Working Paper

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Abstract

Worker cooperatives are shown to provide higher level of employment, higher employment stability and often greater wage volatility than similar investor-owned firms. A stylized fact that is nevertheless largely unexplained by the literature is the frequent evidence of lower wages in worker managed firms. To engage in the explanation of this fact, we use the Shapiro and Stiglitz (1984) model on efficiency wages and unemployment as a discipline device. Given more efficient monitoring and the absence of wage premiums compensating the expected costs of contract failures, we show that efficiency wages in cooperatives are lower than in investor owned firms while employment is confirmed to be always higher. Our result is due to the informational advantage enjoyed by the firm's owners, which imply a compensation requested by workers for employer opportunism, and to the role of horizontal control among workers, which reduces the equilibrium level of wages. We conclude that the S-S (1984) result, as applied to worker cooperatives, is a special case of a wider class of equilibria in the presence of contractual imperfections in the agency relation and that different ownership forms can differently impact the unemployment level.

Keywords: efficiency wage; contract failure; asymmetric information; moral hazard; worker owned enterprises

JEL Codes: D21, D86; J31, J54; J64

Introduction

Worker cooperatives are enterprises owned and controlled by their worker-members. The economics theoretical literature on worker cooperatives, usually labelled Labour Managed Firms (LMF) or Worker Owned Firms (WOFs),[1] was initiated by Benjamin Ward, in his 1958 model. He studied the behaviour of worker cooperatives in a former Yuguslav-type economic environment and assumed average labour income maximization as the worker-members' objective in cooperatives. Since members are entrepreneurs and control strategic and distributional decisions, they appropriate the whole value added (net of the cost of capital). Under the assumption of perfect competition and perfect variability of labour in the short run, average per-member income is maximized when marginal productivity is equal to average productivity of labour[2].

Ward model implies two main results. First, members in cooperatives obtain a higher income relative to employees in Investor Owned Firms (IOFs), since they appropriate the competitive equilibrium amount of labour remuneration plus a share of pure profits. Second, worker cooperatives, for the sake of maximizing average income revenue per worker, will react to increased output prices by decreasing employment. The latter conclusion, considered by critics of worker cooperatives as a perverse effect of their reaction to market stimuli, has been widely criticised theoretically (e.g. Meade, 1972; Drèze, 1976), and refuted by several empirical tests (e.g. Bonin, 1981; Montias, 1986; Nantz and Sparks, 1990). WOFs, in most studies, appear to have a more rigid, but not downward sloping supply curve. The former conclusion, instead, has generally been held correct by economic theory, but not confirmed by contrasted empirical evidence. In this paper, we introduce a macroeconomic argument trying to explain why wages in WOFs are usually found to be *lower*, not higher, than wages in IOFs.

Our argument departs from the well-known contribution by Carl Shapiro and Joseph Stiglitz (S-S, 1984, model hereafter) on unemployment as a worker discipline device. Their model shows that worker owned firms can achieve the Pareto optimal level of equilibrium unemployment since, when the owners of the firm coincide with its workers, equilibrium unemployment is lower and wages are higher than in investor owned companies. This conclusion is clearly consistent with wage determination in the Ward (1984) and Vanek (1970) model of the labour managed firm. The extensive empirical evidence showing lower

[1] The worker cooperative is the most representative case of worked owned enterprises, which include also capitalistic companies owned by employees (employee owned companies). For the sake of simplicity, we use the two terms interchangeably. In a similar fashion, we use interchangeably the terms investor owned firms and capitalistic enterprises.

[2] In the long run competitive equilibrium, instead, given the exhaustion of short term profit opportunities and the convergence of prices towards minimum average costs, labour remuneration in worker owned and investor owned firms would tend to coincide.

wages in worker cooperatives as compared to similar investor-owned firms is clearly at odds with these conclusions.

In this paper, we present a comparative static exercise extending the results of the Shapiro and Stiglitz model, and showing why, at equilibrium, wages in worker cooperatives can be lower than the economy wide level. Shapiro and Stiglitz compare two states of economy: one in which only WOFs are present and a second one characterised by the presence of IOFs only. We use their micro-foundation to study an economy where IOFs and WOFs co-exist. Our explanation of why equilibrium wages in WOFs can be lower than in IOFs starts from the observation that WOFs overcome market failures due to asymmetric information, hierarchical control and contrasting interests better than IOFs, implying lower rationing of jobs in WOFs.[3] However, the overcoming of contract failures alone would be sufficient to explain increased employment, but not to determine whether equilibrium wages are higher in WOFs or in IOFs. At this point, we introduce the macroeconomic implications of our model, since lesser failures of the employment contract imply that the non-shirking constraint in the S-S (1984) model shifts rightwards and downwards, pushing equilibrium wages down. Production is increased, but the depressive effect on wages can take them to a level lower than in a IOF economy.[4]

While notable contributions in the theoretical literature warned against the risk of the spread of free riding (sub-optimal effort contribution) in teamwork (Alchian and Demsetz, 1972), we notice that horizontal control in the form of peer monitoring in cooperatives can be more effective in limiting free riding than hierarchical control by supervisors, reducing the cost of monitoring and efficiency wages levels (Bowles and Gintis, 1987). Furthermore, we show that efficiency wages in worker owned enterprises are lower than in investor owned companies due to lower expected costs of employer moral hazard, abuse of contractual power and hidden action by the employer.

To the best of our knowledge, our analysis represents a new synthesis between the theoretical literature dealing with worker cooperatives and the traditional Shapiro and Stiglitz approach to efficiency wages, as applied to worker owned firms. It introduces the effects of the opportunism of the employer on efficiency wages in comparative terms. Our results reconcile theory and empirical evidence

[3] Wage differences are possible in equilibrium due to compensatory differentials dependent on non-monetary welfare components that exist in WOFs, while they are lacking in IOFs, especially greater job stability, better working conditions, less hierarchal control and supervision (Bonin *et al.*, 1992). All this can help WOFs create more jobs, even in the presence of lower monetary wages.

[4] In this case, the analogy is drawn with other forms of cooperative enterprises, for example credit co-operatives, which, by overcoming failures in the agency relation between banks and borrowers, are able to supply a larger quantity of loans to opaque producers (e.g. small enterprises deprived of collateral guarantees, innovative start-ups, etc.) than investor owned (commercial) banks in local economic systems (Coccorese and Ferri, 2017).

on wage and employment levels in worker cooperatives. We also show that the different ownership forms can support different equilibrium levels of unemployment.

More precisely, the three main implications of the model are:

1) A cooperative economy is always characterised, other conditions being equal, by higher employment levels than a capitalist economy;
2) Wages in cooperative firms are lower than wages in investor owned enterprises;
3) The risk of unemployment is higher in capitalist firms than in worker cooperatives.

The paper is organised as follows: Section 1 reports stylized facts related to unemployment and wage levels in cooperatives. Section 2 presents the theoretical background and introduces our core arguments concerning both the costs of monitoring and the costs of employer moral hazard and hidden action as determinants of wage and employment levels in WOFs. Sections 3 and 4, after briefly summarising the Shapiro and Stiglitz (1984) model, present our model, which incorporates into the Shapiro and Stiglitz model WOFs advantages in terms of horizontal control and lower employer's opportunism. Section 4.1 summarises the comparative results concerning WOFs and IOFs. Section 6 concludes.

1. Stylized facts

Shapiro and Stiglitz model (1984) show that WOFs support higher levels of employment and higher wages than IOFs. Their predictions are not discordant with empirical evidence in the case of employment, but clash with it in the case of wages. In most studies capitalist enterprises show higher wages compared to worker cooperatives. Among the best known empirical tests, Bartlett et *al*. (1992) compare similar groups of cooperatives and IOFs in the industrial sector in Italy, finding that worker cooperatives pay lower wages, mainly due to managers' reduced pay and, to a lower extent, to lower white-collars' pay.[5] The focus of this study is on Italian light manufacturing industrial sectors, which are, on average, highly competitive since they are populated by small and medium sized enterprises, while the Italian industrial sector was, at the time of the study, one of the largest and most competitive in western countries. Pencavel, Pistaferri and Schivardi (2006), using employee matched panel data including all Italian firms, show that worker cooperatives are only apparently characterised by higher wages than IOFs: once controlling for a set of characteristics, especially for the sector of activity, cooperatives display wages

[5] The ratio of managerial pay to unskilled manual pay was almost 75% higher in private firms than in cooperatives (*ibid.:* 110).

that are, on average, 14% lower than in IOFs. Using Eurostat data and data on a smaller sample of North-Eastern Italian enterprises (in the province of Ravenna, Emilia-Romagna region), Navarra (2016) notices that cooperatives pay lower wages than the average market rate in the area, with the exception of the construction sector, in which cooperatives hold significant market power. This evidence is not limited to Italy: Craig, Pencavel, Farber and Krueger (1995) show that wages in the plywood lumberjack cooperatives in US Pacific North West are 2% lower than wages in capitalist firms of similar size in the same sector. Given the fact that productivity in the plywood cooperatives was reported to be significantly higher in cooperatives than in comparable IOFs (Craig and Pencavel, 1992, 1994), wage differentials are again left explained also in the US case too. Clemente, Diaz-Foncea, Marcuello and Sanso-Navarro (2012) address the wage-gap issue in Spain. They observe that wages in worker-owned cooperatives are lower than in other organisation types. This result holds across sectors, while it does not always hold when cooperatives are owned by stakeholders different from workers. The result is also confirmed by the quintile analysis of the wage gap: wages in worker-owned cooperatives are always lower than in capitalist firms, while the opposite applies to non-worker-owned cooperatives when the higher quintiles are considered. Similar conclusions have more recently been reached by Bailly, Chapelle and Prouteau (2017) on economy-wide data for France: wages in cooperatives are no lower, some times higher, than in the rest of the economy, except in the case of non-worker owned cooperatives. These same contributions explain low wages by the need to stabilise employment. Finally, in Burdin's (2016) contribution on the whole economy in Uruguay, lower wages in cooperatives are also explained by the stronger outflow of educated workers from worker cooperatives than from investor owned enterprises.

Lower levels of wages in cooperatives aren't related to lower production efficiency. Pencavel, Pistaferri and Schivardi (2006) find no difference in productivity to explain the wage gap. Craig and Pencavel (1992, 1994) and Craig *et al.* (1995) compare US plywood cooperatives to IOFs of similar size in the same sector. They find slightly higher labour productivity and technical efficiency (between 6 and 14 per cent) in cooperatives relative to both unionized and non-unionized investor owned mills. Estrin (1991), on the Italian case, finds, in worker cooperatives, higher labour productivity, which, however, doesn't translate into higher wages. Bartlett *et al.* (1992) find better performance in worker cooperatives relative to IOFs in the industrial sector in Italy. The causes are found in three distinct organisational features of cooperatives, which would lower organisational costs and increase worker welfare and productivity: (i) lower incidence of control costs in terms of flatter hierarchical structure and lower utilisation of intermediate clerical positions devoted to monitoring activities; (ii) lower costs of conflict, especially lower incidence of strikes, other

forms industrial action, and sabotage in cooperatives; (iii) better forms of worker involvement through membership representation.[6]

Related evidence deals with the well-established and widely studied phenomenon of employment stabilisation occurring in cooperatives and employee owned companies (Kruse, 2016).[7] Since workers are reported to value strongly employment stability (Guest, 2002; Depedri, Carpita and Tortia, 2012), increased stability would correspond, *ceteris paribus*, to increased worker welfare, which can translate into lower absenteeism and turnover, and into increased productivity. The idea that wage flexibility in terms of profit sharing is important in reducing unemployment was already present in classical contributions in the theory of labour managed firms (Meade, 1972). Furthermore, increased job stability can also translate, in principle, into the willingness to accept lower wages in order to guarantee stability. When empirical tests are considered, most of them show that WOFs face demand shocks by avoiding layoffs and, in order to reduce layoffs, they let wages fluctuate more than their capitalist counterparts (Kruse, 2016). Burdin and Dean (2009) consider the economy wide comparison between worker cooperatives and IOFs in Uruguay in the decade spanning from 1996 to 2005. They find substantially more pronounced variation in wages in cooperatives relative to conventional enterprises. The stark difference in wage dynamics is explained by the necessity for cooperatives to preserve stable employment in the face of economic fluctuation and crisis, which, in this country, started in 2001. Alves, Burdin and Dean (2016) highlight that labour managed firms display a more resilient employment dynamic than analogous capitalist firms, both in terms of job creation and destruction. Both works find that output prices affect employment in IOFs, but not in worker cooperatives. Arando *et al.* (2010) show much better performance in employment creation and preservation in the Mondragon group of worker cooperatives, than the average of the whole Spanish economy in the period 1983-2009, both inside and outside the Basque Region where the group is located. Cooperatives showed better than average propensity to create, but not to reduce employment. The analysis of firm performance during the economic crises over the same time-span, shows that Mondragon cooperatives adjusted less (or didn't adjust at all) employment to reduced firm performance. In the same paper, it is observed that during the economic crisis in 2009, industrial cooperatives in Mondragon laid off less than 1% of their worker-members[8]. This result has been achieved mainly thanks to relevant degrees of wage and working-hour flexibility for members. Following the financial crisis in 2007-2008, total employment in the whole Mondragon

[6] Similar results concerning worker productivity and wage equity have been obtained in experimental settings by Frohlicha, Godarda, Oppenheimer and Starke (1998).

[7] The idea of employment insurance as opposed to wage insurance was first introduced in the theory of labour managed firms by Miyazaki and Neary in 1983.

[8] Laid-off members were still paid 80% of their wages.

group fell by about 9%, but most lay-offs hit temporary and non-member workers. This is contrasted with 20% average employment fall in Spain, and 12% in the Basque Region. Delbono and Reggiani (2013) analyse a group of Italian production cooperatives in the periods 2003-2010 and 1994-2011 and contrast co-ops behaviour with the overall trend in the same sectors. They find a stabilizing effect on employment with respect to demand shocks, thanks to adjustments of wages.

As for the ability of worker co-operatives and of co-operatives in general to favour employment creation and protection, some recent reports deal with the effects of the global financial crisis since 2007. In Italy, from fall 2008 to the end of 2013, cooperatives increased their overall employment by 6,8%, (by 80 thousand workers) while employment in private enterprises shrank by 473 thousand units out of a national total of about 22 million. Still more remarkably, in cooperatives, the number of permanent workers increased by about 100 thousand, while short-term contracts fell by about 20 thousand. About 50 per cent of increased employment in cooperatives is accounted for by socially-oriented cooperatives, the so-called social cooperatives, which operate in the social service sector (Euricse, 2015).[9] The 2012 CECOP (Roelants *et al.*, 2012) report confirms the high level of cooperative resilience to the financial and economic crisis. Focusing on France and Spain, the report argues that, although cooperatives have not been spared by the crisis, they have been able to limit firm closures and lay-offs better than the average business, in some cases even restoring a job creation pattern. This effect is stronger where the peculiar features of cooperatives are explicitly regulated by dedicated legislation or by statutory by-laws, for example through the partial imposition of the non-profit distribution constraint, and through the accumulation of locked assets. Also through the creation of co-operative groups, consortia and mutualized financial tools.

In the next two sections, starting from the S-S (1984) analysis, we develop a model, which aims at explaining lower wages in worker cooperatives as the result of the reduction of agency costs due to governance and contract failures characterising IOFs. In line with the presented empirical evidence, we also show that cooperative enterprises favour, ceteris paribus, lower unemployment at the aggregate level.

[9] Social co-operatives are defined by Italian law (n. 381/1991) as multi-stakeholder co-operatives and are not required to have paid workers included in their membership base. However, the greatest part of social co-operatives can be, de facto, considered worker co-operatives since workers represent either the only, or the dominant stakeholder group in the membership.

2. Theoretical background

Our theoretical argument starts from the observation that WOFs, when compared to IOFs, are able to reduce the costs connected to labour contracts thanks to improved horizontal monitoring and by eschewing the risk of exploitative labour relations.

2.1. Costs of monitoring

Alchian and Demsetz (1972) introduced one of the most radical critiques against the possibility that a teamwork led by a set of principals would be able to deliver efficient production in a decentralised economy. When the outcome of team production cannot be exactly imputed to each individual worker, free riding on effort contribution is likely to spread, leading to inefficiently low provision of effort. Only the presence of a central monitor endowed with strong monetary incentives which consist, in the standard case, of being the residual claimant or enterprise owner, can remedy the intrinsic inefficiency of team production. The authors explain in this way the historical and institutional emergence of capitalist ownership as the conjunct result of profit maximization by the owner and of tight control over the labour process.

While dealing with the same problem of control over the labour process, a line of enquiry at odd with Alchian and Demsetz's was initiated by Putterman (1984) who evidenced that the role of the central monitor does not need to imply residual claimancy. This role can be carried out effectively by other institutionalised agencies, such as appointed managers or elected directors. Taking a more general stance in the study of governance structures, the new institutionalist approach by Ostrom (1990) showed that, contrary to the well-known thesis by Olson (1965), in many actual circumstances groups of principals can solve social dilemmas such as the spread of opportunism in collective action. This is achieved through a complex and often time and effort-consuming process of development of suitable governance rules, which include both incentives (monetary and non-monetary) and sanctions against offenders. Empirical research first developed in the field of the management of common-pool natural resources evidenced that appropriate governance and working rules can be effective in sustaining efficient cooperative activities of collectives of principals over long time spans.[10]

The specialised literature dealing with worker owned and worker controlled enterprises demonstrated that, since mutual monitoring and peer pressure are stronger instruments than hierarchical control in reducing shirking and free

[10] As Elinor Ostrom (1990: 45) puts it: "Dilemmas nested inside dilemmas appear to be able to defeat a set of principals attempting to solve collective-action problems through the design of new institutions to alter the structure of the incentives they face. … But some individuals and/or communities have created institutions, committed themselves to follow rules, and monitor their own conformance."

riding, the risk of worker opportunism is lower in worker cooperatives than in capitalistic firms (Bowles and Gintis, 1987, 1998). Following a different but converging explanatory strategy, also new institutionalism reached similar conclusions, especially in the works by Henry Hansmann (1996, 2000). Organisational costs in terms of agency and control costs would be lower in producer and worker cooperatives than in investor owned companies thanks to reduced information asymmetry and horizontal (peer) monitoring. This effect is especially strong when members' features, preferences and objectives are homogeneous since, in this case, their monitoring ability is strongest, and coordination in the pursuit of collective objectives is easier (less costly and time consuming)[11].

2.2. Labour Contract failures

2.2.1. Contrasting interests and hierarchical relations

The literature initiated by Jensen and Meckling (1976) demonstrated the existence and the importance of agency costs in principal-agent interactions. This approach complements Alchian and Demsetz's (1972) one within the tradition seeking to explain the firm as a nexus of contracts: in the presence of asymmetric information and contrasting interests, agency costs are thought to be minimized by resorting not only to the monitoring of and hierarchical control over the agent, but also to highly powered monetary incentives.

Contrasting interests between employers and employees, besides depending on different economic objectives (profit maximization vis-à-vis utility maximization) can be enlarged and made to depend on the hierarchical nature of relations existing in conventional firms, as spelled out by new institutionalist classics (Coase, 1937, Simon, 1951). The different objectives are at the basis of the analysis focusing on worker's shirking behaviour, that is the lowering effort under limited monitoring. When monitoring is too costly or ineffective due to contract incompleteness and limited information, in the presence of involuntary unemployment employers can leverage on efficiency wages and the threat of lay-off as a worker discipline device. While research on principal-agent models spanned wide and deep throughout the discipline, on the other side of the employment relation the existence and relevance of psychological costs in terms of the need of employed workers to align their behaviour to the employer's objectives has been under-researched to date, especially in the most orthodox streams (Prendergast, 1999). Some behavioural economists, instead, explicitly considered the costs connected with the imposition of hetero-directed objectives on workers. The seminal work by Frey (1997), as based on previous contributions in social psychology (Deci, 1971; 1975; Deci and Ryan, 1985),

[11] In the presence of heterogeneous membership, instead, more complex governance solutions suited to reconciling different and possibly divergent members' objectives would be needed (Albanese, 2016; Borzaga and Tortia, 2017).

highlights the possibility of the crowding out of intrinsic motivations by monetary incentives. This effect can be understood as primarily connected with hetero-direction in labour relations, since employees are not allowed, as a norm, to autonomously select their preferred tasks, while monetary incentives can be used by employers as alignment devices, which negatively impact on employees' intrinsic motivation to work. Furthermore, the employer's objectives and choices may not always aligned with the optimal accumulation of human capital along the lifecycle of the worker. Short sighted choices dictated by the necessity to maximize profits can reduce investment in training and development of new skills.

Furthermore, asymmetric information and contrasting interests can also imply the unwillingness of employees in IOFs to accept wage reductions or moderation when the economic conditions of the firm don't fare well. This is so because they may not be able to ascertain whether wage moderation is required by the financial and economic sustainability of the organisation, or if it is, instead, a way to increase private appropriation by shareholder-owners (Albanese *et al.*, 2015). Because of these reasons, workers in IOFs may show a tendency to demand more rigid and higher wages, by threatening lower effort. In turn, employers can react by increasing the equilibrium level of the wage, which, in the S-S (1984) approach, implies using equilibrium unemployment as a threat to discipline workers[12].

2.2.2. Employer opportunism: moral hazard, hidden action and abuse of authority

Some authors (Ben-Ner, 1988; Screpanti, 2001; Dow, 2003) evidenced that ex-post opportunism in the employment relation in not alien not only to the employee, but also to the employer side. The employer can, in several common instances, diffuse wrong, biased, or incomplete information concerning the economic and financial conditions of the organisation in order to increase profits by reducing wages or halting their growth. Asymmetric information and the risk of employer opportunism can lead workers in IOFs to prefer fixed to fluctuating wages, since fixed wages represent a better guarantee against the risk of employers behaving opportunistically to increase profits (Albanese *et al.*, 2015). A similar conclusion is reached by Chang *et al.* (2002): in their model, profit sharing or, more generally, variable employee pay, do not bring positive productivity effects if moral hazard on the firm's side is possible. Their model, like Albanese *et al.* (2015), posits that, together with workers' opportunism (incorporated in the efficiency wage model) there can be opportunism on the employer's side, since the employer may conceal the true value of profits. This

[12] This upward profit to wage spiral, in the absence of wage flexibility, engenders higher risk of lay-off when the economic conditions of the organisation worsen. In the end, too high wage demands by workers, and concessionary behaviour by employers, can aggravate business cycle fluctuations at the macroeconomic level.

prevents profit sharing agreements to have the otherwise predicted positive effects (cfr. Bisio *et al.*, 2017 on the positive role that unions can play in conventional enterprises in reducing this problem). The employer can also, thanks to the asymmetric distribution of decision making power, start too risky investment plans when expected losses, but not gains, are borne by workers in terms of reduced wages and/or higher risk of lay-off. A similar effect is obtained when the employer exploits contract incompleteness to abuse his/her authority and impose worse contractual conditions on workers, for example by requiring increased work pace without increasing worker remuneration[13]. In this stream, abuse of authority is understood as the main failure in the social contract between the owners of the organisation and the other stakeholder groups (Sacconi, 2012)[14].

Coherently with the arguments developed so far, it can be hypothesized that workers in IOFs internalize the expected costs of employer opportunism concerning hetero-direction, hidden action and abuse of authority leading to higher risk of lay off, and unfairly low wages by demanding compensatory wage increases. Also, against the risk of employer's opportunism, workers may show a higher propensity to reduce effort unless some monetary compensation is paid as insurance in the form of wage premium. In turn, the employer may prefer concessionary wage bargaining in order to prevent shirking and other forms of worker misbehaviour. Wages are set at higher than market clearing levels because employees are looking for compensation against employer opportunism, while employers use higher wages as a discipline device to fight shirking. As in Shapiro and Stiglitz (1984), equilibrium unemployment can be at least partly read as negative external effect of labour contract failures.

2.2.3. Worker owned enterprises

All principal-agent arguments and arguments dealing with power and abuse of authority, as applied to the employment relation, lead to second best organisational solutions. This leaves open the possibility that social structures different from conventional, investor owned enterprises, can achieve Pareto superior outcomes by redefining the contractual relations between the organisation and employed workers. In the most radical case, agency and the employment relation can be overcome (Jossa, 2014). Our argument develops within this line of enquiry, and shows that higher than competitive wages and job rationing in IOFs is, indeed, matched by lower wages and lower agency

[13] This problem has been evidenced in related research streams, which build on the idea of corporate social responsibility (Sacconi, 2012).

[14] This failure requires the introduction of both legal regulation and self-regulation aimed at developing multi-stakeholder governance (Blair and Stout, 1999). Direct worker control can be understood as a similar, but more radical and thorough solution to the same problem, since this solution would imply the overcoming of the employer relation per se (Jossa, 2014).

costs in flatter and participative organisational structures, such as worker co-operatives.

In our framework, cooperatives represent an instance of collective entrepreneurial action in the pursuit of mutual members' benefit. Principal-agent relations are substituted by mutual benefit interaction (Jossa, 2017). In principal-agent relations, objectives' alignment imply that second best contractual solutions, such as monitoring and incentives, can reduce, but never eliminate agency costs (Prendergast, 1999). Worker owned enterprises, instead, can reduce agency costs by resorting to horizontal control and better alignment between individual and organisational objectives. This is achieved through worker involvement and participation in decision making.[15] Decision making power in the definition of the firm's objectives and production plans can allow worker members to redress the problems highlighted in the previous paragraphs. Hierarchy in cooperatives is either absent (in case of direct worker control) or based on delegation by members. Involvement in decision making puts worker members in co-operatives in a better position than employees in IOFs to align individual and organisational objectives as concerns monetary remuneration, work pace, and professional growth, that is the setting of the optimal inter-temporal schedule for human capital accumulation (Jossa, 2014, 2017; Ellerman, 2017). While horizontal control and peer pressure reduce the probability and impact of free-ring on effort contribution, the negative impact of hierarchy on workers' welfare and psychological wellbeing is expected to shrink when compared to IOFs. In our model, better control, alignment and lower hierarchical intensity imply lower incidence of worker misbehaviour, and less compensatory wage demands by workers. Employement stability, the consequence of worker control that has more often occupied the scholarly literature to date, can be interpreted as part of this process of setting their own objectives in order to improve their welfare. In the extension of the Shapiro and Stiglitz (1984) model that we are going to implement in the next section, the reduction of control and agency costs takes wages in WOFs closer to the market clearing level, while employment is increased relative to a IOF economy.

3. Efficiency wages in IOFs and WOFs allowing for heterogeneous monitoring costs

In their efficiency-wage framework, Shapiro and Stiglitz (1984) (S-S hereafter) show that involuntary unemployment can be compatible with the equilibrium of the labour market, when the monitoring of the work activity is not perfect. This kind of involuntary unemployment is not due to workers' unwillingness to

[15] Even if the issue of decision making costs is not central in this study, we highlight that such costs need to be factored in and can be inflated by worker participation, due to complex, time consuming, uneven and contrasted decision making processes (Hansmann, 1996). Cooperatives need to reduce these emerging categories of costs by developing effective governance solutions and working rules (Ostrom, 1990; Borzaga and Tortia, 2017).

accept salaries lower than the current ones, but to the employers' unwillingness to lower wages down to the market clearing level to eschew the risk of workers shirking on effort contribution. S-S make four assumptions: (i) the information available to entrepreneurs is imperfect as workers can perform "hidden actions"; (ii) entrepreneurs can only imperfectly monitor the commitment of workers; (iii) each worker decides his or her level of effort; (iv) each worker who is caught shirking is fired. All workers and firms are identical and there is perfect information about job availability. The employer sets wages at a level high enough to prevent shirking: this means that efficiency wages are understood as "worker discipline" device. Workers select their effort level to maximize their discounted utility stream and compare their expected utility in the two alternative states of "shirking" and "non-shirking". The one period expected utility is expressed as sum of the utility of the current period plus the probability of state change multiplied by the change in expected utility. The employer knows that these utilities can act in such a way to induce workers to engage in his or her preferred action (non-shirking). To this end, the employer can leverage on *q* (the probability of lay-off) and *w* (the wage): he or she can either tighten control (increase *q*) or incentivize the worker by means of higher *w*. The Shapiro-Stiglitz no-shirking condition *(NSC)* is (S-S: 438):

$$w \geq \overline{w} + e + (a + b + r)\frac{e}{q} \tag{1}$$

The critical wage level corresponding to a non-shirking behaviour (w) is greater: (i) the smaller the detection probability *q*; (ii) the larger the effort level *e*; (iii) the higher the quit rate *b*; (iv) the higher the interest rate *r*; (v) the higher the unemployment benefit $\overline{w}$; (vi) the larger the flow out of unemployment *a*.

If, as in S-S, we set:

$$a = b\frac{L}{N - L} \tag{2}$$

we obtain $w \geq \overline{w} + e + \left(b\frac{N}{N - L} + r\right)\frac{e}{q}$. (3)

As concerns WOFs (S-S: 439) analyse the case in which the owners of the firm are the same *N* individuals who are employed by it, and ownership is equally distributed among the *N* workers. They assume in this case that the value of the

unemployment benefit $\overline{w}$ is zero[16]. In this case, the problem to be solved by the employer is:

$$(w-e)L \tag{4}$$

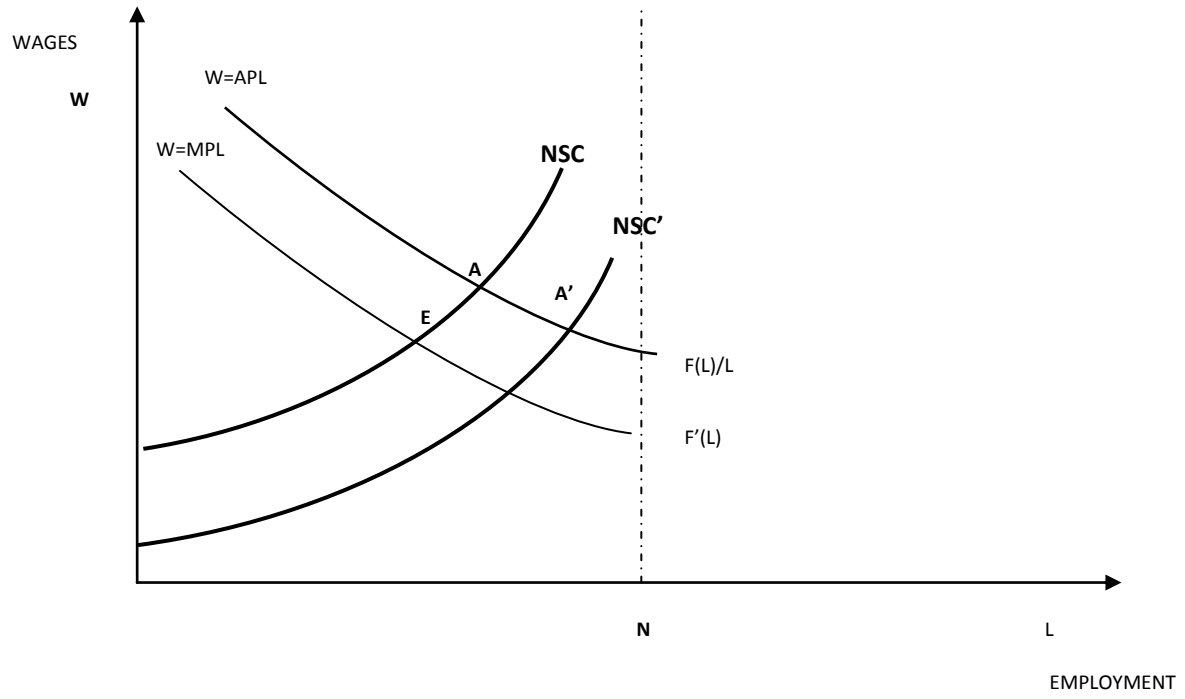
subject to:

$$w \geq e + \left(b\frac{N}{N-L} + r \right)\frac{e}{q} \tag{5}$$

and $wL \leq F(L)$ (6)

The optimal equilibrium occurs at point A in Figure 1 where the *NSC* intersects the schedule of the average product of labour w = F(L)/L. This result concerning WOFs is different from the market equilibrium in which workers are employed by IOFs, which occurs at E, where the marginal product of labour schedule intersects the *NSC*.

Figure 1 - Equilibrium Wage Determination in Case of Worker's Cooperatives



[16] The reason is that increases in $\overline{w}$ tighten the *NSC*, so all payments are made in the form of w rather than $\overline{w}$.

S-S demonstrate that when workers own the firm, the equilibrium level of unemployment is lower and wages are higher than in other enterprise forms[17]. The macroeconomic equilibrium level of wages in the presence of WOFs corresponds to the implications of the Ward (1958) and Vanek (1970) models of the labour managed firm. However, empirical evidence shows this implication to be, as a rule, violated since WOFs usually show lower salaries than WOFs. Our models aims at bridging the gap between the S-S explanation, and empirical evidence.

In the S-S model the parameter *q* is the probability that the worker is caught shirking and fired by the employer. When the monitoring activity becomes more effective or intensive the incentive to shirk is reduced. Each NSC is built for a given level of q, but q – as we have argued – can change according to different ownership rights. In line with Bowles and Gintis (1987, 1998)[18], we assume that, in WOFs, peer pressure and peer monitoring underpin horizontal forms of control, thus increasing the value of q.

In this case the problem is the same as in (4), (5) and (6) and the stronger is the positive effect of self-monitoring on *q*, the larger is the reduction of efficiency wages implied by the downward shift of the *NSC*.

In Figure 1, when the value of *q* increases the *NSC* moves downward and rightward. If the value of *q* is the same in traditional firms and in worker owned firms, the equilibrium point in WOFs is A, as in the S-S model, which does not distinguish between the two cases. If, instead, the value of *q* is higher in cooperatives, the new equilibrium is always associated to higher levels of employment in WOFs, but wages can be lower in WOFs than in IOFs (point A'). The higher is the value of q the lower is the equilibrium level of wages in WOFs. Our results imply that the S-S representation is a special case of a wider class of equilibria, which depend on the variables impacting on the position of the *NSC* in different organisational forms.

The discussion of this result, however, can be further extended, including the analysis of not only monitoring activities, but also of the role of different forms of employer opportunism in the presence of contrasting interests in the employment relation.

[17] This induces the two authors to affirm that wages should be subsidized using "whatever (pure) profits can be taxed away" (*ibid.*, p. 440).

[18] As stated, Bowles and Gintis (1987) demonstrate that in worker cooperatives the risk of worker opportunism, with workers reducing effort when not properly controlled, is lower than in capitalistic firms, and mutual monitoring is a stronger instrument increasing the probability of successful monitoring.

4. Efficiency wages in IOFs and WOFs in presence of contractual failures

When employer opportunism in the form of moral hazard, hidden action and abuse of authority connected with contractual power is considered, similar conclusions on equilibrium wages and employment are reached. The idea underlying this extension of the analysis it that workers, fearing that the employer would exploit privileged information and contractual power to his own advantage, can be induced to demand a higher salary compensating the risk of employer opportunism.[19] In turn, the employer would concede wage increases in order to keep the worker on the non-shirking schedule. In this perspective, in our model we assume that the *NSC* includes a new parameter, *d*, which signals the presence of contractual failures connected with contrasting interests (c); hierarchical control (h); employer opportunism (m) as discussed in Section 2.2.

These contract failures translate into workers' demand for a wage premium that compensates the risk of losses both in monetary and non-monetary terms, as measured by *d*. In formulas:

$$d = f(c, h, m) \tag{7}$$

with $\frac{\delta c}{\delta d} > 0; \frac{\delta d}{\delta h} > 0; \frac{\delta d}{\delta m} > 0$

where c measures the cost of contrasting interests, *h* the cost of hierarchical control and *m* the cost of employer opportunism. These three variables in the model are strictly connected to our arguments in the concepts discussed in the first part of the paper. The variable "Hierarchical control" control in the model corresponds to the phenomenon of abuse of authority, as discussed in the conceptual part of the paper. The existence of asymmetric distribution of decision-making power (hierarchy) creates the precondition for employers to take decisions that are not aligned with employees' interests and objectives. "Employer opportunism" in the model corresponds to morally hazardous behaviours by employers, who can take advantage of privileged information to lower wages and increase work pace. Finally, the variable "contrasting interests" corresponds, again in the presence of asymmetric information and distribution of decision-making power, to hidden actions that can, in the most common case, lead to run too risky investments projects, to the detriment of job stability and long term financial sustainability.

The *NSC* in the case of the IOF when contractual failures are present is:

[19] The demand for higher employment protection in exchange for lower wages, like in WOFs, would, instead, not be effective, since the employer would retain decision making power, hence the possibility to start too risky investment projects in order to increase expected net income. Hidden action would, again, increase the probability of workers' lay-off.

$$w \geq \overline{w} + e + d + \left(b\frac{N}{N-L} + r \right)\frac{e}{q} \tag{8}$$

subject to: $wL \leq F'(L)$

We recall that in the case of worker-owned firms the unemployment benefit is zero and the equation of the *NSC* is (5). Also in this case we sum the value of parameter *d* to the elements that increase the minimum level of the non-shirking wage.[20] The *NSC* in the case of WOFs amounts to:

$$w \geq e + d + \frac{e}{q}\left(\frac{bN}{(N-L)} + r \right) \tag{9}$$

Where $N/(N\text{-}L) = u$ is the unemployment rate. That is:

$$w \geq e + d + \frac{e}{q}\left(\frac{b}{u} + r \right) \tag{10}$$

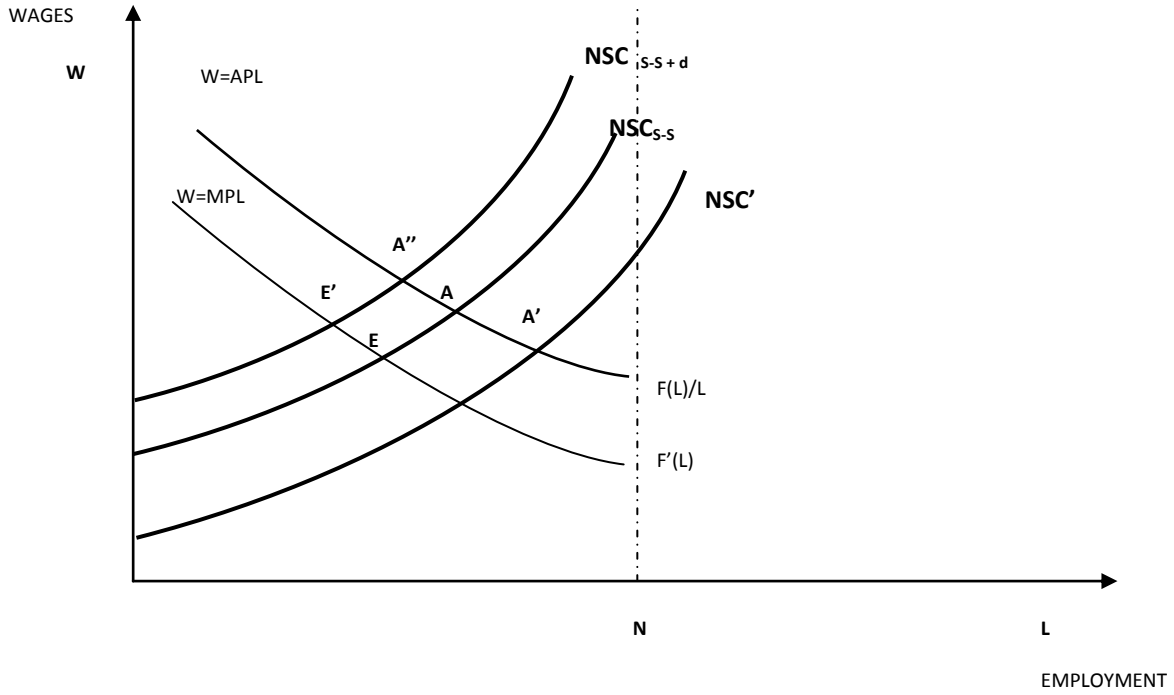
subject to: $wL \leq F(L)$.

Under these hypotheses, the *NSC* slides upward if *d*, the premium for the costs of contractual failures, increases. In this case, both equilibrium unemployment and the equilibrium wage increase.

In Figure 2 we report the new equilibrium levels in the case of IOFs and WOFs considering the (8) and (10) no-shirking conditions and comparing them with the S-S equilibrium condition ($NSC_{S\text{-}S}$), under the hypothesis (implicit in the S-S model) that *d* and *q* assume the same value in the two kinds of firm. The new equilibrium is at B in the case of IOFs, while it is A'' in the case of WOFs.

[20] We assume that parameter *d*, which represents the impact of contract failures on the *NSC*, is separable from the other parameters of the model, that is it is independent of effort and unemployment.

Figure 2 - Equilibrium Wage Including Costs of Contractual Failures



In instead WOFs are different from IOFs, and characterised by a lower level of *d*, the NSC in the case of WOFs slides down to the right. This effect can be as strong as to take wages in WOFs at a level lower than the equilibrium in IOFs, at point A' in Figure 2. In other words, given the different nature of control rights in worker cooperatives, worker members are in a good position to control the behaviour of decision makers (managers) and this reduces the need to demand compensatory wages. The value of *d* in WOFs shrinks. In the next section we compare the equilibria in WOFs and IOFs.

4.1. Investor owned firms and worker cooperatives: a comparison

Within the framework of our efficiency wage model, these theoretical premises allow us to hypothesize that, ceteris paribus, the *NSC* in IOFs is positioned above and to the left of the *NSC* in worker cooperatives since:

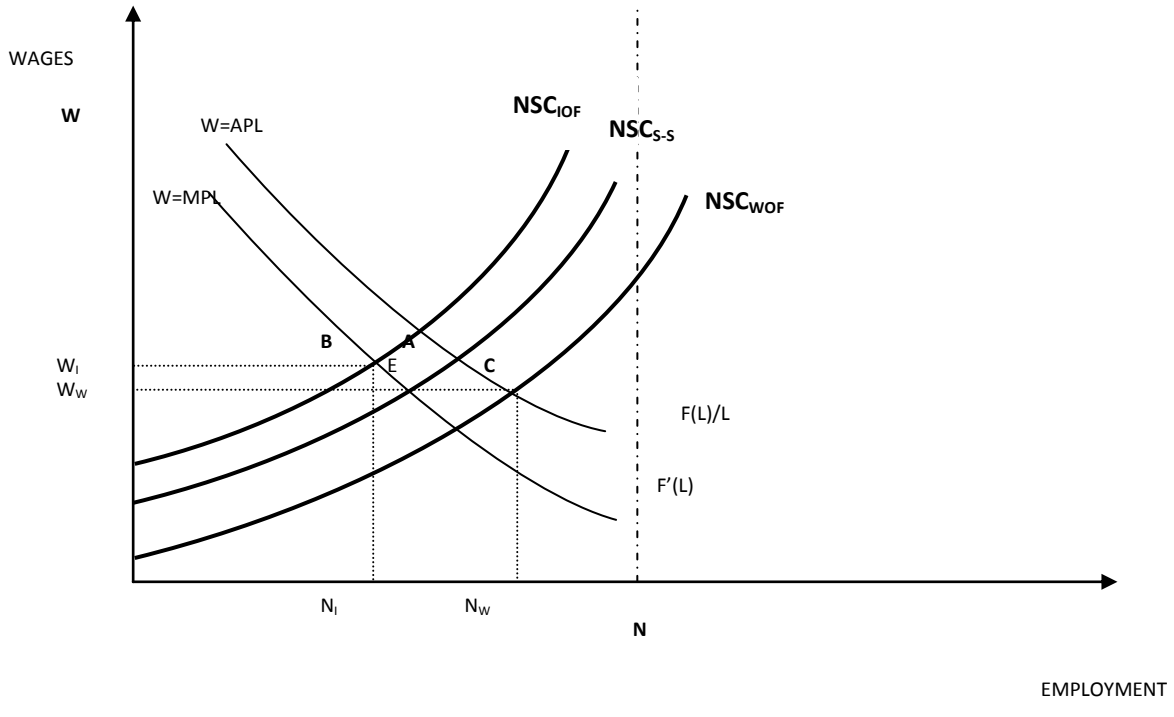
- looking at WOFs, monitoring is more effective than in IOFs, which implies that *q* increases and the level of the non-shirking wage decreases, shifting the *NSC* curve downward. In IOFs the employer pays higher wages in order to sterilize the risk of shirking on the worker's side;

contrasting interests and the risk of employer opportunism in terms of moral hazard, hidden action and abuse of authority resulting in lower wage levels, higher risk of lay-off and worse contractual conditions impose positive expected costs on workers. Compensation for expected losses in terms of higher wages is

asked by workers. Employers may tend to accept such compensation in order to prevent workers' misbehaviour (reduced effort levels). Unemployment is used as worker discipline device. In worker cooperatives the value of parameter *d* is always lower than in IOFs as the variables *c* (contrasting interests) and *m* (employer opportunism) are nil. Since worker members delegate decision making power to the board of directors, and appointed managers take discretionary decisions that impact on workers, hierarchical control (h) may be positive. However, delegation and discretionary management are instrumental to the pursuit of members' objectives, which are factored in cooperative governance through members' control rights and through democratic procedures. Better involvement of workers reduces the risk of worker misbehaviour, reducing this way also the need for tight hierarchical relations. Parameter *d*, again, is expected to be lower in WOFs than in IOFs.

In Figure 3, the S-S model would predict the IOF equilibrium to be positioned in E and the WOF equilibrium in A. In our model, due to the positive value of *d* in IOFs, equilibrium is found at point E' on the NSC_{IOF} curve, in which case the equilibrium wage is higher and employment is lower relative to point E in the S-S model (NSC_{S-S} curve). The *NSC* in cooperatives (labelled NSC_{WOF}) is, in the general case, positioned to the right and below the NSC_{IOF}, due to both higher *q* and lower *d*. The WOFs equilibrium (point C) is coherently with prevailing empirical evidence in predicting lower wages and higher employment in WOFs.

Figure 3 - Equilibrium Wage and Unemployment in Investor Owned Firms and Worker Cooperatives



The S-S equilibrium represents the special case in which parameters *d* and *q* are equal in the organisational forms, implying that the *NSC* in the two cases coincides.

5. Conclusion

The Shapiro and Stiglitz (1984) efficiency wage model demonstrates that Pareto optimality is an equilibrium solution not obtainable in the case of separation between owners and workers. Pareto optimality is obtained as new equilibrium level in the wage-employment space in correspondence with the intersection between the no-shirking condition curve and the average productivity of labour characterising worker owned firms. The ensuing higher level of wages corresponds to the implications of the Ward-Vanek model of the labour managed firm. In contrast with theory, observed market equilibrium shows in most cases lower wages in worker cooperatives compared to similar IOFs. Our extension of the S-S (1984) model has deepened the analysis of the position of the non-shirking constraint, aiming at clarifying the theoretical premises of empirical tests and at providing new explanation for the observed level of wages in cooperatives.

Coherently with the extant empirical literature, in our model lower wages do not depend on lower worker productivity, or on higher shirking in WOFs. Instead, the higher efficiency of WOFs is measured in terms of higher equilibrium employment. We reconciled theory and empirical record by showing that different ownership forms are characterised by different contractual and behavioural consequences, which correspond to a stronger tendency towards employment stabilisation and creation in WOFs. Given more efficient monitoring and the absence of wage premiums compensating the expected costs of contractual failures, the *NSC* curve in cooperatives is always positioned below the *NSC* curve in IOFs. The implication is that efficiency wages in cooperatives can be lower than in IOFs, while employment is confirmed to be always higher, like in the S-S (1984) model. In this, the Shapiro and Stiglitz results represent special cases of a wider class of equilibria corresponding to different types of contractual imperfections in the agency relation between the employer and the employee.

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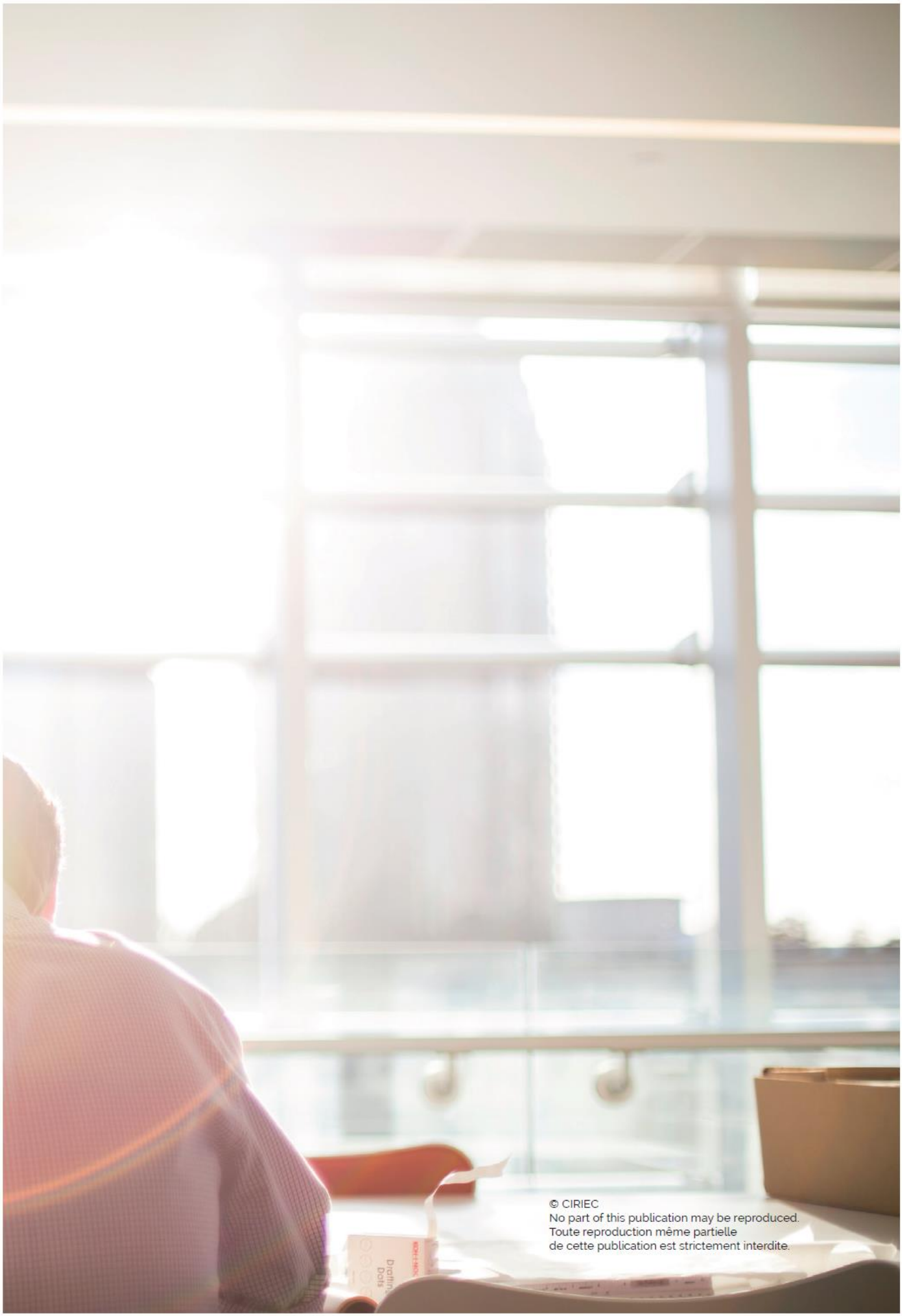

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