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Abstract

1. INTRODUCTION	3
2. THE ROLE OF FIRMS AND INDUSTRIES IN EXPLAINING THE INTER-FIRM MOBILITY OF WORKERS	6
3. THE IMPACT OF WORKER TURNOVER ON THE EVOLUTION OF FIRMS AND INDUSTRIES	18
4. THE COUPLED DYNAMICS OF INDUSTRY STRUCTURES AND WORKER MOBILITY: POSSIBLE ALTERNATIVE STRATEGIES FOR THEORETICAL DEVELOPMENTS	24
5. CONCLUSIONS AND OPPORTUNITIES FOR FUTURE RESEARCH	27
REFERENCES	31

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Towards an integrated approach to industry dynamics and labour mobility

Abstract

Industrial dynamics and labour mobility are two fields of economic research that have developed fast in recent years, but along what are essentially separate lines. This paper shows that the processes those two fields deal with can be highly interdependent, and demonstrates the usefulness of (and the opportunity for) an integrated approach to the dynamics of industries and labour mobility. It concludes with a list of questions that inform a research agenda dedicated to such approach.

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1. INTRODUCTION

Industrial dynamics and studies of labour mobility are two fields of economic research that have developed fast in the past two decades. In both cases such development was very much related with the increased availability of micro data, of computational resources, and of statistic and econometric tools suitable to their treatment. These, in turn, have favoured the identification of a number of empirical regularities (which are often taken as ‘stylised facts’ in both domains). On the basis of such evidence, existing theoretical models were tested and new models were developed aiming at a better explanation of the regularities found in the data.

A further common feature of those two fields of research is the fact that both deal with what can be seen as epiphenomena of the dynamic nature of the contemporary capitalist societies. We now know that the turbulence in industry structures – as a result of entry and exit of firms, changes in market shares, changes in property control, etc. – is striking. For example, using a harmonised firm-level dataset of 24 industrial and developing countries, Bartelsman et al. (2004) found that, even when micro firms (i.e., firms with less than 20 people) are excluded, the annual sum of entries and exits is between 3% and 8% of the total number of firms in most industrial countries; with micro firms included, the figure increases to 20-25%. When we look at the figures on labour market dynamics, the picture is no less impressive: according to the OECD (1999), the annual turnover of the workforce in industrial economies (understood as the sum of hires and separations) varies between 10% and 15% (whilst total employment typically does not change more than 1-2%).

There are plenty of reasons to believe that changes in industry structures and worker mobility are not entirely independent phenomena. At the most obvious level, the growth of existing firms and the creation of the new ones is necessarily related to an inflow of workers to those firms, just as the contraction and the closure of firms have the opposite effects on the supply-side of the labour markets (Davis et al., 1996). Moreover, industry turbulence affects the labour markets not only in such direct way, but also indirectly through the vacancy chains that are opened and closed by firms’ growth/founding and contraction/failure (as pointed out, e.g., by Haveman, 1995). Reverting the direction of the causality, it has been noted for a long time (e.g., Staw, 1980) that worker turnover has both positive and negative consequences for organisations, and in this sense they may constitute an important determinant of industry dynamics. More recently, research on the importance of previous experience for entering firms

(e.g., Helfat and Lieberman, 2002) draws attention to the role of workers' turnover in bringing competences to, and therefore increasing the survival prospects of, newly founded firms.

In this paper I will argue that, notwithstanding all the possible interdependencies between industry evolution and labour market dynamics, there remains a lack of systematic discussion about the details of such coupled dynamics and its implications. In fact, most theoretical models of industrial dynamics (for surveys see, e.g., Dosi et al., 1997; Sutton, 1997; Caves, 1998) tend to focus on the technological or financial determinants of changes in the structure of industries, abstracting from the influence of labour market determinants. In the same vein, the reference models of worker mobility (for a survey see, e.g., Farber, 1999) typically underestimate the mutual influence between industry dynamics and labour market forces. With a few notable exceptions, most of the empirical work that has been done in both fields of research has followed along the same lines.

In many contexts, ignoring the mutual influence between the evolution of industry structures and the patterns of worker mobility does not do much harm to the progress of knowledge. While it is difficult to imagine situations in which the two dynamic processes are entirely independent, it is clear that the movement of workers between firms tends to be a minor issue in the evolution of several industries (specially those that essentially rely on low-skilled, homogeneous labour, and/or in which firms operate as monopsonists, or quasi-monopsonists, within the relevant labour markets); similarly, the movement of workers in the labour market is only partly determined by the evolution of the firms that employ them – cultural, institutional, and/or idiosyncratic factors usually exert their influence and may often be more relevant than industry turbulence in determining the patterns of worker mobility. In such contexts, abstracting from the influence of worker turnover on industry evolution, or vice-versa, simply reflects the need to concentrate on the essentials and leave aside the details, which is common to any scientific endeavour.

However, we also know that such mutual influence can be crucial in many other contexts. In fact, historical accounts of industries which are highly dependent on a specialised labour force often show that the patterns of firms' evolution and of labour force mobility are intrinsically related. For example, in relation to both hi-tech (Baron, 2004) and professional services industries (Mamede, 2002; Gallouj and Gallouj, 1996) it has been emphasised that the performance of firms is very much affected by their capacity to recruit skilled workers and to avoid poaching by competitors. Such 'recruitment-based competition' (to use the expression suggested by Sørensen, 2004), together with the highly turbulent character of some of those industries (especially those in the early phases of their life-cycle), also imply that the movement

of workers will be strongly influenced by the dynamics of the relevant population of employing organisations. When this is the case, theoretical and empirical inquires of industry evolution which abstract from the role of labour market dynamics – or vice-versa – risk missing the main elements of the dynamic picture they propose to explain.

It is thus worthwhile to look at where we stand in our knowledge of the interdependencies between the evolution industry structures and the patterns of worker mobility between firms, to signal the gaps in the relevant literature, and to point towards possible developments that may help us elucidate the dynamic processes involved. These constitute the central aims of this paper.

The remaining sections are organised as follows. Sections 2 and 3 are dedicated to the separate analysis of two opposite influences: first I discuss the extent to which the existing literature has considered the role of firms and industries in explaining the turnover of workers, and then I turn to the analysis of the literature related to the impact of workers turnover on the evolution of industries. Section 4 discusses different possible strategies to put industry and labour market dynamics together in an integrated theoretical framework. Section 5 summarises the main arguments and concludes the paper.

2. THE ROLE OF FIRMS AND INDUSTRIES IN EXPLAINING THE INTER-FIRM MOBILITY OF WORKERS

This section deals with one direction of causality which is inherent to the coupled dynamics of industry structures and patterns of labour market mobility: the impact of industry dynamics on worker mobility. First it will look at a number of empirical regularities which have been identified in relation to inter-firm movements of workers, and at examples of influential theories which provide alternative explanations for the regularities found in the data. While the typical explanations for the usual patterns of worker mobility focus on factors related to the supply-side of the labour market, or to job-match quality issues, there is now a considerable amount of evidence emphasising the relevance of determinants of worker mobility related to turbulence on the demand-side. Still, the empirical studies that can be found in the literature capture only part of the possible links between industry dynamics and worker mobility – as should become clear by the end of the section – leaving open a number of questions associated with the dynamics relation under discussion.

2.1. Empirical regularities and typical theoretical explanations of inter-firm worker mobility

Drawing on an extensive review of empirical studies concerned with the analysis of the stability and mobility of employment relations, Farber (1999) emphasises three central facts describing inter-firm worker mobility in modern labour markets: (i) long-term employment relationships are common (i.e., a significant proportion of workers are involved in durable employment relations), (ii) most new jobs end early, and (iii) the probability of a job ending declines with time (the relation is not necessarily monotonic – some studies find that the probability of a job change may first increase with tenure, before starting to decrease).

To provide an instance of such regularities, drawing on data from unemployment insurance systems in the U.S., Andersen and Meyer (1994) have found that: most turnover (55%) is due to a minority of individuals (22%) who frequently change jobs; about 40% of employment relations last no more than one year; and the impact of tenure on the dissolution of job matches is negative (after controlling for other relevant factors, such as wage levels).

Different types of models have been put forward which can account for such statistical regularities. However, the most influential of such models have one thing in common: they typically abstract from the effects of industry turbulence on labour mobility (putting the burden of the explanation on factors belonging to the supply-side of the labour market, or on the quality of the match between employer and worker). The following examples illustrate this point.

The first case consists in models of worker mobility which are based on individual heterogeneity. The idea underlying these approaches is that individuals have different propensities towards work and mobility (which may be captured, at least partially, in the empirical work by such variables as age, gender, ethnicity, education background, etc.). Faber (1999) presents a simple model of this type to show how individual heterogeneity can lead to the three regularities mentioned above: suppose there are two types of workers, which only differentiate by their turnover probability; in order to have a high percentage of long tenures, we just have to assume that less turnover-prone individuals are highly represented in the population; since highly mobile workers have a lower probability of experiencing long tenures, most of the workers involved in durable employment relationships will be of the low-turnover type and, consequently, the probability of separations decreases with tenure; finally, since the less mobile workers are typically involved in long tenures, most new job vacancies will be filled by high-turnover individuals and, therefore, many new jobs matches will end early.

A second example of an influential model explaining those patterns of job turnover is the one put forward by Jovanovic (1979). The building block of this model is the idea that the productivity of each particular job match is not known in advance – it is gradually revealed, since output constitutes a noisy signal of match quality. As the expectations of both firms and workers are updated on the basis of each period's output, both sides can decide whether to continue or to stop the employment relationship. Jovanovic's model is particularly successful in replicating the statistical regularities listed above, since it allows for a non-monotonic relation between tenure and probability of turnover: initially, even if the observable output signals a bad-quality match, workers tend to remain in the firm since they know the signal is noisy; as time goes by, the assessment of match quality becomes more precise, leading either to a separation (because the match quality is too low) or to a permanent match (because its quality is high); thus, in an early phase more and more workers will decide to move, but on the other hand an increasing number of workers is involved in enduring employment relationships.

These are two instances of models that successfully replicate a few central statistical regularities of worker mobility, and they both illustrate the tendency (often noted among students of the labour markets) to abstract from demand-side disturbances as determinants of

employee turnover. Such tendency has been gradually reverted in recent years, as more and more studies have shown the extent to which labour market dynamics are influenced by the turbulence experienced on the employers' side. Quoting Davis and Haltiwanger (1999, p.2715), *«It is now apparent, as perhaps it was not a decade ago, that a satisfactory account of worker mobility dynamics in market economies requires a major role for demand-side disturbances as well as for supply-side and match-quality effects.»* A major role for industry turbulence in labour market analyses is provided by the literature on job creation and destruction, which will be dealt with in the next section.

2.2. Industry dynamics and the gross creation and destruction of jobs

The literature on job creation and destruction provides the first instance of a direct link between research on industrial dynamics and work on labour market flows. In fact, this literature – which focuses on traditional topics in labour economics – as both benefited from and contributed to the theory and evidence produced in the realm of industrial dynamics.

During the 1980s, the evidence on the pervasiveness of entry and exit of firms in the markets accumulated continuously. Dunne, Roberts and Samuelson (1988), for example, have used data from the US Census Bureau, which included information collected by 5 Census of Manufacturing from 1963 to 1982, to study the patterns of entry and exit in US manufacturing industries. They have shown that, even excluding the smallest firms, 38.6% of the firms included in each census were not included in the previous one (which typically took place 5 years before). The authors have also shown that, although numerous, entrants tend to be much smaller than incumbent firms, being responsible for only 15.8% of the industry output. Similar results were obtained with respect to firm exits (with the market share of the exiting firms being slightly higher). These results corroborated the evidence already produced by the empirical literature on the so-called 'Gibrat's Law' (e.g., Evans, 1987; Hall, 1987)², which has also shown that firm growth is negatively related with firm size and age, with younger firms facing a higher probability of failure but also better growth perspectives for those that survive.

The literature on job creation and job destruction has established a link between such patterns of turbulence in industry structures and the gross flows of jobs in the labour markets. The

² For a review of the debate surrounding the 'Gibrat's Law' of proportionate effects see Sutton (1997).

following definitions (or minor variations of it) are central to the establishment of such link in the context of this literature (see, e.g., Davis and Haltiwanger, 1992): *gross job creation at time t* corresponds to the employment gains summed over all business units that expand or start up between t-1 and t; *gross job destruction at time t* corresponds to the employment losses summed over all business units that contract or shut down between t-1 and t; *gross job reallocation at time t* is the sum of all business unit's employment gains and losses that occurred between t-1 and t (it equals the sum of gross job creation and job destruction). The corresponding rates are obtained by dividing those variables by the total employment at t (or, as is often the case, by the arithmetic mean of total employment in periods t and t-1).

This stream of literature has produced an immense amount of evidence on some crucial aspects of the labour market dynamics. Davis and Haltiwanger (1999) review the main results that were obtained in studies conducted in several different countries during the 1990s; on the basis of such studies they show that: around 10% of jobs are created and other 10% are destroyed every year; in every country the rate of job reallocation is higher than 10% for most of the sectors at a two-digit desegregation level (using the international system of industrial classification); most of the job creation (destruction) is due to the expansion (contraction) of existing firms, rather than to firm entries (exits).

For example, using data from the US Annual Survey of Manufacture between 1972 and 1986, Davis and Haltiwanger (1992) have found that: the annual rates of job creation and job destruction at the plant level were 9.2% and 11.3%, respectively (Dunne et al., 1989, have reached similar results, using different data); entries were responsible for 20% of job creation and exits by 25% of job destruction (thus confirming the notion that both entering and exiting firms are typically smaller than the average incumbent); not only is job destruction mostly driven by the contraction of existing firms, but about ¾ of job destruction takes place in plants that lose more than 20% of employment in one year.

More importantly in the present context, Davis and Haltiwanger (1992) show that the inter-sectoral reallocation of jobs plays a minor role in explaining total job reallocation (this is true even if sectors are defined not only in terms of industrial classification, but also according to plants' age, size, ownership type, or region); that is, they show that explaining total employment reallocation implies taking into account the causes underlying the simultaneous occurrence of job creation and job destruction within each sector.³

³ The authors show that, although all two-digit sectors have experienced a contraction in total employment during the period under analysis (1972-1986), in every such sector there were plants in which job creation took place (the same applies up to the four-digit desegregation).

As one could expect, different industries do not show the same intensity of job reallocation. Some of the studies that have been done within this line of inquiry since the early 1990s have thus tried to identify the determinants the inter-industrial differences in the patterns of job creation and destruction. For example, using data on the Swedish economy between 1986 and 1997, Antelius and Lundberg (2003) have found that job reallocation is: lower in manufacturing industries than in services; higher in more innovative and fast growing industries, higher in industries with smaller firms and lower returns, lower in industries with more stables market shares, lower in the more export-oriented industries in which the presence of foreign capital is more pronounced. These results clearly suggest that the same kind of features that characterise the more turbulent industries – innovativeness, fast growth, competitive pressure, etc. – are also present in the explanation of higher degrees of job reallocation.

Such coincidence, however, is not at all surprising. In fact, the definitions of job creation, job destruction, and job reallocation which were presented above are indeed not indicators of worker flows, but rather indicators of net employment changes summed over all business units belonging to some category. And it is only natural that higher levels of net employment changes (in absolute terms) occur in firms belonging to more turbulent industries.

The use of such definitions constitutes both the crucial strength and the crucial weakness of the ‘job creation and job destruction’ type of approach. On the one hand, the use of those definitions has allowed the production of a considerable amount of new evidence on the heterogeneity of business units in terms of job dynamics (which had a significant impact in such diverse fields of labour economics, industrial organisation, and macroeconomics), drawing on data sources that were readily available. While most evidence on labour market mobility had been previously produced using information on individuals, Davis, Haltiwanger and others took advantage of databases dedicated to the demand-side of the labour market (actually using the same type of information used by researchers of industry dynamics) to explore this field from a different perspective. On the other hand, by looking only at the net employment changes in business units, research on job creation and destruction is unable to capture a significant part of the labour market flows; for example, it ignores all the changes in the composition of the workforce that do not lead to variations in total employment within firms. The type of work to be discussed in the following section has tried to overcome this limitation by looking simultaneously at both sides of the labour market in the analysis of worker mobility.

2.3. Worker turnover in excess of job reallocation

The last two sections dealt with two contrasting approaches to the analysis of labour market dynamics: on one hand, we have those contributions focusing on worker flows, which typically emphasise the role of labour market supply-side or match-quality factors, and which rely on data on individual workers, in order to explain the observable patterns; on the other hand, the ‘job creation and job destruction’ approach focuses on strictly demand-side determinants of labour market flows. Both types of approaches present obvious shortcomings: the first one tends to underplay the role of industry turbulence, and its impact on the demand for labour, in explaining the patterns of workers’ moves; the second approach is unable to account for movements of workers that exceed the net changes in total employment within each productive unit.

Both cases represent real obstacles to the understanding of the mutual influence between industry dynamics and worker mobility. On the one hand, it is not indifferent to a firm whether the amount of changes in the composition of its workforce has exceeded or not the number of hires/separations needed to accommodate the expansion/contraction of the firm: even if the total number of employees has remained the same, if half of the people left since last period and half of the personnel is new to the firm in the current period this may have a significant impact in the firm’s performance. On the other hand, hires or separations that are not related to changes in the dimension of the firm probably are motivated by factors other than purely demand-led job reallocations, and it may be worthwhile to consider those differences.

To a large extent, the shortcomings of the approaches which were discussed before reflect the absence of adequate data to carry out an integrated analysis of labour market dynamics: while the availability of longitudinal data from different countries concerning either individual workers or business units has increased sharply since the early 1980s, databases matching the trajectory of both workers and firms in different time periods – the kind of data that allow the joint consideration of supply and demand in the analysis of worker mobility – are still scarce.

The use of matched employer-employee longitudinal databases⁴ provides the basis for more precise estimations concerning the relative importance of demand- and supply-side determinants in explaining the mobility of workers between productive units. In one of the first studies

⁴ For an overview of the different studies that have used matched employer-employee data see Abowd and Kramarz (1999). Hamermesh (1999) discusses some research avenues (which overlap only partly with what is discussed in the present paper) that are opened with the increased availability of this type of data.

providing direct evidence on this issue⁵, drawing on data for eight States in the U.S., Andersen and Meyer (1994) estimate that 31% of the quarterly total worker turnover (i.e., the sum of all hires and separations) was explained by the creation and destruction of jobs (this proportion is lower for manufacturing industries and higher for services). Similar results were achieved by Hamermesh et al. (1996) in their study of the Dutch economy in the period 1988-1990 (job turnover rate was found to be 6.2%, about one third of the figure estimated for worker turnover, 22%). Albaek and Sorensen (1998), using data from Denmark for the period 1980-1991, found that, on average, job creation constituted 42% of hiring, and job destruction represented 41% of separations. Abowd et al. (1999) used a representative sample of French establishments from 1987 to 1990 to show that annual job creation is characterised as hiring three persons and separating two for each job created in a given year, and that annual job destruction is characterised as hiring one person and separating two for each job destroyed in a given year. Finally, using quarterly data for the State of Maryland in the U.S., Burgess et al. (2000) found that job flows account for nearly 30% of the worker flows in non-manufacturing industries, and about 37.6% in manufactures.

All these studies demonstrate that underneath the net changes in total employment at the firm level, there is a considerable amount of simultaneous hiring and separations going on. In fact, many of those studies have shown that the turnover of workers is only loosely connected to job creation and job destruction. For example, Hamermesh et al. (1996) show that: the flows of workers are large even in firms where net employment changes are small; most firing is done by firms that are also hiring; although hiring is higher for firms with expanding employment, hiring rates in firms with declining employment average 5.9%; and while matches dissolve more intensively among firms with declining employment, firms with expanding employment still fire 1.1% of their workers each year, and (voluntary) quit rates seems relatively unaffected by conditions within the firm.

The fact that the turnover of workers is only partly determined by the expansion and contraction of business units should not, however, be taken as an indication of little mutual influence between labour market flows and industry dynamics. While there are a number of different factors which may explain worker flows in excess of job reallocation – or ‘churning’, as Lane, Stevens and colleagues (see references below) call it – it is plausible that at least part of those

⁵ As a matter of fact, Davis and Haltiwanger (1992) were able to estimate approximately the impact of demand-led disturbances on worker mobility by combining plant-level data with information from different sources on the mobility in the labour markets. They suggested that 35% to 56% of the transitions between employment states were due to employment opportunities related to job creation and destruction. Although it is only an approximate estimation, this interval is not incompatible with more precise estimations obtained on the basis of matched employer-employee data.

factors are strictly related with the dynamics of firms and industries. The next section is dedicated to the discussion of this topic.

2.4. The dynamics of firms and industries as a determinant of churning⁶

The level of worker turnover may differ across industries or across firms for several reasons, for example: high hiring and training costs may reduce turnover, and such costs can vary across industries (or between different phases in the lifecycle of the same industry) due to differences in the production process and the nature of worker skill requirements; implicit contracts may develop between firms and workers, and such contracts may vary with firm size and product demand; there may also be economies of scale in screening devices, which may help increase the initial quality of job matches in bigger firms; moreover, firms may learn to develop more effective screening devices as they age, which means that turnover is expected to be lower for older firms (Lane et al., 1996). All these examples suggest that the type and amount of turnover expected to be found (and/or to be desirable) in different firms, in different industries, or in different phases of the lifecycle of firms and industries may vary in some consistent manner.

Unfortunately, the amount of evidence on this is still modest. Again, this is mainly due to the scarcity of data: not only matched employer-employee databases still do not abound, moreover the information included in the available datasets often does not allow a systematic discussion of the links between worker turnover and the dynamic features of firms and industries. The implication is that the available evidence related to such links was produced on the basis of very few data sources; therefore, the following results should be seen as preliminary ones.

(i) *Firm size is not on itself a determinant of worker turnover.* The discussion above seemed to suggest that bigger firms would experience lower turnover rates. Some empirical studies have in fact suggested this relationship: for example, DiPrete (1993) regressed the number of worker separations per organisation on the dimension firms (and other variables related to industry and the worker type) and found an inverse relationship between the two variables. However, other studies seem to contradict this result: Burgess et al. (2001) found that churning is unrelated with size; in the same vein, Martin (2003) finds that the effect of firm's dimension on worker

⁶ Churning flows are typically computed at each period as the difference between total worker turnover (i.e., the sum of hires and separations occurring in that period) and the absolute value of net job changes. I.e., $CF=WF-|H-S|$, where CF are the churning flows, WF are the total worker flows ($WF=H+S$), H are the hires, and S stand for the separations in the period.

turnover is not significant. While the comparability of these studies is somewhat hampered by differences in the variables they purpose to explain (separations, churning, total worker turnover) and in the type of data being employed, there are reasons to believe that firms' sizes exert their influence on workers mobility by means of other organisational features – and therefore the statistical significance of their impact tends to wither as the relevant variables are included in the regressions. For example, in the study just mentioned, Martin (2003) finds that worker turnover is negatively related to wages, while not significantly related to firm size; on the other hand, wages have been shown to be systematically related with the size of firms (Oi and Idson, 1999); therefore, it may happen that a negative statistical relation between worker turnover and firm size will be rendered insignificant when wage is included as an explanatory variable in the regression.⁷

(ii) *Churning is positively related to firm's growth.* The study by Burgess et al. (2000) concludes that increases in firms' employment lead to higher churning rates, while reductions in employment have the opposite effect; in explaining this result, the authors suggest that the expansion of firms' workforce lead to an increase in bad matches, thus justifying the simultaneity of hires and separations at the firm level (again, the contraction of the workforce has the opposite effect).⁸

(iii) *Churning rates decrease with firm age.* Lane et al. (1996) found that churning is slightly decreasing in the age of the firm. In order to analyse churning rates over the lifecycle of firms, Burgess et al. (2000a) divided firms into 4 lifecycle categories⁹: (1) firms that survive 12 quarters or less, (2) continuing firms within 12 quarters, (3) non-infant firms within 12 quarters of death, and (4) the rest (i.e., continuing mature firms). The results showed that the worker flow rate (i.e., churning rate plus job reallocation rate) decreases monotonically from category 1 (65,4%) to 4 (30,4%); but they also showed that hires and separations are important in every category, making churning flows more common across categories than job reallocation. This implies, for instance, that in continuing mature firms, which typically experience smaller

⁷ Of course this will depend on the factors that underlie the size-wage positive relation. Oi and Idson (1999) discuss alternative theories that account for such robust result.

⁸ A few studies have tried to analyse the relative incidence of hires and separations as firms adjust to their new dimensions, but the results seem contradictory: Burgess et al. (2001) found that growing firms mostly increase their hiring and do not act to reduce turnover; declining firms generally maintain hiring but increase separations; on the contrary, Abowd et al. (1999), found that employment adjustments are primarily made by adjusting entry, rather than exit rates; the later result is consistent with the findings of Anderson and Meyer (1994) and of Albæk and Sørensen (1998).

⁹ The same firm could be classified into different categories, depending on its current condition in different periods.

changes in net employment (see section 2.2), the weight of churning as a percentage of worker flows is particularly high. Still, the analysis of a specific cohort of firms confirmed the idea that churning rates tend to decrease with firm age.¹⁰

(iv) Churning rates are a persistent, distinctive feature of firms. In order to explain the heterogeneity among firms in the rates of labour market flows, Burgess et al. (2000) run separate regressions for job flows and for churning flows, including as independent variables time dummies, seasonal dummies, industry dummies, and employer dummies (fixed effects). While these regressors were able to explain only a very small part of the heterogeneity in job flows, about 50% of the variation in churning rates was explained with those variables, with employers' fixed effects assuming particular relevance. These results clearly suggest that it is possible to identify firms that have systematically high churning rates and other which have systematically low churning rates (while the same cannot be said about the changes in net employment). In the same vein, Lane et al. (1996) have found that churning rates are positively dependent on past churning, which also point the presence of persistent differences between firms in relation to churning rates.

(v) The determinants of churning play different roles according to the characteristics of firms. Given that firms persistently differ in churning rates, it is reasonable to expect that some of the determinants of churning that have been discussed up to now will have different impacts according to the type of firm. By estimating a number of quantile regressions (at the 25th, median, and 75th percentiles) Burgess et al. (2001) find some evidence on this, for example: while churning is not significantly related with size for the pooled sample of firms, it shows to be decreasing in size for high churning firms and increasing in size for low churning firms; quantile regressions also show that, while churning rates tend to decrease in tight labour markets, the aggregate labour market conditions have a significantly greater effect on high churning firms than on low churning firms; similarly, the negative relationship between churning and wages is much weaker in low churning firms.

¹⁰ There are two possible explanations for this: (i) the churning rate is reduced as firms ages due to better job matches, and (ii) high churning firms have lower survival probabilities, so those firms that survive have typically low churning rates. Two pieces of evidence that will be discussed below – the negative relation between churning rates and firm survival, and the persistent heterogeneity of churning rates between firms – seem to favour the second explanation.

(vi) *The incidence of churning is particularly high in some industries.* Several studies have also revealed the presence of some industry specificities in churning rates. For example, Burgess et al. (2001) included industry dummies as regressors in an empirical model of the determinants of churning; their results show that, while the impact of most industries does not quantitatively differ in a significant manner, for a few other industries – namely, finance, insurance and real estate, and professional services – the effect on churning rates is particularly high.

(vii) *Industry turbulence seems to lead to higher churning (and not only to the reallocation of jobs).* While the literature on job creation and job destruction clearly shows the impact of changes in industry structures in the reallocation of jobs (see section 2.2), the evidence on the impact of industry turbulence on worker flows in excess of changes in firms' net employment changes is still rather scarce and unsystematic. For example, Haveman and Cohen (1994) have shown that organisational founding, organisational dissolution, and mergers and acquisitions have all had a significant impact on the mobility of executive employees between firms, using data on the California savings and loans industry between 1969 and 1988. Using a sample extracted from the US Statistical report on Mergers and Acquisition between 1979 and 1981, Walsh (1988) also found that turnover rates in the acquired top management teams were significantly higher than usual. The results in Burgess et al.(2000) pointing to a mutual influence between changes in net employment and churning rates at the firm level further suggest that turbulence in firms' market shares typically lead to an increase of worker flows in excess of job flows.

2.5. Summing up

It should now be clear that industry dynamics has a relevant impact on the mobility of workers in the job market, both in direct and indirect ways. Research on 'job creation and job destruction' has shown that firms' entries, exits, expansions, and contractions, which occur simultaneously at several levels of the economic system, are directly responsible for the creation of about 10% of new jobs, and the destruction of other 10% of existing jobs, every year. On the other hand, research on churning flows has shown that movements of workers between firms which are caused by such processes of job creation and destruction usually represent no more than 1/3 of total worker mobility, what could be taken as an indication of the relatively small role played by industry dynamics on worker mobility. However, we have also seen that worker flows in excess of job flows can also be related, at least partially, to the dynamics of industry

structures: first, because the creation and destruction of jobs affect the mobility of workers not only directly, but also indirectly through vacancy chains; second, since several determinants of worker turnover – such as the costs of hiring and training, the efficiency of screening devices, wages levels, among others – are often systematically related with the size and age of firms, with different phases of their lifecycle, and with the type of industry (and the competition for human capital between firms in each context).

In other words, there are reasons to believe that the observable patterns of worker mobility emerge from the consistent behaviour of both workers and firms, who systematically take into account the dynamic features of industries. Moreover, it has been shown that varying degrees of worker turnover seem to be a persistent characteristic of firms. That is, *the influence of persistently heterogeneous employers acting in the context of changing industry structures* emerges from this discussion as central features in the understanding of the patterns of worker turnover.

Notwithstanding, we have seen that the most influential models of worker mobility tend to ignore such features in their explanatory frameworks.¹¹ Furthermore, it was shown that the evidence on the impact of industry dynamics on worker mobility (in particular, on worker flows in excess of net employment changes) is still rather scarce. In sum, there seems to be plenty of room for both theoretical and empirical developments related to the understanding of such relation.

I will come back to this issue in the concluding section of the paper. For the moment I will turn to the other direction of the causality in the relation between industry dynamics and worker mobility.

¹¹ It is worth noting that, following the empirical work that revealed the significance of ‘job creation and job destruction’, many models have considered the interactions between the demand side of the labour market and gross labour market flows (e.g., see the survey by Pissarides and Mortensen, 1999). Those models, however, typically aim at explaining certain aggregate regularities, such as the positive relation between wage and labour productivity, or the aggregate behaviour of unemployment and gross job flows – and not the central facts on the patterns of inter-firm worker mobility, which were emphasized by Faber (1999), and which were presented in the beginning of section 2 as the focus of the present discussion. On the other hand, one can find models that focus specifically on worker mobility, while at the same time considering the role of demand-side factors – as the one by Jovanovic and Moffit (1990); this model nests match quality and sectoral shocks as determinants of labour mobility; however, as is usually the case with models of this kind, it only considers productivity shocks that are common to all firms in each sector; that is, although they take into account changes on the firms’ side, such models still abstract from the role of industry turbulence in determining worker mobility – which is the topic of interest here.

3. THE IMPACT OF WORKER TURNOVER ON THE EVOLUTION OF FIRMS AND INDUSTRIES

The aim of the present section is to discuss to what extent this second nexus of causality has been considered in both the theoretical and the empirical literature on industry dynamics. As before, I start by presenting the main statistical regularities which have been found in this field, and discuss the role played by worker turnover in the most influential models that explain those regularities. This discussion will reveal the usual absence of labour mobility factors in theories of industry dynamics; this contrasts with the notion that worker turnover may exert a significant influence on the performance of firms, and on the patterns of change in industry structures. After discussing a number of theoretical arguments that suggest different ways in which such influence can be felt, I analyse the empirical evidence on that causal relation, drawing on studies related to different research streams. As before, the achievements and limitations of both theoretical and empirical analysis of industry dynamics concerning the integration of labour mobility factors will be emphasised at the end of the section.

3.1. Empirical regularities on the dynamics of industries and usual explanations

As in the case of labour mobility, the empirical evidence drawn from several studies on industry dynamics allows the identification of some statistical regularities (for surveys see Caves, 1998; Dosi et al., 1997; Geroski, 1995), including the following: the entry and exit of firms are two frequent, and very often correlated, phenomena; the distribution of the size of the firms is typically biased towards smaller scales; new firms are smaller than the average incumbent, have a small probability of survival, and those that survive grow faster than the average; the variability in firms' growth rates diminishes with size; several industries experience shake-outs in the number of firms, after reaching a peak in the number of incumbents.

Many formal models have integrated those (and other) regularities in their assumptions and/or replicated them in their outcomes, thereby providing alternative explanations for the observable patterns of industry dynamics. In spite of the diversity of the causal mechanisms put forward in those theoretical exercises, the most quoted models of industry dynamics tend to focus on technological or financial determinants of changes in the structure of industries, abstracting from the possible impact of labour market dynamics on those changes.

Two of the most influential contributions illustrate the point. In the evolutionary models of Nelson and Winter (1982), the selection of firms is determined by their innovativeness, which is a stochastic function of firms' investments in R&D; innovative behaviour of firms hence determines the structure of the industry and its evolution, which follows the above mentioned patterns for the relevant part of the space of parameters. Contrasting with these models, in which agents actively invest in learning, Jovanovic's (1982) model is able to replicate many of the statistical regularities of industry dynamics assuming instead that firms are born with certain level of efficiency; such level is not known with certainty by firms when they enter the market; over time, production outcomes gradually reveal the true efficiency levels, leading to decisions by firms to either expand or contract (and eventually exit the market). The same type of emphasis on information updating or on technological learning – and the absence of labour mobility among the causal mechanisms – can be found in other reference models of industry dynamics, including the ones by Hopenhayn (1992), Jovanovic and McDonald (1994), Ericson and Pakes (1995), Klepper (1996), and Winter et al. (2003).

Although such models were relatively successful in replicating a number of statistical regularities associated with industry dynamics, they shed little or no light on the ways through which changes in industry structures may be influenced by the mobility of individuals in the labour markets. And, still, there are both theoretical and empirical reasons to suspect that a relevant part of the picture is thus being left aside. The following two sections discuss such reasons.

3.2. Theoretical arguments on the impact of labour turnover on firms' performance

It has been noted for a long time that worker turnover has both positive and negative consequences for firms. In a paper that influenced many later developments in organisation studies, Staw (1980) discusses in detail the main costs and benefits of turnover to organisations. Some of such costs were already mentioned in section 2, and include: costs of selection, recruitment and training (which are specially high for complex jobs in the context of tight labour markets, in particular for firms which cannot rely on dedicated departments and/or internal mobility); operational disruption (particularly when turnover affects central functions in the context of highly interdependent structures); de-moralisation of organisational members (when turnover affects group cohesion). While organisational costs of worker mobility are often emphasised, turnover may also be beneficial to the performance of organisations in several

ways, such as: new hires can be associated with more motivated, more competent, and more educated workers; the exit of workers (in the form of either fires or quits) is one of the possible solutions to entrenched organisational conflicts; worker turnover (both inwards and outwards) can lead to a diversification of the external links of organisations, with benefits in terms of access to different types of resources.

The discussion on the costs and benefits of turnover, together with the moderating role played by a number of different factors, suggest that the mobility of workers may reveal some consistent relations with the performance of firms. Furthermore, given that firms typically show different, persistent propensities for employee turnover (see section 2), one can expect to find some systematic impacts of turnover on the relative performance of firms – and, through this, on the evolution of industry structure.

Moreover, beyond its impact on individual firms, employee turnover can shape the patterns of competition between firms. For example, students of technological innovation and diffusion have often noted that the mobility of workers is an important mechanism of knowledge spillovers, thereby affecting firms' incentives for R&D investment (see Møen, 2005, for recent evidence on this issue). In a different vein, Sørensen (1999, 1999a) has suggested that the patterns of mobility of workers among firms affects their strategies by influencing the degree of overlap in firms' competences. To put it more generally, the mobility of human resources between organisations can be a source of increased strategic interdependency among competing firms.

The idea that turnover can have deleterious consequences which are somewhat anticipated by firms in their strategies has indeed provided the basis for the explanation of labour market related phenomena. For example, efficiency wage theories (see Akerloff and Yellen, 1986) incorporate the idea that employee turnover is reduced by increasing current and (expected) future wages and other benefits. In those cases in which reducing turnover rates is beneficial to the firm (e.g., increasing productivity by promoting investments in firm-specific capital, and/or reducing the costs of searching and recruitment), that idea explains why wages are often higher than expected, or why incentive regimes are particularly generous in rewarding tenure (as found, for example, by Møen, 2005, in the case of technical staff in R&D-intensive firms, where the wage-tenure profile is particularly steep).

The fact that firms respond to the risks posed by employee turnover resorting to internal incentive systems may suggest that, ultimately, this renders the mobility of workers irrelevant (since firms would optimally respond to the possibility of turnover). However the fact that firms display persistent differences in their propensity for labour mobility may be an indication that

later is not always the result of optimal turnover strategies – and, therefore, labour mobility may indeed autonomously contribute to the dynamics of industry structures. In the following section I present some more direct evidence in support of this idea.

3.3. Evidence on the impact of turnover on industry dynamics

While the empirical work on the dynamics of industries tends to mirror the situation found in the theoretical front in what concerns the absence of labour mobility factors in the analyses (see section 3.1), it is possible to find a few studies that have produced some evidence on this topic. Such studies can be divided in three types: the first type deals with econometric analyses of the impact of turnover on the performance of firms (in terms of growth, productivity, profitability, etc.); the second type of studies consists on statistical analyses of firm survival which include variables of workers mobility among the regressors; the third type corresponds to case-studies of specific industries.

One instance of the first type is the work by Kramarz and Roux (1999). Using a matched employer-employee database for France in the period 1976-1995, the authors estimate the effects of employee turnover on firm performance on the basis of firms' tenure structure. They find that a low turnover rate is associated with higher productivity, but a high turnover rate slightly favours profitability (suggesting the simultaneous presence of cost and benefits of labour mobility for firms). The simultaneity of harmful and beneficial turnover as also been identified by Garino and Martin (2005), using cross-sectional data for the UK; they found that the impact of worker mobility on firms would depend not only on the costs of recruitment and training, but also on the way wages are fixed in each context – turnover tends to have positive consequences for firms when wages are fixed exogenously (the authors explain this on the basis of the idea that when firms are free to fix the wages, they minimise labour costs, leading turnover rates to increase over the optimal level).

Still in relation to the first type of empirical studies mentioned above, in analysing the relation between churning flows (that is, worker turnover in excess of absolute net job changes) and job flows, Burgess et al. (2000) have found that increases in churning flows typically lead to reductions in the size of firms (specially for firms in the smaller size classes). Using revenues, instead of total employment, as a proxy of firms' size, Baron et al. (2001) also found that turnover (here understood as the proportion of individuals leaving the firm) has a negative impact on growth.

Among the second type of studies – those dealing with the relation between worker mobility and firm survival – Lane et al. (1996) have used a hazard rate model in order to test the prediction that high turnover firms will have lower survival rates. Together with other variables, the authors included as regressors the lagged churning rate of the firm (with various lags) to capture the effects of persistent churning. Their results strongly support the view that firms with high churning rates are less likely to survive than firms with lower churning rates, with the coefficients on churning rates lagged as much as three quarters showing to be consistently negative and significant. Burgess et al. (2000) have also analysed the relation between past churning and the probability of survival, modelling the probability of survival at time t as a function of the average churning up to t ; the impact of past average churning on firms' survival was found to be lower than current churning, but it was still significant. This result suggests that turnover is not simply the anticipation by workers of the future misfortunes of firms, and reinforces the argument that high churning may not be optimising for firms.

Evidence on less obvious impacts of labour mobility on the hazard rates of firms is provided by studies focusing on the relation between the probability of survival and the previous experience of firms' founders. For example, Eriksson and Kuhn (2004) analyse whether spin-offs¹² take advantage of intangible assets such as industry-specific knowledge, personal networks, or trust among its founders, in terms of their survival prospects (in comparison to other start-ups); they found that spin-offs were in fact associated with lower death risks than other types of entry. Pointing towards similar results, the literature on entry by spin-offs (see Klepper and Sleeper, 2005, and Helfat and Lieberman, 2002, for two influential papers related to the topic) has accumulated evidence on the relevance of the movement of workers out of incumbent firms and into new ventures in determining the evolution of industry structures.

Finally, the centrality of labour market dynamics was shown to be a distinctive feature of a number of competitive contexts on the basis of industry specific case-studies. For example, the performance of firms was found to be very much affected by firms' capacity to recruit skilled workers and to avoid poaching by competitors in industries such as professional services (Mamede, 2002; Gallouj and Gallouj, 1996) and hi-tech industries (Baron, 2004). In such cases, the patterns of worker turnover and firms' persistently heterogeneous competences in managing human resources are clearly influential features in determining the patterns of industry evolution.

¹² Spin-offs are understood in this context as new firms originating from within an existing company.

3.4. Summing up

The picture that emerges from this discussion on the impact of turnover on industry dynamics is not exactly similar to the one resulting from the discussion on the reverse impact (see section 2). In fact, while in both cases the most influential theoretical models have typically ignored the mutual influence between the two types of dynamics – labour mobility and changes in industry structures – on the empirical front the differences are more pronounced. In section 2 we have seen that, although many gaps remain to be filled (specially those concerning the role of industry dynamics in explaining worker flows in excess of job flows), a significant amount of evidence on the impact of firms' entry, exit, expansion and contractions on the mobility of workers is now available, making it unequivocal the existence of a link between the two domains. On the contrary, the evidence produced by empirical studies dealing with the impact of worker turnover on industry dynamics (which, as we saw, is essentially restricted to the analysis of the impact of turnover on firms' performance and survival prospects, or to case-studies of specific industries) is only enough to suggest that the development of theoretical accounts pointing towards that direction may not be absurd.

There may be good reasons, though, for such asymmetry in the available empirical evidence concerning the mutual influence between industry dynamics and labour mobility. In fact, while the net changes in the total employment of firms always leads to the movement of workers in the labour market regardless of the specific context under analysis¹³, the movement of workers between firms is typically irrelevant to the evolution of several industries (for example, those that essentially rely on low-skilled, homogeneous labour, and/or in which firms operate as monopsonists, or quasi-monopsonists, within the relevant labour markets). This suggests that while the empirical work on the impact of industry turbulence on the mobility of workers can usually ignore the existence of inter-industry differences (as is often the case¹⁴), the identification of the reverse effect (i.e., the impact of worker turnover on industry dynamics) may require the consideration of industry specificities.

¹³ At least to the extent that firms' expansion/contraction imply the creation/destruction of jobs.

¹⁴ In most of the studies which were discussed in section 2, the only way inter-industry specificities enter the empirical models is through the inclusion of industry dummy variables as determinants of worker turnover. While this may reveal some differences across industries in the scale of turnover rates, it does not allow to capture industry specificities concerning the determinants of turnover. The introduction of interaction effects between industry dummies and other variables, or running separate regressions for different industries – two strategies which would allow to capture more fundamental industry specificities – is often conditioned by the amount of data available (specially in those studies using matched employer-employee data).

I will come back to this issue and its implications for future research in the concluding section of the paper. Now I will turn to the discussion of the simultaneous analysis of the mutual influences between industry dynamics and labour mobility.

4. THE COUPLED DYNAMICS OF INDUSTRY STRUCTURES AND WORKER MOBILITY: POSSIBLE ALTERNATIVE STRATEGIES FOR THEORETICAL DEVELOPMENTS

Examples of industries where competition is based on recruitment (to borrow the expression used by Sørensen, 2004) were given above; those examples suggest that the evolution of industry structures in such contexts can be highly influenced by the patterns of worker turnover and by the heterogeneous competences of firms in this matter. On the other hand, the highly turbulent character of some of those industries (especially those in the early phases of their life-cycles), implies that the movement of workers between firms is strongly influenced by the dynamics of the relevant population of employing organisations. That is, one can expect to observe causality running in both ways¹⁵, suggesting the opportunity for – and the usefulness of – an integrated approach to the dynamics of industry structures and labour mobility.

Nevertheless, as could be expected from the discussions in section 2 and 3 above, examples of theoretical analyses taking into account the joint dynamics of industry structures and labour mobility do not abound in the literature. Given this scenario, the aim of this section is to discuss possible strategies for the development of theoretical approaches to the coupled dynamics of industry structures and labour mobility.

The question of interest here is: what are the conceivable mechanisms through which industry turbulence (understood as the entry and exit of firms, changes in sizes and in market shares, changes in property control, evolution in industry concentration) and labour market mobility would mutually influence each other? Answering this question is equivalent to sketch the main features of alternative integrated models dealing with the problem at hand.

One possible strategy for the development of such approach to this problem is suggested by bridging the literature on organisational ecology (or corporate demography – for an extensive review see Carrol and Hannan, 2000) and the research on internal organisational demography (e.g., Pfeffer, 1985). An example of such bridging can be found in Haveman (1995), who starts

¹⁵ Burgess et al. (2000) is the only paper I am aware of providing statistical evidence on such type of two-way causality. Using VAR analysis, the authors show that the relation between job flows (i.e., absolute net changes in total employment) and churning flows (i.e., worker flows in excess of job flows) is bidirectional.

from the idea that the founding, dissolution and merging of organisations has systematic impacts on firms' internal demographic composition (namely, in terms of tenure distribution). She suggests, for example, that while short-tenured employees are more likely to exit firms in general (because they may not fit their jobs or firms well, or because they have developed little firm-specific capital), moving into new ventures is an especially attractive opportunity for long tenured employees because they possess the reputations, expertise and external contacts on which new ventures rely. Thus, in periods of high entry rates the proportion of long-tenured to short-tenured employees leaving established companies will increase (and since not all long-tenure individuals leave their firms, the tenure dispersion in organisations will increase). In the same vein, the author discusses the type of changes in internal organisational demography that result from the increase in exit rates or in organisational mergers.

Although Haveman's paper does not discuss the feedback effects from changes in organisational tenure distributions to the evolution of firms and industries, this has been a central concern for research done in the field of internal organisational demography. According to Pfeffer (1985), two central suggestions have been put forward (and investigated) by organisational demographers: (i) the idea that tenure (and other demographic characteristics) strongly influence the managerial competences of individuals; and (ii) that the distribution of the competences among management teams has a significant impact on the performance of firms (the impact in terms of relative performance may depend on the distribution of competences in the management teams of the direct competitors, as suggested by Sørensen, 1999).¹⁶

In sum, on the one hand, as Haveman (1995) suggests, different dimensions of industry turbulence (entry, exit, merger, etc.) lead to selective changes in the internal demography of firms (namely, in terms of tenure distributions); on the other hand, as organisational demographers emphasise, such changes imply a reconfiguration of the set of competences in firms, which may be expected to affect the performance of firms (and, when the population of firms in an industry is jointly considered, to affect the structure of the industry as well). Thus, the coupled dynamics would be here obtained on the basis of the causal sequence «specific elements of industry turbulence – selective worker turnover – changes in internal demography of firms – differential impacts on the performance of firms – further industry turbulence – ...».

¹⁶ The idea that the individual characteristics of top managers can have strong implications for the strategy and performance of firms has also been central to the research tradition in management studies frequently referred to as research on the 'upper echelons' (for a seminal paper, see Hambrick and Mason, 1984).

Another possible way to establish the bidirectional link between industry dynamics and worker mobility is through the consideration of social networks as part of the structure of both the industry and the labour market. The fact that social networks can, and often do, influence the dynamics of labour markets has long been emphasised by economic sociologists (see Granovetter, 1995), and has been increasingly discussed by labour economists (e.g., Montgomery, 1991; Bentolila et al., 2004; Pellizzari, 2004). Studies within this tradition have revealed that employers and employees tend to know (or, at least, have information about) each other even before the beginning of their labour relation; and that social networks are extensively used by both firms and workers to find jobs and fill vacancies.¹⁷

Granovetter's approach has a clear dynamic flavour: worker mobility is not only (partly) determined by the social structure, but it helps in turn to change the social structure itself – since new personal links are being established as workers move between firms. And while his framework does not take into account the dynamics of firms and industries, it is not difficult to think of ways in which social networks, industry structures and worker mobility can actually co-evolve. One possibility would be to focus on the informational consequences of mobility (the crucial element in Granovetter's analysis) and suggest that a firm has an incentive to hire individuals who are known to its employees (since this would facilitate the access to detailed information about the competences and personality of prospective employees); and since social links are expected to be more easily established between individuals with similar demographic characteristics (age or tenure cohorts, educational or socio-economic background, etc.), one can expect that the impact of social networks on the mobility patterns will also affect firms' performance and, therefore, help to shape the evolution of industries; to the extent that social links are possibly formed when individuals work for the same firms, the evolution of industries feeds-back on the network structure and on the patterns of future mobility. Another possibility would be to apply this logic of «structure shapes mobility, mobility shapes structure» (where 'structure' refers both to social networks and populations of firms), not in terms of the informational role of networks in determining job matches, but in terms of workers' preferences in their choices of employers (e.g., all else being equal, individuals will prefer to work for those organisations in which they have acquaintances).

¹⁷ Granovetter (1995) tends to emphasize the benefits of social networks for individual (not necessarily social) outcomes in the labour market; namely, he suggests that: information given by personal acquaintances about the nature of a job is often considered more reliable; friends may facilitate individual integration and learning in organizations; having personal acquaintances among colleagues can facilitate the access to promotion and other discretionary benefits (especially, if those acquaintances are well positioned in the organizational power structure, and if contracts are more difficult to be drawn exhaustively and enforced). On the other hand, it has been shown that in some contexts jobs found through acquaintances may be associated with lower wages – see, e.g., Bentolila et al. (2004); Pellizzari (2004).

The two types of causal sequences presented above are only instances of alternative processes that may underlie the co-evolution of industry structures and labour mobility. Whether these specific processes will show to be relevant in jointly explaining the patterns of industry dynamics and of worker mobility observed in specific industrial contexts, is left to investigation. In any case, those examples may help to stimulate the further development of integrated models dealing with the problem at hand.

5. CONCLUSIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

The idea pervading this paper is that the mobility of workers in the labour markets and the patterns of industry evolution can, and often do, influence each other, and that both empirical and theoretical research in those two domains should take into account such interdependencies. Having that idea in mind, I have reviewed different streams of literature in order to identify the main empirical and theoretical results and the remaining gaps, and discussed examples of how an integrated approach to the dynamics of industries and worker mobility could be developed. It is now time to summarise the main results and to point towards the future avenues of research that are suggested by this discussion.

Concerning the empirical work, it was shown that studies focusing on the impact of entry, exit, expansion, and contraction of firms over the creation and destruction of jobs abound in the literature, and point towards the importance of that direct effect of industry dynamics on labour mobility. But we have also seen that job creation and destruction is typically only a small part of total worker flows, and that the studies which try to relate the dynamics of industries to worker flows in excess of job flows (or ‘churning’) are still very scarce. On the basis of the few studies available I have suggested a number of regularities which seem to emerge, which include the following: churning rates are positively related to firm’s growth, decrease with firm age, and do not seem to have a systematic relation to firm size (as long as other variables such as firms’ age and wages are considered); even within restrictively defined industries, firms are typically heterogeneous in terms of churning rates, and are persistently so; the incidence of churning is particularly high in some industries; and industry turbulence seems to lead to higher churning (and not only to the reallocation of jobs). However, contrarily to many of the statistical regularities which have been recurrently found in the realms of both industry dynamics and labour mobility (which can be, and have been, taken as ‘stylised facts’) the results listed above are derived from a rather small number of studies, and therefore should be considered with care.

The same applies to the results available in the literature concerning the reverse direction of causality (that is, the impact of labour mobility on the dynamics of industries); we have seen that the evidence available in this case is basically restricted to the analysis of the impact of turnover on firms' performance and survival prospects, and is also based on a small number of studies. In sum, while it is possible to find in the literature some evidence suggesting the presence of the bidirectional link under discussion, there is the need for further empirical work analysing such two-way causality.

The possibilities for such empirical developments are growing as more and more matched employer-employee database are becoming available. While this type of data has been increasingly used within labour economics, its potential for the advance of knowledge in the field of industrial dynamics is still rather unexploited.¹⁸ And even in labour economics such data could be used to analyse more systematically the influence of industry turbulence on the patterns of worker mobility. The following are examples of research questions which could be further investigated on an empirical level:

- What are the indirect impacts (i.e., beyond direct job creation and destruction) of entry, exit, expansion, and contraction of firms on worker mobility, namely in terms of vacancy chains?
- How are worker turnover and its determinants (such as the costs of hiring and training, the efficiency of screening devices, wages levels, among others) related with the size and age of firms, and what impact does it have on the post-entry performance of firms?
- Do workers cluster within specific firms according to their propensity to turnover? If yes, what are the dynamic features of such firms?
- Do highly mobile labour markets lead to lower survival chances for some types of firms?
- Are entry rates determined by the patterns of worker mobility?
- Do rates of worker turnover systematically vary between different phases of industries' life-cycles?

¹⁸ One example of a fruitful use of matched employer-employee data in the field of industrial dynamics – which is not exactly related to the problem dealt with in this paper – was recently given by Benedetto et al. (2004). Empirical work in industrial dynamics has often used administrative data to follow the firms' trajectories through time; one problem with such data, which has been recurrently identified (but not satisfactorily solved), is the fact that entry and exit can be mistakenly measured, since simple changes of ownership or legal form of organizations may modify the administrative identifiers with no other change in economic activity. In that paper the authors describe how those new datasets can provide information about the flows of clusters of workers across business units in order to identify longitudinal linkage relationships in business data.

- To what extent the impact of worker turnover on the performance of firms depends on the different phases of their lifecycle, and on the type of industry?
- To what extent differences in the way firms adjust their sizes (which are highly influenced by national laws and regulations) have an impact on the dynamic patterns of both industries and labour markets?

Such questions remain largely unanswered, and interesting results could arise by investigating them empirically.

If that is true for the empirical side, the need – and opportunity – for further work concerning the mutual influence between industry turbulence and worker mobility is even more pronounced on the theoretical front. Calls for the development of models of labour mobility that incorporate the influence of industry dynamics have been explicitly put forward before (for example, Haveman and Cohen, 1994; Lane et al., 1996), but still, as we have seen, most models providing explanations for the statistical regularities on labour market flows tend to focus on essentially supply-side determinants. This contrasts with the results discussed in this paper, which suggest that the observable patterns of worker mobility emerge from the consistent behaviour of both workers and firms (both of them persistently revealing heterogeneous characteristics), who systematically take into account the dynamic features of industries. In the same vein, models of industry dynamics typically focus on technological and/or financial determinants, ignoring the possible role of worker mobility in their explanatory frameworks.

In this paper I have discussed possible strategies that would allow filling such gaps in those literatures, and provided a couple of examples of causal sequences that could constitute the basis for integrated models of industry structures and labour mobility. Just as in the case of separate models of worker turnover and of industry dynamics, those integrated models of industry structures and labour mobility should take into account, either in their assumptions or in the desired properties of their outcomes, the statistical regularities that have been found to prevail in these domains (and which were mentioned in the preceding paragraphs).

One should not expect, however, that such integrated models will be of universal applicability. As was emphasised before in this paper, the movement of workers between firms is mostly irrelevant to the evolution of several industries, particularly those that rely on a low-skilled, homogeneous workforce. Similarly, the role of industry dynamics in determining the patterns of labour mobility is not expected to be high if the industry's turbulence is minimal.

However, taking into consideration the mutual influences between changes in industry structures and the mobility of workers may be crucial to the understanding of the dynamic

patterns observable in many contexts. In particular, an integrated approach to industry dynamics and labour mobility may be particularly adequate to the analysis of industries in the early phases of their lifecycles (when structural turbulence tends to be highest) and in which competition is strongly based on the recruitment of highly-skilled workers. These criteria would often include some of the most dynamic industries in the contemporary societies – such as higher education, biotechnology, consultancy, law firms, among others – to which the prevailing models of industry dynamics and labour mobility are not particularly well suited.

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