

1 **Income Inequality and Subjective Well-Being: A Systematic Review and Meta-Analysis.**

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17

Abstract

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Background: Reducing income inequality is one possible approach used by some governments to boost subjective well-being (SWB). Nevertheless, previous studies have reported positive, null and negative associations between income inequality and SWB.

Objectives: This study reports the first systematic review and meta-analysis of the relationship between income inequality and SWB, and seeks to understand the heterogeneity in the literature.

Methods: This systematic review was conducted according to guidance (PRISMA and Cochrane Handbook) and searches (between January 1980 and October 2017) were carried out using Web of Science, Medline, Embase and PsycInfo databases.

Results: 39 studies were included in the review, but poor data reporting quality meant that only 24 studies were included in the meta-analysis. The narrative analysis of 39 studies found negative, positive and null associations between income inequality and SWB. The meta-analysis confirmed these findings. The overall association between income inequality and SWB was almost zero and not statistically significant (pooled $r = -0.01$, 95% CI = -0.08 to 0.06; $Q = 563.10$, $I^2 = 95.74\%$, $p < 0.001$), suggesting no association between income inequality and SWB. Subgroup analyses showed that the association between income inequality and SWB was moderated by the country economic development (i.e., developed countries: $r = -0.06$, 95% CI = -0.10 to -0.02 versus developing countries: $r = 0.16$, 95% CI = 0.09 to 0.23). The association between income inequality and SWB was not influenced by: (a) the measure used to assess SWB, (b) geographic region, or (c) the way income inequality was operationalised.

Conclusions: The association between income inequality and SWB is complex and moderated by the country economic development.

43 **Keywords:** Subjective well-being, happiness, life satisfaction, income inequality,
44 redistribution.

45

46 1. Introduction

47 Income inequality is one of many possible determinants of subjective well-being
48 (SWB) well-being [1, 2]. There is a view that income inequality – the unequal distribution of
49 household income across different participants in an economy (OECD, 2011) – is a predictor
50 of SWB and that decreasing income inequality will boost SWB [3, 4]. However, the assumed
51 linear relationship between income inequality and SWB is not grounded in a solid research
52 evidence base. In fact, our scoping search yielded studies that showed mixed findings: some
53 studies show a significant positive association between SWB and income inequality [5, 6],
54 some show a significant negative association [4, 7, 8], and others a no significant association
55 [9]. One explanation of these inconsistent findings is that the strength and the direction of the
56 relationship between SWB and income inequality is moderated by other factors. For example,
57 although both happiness and life satisfaction have been used interchangeably to assess SWB
58 across different studies, these terms are not synonymous and might relate differently to income
59 inequality [10]. Similarly, the literature suggests that level of economic development [11] [12],
60 geography [8], and how income inequality is operationalised [13] may affect the relationship
61 between income inequality and SWB [14].

62 Given that the relationship between income inequality and SWB is important to social
63 policy decisions, it is surprising that no systematic evaluation of this literature has yet been
64 undertaken. We therefore decided to undertake the first systematic review of the literature to
65 examine the link between income inequality and SWB. The objectives were:

- 66 1. To examine the direction and the magnitude of the association between income
67 inequality and SWB.
- 68 2. To examine factors that may moderate the association between income inequality and
69 SWB. On the basis of previous research evidence, we focused on the effects of:
 - 70 • Types of measures of SWB (i.e., happiness versus life satisfaction),

- 71 • Country level of development (i.e., developed countries versus
72 developing countries),
- 73 • Geographic region (e.g. studies conducted in the USA versus studies
74 conducted in Europe).
- 75 • The way income inequality was operationalised (exogenous Gini versus
76 endogenous Gini).

77

78 **2. Methods**

79 The systematic review was conducted and reported according to PRISMA (Preferred
80 Reporting Items for Systematic Reviews and Meta-Analyses) and Cochrane Handbook
81 recommendations [15, 16].

82 2.1. Search strategy and data sources

83 Systematic searches of the literature published between January 1980 and October 2017
84 were carried out using Web of Science, Medline, Embase, PsycInfo. Combinations of two key
85 blocks of terms were used: (1) SWB, happiness, life satisfaction, quality of life, well-being;
86 and (2) income inequality, income level, social equality, income disparities, income
87 redistribution. We also checked the reference lists of the studies meeting our inclusion criteria.
88 The search strategy in each of the databases is presented in Appendix 1.

89 2.2. Study Selection

90 Screening was completed in two stages. Initially, the titles and abstracts of the
91 identified studies were screened for eligibility. Next, the full-texts of studies initially assessed
92 as “relevant” for the review were retrieved and checked against our inclusion/exclusion criteria.
93 Authors were contacted and asked for further information as necessary, most frequently for the
94 zero-order correlation between income inequality and SWB[17].

95 2.3. Eligibility criteria

96 Studies were eligible for inclusion if they met the following criteria:

- 97 1. Original studies that employed quantitative methods. Qualitative studies were
98 excluded.
- 99 2. Included a measure of income inequality (i.e., exogenous Gini and endogenous Gini).
- 100 3. Included a measure of SWB (happiness and/or life satisfaction). [18, 19]
- 101 4. Provided quantitative data regarding the association between income inequality and
102 SWB.
- 103 5. Were published in a peer-reviewed journal. Grey literature was excluded because they
104 were not published through conventional and credible publishers.

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106 2.4.Data extraction

107 Information about the following characteristics of the studies were extracted: (1) first
108 author name and year of publication, country where study was conducted, participant
109 characteristics, period of the study, data used, research design, measures of SWB, measure of
110 income inequality, zero order correlations, regression coefficient, direction of the association,
111 country level of development; and (2) methodological quality of the study, namely, validity of
112 measures, quality of the research design, population and recruitment methods, and control of
113 confounders. Data extraction was completed by the first author. A second researcher extracted
114 data from three randomly selected studies.

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116 2.5.Assessment of methodological quality

117 The quality review included assessment of the quality of the research design, population
118 and recruitment methods, verified if the choice of the income inequality measure and SWB
119 measures were valid and reliable, and if the analysis reported the association between income
120 inequality and SWB (Table 1). Of 39 studies, 15 were given a high-quality rating of 6/6 and

121 the remaining 24 studies were given a low-quality rating of 5/6.

122

123 2.6.Narrative synthesis

124 The narrative synthesis of all 39 eligible studies focused on the way SWB is assessed,
125 country level of development, geographic region and the way income inequality was
126 operationalised.

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128 2.7.Data analysis

129 Our plan was to pool the results of the association between income inequality and SWB
130 across the individual studies using meta-analysis. Authors of published papers that did not
131 report data in a form amenable for meta-analysis were contacted and eight authors provided
132 further information. We performed a meta-analysis of all 24 studies reporting the correlation
133 coefficients between income inequality and SWB. Studies that assessed both happiness and life
134 satisfaction were reported separately in the subgroups in order to test whether variation is due
135 to the way SWB was assessed. Using the World Bank classification of countries, we performed
136 another subgroup analyses to examine whether the results differed between developed and
137 developing countries. According to the World Bank, developed countries are defined as
138 industrial countries, advanced economies with high level of Gross National Income (GNI) per
139 capita of 12,736 US dollars per year (estimated in July 2015) [20, 21]. In contrast, developing
140 countries includes countries with low and middle levels of GNI per capita (less than 12,736 US
141 dollars) [20, 21].

142 The associated Confidence Intervals (CI) of the zero-order correlations were calculated
143 in STATA 13.1 [22]. The pooled zero-order correlation as well as the forest plots were
144 computed using the meta-an command for STATA [22]. A random effects model was used for
145 all the meta-analyses because of anticipated heterogeneity. Heterogeneity was assessed using

146 the Cochran's Q and Higgin's I^2 statistic [16]. We focus our interpretation of the results in
147 terms of effect sizes [23]. To test whether the association between income inequality and SWB
148 varies across sub-groups, we used Cohen's q to test whether there were significant differences
149 in the magnitudes of the correlation coefficients following Fisher's z transformation of r [24].
150 By convention, if z score values are greater than or equal to 1.96 or less than or equal to -1.96,
151 the two correlation coefficients are significantly different at a .05 alpha level (suggesting
152 difference of correlation coefficients between two population groups) [25, 26].

153

154 **3. Results**

155 A total of 619 titles were retrieved, and after removing duplicates ($n = 250$), 336 journal
156 articles, 30 books and 5 dissertations were screened for relevance. Following title/abstract and
157 full-text screening, 39 articles were deemed eligible for the narrative analysis and 24 studies
158 were eligible for meta-analysis. The flowchart of the screening and selection process is shown
159 in Figure 1.

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161 [Figure 1. about here]

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166 **Identification**

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170 **Screening**

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175 **Eligibility**

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179 **Included**

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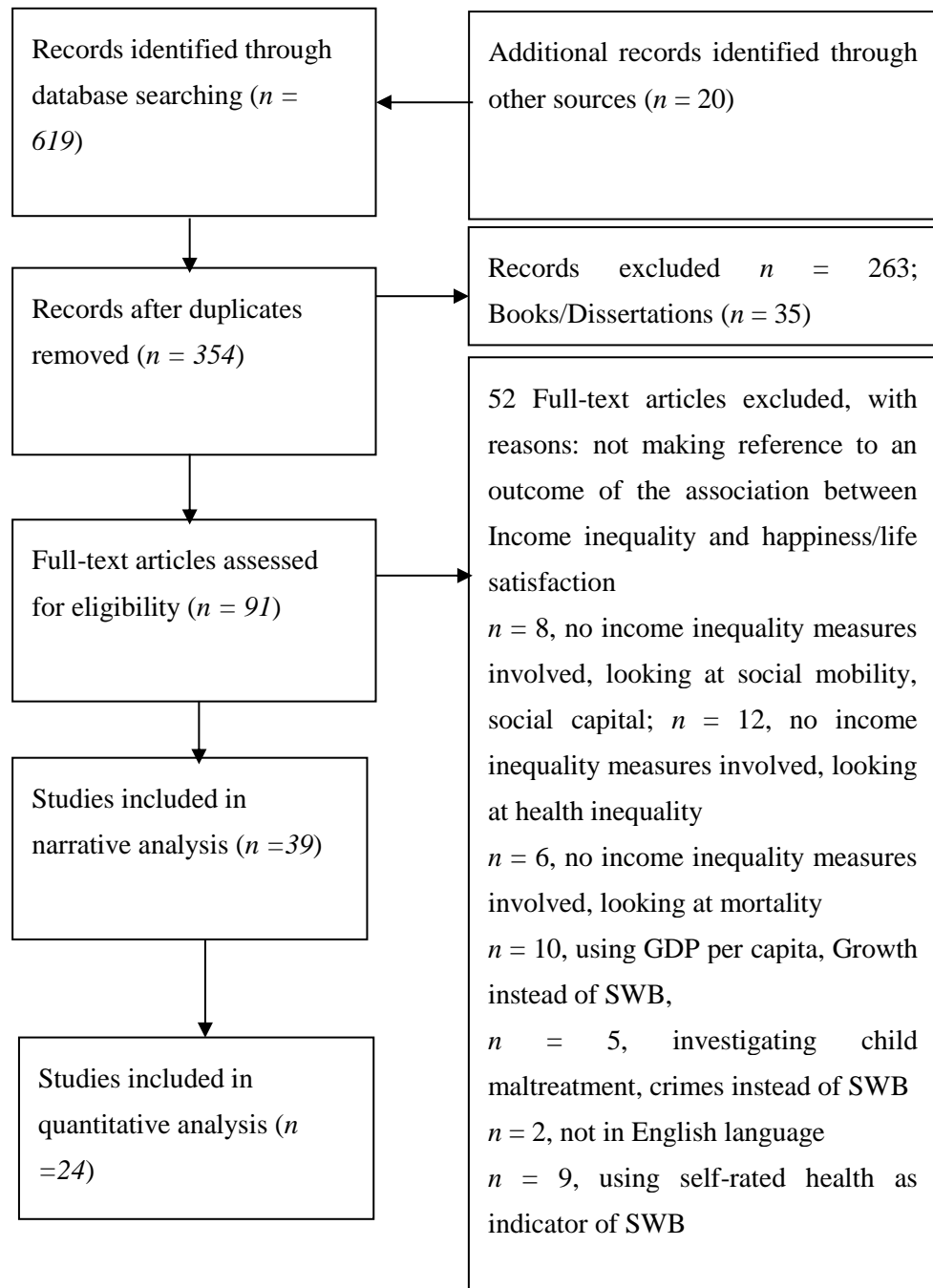
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188 Figure 1. PRISMA Flow Diagram (Income inequality and SWB); Source: [15, 27].

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192 3.1.Descriptive characteristics of the studies:

193 Table 1 presents the main characteristics of the 39 articles included in the review. The
194 Table 1 provides details about the country in which each study was conducted, participant
195 characteristics, data used, research design and measures used to assess SWB and income
196 inequality. Table 1 presents the zero-order correlation and regression coefficients, the outcome
197 of the association between income inequality and SWB, and the quality ratings.

198 Six studies were conducted in the USA, eleven studies were conducted in Europe, two
199 in Latin America, ten worldwide (including all continents) and nine elsewhere or used different
200 groupings (e.g., three in China, two in Industrialised countries, one in Russia, one in Israel, one
201 in developing countries and one in Taiwan) – please see Table 1 for more details. All studies
202 were published between 1977 and 2015 and participants were adults aged between 16 and 99
203 years. The sample size varied from 1,277 to 278,134 and recruited from different groups
204 including students, workers, self-employed and general population. Studies used data from a
205 range of surveys such as the General Social Survey (GSS), World Value Survey (WVS),
206 Eurobarometer, World Database of Happiness (WDH), European Quality of Life (EQL), and
207 Chinese Household Income Project (CHIP). Most studies were conducted in developed nations.
208 Only four studies were conducted exclusively in developing countries (three studies in China
209 and one study in Russia). Different measures were used to assess SWB (e.g., happiness[4] and
210 life satisfaction[12]) and income inequality (e.g., Gini coefficient[28], 80/20 skew[29]).

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212 [Table 1. about here]

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Table 1. Included studies and quality ratings (Income inequality and SWB).

Ist author & year of publication	Country & participants	Period of Data the study used	Methods – analysis	SWB measures	Inc.Inequality measure	Zero-order correl. P<0.05	Reg. coeff., p<0.05	Income Inequality – SWB link	Level of Dev*	Qual. Rating **	
Alesina, 2004 [8]	US N=19895	US- 1981-1996	GSS	Ordered logit reg.	Hap 1-3	Gini exogenous	US: -0.014	Gini negative ass. but sensitive to covariates (CV). Subgroups: US: Gini neg. for upper inc. group; No corr with Gini for poor and political left.	Developed	6	
Alesina, 2004 EUR [8]	Europe N=103773	Eur – 1975 -1992	EuroBarometer	Ordered logit reg.	Life satisf (1-10)	Gini exogenous	EUR: -0.025	Gini negative ass. but sensitive to CV. Europe: Gini neg. for poor and political left.	Developed	6	
Beja, 2013Ind [12]	14 Industrialised countries	2005	WVS	Ordinal regression	Life Satisf (1-10)	Gini exogenous	-0.0019	-0.0003	Gini negative in both industrialized and emerging econ. but very sensitive to the industrialized econ. Both groups tolerate subjective inequality.	Developed	6
Beja, 2013Emerg [12]	19 emerging countries	2005	WVS	Ordinal regression	Life Satisf (1-10)	Gini exogenous	0.031	0.031	Gini less sensitive to Emerging Economies.	Developing	6
Berg, 2010	Worldwide 119 countries	1993-2004	WDH	Correlation	Life satisf. Mood, contentment	Gini exogenous (LS)	-0.08	+ 0.28 (CVWealth)	Life satisf. & Contentment: Gini neg. at univariate level but de turns positive when CV GDP in. Mood: Gini positive even with CV. Subgroups: diff. in national wealth can distort. Gini neg. in Western countries, positive in Eastern Eur, Asia, Latin Am. But no sig in Africa.	Worldwide	6
Blanchflower & Oswald, 2004 [30]	USA	1972-1998	GSS	Ordered logit FE	Hap	75/25 endogenous			Ineq neg. & sig, sensitive to CV; Subgroups: neg. for women, low educ. Neg for US black. Higher income is associated with higher hap.	Developed	5

Blanchflower & Oswald, 2004 UK [30]	UK	1973-1998	Eurobarometer	Ordered logit FE	LS	75/25 endogenous			Ineq neg. & sig, sensitive to CV; Subgroups: neg. for women, low educ. Higher income is associated with higher hap; Relative income matters per se.	Developed	5
Bjornskov, 2013[28]	87 countries N=278,134	1990 - 2008	WVS	OLS	Life Satisfaction (1-10)	Gini from SWIID exogenous	.067		Subjective ineq: Positive (Fairness perceptions); demand for redistribution is neg ass with SWB. Gini: neg. effects of actual inequality on hap. decrease with increasing perceived fairness.	Worldwide	5
Bjornskov, 2008[31]	25 countries N= 25,448	1998-2004	WVS & ISSP	Ordered probit	Hap (0-10)	Gini coef exogenous	-0.0057		Gini neg at ind. level. But Gini positive when people believe that income distribution is 'fair'. Redistribution can have both positive and negative effects.	Developed	5
Carr, 2013[32]	USA N=9,087	1998-2008	US GSS	OLS, & Multilevel	Happiness (1-3)	Gini from US census exogenous	Not provided	0.0133 (county) -0.0762 (state)	Positive at local (county; 0.0133); Negative at State level (-0.0762). The effect of country ineq 85% larger for high inc (-0.2) than low-inc (-0.375). And, the effect of state inequality on well-being is 250% larger for high incomes (0.55) than low incomes (0.22).	Developed	5
Clark, 2003[33]	UK	1991-2002	BHPS	Ordered logit reg. FE, RE	Life satisf.	Gini, 90/10 endogenous		0.104* *P<0.10	Gini positive, sig, robust to CV Inc ineq. seems to include some aspect of opportunity	Developed	5
Delhey &	Europe	2007	EQLS	ML	Index from	Gini	-0.025	-0.037	Gini neg. sig, robust to CV.	Developed	6

Dragolov, 2014[34]				mediation	Life Sat - Hap	exogenous		(trust)	Full mediation by trust, anxiety ed status.	
							-0.029	-0.023	Distrust and status anxiety are the main explanations for the neg. effect of ineq.	
Diener, 1995[35]	Worldwide	Diff. time points, 1984-1986	WDH	correlation	Life satisf	Gini exogenous	-0.48	Not sig.	Gini neg sig. Subgroups: Gini not sig among student sample	Worldwi 5 de
Dynan & Ravina, 2007[36]	USA	1979 - 2004	GSS	FE reg	Hap	Gini exogenous			Hap. depend positively on how well the group is doing relative to the average in their geographic area. Robust to CV, income. People with above-average inc. are happier.	Develop 5 ed
Fahey & Smyth, 2004[37]	Europe	1999/2000	EVS	ML OLS	Life satisf	Gini exogenous			Gini neg sig (ML) CV GDP	Develop 5 ed
Graham & Felton, 2006[38]	Latin America	1997-2004	Latino Baromet	Ordered logit cluster	Life satisf	Gini exogenous			Ineq. has negative effects on happiness in Latin America (LA). But Gini not sig. when control for wealth. Ineq. or relative position matters more in LA.	Developi 5 ng
Grosfeld, 2010[39]	Poland N=1081-3168	1992-2005	Poland CBOS	Ordered logit	Satisfaction with country economy (1-5)	Gini(endogenous)**	0.074	0.087	Positive, then Neg when expectation change	Develop 6 ed
Gruen, 2012[40]	21 Transition countries (TC) in Europe	1988-2008	WVS	Regression analysis	Life Satisfaction (1-10)	Gini from SWIID	-0.132		No significant when all, but Negative in TC No significant in TC in the last wave.	Develop 6 ed
Hagerty, 2000[29]	USA	1989-1996	GSS	OLS	Hap	80/20 pareto			Neg sig for 80; positive sig for 20; not sig for mean income	Develop 5 ed

Author, Year	Country/Region	Year	Survey	Method	Variable	Control	Effect	Notes	Development
Hajdu, 2014[41]	29 EU Countries N= 179,273	2002-2008	ESS	OLS regressions	Life satisfaction (0-10)	principle Gini from SWIID	-0.045 -0.036	People in Europe are negatively affected by income inequality, whereas reduction of inequality has a positive effect on well-being. a 1 % point increase in the Gini index results in a -0.036 point lower satisfaction	Developed
Haller & Hadler, 2006[42]	Worldwide	1995-1997	WVS	ML	Life satisf, Hap	Gini		Gini positive sig. Subgroups: Latin America : high inc ineq but happier; Eastern Europe: high inc ineq & less happy	Worldwide
Helliwell, 2003[43]	Worldwide	1980-1997	WVS	OLS FE	Life satisf	Gini		Gini not sig	Worldwide
Helliwell & Huang, 2008[44]	Worldwide	1980-2002	WVS/EVS	OLS, Correl	Life satisf	Gini		Gini positive sig robust to CV. Subgroups: Gini positive in Latin America, poorer countries & poor governance nations	Worldwide
Jiang, 2012[45]	China N=5630	2002	CHIP	OLS; ANOVA	Happiness (1-5)	Gini(endo genous)**	Not provided	Positive when they look local BUT Negative with between group inequalities.	Developing
Knigh, 2010[46]	China N=6813 in urban N=9160 in rural.	2002	CHIP	OLS	Happiness (1-5)	Gini(lowest, middle, highest) **	Not provided	Change with reference group. Positive at county level. Urban less happier than rural.	Developing
Layte, 2012[47]	Europe	2007/2008	EQLS	ML	WHO5 Hap	Gini		Gini neg sig, sensitive to CV. Subgroups: Gini effect stronger in high inc. countries	Developed
Lin, 2013[48]	116 countries	2006	WH & Country mean	OLS & SAR	Happiness (0-10)	Gini (equal & unequal >40)	-0.23	Importance of group clustering in the studies of hap. Unemp high in unequal soc. Better governance, equal	Worldwide

Morawetz, 1977[49]	Israel	1976	-	Correlations	Hap	Equal/ Unequal			opport. improve hap.		
Ngamaba, 2016[50]	Rwanda	2007 & 2012	WVS	ML FE	Hap 1-4 LS 1-10	Gini from SWIID	Hap 0.269 LS 0.371	Not provided	Equal societies happier and Unequal societies less happy In Rwanda: Gini positive sig, sensitive to CV. When all nations are included: the positive Gini (Hap 0.071, LS 0.043) change to negative (Hap -0.031, LS -0.039), sensitive to CV.	Developed	Developing
Oishi, 2011[4]	USA N=53043	1972-2008	US GSS	Multilevel mediation	Happiness (1-3)	Gini from US census	-0.37	-0.206	Negative, mediated by fairness and trust	Developed	
Oishi, 2015 HIC[51]	16 countries (high income nations)	1959-2006	Veenh. world database of hap	Multilevel	Different measures, also LS (1-4)	Gini from UNU-WIDER	-0.022	-0.022	Negative after controlling for GDP per capita	Developed	
Oishi, 2015 Latin Am[51]	18 Latin American Countries	2003-2009	Latinobarometro data	Multilevel	Life satisf (1-4)	Gini from the World Bank	-0.005 P=.067	-0.007 p=.010	Negative after controlling for GDP per capita. Some authors may argued that these findings are close to 0 and no sig (-0.005, P= .067).	Developing	
Rozer, 2013[5]	85 countries N=195091	1989-2008	WVS	OLS, Multilevel	Index from LS(1-10)&Hap(1-4)	Gini (exogenous)	0.04		Positive, weaker when people trust more others	Worldwide	
Schwarze and Harpfer, 2007[52]	West Germany	1985-1998	Socio Econ Panel	OLS	Life satisf	Atkinson inequality measure			Gini neg sig	Developed	
Senik, 2004[53]	Russia N=4685	1994-2000	RLMS	Ordered probit	Life Satisfaction	Gini from reference group income	0.331		Gini Positive, total effect : Gini not sig. Support the “tunnel effect”. The ref group’s income exerts a positive influence on individual LS.	Developing	
Tao, 2013[54]	Taiwan N=1277	2001	TSCS	OLS & Ordered	Happiness (1-4)	Gini (endogenous)		Not provided	Negative but change to positive when perception on reference	Developed	

				probit		us) rich, middle, poor Gini		group change	
Wang, 2015[55]	China N=8,208	2006	CGSS	ordered probit model	Hap (1-5)	Gini	-0.0382	Ind. hap. increases with Gini when Gini is < 0.405. Then decreases when 60% of the pop have >0.405	Developi 5 ng
Verme, 2011[14]	84 countries N=267870	1981- 2004	WVS & EVS	Ordered logit	Life Satisf (1-10)	Gini WVS	-0.029	Gini neg and sig on LS. Robust across dif. inc. groups and countries. Sensitive to multicollinearity generated by the use of country and year fixed effects, and if Gini data points is small. Subgps: Poor: -0.023; No poor: -0.031; Western: -0.035; No Western: -0.016	Worldwi 5 de
Zagorski, 2014 LS[9]	28 EU N=20498- 26257	2003	EQL	Multilevel	Life Sat. (1- 10) Hap (1- 10)	Gini	LS : -0.19 Hap: -0.14	-0.03 no sig. No sig.; income inequality does not reduce SWB in advanced societies.	Develop 6 ed

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216 Note: =SWB: Subjective well-being; BHPS: British Household Panel Survey; NSCW: National Study of the Changing Workforce; WVS: World
 217 Value Survey; GSS: General Social Survey; ISSP: International Social Survey Programme; CHIP: Chinese Household Income Project; WDH:
 218 World database of Happiness; RLMS: Russian longitudinal monitoring survey; CBOS: Polish Public Opinion Research Center; TSCS: Taiwan
 219 social change survey; WIDER: World Institute for Development Economics Research; EQL: European Quality of Life; CGSS: China General
 220 Social Survey; ESS: European Social Survey; “Hap 1-4” means the study assessed Happiness on a 1-4 scale; “LS 1-5” means the study assessed
 221 life satisfaction on a 1-5 scale; OLS: Ordinary Least Squares; SAR: Spatial autoregressive; CV: covariates; sig: significant; Dev: development;
 222 *We classified country level of development according to the World Bank estimate [20]; ** The quality assessment score is calculated by awarding
 223 1 point for each of the criteria such as valid recruitment procedure, research design, income inequality measures, SWB measures and if the outcome
 224 of the association was reported.

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228 3.2.Narrative synthesis of the results including studies with non-amenable data

229 Thirty-nine studies were included for the narrative analysis of the association between
230 income inequality and SWB. The overall evidence for the relationship between income
231 inequality and SWB was mixed; ranged from negative, positive or non-significant across
232 studies (see Table 1). The narrative synthesis focused on four factors:

233 (1) *SWB assessment (i.e., happiness versus life satisfaction)*: 14/39 studies assessed
234 happiness and 21 studies used life satisfaction to assess SWB. The remaining 4 studies used
235 both happiness and life satisfaction to assess SWB. Of 14 studies using happiness to assess the
236 SWB, 8 reported a negative association and 6 reported a positive association with income
237 inequality. Of 21 studies using life satisfaction to assess SWB, 12 reported a negative
238 association, 6 reported a positive association and 3 found no relationship. The remaining 4
239 studies that used both happiness and life satisfaction reported negative (n = 2), positive (n = 1)
240 and no (n = 1) associations.

241 (2) *Country level of development*:

242 Using the World Bank classification of countries [20], our narrative analysis shows that
243 21 studies were conducted in developed countries, of which 18 reported a statistically
244 significant negative association between income inequality and SWB and the remaining 3
245 report a statistically significant positive association. Studies that were conducted worldwide (n
246 = 9) report both negative (n = 4) and positive (n = 4) associations, one study found no
247 association[44]. The remaining 9 studies that were conducted in developing countries report a
248 positive (n = 6) or no association (n = 3) between income inequality and SWB. Studies
249 conducted in Russia, Rural China and Rwanda report a positive association between income
250 inequality and SWB [46, 50, 53, 56]. While all 3 countries are classified as developing
251 countries, their GDP per capita varied considerably from \$9,092 in Russia to \$8,027 in China

252 and \$697 in Rwanda (World Bank estimate, 2015).

253 (3) *Geographic region:*

254 Of 39 studies, one study (i.e., Alesina and colleagues) compared Europeans to
255 Americans [8] and found that the between income inequality and SWB was stronger among
256 Europeans than Americans. A cross-national study investigating the association between
257 income inequality and SWB in 119 nations reported mixed findings: a negative association in
258 the Western world (i.e. Western European countries, US, Canada, Australia and New Zealand);
259 a slight positive association in Eastern Europe, Asia and Latin America (after controlling for
260 wealth); a no association in Africa [6]. Berg and Veenhoven (2010) reported only the overall
261 association and did not report the quantitative data supporting the negative association in
262 Western Countries or either the positive or no association in other regions [6].

263 (4) *The way income inequality was operationalised (i.e., exogenous Gini and*
264 *endogenous Gini).*

265 The majority of studies (n = 26) used exogenous Gini (i.e., extracted from nation-level
266 data) and the remaining 13 studies used endogenous Gini (i.e., calculated from individuals'
267 responses). Studies that used endogenous Gini were longitudinal studies and conducted in
268 single countries such as UK, Russia, China, and Poland, whereas studies using exogenous Gini
269 (n = 18) were mainly cross-sectional studies. In both groups, the studies have report both
270 negative and positive associations between income inequality and SWB regardless of whether
271 the Gini coefficient was exogenous or endogenous.

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273 3.3. Meta-analysis of the association between income inequality and SWB

274 3.3.1. *The overall relationship between income inequality and SWB*

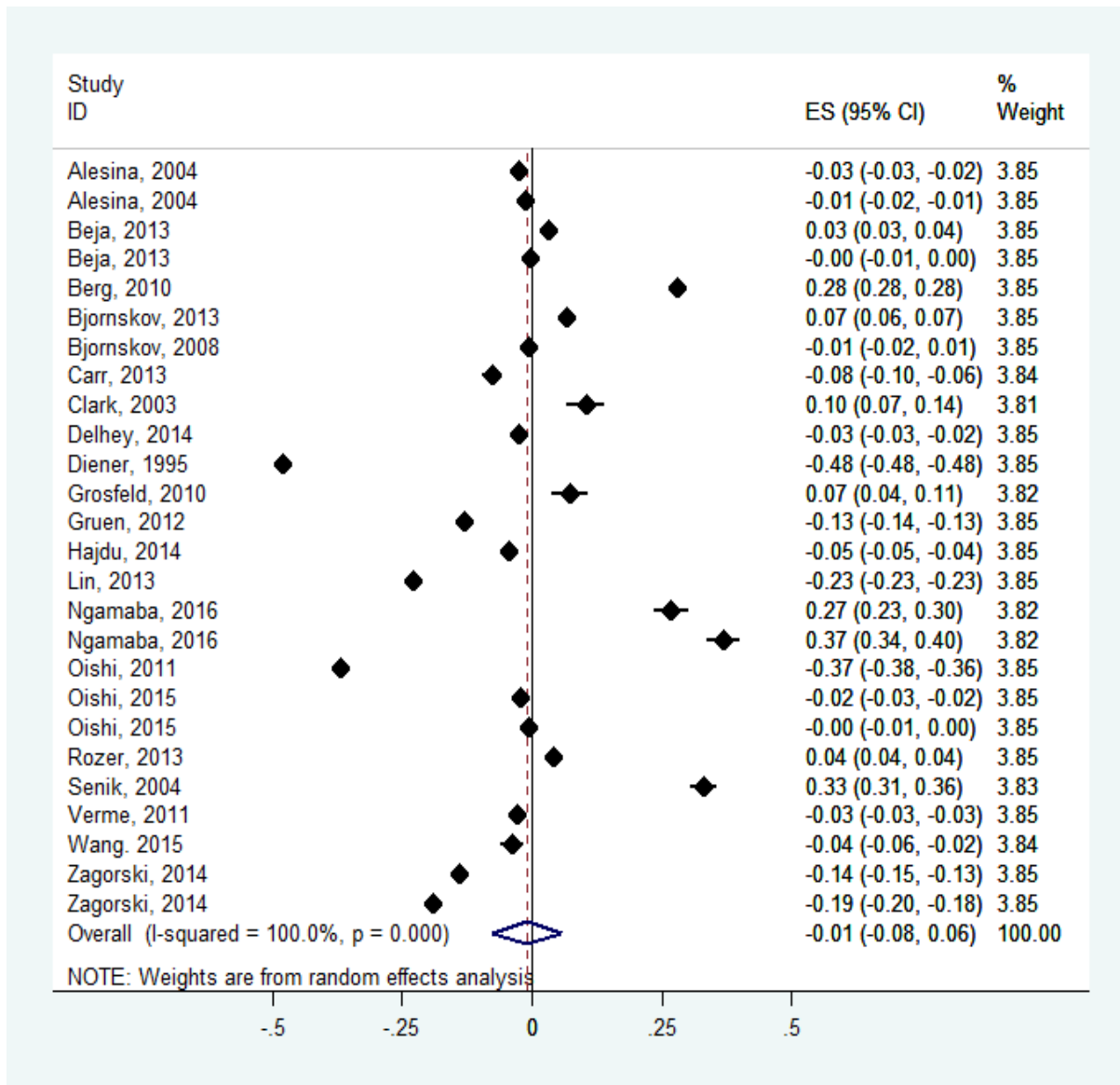
275 Figure 2 presents the forest plot of the main analysis, namely, the overall relationship
276 between income inequality and SWB across the 24 studies that provided the relevant statistics.

277 The overall pooled effect size was practically zero and non-significant suggesting that there is
278 no association between income inequality and SWB (pooled $r = -0.01$, 95% CI = -0.08 to 0.06)
279 and the heterogeneity between studies was high ($Q = 563.10$, $I^2 = 95.74\%$, $p < 0.001$). As
280 shown in Figure 2, the effect sizes of the individual studies included in the meta-analysis
281 differed considerably in direction and magnitude. Sixteen studies reported a negative
282 association between income inequality and SWB whereas eight studies reported a positive
283 association between income inequality and SWB.

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285 [Figure 2. about here]

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290 Figure 2. Forest plot displaying meta-analysis of the correlations between income inequality

291 and SWB across 24 independent samples.

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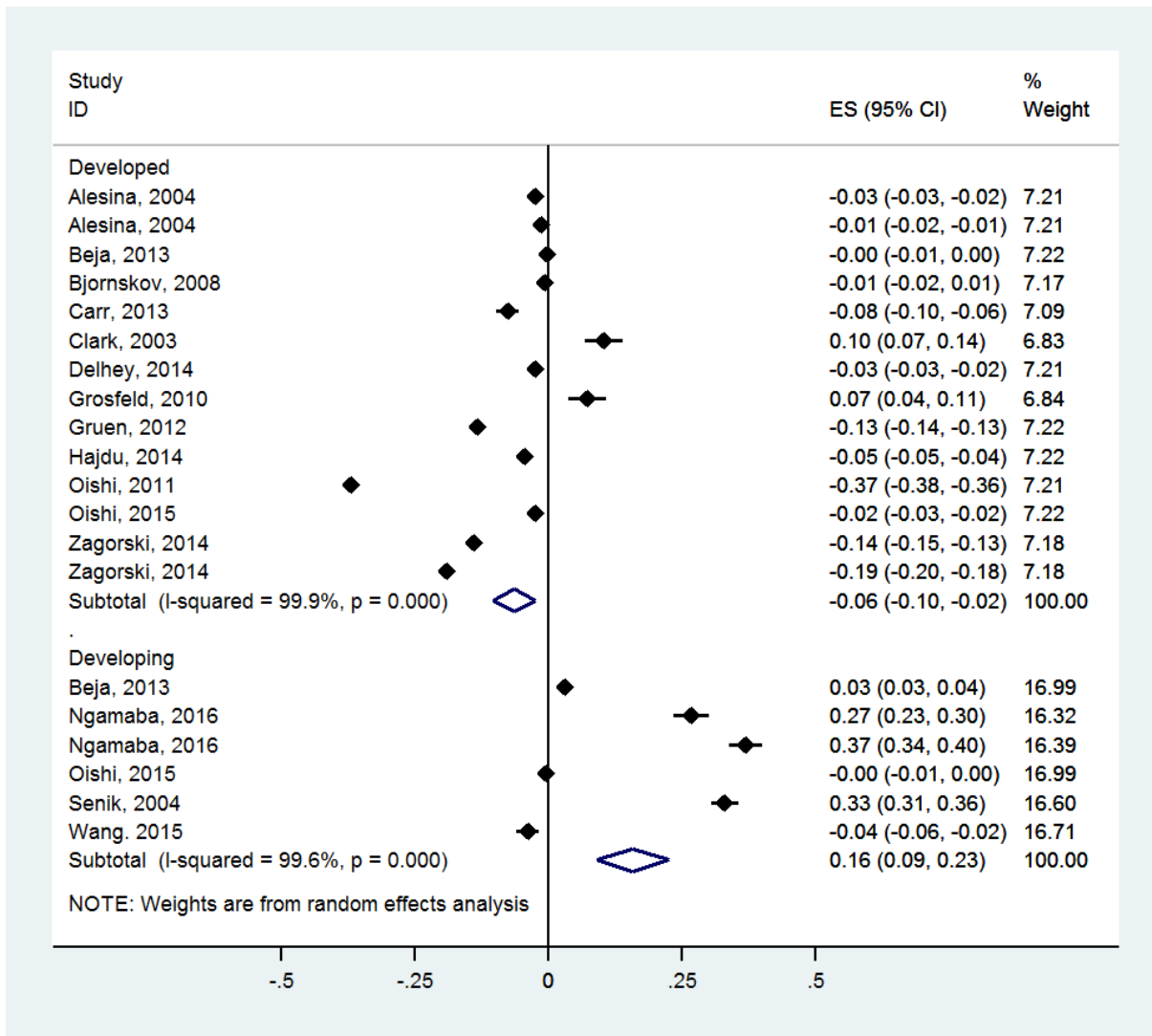
3.3.2. *The results of the subgroup analysis*

Country level of development

Of 24 studies eligible for the meta-analysis, 14 studies were conducted in developed countries (e.g., USA) versus 5 studies conducted in developing countries (e.g., China). The pooled effect sizes across studies based on populations from developed and developing countries were statistically significant in both groups indicating that the relationship between income inequality and SWB does differ across developed and developing countries (developed countries pooled $r = -0.06$, 95% CI = -0.10 to -0.02; developing countries: pooled $r = 0.16$, 95% CI = 0.09 to 0.23). The results of the Cohen's Q test confirmed that the magnitude of the correlation was significantly negative among studies conducted in developed countries and significantly positive among studies conducted in developing countries: Cohen's $q = 24.556$, $p < 0.05$ (See figure 3).

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322 Figure 3. Forest plot displaying meta-analysis of the correlations between income inequality

323 and SWB of sub-group: Developed versus Developing countries

324

325 Geographic region (USA versus European countries)

326 Of 24 studies eligible for the meta-analysis, 3 studies were conducted in the USA versus
327 7 studies conducted in European countries. The pooled effect sizes in these two regions (i.e.,
328 studies conducted in the European Countries and the USA) were statistically significant
329 indicating a negative association between income inequality and SWB (European countries:
330 pooled $r = -0.05$, 95% CI = -0.09 to -0.01; USA pooled $r = -0.08$, 95% CI = -0.14 to -0.01)
331 (See figure 4 in supplementary material -appendix 2).

332 SWB measures

333 The meta-analysis involved 8 studies that used happiness to assess SWB versus 18
334 studies that used life satisfaction to assess SWB. The main effect was not influenced by type
335 of SWB measures (life satisfaction: pooled $r = 0.02$, 95% CI = -0.06 to 0.10; happiness pooled
336 $r = -0.08$, 95% CI = -0.18 to 0.03); (See figure 5 in supplementary material - appendix 2).

337 Exogenous Gini versus endogenous Gini

338 Of 24 studies eligible for the meta-analysis, the majority of studies ($n = 18$) used
339 exogenous Gini, while the remaining 6 studies used endogenous Gini. The pooled effect sizes
340 between studies that used exogenous Gini and studies that used endogenous Gini were
341 statistically non-significant indicating that the relationship between income inequality and
342 SWB does not varied when exogenous or endogenous Gini was used (exogenous Gini: pooled
343 $r = -0.02$, 95% CI = -0.10 to 0.06; endogenous Gini: pooled $r = 0.03$, 95% CI = -0.09 to 0.16)
344 (See figure 6 in supplementary material -appendix 2).

345

346 **4. Discussion**

347 The association between income inequality and SWB is complex and highly dependent
348 on methodological variations across studies. The findings of this review do not support a link
349 between income inequality and SWB in general. Subgroup analyses revealed that the

350 association between income inequality and SWB is significantly influenced by the country
351 economic development. The association between income inequality and SWB is significant
352 negative in developed countries (pooled $r = -0.06$, 95% CI = -0.10 to -0.02) but significant
353 positive in developing countries (pooled $r = 0.16$, 95% CI = 0.09 to 0.23).

354 Nevertheless, the association between income inequality and SWB was not influenced
355 by: (a) the measure used to assess SWB (i.e., happiness and life satisfaction), (b) geographic
356 region (i.e., studies conducted in the USA versus studies conducted in the European countries),
357 or (c) the way income inequality was operationalised (i.e., exogenous Gini versus endogenous
358 Gini).

359 4.1. How to interpret the exploratory findings?

360 Our findings suggest that the direction of the association between income inequality
361 and SWB differs between developed and developing countries. Differences in different
362 preferences for income inequality might explain this finding. For example, the evolutionary
363 modernization theory [11, 57] hypothesizes differences in tolerance for income inequality as
364 economies move from developing to developed. According to this theory [11, 57], people in
365 developing countries might perceive income inequality as an economic opportunity or
366 incentive to work, innovate and develop new technologies and therefore as a more core
367 determinant of their well-being compared to developed countries. In contrast, technology,
368 economic growth and innovation might be taken for granted in developed countries, meaning
369 that income inequality may be perceived as a treat rather than a challenge [11, 58]. Moreover,
370 our findings do support the “tunnel” effect theory suggesting that the rise of income inequality
371 may signal future mobility and an increase of SWB [59]. The “tunnel” effect theory supports
372 the idea that people in developing countries may tolerate income inequality by observing other
373 people’s increasingly rapid progression and interpreting this evolution as a sign that their turn
374 will come soon [59, 60]. A study conducted in Poland found that when an increase of income

375 inequality was associated with growth and when it was perceived to change rapidly, people
376 were more satisfied with their lives[39]. For example, Berg has suggested that “income
377 inequality is not necessary harmful to well-being. Beja (2014) added that people may accept
378 income inequality when they see the possibilities to rise above their current position”, p.153
379 [12].

380 4.2.Research and social and policy implications

381 The main contribution of this systematic review and meta-analysis is that the country
382 level of development influences the link between income inequality and SWB: income
383 inequality is more likely to be a contributor to SWB in citizens of developing countries than in
384 developed countries. Reducing income inequality could be a potentially fruitful approach for
385 governments and policy makers of developed countries as a means of improving the SWB of
386 their citizens[11, 12]. The inverse association of SWB with income inequality in developing
387 countries suggests that income inequality is more likely to be seen as job opportunities for
388 innovation in these countries. However, this review was only based on cross-sectional studies
389 and no causal inferences are allowed; longitudinal studies are needed prior to forming any
390 causal links. The association between income inequality and SWB was not influenced by the
391 measure used to assess SWB, geographic region, or the way income inequality was
392 operationalised. Our findings are in line with previous research conducted in OECD countries
393 suggesting no association between income inequality and SWB [9] “the best evidence that we
394 have to date is that redistribution beyond the minimum for advanced societies does not enhance
395 subjective well-being/quality of life” [9], p. 1107. Nevertheless, further studies are needed to
396 understand the circumstances in which income inequality reduce SWB [3, 4, 61] versus the
397 circumstances in which income inequality is not necessarily harmful to SWB[6, 12]. For
398 example, extraordinary circumstances such as the great recession may affect how inequality is
399 associated to subjective well-being. This gap in knowledge is critical because some government

400 and policy makers still ask whether people care about income inequality and if income
401 inequality affect SWB. At present, the evidence base is weak and cannot support strongly such
402 decisions. Most importantly, the present systematic review highlights the need to produce a
403 higher-quality evidence base to support social and political decisions relating to income
404 inequality and SWB both with respect to identifying: (a) what are the consequences of income
405 inequality, and (b) what are the antecedents of SWB.

406 4.3.Strengths and limitations

407 This review has several strengths. First, the search was conducted according to
408 PRISMA published guidance[27]. Consistent with the Cochrane guidance[16], the search
409 strategy comprised a thorough literature review, screening of reference lists and contacting
410 authors for additional information. Second, this is the first systematic review that investigated
411 the association between income inequality and SWB, and therefore the findings of this review
412 have the potential to inform the literature in this area.

413 Nevertheless, it is important to recognise few key limitations of this review. First, the
414 preponderance of cross-sectional studies means it was impossible to establish a temporal or
415 causal relationship between income inequality and SWB. Second, the poor reporting of data in
416 combination with the use of different analytic approaches precluded any firm conclusions about
417 the direction and strength of the association between income inequality and SWB. Future
418 studies are encouraged to concentrate on establishing an initial correlation between income
419 inequality and SWB before embarking on multivariate analyses. Third, this study investigated
420 the relationship between income inequality and SWB. Nevertheless, previous studies
421 investigating people's quality of life have reported a link between inequality, SWB and health
422 status [5, 9]. Further study is needed to systematically investigate the association between
423 income inequality, SWB and health status. Finally, the majority of studies included in this
424 review were conducted in developed countries (N=14) and only 5 studies were classified as

425 developing countries. This is problematic in terms of the representativeness for the purpose of
426 global decision-making. More studies are needed in developing countries. Due to poor data,
427 we were unable to compare Latin America to Europe or USA because only one Latin America
428 country had data amendable for the meta-analysis. The social and political history may affect
429 the association between income inequality and SWB because Inglehart and colleagues have
430 reported that with the same level of wealth, Latin-America is happier than their counterparts of
431 Ex-Communist nations [58]. We strongly encourage more methodologically sound
432 investigations to examine the association between income inequality and SWB and to elucidate
433 current gaps and inconsistencies.

434 4.4.Conclusion

435 In conclusion, this is the first systematic synthesis of the literature regarding the link
436 between income inequality and SWB. The main finding of this review is that the association
437 between income inequality and SWB is complex. More rigorous investigations are needed to
438 elucidate the link between income inequality and SWB, and to identify what are the antecedents
439 and consequences of income inequality and SWB taking into account the country development
440 level.

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443 systematic review and meta-analysis. We would like to thank the editor and external reviewers
444 for their useful comments and suggestions.

445 **Conflict of interest**

446 The authors declare no conflicts of interest.

447 **Ethical approval**

448 No human participants were involved in the article as it is a review of previously published
449 research.

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596 **Appendix 1: Search terms and strategies used**

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598 1. Happiness OR life satisfaction OR subjective well-being OR quality of life

599 AND

600 2. Income inequalit* OR income disparit* OR income deprivation

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602 We did use three steps in each database

603 The 1st step was to look at subjective well-being using these words: Happiness OR life

604 satisfaction OR subjective well-being OR quality of life

605 The 2nd step was to look at income inequality using these words: Income inequalit* OR

606 income disparit* OR income deprivation.

607 We used terms such as: Gini coefficient, pareto principle 80/20, the Atkinson inequality

608 measures, Coefficient of variation and Robin Hood index.

609 The 3rd step was to look at both using AND between these two

610 Note: for web of science, we have used

611 Subjective NEAR/2 well* being OR life NEAR/2 satisfaction OR quality NEAR/2 life OR

612 happiness

613 Income NEAR/2 inequalit* OR income NEAR/2 disparit* OR income NEAR/2 deprivation

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Step 1

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Medline
129PsycINFO
64,731Embase
319,405Web of Science
663,783

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Step 2

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Medline
30PsycINFO
713Embase
985Web of Science
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Step 3

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Medline
10PsycINFO
59Embase
33Web of Science
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After deleting duplication

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Medline
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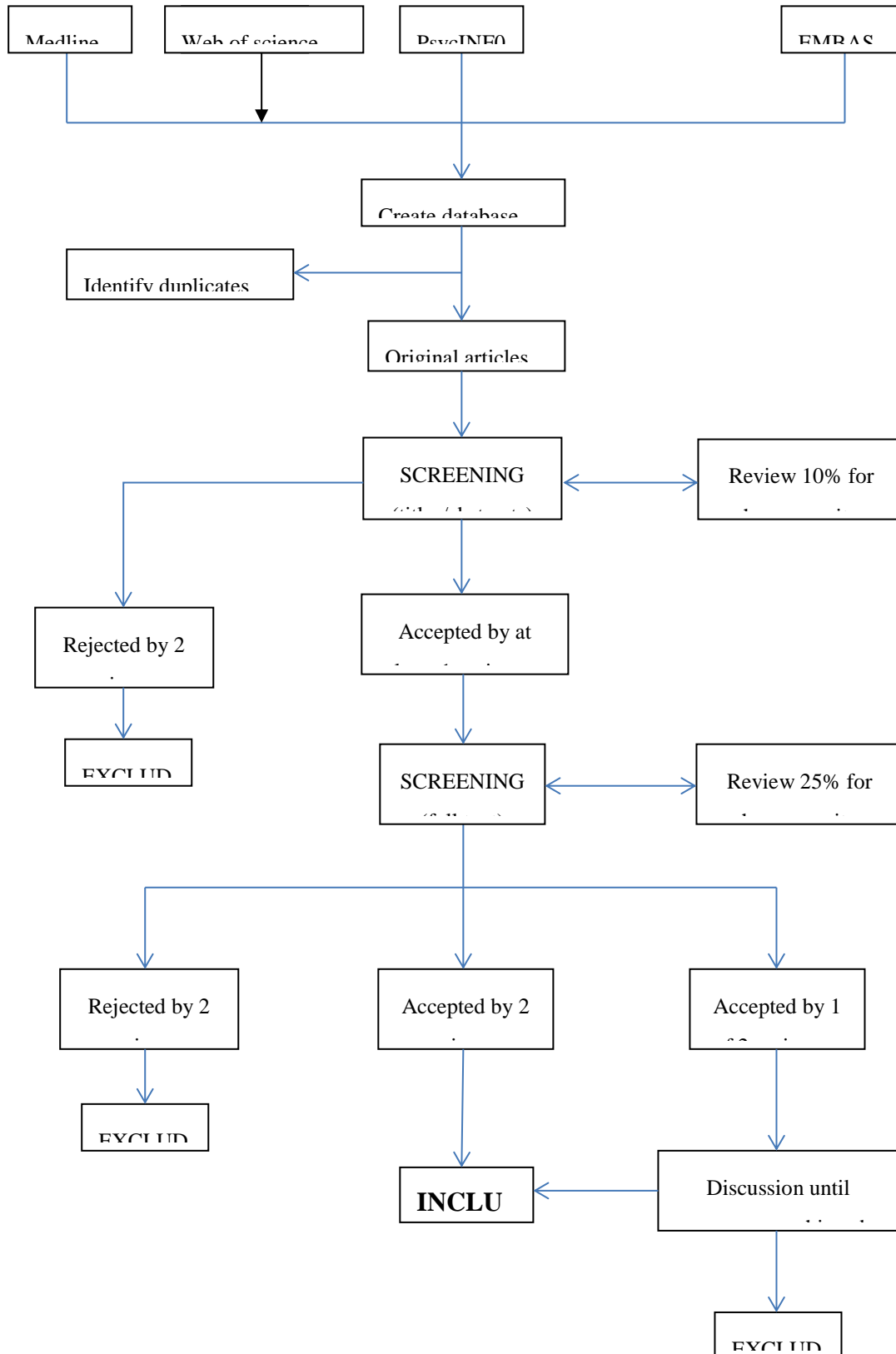
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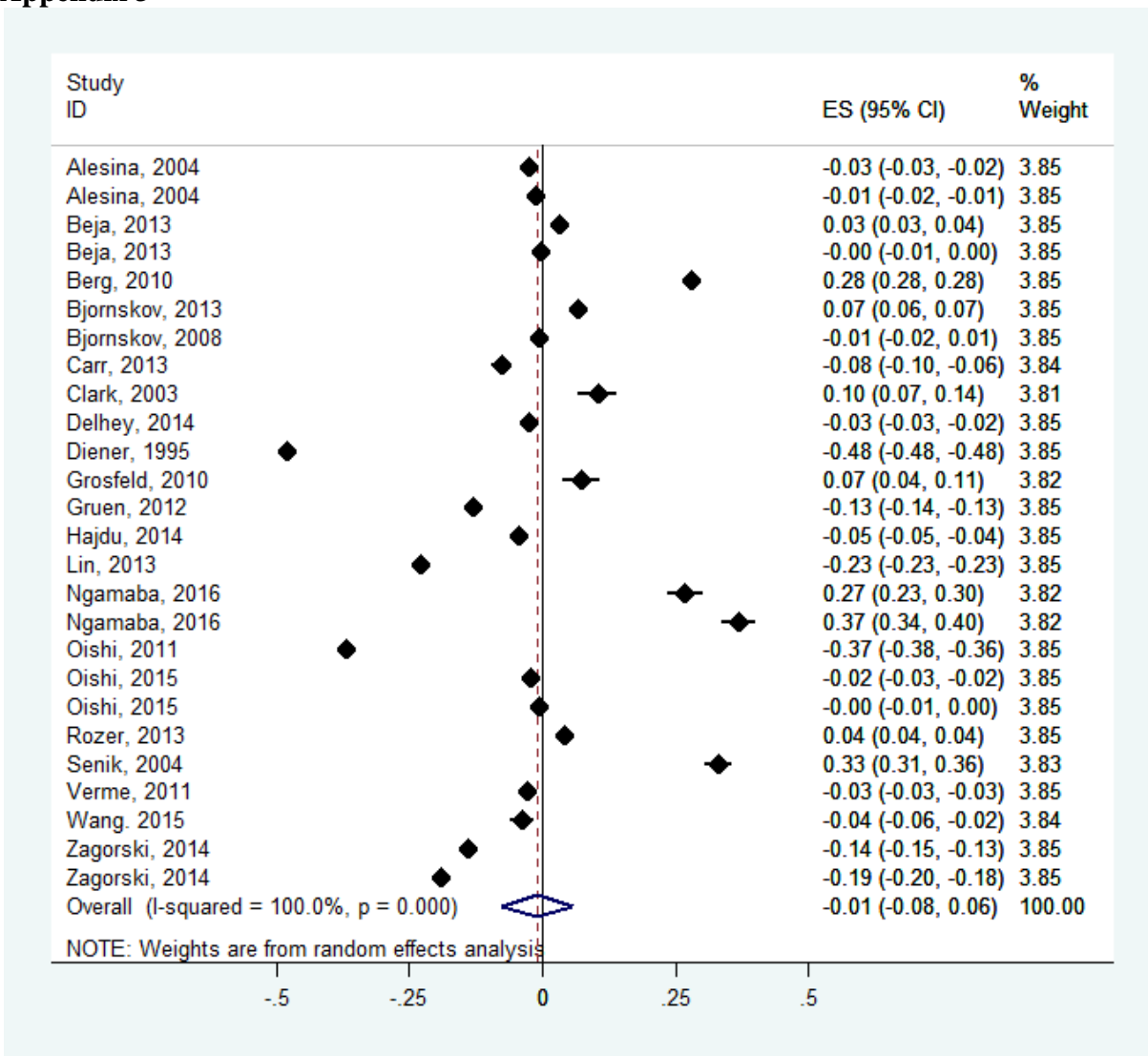
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Appendix 2: Screening Process (Income inequality and SWB)

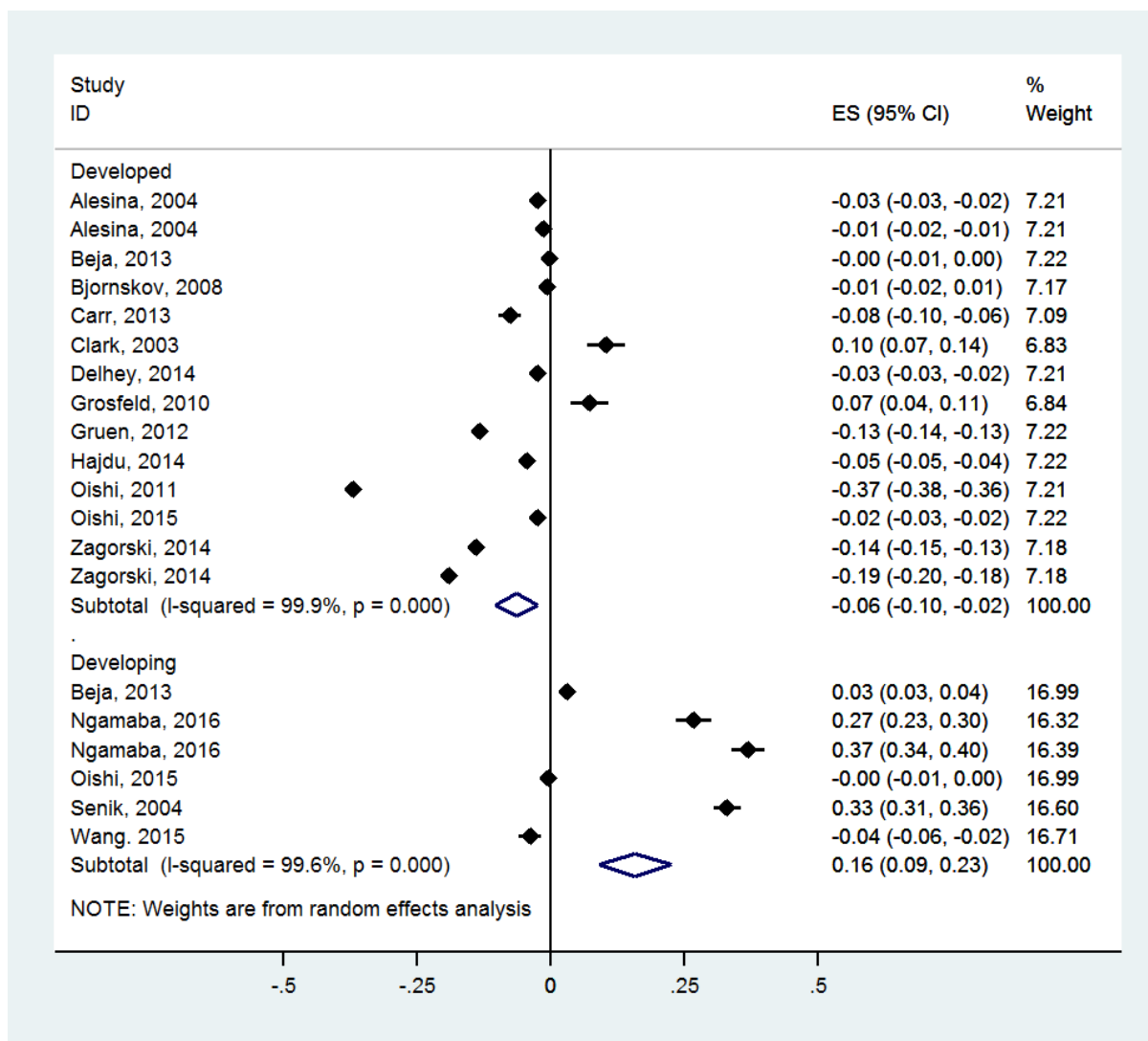


666 **Appendix 3**



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 668 Figure 2. Forest plot displaying meta-analysis of the correlations between income inequality
 669 and SWB across 24 independent samples.

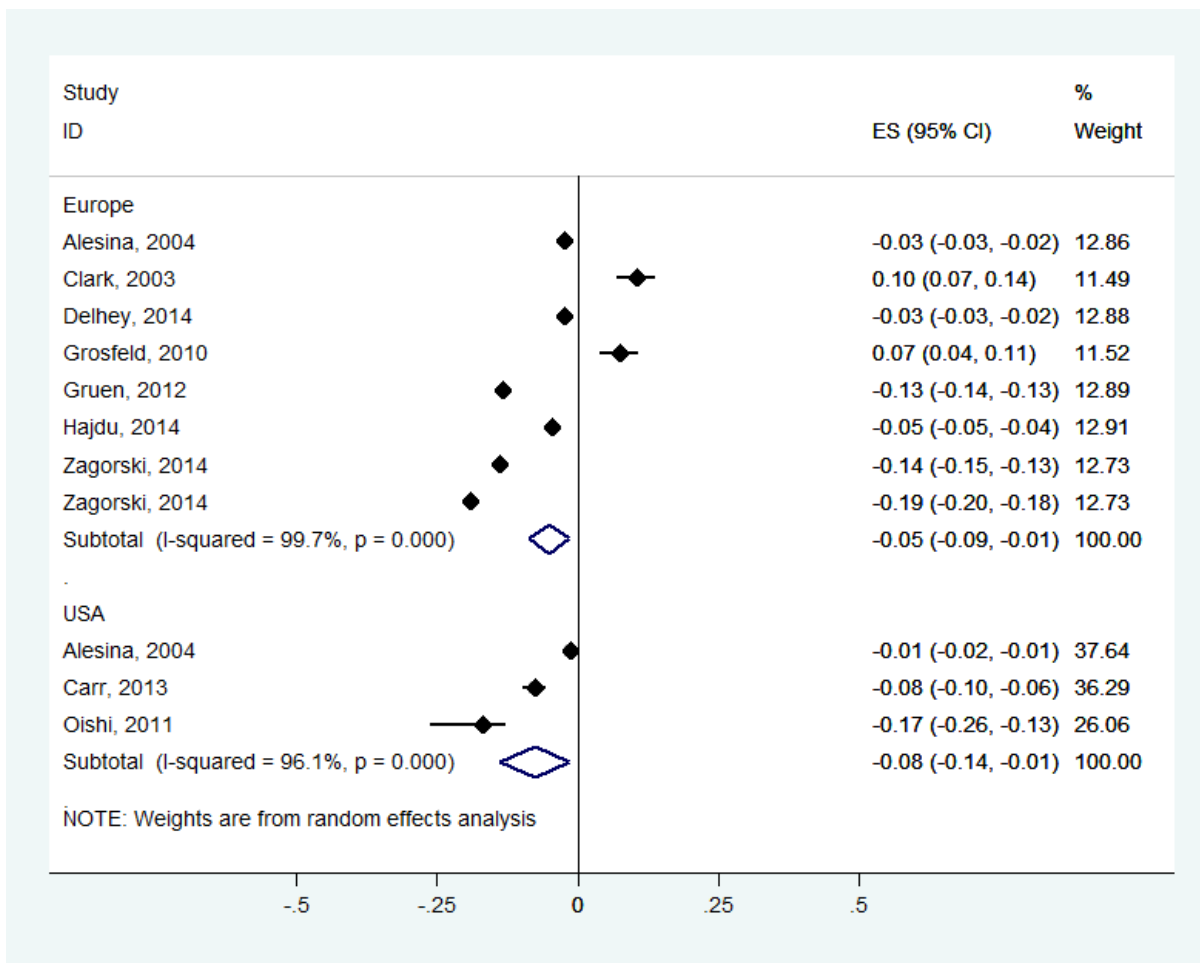
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680 Figure 3. Forest plot displaying meta-analysis of the correlations between income inequality
 681 and SWB of sub-group: Developed versus Developing countries

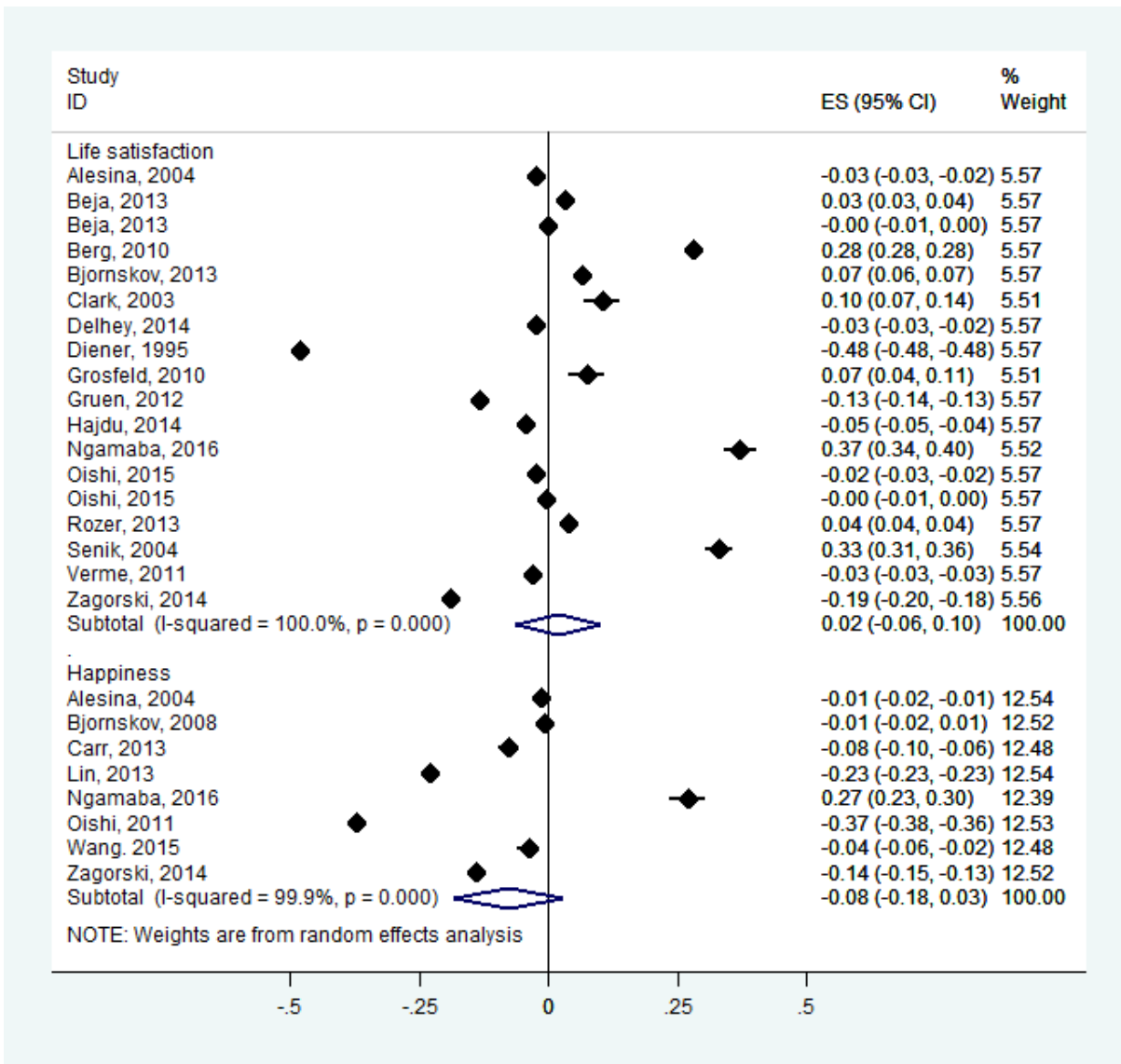
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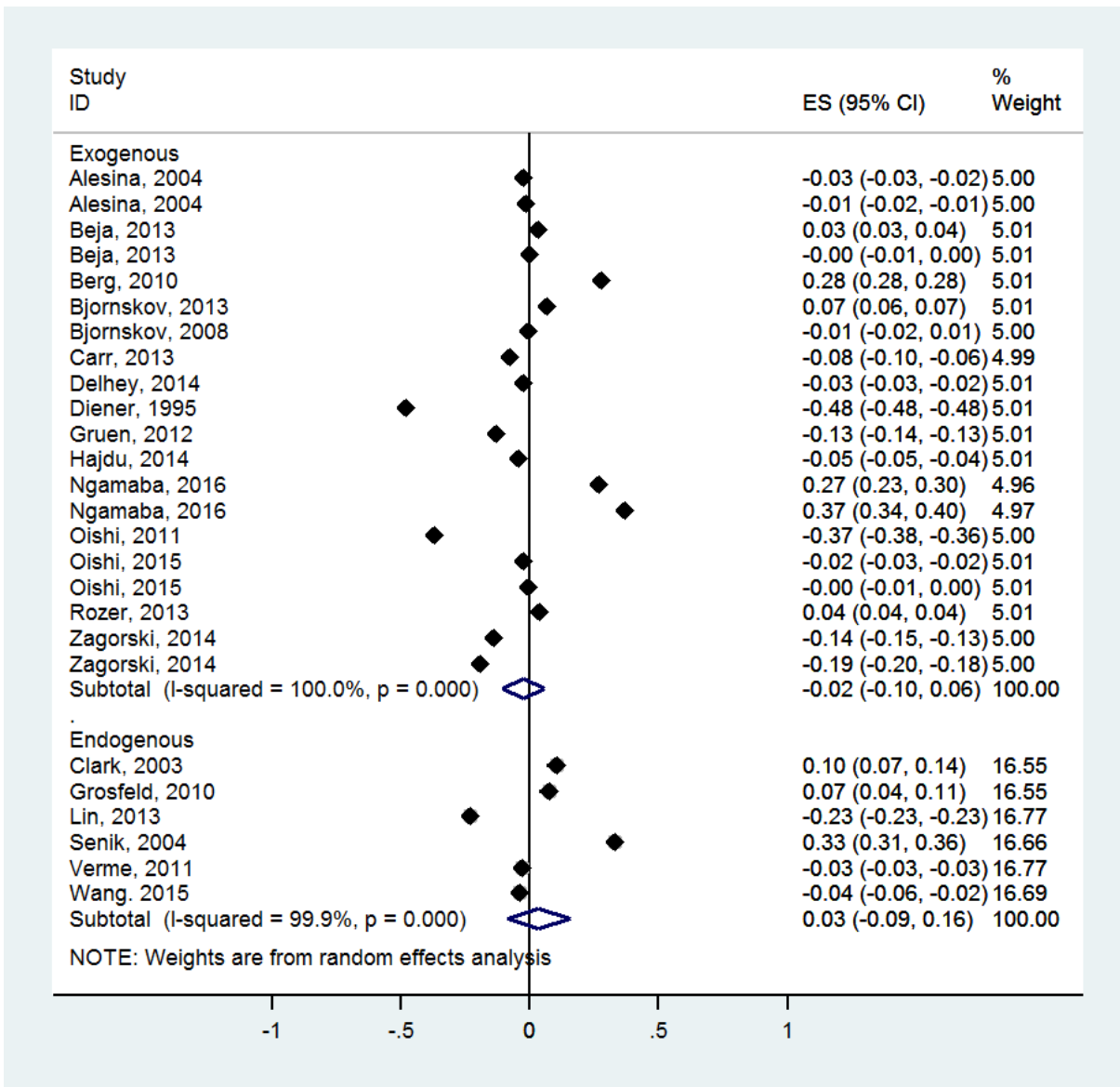
684 Figure 4. Forest plot displaying meta-analysis of the correlations between income inequality
 685 and SWB of sub-group: European countries versus USA.

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Figure 5. Forest plot displaying meta-analysis of the correlations between income inequality and SWB of sub-group: Life satisfaction versus Happiness



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Figure 6. Forest plot displaying meta-analysis of the correlations between income inequality and SWB of sub-group: Exogenous Gini versus Endogenous Gini

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