A Best evidence synthesis on the link between budgetary participation and managerial performance

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Abstract
By using the best evidence synthesis (Slavin, 1995), we want to find out an accurate synthesis on the budgetary participation -BP- and managerial performance-PM- link. The use of criteria of selection has allowed to decrease the heterogeneity. The results explain the presence of the heterogeneity by cultural and industrial contengencies. The best evidence synthesis based on an homogeneous subgroup (managers in publicly traded firms in Taiwan Stock Exchange) shows a time dependency of BP-MP link and some recommandations for further research:
1/to continue the study of the traded firms in Taiwan Stock Exchange to analyse the causal BP-PM link with a Granger test,
2/to study the evolution of this link over time in other countries.

1. Introduction

« A few writers refer to comparing or combining apples and oranges, but the meta-analytic mixtures are usually too heterogeneous to be described with only two fruits. Other writers, with lower levels of enthusiasm or reverence, talk about rotten fruits or even less savory substances. » (Feinstein, 1995: 72). Feinstein's citation is helpful to understand that the selectivity is much more attractive than combining heterogeneous articles into a standard meta-analysis that lacks the scientific precautions offered by individual results from randomised trials.

Meta-analysis is a quantitative method of combining the results of independent studies and synthesizing all the summaries and the conclusions usuable to evaluate notably effectiveness of a managerial practice. This type of syntheses differs from traditional reviews of literature using a narrative format to summarise the results of studies on a topic to draw conclusions or inform theory.

In accounting literature, the meta-analysis has been used to agregate results in numerous fields (Ahmed and Courtis, 1999; Hay et al, 2006; Trotman and Wood, 1991, among others). To the best of our knowledge, two meta-analyses (Derfuss, 2009, Greenberg et al., 1994) and many reviews of literature have been written about the link between budgetary participation and managerial performance (see for exemple: Chalos and Poon, 2001; Shields and Shields, 1998).

Budgetary participation -BP- is usually defined as « a process in which a manager is involved with, and has influence on, the determination of his or her budget » (Shields and Shields, 1998: 49). A *budget* is an expression of expectations of a company presented in economic terms for a futur time period (Samuelson, 1973: 31). An usual budgetary participation assessment is Milani's scale which measures the perceived influence of a budgetee on a budget (Milani, 1975).

Employee's *performance* has been defined as « the degree to which successful role achievement is accomplished » (Ferris, 1977: 610). The usual managerial performance -MP- questionnaire is based on the results of a survey conducted by Mahoney et al. (1963) that measures eight performance dimensions (planning, investigating, coordinating, evaluating, supervising, staffing, negotiating, representing) which provides an overall measure of performance. Mahoney's and Milani's scales have been used by most of studies investigating the link between BP and PM.

Derfuss (2009) has found that BP and PM are significantly and positivly linked. Nevertheless, Derfuss' meta-analysis on this link include heterogeneous results and only published english articles. Following Feinstein (1995), it could be interesting to combine only the quantitative randomised-sample results.

The objective of this article is to answer to the following research question: **Is Derfuss' meta-analysis result valid when the only trials based on randomised samples are combined?** By selecting studies with « randomised-sample » criterion, we have done a « best evidence synthesis » (Slavin, 1995).

Best evidence synthesis is « a response to concerns about misleading conclusions from meta-analyses » (Slavin, 1995: 11). Following Slavin, if a literature contains some studies high in internal and external validity, thus lower quality studies had to be excluded from the combination of the results. According to Feinstein (1995), studies using randomised sample are more homogeneous and could be agregated in a meta-analysis.

The rest of the paper is organised as follows. Section 2 describes the data and the method used. Section 3 presents the empirical results. Section 4 discusses them and the last one concludes.

2. Data and method

2.1. Process of studies collection

Firstly, we have collected the articles from existing reviews of literature and meta-analyses (Banovic, 2005; Shields and Shields, 1998; Chalos and Poon, 2001; Derfuss, 2009). Then, the first draft has been published in the *Muenchen repec* base of working papers. Thus, our article has been appeared in *scholar.google.com* and related articles have been collected. The new articles have been included in the first draft. This procedure has been iterated until stability of our base of papers on the link between BP and MP.

Finally, we have based our synthesis on the list of articles which appears in appendix. Some articles have not statistical results and others have unusable results in a meta-analysis because of the lack of precisions. Seventy-three results have been gathered. Our meta-analysis considers *a priori*

more articles than the one by Derfuss (2009) and our method differs.

2.2. Methods and criteria

To ensure its reproducibility, our best evidence synthesis has used fixed-effect procedure of Hedges and Olkin (1985). Their statistical procedure is recognised in many scientific fields. The result of our first draft has been computed with MS Excel. Then, a triangulation of the results has been realised by using « rmeta »: an R package for meta-analysis.

The criteria of selection to exclude articles from the best evidence synthesis are the following:

- the non-using of Milani's and Mahoney's measurement scales. This criterion avoid the combination of articles which use different measure scales.
- Articles which are based on laboratory experiment and thus having low in external validity have been excluded.

After filtering with this two criteria, the article base encompasses forty-eight trials. For the best evidence synthesis, following Feinstein (1995), we have used a criterion to exclude the studies which are not based on randomised sample. Thus, the best evidence synthesis is only based on 20 randomised trial results (Table 1). but some of these randomised-sample results do not use Milani's and Mahoney's scales (Kobory, 2006; Dunk, 1995; Chong, Eggleton and Leong, 2006) or the presentation of the results is not enough clear to be used (Chong and Chong, 2002). Therefore, we have excluded these results.

Table 1
Papers used for the best evidence synthesis

Randomised trial papers	Countries	Use Milani and Mahoney's scales	Firms/sectors
Kren 1992	USA	x	manufactures
Chong Chong 2002	Australia	x	manufactures
Lau low Engelton 1995	Singapour	x	manufactures
Dunk 1990	USA	x	cost centers
Abdullah 1998	Australia-Sydney	x	metropolitan
Kobory 2006	Taïwan		Large compagnies
Ni and Su 2001	Taïwan	x	Large compagnies
Subramanian Ashkanasy 2001	Australia	x	agribusiness firms
Su Lin WP 2007	Taïwan	x	Large compagnies
Dunk 1993	Australie	x	manufactures
Brosnan Hoque 2007	Australia	x	Mining sector
Dunk 1995	Australia-Sydney		manufactures
Dunk 1995	Australia-Sydney		manufactures
Chong eggleton Leong 2006	Australia		business directory
Quirin, O'Bryan Donnelly 2004	USA	x	Large compagnies
Chalos Poon 2001	USA	x	Marketing managers
Chong Bateman 2000	Australie	x	industrial sector
Lau buckland 2000	Norvège	x	Mining sector
Ni, Su, Zhongshao Zheng 2005	Taïwan	x	Large compagnies
Breaux 2004	USA		Certified Public Accountant

Sometimes, the use of criteria of selection cannot eliminate heterogeneity between individuals sutdies. If the heterogeneity test rejects the homogeneity null hypothesis, one will use

subgroup analysis or will assess the quality of trials. Nevertheless,evaluation of the methodological quality of a study is a difficult burden (Cho and Bero, 1994). Moreover, the use of quality score is highly criticized in litterature (Moher et al., 1995, among many others). Thus, subgroup analysis seems to be a better research strategy.

The presence of cultural contingencies has been studied in the litterature (Frucot and Shearon, 1991; Lau, low and Eggleton, 1997; Tsui, 2001). The link between BP and MP depends on cultural variables. Thus, if the homogeneity null hypothesis is rejected, it will be useful to make cultural subgroup differencies analysis in order to study the causes of the heterogeneity.

The heterogeneity reduction could be useful to see the impact of other variables on the relationship between BP and MP and to make some recommandations for further research.

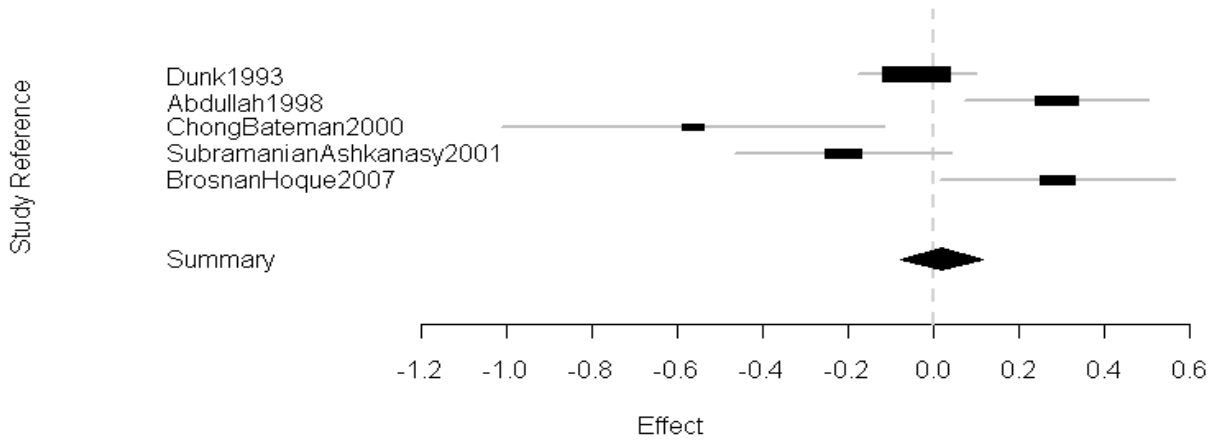
3. Results

Among the twenty randomised-sample results, it has been excluded the ones which does not use the Milani's and Mahoney's et al. measurement scales. The summary effect is about 0.00563 (95% confidence interval=[-0.00856, 0.0198]). One cannot rely on this result because of the presence of heterogeneity among results (estimated heterogeneity variance: 0.0055 , P= 0; test for heterogeneity: X^2(13) = 74.91, P=0). The result of these heterogeneity tests has to be compared with the ones not using Milani's and Mahoney's scales (estimated heterogeneity variance=0.0029, P= 0; Test for heterogeneity: X^2(18) = 83.5, P=0). This criterion has decreased the heterogeneity, but the null homogeneity hypothesis is still rejected.

Following Frucot and Shearon (1991), Lau, Low and Eggleton (1997) and Tsui (2001), a cultural subgroup analysis could be computed to reduce the heterogeneity. The subgroups are the following: Australian managers (5 randomised-sample results using Milani's and Mahoney's et al. scales), Taiwanese ones (3) and American ones (4). The studies based on survey of managers from others countries have been excluded from the subgroups analysis, because of the lack of study from some political territories.

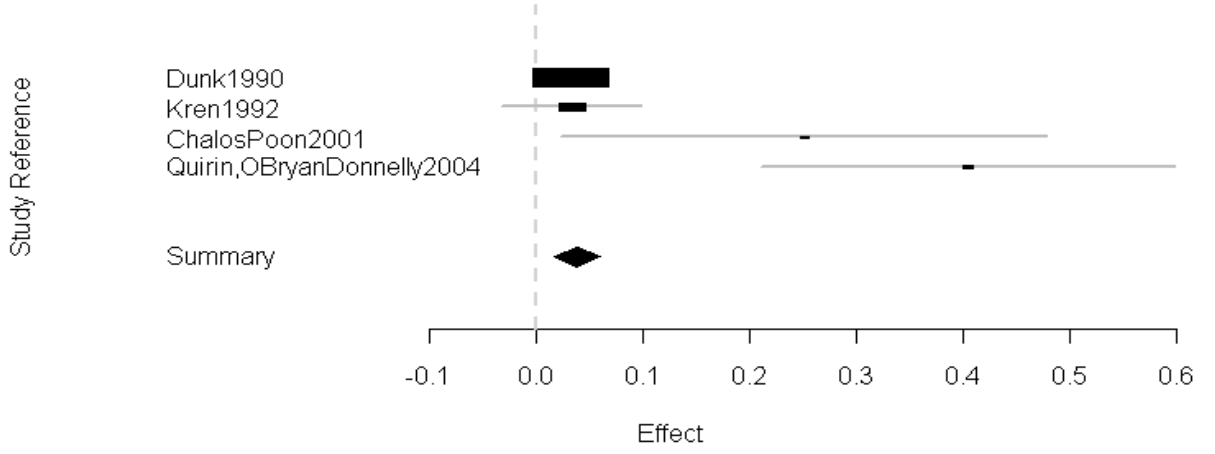
From the australian subgroup synthesis, it appears a non-significant positive link between BP and MP (summary effect=0.02 with 95% CI=[-0.08,0.11]). One cannot rely on this subgroup synthesis because of the reject of the homogeneity null hypothesis (estimated heterogeneity variance=0.057,P= 0; test for heterogeneity: χ^2(4) = 20.07, P=5e-04). Nevertheless, the result seems to be more homogeneous. Chong and Bateman's article and, to a lesser extent, Abdullah's one increase the heterogeneity (Figure 1).

Figure 1
Best evidence synthesis of the australian results



From the american subgroup synthesis, it appears a significant positive link between managerial performance and budgetary participation (summary effect=0.039, 95% CI =[0.0173, 0.0607]). One cannot rely on this subgroup best evidence synthesis because of the reject of the homogeneity null hypothesis (estimated heterogeneity variance=0.0075, P=0.001; test for heterogeneity: $\chi^2(4) = 17.42$, P=6e-04). The synthesis plot shows a tendency (Figure 2). But because of the lack of homogeneity between these individual results, one cannot infer something about this temporal tendency.

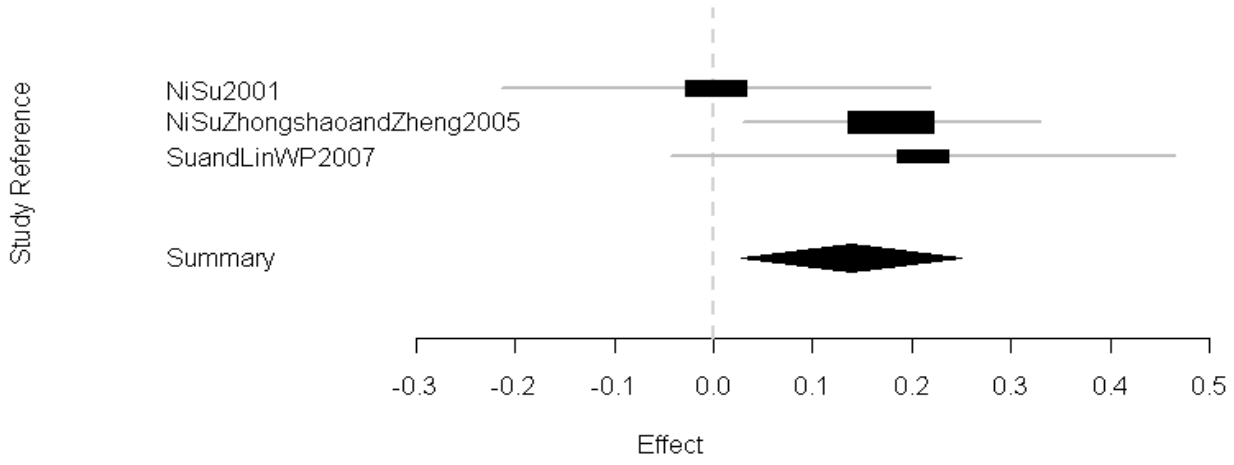
Figure 2
Best evidence synthesis of the american results



From the taiwanese subgroup synthesis, it appears a significant positive link between the studied variables (Summary effect=0.139, 95% CI= [0.028, 0.249]). One can rely on this subgroup result because of the acceptation of the homogeneity null hypothesis (estimated heterogeneity

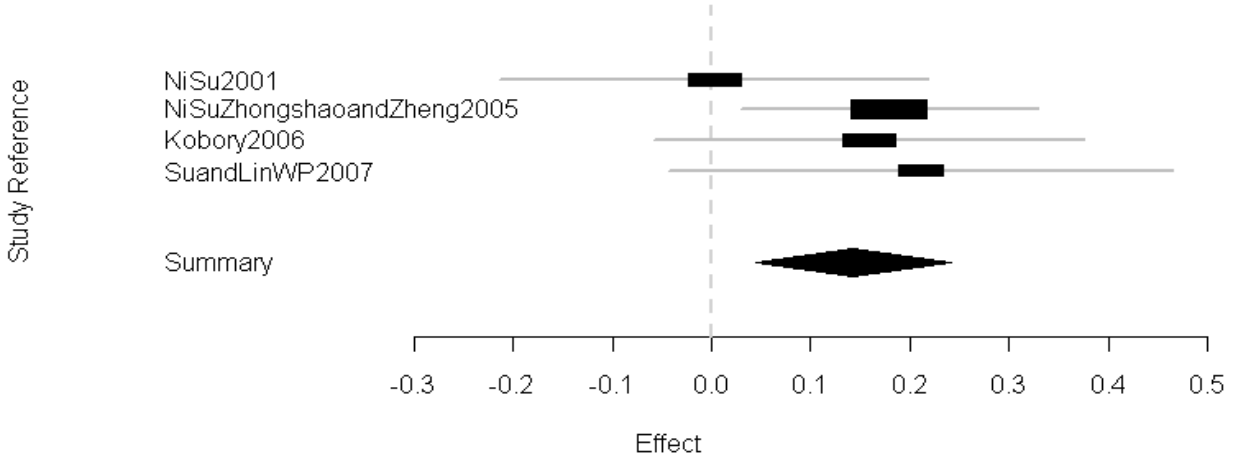
variance: 0.00059, P= 0.348; test for heterogeneity: $\chi^2(2) = 2.11$, P=0.3483). The synthesis plot shows the same tendency (Figure 3) as the american subgroup one. The relation between BP and MP evolves positively over time.

Figure 3
Best evidence synthesis of the Taiwanese results



The same tendency appears when Kobory's article, which does not use the Milani's budgetary participation scale, is added in the subgroup analysis (Figure 4; summary effect=0.143, 95% CI=[0.0443, 0.242]; estimated heterogeneity variance=0, P= 0.545; test for heterogeneity: $\chi^2(3) = 2.14$, P=0.5446). These results deserve some comments, which appears in section 4.

Figure 4
Best evidence synthesis of the Taiwanese results without Milani's & Mahoney's scales criterion



4. Comments and further research

From these results, it seems possible to highlight and to comment two of them. Firstly, the taiwanese subgroup synthesis is really interesting because the sample is the same through the studies: publicly traded firms in the Taiwan Stock Exchange. Thus, the time dependency of the link between BP and MP is shown when the effects of cultural and industrial contingencies are under control. Secondly, Derfuss' meta-analysis results cannot be rejected following our results. In fact, in the best evidence syntheses of american and australian subgroups, the lack of control on industrials contengencies could be linked to higher heterogeneity than in the taiwanese one.

Based on these comments, it seems possible to give a recommandation for further research. The time dependency of the link between BP and MP has been infered from a limited field: the publicly traded firms in Taiwan Stock Exchange from 2001 to 2007. One should examine the robustness of this result:

- In the long-run, by surveying annually traded firms in the Taiwan Stock Exchange during twenty years or more. With a causality Granger test on this base of results, one will allow to show the evolution over time of the causal link between budgetary participation and managerial performance.
- Through countries, by studying, in different political territories, the same populations of firms over time.

5. Conclusion

Finally, after having seen that meta-analysis based on the selection of homogeneous individual results is better than « meta-analytic mixtures (...) usually too heterogeneous » (Feinstein, 1995: 72), we have justified the use of some criteria of selection. Moreover, if the conbined results are still significantly heterogeneous, it will be justified to combine articles by cultural subgroups.

The best evidence synthesis using « randomised-sample » and « same measurement scales » criteria is heterogeneous. Thus, we have analysed cultural subgroup syntheses. On the base of our subgroup syntheses, it seems that cultural and industrial contengencies are highly plausible.

The synthesis, based on survey of managers of publicly traded firms in Taiwan Stock Exchange from 2001 to 2007, is significantly positive and homogeneous. From this subgroup synthesis, it appears that the link between BP and BP is time dependent.

This time dependency has to be confirmed with further research. One could use the Taiwanese Stock Exchange as a basis to observe the long-run evolution and to test the causal link between the BP and MP with Granger's causality test or, if expectations play a rôle, Sims' one (Granger, 1969; Sims, 1980). One could replicate the Taiwanese synthesis result by studying this link, in different political territories, on the same populations of compagnies over time.

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Appendix

Studies	***Nationalities***	***Randomised trials***	***Budgetary participation measures***	***Managerial performance measures***
Abdullah, 1998	62 australian managers	Yes	Milani (1975)	Mahoney *et al.* (1963)
Agbejule and Saarikoski, 2006	83 finnish managers	No	Milani (1975)	Mahoney *et al.* (1963)
Alam, Mia et Gnepa, WP	113 bangladeshi NGO managers	No	Milani (1975)	Mahoney *et al.* (1963)
Aranya, 1990	223 canadian managers	No	Personal scale	Personal scale
Arifin, 2007	44 indonesian managers	No	Personal scale	Personal scale
Bass and Leavitt, 1963	3 experiments on 36 managers	No	Personal scale	Personal scale
Bento and White, 2006	64 american managers	No	Adapted from Milani (1975) by Chow (1999)	Mahoney *et al.* (1963)
Breaux, 2004	197 AICPA members (USA)	Yes	Clinton eand Hunton (2001)	Mahoney *et al.* (1963)
Brownell, 1981	Experiment on 46 students and 48 managers (USA)	No	Personal scale	Personal scale
Brownell, 1982	48 managers (USA)	No	Hofstede (1967) and Milani (1975)	Mahoney *et al.* (1963)
Brownell, 1982	48 managers (USA)	No	Hofstede (1967) and Milani (1975)	Mahoney *et al.* (1963)
Brownell, 1985	61 managers (USA)	No	Milani (1975)	Mahoney *et al.* (1963)

Brownell and Dunk, 1991	79 managers (USA)	No	Milani (1975)	Mahoney *et al.* (1963)
Brownell and Hirst, 1986	76 managers (USA)	No	Hofstede (1967) and Milani (1975)	Mahoney *et al.* (1963)
Brownell and Mc Innes, 1991	224 managers (USA)	No	Milani (1975)	Mahoney *et al.* (1963)
Brownell and Merchant, 1990	146 american production managers	No	Personal scales	Personal scales
Chalos and Poon, 2001	93 american martketing managers in publicly traded firns	Yes	Milani (1975)	Mahoney *et al.* (1963)
Chenhall and Brownell, 1988	33 managers of a large compagny	No	Milani (1975)	Personal scale
Cherrington and Cherrington, 1973	Experiments on 230 students	No	Personal scale	Objectives achievements
Chong and Bateman 2000	79 american managers in industrial sector	Yes	Milani (1975)	Mahoney *et al.* (1963)
Chong and Chong, 2002	79 australian managers	Yes	Milani (1975)	Mahoney *et al.* (1963)
Chong, Eggleton and Leong, 2006	141 australian managers	Yes	Milani (1975)	Merchant *et al.* (1981)
Dunk, 1990	26 american managers	Yes	Milani (1975)	Mahoney *et al.* (1963)
Dunk, 1993	79 american managers	Yes	Milani (1975)	Mahoney *et al.* (1963)
Dunk,1995	78 australian managers (two sample of 44 and 34 managers)	Yes	Milani (1975)	Merchant *et al.* (1981)
Eker, WP	150 managers in the top 500 firms in Turkey	No	Milani (1975)	Mahoney *et al.* (1963)
Frucot and Shearon, 1991	83 mexican managers	No	Milani (1975)	Mahoney *et al.* (1963)
Frucot and White, 2006	178 managers (nationality unknown)	No	Milani (1975)	Mahoney *et al.* (1963)
Godene and Fornerino, 2009	155 french managers	No	Two personal scales	Govindarajan and Gupta (1985)
Govindarajan 1986	77 american managers in responsibility centers	No	Personal scale	Personal scale
Gul, Tsui, Fong and Kwok, 1995	54 managers in Hong Kong	No	Milani (1975)	Mahoney *et al.* (1963)
Hassel and Cunningham, 1996	36 finnish manager and 31 foreign managers	No	Milani (1975)	Govindarajan (1984)
Heath and Brown, 2007	171 employees in Oklahoma	No	Milani (1975)	Fraser (1995)
Hirst, 1987	44 australian managers	No	Milani (1975	Mahoney *et al.* (1963)
Hoque and	55 australian	Yes	Milani (1975)	Mahoney *et al.* (1963)

Brosnan, 2007	managers			
Jermias and Setiawan, 2008	204 indonesian public managers	No	Vroom and Mann (1960)	Mahoney *et al.* (1963)
Kenis, 1979	169 american managers	No	Personal scale	Personal scale
Kobori, 2006	86 taiwanese managers (toyo Kenzai)	Yes	Hofstede (1967)	Mahoney *et al.* (1963)
Kren, 1990	Experiments on 44 students	No	Personal scale	Personal scale
Kren, 1992	80 american managers (Fortune 500)	Yes	Milani (1975)	Mahoney *et al.* (1963)
Lau and Buckland, 2000	71 norvegian managers in mining firms	Yes	Milani (1975)	Mahoney *et al.* (1963)
Lau and Lim, 2002	83 australian managers	No	Milani (1975)	Mahoney *et al.* (1963)
Lau, Low and Eggleton, 1995	112 singapourean managers in industrial firms	Yes	Milani (1975)	Mahoney *et al.* (1963)
Lau and Tan, 1998	104 australian managers & 85 singapourean managers	No	Milani (1975)	Mahoney *et al.* (1963)
Leach-López, Stammerjohan and Lee, 2009	71 korean managers	No	Milani (1975)	Mahoney *et al.* (1963)
Leach-López, Stammerjohan and McNair, 2007	143 mexican and american managers in maquiladoras	No	Milani (1975)	Mahoney *et al.* (1963)
Merchant, 1981	19 american managers in electronics	No	Three personal scales	Managers self-evaluation in relation to the average performance
Merchant, 1984	170 american managers	No	Influence on budget plan	Personal scale
Mia, 1988	83 american managers	No	Milani (1975)	Supervisors' evaluation
Mia, 1989	62 american managers	No	Milani (1975) and Brownell (1979)	Supervisors' evaluation
Mia, 2001	52 australian managers	No	Milani (1975)	Mahoney *et al.* (1963)
Mia and Patiar, 2002	52 australian managers in hotel sector	No	Milani (1975)	Mahoney *et al.* (1963)
Milani, 1975	82 foremen	No	Personal scale	Two Personal scale
Ni and Su, 2001	205 taiwanese managers in publicly traded firms	Yes	Milani (1975)	Mahoney *et al.* (1963)
Ni, Su, Zhongshao and Zheng, 2005	155 taiwanese managers in publicly traded firms	Yes	Milani (1975)	Mahoney *et al.* (1963)
Ni,Su and Su, 2003, published version of Ni and Su, 2001	194 japanese managers	Yes	Hofstede (1967)	Mahoney *et al.* (1963)
Ni, Su, Zhongshao and Zheng, 2005	155 taiwanese managers in	Yes	Milani (1975)	Mahoney *et al.* (1963)

	publicly traded firms			
Nouri and Parker, 1998	135 managers (unknown)	No	Milani (1975)	Govindarajan and Gupta (1985)
Orpen, 1992	133 australian managers	No	Milani (1975)	Personal scale
Otley and Pollanen, 2000	121 managers in canadian universities	No	Milani (1975)	Mahoney *et al.* (1963)
Parker and Kyj, 2006	70 managers in bank and insurance sector	No	Milani (1975)	Mahoney *et al.* (1963)
Patiar and Mia, 2008	52 australian managers in hotel sector	No	Milani (1975)	Mahoney *et al.* (1963)
Quirin, O'Bryan and Donnelly 2004	98 american employees in large compagnies	Yes	Milani (1975)	Mahoney *et al.* (1963)
Shields, Deng and Kato, 2000	358 japanese ingineers in a car manufacture	No	Shields et Young (1993)	Personal scale
Shields and Young 1993	98 controlers in S&P 500 firms	No	Milani (1975)	Four personal scale
Soobaroyen, 2007	130 australian managers	No	Milani (1975)	Mahoney *et al.* (1963)
Su and Lin, Working Paper	168 taiwanese managers in publicly traded firms	Yes	Milani (1975)	Mahoney *et al.* (1963)
Subramaniam and Ashkanasy, 2001	114 australian managers in agribusiness	Yes	Milani (1975)	Mahoney *et al.* (1963)
Taylor, Abdul-Hamid and Mohd-Sanusi, 2008	81 malaysian managers in public local administration	No	Milani (1975)	Mahoney *et al.* (1963)
Tiller, 1983	Experiments on 150 students	No	Personal scale	Personal scale
Tintri, 2002	53 malaysian managers	No	Milani (1975)	Mahoney *et al.* (1963)
Tsui, 2001	89 chinese managers in a large compagny	No	Milani (1975)	Mahoney *et al.* (1963)
Wentzel, 2002	74 american managers in a large hospital	No	Milani (1975)	Mahoney *et al.* (1963)
Winata and Mia, 2005	74 australian managers in hotel sector	No	Milani (1975)	Mahoney *et al.* (1963)
Yahya, Ahmad and Fatima, 2008	111 malaysian managers in defense minister	No	Milani (1975)	Mahoney *et al.* (1963)
Yuen, 2007	216 public managers in Macau	No	Milani (1975)	Mahoney *et al.* (1963)