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**Hristos Doucouliagos**

*DeLMAR, Deakin University and IZA*

**T.D. Stanley**

*DeLMAR, Deakin University*

**Patrice Laroche**

*Université de Lorraine*

**Douglas L. Kruse**

*Rutgers University and IZA*

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## ABSTRACT

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# Where Does Profit Sharing Work Best? A Meta-Analysis on the Role of Unions, Culture, and Values

In this article we re-examine the relationship between group-based profit sharing and productivity. Our meta-regression analysis of 313 estimates from 56 studies controls for publication selection and misspecification biases and investigates the impact of firm level unionisation and national differences in values and culture. Profit sharing is positively related to productivity on average, with a stronger relationship where there is higher unionisation and in countries where honesty is less highly valued and there are higher levels of individualism. The latter two results suggest profit sharing works best in settings where cooperation does not naturally occur. The positive effect of profit sharing on productivity is larger in cooperative firms and in transition economies.

**JEL Classification:** J33, J51, J54, M52

**Keywords:** profit sharing, productivity, meta-regression analysis, unions, tax evasion, individualism

**Corresponding author:**

Hristos Doucouliagos  
Department of Economics  
Deakin Business School  
Deakin University  
70 Elgar Road  
Burwood, Vic 3125  
Australia

E-mail: [chris.doucouliagos@deakin.edu.au](mailto:chris.doucouliagos@deakin.edu.au)

## 1. Introduction

“The economists' tool of a “production function” cannot be defined independently of workers' morale, attitudes, and wage rates .... Workers may produce more effectively and may promote the profitability of the firm if they have a sense of financial incentive and profit reward when the corporation flourishes.”

Samuelson (1986, p. 959)

Profit-sharing schemes, which directly link employee compensation to firm profits, have grown rapidly in recent decades, now covering about one-third of U.S. workers and between 14% and 60% of workers across European countries (Blasi *et al.*, 2014: 113).<sup>1</sup> The proportion of firms offering profit sharing has increased since 2000 (Hashi and Hashani, 2013). The empirical evidence on their effects provides a wide range of estimates, and debate about the impact of profit sharing on employee attitudes (Coyle-Shapiro *et al.*, 2002; Heywood *et al.*, 2005) and productivity continues (Blinder, 2011; Blasi *et al.*, 2016). While the majority of studies find a positive relationship between profit sharing and productivity, there is much variation in the effects of profit sharing, and many studies find little or no improvement in productivity. Of the 313 reported estimates of the effects of profit sharing, uncovered in this study, 57% report positive and statistically significant productivity effects at the 10% level. Given the growing embrace of profit sharing schemes and the enduring uncertainty in their effects, the time is ripe for a comprehensive evaluation of the relevant research. In this study, we revisit the extant evidence literature through the lenses of meta-regression analysis and make two contributions: an expanded updated meta-analysis review of the evidence base and a new investigation of the role that culture and values might play on profit-sharing effects.

Weitzman and Kruse (1990) and Doucouliagos (1995) present earlier meta-analyses. However, the evidence base has since expanded, and recent studies have shifted the focus on

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<sup>1</sup> The European estimates are based on data from 34 countries in the 2015 European Working Conditions Survey (<http://doi.org/10.5255/UKDA-SN-7363-4>). We appreciate the help of Erik Poutsma and Paul Ligthart in calculating these numbers.

the broader international context (Jones and Kato, 1995; Cahuc and Dormont, 1997; Ohkusa and Ohtake, 1997; Kato and Morishima, 2002; 2003; Yao, 1997; Lin *et al.*, 2014). Hence, our meta-analysis is based on a larger number of research studies (56), covering a broader range of countries that include transitional economies: Albania, Bulgaria, Poland, and Ukraine. In their review of 16 studies, Weitzman and Kruse (1990) find that profit sharing has a positive effect on productivity. One limitation with Weitzman and Kruse is that they assign equal weight to all estimates. Doucouliagos (1995) updated Weitzman and Kruse (1990) (19 studies) and used weighted averages that gives greater influence to more precise, more accurate, estimates. By doing so, positive effects were found for both cooperatives and non-cooperatives, though the productivity effect is much larger for cooperatives. Combs *et al.* (2006) survey 31 studies on incentive compensation and also find a positive effect. However, incentive compensation is not clearly defined and their outcome variable is operational performance, which is a broader concept than productivity. A major limitation with all these prior meta-analyses is that they do not correct estimates for publication selection or model misspecification bias (Stanley, 2001). Our analysis uses a larger sample, is clearly focused on the impact of profit sharing and productivity, and corrects the evidence base for publication selection and misspecification biases.

Our second contribution is to explore the influence of contextual or situational differences (Blasi *at al.*, 2010). This enables us to disentangle some of the channels through which profit sharing impacts productivity. For example, profit sharing increases productivity by increasing incentives to exert more effort. However, free-riding can offset this effect. Consequently, empirical studies report the *net* effect of profit sharing on productivity. By pooling diverse studies, meta-analysis can make use of variation in contextual factors such as national differences in culture and values that single country studies have not and often cannot investigate. In this paper we focus on three such channels: unions as collective voices, the

impact of honesty as a proxy for free riding, and the degree of individualism as a measure of national culture. We investigate the impact of variation in these variables across space (countries) and time. Hence, our meta-analysis enables us to explore differences in firm/establishment level context (unionisation) and differences in national level values and culture, where values change over time but culture is time invariant. Often, conventional econometric studies cannot investigate these broader issues of cultural and values, because they are confined to one region and/or time. In this way, meta-regression analysis (MRA) is more than a summary and evaluation of the research record and can explore new dimensions of research beyond the reach of most conventional studies. Our meta-regression analysis enables us to investigate several additional research questions: Does unionisation moderate the effectiveness of profit sharing? Does the impact of profit sharing change when people are believed to behave honestly? Do deep-seated dimensions of culture impact on firm level interventions?

The aims of our meta-analysis are to: (1) provide a statistical synthesis of the existing research on the relationship between group-based profit sharing and productivity; (2) assess the competing claims made about the impact of profit sharing on productivity; (3) examine the effect of moderators such as union density, honesty, free-riding, and national culture; (4) assess the impact of alternative measures of profit sharing and productivity; (5) explore the sensitivity of empirical reported results; and (6) investigate and correct the evidence base for publication and misspecification biases. It is well known that methodological, specification, and data differences impact on empirical estimates (Stanley, 2001). The issue is how to quantify that impact. Meta-analysis is a set of statistical techniques that has been developed to identify and quantify associations drawn from an existing body of literature (Stanley, 2001; Schmidt and Hunter, 2015). Meta-regression analysis is based on a focused examination of the role of

specification and data sets, among others, on the reported effects of profit sharing on productivity.

We demonstrate that these factors play an important moderating role. Specifically, our results show that unionisation increases the effectiveness of profit sharing, as do more individualistic national cultures. In contrast, perceived honesty reduces the effectiveness of profit sharing, probably as it acts as a substitute for engendering cooperation.

The article is set out as follows. In the next section, we briefly review the theoretical arguments. This is followed by a discussion on the data and the meta-regression methodology in sections 3 and 4, respectively. The results are presented and discussed in section 5, followed by the conclusion in the last section.

## **2. Theoretical considerations: Linking profit sharing to productivity**

Group-based bonus plans such as profit sharing can increase productivity by: aligning employee and employer incentives, increasing worker motivation, enhancing work and remuneration flexibility, increasing worker loyalty, and fostering greater teamwork (Kruse, 1993; Blasi *et al.*, 2010). Group-based profit-sharing schemes may be particularly beneficial in situations where it is costly for a manager to measure individual effort, but workers are able to easily observe the performance of their fellow workers, in which case profit sharing may increase cooperation and peer pressure, and reduce monitoring costs. Profit sharing might also serve as a channel to retain good employees. Lower employee turnover amplifies incentives to invest in training, which, in turn, increases human capital and thereby productivity. However, these benefits can be offset by other factors. For example, in group-based incentive schemes, the costs of effort are privately experienced while the benefits from effort are shared collectively. Hence, free riding is a serious possibility, especially in larger groups. Consequently, productivity need not increase if free riding is high. Nevertheless, free-riding

might be mitigated by peer group pressure and social norms, especially when punishment is co-ordinated (Boyd *et al.*, 2005).

The relation of profit sharing to productivity is further complicated by employee attitudes toward risk and extrinsic motivators. Risk-averse employees may be uncomfortable with any type of variable pay, including profit sharing, and there is some evidence that such employees tend to avoid group incentive plans (Kruse *et al.*, 2010: 65). The risk may be mitigated, however, by having group-based pay come on top of (rather than substitute for) fixed pay, and by supportive policies that give workers greater skills and opportunities to improve performance (Kruse *et al.*, 2010). There is also some social psychology research that suggests extrinsic motivation such as financial incentives may reduce intrinsic motivation, risk-taking, and job satisfaction (Jenkins *et al.*, 1998; Frey and Jegen, 2001), although again these effects may be conditioned by other workplace policies (Kruse *et al.*, 2010: 268-269, 276).

The above considerations suggest that social norms and values may play a significant moderating role. That is, the effectiveness of profit sharing on productivity might be influenced by values such as attitudes towards free riding. Additionally, heterogeneity in profit sharing effectiveness can emerge between industries and from national institutional differences. Our MRA investigates all these sources of heterogeneity with special focus on three contextual variables: unionisation, honesty, and individualism.

### 2.1 *Unions and profit sharing*

“While there is potential for profit sharing to positively affect performance in a union setting, too little is known to make general conclusions.”

Kruse (1993, p. 166).

Unions can affect the incidence and effectiveness of profit sharing. For example, unions and profit sharing might be substitutes. In such cases, we would find a negative association between

unionisation and the incidence of profit sharing. Where unions provide collective voice mechanisms that increase productivity and reduce turnover of skilled workers, firms may find less need to introduce profit sharing. Alternatively, firms may introduce profit sharing as a strategy to prevent unionisation or to reduce union influence. Profit sharing plans are less common among unionized workers (Kruse, 1996; O'Halloran 2013), which at least partly reflects firms dropping such plans after a union drive (Freeman and Kleiner, 1990). This may reflect the traditional union goal to “take wages out of competition” by standardizing compensation across firms, as well as union concerns about ensuring that profit shares are calculated fairly.

A more interesting possibility is that unions and profit sharing might be complementary to the production process. While profit-sharing schemes are now integrated with some collective bargaining agreements (Del Boca *et al.*, 1999; Blasi, 2016)<sup>2</sup>, unions are often opposed to profit sharing. In the USA, for example, unions have historically been unreceptive to profit-sharing plans (National Civic Federation, 1920; Zalusky, 1990). Nevertheless, unions might serve as a vehicle to make profit sharing more effective for those firms that do introduce profit sharing. For example, if workers are protected by union representation, then they may be more willing to accept schemes such as profit sharing and more committed to make them work. Profit sharing requires financial information and unions can assist profit sharing effectiveness by auditing corporate profits and ensuring fair and appropriate bonuses are paid. Additionally, if profit sharing becomes a significant portion of total compensation, worker interests may become more important in management’s decisions that affect profits. Unions can offer a voice for workers in such decisions, helping align the interests of workers and employers. Union

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<sup>2</sup> For examples see <https://www.chron.com/business/article/Southwest-Airlines-to-give-employees-586-million-10921211.php>; <https://uaw.org/uaw-statement-on-gm-profit-sharing/>; <https://www.freep.com/story/money/cars/chrysler/2017/01/26/fca-union-workers-get-5000-profit-sharing-checks/97066284/> (all accessed 5-24-18).

norms of solidarity and reciprocity may also create favourable conditions for peer pressure to help overcome the free rider problem. Profit sharing may then have larger productivity effects in unionised workplaces, which is supported empirically by Cooke (1994) and Fernie and Metcalf (1995), though Lee and Rhee (1996) find that adversarial unions reduce the effectiveness of profit sharing. McCarthy *et al.* (2011) find greater effects among union workers of group incentives on job satisfaction and performance-related attitudes.

Conversely, confrontational unions may impede profit-sharing effectiveness. For example, in response to profit sharing, unions may question financial information, impede the introduction of new technologies, and resist workplace reforms (Kruse, 1993). Hence, the links between unions and profit-sharing effectiveness are theoretically ambiguous and careful research is needed to distinguish the predominant patterns from these nuances and ambiguities. Bullock and Tubbs (1990) conduct a meta-analysis of gain-sharing plans and find no link between unions and organisational effectiveness. However, their outcome variables combine productivity, costs, and quality.

A related factor is the *direct* impact of unions on productivity, which is also theoretically ambiguous (Freeman and Medoff, 1984). The extant evidence suggests that unions have an adverse effect on productivity in the UK, a positive effect in some US industries (*e.g.* construction and mining), and positive productivity effects in developing countries (Doucouliagos *et al.*, 2017). This suggests that the impact of unions on the effectiveness of profit sharing might not be so simple and varying across countries. We collect data on firm (or establishment) level union density and use MRA to investigate whether variation in union density is associated with the reported profit-sharing effects on productivity.

## 2.2 *Trust, honesty, and profit sharing*

Team-based work is vulnerable to free-riding (Olson, 1965). However, free-riding can be offset by trust. And, trust and honesty can have a positive effect on a team's performance (Dirks, 1999; De Jong *et al.*, 2016). If high levels of trust reduce free-riding, then trust will be positively correlated with profit-sharing effectiveness. However, high levels of trust may also reduce the *need* for profit sharing to increase productivity. In circumstances where trust levels are high, teams are likely to already be working with high levels of cooperation, and interventions such as profit sharing may do little to boost productivity further. When trust is high, firms may be less inclined to rely on elaborate safeguards such as profit sharing for monitoring and enforcing workers effort. We would then find a negative correlation between trust and profit-sharing effectiveness, as profit sharing has larger productivity effects in lower trust environments. Kahan (2003, p. 76) argues that: "The simple existence of an incentive scheme can be seen as a cue that other individuals are not inclined to cooperate voluntarily: if they were, incentives would be unnecessary."

To investigate these dimensions, we use data from the World Values Survey on attitudes to tax evasion (see section 3 for details). People who evade taxes contribute less to the provision of public goods. Hence, we take attitudes towards tax evasion to be broadly representative of values of honesty and of attitudes to free-riding. Attitudes to tax evasion vary between countries and over time and this variation can be used to identify whether attitudes impact profit-sharing effectiveness.

## 2.3 *Culture and profit sharing*

Corporate culture can affect the effectiveness of profit sharing). The effectiveness of profit sharing may also be influenced by national culture. Hofstede (1980, 2001) and Hofstede *et al.* (2010) argue that national culture traits such as individualism (or its converse, collectivism)

can deeply affect organisational performance. Empirical evidence reveals the importance of culture (Marcus and Lee, 2013). Gorodnichenko and Roland (2011) show that countries with individualist cultures achieve higher productivity than collectivist cultures. Undoubtedly, corporate culture can differ from national culture. However, corporate culture is influenced by national culture. Indeed, some authors find that national culture can dominate corporate culture (Adler, 1986; Johns, 2006).

We do not have measures of organisational culture for the 56 studies included in the meta-analysis, because it is likely to vary greatly within each study in unmeasured and unmeasurable ways. However, data on national culture differences are available, and they enable our meta-analysis to investigate whether deep-seated attitudes reflected in national culture impact on effectiveness of corporate initiatives such as profit sharing. Specifically, we explore the links between individualism and profit-sharing effectiveness. Hofstede (2001) defines individualism as the “degree to which people in a country prefer to act as individuals rather than as members of groups”. Individualistic cultures are orientated towards “I”, compared to the collectivist “we”. Individualist cultures establish loose ties between people. Data on individualism are time invariant, and reflect that culture is slow to change.

The links between individualism and the effectiveness of profit sharing are theoretically unclear. Gorodnichenko and Roland (2011) argue that collectivism is more conducive to resolving collective action problems and that “collectivism should have an advantage in coordinating production processes and various forms of collective action” (2001, p. 21316). Hence, on this basis, we would expect team-based incentives to be more effective in collectivist cultures and that individual incentives would be more effective in individualistic cultures. Nevertheless, the opposite, though counterintuitive, is also possible for several reasons.

Financial incentives can have a significant impact on employee motivation (Baker *et al.*, 1988). Self-interested individuals may recognise the importance of mutually shared

interests and the need for collective action, such as the need for team work. If free-riding problems are resolved, self-interest may see greater effort rewarded through profit sharing schemes. Wagner *et al.* (2012, p. 949) reassess the links between individualism and team performance and conclude that: “ (...) the assumptive basis of the conclusion that member collectivism enhances performance in teams seems questionable (...)” Nations can be individualist orientated but still engage in significant team work. Moreover, as Wagner *et al.* (2012) note, many team tasks are actually individualized.

The assumption of universal free-riding and non-cooperative behaviour is challenged by many studies (Chaudhuri, 2001; Fehr and Gächter, 2000). The empirical evidence in our meta-analysis is based entirely on observational data from firms engaged in repeated games; groups of workers and managers who need to work together over long periods of times. In such situations, team members can sanction each other to reduce free-riding (Barnes, 1988) or find other ways to resolve such problems and solicit effort. Indeed, profit sharing may offer a solution to some workplace collective action problems. The question then remains whether nations with individualistic or collectivist cultures are better at reducing free-riding in the workplace. In their meta-analysis of the literature on culture and performance, Marcus and Le (2013) find a negative correlation between collectivist societies and performance. Their explanation for this counterintuitive result is that: “(...) people in collectivistic societies are more likely to distinguish between in-groups and out-groups during situations of conflicts or cooperation (...) Because in-groups tend to be narrowly defined in collectivistic societies (e.g., family members, friends, classmates), it is conceivable that work-related group members may not be considered to be in-group members. Consequently, cooperation in work related groups may actually be lower in these societies relative to individualistic societies where little distinction is made between in-groups and out-groups.” (2013, p. 830).

There is also emerging evidence that individualism can moderate the relationship between profit sharing and productivity. For example, Coyle-Shapiro *et al.* (2002) demonstrate that profit-sharing plans have a stronger effect on commitment (which often translates into higher productivity) when employees' perceived ability to contribute individually to the firm's profits is high. Similarly, any factor that positively (or negatively) influences such as perceived impact may moderate the relationship between the profit sharing and productivity.

### **3. Data**

We followed closely the MAER-Net protocols for conducting and reporting meta-analyses (Stanley *et al.*, 2013). We commenced with a database search for relevant studies in EconLit, ISI Web of Science, Business Source Premier, Ebsco, Scopus, and Google scholar, using combinations of the following broad keywords: “profit sharing”, “gain-sharing”, “firm performance”, “organization performance”, “team incentives”, “group incentives”, “shared compensation”, “profit-related-pay”, “pay-for-performance”, “productivity”, and “labor productivity”. We also searched manually all the academic journals that have published studies on profit sharing. Our search also included the examination of references in covered empirical studies to other studies that might report profit sharing-productivity effects. Our search was extended to unpublished working papers and theses, the so-called ‘grey’ literature. The search ended in September 2017. See the appendix for a PRISMA diagram.

It is essential that the data consists of a comparable group of estimates. This necessitates the exclusion of several groups of empirical studies. First, since our focus is on productivity, we exclude estimates of the effects of profit sharing on company performance measured in terms of profitability, wages, or employment. While indirectly related to productivity, these alternate performance outcomes are not comparable to direct productivity effects. Second, we concentrate on firm or establishment level productivity effects; hence we exclude

macroeconomic studies. Specifically, we focus on studies that estimate a production function and measure output either as value added or sales. Third, we are interested in actual performance outcomes. Hence, we focus on studies using data from actual firms and exclude any experimental (laboratory) based studies. Laboratory based studies may not accurately reflect actual performance of organisations (Roth, 1994; Doucouliagos, 1995). Related to this, we exclude a fourth group of studies that explores managers' perceptions of performance. We focus only on studies that report empirical estimates of objective measures of performance. Fifth, we also exclude studies that include profit sharing as part of a 'bundle' of interventions, *e.g.* Black and Lynch (2004) and Eriksson (2003). These 'bundled' estimates are not strictly comparable with estimates of the effect of profit sharing on its own.

Sixth, by necessity, we exclude studies that do not report information necessary for calculating effect sizes such as *t*-statistics, correlations, or regression coefficients. Seventh, in a few cases, multiple studies use the same data and report essentially the same results. Here, we include only one of these studies to avoid double-counting (*e.g.*, Yao, 1995). Finally, we include only econometric-based studies and thus exclude studies that report differences between sample means and we also exclude reviews that do not provide any original empirical analysis (*e.g.* Blanchflower and Oswald, 1987).

Our final data set includes 56 independent studies, covering 18 countries: Albania (1), Bulgaria (1), Canada (2), China (1), Finland (2), France (6), Germany (7), India (1), Italy (5), Japan (3), Korea (1), Netherlands (1), Poland (1), Portugal (1), Taiwan (1), Ukraine (1), UK (8), and the USA (13). The data include two groups of firms: six studies of cooperatives and 50 studies of participatory capitalist firms with profit sharing. The appendix references the studies included in the meta-analysis.

Many studies do not provide sufficient information from which to calculate the percentage change in productivity as a result of profit sharing. Hence, following the approach

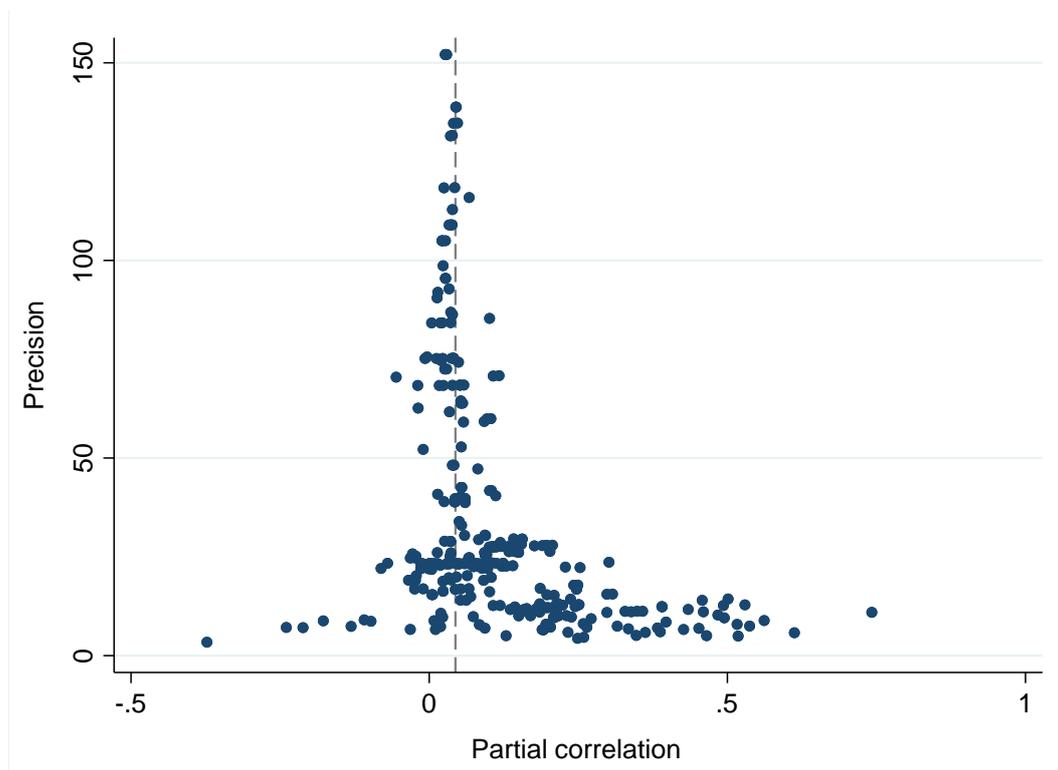
of Doucouliagos and Laroche (2003; 2013) we calculate partial correlations. This is the correlation between profit sharing and productivity controlling for the effects of other factors that potentially influence productivity, such as capital stock. These partial correlations enable us to construct the largest possible dataset of the productivity effects of profit sharing.

We identified five outlying observations by regressing the partial correlation on a constant and its standard error, and treating any observations as an outlier if the absolute value of the standardised residual exceeded 3.5 (for a similar approach see de Linde Leonard *et al.*, 2014). These outliers may represent typing, estimation or coding errors; hence, they are removed from the subsequent meta-regressions to ensure that our findings are not unduly influenced by erroneous information.

These partial correlations measure the ‘effect’ of profit sharing on productivity. Yet, because productivity might enable the introduction of profit sharing (reverse causation), it is more accurate to interpret these measures as reflecting the strength of the association. Nevertheless, all authors treat the relationship as causal and several studies have attempted to formally accommodate endogeneity. We deal with the potential endogeneity between profit sharing and productivity directly through the meta-regression analysis.

The 56 studies were independently coded by the authors for characteristics of the sample, measurement, and potential moderators (Stanley *et al.*, 2013). The data are illustrated in Figure 1 in the form of a funnel plot (Stanley and Doucouliagos, 2012), showing that: (i) the majority of the estimates report positive profit-sharing effects, (ii) the distribution of results is asymmetrical, and (iii) there is a large degree of heterogeneity in reported findings. An asymmetrical distribution of results may be consistent with publication selection bias but also with heterogeneity among the reported effects (Stanley and Doucouliagos, 2012). In section 5 below, we use MRA to investigate the nuances of potential publication selection and heterogeneity.

**Figure 1: Estimates of profit sharing and productivity correlations**



*Notes:* The dashed vertical line shows the weighted average partial correlation (0.044), using inverse variance weights. Precision is measured as the inverse of the estimated standard error of the partial correlations.

Table 1 presents average partial correlations grouped by ‘cooperatives’ versus ‘non-cooperatives’ (panel A). Because profit sharing effects from non-cooperative firms represent the vast majority of these estimates, we also breakdown the average partial correlations by various countries for ‘non-cooperative,’ (panel B).<sup>3</sup> Profit sharing increases productivity in both cooperative and non-cooperative firms. However, the productivity effects are six times larger for cooperatives and the 95% confidence intervals do not overlap. The finding that cooperatives have much stronger profit-sharing effects than other firms has been noted before (Doucouliagos, 1995). One explanation for this difference is that workers in cooperatives tend

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<sup>3</sup> Throughout the paper we use the term ‘effect’. However, our measure of effect size is correlations.

to be a self-selected group. They voluntarily choose to work in cooperatives, tend to be co-owners, and may thus be more highly motivated. Members of cooperatives are also likely to have greater trust of other members and in the information provided within their firm. Another explanation is that this heterogeneity may reflect differences in profit sharing measures. Nearly all the estimates for cooperatives use a dollar based measure of profits shared, whereas nearly three quarters of the estimates for non-cooperatives use a dummy variable for the presence of profit sharing. Dollar based measures are more likely to reflect endogeneity, as high productivity produces high profit shares. While the sample of estimates is limited, a comparison of endogeneity-corrected dollar-based estimates still suggests a stronger effect of profit sharing in cooperatives than in non-cooperatives.<sup>4</sup> See the appendix for further comparisons.

Table 1 also reports average productivity effects for non-cooperatives for various countries and groups of countries for the USA, the UK, Germany, Other Europe (Italy, France, Portugal, Netherlands, and Finland), Asia (Japan, China, Taiwan, and Korea), and European transition economies (Albania, Bulgaria, Poland, and Ukraine).<sup>5</sup> These averages suggest that profit sharing has the largest effect on productivity in Germany and in transition economies. There appears to be a zero correlation for the United Kingdom and for Asian economies. However, these overall averages do not allow heterogeneity and research design differences; we turn to these issues in the following section.

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<sup>4</sup> The weighted average correlation for dollar based estimates that correct for endogeneity is 0.23 ( $p$ -value = 0.252) in cooperatives compared to 0.15 ( $p$ -value = 0.001) in non-cooperatives.

<sup>5</sup> We combine these groups to reduce the burden on degrees of freedom and to construct a simpler model. Analysing these countries separately does not change any of the inferences.

**Table 1. Profit sharing and productivity, unconditional weighted averages**

Group/Country	Number of estimates [studies] (1)	Weighted average partial correlation (2)
<i>A: Cooperatives versus non-cooperatives</i>		
Cooperatives	38 [6]	0.253 (0.127; 0.379)
Non-cooperatives	275 [50]	0.043 (0.032; 0.053)
<i>B: Country differences (non-cooperatives)</i>		
USA	80 [13]	0.036 (0.022; 0.050)
United Kingdom	26 [8]	0.033 (-0.034; 0.099)
Germany	26 [8]	0.113 (0.051; 0.175)
Other Europe:	85 [10]	0.040 (0.030; 0.051)
- Italy	27 [3]	0.035 (0.023; 0.048)
- France	22 [4]	0.040 (0.005; 0.075)
Asia:	43 [8]	0.078 (0.007; 0.150)
- Japan	27 [3]	0.077 (-0.118; 0.273)
Transition	15 [4]	0.147 (0.054; 0.240)

*Notes:* Column (1) reports the number of observations [and studies] used to calculate the weighted averages. Column (2) reports the weighted average partial correlation estimated with unrestricted weighted least squares using inverse variance weights. Figures in brackets in Column (2) are 95% confidence intervals. Panel A compares cooperatives to non-cooperatives. Panel B reports country specific averages for non-cooperatives (participatory capitalist firms). See text for definition of Other Europe, Asia, and Transition.

#### 4. Meta-regression methodology

Our meta-regression model involves regressing estimates of the partial correlation between profit sharing and productivity,  $r$ , on a range of moderator and contextual variables:

$$r_{ij} = \beta_0 + \beta_1 SE_{ij} + \beta_x \mathbf{x}_{ij} + \beta_y \mathbf{y}_{ij} + \varepsilon_{ij}, \quad (1)$$

where  $SE$  is the estimated standard error of the partial correlation,  $\mathbf{x}$  is a vector of moderator variables that reflect research design choices (*e.g.*, econometric specification, years, countries, and industries studied),  $\mathbf{y}$  is a vector of contextual variables (*e.g.*, union density, values, and culture),  $i$  and  $j$  index denote estimates and studies, respectively, and  $\varepsilon$  denotes the error term.

We estimate Eqn. (1) using data from the 50 studies that report 275 estimates of profit sharing for participatory capitalist firms. We exclude cooperatives from this analysis in order to ensure a focussed analysis on participatory capitalist firms. The dataset contains several estimates from the same study, so that estimates are clustered within studies. We deal with this potential data dependence by adjusting standard errors for data clustering within studies.

Estimation of Eqn. (1) achieves three tasks. First, Eqn. (1) can be used to correct the evidence base for publication selection bias and econometric misspecification bias (see Stanley and Doucouliagos, 2012). If the empirical literature is free of publication selection bias, then the estimated profit-sharing partial correlations will not be correlated with their standard errors (Egger *et al.*, 1997; Stanley 2005, 2008).<sup>6</sup> In contrast, *some* researchers might search for estimates that are statistically significant at an ‘acceptable’ significance level. Such selection will often generate a correlation between an estimated effect and its standard error and can result in a truncated and asymmetrical distribution of reported profit-sharing effects (Stanley 2008; Stanley and Doucouliagos, 2014). Hence, publication selection bias can be statistically investigated by testing the coefficient on the standard error ( $SE$ ),  $\beta_1 = 0$ , also known as the funnel asymmetry test (or FAT).

Second, Eqn. (1) can also be used to identify the factors that generate heterogeneity in reported estimates. Parts of this heterogeneity will reflect genuine differences in profit sharing effects, but some heterogeneity will also be created by research design choices. Heterogeneity can be identified and quantified by the coefficients in the  $\mathbf{x}$  and  $\mathbf{y}$  vectors in Eqn. (1). The  $\mathbf{x}$  vector contains information extracted from the primary studies themselves, such as the samples used (e.g., country, time period, and panel data). This enables us to explore heterogeneity both in terms of data and in terms of research design choices. By identifying the impact of specification on reported estimates, through the variables included in the  $\mathbf{x}$  vector, it is possible to ‘correct’ the evidence base for misspecification bias. The  $\mathbf{y}$  vector contains information collected from external sources and is used to quantify the impact of contextual factors; see below discussion.

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<sup>6</sup> Calculation of the standard deviation of the partial correlation requires an estimate of the partial correlation. Hence, there is some correlation between these two variables. To get around this, authors sometimes use the Fisher  $z$ -transformation (e.g., Doucouliagos and Laroche, 2003). However, this transformation makes little difference. Results using the  $z$ -transformation are reported in the appendix.

Third, the estimated coefficients from Eqn. (1) can be used to quantify the size of the profit-sharing effect; the coefficients from the meta-regressions provide estimates of the effect of profit sharing on productivity, corrected for publication selection, model misspecification bias, heterogeneity, and adjusted for context.

The moderator variables used to explore genuine heterogeneity and heterogeneity introduced by research design choices are listed in Table 2.

*SE* is the estimated standard error of the partial correlation and is included to accommodate the potential presence of publication selection. *Unpublished* is a binary variable for unpublished studies. Seven binary variables are included relating to the country or region studied by primary studies: *UK*, *Canada*, *Germany*, *Other Europe* (all other European nations), *Japan*, *Asia* (excluding Japan), and *Transition* (transition economies). The baseline (omitted category) is the USA.

We include seven variables that reflect data differences. *Year* is the average year of the data used by studies. *Continuous* is a binary variable for studies that measure profit sharing as a continuous measure with studies that use a dummy variable (the incidence of profit sharing) as the base. *Panel*, *Nonmanuf*, and *Managerial* are binary variables for panel data, data relating to non-manufacturing industries, and profit sharing for managerial staff, respectively; with profit sharing for cross-sectional data for manufacturing non-managerial employees as the baseline. *Number of firms* is the number of firms or establishments used by primary studies.

Ten binary variables reflect specification and estimation differences. *Decision* and *Ownership* reflect studies that control for employee participation in decision making and ownership, respectively. These are important dimensions of participatory firms that may also affect productivity. The moderator variables *Human capital*, *Market share*, *Capital*, and *Age*, are included to reflect studies that control for human capital or skill differentials, market share or firm concentration, capital stock, and age of firm/establishment, respectively. *Endogeneity*

controls for studies that have attempted, in some fashion, to address the issue of reverse causality between profit sharing and productivity. Finally, *Random effects*, *Fixed effects*, and *Time effects* control for studies that use a random effects panel model, and studies that control for firm specific and time specific fixed effects, respectively.

The  $\mathbf{y}$  vector contains the three contextual variables: union density, tax evasion, and individualism. Most of this information on these variables was collected from sources external to the primary studies. While some primary studies included union density, none considered the other contextual variables.

*Union density* is the average percent of workforce that is unionized. This variable is included to investigate whether the impact of profit sharing on productivity is conditional upon the degree of unionisation. This serves as a proxy for the power of unions. As discussed in section 2 above, unions may facilitate or hinder the effectiveness of profit sharing. In most cases, data on union density are reported in the studies themselves and relate to unionisation at the firm or establishment level. However, in a handful of cases, we use national level data on unionisation (matched to the country and time period studied by the primary studies) to proxy for the sample specific unionisation; this decision does not influence results.

*Tax evasion* is the proportion of respondents who state that tax evasion is never justified. This variable was constructed using data from various issues of the World Values Survey (WVS). For countries not included in the WVS, we use the equivalent responses from the European Values Study. We use the response to the following question: “*Please tell me for each of the following statements whether you think it can always be justified, never be justified, or something in between, using this card. Cheating on taxes if you have a chance*”. We use the percent of responses stating that cheating on taxes is *never justified*.<sup>7</sup> Recall from section 2 that

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<sup>7</sup> The actual question number in the surveys has changed over time but the question has not. Data was extracted from the ASEP/JDS website: [http://www.jdsurvey.net/jds/jdsurveyAnalysis.jsp?ES\\_COL=131&Idioma=I&SeccionCol=06&ESID=397](http://www.jdsurvey.net/jds/jdsurveyAnalysis.jsp?ES_COL=131&Idioma=I&SeccionCol=06&ESID=397). Accessed 31 May 2018.

a major issue in the effectiveness of profit sharing is the degree of free-riding. We use this variable to reflect the degree to which people are trustworthy and unlikely to free ride. The data relate to national differences in attitudes to tax evasion. These change over time; so there is variation in this trust indicator across both space and time. One limitation with these data is that they are based on self-reported measures of trust and hence may be biased if survey responders misrepresent their true attitudes to tax evasion.

The third contextual variable is *Individualism*. The data for this dimension of culture are based on the work of Hofstede (1980). These data are at the national level and are time invariant. We hypothesize that the effectiveness of collective incentive remuneration may be influenced by the degree of individualism.

The moderator variables can be reasonably taken to be exogenous to the estimated profit-sharing effects. For example, national attitudes to tax evasion and individualism are unlikely to be influenced by the effectiveness of profit sharing, especially considering the low incidence of profit sharing in most countries. Hence, our MRA estimates are unlikely to suffer from reverse causality bias. However, reverse causality with union density is more plausible.

**Table 2. MRA Moderator Variables**

Variable	Description	Source of data	Mean	Standard deviation
<i>r</i>	Partial correlation, the dependent variable	Primary studies	0.091	0.116
<i>SE</i>	Standard error of the partial correlation	Primary studies	0.049	0.037
<i>Unpublished</i>	Unpublished study	Primary studies	0.138	0.345
	<i>Country/region (base is USA)</i>			
<i>UK</i>	UK sample	Primary studies	0.095	0.293
<i>Canada</i>	Canadian sample	Primary studies	0.011	0.104
<i>Germany</i>	German sample	Primary studies	0.095	0.293
<i>Other Europe</i>	Other European country sample	Primary studies	0.309	0.463
<i>Japan</i>	Japanese sample	Primary studies	0.098	0.298
<i>Asia</i>	Asian sample data (excluding Japan)	Primary studies	0.047	0.213
<i>Transitional</i>	Transitional economy sample	Primary studies	0.055	0.228
	<i>Data</i>			
<i>Average Year</i>	Average year of sample normalized to sample mean year, 1986	Primary studies	0.961	7.640
<i>Nonmanuf</i>	Non-manufacturing sample data (base is manufacturing)	Primary studies	0.494	0.501
<i>Panel</i>	Panel data (base is cross-sectional)	Primary studies	0.756	0.430
<i>Continuous</i>	Non-binary measure of profits sharing used (base is binary measure)	Primary studies	0.273	0.446
<i>Salesbased</i>	Sales based productivity measure (base is value added measure)	Primary studies	0.230	0.422
<i>Number of firms</i>	The number of firms in the data/1000	Primary studies	0.695	1.480
<i>Managerial</i>	Profit sharing for managerial staff (base is non-managerial staff)	Primary studies	0.029	0.168
	<i>Econometric specification and estimation</i>			
<i>Decision</i>	Model controls for employee participation in decision making	Primary studies	0.135	0.342
<i>Ownership</i>	Model controls for employee ownership	Primary studies	0.316	0.466
<i>Human capital</i>	Model controls for human capital	Primary studies	0.193	0.395
<i>Market share</i>	Model controls for market share or industry concentration	Primary studies	0.171	0.377
<i>Capital</i>	Model controls for physical capital	Primary studies	0.745	0.436
<i>Age</i>	Model controls for age of firm	Primary studies	0.164	0.371
<i>Endogeneity</i>	Estimation corrects for endogeneity	Primary studies	0.113	0.317
<i>Fixed effects</i>	Estimation with firm or industry fixed effects	Primary studies	0.502	0.501
<i>Time effects</i>	Estimation with time fixed effects	Primary studies	0.655	0.476
<i>Random effects</i>	Estimation with random effects	Primary studies	0.113	0.317
	<i>Contextual variables (y vector)</i>			
<i>Tax evasion</i>	% of survey responders stating it is never justified to cheat on taxes	World Values Survey & European Values Study	58.319	12.396
<i>Individualism</i>	The extent people in a society are integrated into groups	Geert Hofstede	69.375	23.497
<i>Union density</i>	Union density	Primary studies and OECD	0.310	0.160

## 5. Results

The key MRA results are presented in Table 3, and the full set of results are reported in the appendix. Column (1) reports the general MRA model with estimates of the effects of all moderator variables included, except for the contextual variables. In Column (2) we add the three contextual variables - *Union density*, *Tax evasion*, and *Individualism* - serving as proxies for the power of insiders, the degree of honesty, and the culture of individualism, respectively. Column (3) reports the results of a general-to-specific modelling strategy that removes any moderator variable that was not statistically significant at the 10% level. This is a recommended approach to simplifying complex MRA models to avoid the real possibility that multicollinearity might obscure the central message(s) (Stanley and Doucouliagos, 2012). All these models are estimated using unrestricted weighted least squares meta-regression using inverse variance ( $1/se^2$ ) weights, as recommended by Hedges and Olkin (1985) and extended by Stanley and Doucouliagos (2015; 2017).

Columns (4) and (5) explore the robustness of the MRA estimates to different weights. Column (4) replaces inverse variance weights with sample size, as recommended by Schmidt and Hunter (2015). Column (5) uses random effects weights,  $1/(se^2 + \tau^2)$ , where  $\tau^2$  is the estimate of random effects variance (the between-study or heterogeneity variance). These models, however, have been shown to result in biased estimates when a literature faces publication selection bias (Stanley and Doucouliagos, 2015; 2017).

**Table 3: Profit sharing and Productivity, Meta-Regression Analysis**

	(1)	(2)	(3)	(4)	(5)
	General	General with values and culture	Specific with values and culture	Sample size weights	Random effects
<i>A: Meta-regressions</i>					
Constant	-0.003 (-0.10)	0.007 (0.07)	-0.082 (-2.83)***	-0.071 (-2.41)**	-0.080 (-2.20)**
<i>SE</i>	1.395 (4.35)***	1.590 (3.97)***	1.945 (6.47)***	1.761 (5.85)***	1.891 (8.43)***
<i>Endogeneity</i>	0.041 (3.24)***	0.047 (3.79)***	0.051 (4.38)***	0.049 (4.17)***	0.042 (2.98)***
<i>Average year</i>	-0.001 (-0.89)	-0.001 (-0.73)	-	-	-
<i>Number of firms</i>	0.005 (3.46)***	0.006 (4.20)***	0.005 (3.61)***	0.005 (3.49)***	0.004 (1.51)
<i>Capital</i>	-0.004 (-0.30)	0.009 (0.51)	0.028 (3.03)***	0.029 (3.08)***	0.022 (1.74)*
<i>Time dummies</i>	0.010 (0.83)	0.019 (1.95)*	0.020 (2.49)**	0.017 (2.24)**	0.032 (3.09)***
<i>Age</i>	0.029 (1.14)	0.024 (1.08)	0.024 (2.15)**	0.024 (2.12)**	0.013 (0.99)
<i>Human capital</i>	0.002 (0.10)	-0.022 (-1.05)	-0.016 (-2.13)**	-0.019 (-2.30)**	-0.002 (-0.22)
<i>Union density</i>	-	0.099 (2.31)**	0.070 (4.40)***	0.066 (4.18)***	0.038 (1.36)
<i>Tax evasion</i>	-	-0.002 (-1.39)	-0.002 (-2.94)***	-0.002 (-2.85)***	-0.001 (-2.07)**
<i>Individualism</i>	-	0.001 (2.06)**	0.001 (4.87)***	0.001 (4.46)***	0.001 (3.18)***
<i>B: Country specific weighted averages</i>					
USA	0.08 (-0.01; 0.17)	0.07 (0; 0.16)	0.06 (0.03; 0.10)	0.06 (0.02; 0.10)	0.06 (0.02; 0.11)
UK	0.06 (-0.03; 0.15)	0.04 (-0.05; 0.12)	0.02 (-0.04; 0.08)	0.02 (-0.04; 0.08)	0.02 (-0.03; 0.07)
Germany	0.10 (0; 0.20)	0.08 (-0.01; 0.17)	0.07 (0.04; 0.10)	0.07 (0.04; 0.10)	0.07 (0.03; 0.11)
Japan	0.08 (-0.02; 0.18)	0.07 (-0.01; 0.16)	0.08 (0.04; 0.12)	0.08 (0.03; 0.13)	0.09 (0.05; 0.13)
Transition	0.14 (0.04; 0.24)	0.20 (0.08; 0.32)	0.19 (0.13; 0.25)	0.20 (0.14; 0.25)	0.17 (0.10; 0.24)
N [k]	275 [50]	267 [48]	267 [48]	267 [48]	267 [48]
Adjusted R <sup>2</sup>	0.34	0.36	0.37	0.36	-

*Notes:* Only the key variables reported; see the appendix for full results and Table 2 for variable definitions and summary statistics. Column (1) reports the general model including the full set of controls but excluding contextual variables. Column (2) adds three contextual variables: *Union density*, *Tax evasion*, and *Individualism*. Column (3) reports the general-to-specific MRA after removing all statistically insignificant variables. Columns (1) to (3) use weighted least squares with inverse variance weights ( $w=1/SE^2$ ). Column (4) uses sample size weights, while Column (5) uses random effect weights ( $w=1/(SE^2+\tau^2)$ ), where  $\tau^2$  is the estimate of the between-study or heterogeneity variance. Brackets report  $t$ -statistics using standard errors adjusted for study-level clustering. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% levels, respectively. Panel B reports weighted averages for various countries evaluated using country specific sample averages for contextual variables.

Several of the variables appear to be important moderators of the effect of profit sharing on productivity. *SE* always has a positive and statistically significant coefficient, consistent with *some* researchers selectively reporting statistically significant positive profit-sharing effects. The degree of bias may be considered substantial because its coefficient is consistently larger than 1 (Stanley and Doucouliagos, 2013).<sup>8</sup>

Reverse causality is a major concern in this area of research. For example, profit sharing may be introduced by the more productive firms. The coefficient on *Endogeneity* indicates that studies that do *not* treat reverse causality find smaller effects. In particular, simple OLS models produce smaller estimates. Correcting for reverse causality results in partial correlations that are about 0.05 larger, giving further credence that the positive profit-sharing effect is authentic.

The number of firms included in the sample is important; larger productivity effects emerge as samples are broadened to embrace more firms. This finding is consistent with an underlying positive productivity effect that is more likely to be revealed by the greater statistical power of larger samples.<sup>9</sup>

Measurement appears to be unimportant. Specifically, conditional on the other dimensions of research design and data, it makes little difference to the size of the productivity effect if profit sharing is measured as a continuous measure or as a binary variable for the presence of profit sharing. However, the specification of the econometric model moderates the size of the profit-sharing productivity effect. Specifically, studies report smaller productivity effects if they do not control for the contributions of capital, the age of the firm or establishment, and time dummies to control for unobservable time effects, *i.e.*, excluding these variables results in model misspecification bias in the direction of reporting smaller effects.

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<sup>8</sup> We are not suggesting that all authors take part in this process. Rather, it appears that some results produced in *some* studies are likely to be missing from the reported evidence base. Applying the coefficients on *SE* in Table 3 to the average *SE* (0.049) implies that most (and perhaps all) of the average positive correlation between profit sharing and productivity (0.091) can be attributed to selective reporting or small sample bias.

<sup>9</sup> Larger samples will tend to report estimates with greater precision. However, this does not necessarily mean that larger samples will produce larger effects.

Conversely, studies that exclude human capital report larger productivity effects, suggesting that some of the productivity effect attributed to profit sharing stems from human capital rather than profit sharing directly. As discussed in Section 2, above, profit sharing may enable retention of more productive employees and thereby causing profit sharing to impact productivity through human capital investment.

The three contextual variables also play important moderating roles, explaining some of the heterogeneity among reported estimates. The positive coefficient on *Union density* suggests that unions and profit sharing are complementary; that is unions enhance the profit sharing effect on productivity. These findings are consistent with the importance of collective voice mechanisms. Greater voice, representation, and protection of workers can induce profit sharing to be more effective in increasing productivity.

*Tax evasion* has a negative coefficient. Recall that this variable reflects general societal views that “Tax evasion is never justifiable” and serves as a proxy for attitudes towards free riding in a society. The negative coefficient suggests that profit sharing has weaker productivity effects in societies with higher (self-reported) levels of trust and honesty. This result is consistent with the idea that a high level of trust already engenders a larger degree of cooperation. Consequently, profit sharing may not contribute as much to promote productivity *i.e.*, productivity is already likely to be higher because of higher trust and profit sharing does not add as much to productivity.

*Individualism* has a positive coefficient suggesting that profit sharing has a greater effect on productivity in more individualistic cultures. At first blush, this finding seems counterintuitive given that we are assessing the effectiveness of group-based profit-sharing schemes. Evidently, individualistic national cultures are not a hindrance to group-based incentive schemes. As discussed in Section 2, if free-riding problems can be resolved, self-interested, individualistic workers may see how greater efforts are rewarded through profit

sharing schemes. Moreover, this finding may have a similar explanation as for the tax evasion result; collectivist cultures already cooperate, so a cooperation-enhancing policy like profit sharing may only be needed, or will be more effective, in an individualistic culture where it gets people to see past their narrow self-interest.

### *Country differences*

The MRA results reported in Table 3 account for a large proportion of the variation in reported estimates. In addition to explaining the heterogeneity in the results, the MRA coefficients can also be used to evaluate the size of the profit-sharing effect for particular countries or conditional on 'best practice'. We present conditional meta-averages using the coefficients from the MRA in panel B of Table 3 for several countries evaluated using: individual country sample means of the contextual variables (union density, individualism, and attitudes to tax evasion), the country sample mean of the number of firms studies, and assuming that best practice econometric modelling for this literature controls for reverse causality, physical and human capital, firm age, and fixed time effects.

These meta-regressions suggest that the correlation between profit sharing and productivity is about 0.07 in the USA, Germany, and Japan. However, it is effectively zero in the UK. The effect is strongest in transition economies. These results differ from the unconditional estimates reported in Table 1, as they correct for potential publication selection bias and model misspecification.

Our findings for transition economies might be driven by sparse data. Alternatively, profit sharing in transitional economies may have been introduced, initially, into firms that were receptive to it. Further study is needed to confirm if this is a lasting finding.

## 6. Discussion and Conclusion

Profit sharing is often promoted as a means of boosting firm productivity by increasing workplace cooperation, information-sharing, and employee commitment. Evidence has been mixed, with many studies finding no effect on productivity, others a positive effect and some studies reporting adverse productivity effects. We find that the majority (57%) of the 313 coefficients in our 56 studies are positive and statistically significant at the 10% level. The average partial correlation between profit sharing and productivity is 0.253 for cooperatives and 0.043 for non-cooperatives, both significantly greater than zero. The latter result is remarkably close to the small but significant 0.04 partial correlation between employee ownership and performance found in the meta-analysis by O'Boyle *et al.* (forthcoming). Profit sharing and employee ownership obviously share the feature of tying worker compensation to company performance, although there are clear differences, in particular that profit sharing provides a more immediate reward while employee ownership creates greater issues of financial diversification.

This positive relationship between profit sharing and productivity holds up in our meta-regression analysis. It is noteworthy that the effect is strengthened when accounting for reverse causality, and is stronger in studies that (properly) control for capital intensity. The effect is somewhat reduced when controlling for human capital levels, indicating that part of the positive effect of profit sharing may come from the effects of higher human capital (possibly due to workers with higher human capital being attracted to profit sharing schemes).

Simply installing a profit sharing plan, however, does not lead to automatic improvement. There is substantial dispersion in the effects of profit sharing. We find that profit sharing appears to be more effective in the presence of unions, consistent with the idea that unions provide job security, voice, and opportunities for worker cooperation that enhance the effect of profit sharing. We also find that profit sharing has a larger effect on productivity in

countries where honesty is less highly valued, and in countries with higher levels of individualism. Both of these results at first appear counterintuitive, since workplace cooperation should work better in companies where workers trust each other and are more prone to cooperate. These results may indicate, however, that profit sharing works best at inspiring workplace cooperation in settings where cooperation does not naturally occur; that is, cooperation may enhance productivity, and profit sharing may be especially useful to encourage such cooperation in cultures with low social trust and high levels of individualism. These results clearly warrant further research.

The results have implications for firms, policy makers, and researchers. For firms, the results indicate that contextual factors are very important. The improvement in outcomes is better, on average, among firms that adopt profit sharing but has a wide dispersion (recall Figure 1), indicating that some adopters do extremely well while others see decreases in performance (Kruse, 1993). Recent evidence suggests that profit sharing, employee ownership, and other group incentives work better when combined with high-performance policies of employee involvement, training, job security, market-level fixed wages, and low supervision (Kruse *et al.*, 2010, Blasi *et al.*, 2016).

For policy makers, the results suggest that profit sharing may help, and at a minimum will not harm, economic performance. The United States has a long history of encouraging broader sharing of economic rewards, starting with George Washington's policy to rebuild the cod fishing fleet (which had been decimated by the British in the Revolutionary War) with tax credits for ships that established profit sharing plans for sailors (Blasi *et al.*, 2014). Washington and other founders believed that greater sharing of economic rewards would strengthen democracy by mitigating economic inequality, which is highly relevant given current trends toward inequality. To the extent that profit sharing provides a social good, these results indicate at a minimum that it will not come with an economic cost. A variety of public policy ideas to

encourage greater sharing of economic rewards with employees is discussed in Blasi *et al.* (2014).

For researchers, the results suggest that while profit sharing improves performance on average, there is still much to learn about how this happens, and a substantial amount of dispersion to be explained. While a common criticism is that the positive effects reflect reverse causality, these meta-regression results indicate the relationship is actually strengthened when accounting for this endogeneity. Some of the deeper explanation should involve more direct measurement of worker behaviours and motivations. For example, Freeman *et al.* (2010) found that workers with profit sharing, employee ownership, or other group incentive schemes were more likely to take action against a shirking co-worker, and a large portion of those workers said it was because “poor performance will cost me or other workers in bonus or stock value” (Freeman *et al.*, 2010: 97). It would be immensely useful to have more such measures of worker attitudes and behaviour, including the types of cultural attitudes measured here, to better unlock the question of how and why profit sharing affects productivity.

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## APPENDIX

### Studies included in the meta-analysis

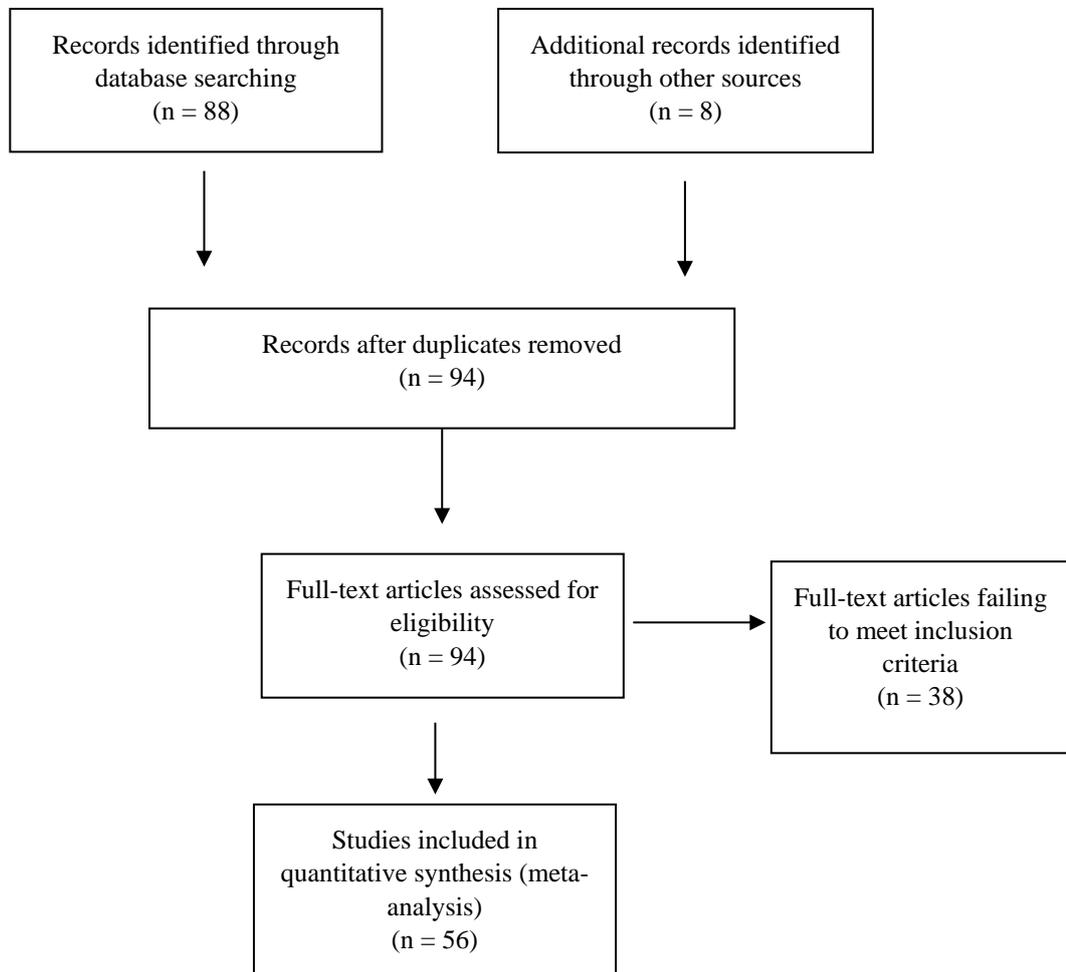
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\* These two studies are treated as a single study as they involve the same authors using the same data.

## Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Diagram



**Table A1: Studies Excluded From the Meta-Analysis and Reasons for Exclusion**

Articles	Journals/Outlet
<b>Examples of reviews and essays excluded; only empirical studies are included</b>	
Blanchflower & Oswald (1987)	<i>Irish Journal of Management</i>
Jones & Pliskin (1988, 1991)	<i>Working papers</i>
Weitzman & Kruse (1990)	<i>Book Chapter</i>
Kruse (1993)	<i>NBER Working Paper</i>
Welbourne & Meija (1995)	<i>Journal of Management</i>
D'Art & Turner (2001)	<i>The Irish Journal of Management</i>
Urgakovic (2008)	<i>Book</i>
Kruse et al. (2010)	<i>Book</i>
<b>Examples of no quantifiable effect size available</b>	
Weiss (1987)	<i>NBER Working Paper No 2194</i>
Bradley, Estrin & Taylor (1990)	<i>Industrial Relations</i>
Kaufman (1992)	<i>Industrial and Labor Relations Review</i>
Bowie-McCoy, Wendt & Chope (1993)	<i>Industrial Relations</i>
Krauter, Basso, & Kimura (2004)	<i>Working Paper</i>
Blasi et al. (2008)	<i>NBER Working Paper</i>
Kraft & Lang (2016)	<i>ILR Review</i>
<b>Examples of studies where productivity is not the dependent variable, e.g. we exclude studies that measure outcome as profitability, costs, wages, or employment</b>	
Hatcher & Ross (1991)	<i>Journal of Organizational Behavior</i>
Hubler (1993)	<i>Empirical Economics</i>
Knez & Simester (2001)	<i>Journal of Labor Economics</i>
Petersen & Luthens (2006)	<i>Journal of Applied Psychology</i>
Long and Fang (2013)	<i>IZA Discussion Paper</i>
Park & Kruse (2014)	<i>Human Resource Management Journal</i>
<b>Examples of studies where effects of profit-sharing not identified (combined with other participatory practices or combined with individual incentive schemes)</b>	
Eriksson (2003)	<i>Advances in the Economic Analysis of Part. &amp; LMF</i>
Black & Lynch (2004)	<i>The Economic Journal</i>
Kim (2005)	<i>Industrial and Labor Relations Review</i>
Hassan, Hagen, Daigs (2006)	<i>Academy of Strategic Management Journal</i>
Zwick (2006)	<i>Industrial Relations</i>
Wolf and Zwick (2008)	<i>SBR</i>
Roman (2009)	<i>Accounting, Organizations and Society</i>
Origo (2009)	<i>Labour Economics</i>
Damiani & Ricci (2011)	<i>Advances in the Economic Analysis of Part. &amp; LMF</i>
<b>Estimates included in other studies</b>	
Yao (1995)	<i>Applied Economics Letters</i>
<b>Examples of studies that use subjective measures of productivity</b>	
Blanchflower & Oswald (1988)	<i>The Economic Journal</i>
Pendleton (1997)	<i>Industrial Relations Journal</i>
Pendleton et al. (2002)	<i>Transfer: European Review of Labour and Research</i>
Pendleton et al. (2003)	<i>Advances in the Economic Analysis of Part. &amp; LMF</i>
D'Art & Turner (2004)	<i>Personnel Review</i>
Kalmi et al. (2005)	<i>Human Resource Management Journal</i>
Poutsma et al. (2006)	<i>Economic and Industrial Democracy</i>
Akthar et al. (2008)	<i>Human Resource Management</i>
Pendleton & Robinson (2010)	<i>Industrial and Labor Relations Review</i>

Table A2 reproduces Table 1 from the article, replacing partial correlations with the Fisher  $z$ -transformation. All the averages are essentially the same. However, as stated in the article, unconditional weighted averages do not allow heterogeneity and research design differences and are best treated as summary statistics.

**Table A2. Profit sharing and productivity, unconditional weighted averages, Fisher  $z$ -transformation**

Group/Country	Number of estimates [studies] (1)	Weighted average partial correlation (2)
<i>A: Cooperatives versus non-cooperatives</i>		
Cooperatives	38 [6]	0.266 (0.130; 0.402)
Non-cooperatives	275 [50]	0.043 (0.032; 0.054)
<i>B: Country differences (non-cooperatives)</i>		
USA	80 [13]	0.036 (0.021; 0.050)
United Kingdom	26 [8]	0.033 (-0.034; 0.099)
Germany	26 [8]	0.116 (0.051; 0.180)
Other Europe:	85 [10]	0.040 (0.030; 0.051)
- Italy	27 [3]	0.035 (0.023; 0.048)
- France	22 [4]	0.040 (0.005; 0.075)
Asia:	43 [8]	0.079 (0.007; 0.151)
- Japan	27 [3]	0.078 (-0.119; 0.275)
Transition	15 [4]	0.149 (0.053; 0.246)

*Notes:* Column (1) reports the number of observations [and studies] used to calculate the weighted averages. Column (2) reports the weighted average partial correlation estimated with unrestricted weighted least squares using inverse variance weights. Figures in brackets in Column (2) are 95% confidence intervals. Panel A compares cooperatives to non-cooperatives. Panel B reports country specific averages for non-cooperatives (participatory capitalist firms). See article for definition of Other Europe, Asia, and Transition.

Table A3 compares the estimated weighted average correlation of cooperatives to non-cooperatives with respect to the treatment for endogeneity. Panel A uses all measures of profit sharing, Panel B focuses only on profit-based measures, and Panel C focuses on all non-profit-based measures. However, the cell entries are rather small for cooperatives making credible inference difficult. Nevertheless, three conclusions can be drawn. First, in all cases, the average is much larger for cooperatives. Second, correction for endogeneity leads to larger correlations for non-cooperatives and smaller correlations for cooperatives. Third, profit-based measures produce larger averages. However, as stated in the article, unconditional weighted averages do not allow heterogeneity and research design differences and are best treated as summary statistics.

**Table A3. Profit sharing and productivity, unconditional weighted averages, by measure of profit sharing and endogeneity correction**

	Endogeneity correction (1)	No correction for endogeneity (2)
<i>A: All measures</i>		
Cooperatives	0.209 (-0.092; 0.509) 17 [3]	0.295 (0.207; 0.384) 21 [5]
Non-cooperatives	0.098 (0.043; 0.153) 31 [10]	0.040 (0.032; 0.049) 244 [49]
<i>B: Profit-based measures</i>		
Cooperatives	0.231 (-0.998; 1.459) 16 [2]	0.310 (0.230; 0.389) 20 [4]
Non-cooperatives	0.154 (0.091; 0.216) 18 [6]	0.093 (0.059; 0.126) 45 [13]
<i>C: All non-profit-based measures</i>		
Cooperatives	na	na
Non-cooperatives	0.069 (0.054; 0.084) 13 [5]	0.037 (0.030; 0.043) 199 [39]

*Notes:* Column (1) reports the weighted average for estimates derived using some endogeneity correction. Column (2) reports the weighted average for estimates that are not corrected for endogeneity. Panel A uses all estimates regardless of the measure of profit sharing. Panel B uses only estimates derived using a profit-based measure. Panel C uses estimates using a non-profit-based measure. The first row in each cell is the weighted average estimated with unrestricted weighted least squares using inverse variance weights. Figures in brackets are 95% confidence intervals. The second row in each cell reports the number of observations [and studies] used to calculate the weighted averages. na denotes insufficient estimates.

Table 3 in the article presents the key meta-regression results. Table A4 below presents the full meta-regression results. Column (6) presents the robustness of the results after removing any profit-based estimate.

**Table A4: Profit sharing and Productivity, Meta-Regression Analysis, Full Results**

	(1) General	(2) General with values and culture	(3) Specific with values and culture	(4) Sample size weights	(5) Random effects	(6) Excluding dollar- based measures
<i>A: Meta-regressions</i>						
Constant	-0.003 (-0.10)	0.007 (0.07)	-0.082 (-2.83)***	-0.071 (-2.41)**	-0.080 (-2.20)**	-0.073 (-2.64)**
SE	1.395 (4.35)***	1.590 (3.97)***	1.945 (6.47)***	1.761 (5.85)***	1.891 (8.43)***	1.763 (7.26)***
Endogeneity	0.041 (3.24)***	0.047 (3.79)***	0.051 (4.38)***	0.049 (4.17)***	0.042 (2.98)***	0.040 (4.03)***
Average year	-0.001 (-0.89)	-0.001 (-0.73)	-	-	-	-
Number of firms	0.005 (3.46)***	0.006 (4.20)***	0.005 (3.61)***	0.005 (3.49)***	0.004 (1.51)	0.005 (3.40)***
Capital	-0.004 (-0.30)	0.009 (0.51)	0.028 (3.03)***	0.029 (3.08)***	0.022 (1.74)*	0.019 (2.01)*
Time dummies	0.010 (0.83)	0.019 (1.95)*	0.020 (2.49)**	0.017 (2.24)**	0.032 (3.09)***	0.006 (1.16)
Age	0.029 (1.14)	0.024 (1.08)	0.024 (2.15)**	0.024 (2.12)**	0.013 (0.99)	-0.007 (-0.37)
Human capital	0.002 (0.10)	-0.022 (-1.05)	-0.016 (-2.13)**	-0.019 (-2.30)**	-0.002 (-0.22)	-0.010 (-1.23)
Union density	-	0.099 (2.31)**	0.070 (4.40)***	0.066 (4.18)***	0.038 (1.36)	0.061 (4.25)***
Tax evasion	-	-0.002 (-1.39)	-0.002 (-2.94)***	-0.002 (-2.85)***	-0.001 (-2.07)**	-0.001 (-1.57)
Individualism	-	0.001 (2.06)**	0.001 (4.87)***	0.001 (4.46)***	0.001 (3.18)***	0.001 (3.56)***
UK	-0.0170 (-0.46)	-0.071 (-2.10)**	-0.070 (-2.46)**	-0.064 (-2.20)**	-0.064 (-3.77)***	-0.054 (-1.98)*
Japan	0.009 (0.43)	0.054 (1.47)	0.091 (4.37)***	0.090 (4.02)***	0.097 (3.67)***	0.061 (2.44)**
Asia	0.005 (0.15)	0.093 (1.95)*	0.125 (4.29)***	0.118 (3.89)***	0.108 (2.70)***	0.115 (3.44)***
Transition	0.065 (2.75)***	0.117 (2.49)**	0.165 (5.58)***	0.170 (5.46)***	0.159 (4.12)***	0.133 (10.96)***
Random effects	0.010 (1.91)*	0.009 (2.20)**	0.018 (1.70)*	0.018 (1.73)*	0.021 (1.77)*	0.019 (1.77)*
Canada	-0.014 (-0.42)	-0.008 (-0.24)	-	-	-	-
Germany	0.022 (0.65)	-0.023 (-0.47)	-	-	-	-
Other Europe	-0.007 (-0.32)	-0.034 (-0.85)	-	-	-	-
Nonmanuf	0.005 (0.67)	0.001 (0.18)	-	-	-	-
Continuous	0.019 (1.11)	0.014 (0.90)	-	-	-	-
Salesbased	-0.01222	-0.016	-	-	-	-

	(-1.44)	(-1.45)				
<i>Panel</i>	0.032	0.022	-	-	-	-
	(1.54)	(1.07)				
<i>Decision</i>	.00104	-0.002	-	-	-	-
	(0.09)	(-0.17)				
<i>Ownership</i>	-0.011	-0.008	-	-	-	-
	(-0.54)	(-0.39)				
<i>Market share</i>	-0.037	-0.007	-	-	-	-
	(-1.78)*	(-0.28)				
<i>Unpublished</i>	-0.013	0.001	-	-	-	-
	(-0.78)	(0.02)				
<i>Managerial</i>	0.002	-0.003	-	-	-	-
	(0.09)	(-0.19)				
<i>Fixed effects</i>	-0.016	-0.023	-	-	-	-
	(-1.09)	(-1.52)				
N [k]	275 [50]	267 [48]	267 [48]	267 [48]	267 [48]	209 [39]
Adjusted R <sup>2</sup>	0.34	0.36	0.37	0.36	-	0.30

*Notes:* See Table 2 of the article for variable definitions and summary statistics. Column (1) reports the general model including the full set of controls but excluding all contextual variables. Column (2) adds six contextual variables: *Union density*, *Tax evasion*, and *Individualism*. Column (3) reports the general-to-specific MRA after removing all statistically insignificant variables. Columns (1) to (3) use weighted least squares with inverse variance weights ( $w=1/SE^2$ ). Column (4) uses sample size weights, while Column (5) uses random effect weights ( $w=1/(SE^2+\tau^2)$ , where  $\tau^2$  is the estimate of the between-study or heterogeneity variance. Column (6) removes all estimates that use a dollar-based measure of profit sharing to further reduce impact of endogeneity. Brackets report *t*-statistics using standard errors adjusted for study-level clustering. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% levels, respectively.