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Employers' Associations, Worker Mobility, and Training*

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Abstract

This paper studies firm-provided training in a context of potential worker mobility. We argue that such worker mobility may be reduced by employers' associations (EAs) through no-poach agreements. First, we sketch a simple model to illustrate the impact of employer coordination on training. We then present supporting evidence from rich matched panel data, including firms' EA affiliation and workers' individual training levels. We find that workers' mobility between firms in the same EA is considerably lower than mobility between equivalent firms not in the same EA. We also find that training provision by EA firms is considerably higher, even when drawing on within-employee variation and considering multiple dimensions of training. We argue that these results are consistent with a role played by EAs in reducing worker mobility.

Keywords: Employers organisations, No-poach agreements, Worker mobility.

JEL Codes: J53, J62, L40.

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1 Introduction

No-poach agreements (NPAs) have recently been documented in the US (Krueger & Ashenfelter (2018)),^{1,2} and have motivated an executive order (White House (2021)) seeking to ban or limit no-poach and non-compete agreements, and to prevent employers from collaborating to suppress wages.³

While regulators have seen these agreements as being generally detrimental to worker welfare, one positive reason for firms to collude in the labour market may be to mitigate poaching (or quitting) externalities. This idea can be traced at least as far back as Pigou (1912) and arises when some of the returns from investment in training may accrue to an outside firm if a worker quits their original firm, leading to levels of training that are too low from a societal point of view.⁴ This situation may prompt firms to increase their coordination towards lower levels of worker mobility. Thus firms may engage in no-poach agreements not only to reduce their labour costs (from wages and turnover) but also to increase their returns from training.

In this paper, we investigate the potential role of *employers' associations* (EAs) in promoting employers' coordination on an NPA. EAs are better known as the counterparts to trade unions in collective bargaining (OECD (2019)) in many countries. However, EAs typically provide many additional (sectoral) public goods, including representation, industry lobbying, and dissemination of information across their members. We argue in this paper that EAs may also promote *collusion* amongst affiliated firms, both in the product market and in the labour market, and this may influence the training provision of their member firms.

Specifically, we analyse the role of EAs in potentially restricting worker mobility between firms and how this impacts training. We highlight a model in which firms invest in general human capital, and trained workers may receive outside offers. Membership of an EA means

¹As stated in the published version (Krueger & Ashenfelter (2022)), “as a direct result of an early draft of this paper many, if not all, franchise no-poaching agreements have been forcibly abandoned because of actions by the Washington State Attorney General and others.”

²As reported in New York Times (2018), “Seven major restaurant chains, including McDonald’s, agreed to drop a hiring practice that critics say may be keeping tens of thousands of fast-food workers locked in low-wage jobs. The provisions prohibit workers at one franchise from going to another franchise of the same restaurant chain. No-poach clauses have drawn scrutiny over whether they hold down pay for restaurant employees”. See also U.S. Department of Justice (2021) for further evidence of wage collusion across employers.

³In the executive order, White House (2021), the U.S. President encourages the U.S. competition agency to ban or limit non-compete agreements. The executive order also seeks to strengthen antitrust guidance to prevent employers from collaborating to suppress wages by sharing wage information with one another.

⁴“Franchise owners say the clauses help protect their investments of time and money in training employees” (New York Times (2018)).

workers face reduced opportunities to further their career outside of the training firm, but the firm will provide correspondingly more training. Our conclusion from this, and other relevant literature, is that participation in an EA which implements an NPA would be expected to lead to more training.

In the empirical application, we draw on matched employer-employee panel data from Portugal over three years (2009-2011), including information on EA affiliation of each firm and employee firm-provided training of each worker. We find results that are consistent with NPAs and consistent with the theory. In particular, we find that EA workers are less likely to move to another firm *of the same EA* and that EA workers tend to receive (much) more training from their employers than other similar workers.⁵

Given legal restrictions on NPAs in most countries, and the likely tacit nature of existing NPAs, examples of EAs operating such agreements are not common.⁶ A recent example in Europe however is the Portuguese football league’s decision that their member clubs should not hire players that had quit their former clubs during the pandemic. As indicated in Competition Authority (2022), “Through a no poach agreement, the companies refrain from hiring each other’s workers, thus renouncing competition for the acquisition of human resources, besides depriving the workers of labor mobility.” This led to a 11.3 million euro fine imposed in 2020 by the Competition Authority of Portugal on the country’s football league and its 31 member clubs (Competition Authority (2022)).

Our paper contributes to both empirical and theoretical literatures. To our knowledge there are no extant studies of the impact of NPAs on training; there is however one paper, Starr (2019), discussed below, which looks at the impact of non-compete covenants on training, and which might be expected to have similar effects. Moreover we believe this is the first paper that examines empirically the potential role of EAs in employers’ labour market coordination, such as no-poaching agreements, and its implications for training. There is also little theoretical work which explicitly considers the training impact of varying the outside opportunities of trained workers, and we discuss a theoretical framework to analyse this. Empirically, our paper also contributes to the recently growing literature on monopsony (Azar et al. (2022,

⁵We note in passing that the study of interfirm worker mobility is also relevant on its own. The mobility of workers across firms can be an important source of both productivity and wage growth. Worker mobility will tend to increase the size of more productive firms (which attract workers by paying higher wages) and decrease the size of less productive firms (which will not be able to cover the salary offers of competing firms).

⁶The authors know of anecdotal evidence concerning two different industries, in different countries, where employers affiliated in the same employers’ association actively try to prevent worker mobility amongst their firms. We do not provide specific information on these for legal reasons.

2020), Bassanini et al. (2022)) in that it implies that industry concentration alone may not capture the degree of competition if there are tacit arrangements such as an NPA.

The remaining of the paper is as follows: Section 2 reviews the theoretical and empirical literatures and Section 3 present a simple model. Sections 4 and 5 describe the institutional setting and the data sets we use; Section 6 present our empirical results. Finally, Section 7 concludes.

2 Literature

2.1 Related theoretical literature

There are few papers that consider the effect on training of *varying* the degree of mobility when there are endogenous separations. A notable exception is Stevens (1994). In her model, investment may be in specific or general human capital, and the latter may be transferable to outside firms in differing degrees: specifically, some dimension of investment in human capital potentially benefits output in the training firm and a subset of outsider firms equally (but randomly). Varying the size of the subset of outsiders, which would be one way to model the possibility of increased outside opportunities, leads in her model to no effect on *general* human capital investment. The logic here is that although the leakage of surplus to outside firms is increasing in the subset size up to some point, and workers will be more likely to leave, leakage does not vary with the level of investment.

There is a small literature analysing the impacts of restrictions on mobility (“covenants not to compete”) where training investments occur. One is Posner et al. (2004). While it excludes the pure general human capital case that we analyse, it considers in an incomplete contracting model the trade-offs between enhancing investment incentives by restricting mobility and achieving efficient *ex post* mobility. They show that first-best outcomes arise when full mobility is still possible if mutually agreed *ex post* between employer and employee. A closely related model is Garmaise (2009) which looks at the effects of non-compete enforceability on training of managers. Again, this excludes the pure general human capital, and allows for *ex-post* mobility if all parties agree. It considers firm training, which is more likely to take place if a non-compete exists, and also self-funded training, which is correspondingly lower. Ghosh & Shankar (2017) contrast non-compete agreements with no-poach agreements. They model the former as putting a limit on the extent to which training is transferable

to outside firms (and so effectively specific human capital formation), and characterise the optimal degree of transferability, whereas a no-poach agreement is an extreme version where there is no transfer (and hence no incentive to poach). These papers, as here, consider the trade-off between training and efficiency enhancing outside opportunities.

A paper without realised mobility in equilibrium which explicitly addresses whether a noncompete agreement can increase training is Meccheri (2009). In his reduced-form model a noncompete reduces the worker's outside option. He applies the outside option bargaining principle to the second period bargaining (see also Balmaceda (2005) for a similar model). By reducing the frequency of a binding outside option, the noncompete increases the return to training. (As there is no mobility in equilibrium this approach is less useful for our purposes.)

There is also a literature on non-competes which deals with similar issues, but in a context where an employee who leaves may be in a position to compete with the initial employer, bringing in an additional effect. See Wickelgren (2018) for a discussion of this literature.

The above literature endogenously derives job flows. There is in addition relevant work which assumes that separations are exogenous.⁷ The basic model with an exogenous probability of separation and a competitive market for trained workers would predict that the worker finances training at the optimal level by taking a sufficiently low period one wage, as argued by Becker (1962). Acemoglu (1997) argues however that if labour markets are frictional, investment in general human capital, while positive, is too low from a societal point of view because the firm-worker problem doesn't take account of any surplus that accrues to outside firms – i.e., if the worker in a new match only retains a fraction of any increase in output due to training. This externality cannot be captured by the initial worker-firm pair, so even if they have a contract that is “internally efficient” with the worker contributing to training costs, the loss of return to training cannot be avoided. This logic would also imply that as the probability of separation increases, this externality increases and training will fall.

There are some papers with endogenous separations and with ex post wage determination in which investment in human capital is too low. Although they do not vary the likelihood of poaching occurring, this is suggestive of a negative effect of outside opportunities on training. In Booth & Chatterji (1998) and Stevens (1996) firms choose how many workers to train rather than the level of training, and human capital is not fully general. They show that wages are set too low leading to excessive turnover. For example, in Stevens (1996) the firm

⁷We discuss such a model when there are credit constraints in Section 3.

only benefits from a fraction of the gap between productivity and the wage because some workers quit, and the worker only benefits from the difference between the trained wage and the wage an untrained worker would get, so the combined return to the worker and firm is smaller than the productivity gain. This leads to inefficiently low training as too few workers are trained. Likewise, Moen & Åsa Rosén (2004) show in a model with competitive search that if wages are set ex post to maximise profits, then wages are too low, turnover too high and general training too low relative to the social optimum. However if firms and workers can commit to contracts – more generally if there is internal efficiency – then in contrast to Acemoglu (1997) and despite the frictional labour market for trained workers, both investment in general training and allocation of trained workers to firms is efficient.

While the literature broadly suggests that more turnover is likely to lead to lower investment in training, Booth & Zoega (1999) is an exception that shows in a real options model under uncertainty about future firm productivity, the effect can be reversed as firms wait less time before training new workers when the quit rate is higher.

2.2 Related empirical literature

The only study of which we are aware estimating the impact of mobility restrictions on training is Starr (2019). He exploits cross-state variations in noncompete enforceability in the U.S. and estimates a +14% effect on firm-sponsored training from increasing enforcement from zero to the mean state level (though he finds no noticeable effect on self-sponsored training and a reduction in hourly wages). Consistent with this, higher enforceability also is associated with increased mean tenure (and hence lower mobility). To conduct this analysis, he constructs an index of enforceability using a factor analysis. Covenants not to compete, while agreed at the firm-worker level rather than between firms as in a NPA, may have a similar effect on competition in that they restrict the mobility of workers between certain firms, although as documented by Starr, how this works varies considerably across U.S. states.⁸

There is also some indirect evidence. At a broad level, Acemoglu & Pischke (1999) argue that evidence that high turnover economies such as the U.S. have lower formal training than low turnover economies such as Germany, is consistent with the view that mobility adversely

⁸In most cases for a noncompete to be enforceable, it must be demonstrated that the firm has invested in the worker acquiring some valuable information which it seeks to protect. Once this hurdle is passed, however, Starr argues that further investment in training then becomes equally protected. In addition, some states will only enforce a noncompete if it can be demonstrated that some “consideration,” such as additional pay or bonus, is provided in exchange for signing the noncompete.

affects training. Garmaise (2009) studies executive mobility using a similar cross-sectional approach to Starr (as well as a time-series test using changes in the law over time in certain states). He finds that greater enforceability leads to reduced mobility, in line with theoretical predictions. While not testing the impact on training, he argues that the results on manager compensation are suggestive of there being more firm investment in training in jurisdictions where enforcement is greater. There is work in a number of countries finding that firms provide less training in dense regional labor markets: Brunello & Gambarotto (2007) for the UK, and Brunello & De Paola (2008) for Italy. Using Swiss data and defining regional labour markets by travel time, Muehleemann & Wolter (2011) get similar results, strongest at the extensive margin of whether a firm trains at all. Marcato (2022) finds that employers in Italy in highly concentrated labor markets provide more training at both the extensive and intensive margins. These papers support the theory that potential labour poaching, assumed to be greater in dense labour markets, adversely affects firm-financed investment in general training. These papers also point out that there may be agglomeration effects that go in the other direction in dense markets, although these effects are not sufficient to offset the apparent negative poaching effect.⁹

The above literature suggests that mobility has an important effect on training. One study, however, which looks in some granular detail at poaching, finds that it appears not to be an important phenomenon in the German system at least. Mohrenweiser et al. (2019) use a novel empirical strategy for German data to directly identify workers who are poached, and thereby also identify training firms which are “victims” of poaching. Given the German apprenticeship system is thought to provide a high level of transferable skills, it is interesting to see whether training firms are systematically losing many workers to poaching (which would be a puzzle from the point of view of theory given the level of training). They conclude that this is not the case; losing workers to poaching appears to be largely transitory, relating to firm downsizing events when a firm is not in a position or willing to, e.g., make counter-offers to retain staff. This finding does not rule out the effects of *potential* mobility on the contract (and on training) if for example firms respond with contracts that limit quits, for example by paying higher wages to retain trained workers.

⁹By locating where similar competitors are located, firm investment in general human capital may be subject to hold up as the worker can take her human capital elsewhere (Matouschek & Robert-Nicoud (2005), Almazan et al. (2007)) (see the discussion in Section 3). For worker provided training, Rotemberg & Saloner (2000) stress the positive effects of agglomeration.

Recent research on labour market monopsony or market power, including Azar et al. (2022, 2020) and Bassanini et al. (2022), finds evidence of local labour markets characterised by high levels of employer concentration and that such concentration is associated with lower wages. Concentration is measured using the number of employers in a given local labour market (a combination of a region, such as a commuting zone, and an occupation). Any restriction on hiring of the type we study is likely to lead to further monopsony power, beyond that indicated by concentration.

Finally, while we look at general human capital accumulation, specific human capital accumulation is also impacted by inter-firm worker mobility. For instance, Buchinsky et al. (2010) consider workers' mobility decisions to study returns to tenure. Hijzen et al. (2013) draw on workers moving between firms to estimate wage premiums of foreign firms. In general, worker mobility has been used extensively to decompose firm and worker heterogeneity and study the wage returns or premiums of specific firm or worker attributes.

3 Theory

In this section, we discuss the predictions of theory. Our main focus will be on firm financed acquisition of general human capital, as this is most relevant to the training data we use.

To do so, we will use a simple theoretical framework. See Brunello & De Paola (2004) for the basic model we use here and a useful discussion of the turnover-training relationship. Assume that a worker works at a firm for two periods. In period one, output of the (untrained) worker is zero and wages are equal to zero, but training at level τ takes place at a cost $c(\tau)$ which is borne by the firm. Denote by $y(\tau)$ and $w(\tau)$ productivity and wages, respectively, in the second period, and assume for simplicity there is no discounting and firms and workers are risk neutral. Assume finally that there is a probability of separation q between periods one and two. Assuming that firms in the same EA have a no-poaching agreement, we hypothesise that there will be fewer outside opportunities for trained workers in such firms, and hence a lower value of q relative to non-EA firms. The theoretical question concerns the relationship between q and τ .

It is important to highlight the assumption that period-one wages are fixed.¹⁰ If they are

¹⁰At zero without loss of generality, to avoid extra notation. This is to be thought of as a binding minimum wage – allowing wages to be higher would not affect results as firms would always prefer the lowest possible period one wage in the models we discuss.

not, and can take any value, Becker (1962) argued that since the worker benefits from general human capital investment, it will be financed by the worker, if necessary by taking a pay cut in period one, and training will be at the socially optimal level. As Stevens (1996) says, Becker shows “the old argument about externalities was false in the case of general training. [...] Although Becker’s refutation of the externality argument referred only to the cases of purely general and purely specific training, he was widely interpreted as having disproved the existence of a ‘poaching’ externality” (p. 22). The fixed wage assumption corresponds to the idea that workers are credit constrained and cannot take a sufficiently large pay cut to finance training, which must then be firm-financed. Consequently it is this case we mainly focus on.

As training is in general human capital, and assuming separated workers are guaranteed work, the first-best level of training τ^* requires the following:

$$c'(\tau^*) = y'(\tau^*)$$

(where the primes denote first derivatives), i.e., the marginal cost of training equals its marginal product.¹¹ This is a useful benchmark as much of the literature relates its results to the efficient level. Profits of the firm are:

$$(1 - q)(y(\tau) - w(\tau)) - c(\tau). \tag{1}$$

Consider first the case where q is exogenous. If there is *perfect competition* in the labour market so the worker can costlessly quit and realise their full value elsewhere then $w(\tau) = y(\tau)$ and the firm would not invest, independently of the value of q . Only the worker has an incentive to pay for training (but as discussed above, this is precluded by the assumption that the worker is credit constrained). As argued in Acemoglu & Pischke (1999), a necessary condition for the firm to invest in training is that there is some “wage compression” in the sense that the increased productivity of the worker is not fully reflected in wages (i.e., the gap between $y(\tau)$ and $w(\tau)$ is increasing over a range of training levels) so the firm will get some return from training investments.

Thus interest has focused on situations where there is wage compression. A number of reasons for its existence have been studied. For example, if there is imperfect competition

¹¹Assuming the standard second-order conditions that $c'' > 0$ and $y'' < 0$ (increasing marginal costs of training and decreasing marginal returns from training), and that $\tau^* > 0$, where $''$ denotes a second derivative.

in the market for trained workers, even with general human capital, not all of its value can be recouped by the worker. As an example, assume that the firm cannot commit to the second-period wage when the worker is hired; instead suppose there is Nash bargaining where the outside options for the firm and worker are 0 and the income the worker would receive if they quit, respectively. Moreover, suppose the worker can only recoup a fixed fraction of any increase in their productivity if they quit, due to the imperfect competition in the market for trained workers. It follows that as training increases, the surplus to be shared in bargaining also increases (as the worker's outside option only increases by a fraction of the extra output they contribute). Since the firm gets a fraction of the surplus under Nash bargaining, it will receive some positive return on its investment, and investment will be positive (but suboptimal).^{12,13}

As our interest concerns the relationship between the separation rate and training, and not optimality *per se*, consider now the above scenario but where q is varied. Suppose that $w(\tau)$ is independent of q , as would be the case in the bargaining model above. Then τ falls as q increases. Intuitively, the firm does not get any benefit from investment if the worker leaves, so the marginal return to training falls as turnover increases (see Acemoglu & Pischke (1999), Brunello & De Paola (2004)).¹⁴ Note that the assumed wage compression is needed for there to be any positive return to investment by the firm when the worker stays; the separation probability means this happens with a probability less than one, reducing the return. If the worker separates, it doesn't matter whether the returns from training stay with the worker or go to the outside firm as a poaching externality; either way they are lost to the firm.¹⁵

To summarise: assuming the separation rate is exogenous, if it is higher in non-EA firms,

¹²Acemoglu & Pischke (1999) model the outside option by assuming that a worker who quits faces some probability of unemployment. Otherwise the worker engages in Nash bargaining with a new employer, where the outside option to this bargain is a fixed unemployment pay. Then the bargained wage with the outside firm will only capture a fixed fraction of any increase in productivity (given by the worker's bargaining weight), and moreover the chance of unemployment adds a productivity independent component to the outside option. So the bargained wage in the initial match does not fully respond to increases in $y(\tau)$.

¹³Another reason for the existence of wage compression is if outside firms cannot perfectly observe τ . Then it may be impossible for the worker to realise their full value if they quit, again compressing the outside option as τ varies.

¹⁴For example, if any increase in the second-period wage is a fixed fraction, say $\theta < 1$, of the increase in the worker's productivity, first-order conditions for the choice of τ to maximise profits when q is exogenous can be written as $(1 - \theta)y'(\tau) = c'(\tau)/(1 - q)$. Given we are assuming that the marginal product of τ is decreasing, and the marginal cost of training is increasing with τ , as is standard, τ must fall. A similar argument is shown by Acemoglu & Pischke (1999) to apply to the bargaining setup described in Footnote 12.

¹⁵Acemoglu & Pischke (1999) (Section II.E) consider also the non-credit-constrained case where firms must offer trainees a market determined utility; they assume w is determined by bargaining (this is unimportant as joint surplus is maximised by choice of τ). Inefficiency only results from the chance of separation and a lower return to τ than $y'(\tau)$ in that event, as in Acemoglu (1997).

then we expect training to be lower *ceteris paribus*.

Given that an implicit no-poach agreement between members of an EA likely impacts on the job opportunities of workers in such firms, taking separations as being purely exogenous may miss important effects. We therefore consider next a model where separations are *endogenous* and occur through poaching; q now corresponds to the *quit rate*. Profits are still as in (1), but the response (and hence return) to a change in τ may now involve q changing, given that outside offers depend on τ ; moreover the firm anticipating this response may set w differently than when q is an exogenous variable and this will also affect q .

Specifically, suppose that rather than a single outside wage as in the competitive case where workers can quit and receive the value of their human capital, workers receive a limited number of outside offers (we abstract from on-the-job search intensity). Assume that these offers are drawn from a distribution reflecting potential match specific additive effects (match specific productivity, for example, or attractiveness of amenities such as firm location to the worker if the distribution reflects total utilities). Further suppose that a worker will leave if a better outside offer is received than $w(\tau)$. We then model the no-poach agreement by assuming the number of outside offers is lower for a firm in an EA.

In the absence of commitment (e.g., a legally binding contract) to the period-2 wage, suppose the firm determines $w(\tau)$ optimally as an efficiency wage, balancing lower wages (good for profits) against an increased chance of a worker getting a superior offer from outside (bad as $y(\tau) - w$ is lost). However if the entire distribution of outside offers shifts up by the increase in $y(\tau)$ following an increase in τ , as might be expected with general human capital investment, then the return to investment will be zero and we have $\tau = 0$, independent of q . The reason for this somewhat surprising result is as follows. In period 2, τ is pre-determined, so the firm will set w to maximise $(1 - q)(y(\tau) - w(\tau))$ where q is now the chance an offer superior to w is received. At higher $y(\tau)$ the firm will keep $(y(\tau) - w(\tau))$ constant, so profits do not increase.¹⁶ This is akin to the result that under perfect competition firms will not finance general human capital formation; the difference is that here $y(\tau) - w(\tau)$ will be positive; nevertheless as it is constant in τ when w is set optimally, there is no return to training.

¹⁶The firm chooses w to maximise $(1 - q)(y(\tau) - w)$, where q depends only on $y(\tau) - w$ by the assumption that human capital is general. Thus the firm equivalently chooses the optimal level of $y - w$. Any change in y is matched by the same change in w , leaving q and period 2 profits unchanged. (This argument assumes that the efficiency wage has an interior solution, so that the optimal w does not violate any minimum wage constraint.)

A variant of this model that does have positive training is as follows. Rather than w being optimally determined ex post, suppose that the firm can *commit* to w and τ at the point of hiring. Moreover suppose that there is competition in the labour market for untrained workers in period 1, so that the firm needs to satisfy a “participation constraint” by offering an untrained worker a (market determined) level of utility. Commitment can be justified by the idea that a firm builds a reputation for training and paying its trained employees at a certain rate, or alternatively is able to write a binding contract. Competition for untrained workers seems a reasonable assumption if untrained workers take into account future employment possibilities which follow from human capital acquisition, and the contract offer matters for attracting untrained workers (as would be the case also with a monopsonist firm or in a directed search framework, where broadly similar results would hold). Then τ will have a positive return: a worker offered a higher level of training will anticipate better outside offers, and consequently will be prepared to accept a lower wage in anticipation of this. The firm then benefits from lower wage costs. Thus the commitment case has a positive level of training, unlike the no commitment case.

Martins & Thomas (2022) shows that this set-up leads to higher training when workers get fewer outside offers – in the current context, where the firm is in an EA which operates a no-poach agreement among its members. Suppose that a trained worker gets an outside offer with probability p , drawn from a distribution of offers, and membership of an EA reduces p . Training is general so as described above, the distribution of offers shifts one-to-one with changes in $y(\tau)$. We show that in this environment, training is always decreasing in p . To get some intuition for this, suppose that for an EA-firm $p = 0$. Then w is set to satisfy the participation constraint, and τ is at the optimal level, τ^* , as all the returns accrue to the firm (the worker gets no outside offers). Suppose next that for a non-EA firm, $p > 0$. Assume first that the distribution is degenerate and if an outside offer arrives, it is equal to $y(\tau)$ ($y(\tau) > w$ as otherwise the firm would make no profits and would not finance any training). The worker would then leave with probability $q = p$. Consider the return to an increase in τ : if an outside offer arrives the worker benefits by the full increase in $y(\tau)$, and so although the firm receives no direct benefit from the increase in y in this event, it recoups the full amount by paying a lower wage. In the parlance of the literature, there is no poaching externality (and $\tau = \tau^*$). Suppose instead that there is a distribution of potential offers, and when τ is

increased, there is an offer that now just becomes acceptable (recall each offer – each point in the distribution – increases by the change in y). The worker takes the offer but only gains a small amount, less than the increase in y , so w falls little on account of this offer becoming acceptable. The firm loses any direct benefit from the increase in y if this offer arrived, and is thus not compensated by the small fall in w . So the return to the firm is less than the increase in y . What happens as p increases? The above occurs with a higher probability so the return is decreased further, and hence τ falls. In brief: At higher levels of τ , workers are accepting “lower quality” offers (i.e., lower down the wage distribution); this reduces the return to τ , and the probability of this happening rises with p .

This argument holds generally for any increase in p ,¹⁷ so provided non-EA firms have a higher p , training will be lower. Moreover the observable quit rate q will be higher in such firms because not only does the worker get offers with a higher probability, but is more likely to accept an offer which is received.¹⁸ Thus the main result shows that even with firm commitment to a contract, training is generally higher when there are fewer outside opportunities.

The above discussion implicitly assumes constant returns to scale at the firm so that the worker-firm training/retaining relationship can be treated separately from the hiring of trained workers from outside. If this was not the case, so for example if quits open up positions that need to be filled, an EA member may have more difficulty replacing quits, but at the same time would face fewer quits, relative to non-EA members. The overall effect on training is unclear and it would be a useful topic for future work to investigate.

Thus our main hypothesis is that if there are lower worker flows between members of the same EA, indicative of a tacit agreement not to poach, training will be higher in EA firms.

4 Institutional background

The labour market of Portugal and its institutions share many similarities to those of other continental European countries, in particular in Southern Europe. One important dimension concerns the relevance of sectoral collective bargaining, which covers 86% of private-sector employees as of 2010, when the empirical analysis in this paper is conducted. Sectoral col-

¹⁷Provided w lies interior to the distribution and the distribution is continuous.

¹⁸In Martins & Thomas (2022) we also extend the framework to allow for bargaining between the outside firm and the worker, and for counter-offers by the incumbent employer, and show that the same negative relationship between likelihood of outside offers and training holds.

lective bargaining is conducted by over 500 EAs (523 EAs as of 2009) and an even larger number of trade unions. Martins (2020) provides a detailed description of EA activities and their potential effects, with a particular focus on the case of Portugal.¹⁹

On top of collective bargaining minimum wages, there is also a national, statutory minimum wage, potentially applicable to all employees. This minimum wage is relatively large when compared to the median and mean wages over the period considered in the study, with a Kaitz index of approximately 60%. Typically, the lowest minimum wage of a collective agreement will be higher than the statutory minimum wage. If not, the former will be legally superseded by the latter.

EA affiliation is estimated at 43%, a figure in line with the OECD mean, but much below the coverage rate of sectoral agreements. This gap is explained by the pervasive nature of administrative extension schemes, which widen the coverage of collective agreements to all firms and employees in each sector (Martins (2020)).

Regarding no-poach agreements (NPAs), the labour code of Portugal states that 'agreements between employers that forbid the hiring of a current or former employee or that require the payment of compensation for such hires are null'. This indicates that NPAs in the country are illegal in the sense that they are not enforceable in a court of law. However, if two or more employers agree to pursue such arrangements and benefit from them, such NPAs will be sustainable from a practical point of view. It may also be difficult to submit evidence of tacit agreements of this type before a court of law.

When considering labour market concentration, Bassanini et al. (2022) finds statistics for Portugal that are similar to those for other European countries (France, Spain, Italy, Germany and Denmark). This applies both in the case of Herfindahl indices and in the case of the wage effects of such measures of concentration. Of course, the number of effective employers in a given local labour market (a combination of an occupation and a commuting zone) may be lower if such employers engage in collusive behaviour.

An additional institutional dimension relevant in our study concerns legal requirements around firm-provided training. The labour code of Portugal mandates firms to provide a minimum of 35 hours of training (40 hours since 2019) to each employee per full year of employment. However, a number of exceptions apply, namely the possibility of backloading or

¹⁹The total number of EAs in Portugal is lower than in some other European countries. For instance, Schroeder & Silvia (2005) report around 1,000 EAs in Germany. The difference may be driven by the larger size of Germany and the importance of regional EAs, while in Portugal most EAs cover the entire country.

frontloading of training over three-year periods and of payment of work hours in compensation for training hours not provided by firms. Again, collective agreements may establish different provisions round training hours.

The country's public employment services (IEFP) have an important role in training provision, although its focus is on unemployed jobseekers. Some of the PES training activities are conducted under partnerships with EAs, in order to focus on the training for particular occupations in the industries of the EAs. While, again, the main targets of these training activities are unemployed jobseekers, some of these individuals may subsequently be hired by the firms that are members of these EAs.

From a macroeconomic perspective, we mention that, over the period analysed in this study, 2009 and 2011 were years of recession, with GDP falling by 3.1% and 1.7%. However, in 2010 GDP grew by 1.7%.

5 Data

Our empirical analysis is based on the population of all private-sector firms in Portugal and all their individual employees. Moreover, we also draw on the employers' association affiliation of each firm. These data are made available in Personnel Records ('Quadros de Pessoal', QP), a census of all firms with at least one employee, conducted by the Ministry of Employment.

This census also includes a number of additional variables about firms and their workers, such as identifiers, geographical location, industry (five-digit code), sales, employee headcount, and individual wages of each employee. This data set, QP, has been used extensively in industrial relations and labour economics research, including, more recently, Martins (2021 *a*), Card & Cardoso (2022) and Bassanini et al. (2022).

We focus on employers' association data for 2009, the latest year available (Martinez-Matute & Martins (2022)), and wages and training data for 2010 and 2011 (training data is currently only available for those two years - see also Martins (2021 *b*)). Because we do not have information on EA affiliation on the same years for which we have training information, we assume that each firm's EA affiliation is unchanged during the latter period, namely between 2009 and 2011.

5.1 Worker mobility data set

We exploit the comprehensive nature of the QP data set to construct a data set of all instances of inter-firm worker mobility. We believe our approach is novel but can be used in other countries for which similar data sets are also available. As QP covers the full population of employees in Portugal and in each year (in October) and also includes time-invariant identifiers for each employee and for each firm, we can establish all pairs of firms that were linked through the mobility of their workers between one year and the next. Moreover, we can also infer that all the remaining pairs of firms have not had worker mobility between them.

As the training data that we exploit later is only available for 2010 and 2011, we focus on inter-firm mobility between these last two years. Moreover, we assume that the 2009 EA affiliation status of each firm remained unchanged in 2010 and 2011 (as indicated above, we only have EA affiliation data for 2009). We believe this is a reasonable assumption given the limited amount of changes in firm EA affiliation over such short period of time. Indeed, out of the 308,491 firms present in 2008 and 2009 (years in which we have EA affiliation data), only 13,730 (4.5%) change their EA affiliation between those two years.

We find a total of nearly 80,000 employees that move between different firms in the period above (out of a total of over three million employees in each year). These correspond to workers that are employed in one firm in (October of) 2010 and are then employed in a different firm in (October of) 2011.²⁰ These 80,000 employees are employed by nearly 37,000 firms in 2010 and by about 15,000 firms in 2011 (out of a total of around 300,000 firms in each year in the country). The difference in the first two figures (37,000 and 15,000 firms) indicates greater dispersion amongst separating firms compared to hiring firms.²¹

We use the data set above to estimate inter-firm mobility equations and the impact of same-EA affiliation on worker mobility. Same-EA affiliation arises when both firms are affiliated in the same EA, which may have negative effects of interfirm worker mobility because of employers' coordination or collusion. In other words, we are interested in identifying the

²⁰To ensure that these are not spurious moves driven by changes in the firm identifier because of mergers or acquisitions, for instance, we also require that the tenure counter of the worker is reset to zero at the new firm (i.e. the hiring is 2011 or November or October of 2010). Moreover, we ignore inter-firm mobility spells that involve more than 25 employees moving between a specific pair of firms, as that may denote a displacement from the first firm or mobility to another firm of the same holding or conglomerate.

²¹Although we have information in QP regarding the month when the employment contract with each firm started, we do not know directly when an employment contract comes to an end. This implies that our data set includes both separations and quits and also both workers that move directly from one firm to the next and those that experience a spell of unemployment in between.

causal impact of EA affiliation on worker mobility. However, in the absence of counterfactuals (outcomes of the same firm when it is and is not EA affiliated), we compare outcomes of the same firms in different matches (when both firms are EA affiliated, when only one of the two firms is EA affiliated, and when none of the firms are EA affiliated). Moreover, we seek to partial out the potential roles of other variables that characterise the firms and the match and which may be correlated with same-EA status.

Our analysis considers both actual and *potential* mobility. Actual mobility is composed of all, nearly 80,000 workers that change firms between 2010 and 2011 and the firm pairs that such mobility creates, as described above. In contrast, potential mobility observations correspond to pairs of firms between which worker mobility does not exist, as it is not observed in our comprehensive data. Given the very large total number of such cases (about $300,000^2$, in which 300,000 is the total number of firms per year), we impose some restrictions on this no-mobility data set. First, we consider only the firms from which workers leave and firms to which workers are hired, but only their pairs in which firms are not linked in terms of actual worker flows from one firm to the other. Second, given the large numbers of such no-mobility pairs of firms, we consider a sample of up to 5% of such cases.

It is important to note that our data set construction and estimation approach relies strongly on the population nature of our data. As we cover all employees and all firms in the country, we can identify all cases of both actual and potential but nonexistent mobility.

5.2 Worker mobility descriptive statistics

Table 1 presents the resulting data set, in which the left-hand-side panel considers only firm pairs in which worker mobility was observed between 2010 and 2011 (79,082 observations). In contrast, the right-hand-side panel considers both all firm pairs in which mobility is observed and a sample of firm pairs in which worker mobility is not observed (3.1 million observations). In a first result, we find that about one quarter of all firms in the country exhibit firm-to-firm worker mobility. Moreover, the number of workers in such firm-to-firm mobility spells is low, with an average of 1.25 (first column). In other words, most of the 79,000 mobility spells found involve only one worker. This reflects the scattered nature of these spells and possibly several other factors, such as the relatively small firms in the country, but is also consistent with restrictions on worker poaching.

We find that 7.6% of such spells take place between firms in the same EA, a figure that increases to 20.8% in our full sample of firm pairs (including a sample of potential but not realised mobility spells). In other words, when we consider non-realised mobility pairs, we have a much higher percentage of same-EA firms. The percentage of realised mobility spells that involve both firms in the same collective bargaining agreement is 29.9%, 55.6% are located in the same region, and 24.3% work in the same industry. In the full sample, including both realised and non-realised mobility, the three percentages are lower, at 8.1%, 10.7% and 4.7%, respectively. These statistics indicate that, in contrast to the case of same-EA firms, the cases of CBA, region, and industry identity between firms exhibits much higher worker mobility probabilities.

These descriptive statistics may already point to important restrictions in worker mobility between same-EA firms which may be consistent with employer collusion. Firms operation in the same region, industry or collective agreement (which will all be the case of many same-EA firms) appears to be a strong predictor of inter-firm mobility. This is as expected given the importance of local labour markets, industry-specific skills and CBA-specific skills in worker mobility. For instance, moving outside one's original industry may entail an important loss in human capital, making it difficult for the worker to improve her earnings in a new job. However, on the other hand, we find that same-EA mobility occurs only in a small percentage of realised mobility spells. This is surprising given the presumably large share of same-EA firms that operate in the same region, industry or collective agreement, leading to greater scope for firm-to-firm worker mobility, in contrast to what we find in these preliminary statistics.

Moreover, 51% of the mobility pairs correspond to EA-affiliated firms (in either 2010 or 2011), while 28.7% correspond to case in which both firms are EA-affiliated (although not necessarily in the same EA). In the full sample, the equivalent percentages are 78% and 68%. Finally, realised mobility firms are large, with a mean number of employees of about 830 workers both in the first and second year (2010 and 2011), while their full sample counterparts are much smaller, at about 65 workers. These statistics make it clear that EA firms engage in both separating and recruiting workers that move between firms. However, while EA firms correspond to a large share of firms with realised mobility, there is a relatively low probability that such worker mobility involves firms that are affiliated in the same EA.

5.3 Training descriptive statistics

Table 2 describes our data set at the level of the employee in which we conduct our analysis of training. This data set pools data for 2010 and 2011, for which we have employee-level training information, corresponding to a total of 5.1 million observations. As indicated above, these coverage all employees in the country under private sector contracts. On average, employees have 9.3 years of schooling, they are 39.2 years old, and have been with their firms for eight years. 45.5% are women. 55.4% are employed by EA-affiliated firms, with average employment of 1,054 workers and annual sales of 185 million euros. 47.2% of the observations correspond to 2011.

Turning to training information, we find that 32% of the employees receive training in the year of observation. The average amount of training weeks (across all employees, including those who do not receive training) is 0.33. Training weeks are computed dividing the total training hours per employee by 35. We also consider different types of training: flexible-content training (training conducted outside the official catalogue of training content) corresponds to 0.15 weeks; training provided outside the firm facilities amounts to 0.18 weeks; training provided during work hours corresponds to 0.27 weeks; training delivered by EAs amount to only 0.013 weeks; health and safety training, a specific training content, amount to 0.004 weeks. Overall, this more detailed analysis indicates that most training is provided during work hours and by other agents or organisations than EAs. This last point is particularly relevant in our study because it indicates that any positive training differentials of EA firms would not be driven by a direct channel from greater access to EA-provided training by those firms.

6 Results

Our empirical analysis focuses on the case of employers' associations (EAs) as a mechanism of employer coordination. Such employer coordination may reduce workers' outside options in a similar way to that described in our model. As discussed earlier, EAs can facilitate labour market collusion as they are composed by a number of firms operating not only in the same product market but also in similar labour markets. Different EA member firms will employ workers with the same or very similar skills, who may also live in the same commuting zones. The training provided by these firms may also be specific to the sector and thus general from

the perspective of the firms that are affiliated with the same EA.

6.1 Inter-firm worker mobility results

Our main analysis, presented in this subsection, concerns the question of whether EA-affiliation has a negative effect on worker inter-firm mobility. As discussed above, we hypothesise that EAs can serve as coordination devices to reduce worker mobility between affiliated firms, thus allowing the latter to benefit more from their investments in worker training.

Our empirical analysis is based on all instances of inter-firm worker mobility between (October of) 2010 and (October of) 2011 and a sample of potential but not realised spells of inter-firm mobility. The full sample used is described in Table 1 (right-hand-side panel). Each observation corresponds to a pair of firms, in which the 'separation firm' is a firm from which at least one employee left (to another firm) in 2010 and in which the 'hiring firm' is a firm from which at least one employee left (to another firm) in 2010.

We estimate two types of models: the first one is focused on the extensive margin (whether there is or not worker mobility from a given firm to another given firm), while the second also considers the intensive margin (how many workers move between the two firms, including zero - no mobility - but also one, two, or any other number of workers). We estimate the first case using a simple linear probability model and the second using a Poisson model (and the algorithm of Correia et al. (2020)).

We also pay particular attention to a number of potential determinants of inter-firm worker mobility which could confound the role of the EA-related variables. From the limited literature on this particular type of worker mobility, we seek to control for the role of local labour markets, which will greatly facilitate worker mobility while also potentially be correlated with same-EA status. Similarly, we also control for the industry where both firms operate, as this can also facilitate mobility, given the role of industry-specific skills. The collective bargaining agreement of each firm can also be another form of similarity between the firms that can promote mobility while strongly correlated with EA affiliation and is controlled for in our equation.²² We also control for the general EA status of each firm (affiliated or not in any EA), both individually and jointly (i.e. both separating and hiring firms being EA affiliated, although not necessarily in the same EA). These variables will control for systematic

²²Note that, as discussed in Section 4, because of the extensions mechanism, firms can apply a given collective agreement although they are not affiliated with the EA that bargained such agreement.

differences between EA-affiliated firms in terms of their separation and recruitment outcomes. Note that all previous variables above are also constructed in terms of whether they are matched between the (realised or not) separating and hiring firm.

More specifically, we estimate the following inter-firm mobility equation:

$$y_{i,j} = \beta_1 \text{SameEA}_{i,j} + \beta_2 \text{BothEA}_{i,j} + \beta_3 \text{SameRegion}_{i,j} + \beta_4 \text{SameCBA}_{i,j} + \beta_5 \text{SameIndustry}_{i,j} + \alpha_i + \delta_j + u_{i,j}. \quad (2)$$

The dependent variable, $y_{i,j}$, is a dichotomous variable equal to one if at least one worker from firm i in (October of) 2010 is employed by firm j in (October of) 2011 (linear probability model). Alternatively, $y_{i,j}$ is the count of workers that move from firm i in 2010 to firm j in 2011 (Poisson model). Each i, j observation is an actual or a potential (but not realised) match between two different firms: in all instances in each the match is not realised, $y_{i,j}$ is equal to zero.

The key explanatory variable is $\text{SameEA}_{i,j}$, a dummy variable equal to one if firms i and j are affiliated in the same EA and zero otherwise. Control variables include, depending on the specification: $\text{BothEA}_{i,j}$, a dummy variable equal to one if firms i and j are both EA affiliated (in the same or in a different EA); $\text{SameIndustry}(\text{Region}, \text{CBA})_{i,j}$, a dummy variable equal to one if firms i and j are in same industry (region, CBA); and firm controls (total employment of each firm, in each year).

Finally, the specification may also include α_i and δ_j , which are separating and hiring firm fixed effects, respectively. These will control for systematic differences across firms in their separation and hiring outcomes. Note that controls for firm characteristics (as opposed to match characteristics) will be subsumed by the firm fixed effects, as we observe each firm only once in each year, as either separating or hiring. Standard errors are clustered at the separating and hiring firm levels.

Table 3 presents our results from the perspective of the extensive margin (linear probability model). The first two columns control for EA affiliation (of each firm individually and jointly) and for firm size (column 1) or firms fixed effects (column 2) but do not control for match characteristics, except for the key variable of same-EA status. These first results indicate that same-EA combinations are more likely to lead to worker mobility. However, as discussed above, firm pairs that are affiliated to the same EAs may also operate in the same region,

industry and or collective agreement. All such common characteristics may also influence positively the mobility of workers between firms, leading to an estimate of the same-EA effect that is biased upwards. We are interested in isolating these effects so to zoom in on any marginal effect and distinctive role of same-EA affiliation when other factors that may overlap with same-EA affiliation are taken into account.

In order to obtain such marginal effects of same-EA affiliation, we control for such common characteristics in columns 3 and 4. In other words, this second analysis is equivalent to comparing pairs of firms that operate in the same industry, in the same region or in the same collective agreement but are or are not affiliated in the same EA.

In both columns 3 and 4, the same-EA coefficient switches sign and become larger in absolute terms. When controlling for firm characteristics (EA affiliation and size), the same-EA coefficient is -2.3% while, when controlling for firms fixed effects, it increases to -4.2%, in both cases statistically significant at the 0.1%. These results indicate that, consistently with our earlier discussion, firms that are in the same EA are less likely to have workers moving between them. In terms of their magnitude, the same-EA effects are approximately around half the size of the same-region or same-industry coefficients and two-thirds of the same-collective-agreement coefficient. Note that these same-EA effects are already stripped out of the direct EA effects, both in individual terms (through direct controls and firms fixed effects) and in match terms (through a both-EA-affiliated dummy variable).

We now turn a complementary analysis of the counts of workers moving between each pair of firms (zero, one, or more). Table 4 presents the results from our estimation of a Poisson model that captures both the extensive margin above but also the intensive margin in which several employees may be moving between a specific pair of firms. We find very similar results to those of the previous table in that the same-EA coefficients are positive when not controlling for the common region, industry and collective agreement characteristics of both firms, but these coefficients become negative when considering such variables. In the latter two cases, we find that same-EA effects are of around -70% and statistically significant at the 0.1%. The signs of the control variables are also the same as in Table 3.

Finally, in Table 5 we present similar results, both for the extensive and intensive margins, but considering exclusively a subsample of firm pairs in which both firms are in the same industry, region and collective bargaining agreement. Different firm pairs may be in different

industries, etc, but each firm pair shares, by sample construction, the three (industry, region, and CBA) dimensions above. The only scope for differentiation in this robustness check is whether the two firms are in the same EA or not. We find again, when comparing both mobility status and intensity, that firms that are in the same EA exhibit (much) less worker mobility than firms that are not in the same EA.

In several robustness checks, we reestimated our model under a different sample which only includes firms that are EA affiliated. This analysis may provide us with a more homogeneous data set and a closer comparison of firms. The results, presented in Appendix Tables A.1 and A.2, indicate again that same-EA affiliation significantly dampens inter-firm worker mobility. We also replicated our main results using a larger sample of no-mobility spells, in which we doubled the number of firm pairs without worker mobility. The results, in Tables A.3 and A.4, indicate again that our main findings are robust, with negative same-EA effects on mobility when controlling for CBA, industry and region identity.

Overall, these results support the view that firms that are affiliated in the same EA are less likely to exhibit inter-firm worker mobility. This result emerges once we control for firms' possible common characteristics along other dimensions that may also influence worker mobility. Without such controls, the effects of these variables would have been picked up by the same-EA variable.

As indicated above, we interpret these results as indicating the additional effect coming from pairs of firms that are in the same EA (compared to firms that are not in the same EA) while sharing all other characteristics. In other words, the result presents what is distinctive about EA affiliation in interfirm mobility, on top of the other potential drivers of such mobility. Another approach is to think from a counterfactual perspective, comparing firms that have the same characteristics except that in the factual scenario both firms are affiliated in the same EA and in the counterfactual they are not. Our results, across many samples and specifications, always indicate that, when firms are affiliated in the same EA, their interfirm mobility is lower, compared to the case when firms are not affiliated in the same EA.

Our findings are consistent with the view that EAs can facilitate coordination across affiliated firms towards diminished worker mobility, thus increasing such firms' ability to fully benefit from their investments in the training of their workforce (and enjoy other benefits such as reduced turnover costs and less pressure to increase wages). In the next subsection,

we examine the extent to which workers are effectively receiving more training in these EA firms.

6.2 Training results

Our analysis of training differentials between EA and non-EA firms is similar to the approach of the previous subsection in that we consider both the extensive and intensive margins (train or no train vs different hours of training), using either linear probability or Poisson models.

In this case of our analysis of training differentials, we consider the following equation:

$$tr_{e,i,t} = \beta_1 EAaffiliated_i + \beta_2 X_{e,i,t} + \beta_t + a_i + v_{e,i,t} \quad (3)$$

The dependent variable, $tr_{e,i,t}$, is either a dummy variable equal to one if worker e receives firm-provided training in firm i in year t , or the actual count of hours received by the work. As before, $EAaffiliated_i$ is a dummy variable equal to one if firm i is EA affiliated. $X_{e,i,t}$ is a set of worker and firm control variables (namely age, schooling, tenure, and female; and a 2011 dummy, number of workers and sales volume). These variables can explain differences in training across workers and also be correlated with the EA status of their firm. a_i denotes a worker fixed effect, exploiting the fact that our data includes instances of worker mobility between affiliated and non-affiliated firms. The key parameter is β_1 , which indicates the average difference between workers in affiliated and non-affiliated firms regarding the training they received.

In Table 6, we present our results concerning the extensive margin (whether a worker receives or not firm-provided training in a given year). We find positive and statistically significant EA affiliation coefficients on our training variable across all specifications. In other words, our evidence indicates that workers employed by firms affiliated in EAs tend to receive significantly higher levels of training than workers employed by firms not affiliated in EAs. These gaps range between 4% and 7%.

The only exception to the results above follows from column 4, which includes worker fixed effects and firm controls (firm size measured in both number of workers and total sales). The last result may follow from the limited within-worker variation in EA-firm status, given the short, two-year period covered in our data. Another important aspect concerns the legal requirement (although subject to several caveats) that most employees should receive at least

35 hours of training per year. This legal requirement could lead to limited variation across workers in the dependent variable in this equation, which disregards the intensive margin of training provision.

In this context, we now turn to Table 7, which presents the results of the same specification as before except that the dependent variable is given by the number of hours of training per worker. Given the large number of zeros, we estimate this equation using a Poisson model. Here we find statistically significant, positive effects of EA firms on training hours across all specifications, including in specifications with worker fixed effects.²³ The coefficients vary between 0.152 and 0.318 and are always significant at least at the 1% level. These results indicate that the amount of training provided at EA firms is substantially larger, by at least 15%, at EA firms, even after controlling for a large number of differences across the two types of firms.²⁴

We conduct robustness of our main findings by considering additional control variables, namely collective agreement fixed effects. Martins (2019), using this data set, finds that trade unions tend to push firms to increase the training provided to their employees. Part of this effect may involve collective bargaining agreements. The results are presented in Table A.5, which again finds similar results to previous specifications, with EA firms providing higher levels of training.

Finally, we consider the heterogeneity of our results across different types of training, exploiting the richness of the microdata available. Are the EA affiliation effects stronger in particular dimensions of training? We consider the following types of non-mutually exclusive training types: training hours of flexible training content (outside the main official list of training modules); training hours provided outside the firm; training hours provided during the normal work hours; training hours provided by the employer's association (and the remaining cases of training not provided by the EA); health and safety training (the most common type of training, representing about 15% of training spells).

The results are presented in Tables A.6, A.7, A.8, A.9, A.10 and A.11. We find that, in virtually all these dimensions of training, different control variables, and two dependent variables (dichotomous variable, about whether a positive amount of the type of training

²³Note that the number of observations used in the latter case is substantially smaller than in models without worker fixed effects. This is because the estimation dropped 3.1 million observations that are either singletons or separated by a fixed effect (see more about this procedure in Correia et al. (2020)).

²⁴The coefficients of the remaining control variables are also of general interest. They indicate that training tends to be lower for older and female workers, and higher for more educated and higher-tenure workers.

is provided; or continuous variable, indicating the amount of training hours over the year), there is a statistically significant positive difference of EA firms, compared to non-EA firms. Only in six out of 24 regressions is the EA coefficient not statistically significant at the 5% level. These cases emerge in the specifications including firm controls and the point estimates are still always positive. Of course, the magnitude of the difference varies somewhat across dependent variables and specifications, which may be influenced in part by the different usage of different forms of training.²⁵

Overall, we regard these twin empirical findings of lower same-EA worker mobility and higher training levels in EA firms as consistent with our theoretical model and the role of EAs in promoting employer coordination and reducing outside opportunities for their employees.

7 Conclusions

Firm-provided training is an important avenue for investment in human capital. Such training can greatly increase worker productivity and firm performance. However, worker mobility – and particularly employee poaching – can influence firms’ decisions regarding these investments. Employer coordination, for example through the operation of employers’ associations, can affect these decisions.

In this paper, we studied these trade-offs from both theoretical and empirical perspectives. We argue that theory implies that members of employers’ associations coordinating on reducing mobility leads to increased training. Our empirical analysis supports the hypothesis that employers’ associations may implement tacit no-poach agreements and this increases the returns from training, so that training is higher for EA firms.

We do not have direct evidence on the operation of no poach agreements by EAs in Portugal. But if collusive arrangements are in the interests of the member firms, we should not be surprised if they operate at least implicitly to an extent. As Adam Smith famously declared, “People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.” (The Wealth Of Nations, Book IV Chapter VIII). In this case the conspiracy may

²⁵We note that collective agreements may have an important role in setting training across firms. However, as mentioned above, in Portugal and other European countries there are widespread administrative extension mechanisms and large shares of workers covered by collective bargaining (around 90% of the workforce). This means that both EA firms and non-EA firms will be equally subject to the training provisions of collective agreements. In this context, we believe that the large differential in training provision between EA and non-EA firms that we document is not likely to be explained by CBA coverage differentials.

concern the labour market but it may also solve an externality problem and lead to socially beneficial outcomes.²⁶

In the theoretical approach discussed in Section 3 firms gain if they can limit outside opportunities and capture more of the returns from human capital investment; however this comes at a cost as workers need to be compensated for reduced outside opportunities.²⁷

Our empirical analysis draws on particularly rich matched employer-employee panel data from Portugal, including firm-level information on EA affiliation and employee-level information on inter-firm mobility and training. Our empirical findings are two-fold and in both cases consistent with our theory. The results are also consistent with no-poach agreements and employer coordination intermediated by employers' associations. First, we find that inter-firm worker mobility is significantly lower between EA-affiliated firms. In other words, workers in an EA firm are less likely to be poached by another firm affiliated with the same EA. Second, we find that firm-provided training is considerably higher in EA-affiliated firms.

We believe these are important contributions to the literatures on the economic effects of EAs and on the determinants of employer-provided training. In the first case, we believe we are the first to provide evidence of potential collusive behaviour by EAs. In the second case, we believe we are the first to provide evidence of the increased training that may follow from collusive agreements by EAs.

These findings may also be useful in the new literature on labour market power, including Azar et al. (2022, 2020) and Bassanini et al. (2022). In this literature, concentration is typically measured using the number of employers in a given local labour market. Our results suggest that this approach will in some cases disregard the potential coordination amongst these employers. Indeed, such coordination will reduce the effective number of prospective employers in a local labour market.

We believe our findings are also of policy relevance. EAs – as groups of typically competing firms that operate in the same product markets – may have a strong incentive to coordinate some of their activities, not only in product markets but also in labour markets. Our results suggest that there may be some restrictions on hiring between EA members, and this may

²⁶One of the authors has direct experience of such an arrangement which operated through an “understanding” about limiting hiring from competitors in the same group, by for example not aggressively courting potential hires.

²⁷The net effect is ambiguous in Martins & Thomas (2022). If workers are less foresighted and do not take into account outside opportunities when accepting a contract, firms benefit unambiguously from a no poach agreement.

be a matter that competition agencies should monitor. Specifically, competition authorities may need to pay attention to worker mobility across firms, following similar approaches to those introduced in this study. Evidence of particular anomalous patterns in worker mobility in particular EAs may then lead to more detailed investigations with such EAs. However our findings suggest that such forms of employer coordination may also have important benefits in terms of worker productivity if they lead to higher levels of training. In this case, legislators that may want to reduce employers' coordination may need to take into account the potential detrimental effects of such measures on training levels.

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Table 1: **Descriptive statistics: inter-firm mobility**

| Variable | Mobility type: | | | |
|-------------------------------|----------------|-----------|-------|-----------|
| | Mean | Std. Dev. | Mean | Std. Dev. |
| Positive N. of movers (DV) | 1.000 | | 0.025 | |
| N. of movers | 1.254 | 1.313 | 0.032 | 0.288 |
| Same EA | 0.076 | | 0.208 | |
| Same CBA | 0.299 | | 0.081 | |
| Same region | 0.556 | | 0.107 | |
| Same industry | 0.243 | | 0.047 | |
| EA affiliated (2010) | 0.514 | | 0.780 | |
| EA affiliated (2011) | 0.512 | | 0.782 | |
| EA affiliated (2010 and 2011) | 0.287 | | 0.680 | |
| Employees (2010) | 838.5 | 2777.13 | 64.8 | 539.74 |
| Employees (2011) | 826.1 | 2675.25 | 68.1 | 531.92 |
| N (firm pairs) | | 79,082 | | 3,106,783 |

Notes: The table characterises the pairs of firms between which there is worker mobility in the QP data set between 2010 and 2011. 'Positive N. of movers' is a dummy variable equal to one if there is at least one worker moving between the pair of firms. 'N. of movers' is the number of workers moving between the two firms, which can range from zero (no mobility) until 24 (cases of 25 and more workers moving between a pair of firms were excluded). 'Same EA (CBA, region, industry)' is a dummy variable equal to one if the two firms upon which mobility may have taken place are in the same employers' association (collective bargaining agreement, region, industry). 'EA affiliated (2010, 2011, and 2010 and 2011)' is a dummy variable indicating if the firm is affiliated in an employers' association in 2010, 2011 and 2010 and 2011. 'Employees (2010, 2011)' indicates the number of workers employed by the 2010 or 2011 firm.

Table 2: **Descriptive statistics on training: employees (2010 and 2011)**

| Variable | Mean | Std. Dev. |
|--|--------|-----------|
| Schooling | 9.348 | 4.02 |
| Age | 39.29 | 11.09 |
| Tenure | 8.045 | 8.412 |
| Female | 0.455 | |
| EA firm | 0.554 | |
| Firm employees | 1054.6 | 3134.7 |
| Firm sales | 185.0 | 784.7 |
| Year 2011 | 0.472 | |
| Training (0/1) | 0.32 | |
| Training weeks | 0.332 | 1.149 |
| Flexible content training weeks | 0.148 | 0.764 |
| Training weeks delivered outside the firm facilities | 0.181 | 0.823 |
| Training weeks delivered during work hours | 0.267 | 1.008 |
| Training weeks delivered by an EA | 0.013 | 0.202 |
| Training weeks not delivered by an EA | 0.319 | 1.129 |
| Health and safety training weeks | 0.004 | 0.015 |

Notes: The table describes the worker level data used in the training equations. The data concerns all employees in the QP data set observed in 2010 and or 2011. The number of observations is 5127627 in all variables, except 5113319 in Schooling. Schooling indicates the years of schooling of each worker (based on the highest degree obtained). Tenure denotes the number of years of the worker in the firm. EA firm is a dummy variable equal to one for workers in firms affiliated with employers' associations. Firm employees is the number of workers of the firm. Firm sales is the total sales of the firm (in millions of nominal euros). Year 2011 is a dummy variable equal to one for observations of 2011. Training (0/1) is a dummy variable equal to one when the worker received firm-provided training (at least one hour) by his/her employer in that year. Training weeks is the number of hours of firm-provided training (divided by 35) received by the worker over the year. Log earnings is the logarithm of the October total monthly salary of the worker. The five additional training categories (Flexible content training, Training delivered outside the firm, Training delivered during work hours, Training delivered by EA, Health and safety training) are not mutually exclusive as they consider different dimensions of training provision and types.

Table 3: **Inter-firm mobility: extensive margin**

| | (1) | (2) | (3) | (4) |
|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Same EA | 0.004*** (7.59) | 0.011*** (23.27) | -0.023*** (-33.66) | -0.042*** (-55.50) |
| EA affiliated (2010 and 2011) | -0.038*** (-32.52) | -0.036*** (-36.10) | -0.035*** (-32.68) | -0.032*** (-34.74) |
| Employees (2010) | 0.000*** (7.36) | | 0.000*** (7.66) | |
| Employees (2011) | 0.000*** (7.90) | | 0.000*** (7.95) | |
| EA affiliated (2010) | -0.003** (-2.95) | | -0.000 (-0.45) | |
| EA affiliated (2011) | -0.005*** (-3.80) | | -0.002 (-1.43) | |
| Same CBA | | | 0.054*** (47.10) | 0.065*** (61.27) |
| Same region | | | 0.098*** (80.14) | 0.105*** (101.35) |
| Same industry | | | 0.089*** (51.67) | 0.088*** (58.81) |
| Constant | 0.049*** (50.49) | 0.047*** (72.32) | 0.030*** (34.05) | 0.035*** (56.94) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 3106783 | 3106783 | 3106783 | 3106783 |

Notes: The table presents different models of worker inter-firm mobility estimated using a linear probability model. The dependent variable indicates if a positive number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a sample of firm combinations which do not exhibit such mobility. In the former case, the dependent variable is equal to one. In the latter case, the dependent variable is equal to zero. 'Same EA (CBA, region, industry)' is a dummy variable equal to one if the two firms upon which mobility may have taken place are in the same employers' association (collective bargaining agreement, region, industry). 'EA affiliated (2010, 2011, and 2010 and 2011)' is a dummy variable indicating if the firm is affiliated in an employers' association in 2010, 2011 and 2010 and 2011. 'Employees (2010, 2011)' indicates the number of workers employed by the 2010 or 2011 firm. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: **Inter-firm mobility: intensive margin**

| | (1) | (2) | (3) | (4) |
|----------------------------------|------------------------|-----------------------|-----------------------|-----------------------|
| Same EA | 0.201*** (3.67) | 0.750*** (15.02) | -0.707*** (-17.10) | -0.657*** (-13.49) |
| EA affiliated (2010 and 2011) | -1.206*** (-14.54) | -1.111*** (-17.50) | -1.037*** (-12.70) | -0.958*** (-13.70) |
| Employees (2010) | 0.000*** (16.56) | | 0.000*** (12.64) | |
| Employees (2011) | 0.000*** (15.87) | | 0.000*** (14.20) | |
| EA affiliated (2010) | -0.204*** (-4.98) | | -0.106* (-2.57) | |
| EA affiliated (2011) | -0.220*** (-5.63) | | -0.115** (-2.86) | |
| Same CBA | | | 1.175*** (36.73) | 1.165*** (26.26) |
| Same region | | | 1.800*** (32.54) | 2.116*** (31.78) |
| Same industry | | | 1.061*** (18.74) | 1.154*** (20.07) |
| Constant | -2.237*** (-107.51) | -1.423*** (-88.52) | -3.318*** (-64.13) | -2.698*** (-57.65) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 3106783 | 3106783 | 3106783 | 3106783 |

Notes: The table presents different models of worker inter-firm mobility estimated using a Poisson model and Correia et al. (2020). The dependent variable indicates the number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a sample of firm combinations which do not exhibit such mobility. In the latter case, the dependent variable is equal to zero. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: **Inter-firm mobility: extensive and intensive margins; only pairs of firms in the same industry, region and CBA**

| | (1) | (2) | (3) | (4) |
|----------------------------------|-----------------------|----------------------|-----------------------|---------------------|
| | N. of movers positive | | N. of movers | |
| Same EA | -0.210*** (-23.99) | -0.168*** (-9.65) | -1.065*** (-18.77) | -0.442** (-3.29) |
| EA affiliated (2010 and 2011) | -0.295*** (-16.64) | -0.175*** (-4.70) | -0.445*** (-5.88) | -0.266 (-1.53) |
| Employees (2010) | 0.000*** (4.49) | | 0.000*** (8.93) | |
| Employees (2011) | 0.000*** (4.62) | | 0.000*** (11.83) | |
| EA affiliated (2010) | -0.045*** (-3.49) | | -0.203*** (-4.54) | |
| EA affiliated (2011) | -0.054*** (-4.18) | | -0.203*** (-4.83) | |
| Constant | 0.684*** (76.76) | 0.422*** (13.16) | 0.128*** (4.43) | 0.924*** (10.98) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 40329 | 30073 | 40318 | 7057 |

Notes: The table presents different models of worker inter-firm mobility estimated using a linear probability model (first two columns) or a Poisson model (and Correia et al. (2020), last two columns). The dependent variable indicates if workers (or how many workers, including zero) moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a larger sample of firm combinations which do not exhibit such mobility, in both cases only if the firms are in the same industry, region and collective bargaining agreement. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6: **Training: extensive margin**

| | (1) | (2) | (3) | (4) |
|---------------|----------------------|-----------------------|--------------------|---------------------|
| EA firm | 0.074*** (5.21) | 0.044*** (6.68) | 0.041* (2.45) | 0.019 (1.20) |
| Age | -0.003*** (-8.31) | -0.003*** (-21.91) | -0.001* (-2.21) | -0.001* (-2.18) |
| Schooling | 0.021*** (18.89) | 0.012*** (32.26) | 0.005*** (4.86) | 0.006*** (5.75) |
| Tenure | 0.006*** (13.20) | 0.003*** (11.96) | 0.003*** (4.02) | 0.002*** (3.49) |
| Female | -0.020** (-2.72) | -0.010*** (-4.75) | 0.027** (2.87) | 0.007 (0.85) |
| Year 2011 | 0.032*** (7.21) | 0.027*** (6.31) | 0.010* (2.17) | 0.011* (2.30) |
| Employees | | 0.000* (2.03) | | 0.000 (1.26) |
| Sales | | 0.000 (1.06) | | 0.000 (1.06) |
| Constant | 0.143*** (7.08) | 0.246*** (28.54) | 0.280*** (9.77) | 0.293*** (10.60) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 5105988 | 5105987 | 4149389 | 4149387 |

Notes: The table presents different models of worker training estimated using a linear probability model. The dependent variable is equal to one if the worker received at least one hour of training. The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7: **Training: intensive margin**

| | (1) | (2) | (3) | (4) |
|---------------|------------------------|------------------------|---------------------|-------------------------|
| EA firm | 0.216*** (3.86) | 0.152** (2.59) | 0.318*** (6.87) | 0.295*** (6.50) |
| Age | -0.0185*** (-15.50) | -0.0158*** (-15.04) | -0.00976 (-1.76) | -0.00963 (-1.65) |
| Schooling | 0.0949*** (23.48) | 0.0713*** (26.70) | 0.0290*** (3.77) | 0.0279*** (3.52) |
| Tenure | 0.0224*** (10.49) | 0.0104*** (5.70) | 0.00953* (2.56) | 0.00588 (1.46) |
| Female | -0.141*** (-5.77) | -0.0708*** (-4.92) | 0.0177 (0.36) | -0.0232 (-0.52) |
| Year 2011 | 0.0761* (2.21) | 0.0606 (1.76) | -0.0108 (-0.33) | -0.0130 (-0.40) |
| Employees | | 0.0000314 (1.39) | | 0.0000155 (1.48) |
| Sales | | -6.13e-11 (-0.66) | | -1.66e-10*** (-3.84) |
| Constant | -1.642*** (-19.40) | -1.272*** (-17.20) | 0.170 (0.74) | 0.275 (1.13) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 5105988 | 5105567 | 1914511 | 1914509 |

Notes: The table presents different models of worker training estimated using a Poisson model and Correia et al. (2020). The dependent variable indicates the number of training hours. The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A Appendix: Additional empirical results

Table A.1: **Inter-firm mobility: extensive margin; sample including only EA-affiliated firms**

| | (1) | (2) | (3) | (4) |
|-------------------------------|-----------------------|----------------------|-----------------------|-----------------------|
| Same EA | 0.004*** (8.63) | 0.011*** (22.57) | -0.018*** (-30.96) | -0.032*** (-47.69) |
| EA affiliated (2010 and 2011) | -0.043*** (-38.09) | | -0.038*** (-35.57) | |
| Employees (2010) | 0.000*** (7.90) | | 0.000*** (8.17) | |
| Employees (2011) | 0.000*** (8.34) | | 0.000*** (8.36) | |
| Same CBA | | | 0.043*** (40.91) | 0.052*** (52.66) |
| Same region | | | 0.081*** (70.31) | 0.086*** (87.64) |
| Same industry | | | 0.071*** (45.55) | 0.070*** (50.92) |
| Constant | 0.045*** (36.64) | 0.019*** (171.64) | 0.031*** (27.62) | 0.012*** (78.68) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 2734504 | 2734504 | 2734504 | 2734504 |

Notes: The table presents different models of worker inter-firm mobility estimated using a linear probability model. The dependent variable indicates if a positive number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a sample of firm combinations which do not exhibit such mobility. In the former case, the dependent variable is equal to one. In the latter case, the dependent variable is equal to zero. 'Same EA (CBA, region, industry)' is a dummy variable equal to one if the two firms upon which mobility may have taken place are in the same employers' association (collective bargaining agreement, region, industry). 'EA affiliated (2010, 2011, and 2010 and 2011)' is a dummy variable indicating if the firm is affiliated in an employers' association in 2010, 2011 and 2010 and 2011. 'Employees (2010, 2011)' indicates the number of workers employed by the 2010 or 2011 firm. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.2: **Inter-firm mobility: intensive margin; sample including only EA-affiliated firms**

| | (1) | (2) | (3) | (4) |
|-------------------------------|-----------------------|------------------------|-----------------------|-----------------------|
| Same EA | 0.222*** (4.02) | 0.734*** (15.29) | -0.714*** (-19.62) | -0.668*** (-14.37) |
| EA affiliated (2010 and 2011) | -1.455*** (-20.42) | | -1.163*** (-20.35) | |
| Employees (2010) | 0.000*** (15.93) | | 0.000*** (12.07) | |
| Employees (2011) | 0.000*** (15.15) | | 0.000*** (13.74) | |
| Same CBA | | | 1.229*** (31.90) | 1.211*** (20.50) |
| Same region | | | 1.748*** (26.93) | 2.044*** (27.96) |
| Same industry | | | 1.007*** (13.65) | 1.103*** (17.30) |
| Constant | -2.393*** (-67.18) | -1.637*** (-277.03) | -3.379*** (-60.35) | -2.792*** (-46.04) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 2734345 | 2448415 | 2734345 | 2448415 |

Notes: The table presents different models of worker inter-firm mobility estimated using a Poisson model and Correia et al. (2020). The dependent variable indicates the number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a sample of firm combinations which do not exhibit such mobility. In the latter case, the dependent variable is equal to zero. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.3: **Inter-firm mobility: extensive margin; larger control group sample**

| | (1) | (2) | (3) | (4) |
|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Same EA | 0.002*** (7.33) | 0.006*** (21.05) | -0.012*** (-29.21) | -0.025*** (-52.83) |
| EA affiliated (2010 and 2011) | -0.020*** (-28.45) | -0.020*** (-31.62) | -0.020*** (-28.48) | -0.018*** (-30.48) |
| Employees (2010) | 0.000*** (7.92) | | 0.000*** (8.10) | |
| Employees (2011) | 0.000*** (7.62) | | 0.000*** (7.63) | |
| EA affiliated (2010) | -0.002* (-2.53) | | -0.000 (-0.69) | |
| EA affiliated (2011) | -0.002** (-3.16) | | -0.001 (-1.25) | |
| Same CBA | | | 0.030*** (43.87) | 0.038*** (56.22) |
| Same region | | | 0.055*** (71.09) | 0.059*** (92.14) |
| Same industry | | | 0.051*** (48.15) | 0.052*** (54.23) |
| Constant | 0.024*** (41.75) | 0.025*** (61.36) | 0.015*** (28.02) | 0.019*** (48.79) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 6112343 | 6112343 | 6112343 | 6112343 |

Notes: The table presents different models of worker inter-firm mobility estimated using a linear probability model. The dependent variable indicates if a positive number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a larger sample of firm combinations which do not exhibit such mobility. In the former case, the dependent variable is equal to one. In the latter case, the dependent variable is equal to zero. 'Same EA (CBA, region, industry)' is a dummy variable equal to one if the two firms upon which mobility may have taken place are in the same employers' association (collective bargaining agreement, region, industry). 'EA affiliated (2010, 2011, and 2010 and 2011)' is a dummy variable indicating if the firm is affiliated in an employers' association in 2010, 2011 and 2010 and 2011. 'Employees (2010, 2011)' indicates the number of workers employed by the 2010 or 2011 firm. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.4: **Inter-firm mobility: intensive margin; larger control group sample**

| | (1) | (2) | (3) | (4) |
|-------------------------------|------------------------|------------------------|-----------------------|-----------------------|
| Same EA | 0.159** (2.77) | 0.708*** (12.34) | -0.875*** (-20.10) | -0.800*** (-14.75) |
| EA affiliated (2010 and 2011) | -1.261*** (-16.18) | -1.174*** (-18.02) | -1.110*** (-13.69) | -1.039*** (-14.83) |
| Employees (2010) | 0.000*** (16.83) | | 0.000*** (13.74) | |
| Employees (2011) | 0.000*** (16.65) | | 0.000*** (15.05) | |
| EA affiliated (2010) | -0.203*** (-5.01) | | -0.120** (-2.83) | |
| EA affiliated (2011) | -0.216*** (-5.56) | | -0.120** (-2.95) | |
| Same CBA | | | 1.278*** (38.07) | 1.261*** (27.48) |
| Same region | | | 1.928*** (33.46) | 2.229*** (32.07) |
| Same industry | | | 1.211*** (17.80) | 1.259*** (19.56) |
| Constant | -2.830*** (-128.56) | -1.878*** (-118.14) | -3.932*** (-69.97) | -3.179*** (-63.23) |
| Firm controls x2 | X | | X | |
| Firm FE x2 | | X | | X |
| Observations | 6112343 | 6047816 | 6112343 | 6047816 |

Notes: The table presents different models of worker inter-firm mobility estimated using a Poisson model and Correia et al. (2020). The dependent variable indicates the number of workers that moved between a particular firm in 2010 to another particular firm in 2011. The sample considers all spells of inter-firm mobility plus a larger sample of firm combinations which do not exhibit such mobility. In the latter case, the dependent variable is equal to zero. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.5: **Training: extensive and intensive margins; including CBA fixed effects**

| | (1) | (2) | (3) | (4) |
|--------------------------|---------------------|---------------------|--------------------|----------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.032* (2.10) | 0.020 (1.34) | 0.303*** (6.63) | 0.301*** (7.12) |
| Age | -0.001 (-1.94) | -0.001 (-1.93) | -0.007 (-1.25) | -0.006 (-1.06) |
| Schooling | 0.005*** (5.33) | 0.005*** (5.48) | 0.026*** (3.32) | 0.026** (3.22) |
| Tenure | 0.002*** (3.54) | 0.002** (3.25) | 0.008* (2.02) | 0.006 (1.30) |
| Female | 0.013 (1.54) | 0.007 (0.89) | -0.019 (-0.40) | -0.023 (-0.55) |
| Year 2011 | 0.011* (2.25) | 0.011* (2.37) | -0.017 (-0.51) | -0.017 (-0.51) |
| Employees | | 0.000 (1.27) | | 0.000 (0.60) |
| Sales | | 0.000 (0.22) | | -0.000*** (-3.48) |
| Constant | 0.287*** (10.40) | 0.293*** (10.78) | 0.159 (0.66) | 0.187 (0.76) |
| Firm controls | | X | | X |
| Collective bargaining FE | X | X | X | X |
| Worker FE | | | X | X |
| Observations | 4149382 | 4149380 | 1914308 | 1914306 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). All specifications include a fixed effect for each collective bargaining agreement which is relevant for each employee. The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.6: **Flexible content training: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|--------------------|--------------------|---------------------|--------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.053*** (3.79) | 0.027** (3.13) | 0.407*** (6.01) | 0.282*** (4.30) |
| Age | -0.001* (-2.25) | -0.001* (-2.24) | -0.015** (-2.68) | -0.007 (-1.24) |
| Schooling | 0.002* (2.11) | 0.002*** (3.43) | 0.014** (2.89) | 0.022*** (4.74) |
| Tenure | 0.001* (2.42) | 0.001* (2.02) | 0.008 (1.86) | 0.005 (1.74) |
| Female | 0.025* (2.40) | 0.006 (0.68) | 0.230** (2.98) | 0.025 (0.37) |
| Year 2011 | -0.001 (-0.11) | -0.000 (-0.09) | 0.003 (0.14) | -0.004 (-0.18) |
| Employees | | 0.000 (1.66) | | 0.000 (0.09) |
| Sales | | 0.000** (2.71) | | 0.000 (1.85) |
| Constant | 0.137*** (7.03) | 0.140*** (7.52) | -0.295 (-1.35) | -0.508* (-2.16) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 975088 | 975065 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.7: **Training weeks provided outside the firm facilities: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|--------------------|--------------------|----------------------|----------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.017** (3.24) | 0.024*** (5.80) | 0.150*** (4.34) | 0.235*** (6.70) |
| Age | -0.001* (-2.31) | -0.001* (-2.12) | -0.012** (-3.07) | -0.011** (-2.64) |
| Schooling | 0.003*** (5.65) | 0.003*** (5.00) | 0.027*** (7.00) | 0.021*** (5.68) |
| Tenure | 0.005*** (4.81) | 0.004*** (3.47) | 0.037*** (5.56) | 0.031*** (3.83) |
| Female | 0.013 (1.68) | 0.006 (0.91) | 0.095* (2.33) | 0.028 (0.83) |
| Year 2011 | 0.008* (2.18) | 0.008* (2.19) | 0.034* (2.48) | 0.035* (2.44) |
| Employees | | -0.000 (-0.09) | | -0.000 (-0.88) |
| Sales | | -0.000 (-1.45) | | -0.000 (-1.71) |
| Constant | 0.150*** (6.62) | 0.160*** (7.09) | -0.669*** (-4.21) | -0.603*** (-3.64) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 1226284 | 1226284 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.8: **Training weeks delivered during work hours: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|--------------------|--------------------|---------------------|---------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.039* (2.32) | 0.018 (1.26) | 0.162*** (3.36) | 0.056 (0.97) |
| Age | -0.001* (-1.98) | -0.001 (-1.93) | -0.008* (-2.51) | -0.006 (-1.76) |
| Schooling | 0.005*** (4.48) | 0.005*** (5.57) | 0.021*** (5.72) | 0.027*** (7.68) |
| Tenure | 0.003*** (3.54) | 0.002** (2.94) | 0.008* (2.03) | 0.005 (1.60) |
| Female | 0.022* (2.43) | 0.002 (0.18) | 0.107*** (3.33) | 0.014 (0.44) |
| Year 2011 | 0.011* (2.20) | 0.011* (2.28) | 0.040** (3.17) | 0.039** (3.11) |
| Employees | | 0.000 (0.99) | | 0.000 (0.12) |
| Sales | | 0.000 (1.63) | | 0.000 (0.87) |
| Constant | 0.238*** (8.86) | 0.248*** (9.60) | -0.402** (-3.00) | -0.434** (-3.14) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 1692060 | 1692056 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.9: **Training weeks delivered by an EA: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|---------------------|---------------------|----------------------|----------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.004*** (6.42) | 0.004*** (6.10) | 0.559*** (9.14) | 0.667*** (9.85) |
| Age | 0.000 (0.81) | 0.000 (0.77) | 0.019 (0.96) | 0.014 (0.62) |
| Schooling | 0.000 (1.77) | 0.000 (1.60) | 0.035* (2.07) | 0.032 (1.68) |
| Tenure | 0.000*** (5.29) | 0.000*** (4.84) | 0.023* (2.48) | 0.030*** (5.37) |
| Female | 0.000 (0.24) | 0.000 (0.20) | 0.041 (0.33) | 0.012 (0.10) |
| Year 2011 | -0.003** (-2.89) | -0.003** (-2.86) | -0.179*** (-3.81) | -0.192*** (-3.93) |
| Employees | | 0.000 (0.78) | | -0.000*** (-3.51) |
| Sales | | -0.000 (-1.91) | | 0.000* (2.50) |
| Constant | 0.001 (0.17) | 0.003 (0.38) | -2.196** (-2.85) | -2.028* (-2.29) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 105112 | 105097 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.10: **Training weeks not delivered by an EA: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|--------------------|---------------------|---------------------|---------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.039* (2.33) | 0.017 (1.05) | 0.146*** (3.34) | 0.037 (0.64) |
| Age | -0.001* (-2.30) | -0.001* (-2.28) | -0.009** (-2.97) | -0.007* (-2.46) |
| Schooling | 0.005*** (4.67) | 0.005*** (5.54) | 0.020*** (6.04) | 0.024*** (7.67) |
| Tenure | 0.003*** (3.78) | 0.002** (3.20) | 0.008* (2.20) | 0.005 (1.78) |
| Female | 0.027** (2.84) | 0.007 (0.82) | 0.115*** (3.88) | 0.031 (1.14) |
| Year 2011 | 0.012* (2.52) | 0.012** (2.65) | 0.039*** (3.61) | 0.040*** (3.71) |
| Employees | | 0.000 (1.28) | | 0.000 (0.98) |
| Sales | | 0.000 (1.05) | | 0.000 (0.04) |
| Constant | 0.279*** (9.81) | 0.291*** (10.67) | -0.353** (-2.97) | -0.345** (-2.83) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 1876444 | 1876442 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.11: **Health and safety training weeks: extensive and intensive margins**

| | (1) | (2) | (3) | (4) |
|---------------|--------------------|--------------------|--------------------|--------------------|
| | Training (0/1) | Training (0/1) | Training weeks | Training weeks |
| EA firm | 0.023** (2.88) | 0.012 (1.64) | 0.253*** (4.29) | 0.075 (0.80) |
| Age | -0.001 (-1.33) | -0.001 (-1.30) | -0.011 (-1.82) | -0.009 (-1.40) |
| Schooling | 0.001** (2.64) | 0.001** (2.61) | 0.016*** (3.69) | 0.017*** (3.70) |
| Tenure | 0.001** (2.76) | 0.000 (1.53) | 0.015*** (5.36) | 0.010*** (3.51) |
| Female | 0.003 (0.34) | -0.003 (-0.40) | 0.042 (0.49) | -0.053 (-0.61) |
| Year 2011 | 0.003 (0.76) | 0.003 (0.75) | 0.024 (0.98) | 0.021 (0.85) |
| Employees | | 0.000 (0.79) | | 0.000 (0.74) |
| Sales | | 0.000 (1.91) | | -0.000 (-0.04) |
| Constant | 0.099*** (5.39) | 0.104*** (5.76) | -0.490* (-2.10) | -0.415 (-1.66) |
| Firm controls | | X | | X |
| Worker FE | | | X | X |
| Observations | 4149389 | 4149387 | 762578 | 762557 |

Notes: The table presents different models of worker training estimated using a linear probability model (first two columns) and a Poisson model (last two columns). The dependent variable (first two columns) is equal to one if the worker received at least one hour of training; or the amount of training (in training week units, constructed from dividing training hours by 35). The data set considers all individual workers in Portugal in 2010 and 2011 and the amount of training provided by their firms of the type indicated in the table title and in each year. 'EA firm' is a dummy variable equal to one if the worker is employed by a firm affiliated with an employers' association. 'Firm controls' is a list of firm-level control variables (firm size in number of employees and total sales). 'Worker FE' denotes worker fixed effects. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.