Equilibrium unemployment as a worker insurance device. Wage setting in worker owned enterprises

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17 February 2017

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Abstract

Extending Shapiro and Stiglitz's (1984) analysis of unemployment as a worker discipline device, we evidence how an economy populated by worker owned firms (WOFs), by overcoming information asymmetry on the employee side in the presence of employer opportunism (as embodied in moral hazard, hidden action and abuse of authority), can decrease, not increase equilibrium wages, while employment is necessarily higher in the presence of WOFs. Within the Shapiro and Stiglitz framework, our analysis evidences that the non-shirking constraint (NSC) for WOFs is lower for any employment and wage level than in investor owned firms (IOFs). By factoring bi-later asymmetric information and opportunism in the employment relation, our model implies that the Shapiro and Stiglitz (1984) results represent special cases in the wider analysis of equilibrium wages and employment in market economies. Relatedly, the potential for unemployment reduction and efficiency gain of worker ownership (as especially embodied in worker co-operatives, and employee-owned companies) has generally been understudied and empirical evidence coherent with this results need to be more thoroughly analysed.

Key words: efficiency wage; contract failure; asymmetric information; moral hazard; worker owned enterprises.

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

Extended abstract

Shapiro and Stiglitz model (1984) shows that worker owned firms (WOFs) can reach the Pareto optimal level of equilibrium unemployment. This same result cannot be achieved by firms in which workers and owners occupy different positions in the agency relation. In the case in which owners and workers coincide, Shapiro and Stiglitz demonstrate that the equilibrium level of unemployment is lower and wages are higher than in other enterprise forms. This macroeconomic equilibrium in the presence of WOFs corresponds to the implications of the Ward-Domar-Vanek model of the labour managed firm. However, the empirical evidence shows that this result is not always observed, since WOFs tend most often to show *lower,* not higher than average equilibrium wages.

We strive to disentangle this empirical puzzle by observing that economic theory considers only asymmetric information impacting on equilibrium wages on the employee side of the employment relation. It does not consider the impact of information asymmetry on the employer side. We consider contract failures derived from the latter case of information imperfection, working out a more general model in which the equilibrium level of wages in the presence of WOFs can be lower than in investor owned enterprises. In line with existing literature, we confirm that in WOFs the risk of worker opportunism, with workers reducing effort when not properly controlled, is lower than in investor owned firms, given the absence of contrasting interests between owners and workers.

Extending Shapiro and Stiglitz's analysis of unemployment as a worker discipline device, we evidence how an economy populated by worker owned firms (WOFs), by overcoming information asymmetry on the employee side in the presence of employer opportunism (as embodied in moral hazard, hidden action and abuse of authority), can *decrease,* not increase equilibrium wages, while employment is necessarily higher in the presence of WOFs. Within the Shapiro and Stiglitz framework, our analysis evidences that the non-shirking constraint (*NSC*) for WOFs is lower for any employment and wage level than in investor owned firms (IOFs). By factoring bi-later asymmetric information and opportunism in the employment relation, our model implies that the Shapiro and Stiglitz (1984) results represent special cases in the wider analysis of equilibrium wages and employment in market economies. Relatedly, the potential for unemployment reduction and efficiency gain of worker ownership (as especially embodied in worker co-operatives, and employee-owned companies) has generally been understudied and empirical evidence coherent with this results need to be more thoroughly analysed.

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Equilibrium unemployment as a worker insurance device.

Wage setting in worker owned enterprises

1. Introduction

The Ward (1958) model was introduced to study the behavior of worker co-operatives in a former Yuguslav-type economic environment. It assumes average labor income maximization as the objective per worker-member in co-operatives. Since members are entrepreneurs and control strategic and distributive decisions, they appropriate the whole value added (net of the cost of capital). When competition is not perfect (pure profits are positive), members in co-operatives obtain a higher income relative to employees in investor owned companies, since they appropriate the competitive equilibrium amount of labor remuneration plus a share of pure profits.

The Shapiro and Stiglitz (1984) model on unemployment as worker discipline device shows that worker owned firms (WOFs) can achieve the Pareto optimal level of equilibrium unemployment since, when the owners coincide with the workers employed by the organization, the equilibrium level of unemployment is lower and wages are higher than in investor owned companies. The macroeconomic equilibrium presented by Shapiro and Stiglitz in the presence of WOFs corresponds to the implications of the Ward-Domar-Vanek-model.[1] In the paper we present a more general model in which the macroeconomic equilibrium level of wages in the presence of WOFs can be both higher and lower than the economy wide level, contrary to the Shapiro and Stiglitz prediction.

[1] In the Ward (1958) model, given competitive market conditions for all firms, worker controlled firms would hire less workers at higher wages than their investor owned counterparts. The reason is that, under the assumption of perfect variability of labour in the short run, worker owned firms maximize average per member income when marginal labour productivity is equal to average labour productivity, and not to the competitive wage like in the case of capitalist enterprises.

In particular, we demonstrate, in line with existing literature by Bowles and Gintis (1993, 1998), that in the worker co-operative the risk of worker opportunism, with workers reducing effort when not properly controlled, is lower than in the capitalistic firm.[2] In this case we can show that in worker co-operatives the non-shirking constraint (*NSC*) is lower for any employment and wage level than in capitalist enterprises. Some pieces of (indirect) empirical evidence are supportive of this argument (Bartlett et al., 1992).

Before we develop our argument, we criticize the microeconomic rationale for lower wages in worker co-operatives due to x-inefficiency of the production process on the basis of both theoretical and empirical insights. From the theoretical viewpoint, while notable contributions 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 can be more effective in limiting free riding than hierarchical control by superiors (Putterman, 1993), the more so when peer monitoring is coupled with positive reciprocity (McCain, 2007). On the other hand, contrary to hierarchical control, horizontal control has the potential to improve the circulation of efficiency enhancing information, this way better supporting the generation of novel production knowledge. These arguments imply that worker and producer co-operatives would be able to reduce, not increase, control costs, this way boosting x-efficiency, for example because of lower need to resort to monitoring activities and lower costs of access to information (Hansmann, 1996, 1999).[3]

The model delivers three main implications:

1) A co-operative economy is always characterized, other conditions being equal, by higher employment levels than a capitalist economy;

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[2] The worker co-operative is to be considered the most representative case of worked owned enterprise. However, the category of worker owned enterprises is wider, since it includes capitalistic companies owned by their employees alone. Oco-operativeur arguments apply to this second category too. In this paper we use interchangeably the two terms for the sake of simplicity. In a similar fashion, we use interchangeably the terms investor owned and capitalistic enterprises.

[3] The same new-institutionalist account, however, warns against the risk that democratic governance in co-operatives increases governance costs, especially collective decision making costs (Hansmann, 1990, 1996). In a similar fashion to Bowles and Gintis (1993, p. 79), "while we take account of the work monitoring costs in both types of firms, we abstract from the costs of democratic decision making, expressed both in the time spent by participants and in the possible drawbacks of cyclicity in voting, unresponsiveness, and susceptibility to manipulation".

2) In competitive sectors co-operative firms pay lower wages than capitalist enterprises.

3) The risk of unemployment is higher in capitalist firms than in worker co-operatives.

These results are implied by the existence of contrasting interests between employers and employees: in order to increase control over workers, this way reducing the probability of shirking, and to win workers' obedience, employers in a capitalist economy are forced to pay higher equilibrium wages, this way causing higher equilibrium unemployment.

The paper is organized as follows. In the first section we report stylized facts related to unemployment and wage levels in co-operatives and in investor owned enterprises; in the second paragraph we explain the theoretical background of our analysis; in the third paragraph we report the Shapiro and Stiglitz model, as applied to worker owned firms; and in the fourth and fifth paragraphs we describe our model and introduce new parameters representing the costs of employers' opportunism. In the sixth paragraph we summarize the comparative results related to WOFs and IOFs, which are derived from our model, .

2. Stylized facts

Shapiro and Stiglitz's prediction on equilibrium wages and unemployment partially clash with pieces of empirical evidence which, in most studies, show higher wages in capitalist enterprises when compared to worker co-operatives. Bartlett et al. (1992) compare similar groups of co-operative and investor owned enterprises in the industrial sector in Italy, finding that worker co-operatives pay lower wages than investor owned companies (IOFs hereafter), mainly due to mangers' reduced pay and, to lower extent, to lower white-collars pay.[4] Their focus is on light manufacturing industrial sectors which are, on average, highly competitive since they are populated by small and medium sized enterprises, and 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 co-operatives are only apparently characterized

[4] The ratio of managerial pay to unskilled manual pay was almost 75% higher in private firms than in co-operatives. This difference is primarily attributable to the significantly lower salaries paid to the managerial staff in co-operatives; wage rates for the unskilled, skilled, and supervisory workers did not differ significantly between the two types of firm (*ibid*.: 110).

by higher wages than IOFs: once controlling for a set of characteristics, especially for the sector of activity, co-operatives display wages that are on average 14% lower than in IOFs. Using Eurostat data and data on a smaller sample of North-Eastern Italian enterprises (province of Ravenna, Emilia-Romagna region), Navarra (2016) notices that co-operatives pay lower wages than the average market wages in the area, with the exception of the construction sector, in which co-operatives hold significant market power. This evidence is not limited to Italy: Craig, Pencavel, Farber and Krueger (1995) show that co-operative wages in the plywood lumberjack co-operatives of US Pacific North West are 2% lower than wages in capitalist firms of similar size in the same sector. Clemente, Diaz-Foncea, Marcuello and Sanso-Navarro (2012) address the issue of the wage gap between co-operatives and capitalistic firms in the case of Spain. They observe that wages in worker-owned co-operative firms are lower than in other organization types. This result holds across sectors, while it does not always hold when co-operatives owned by stakeholders different from workers are considered. The result is also confirmed by the quintile analysis of the wage gap: wages in worker-owned co-operatives are always lower than in capitalist firms, while the opposite applies to non-worker-owned co-operatives when higher quintiles are considered. In the broader comparison between capitalist firms and all the typologies of co-operatives (including both worker and non-worker owned co-operatives), results are affected by sector. The same contribution explains low wages by the need to stabilize employment. However, while employment stabilization can explain higher wage flexibility, it is more difficult to show a causal connection between employment stabilization and the level of wages. While we keep in mind this possibility, we do not develop this hypothesis in the reminder of the paper.

In the following, we will concentrate exclusively on worker co-operatives ad develop an explanation of why lower wages are found in co-operatives in most cases, except when the market for the firm products is characterized by substantial imperfections. Lower wages require explanation either at the microeconomic, intra-organizational level, by introducing the idea of x-inefficiency in worker-co-operatives, or at the macroeconomic level by introducing in a partial equilibrium context those features of co-operatives that would favour this outcome. In this paper we criticize the former, and we follow instead the latter perspective.

Our explanatory strategy is supported by broad empirical evidence that disconfirmed the presence of lower production efficiency in worker co-operatives. Craig and Pencavel (1992, 1994) and Craig et al. (1995) compare US plywood co-operatives with similar IOFs. They

find slightly higher labour productivity and technical efficiency (between 6 and 14 per cent) in co-operatives relative to both unionized and non-unionized investor owned mills. Estrin (1991), on the Italian case, finds, in worker co-operatives, higher labor productivity, which, however, doesn't translate into higher wages. Bartlett et al. (1992) find better economic, but not financial performance in co-operatives relative to IOFs in the industrial sector in Italy. This evidence is mainly explained with at least three distinct organizational features of co-operatives, which would lower organizational costs and increase worker welfare and productivity: (i) lower incidence of control cost in terms of flatter hierarchical structure and lower utilization 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 co-operatives; (iii) better forms of worker involvement through membership representation. Better involvement, in turn, would favor better circulation of information, creation of firm specific knowledge, and weaker incidence of worker opportunistic behavior (e.g. shirking).

Related evidence deal with the well-established and widely studied phenomenon of employment stabilization that occurs in co-operatives and employee owned companies (Kruse, 2016). 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 in increased productivity. Most empirical works 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). In the Uruguayan case, this is highlighted by Burdin and Dean (2009) and Alves, Burdin and Dean (2014). Both works find that output prices affect employment in IOFs, but not in worker co-operatives. Burdin and Dean (2009) consider the economy wide comparison between worker co-operatives and IOFs in Uruguay in the decade spanning from 1996 to 2005. They find substantially more pronounced variation in wages in co-operatives relative to conventional enterprises. The stark difference in wage dynamics is explained by the necessity for co-operatives to preserve stable employment in the face of economic fluctuation and crisis, which, in this country, started in 2001. The same finding concerining less volatile employment and more volatile wages is found in Pencavel, Pistaferri and Schivardi (2006) on Italian data. Using survey data from the Ravenna province in Central Italy, Navarra (2016) finds that, in co-operatives, employment variation doesn't follow firm revenues, while wages in some cases do. Moreover, Arando et

al. (2010) show much better performance in employment creation and preservation of the Mondragon group of co-operatives than the average of the whole Spanish economy (both inside and outside the Basque Region) from 1983 to 2009. This is confirmed by the analysis of firm performance during the economic crises occurred over the same span of time, since it is observed that co-operatives adjusted less (or didn't adjust) employment to reduced firm performance. In the same paper, we see that during the economic crisis of 2009, industrial co-operatives in Mondragon laid off less than 1% of their worker-members[5]. 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 Mondragon fell by about 9% (most lay-offs were represented by temporary non-member workers), as compared to about 20% in Spain and 12% in the Basque Region. Over the whole considered period Mondragon co-operatives shoed better than average propensity to create, but not reduce employment.

More recent reports dealing with the effects of the global financial crisis started in 2007 show that, in Italy, from fall 2008 to the end of 2013, co-operatives increased overall employment by 80 thousand workers, while employment in private enterprises shrank by about 473 thousand units out of a national total of about 22 million. Still more remarkably, in co-operatives, the number of permanent workers increased by about 100 thousand, while short term contracts fell by about 20 thousand. About 50 per cent of total increased employment in co-operatives is accounted for by socially-oriented co-operatives, the so-called social co-operatives (Euricse 2015). Delbono and Reggiani (2013) analyze a group of Italian production co-operatives in the periods 2003-2010 and 1994-2011 and contrast co-ops behaviour with the overall trend in the same sectors. They find a stabilising effect on employment with respect to demand shocks, thanks to adjustments of wages. Moreover, co-operatives have been more cautious in terms of increasing equity during good years by way of reinvestment of positive residuals in indivisible reserves of capital (asset lock) and show "stronger" than average patrimony during downturns. The 2012 CECOP report confirms the high level of co-operative resilience to the financial and economic crisis. Focusing on France and Spain, the report argues that, although co-operatives 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 some peculiar features of co-operatives are strengthened by legislation or by-laws, for example through the

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

partial imposition of the non-profit distribution constraint and the accumulation of locked assets, and through the creation of co-operative groups and consortia, and of mutualized financial tools.

Further research, albeit rarer, systematically compares unemployment levels in areas characterized by different intensity of worker co-operative presence. Descriptive evidence shows higher employment levels in sectors and areas where worker managed firms are more common. In Italy, areas characterized by the strongest presence of co-operative enterprises,[6] which are concentrated in Central Italy (Emilia-Romagna, Tuscany, Umbria and Marche regions) and North-Eastern Italy (Trentino Alto-Adige, Veneto, and Friuli-Venezia Giulia regions) do also show lower than average unemployment levels (Euricse, 2015).[7] Although not usable to directly test our model, this evidence is compatible with the idea that the spread of co-operative enterprises reduces, ceteris paribus, involuntary unemployment.

3.Theoretical background

Our theoretical argument starts from the observation that worker co-operatives, when compared with IOFs, are able to reduce the costs connected to labor contracts by: (i) reducing control costs thanks to: (a) improved horizontal monitoring, which reduces the presence and spread of shirking and free riding on effort contribution; (b) reduced vertical control and costs of agency thanks to substitution of vertical with horizontal control; (ii) eschewing the risk of exploitative labor relations, i.e. of employers behaving opportunistically by exploiting asymmetric information and decision making power, primarily to keep wages low and to

[6] The figures concerning the diffusion of co-operative enterprises in Italy refer to both producer, and consumer owned co-operatives. However, worker involvement and direct participation can be thought to be more widespread in all typologies of co-operatives than in IOFs, through the weakening of financial incentives to profit maximization and through union and worker representatives' involvement in the management of the organization. Furthermore, workers can be members not only in worker co-operatives, but also in other co-operative forms, for example in social and credit co-operatives.

[7] In contrast with a national average of 12.2% in 2014, the seven selected regions all show lower than average unemployment levels. From lowest to highest: Trentino Alto-Adige, 5.5%; Friuli Venezia Giulia, 7.6%; Veneto, 7.7%; Emilia-Romagna, 8.4%; Tuscany, 8.7%; Umbria, 10.5%; Marche, 11%. These seven regions include the three regions with the lowest unemployment rate in Italy (Trentino Alto-Adige, Friuli Venezia-Giulia and Veneto) and also include seven among the eleven regions (out of a total of twenty) with the lowest unemployment rate in Italy (Urbistat on ISTAT data, retrieved on October 7th, 2015, from: http://www.urbistat.it/adminstat/it/it/classifiche/tasso-disoccupazione/regioni/italia/380/1).

increase work pace (Albanese, Navarra and Tortia, 2015). Appropriation of net residuals by investors increases with decreasing wages and increasing work pace. Workers can anticipate and react to the danger of exploitative labour relations by demanding higher wages and by limiting effort contribution. In other words, the risk of employers behaving in a morally hazardous way and abusing their authority can lead workers' to reduce effort and employers' to strengthen control or to increase wages to counteract this possibility (Sacconi, 2012). However, when workers cannot be perfectly monitored because of asymmetric information and/or contract incompleteness, unemployment can be interpreted as a worker discipline device. As in Shapiro and Stiglitz (1984), higher efficiency wages causing non-zero equilibrium unemployment are paid to dissuade workers from shirking. The *NSC* is shifted left and upwards, since monetary incentives (higher wages) and a more severe threat of lay-off substitute increased monitoring activities (Crf. also Albanese et al., 2015). Coherently, a co-operative economy in which workers have control over entrepreneurial decisions, since this condition reduces asymmetric information on worker behaviour, and the danger of the employer behaving opportunistically, would be characterized by the *NSC shifting downward and to the rights, implying this way lower unemployment and wages.* We dissect these theoretical premises of our model in the following paragraphs.

2.1. Costs of control and costs of monitoring

Alchian and Demsetz (1972) introduced one of the most radical critiques against the possibility that teamwork led by a set of principals would be able to deliver efficient production. When the outcome of team production cannot be exactly imputed to each individual worker, free riding, in a way similar to contribution to public goods production, 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, in being the residual claimant or enterprise owner, can remedy the intrinsic inefficiency of team production. The authors explain in this way the emergence of capitalist ownership as the conjunct result of profit maximization by the owner and of tight control over the labour process. Within the same stream, Milgrom and Roberts (1982) maintain that team production, in which residual rights of appropriation are attributed to member principals, requires strong sanctions to be imposed on defecting members in order to discourage opportunism.

While dealing with the same problem of control over the labour process, a line of enquire at odd with Alchian and Demsetz's one was initiated by authors such as Putterman (1984), Bowles and Gintis (1987). They evidenced that the role of the central monitor does not need to imply residual claimancy. It can be carried out effectively by other institutionalized agencies, such as appointed managers or elected directors. In more general terms, the new institutionalist approach of Elinor Ostrom (1990) showed that, contrary to the well-know thesis of Mancur Olson (1965), in many actual situations groups of principals can solve social dilemmas such as the spread of opportunism in collective action. This is achieved through a complex and time consuming process of development of suitable governance structures, which include both incentives (monetary and non-monetary) and sanctions against offenders. Empirical research first developed in the field of the management of common pools of natural resources evidenced that appropriate governance and working rules can sustain co-operation over long periods of time.

The literature initiated by Michael Jensen and William Meckling (1976) demonstrated the existence and the importance of agency costs in principal agent interactions. This approach complements the one by Armen Alchian and Harold Demsetz (1972) within the tradition seeing the firm as a nexus of contracts, since, in the presence of asymmetric information, agency costs are thought to be minimized by resorting to highly powered monetary incentives, such as different forms of profit sharing and pay for performance. However, since it deals with second best organizational equilibria, it also leaves open the possibility that social structures different from principal agent interactions achieve Pareto superior outcomes. Our arguments develop within this line of enquire.

The economics literature that specialized in the study of worker owned and worker controlled enterprises (Bowles and Gintis, 1998) demonstrated that in worker co-operatives 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 than hierarchical control in reducing the incidence of shirking and free riding. Following a different but converging explanatory strategy, also new institutionalism reached similar conclusions, especially in the works by Henry Hansmann (1996). Organizational costs in terms of agency and control costs would be lower in producer and worker co-operatives thanks to reduced information asymmetry and horizontal (peer) monitoring. This effect would be especially strong when members' features and preferences are homogeneous, since in this case their monitoring ability would be strongest, and coordination in the pursuit of collective

objectives easier and less costly. 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).

In our framework of analysis, co-operatives represent an instance of collective action in the pursuit of entrepreneurial objectives, substituting principal agent relations with mutual benefit interaction. While principal agent interaction requires that the agent's objectives are aligned to the principal's ones by resorting to highly powered monetary incentives, second best solutions can reduce, but never eliminate agency costs (Prendergast, 1999). Co-operatives can reduce agency costs by resorting to horizontal control and better alignment between individual and organizational objectives. This is achieved through worker involvement and participation in decision making.

2.2. Labour Contract failures

2.2.1. Contrasting interests and hierarchical relations

The idea of contrasting interests between employers and employees can be enlarged and made to depend on the hierarchical relation existing between them, as spelled out by new institutionalist classics (Coase, 1937, Simon, 1951) and formalized in the principal-agent relation (Jensen and Mackling, 1976). The different and opposing objectives between employers and employees imply that employees may want to pursue aims that are at odd with the employer's ones, engendering effort reductions whenever wokers' demands are not met by employers. As a reaction, employers can leverage on efficiency wages and the threat of unemployment to disciplining workers.

Given the existence of asymmetric information and contrasting interests between employers and employees, workers in IOFs may not accept wage reductions or moderation since they may not be able to ascertain whether wage moderation is required by the financial and economic sustainability of the organization (e.g. to avoid bankruptcy), or it is instead a way to increase private appropriation by shareholder-owners (Albanese et al., 2014). Besides, lower wages in IOFs imply higher profits, increased distributive disparity, and increased concentration of wealth (Piketty, 2013). The demand for wage increases may represent a way to reduce wealth inequality within the organization, and improve distributive fairness among workers themselves. Because of these reasons, workers in IOFs may show a tendency to increase wage demands by threatening lower productivity levels. In turn, employers can react

by increasing the equilibrium level of the wage, but, at the same time, by using equilibrium unemployment as threat to discipline workers. This upward profit to wage spiral can engender higher risk of lay-offs when the economic conditions of the organization worsen. Consequently, too high wage demands by workers, and concessionary behaviour by employers, can aggravate business cycle fluctuations at the macroeconomic level.

The existence and relevance of economic (in terms of danger of wage reductions aimed at increasing profits) and psychological costs (in terms of the need to align their behaviour to the employer's objectives) to the employment relation has, most of the times, not been analysed by orthodox economics (Prendergast, 1999). Some behavioural economists, instead, have explicitly considered the costs connected with the imposition of hetero-directed objectives on workers. Bruno Frey (1997) bases his seminal work on previous contributions in social psychology (Deci, 1971; 1975; Deci and Ryan, 1985), and highlights the existence of the crowding out of intrinsic motivations by monetary incentives. This effect can be thought as primarily connected with hetero-direction in labour relations, since employees are not allowed, as a norm, to select autonomously their preferred tasks, while monetary incentives can be used by employers as alignment devices, which negatively impact on workers' intrinsic motivations. Furthermore, the employer's objectives and choices may not always be 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.

In worker co-operatives hierarchy is partly of fully substituted by direct worker control based on membership rights, horizontal monitoring and collective action. When present, hierarchy is left with a purely instrumental role in serving members' objectives, since it is based on delegation of decision making power to elected bodies and to appointed managers (Borzaga and Tortia, 2017; Ellerman, 2017). Consequently, the negative impact of hierarchy on workers' welfare and psychological wellbeing is expected to be impoverished and downgraded relative to IOFs.

Since members in worker co-operatives set strategic and operational objectives (either directly or in a delegated way), they are, as a norm, in a better position than employees in IOFs to align their own objectives with the objectives of the organization, and to set the optimal schedule for the inter-temporal accumulation of human capital. In our model, better alignment and lower hierarchical intensity imply lower incidence of worker misbehaviour in

terms of shirking, and absence or lower incidence of compensatory wage demands by workers, that is a level of equilibrium wage that is nearer to the market clearing one.

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 to the employer, not only to the employee side of the relation. The employer can, in the most common instances, diffuse wrong, biased, or incomplete information concerning the economic and financial conditions of the organization in order to increase profits by reducing wages or halting their growth. The employer can also, for the same reason, start too risky investment plans when expected losses, but not gains, are born by workers in terms of higher risk of lay-off. One salient consequence of such features of the employment relation is that workers are likely 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., 2014). The same effect can be 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. This problem has been evidenced in related research streams which built on the idea of corporate social responsibility. In this stream, abuse of authority is understood as the main failure in the social contract between the owners of the organization and the other stakeholder groups. This failure requires the introduction of both legal regulation and self-regulation aimed at developing multi-stakeholder governance (Blair and Stout, 1999; Sacconi, 2012). Direct worker control can be understood as similar, but more radical and thorough solution to the same problem.

Coherently with these arguments, it can be hypothesized that workers internalize the expected costs of employer opportunism concerning higher risks of lay off, lower than equilibrium wages, suboptimal accumulation of human capital, limited involvement, and limited access to sensitive information (Albanese et al., 2015). This process of internalization would lead to the demand for compensatory wage increases. In other words, 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 misbehaviour. The resulting equilibrium level of efficiency wages would be higher

in IOFs than in worker co-operatives. Both workers' and employers' behaviour would conjure in determining inefficient market equilibrium.

4. The Shapiro-Stiglitz model, as applied to worker ownership

In their efficiency-wage framework, Shapiro and Stiglitz (1984) 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 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. Shapiro and Stiglitz 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 (Shapiro and Stiglitz, 1984). Work effort can take two values (0,1): e = 1 in the case of "fair" effort and e = 0 in the case of shirking. The firm chooses the wage level w and the level of employment L_i. The firm knows the future expected utility of each worker in the event he or she chooses e = 0 or e = 1.

The worker utility function is $U(w,e)$, where w is the wage and e is work effort. Standard assumptions on the shape of the utility function apply (that is $\partial U / \partial w > 0$ and $\partial U / \partial e < 0$). The probability that the worker is caught shirking following monitoring activities is q. The worker found shirking is laid-off and, in this case, he or she would receive a subsidy equal to $\overline{w}$ up until he or she does not find a new job. Each unemployed worker is able to find a new job with probability a, corresponding to 1 minus the unemployment rate, that is $a = 1 - u = 1 - (N-L)/N = L/N$, where L is the number of employed workers, while N is the total active workforce (that is $0 \le L \le N; 0 \le a \le 1$). The a probability grows larger with total employment and decreases with the unemployment rate. The probability that a worker is separated from his or her job due to relocation is b, which is exogenous.

Workers maximize the expected present discounted value of their utility with discount rate equal to r > 0. The model is set in continuous time. Workers select their effort level to maximize their discounted utility stream. As in the Shapiro and Stiglitz model, the worker

compares his 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 (1984, pag. 438) no-shirking condition *(NSC)* is:

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

The critical wage level corresponding to non-shirking behaviour 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 Shapiro and Stiglitz, 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, Shapiro and Stiglitz (1984, pag. 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[8]. In this case, the problem to be solved by the employer is:

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

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

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

the market equilibrium in which workers are employed by investor owned companies, which occurs at E, where the marginal product of labour schedule intersects the *NSC*.

Figure 1 about here

Shapiro and Stilgitz (1984) demonstrate that when workers own the firm, the equilibrium level of unemployment is lower and wages are higher than in other enterprise forms[9]. The macroeconomic equilibrium in the presence of WOFS corresponds to the implications of the Ward (1958), Domar (1966), Vanek (1970) model of the labour managed firm. However, empirical evidence shows that this implication of the model is often violated, since worker cooperatives have been observed several times to pay *lower,* not higher than average equilibrium wages. We develop a more complete explanatory model aimed at bridging the gap between Shapiro and Stiglitz explanation, and empirical evidence.

5. Wage setting and unemployment in worker owned enterprises

In the Shapiro and Stiglitz model the parameter q is the probability that the worker is caught shirking and fired by the employer. When asymmetric information is less severe, or the monitoring activity becomes more effective or intensive, the worker performs high effort anyway even if the employer pays a lower wage. The incentive to shirk is reduced.

In line with Bowles and Gintis (1987, 1998), we posit that, in WOFs, peer pressure and peer monitoring underpin horizontal forms of control, thus increasing the value of q. Furthermore, involvement, by better aligning workers' and organizational objectives, reduces workers' misbehaviour, this way making monitoring activities easier and more effective (q increases also in this case). Insofar as involvement based on membership rights is understood as means to overcome the contrasting interests between the employer and the employee, it represents one fundamental mechanism able to explain the lower incidence of worker opportunism in worker co-operatives (Bartlett et al., 1992).

In the Shapiro and Stiglitz framework, it is assumed that ownership is equally distributed among N workers and that the value of the unemployment benefit $\overline{w}$ is zero. In this case the

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

problem is the same as in (4), (5) and (6). In Figure 2, when the value of q increases the *NSC* moves downward and rightward to *NSC'* and the new equilibrium is found in A', where employment is higher and the wage lower than in A. The stronger the effect of self-monitoring on q, the larger the downward shift of the *NSC*.

Figure 2 about here

Our results imply that the Shapiro and Stiglitz (S-S hereafter) representation is a special case of a wider class of equilibria, which depend on the variables impacting on position of the *NSC* in different organizational forms. If the value of q is the same in traditional firms and in worker owned firms the equilibrium point is A, as in the S-S model. If, instead, the value of q is higher in co-operatives, the new equilibrium is in A' with higher employment and lower wage in co-operatives relative to traditional firms.

5. Employer opportunism

The effects discussed in the previous section can explain the oft-found empirical observation of lower wages paid by worker-owned firms relative to investor owned firms. 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.

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. In turn, the employer would concede wage increases in order to keep the worker on the non-shirking schedule. Given the different nature of control rights in worker co-operatives, worker members are in a better position to control the behaviour of decision makers (managers). This would eliminate the need to demand compensatory wage increases, and take the *NSC* nearer to the market clearing equilibrium in point A', like in the previous cases.

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 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:

$$d = f(c, h, m)$$

where c measures the cost of contrasting interests, h the cost of hierarchical control and m the cost of employer opportunism.

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

The no-shirking condition (NSC) in case of the IOF is:

$$w \geq \overline{w} + e + d + \left(b \frac{N}{N - L} + r \right) \frac{e}{q} \tag{7}$$

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

We recall that in the case of worker-owned firms the equation of the *NSC* is (5). In this case we sum the value of parameter *d* to the elements that increase the minimum level of the non-shirking wage.[10] The *NSC* in the case of WOFs amounts to:

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

Where *N/(N-L)= u* is the unemployment rate. That is:

$$w \geq e + d + \frac{e}{q} \left(\frac{b}{u} + r \right) \tag{9}$$

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, equilibrium unemployment and the equilibrium wage increase.

[10] 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 subsidies, effort, and unemployment.

In Figure 3 we report the new equilibrium levels in the case of IOFs and co-operatives considering the (7) and (9) no-shirking conditions (NSC_d), and comparing them with the Shapiro and Stiglitz equilibrium condition ($NSC_{S\text{-}S}$), under the hypothesis that d assumes the same value in the two kinds of firm. The new equilibrium is E' in the case of IOFs, while it is A'' in the case of WOF.

Figure 3 about here

Since q and d trigger opposite impacts on the *NSC*, the final effect on the wage is ambiguous. While for relatively low values of q the equilibrium wage is expected to be higher than in the absence of employer opportunism, when d is lower than q (a situation that is expected to be common in worker co-operatives), the *NSC* shifts down relative to the initial position and a lower wage relative to the case in which employers' opportunism is absent is expected. When monitoring is especially effective and employers' opportunism is limited workers receive lower wages and the equilibrium is associated to higher levels of employment (point A' in Figure 2). If improved monitoring is exactly compensated by the impact of employer opportunism, the *NSC* stays still and the equilibrium is at point A, like in the Shapiro and Stiglitz model. Finally, when employer opportunism has stronger impact than reduced monitoring, higher levels of unemployment and higher wages are expected (a situation common in IOFs).

6. Investor owned firms and worker co-operatives: 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 co-operatives since:

1) the necessity of **increased monitoring activity** requires a higher equilibrium level of the efficiency wage in IOFs. The *NSC* in IOFs shifts leftwards relative to its position in worker co-operatives, accounting for increased monitoring difficulties. The employer pays higher wages in order to sterilize the risk of shirking on the workers' side (parameter q is lower in IOFs). 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.

2) (2a) **contrasting interests** in IOFs imply, ceteris paribus, that lower wages translate into higher profits. To compensate for the risk of distributive unfairness workers can demand higher wages. Concessionary behaviour by employers will push the NSC leftward, increasing the equilibrium level of wages and unemployment (parameter *d* higher in IOFs); (2b) similarly and more generally, within a principal-agent framework, diverging objectives between employer and employee in the presence of **hierarchical relations** can lead to both monetary and psychological costs due to hetero-direction, and suboptimal choices of the employer in the accumulation of workers' human capital. These elements can push workers to ask compensation against the risk of losses. The threat of workers' misbehaviour can induce employers to set higher than equilibrium wages (parameter *d* higher in IOFs); (2c) the risk of **employer opportunism** in terms of moral hazard, hidden action and abuse of authority resulting in lower wage levels and worse contractual conditions impose positive expected costs on workers. In order to shield themselves ex-ante against such costs, workers would threaten lower productivity levels and increase wage demands. Again, employers can prevent this risk by setting higher than equilibrium wages and using unemployment as a worker discipline device (parameter *d* higher in IOFs).

In worker co-operatives the value of parameter *d* is always lower than its value in IOFs as the variables *c* (contrasting interests) and *m* (employer opportunism) are nil.[11] Only hierarchical control (h) may be positive. However, as a matter of course, hierarchy is either absent in co-operatives or, when it exists, it is based on delegation and instrumental to the pursuit of members' objectives, which are factored in co-operative governance through members' control rights. Better involvement of workers reduces the risk of worker misbehaviour, reducing this way also the need for tight hierarchical relations. Hence, also in the case of hierarchical relations, we expect *d* and the position of the *NSC* to be lower in co-operatives, and equilibrium to be characterized, ceteris paribus, by lower wages and higher employment.

Figure 4 about here

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[11] Substantively, the assumption of zero *c* and *m* variables in WOFs can be excessively simplifying. However, we stick to this assumption for the sake of clarity and simplicity at this stage of the development of the model.

In Figure 4, due to the higher than nil value of *d*, equilibrium in IOFs in found at point E' on the NSC_{IOF} curve, in which the equilibrium wage is higher and employment is lower relative to point E in the Shapiro and Stiglitz model (Figure 1). The *NSC* in co-operatives (labelled NSC_{WOF}) is, in the general case, positioned to the right and below the NSC_{IOF}. Equilibrium in co-operatives is found at point A''', in which wages are lower and employment is higher than in IOFs, coherently with prevailing empirical evidence. Shapiro and Stiglitz (1984) report, instead, the special case in which the parameters *d* and *q* exert equal (but opposed) effects on the *NSC*. Employer opportunism in IOFs is exactly counterbalanced by more effective monitoring (equilibrium points E and A in Figure 3). In this situation wages are generally higher in co-operatives, coherently with the Ward-Domar-Vanek model of the labour managed firm. Effects on employment are instead unambiguous both in our model and in Shapiro and Stiglitz. A co-operative economy always performs better than a capitalist economy due to worker control. This result is further reinforced in our model, relative to the Shapiro and Stiglitz case, by the presence of lower monitoring costs, and lower incidence of hierarchical relations and of employer opportunism in co-operatives.

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 of the wage and of employment in correspondence with the intersection between the no-shirking condition curve and the average productivity of labour. The ensuing higher level of employment and wages corresponds to the implications of the Ward-Vanek-Domar model of the worker co-operative (labour managed firm in the theoretical model). Empirical evidence shows instead that observed market equilibrium has, in most cases, features that are at odd with these implications, since *lower*, not higher wages are usually observed in worker co-operatives. Our model deepens the analysis of the position of the *NSC* in the Shapiro and Stiglitz framework, aiming at clarifying the theoretical premises of empirical tests and at providing new explanation for the observed level of wages in co-operatives. We conclude that the equilibrium level of wages in co-operatives can be both higher and lower relative to IOFs, while employment is confirmed to be always higher. The final equilibrium level of wages in co-operatives is related to the position of the average productivity of labour schedule and its intersection with the *NSC*. We show that, given more efficient monitoring, the *NSC* curve in

co-operatives is always positioned below the *NSC* curve in IOFs. Additionally, employer opportunism related to failures of the employment contract strengthens the downward shift of the *NSC* in co-operatives. In this perspective, the Shapiro and Stiglitz model of worked owned firms is only a special case of a more general model in which the factoring in of monitoring costs and wage premiums compensating the expected costs of contract failures are able to reconcile the theory with empirical record.

In terms of policy implications our approach implies that worked owned enterprises and worker co-operatives can complement, at the margin, mainstream, investor owned organizations, in improving the efficiency of the labour market. This minimal argument is sufficient to justify their economic and social role.

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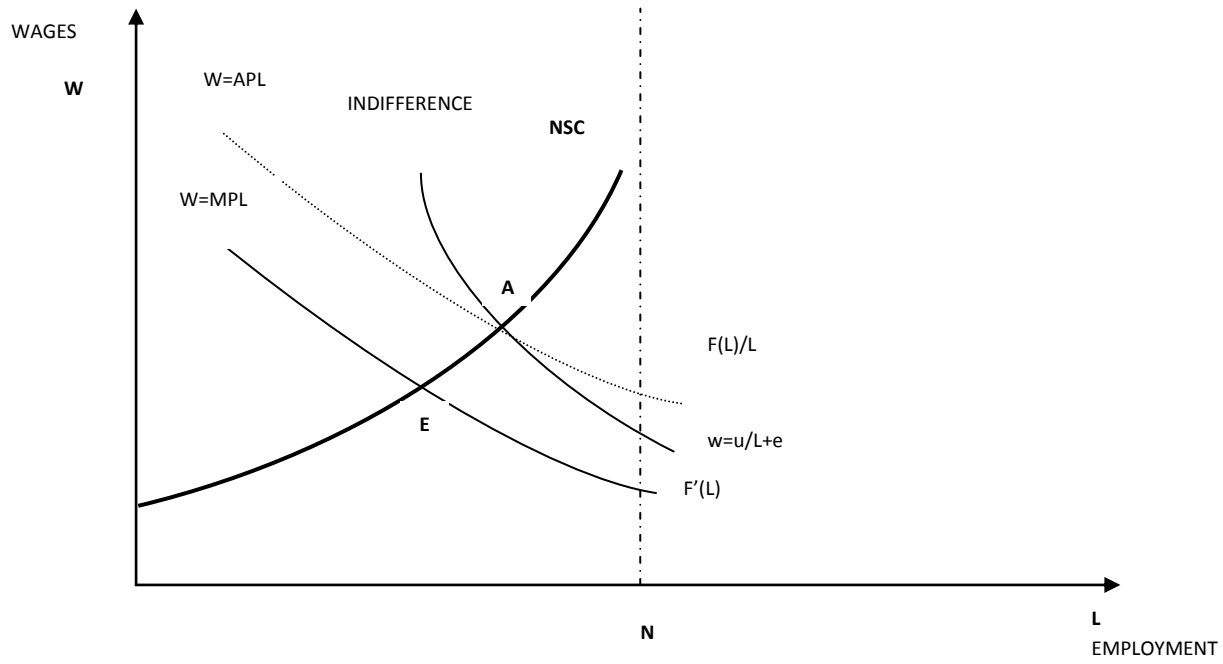
Figure 1: Social Optimum



Shapiro – Stilgitz (1984, p. 440)

FIGURE 2: SOCIAL OPTIMUM IN CASE OF WORKER'S CO-OPERATIVES

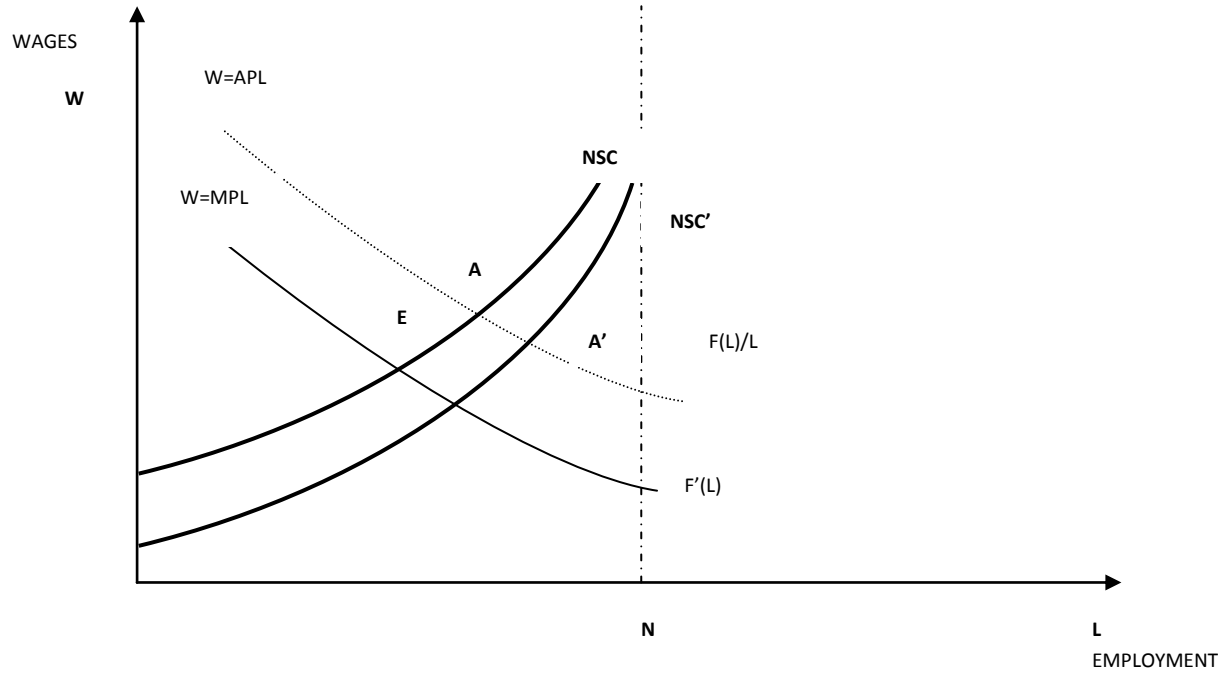


FIGURE 3: OPTIMUM IN CASE OF THE *NSC* INCLUDING THE PREMIUM FOR THE COSTS OF CONTRACTUAL FAILURES

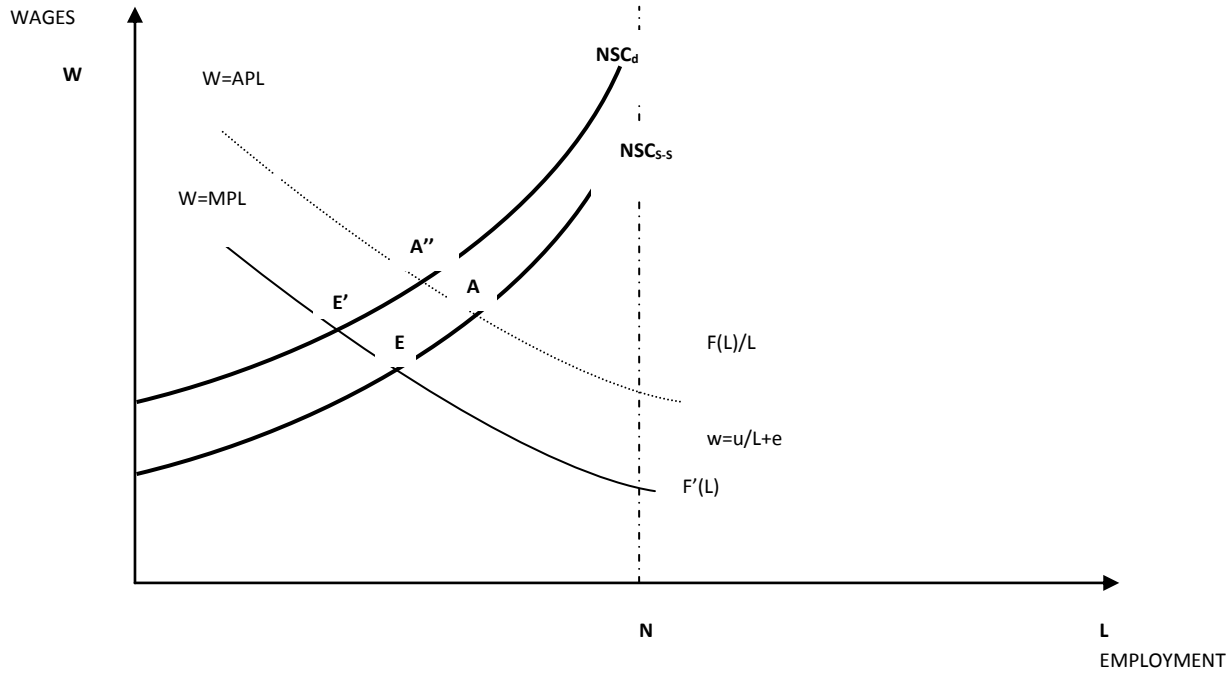


FIGURE 4: NEW OPTIMUM IN IOFs AND WORKER CO-OPERATIVES