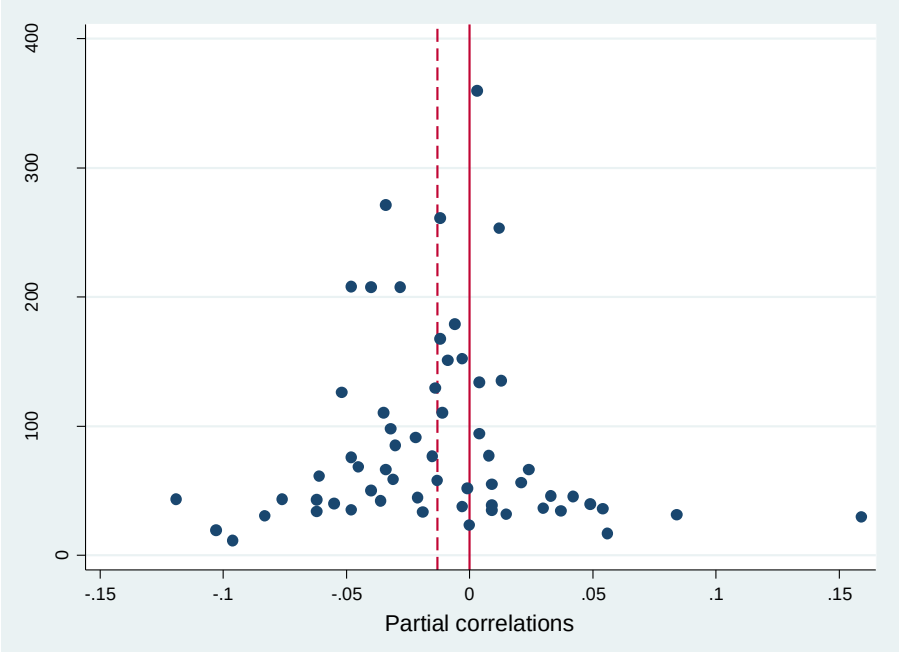
Notes: the (dash) horizontal line shows a *t*-statistic equal to ±1.96 (p<0.05)

TABLE A2
Meta-average partial correlation of unionization and job satisfaction

	Un-weighted Average (1)	FEE-WLS (2)	REE-WLS (3)	FAT-PET, selection bias corrected weighted average (4)	FAT-PET, publication selection bias (5)	PEESE weighted average (6)
All studies, average estimate (n=60, k=60) (1)	-0.013** (-2.20)	-0.014*** (-2.87)	-0.014*** (-2.79)	-0.014* (-1.70)	-0.016 (-1.46)	-0.014** (-2.61)
USA studies, average estimate (n=22, k=22) (2)	-0.011 (-1.04)	0.002 (0.80)	-0.009 (-0.91)	0.008* (1.98)	-0.006 (-0.21)	0.004 (1.64)
UK studies, average estimate (n=18, k=18) (3)	-0.027*** (-3.56)	-0.030*** (-6.82)	-0.026*** (-4.63)	-0.035*** (-5.62)	-0.010 (-1.47)	-0.030*** (-6.52)
All studies, all estimates (n=224, k=60) (4)	-0.017*** (-2.85)	-0.012*** (-3.35)	-0.016*** (-6.37)	-0.009* (-1.72)	-0.016*** (-5.43)	-0.012*** (-3.06)
USA studies, all estimates (n=90, k=22) (5)	-0.010 (-0.91)	-0.003 (-1.41)	-0.008* (-1.73)	-0.000 (-0.14)	-0.004 (-0.64)	-0.002 (-1.65)
UK studies, all estimates (n=71, k=18) (6)	-0.025** (-2.69)	-0.022*** (-5.39)	-0.023*** (-6.51)	-0.021*** (-4.31)	-0.022*** (-5.93)	-0.022*** (-5.25)

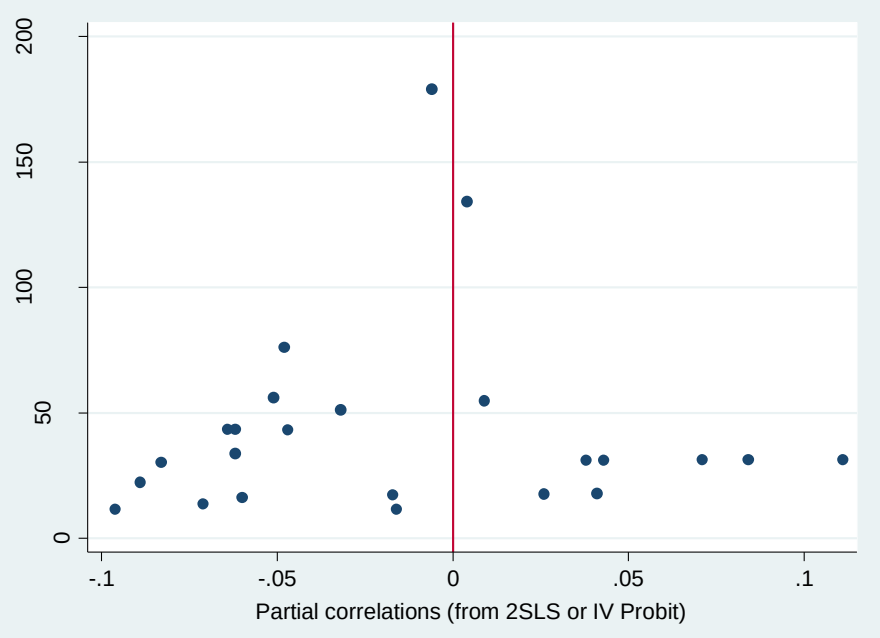
Notes: Column (1) reports the un-weighted average, where each estimate is assigned equal weight in constructing the overall average. In Column (2) we report the weighted average using inverse variance weights, estimated using weighted least squares. This is the fixed effect unrestricted WLS estimate, FEE-WLS. For comparison, in Column (3) we present the random effects WLS, REE-WLS. In Column (4) we report weighted averages corrected for publication selection bias, using the FAT-PET model. Column (5) presents the estimates of publication bias. Finally, in Column (6) we report weighted averages corrected for publication selection bias, allowing non-linearities in selection, using the PEESE model (see Stanley and Doucouliagos, 2012 for details). We consider several combinations of estimates. In Row (1) we take an average of all estimates from each study. Hence, each study contributes one estimate and there is thus no within study dependence to deal with. In Row (2) we use one estimate from each USA study and in Row (3) we use one estimate from each non-USA study. Rows (4), (5), and (6) use all comparable estimates from all studies, only USA studies and only non-USA studies, respectively. Figures in round brackets are t-statistics using either robust standard errors (rows 1 to 3) or standard errors corrected for clustering of estimates within studies (rows 4 to 6). ***, **, * denotes statistically significant at the 1%, 5% and 10%, level respectively. *n* is the number of observations. *k* is the number of studies.

FIGURE A2
Funnel Plot of Estimates of Unionization on Job Satisfaction
(One study – One estimate)



The vertical (dash) line indicates the location of the uncorrected and unweighted average partial correlation (r = -0.013)

FIGURE A3
Funnel Plot of Estimates of Unionization on Job Satisfaction
(Studies that make endogeneity corrections)



Notes: the vertical solid line shows a zero effect size.

TABLE A3
Unionization and Job Satisfaction, Meta-Regression Analysis

	General FEE-WLS (1)	Specific FEE-WLS	REE-WLS (2)	Multi-Level (3)	OLS robust (4)
Control for endogeneity:					
(1) Intrinsic degree of satisfaction is higher than non-unionized workers ($\rho > 0$)	-0.020 (-1.24)	-0.027*** (-3.52)	-0.003 (-0.57)	0.013 (0.36)	0.002 (0.09)
(2) Intrinsic degree of satisfaction is similar between unionized and non-unionized workers ($\rho = 0$)	0.016 (1.16)	-	0.019 (1.43)	0.023* (1.78)	0.033* (1.84)
(3) Intrinsic degree of satisfaction is lower than non-unionized workers ($\rho < 0$)	0.030*** (3.25)	0.025*** (4.11)	0.032* (1.77)	0.065*** (4.15)	0.045* (1.71)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes
Constant	-0.033 (-1.22)	-0.011 (-1.35)	-0.016 (-0.59)	-0.007 (-0.21)	-0.005 (-0.12)
Adjusted-R^2	0.57	0.55	0.60	-	0.45
N	224	224	224	224	224

Notes: Raw (1), (2) and (3) report the regression coefficients for endogeneity corrections. However, contrary to the estimates presented in Table 5, endogeneity correction is divided here into three indicators depending on the intrinsic degree of job satisfaction identified by the studies controlling for endogeneity. The intrinsic degree of job satisfaction of union members is measured by the correlation of unobservables between satisfaction and membership equation (coefficient ρ). If ρ is negative, then one can conclude that union members are intrinsically less satisfied than non-union members. In that case, studies report a lower negative effect (or a positive effect) of unionization and it can be interpreted as a proof of the absence of a causal effect of unionization on job satisfaction. On the contrary, if ρ is positive, union members are intrinsically more satisfied than their counterparts and the coefficient estimate becomes larger (more negative or less positive) once we remove the compositional effects. We can then consider that result as a proof of a causal effect of unionization on job satisfaction. For the sake of brevity, only estimates that control for endogeneity are reported here. All MRAs include the full set of control variables presented in Table 5.

TABLE A4
Estimated Effect of unionization on job satisfaction

US	UK	Australia	Canada	Others	Europe (including UK)	Europe (excluding UK)
-0.015	-0.037**	-0.037	-0.013	-0.011	-0.040*	-0.015
(-0.89)	(-2.31)	(-1.29)	(-0.51)	(-0.47)	(-1.97)	(-0.60)
[0.376]	[0.024]	[0.203]	[0.610]	[0.641]	[0.054]	[0.550]

Notes: Figures in brackets are t-statistics using cluster adjusted standard error. All estimates use coefficients from column 2 of Table 5. Figures in square brackets are *p*-values.

[i] Although many studies have been published on this topic, few have attempted to use formal statistical tools to synthesize the existing results to date. Premack (1984) made his contribution by presenting the first meta-analysis of the empirical evidence on the relationship between union membership and job satisfaction thirty years ago. However, this first meta-analysis is rather rudimentary and somewhat limited; moreover, dozens of studies have been published in academic journals since this first quantitative synthesis. In this paper, we provide an updated meta-analytic synthesis of published research on the relationship between unionization and job satisfaction. Our meta-analysis makes multiple contributions beyond Premack (1984). First, our meta-analysis is based on a larger sample of studies (60 vs 10 studies), allowing better estimation of the population value for the relationship between unionization and job satisfaction. Second, this study cumulates research findings for the US and for other industrialized countries. Third, whereas Premack (1984) used sub-group meta-analysis to evaluate potential moderators, we use meta-regression analysis (MRA) to facilitate the identification of moderating effects. Finally, we use up-to-date meta-analytic methods to facilitate the identification of selection and publication bias in this literature, an interesting issue that has not previously been addressed in this field of research.

[ii] Protection is provided in France for workers exercising representative function at the workplace level (such as union representative or member of the work council) (Laroche, 2015)

[iii] The coding is a challenging task. Once you have decided what study characteristics to code, the next step is to record information about the studies. Ideally, all researchers involved in a meta-analysis project should independently code the studies selected. Indeed, one way to evaluate the replicability of the coding system is to assess the reliability of independent efforts of coding the same studies (intercoder reliability). Our approach was different here as we assess the replicability of our coding system by coding twice the sample of studies at different time period (intracoder reliability). The main idea is that the same person codes the sample of studies twice. Intracoder agreement is not a perfect substitute for intercoder agreement. However, it can be an acceptable evidence of reliability if efforts are made to guarantee the independence of the coding phases.

[iv] We eliminated studies that clearly did not include primary data such as qualitative studies or literature reviews and data-based articles without quantifiable effect size. Studies whose dependent variables were not appropriate for this meta-analysis and studies lacking clear measures of job satisfaction were also excluded, in addition to studies using the same data and reporting the same estimates as were previously published in another paper (for example, Andrew Clark published several papers using the British Household Panel Survey dataset). We also excluded 'union/commitment and job satisfaction' articles (for example, Gordon, Beauvais & Ladd, 1984; Davis, 2013) and 'satisfaction with union' papers (see for example, Jarley, Kuruvilla & Casteel, 1990; Gahan, 2012; Frenkel & Kuruvilla, 1999).

[v] Stanley (2005) notes that heterogeneity of true effect and misspecification biases may be observed as 'type II' publication selection. This arises from the selection of statistically significant results, irrespective of their direction. An inspection of a Galbraith plot reveals evidence of type II selection. In Figure A1 in Appendix, the points should be randomly distributed approximately 0, but here, there is a wide variation in the reported t-statistics, reflecting selection for statistical significance. If this excess variation can be considered random, it also can be considered a selection or misspecification bias. Our MRAs address this type of selection issue.

[vi] Table A2 in Appendix reports six meta-averages of the evidence base. The FEE-WLS and the REE-WLS weighted averages both suggest a negative correlation between unionization and job satisfaction. Results from the FAT-PET indicate no publication bias; Column (5) confirms preferential reporting of negative job satisfaction effects. When either FAT-PET or PEESE is used to correct for the effects of publication selection bias, the literature suggests that there is no correlation between unionization and job satisfaction in the USA but a significant and negative one for the UK.

[vii] This is a subset of studies (k=60, n=60) using only one estimate per study to evaluate the effect of unionization on job satisfaction. We calculated the average partial correlation for each study to obtain this single estimate.

[viii] We investigated the data further in order to identify adverse job satisfaction effects. We first removed any estimate with a positive job satisfaction effect. A justification for this could be that findings of positive job satisfaction might be incorrect and arise from, for example, modelling errors. This reduces the sample size to 150 observations from 48 studies. The effect of this artificial truncation is to significantly increase the estimated coefficient on publication selection bias (from -0.47 to -1.65 with a t-statistics of -5.92). The meta-average is still -0.009 and is more statistically significant (p-value = 0.03). Hence, if we deliberately drop 33% of the evidence base, we still have a negative effect of unionization with the same magnitude. Needless to say, we do not advocate removing such a large proportion of the evidence base, nor can we find any scientific justification for doing so.

[ix] According to Stanley and Doucouliagos (2012), there is clearly a "*danger that the significant moderator variables identified by a meta-logit analysis will reflect mere correlation with the publication selection process rather than any genuine characteristic of the underlying economic phenomenon studied*" (p. 16).

[x] In order to compare with the MRA results, we estimate a model with the inverse of variance as a weight.

[xi] Selnik (2014) has devoted a special attention to the cultural dimension of happiness in France, where people are, in general, less happy than other Europeans whether they live in France or outside. She tries to disentangle the effect of objective circumstance and the effect of psychological and cultural factors and shows that in France there is a real emotional counterpart in self-declared happiness. Additional studies introducing an investigation of the differences in the cultural dimension of job satisfaction across countries will certainly constitute an interesting avenue for future research.