Horizontal Skills Mismatch in the Labor Market: 
Protecting the Past vs. Protecting the Future

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ECARES working paper 2012-030
Abstract

This paper shows how high bargaining power for firms and search costs in the labor market can impede a switch towards new, more competitive economic activities. This is because search costs drive the quality of the horizontal matching between worker types and the old and new sectors of the economy. The high bargaining power of firms pushes wages down, so that small search costs are enough for young workers or workers with new skills to give up looking for jobs in the new sector. Employers end up giving up offering these jobs as well. Politically popular labor policies protecting a dominating old sector and old workers, fail to address the mismatches and increase unemployment. Simply switching support to the new sector may cut jobs for the older workers and thus create other welfare losses. A more effective modernization policy, for both jobs and products, is to link wages to output.
1. Introduction

Many of the formal and informal debates on labor market issues associated with the “Great Recession” blame increasing and lasting unemployment on aging economic structures, e.g. characterized by a decreasing competitiveness. Addressing this concern is the main focus of industrial policies in many European countries. Yet, Europe’s post-World War II history shows that causality may run both ways. Failing to address properly growing concerns for increasingly higher and durable unemployment, in particular among the young, better educated generations, seems to reduce the opportunities to adjust economic structures. For the European economies trying to diversify and modernize, this means that without the right labor market policies, the chances of getting industrial policies to lead to the desired structural changes are significantly lower. The two policies are interconnected and both are impacted by the strength the bargaining power of employers, the key actors in the economic restructuring.

Our focus is the assessment of the cases in which causality runs from poor labor policies to the economic structure. We model an economy where firms choose between favoring an old sector and a new one and make “take it or leave it” offers to potential employees. Those are allowed to search on the market for alternative offers. The model replicates the evidence (discussed at length below) and shows that this high bargaining power for firms pushes wages down in such a way that even small search costs are enough for the market to generate mismatches. Young workers do not want to search for jobs in the new sector if they are underpaid anyway. Therefore, firms do not want to offer such jobs.

Labor market flexibility, a standard policy recommended in countries in crisis, leads to mismatches in the allocation of workers across sectors (i.e. workers take jobs in the wrong sector). The mismatch is not due to the fact that high skilled workers take low skilled jobs because of search costs. It is due to the fact that, as bargaining power pushes wages down, there is no incentive for workers to search for the “right” job. The workers most likely to be able to contribute to the renewal of an economy are not paid their efficient
price and end up failing to work where they could have the highest impact. The Spanish situation provides a good illustration. It shows that, until the crisis, the failure of the labor market to make the most of the new skills available was hidden by the capacity of the construction sector, the old sector, to absorb the excess supply of workers. When the construction sector failed, unemployment exploded.

The main point of the paper is thus that the failure of the labor market to cater to forthcoming workers and industries makes a case for regulation. The *laissez-faire* policy adopted by some governments (UK or Spain for instance) can be improved upon if they want to be able to cater to future jobs and products needs. We consider three potential forms of regulation of the market as alternatives to full flexibility; (i) Guaranteed wages for older workers, (ii) Guaranteed wages for older workers with job protection, (iii) Outcome-dependent wages. Their impact on the quality of matching and their distributional impact are compared to the impact of a *laisser-faire* policy.

We find that the two first policies can lead to unproductive yet costly outcomes in terms of future prospects for both old and young workers and the new sector: more unemployment and lower growth prospects. A theoretically ideal policy is to reduce the bargaining power of employers by imposing that wages are outcome dependent. This has the advantage of also giving workers incentives to self-select on the right jobs and maximize the total gains from trade. Finally, the model can be used to show that as the economy evolves, i.e. the stylized facts are changing, and young workers start to dominate, protecting the older workers and helping them retire early are both desirable policies from a social welfare viewpoint.

The paper is organized as follows. Section 2 presents some of the strongest recent anecdotal evidence on the growth of employers' bargaining power and its impact in OECD countries trying to reinvent themselves and hence trying to handle simultaneously labor and product market reforms. Section 3 briefly reviews the literature on monopsony and bargaining power. We introduce the theoretical model in Section 4. Section 5 shows how the labor market failure hurts the economy. Sections 6 show the extent to which the three types of regulation could reduce inefficiencies. Section 7 concludes.
2. **Some history, anecdotes and facts**

Prior to the Great Recession that started end of 2007, the last time the OECD countries had seen such bleak labor markets prospects so clearly anchored in an inability of the product markets to adjust to a shock may have been from the mid-190s to the mid-1980s. The two oil shocks of the 1970s, about 5 years apart, had waken most OECD countries from the golden growth dreams of the 1960s that had started with the reconstruction of Europe after World War II. The oil shocks, just like the recent financial shocks, had violently increased unemployment among the young workers and those close to retirement. Real wages were falling as well. That’s when researchers started to look for theory and evidence of bargaining power shifts and increased monopsony power in labor markets. Understanding mismatches between employees and employers had become a top research topic in academia.\(^4\) Products market eventually adjusted and so did labor markets by the early 1990s and the world rode the wave generated by the technological revolution. That is, until 2007.

Since the start of this Great Recession, it is hard not to be puzzled by the speed at which the nature of imperfections in the labor market has made a strong return in the media and in academic research. The dominating bargaining power of employers in many European countries is increasingly recognized in some of the countries hardest hit by the crisis and most in need of an economic modernization. Products markets have not adjusted and the number of workers unable to find a job has increased. For those who found a job within the obsolete old economic structure, it is often at salaries inconsistent with the education and skills they have invested in. The parallel with the 1980s crisis is not far-fetched.

An indicator of this shift in bargaining power is the widespread drop in the salaries paid to young educated workers. Clearly, the increase in the share of college educated in the young generation of workers as compared to the old generation could explain part of the drop. However, it cannot explain why in Spain for instance, already in 2006 (i.e. just

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\(^4\) See Kuhn (2004) or Manning (2010) for a detailed discussion of how search models and monosponies emerged in labor economics.
before the crisis) 58% of the wage earners, including many educated workers, earned less
than 1,100 euros per month.\(^5\) A drop in the relative bargaining power of the worker in an
economy organized around a real estate boom could explain it.\(^6\)

Policymakers are not blind. They recognize the need to transform the economies,
just as they did after the oil shocks of the 1970s. Debates on the extent to which a new
industrial policy is needed to make this happen are common and also making a return in
academia.\(^7\) The assumption behind a lot of that research, however, is that the product
sector will pull the labor market out of recession. To our knowledge, there is no real
research on the extent to which adjustments in labor markets could block or at least slow
the economic transformation to be achieved in the product markets, whether from
industrial policy or any other form of intervention. Ensuring that labor market policies fuel
the adjustment of economic structure to the needs of the future rather than extent the life
of obsolete structures at a high social cost to parts of the population could very well be one
of the main challenges faced by the old economies of the OECD.

The risks of socially costly lasting disequilibria in the labor market can be blamed on
many factors. One seems to stand out in the current context. This outlier is the strong
protection granted to jobs in the older industries through temporary or short term fixes
focusing and the lack of protection to jobs aimed at meeting the future economic needs.
Spain, once more, provides the necessary evidence. It has been trying hard since hit by the
2007 crisis to improve the flexibility of its labor market to make it easier for employers to
recruit in the existing economic structure. However, it has been doing little to diversify its
economy and to help recycle its mining or construction workers.\(^8\) This fueled
unemployment among the large number of young people entering the labor market,

\(^5\) For a more detailed analysis of the Spanish situation just before the crisis, see
http://www.aeat.es/AEAT/Contenidos_Comunes/La_Agencia_Tributaria/Estadisticas/Publicaciones/sites/mercado/2005/pr.htm
\(^6\) According to Bentolila et al. (2012), the latest rounds of labor market reforms introduced by the
conservative further increased the shift of bargaining power away from workers and towards employers.
\(^7\) See for instance, Aghion et al. (2011).
\(^8\) It has done a lot of cheap talk, but in practice, it has cut R&D and support the transformation of its energy
and transport sectors, two of the engines expected to be drivers of the next generation growth in most EU
countries.
increasingly with higher skills than the previous generation, and not doing much for workers specialized in economic activities for which the demand continues to fall. The induced long term cost (and the social drama) is that many workers progressively see their skills, and hence their marketability, erode.

Many OECD countries have roughly been in that situation between 2008 and 2012, although on different scales. On average, long-term unemployment jumped from 27% to 35% of the jobless total within 5 years, increasing the risks of structural labor market damage as skills erode. Moreover, young people, skilled or not, and unskilled workers supported the bulk of the burden. More than one in five young people in the labor market were out of work in France, Sweden, Poland, Ireland, Italy and the UK by mid-2012. That is more than double the unemployment rate affecting the general population during that year. Greece and Spain fared worst with youth unemployment rates of over 50% of the total youth labor force. Without some coherence between the transformation of the product and the labor markets, it is unlikely that this generation of worker will be able to contribute to the transformation.

Under these conditions, well established employers have a lot more power in labor market negotiations than workers, even when unions are strong, simply because growing shares of the population have either not enough skills (the youth) or excessively specialized skills (e.g. Peugeot workers in France). But employers also tend to have the upper hand because institutions play out in their favor. For instance, until a 2012 labor reform, Italian employers had at their disposal over 40 types of temporary contracts they could rely on, de facto allowing discrimination in the handling of workers and fueling the growing degree of mismatch between demand and supply, as illustrated by the increased share of structural unemployment. This discrimination is one of the symptoms of the widespread, and possibly growing, monopsony power in labor markets, at least across continental Europe.

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9 See Bell and Blanflower (2011) for a good overview of youth unemployment in Europe and the US.
10 ILO (2011)
11 Spain's youth unemployment rose from 17.4% in March 2007 to 51.1% in March 2012., and Greece's from 21.6% in 2007 to 51.2% in March 2012.
12 Keep, E. et. A. (2006) for an early discussion in the UK context
3. Monopsonies and bargaining in the literature

The recognition that employer can have more bargaining power than the workers which results in the possibility of the presence of monopsonies in labor markets has been around for a while in the literature. For instance, over 25 years ago, Boal and Ramsom (1997) had already done a survey of the importance of static monopsonies in labor economics. But for many, then, monopsonies seemed to be somewhat of an analytical curiosity (Kuhn, 2004). The idea was that industrial relations left a strong role for workers's voice through unions. Things changed with Manning (2003) who introduced dynamics in the modeling of the monopsony and Burdettt and Mortensen (1998) who showed how accounting for search costs could lead uneven distributions of the bargaining power between workers and employers. The new empirical research that followed these two ways of looking at labor market imperfections seems to have become mainstream.

In a recent paper, Manning (2010) surveyed a wide range of research on labor market failures and argues convincingly that, indeed, the evidence suggests that labour markets are imperfectly competitive. Manning has been making the case for the need to consider monopsonies as widely relevant descriptions of employer's behavior in labor markets for close to 20 years now and many researchers have followed his lead. At around the same time Manning delivered his last survey, Ashenfelter et al. (2010) introduced a volume of the Journal of Labor Economics dedicated to monopsonies in labor markets. The volume includes a wide range of empirical paper trying to measure the extent of monopsony in labor markets. Ashenfelter et al. (2010) reach the same conclusion as Manning, arguing that monopsonies may be much more pervasive in labor markets than sometimes recognized.

Similar testable theories have emerged from search models. Rogerson et al. (2005) surveyed the research on the importance of the time it takes for employers and workers to be matched as a result of information gaps suffered by workers. This line of research has been quite influential among macroeconomists looking for explanations for lasting unemployment and for the failures of economies to generate the sorts of jobs it needs to
recover after a recession. Recent research has tended to rely on dynamic stochastic general
equilibrium (DSCGE) models to try look into the costs of efforts associated with jobs search
and the role of bargaining in that context (e.g. Christiano et al. (2010)). Although these
models provide useful insights, they do not really deal with the mismatch between product
and labor markets. Moreover, they often tend to be quite neo-classical in their modeling
of the labor market. Alternative roads have also been considered to explain the lasting
unemployment at the macro level that are closer in spirit to our paper. These look into the
interactions between product and labor market. Fiori et al. (2007), for instance, show the
strong correlation between the effectiveness in the deregulation of these two markets,
implicitly supported by a bargaining model suggested by Blanchard and Giavazzi (2003).
More recently, Tasci et al. (2012) also deal with the interactions between the two markets
in the context of an assessment of the macro impact of technological change on
productivity and unemployment during the Great Recession.

In a nutshell, what emerges from this research is the widespread presence of
monopsony or unbalanced bargaining power for the kind of jobs for which most of
the wage is fixed. Overall, this result boils down to the idea that labor markets are “thin” in the
sense that: (i) job search/high commuting is costly (Manning (2003b), Albrecht and Axell (1984),
Burdett and Mortensen (1998); (ii) jobs are somehow differentiated (Helsey and Strange
and (iii) creation/advertisement of a job is costly, hence employers only advertise jobs they
expect to fill (Manning 2003a).

Although there has been some effort to deal with the interactions between product
and labor markets regulation, the analysis of these interactions has so far ignored the
situations in which employers have high bargaining power. Europe and North America are
no longer the industrial powerhouses they once were. Similarly, unions no longer have the
power they use to have, as shown in the Spanish example mentioned earlier. The recovery
of jobs will have to match the overall transformation of these economies. The real difficulty
facing policymakers that theory should address is thus the need to reduce the risks that the
transformation of the economy is driven by the characteristics of the labor market rather
than the opposite. Stylized facts seem to suggest that policies simply aiming at minimizing
government or at simply protecting existing jobs hurt future jobs. In doing so, they also
hurt the scope for economies to re-invent themselves. Old jobs and old sectors enjoy, de
facto, more protection that the new jobs and new sectors. This is the main focus of the
discussion that follows.

4. The model

This section starts with an intuitive presentation to spell as clearly as possible the
factors we want to account for. The formal modeling then spells out the setup of the model
which is adapted in later sections to build in various forms of labor market regulation
aimed at reducing the bargaining power of employers while stimulating the opportunities
given to the new product and avoid the excess protection of the old market.

a. Intuition

The OECD countries trying to re-invent themselves can be thought of as economies
in which a firm is a match between an employer and at least one worker. In such a typical
economy, there are two sectors, the Old and the New sector, while workers are either old
or young. The choice of a sector by the employer is endogenous while the type of workers
is exogenous. Employers choose the type of jobs they advertise, and workers choose the
type of jobs they apply for. The model of horizontal product diversity developed by Foucart
(2012) offers an ideal framework to represent and analyze the situation. Within that
framework, we consider a polar case in which a large number of employers has full
bargaining power (take it or leave it offers). For technical reasons, we model it as a
continuum of atomless employer.\(^{13}\)

The nature of the matching in this polar economy is horizontal and the match is not
perfect as seen in Table 1. This implies that the difference between sectors and workers is
purely horizontal and it is not a matter of quality. Older workers on the labor market are
more efficient in the old sector (and less so in the new one), while younger workers are less

\(^{13}\) The other polar case is trivial: perfectly competitive employers in a frictionless labor market, where all workers are paid
at their marginal productivity.
efficient in the old sector and would be more efficient in the new sector. Thus, none is strictly dominating the other in terms of marginal value added. Those two types of workers do not have sufficient market power to bargain with an employer. Both are wage takers, but are allowed to search on the market for a better offer. The productivity of workers is perfectly observable, and contracts can be made conditional on output.

<table>
<thead>
<tr>
<th>Labor Market: Workers type</th>
<th>Product Market: Sector</th>
</tr>
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<tbody>
<tr>
<td>Old</td>
<td>OLD Match No Match</td>
</tr>
<tr>
<td>New</td>
<td>No Match Match</td>
</tr>
</tbody>
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Table 1: Horizontal Mismatches in the Product and Labor Market

The model is first solved in the context of a labor market operating without any regulation. The outcome of this policy option is shown to be dominated by the bargaining power of the employer. In this world, an employer sets an equilibrium wage equal to the reservation utility and only advertises jobs in the older sector requiring old skills. The model thus reproduces key observed stylized circumstances. It also reproduces the observed outcome of this situation, showing that such an economy fails to deliver the jobs and the products required to match the needs of an evolving population and of an evolving product market. The model is then used to assess the relative effectiveness of the three policy alternatives mentioned earlier in addressing those needs as compared to the outcomes observed in an unregulated labor market.

b. **Setup**

To focus the discussion on matching in the labor market, we assume the economy is characterized by a continuum of mass 1 of employers. Each employer is simultaneously allowed to advertise jobs in either sector O (Old sector) or N (New sector), but not both.
Job offers are driven by three characteristics: (i) sector, (ii) wage in case of good matching, and (iii) wage in case of mismatch. The idea is that the employer observes perfectly the type of worker and can decide on his/her wage as a function of his/her type. Thus a firm has to decide whether to be in the new or the old sector before hiring, but can make wage offers conditional on the type of each worker. There is also a continuum of mass 1 of potential workers, of type $o$ (old workers) or $n$ (young workers). In most of the paper, we assume there is a strict majority $\alpha$ of workers of type $o$. Most of the game is symmetric with $\alpha<0.5$ (meaning that only jobs in the new sector would be advertised in the decentralized equilibrium, and that search with outcome dependent wage would be similar to what happens with $\alpha>0.5$). However, some differences appear in the presence of policies targeted exclusively at one of the workers group (the older workers, in this case). These differences are discussed in the end of section 5.

A good match ($O-o$, $N-n$) generates a constant marginal product $V$ while a mismatch generates a constant lower marginal product $v$. Employers are allowed to hire more than 1 worker. Each worker randomly draws an employer at no cost, and can either: (i) accept the offer, (ii) reject the offer but continue searching or (iii) give up the search.

If the worker accepts the job, his/her marginal product is determined by the sector in which he/she works and his/her wage is set by the employer (who enjoys full bargaining power). If the worker decides to continue searching for another employer, doing so has a cost in the form of a lower payoff. Every search discounts the final wage by $\delta<1$, such that a wage $w$ received after $n$ searches yields payoff $U=\delta^nw$. Finally, the worker can give up if unhappy with the job offers and take his/her outside option with utility $r$, $0<r<v<V$. The outside option is also discounted after each search.

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14 This is to ensure that the mismatch does not come from information asymmetry or market rigidity.
15 One could also think of this full bargaining power as a monopsony.
16 Thus, the marginal cost of searching is decreasing in the number of searches. The results are robust to linear search costs, but the welfare computations are more tractable using discounting.
5. The failure of a flexible labor market

We first solve the model under a laissez faire policy. In this case, the following proposition is always true.

**Proposition 1:** For any positive search cost (i.e. $\delta<1$), all employers set an equilibrium wage equal to the reservation utility $r$. Hence, workers never have to search and they accept any job. Employers only advertise jobs in sector O which means that all workers of type $n$ are mismatched (and produce less than they could).

**Proof:** For any firm and expected market wage $w$, it is a best response to slightly lower the wage, as long as (i) the new wage $w'$ is such that $w'\geq \delta w$ [incentive compatibility] where $\delta$ is the discount of utility due to the search (ii) the new wage is such that $w'\geq r$ [participation constraint]. Thus, for any $\delta<1$, the only equilibrium wage is $w^*=r$. As this wage is not skill-specific, workers do not have any incentive to search for a good match. As there is a majority of workers of type $o$, employers make higher expected profit by advertising only jobs in sector O.

Proposition 1 explains why a country like Spain has seen the wage of its young educated workers entering the labor market after graduation drop in years of relatively low unemployment just before the crisis.\(^{17}\) Accounting for the bargaining power, search costs and the existence of a reservation wage of workers known by employers, a decentralized market should not be expected to ensure a good skills match. This is because the bargaining power of firms allows them to pay a low wage that does not reflect the actual productivity of workers. As this wage is not skill-specific, there is no incentive for workers to bear search costs to find a good match, as it makes no difference in their wage. As the older workers are a majority, firms only advertise jobs in the Old sector, and have no incentive to start working in the new sector. Jobs in the Old Sector end up only paying the

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\(^{17}\) Well before the crisis, young educated workers were called “mileuristas” because no matter their skills and sector of employment they started to be paid around 1000 Euros per month and only very slowly progressed out of that category.
reservation wage as well, whether the worker is old or young. Indeed, a firm offering a job in the new sector can expect profit of at most:

\[ \pi'_n = (1 - \alpha)(V - r) + \alpha(v - r). \]

As we have assumed that \( \alpha > 0.5 \), this is always lower than the profit of the same firm choosing the old sector:

\[ \pi'_o = \alpha(V - r) + (1 - \alpha)(v - r). \]

Thus, if the beliefs are such that all firms are active in the old sector, and that the offered wage is \( r \), it is a best response for every firm to offer a wage \( r \) and to be active in the old sector. We can show that this is the only Nash Equilibrium of this game. Consider a situation where there is a positive mass of both categories of firms in the market. As shown in proposition 1, all firms set wage equal to \( r \). Thus, no worker has an incentive to search for a firm that corresponds to its type. And firms of sector O make profit \( \pi'_o > \pi'_n \) as depicted above. Therefore, it is a best response for all firms to choose sector O. The same reasoning holds for a situation where all jobs are offered in the N sector. It is a best response for all firms to offer jobs in the old sector as no potential employee will search, due to identical wages in all firms.

From the viewpoint of the employers, since a match between worker and sector ensures a higher marginal product than in the case of a mismatch and the chances of finding an old worker (i.e. a worker with the skills needed in the old sector) in the labor market is higher, it is indeed rational to offer more jobs in the old sector (…and to protect that sector). But the right incentive for the firm is the wrong incentive not only for new workers who are only paid their reservation wage at best, no matter in which sector they work. It is also the wrong incentive from the viewpoint of the economy as a whole as it means that the aggregate output will be lower than the economy’s capacity accounting for the size and skills of its labor force. In sum, a **laisser-faire** protects the past (the incumbent) and hurts the future (the potential or new entrants in the labor market).
6. Options to fix the market failures

We now analyze how 3 potential forms of regulation that could correct the market failure linked to the bargaining power of employers:

a. Guaranteed wage for older workers,

b. Guaranteed wage for older workers with job protection,

c. Outcome-dependent wage.

The first two options are relatively common demands made by unions. We analyze them because they are so common. They do not however tackle the mismatching problem upfront. This is what we try to do with the third option. Each of these options is assessed below in terms of its distributional impact. They are compared in section (iv). In section (v), we revisit the policies accounting for the possibility of a majority of young workers rather than a majority of old workers as we do for sections (i) to (iii). Finally, in section (vi), we discuss the robustness to changes in other assumptions of the model such as welfare benefits and the level of education of the young workers.

a) Guaranteed higher wages for older workers

Assume now a world where there exists labor protection that ensures higher wages for older workers, such that it is forbidden to offer less than \( w_o \) to this type of workers.

**Proposition 2:** Wage protection for older workers either does not change the quality of matching and the share of firms in the old sector, or decreases the quality of matching and decreases the level of employment.

**Proof:** Firms still have incentive to give younger workers a wage \( w=r \). There is a majority \( \alpha \) of workers of type \( o \). The best response for a firm is either to offer only jobs to younger workers in the New sector, or to offer jobs to both types of workers in the Old sector. The expected profits are:

\[
\pi_o = \alpha (V - w_o) + (1 - \alpha)(v - r) \\
\pi_n = (1 - \alpha)(V - r)
\]
If $\pi_o > \pi_n$, higher guaranteed wage for older workers increases the expected wage of older workers, decreases the expected profit of firms, and does not affect the market share of each sector. If $\pi_o < \pi_n$, all firms are on the new sector and all older workers are unemployed. This decreases the total quality of matching. This happens when:

$$(1-\alpha)(V-v) > \alpha(V-w_o)$$

This condition is fulfilled when there are many young workers, or when the guaranteed wage for older workers is high. Also, this condition can only be true when $w_o > v$. In this case, older workers are never employed in the new sector, as their productivity is lower than the wage.

First, as expected, guaranteed minimum wage for old workers may increase their unemployment rate. Second, it does not necessarily solve the matching problem. When it does decrease the quality of matching, it is because firms stop hiring those old workers and switch to the new sector. There is thus a threshold level at which the high level of wages imposed for old workers decreases the incentive for employers to advertise jobs in the old sector. When this happens, the quality of the matching drops because old workers may end up in the new sector. Note that this policy option does not affect the wage of young workers. They stay at their reservation wage. Overall thus, this policy hurts both the past (the old workers) and the future (the new entrants in the labor market).

**b) Guaranteed higher wages for older workers with guaranteed jobs**

The next policy option is designed to reduce the risks of employers compensating for the required guaranteed wage by a policy also imposing guaranteed jobs for older workers. Consider the most general case in which the same guaranteed minimum wage is imposed as in case (i) but where firms are forced to offer jobs to old workers, regardless of the sector. Think, in the short run, of existing firms facing rigidities in firing workers. In that world, proposition 3 holds.
**Proposition 3:** Wage protection for older workers, when accompanied by job protection, does not affect the quality of matching but deters job creation in the new sector.

**Proof:** Now, one has to compare the expected profit made by offering jobs to both types of workers. Since, in the new sector, firms have to offer jobs at wage $w_o > v$ to older workers, they make negative profits from these old workers.

$$\pi_o = \alpha(V-w_o) + (1-\alpha)(v-r)$$
$$\pi_n = \alpha(v-w_o) + (1-\alpha)(V-r)$$

The condition for switching to the new sector becomes:

$$\pi_n > \pi_o$$

$$(1-\alpha)(V-v) > \alpha(V-v)$$

As $\alpha > 1/2$, this condition is never fulfilled. This implies that firms never have an incentive to switch to the new sector if they have to keep the older workers.

Proposition 3 implies that this new rigidity can be either interpreted as a good or a bad news depending on the objective. While it allows higher total employment as long as there are jobs in the older sector, it slows down the transition towards the jobs of the future. Indeed, it makes it more complicated to create a switch from the old sector to the new sector, as developing jobs in the new sector implies losing money on the old workers. Firms are forced to keep the older workers, which are a majority. Regardless of the wage they have to pay them, the firm is more efficient with a majority of workers having a good match. Thus, the employers always choose the old sector. Moreover, this means that it does not affect the quality of matching. Finally, while it improves the wage of older workers, it does not affect the wage of younger workers. Overall thus, the impact of this policy is more complex. The signs of its impact are similar to those of a *laisser-faire* policy, although in a different way as it not only protects old sectors, it also protect old workers. Thus, it helps the past (protects older workers) and better so than the *laisser-faire* policy.
option but hurts the future by hurting the new sector and failing to protect the new workers.\footnote{Clearly it is hard to argue this analytically within our framework since we do not have any dynamic feature. But it seems reasonable to assume that anything that slows the prospects of the potentially most productive part of the economy will hurt the future. In macroeconomics terms, it increases the wedge between actual and potential GDP.}

c) **Outcome-dependent wages:**

The third policy option is one that tries to address the weaknesses of the previous two. To do so, consider a regulation ensuring that a certain share $\kappa$ of the matching surplus has to be given back to workers. This has to be decided by a social planner, as, on their own, firms have no incentive to individually change the remuneration scheme. If $\kappa$ is high enough, such that $\kappa V > r$, then there may start to exist an incentive for workers to search for the “right” employer. There also exist Nash Equilibria where firms only offer jobs in one sector. For instance, advertising jobs only in the *Old* sector is Nash, as employees do not expect to find jobs in the *New* sector. Therefore, they do not search, and offering jobs in the new sector is a dominated strategy for employers. However, these Nash Equilibria are not robust to a small perturbation in those expectations. We define Equilibria robust to those perturbations as “stable.” In that case, proposition 4 holds.

**Proposition 4:** Outcome-dependent wages either do not affect or increase the quality of the matching. In the stable equilibrium of the game, a share of jobs in the new sector corresponds to the share of young workers, and the quality of the matching increases.

**Proof:** In this stable equilibrium, both types of workers search, hence, considering a probability $\Upsilon$ for each employer to choose sector $O$, the profits are given by:

$$\pi_O = \frac{\alpha(1-\kappa)V}{\Upsilon}$$

$$\pi_N = \frac{(1-\alpha)(1-\kappa)V}{1-\Upsilon}$$

As employers are free to choose their sector, the equilibrium share $\Upsilon$ is the one that equates expected profits. Thus:

$$\Upsilon^* = \alpha. \text{ And } \pi^* = (1-\kappa)V$$
This proposition implies that all workers get a good match and see their wage increase (as compared to the *laisser-faire* policy). The problem is that this takes place at the cost of frictional search and unemployment. Indeed, this is the only equilibrium where some of the workers actually search for a job. As this process may take time, this will reflect in frictional unemployment.

It should be noted that with this policy, the profit of employers may actually also increase if:

\[(1- \kappa)V > \alpha(V-r)+(1-\alpha)(v-r)\]

For sufficiently small search costs, \(\delta \rightarrow 1\), the condition for the matching to be efficient is \(\kappa V > r\). In this case, there always exist a \(\kappa\) satisfying this condition, and such that the profits of firms also increase. As search costs increase, the wage also has to increase and lowers the profit of firms.

This also allows us to get a sense of the scope of job subsidies for the older workers one may need if output of those workers is not observable. Indeed, labor intensive industry such as car production or mining may make it complex to monitor the individual contribution of every worker. Consider \(w'_o\) as the minimum wage such that old workers accept to bear the search cost in the presence of a share \(Y^* = \alpha\) of employers in sector \(O\). Then, the total wage subsidy (above the market equilibrium one) is \(\alpha(w'_o-r)\). Assume the outside option corresponds to unemployment benefits, the total fiscal cost of subsidizing jobs in the Old sector is lower than unemployment benefits if:

\[\alpha(w'_o-r)< \alpha r\]

\[w'_o<2r\]

And \(w'_o\) is the solution to:

\[r \leq \alpha \delta w'_o \Sigma (1-\alpha)^i \delta^i\]

\[w'_o \geq r(1-(1-\alpha)\delta)/(\alpha\delta)\]

Thus, this wage is increasing in the outside option and in the search costs, and decreasing in the share of older workers (as it is also the share of firms in the *Old* sector).
d) **A comparative summary of the impacts of the three policy options**

Table 2 summarizes the distributional impacts of the various policies to help highlight the main tradeoffs. Two observations stand out. The first is that, in an environment in which employers enjoy full bargaining power, none of the standard policies (*laissez-faire*, wage protection with and without job protection for old workers) manages to simultaneously avoid unemployment and mismatches between workers and sectors. The only policy that gets close to meeting the two objectives is the adoption of outcome dependent wages. The second observation is that, in an economy in which a majority of workers are old workers, protecting the old sector, hurts as the traditional policies can only be achieved by a misuse of young workers. This is why we argued earlier that with traditional policies, there is a de facto choice between the past and the future of the economy. The *laissez faire* policy, without any minimum wage, ensures jobs for everyone in the short run, but the market fails to offer jobs in the new sector (i.e. the sector of the future), which may underuse and eventually erode the qualification of those younger workers. A minimum wage for older workers does not sensibly affect the result, unless it is high enough to give an incentive to firms to fully switch to the new sector, at the cost of having the older workers unemployed. This switch never happens if there is job protection for the older workers.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Young workers</th>
<th>Older workers</th>
<th>Firms expected profit</th>
<th>Total Unemployment</th>
<th>Jobs in the new sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>waige</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Laissez faire</em></td>
<td>R</td>
<td>Wrong job</td>
<td>r Good job</td>
<td>αV+(1-α)v</td>
<td>None</td>
</tr>
<tr>
<td><em>wₖ</em> (&lt;i&gt;high&lt;/i&gt;)</td>
<td>R</td>
<td>Good job</td>
<td>r Unemployed</td>
<td>(1-α)V</td>
<td>α</td>
</tr>
<tr>
<td><em>wₖ</em> (&lt;i&gt;low&lt;/i&gt;)</td>
<td>R</td>
<td>Wrong job</td>
<td><em>wₖ</em> Good job</td>
<td>α(V-<em>wₖ</em>)+(1-α)v</td>
<td>None</td>
</tr>
<tr>
<td><strong>Wₖ and job protection</strong></td>
<td>R</td>
<td>Wrong job</td>
<td><em>wₖ</em> Good job</td>
<td>α(V-<em>wₖ</em>)+(1-α)v</td>
<td>None</td>
</tr>
<tr>
<td><strong>Outcome dependant wage</strong></td>
<td>κV</td>
<td>Good job</td>
<td>κV Good job</td>
<td>(1-κ)V</td>
<td>frictional</td>
</tr>
</tbody>
</table>
The table thus makes it clear that to get the economy to support its new sector, a non-traditional policy is needed for the labor market. Outcome dependent wages is one option. It allows having a large share of the younger workers in the new sector, which is the right match for them (i.e. a good jobs). What is important however from a social viewpoint is that the policy would be easy to sell to the majority of workers in an economy dominated by older workers. They will also have a job that matches their skills. Of course, in the real world, the policy is likely to be a challenge. Not every individual contribution to output can be measured. This simply means that some jobs may have to be subsidized and this fiscal cost has to be compared either to the loss of not investing in the new sector, or to the cost of having to pay welfare compensation to unemployed older workers.

**e) What if the economy were dominated by young workers?**

Up to this point, we assumed that the majority of workers were old. It may be useful to consider the case of an economy in which young workers dominate the labor market. This could happen with an acceleration of fertility for instance, or if there is massive immigration that changes the composition of the labor market. This is a realistic scenario for some countries or at least some regions in Europe. This would also be a useful way to describe the situation of countries switching from a planned economy, with a public sector as the dominating employer, to market economies, with strong labor reductions in that sector (often early retirements) and a growth in the more dynamic sector. The common point here is that the relative importance of workers in the private sector increases drastically. The massive reduction in public sector jobs shifts the domination of the market by new workers who invested in education to increase their chances of finding a match in the private sector. Within our model, tracking what would happen can be done by assuming that $\alpha<0.5$.

In this case, the *laissez-faire* labor market result is straightforward: the market provides jobs only in the new sector, and both types of workers are hired at the reservation wage. The result in the presence of outcome-dependent wage is exactly similar to the one with a majority of older workers, as both types of workers search until they find a good match. In the presence of a minimum wage without a guaranteed job, older workers are
employed in the new sector, unless \( w_o > v \), this is, as long as their marginal productivity outweighs the labor cost.

Where the results of this change of assumption yield new insights is for policies to protect jobs for the remaining old workers, as is quite common in the sort of situations in which there are massive layoffs that change the core characteristics of the labor market. As in the previous case, the guaranteed wage does not interfere in the choice of sector: all jobs are in the new sector. However, now, a wage that is higher than marginal productivity can be sustainable, as long as the profits of firms are positive. Indeed, firms make profits on the marginal product of young workers. If employers are forced to keep old workers they will still advertise jobs only in the new sector as the total product is higher and the labor cost is identical to what it would be in the old sector. The striking fact is that in this type of economy, the policy leads to a situation in which old workers get better paid than young ones, even if they are less productive.

Guaranteeing wage and jobs for old workers is thus possibly a decent policy to help the future while protecting the past, but only if the new generation is sufficiently large in the labor market. It is interesting to note that in an economy in which the new workers start to dominate the labor market, any effort to delay the retirement age, such as those being considered and sometimes adopted throughout Europe, reduces the opportunity to transform the economy into one in which the new generation dominates. Protecting the older generation may thus mean helping many of them to retire rather than making them work longer. It still protects the old workers who continue to work but it allows the economy to use the skills of the young worker. These are the drivers of the future since their skills are those needed to have the high marginal product.

f) A word on the relevance of social and education policies

The model can also be used to get a sense of the impact of a social policy such as unemployment or more general welfare benefits. This can be done by simulating changes in the reservation utility \( r \). In terms of the quality of matching, increasing welfare benefits is not a bad thing according to this model. For instance, \( r > v \) gives incentive to employers to only attract workers that are a good match. The new problem that emerges is that in the
presence of high search costs, this also may make it impossible to hire some types of
workers, and thus create new unemployment. The results are very similar to those
obtained in more standard models of the labor market.

A second parameter of interest is the level of education of the new generation.
Differences in education levels can be modeled as differences in the marginal product. In
the presence of different marginal product for a high match by old or young workers, one
can imagine to have $V_o$ and $V_n$, respectively the marginal product of an old or a young
workers when correctly matched. If the young generation is more educated, or if a good
match in the new sector is more productive, one can reasonably consider that $V_n > V_o$. The
effort in education (investment in higher education for instance) is a key factor in
determining the value of $V_n$.

In that case, as long as

$$\alpha(V_o - r) > (1 - \alpha)(V_n - r),$$

a high level of education is bad for young workers, as their qualification increases, remains
unused, and does not affect their wage. However, increasing the level of education is only
detrimental when this inequality is fulfilled. Otherwise, firms have incentives to switch to
the new sector. This happens in the presence of a large share of young workers, or in the
presence of very high skills of those workers. Therefore switching to the new sector might
be feasible faster in the presence of high fertility rates (more young workers). Where
fertility rates are low, increasing the education level of the young does not improve the
match.

7. **Concluding comments.**

From a conceptual point of view, the main contributions of this paper show: (i) why
the presence of high bargaining power for the firms in the labor market demands a policy
intervention; (ii) that the existence of search costs drives the optimal choice of policy
interventions, as they define the quality of the matching between worker types and
sectors; (iii) that the bargaining power of firms can be detrimental for the firms
themselves, as it hinders exhausting all the possible gains from trade. Therefore, reducing search costs should be a reasonable policy goal.

From a strict labor policy point of view, this paper shows that: (i) common policies designed to try to protect the past (old workers and old sectors) can lead to unproductive yet costly outcomes in terms of future prospects for both old and young workers and the new sector (i.e. more unemployment and lower growth prospects from a more productive economy); (ii) a successful switch to the new sector may imply a loss of jobs for old workers; under the initial basic assumptions, this switch is thus unlikely to happen since old workers form a majority and are unlikely to have much incentive to help the economy support the new sector (i.e. switch to a sector that supports a higher growth path) since it would cost most of them their job, and (iii) as the economy evolves and young workers start to dominate, protecting the older workers and helping them retire early are both desirable policies.

In a crisis context, the model suggests that betting on liberalizing the labor market including in the public sector when this sector is dominated by old workers, as suggested by the most conservative parties, will not deal with the horizontal mismatches in the labor and product markets. However, simply betting on protecting salaries and jobs in the old sector is just as undesirable as it reduces the scope to improve growth prospects.

An essential result is that it is possible to design a policy to protect both old and young workers as well as the growth prospects approximated by the relative importance of the new sector. It would entail giving at least the same opportunities to new workers and new needs as those given to old jobs and old products. It also required avoiding the potential danger of promoting the new sector without protecting the old one. Relating wages to outcome would deliver this desirable structure for jobs and products in the economy.

Overall, the simple model proposed here manages to highlight some key issues of direct relevance to the choice of policies in economies characterized by polarized labor and product markets. In a context in which the Schumpeterian vision of economies seems to increasingly define policy choices in OECD countries, the model shows that policy makers
restrict themselves to policies stimulating innovation in the product market. Getting the switch from old to new right in the product market requires getting it right as well in the labor market. Current policies are unlikely to help much. They underestimate the importance of search costs and welfare benefits. An extension of the model is needed however to document the importance of transition costs, which are hinted at in the discussion on the mismanagement of investment in education and welfare benefits. A dynamic version of the model is thus the most natural next step in this research.
References


