Cyclical Reallocation of Workers Across Large and Small Employers*

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Abstract

Search-and-matching models with on-the-job search and firm size yield the prediction that job-to-job flows reallocate workers from smaller to larger firms. Recent papers have extended such models to explain the cyclicality of employment at large vs. small firms. In this paper, we use linked employer-employee data for the U.S. to provide direct evidence on worker reallocation by firm size. We find that job-to-job flows do *not* generally move workers from smaller to larger employers. Instead, we show that workers moving directly from one job to another more frequently move from large firms to small firms than the reverse. This is despite the fact that large businesses rely more on poaching workers from other firms when hiring and small businesses hire largely from the pool of nonemployed, results that are consistent with the theory. Regarding the cyclical nature of this reallocation, we find that poaching hires are highly procyclical for both large and small firms. Yet despite the cyclical nature of poaching, net reallocation across firm size classes via poaching is relatively stable across the business cycle. The implication is that net poaching by size class is relatively small in magnitude at all phases of the cycle. We find more supportive evidence of the predictions of recent theories regarding net poaching between small and large firms in times of tight labor markets when we focus on mature firms. Even here however the quantitative effects are small.

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I. Introduction

Models of on-the-job search generally make a natural assumption about "poaching" in the labor market: employers offering higher wages induce workers to leave lower paying jobs and accept their employment offers. This assumption is consistent with empirical evidence that changing employers is associated with strong earnings gains.[1] A related prediction of these models is that, since larger businesses offer higher wages, voluntary job moves should generally reallocate workers from smaller to larger employers. These predictions regarding the patterns of poaching have necessarily been informed by only limited empirical evidence, as there is little empirical data on job-to-job flows[2] by firm size.

In this paper, we provide direct empirical evidence on the reallocation of workers across large and small employers, using newly available data on job-to-job flows by firm size and age for the United States. The motivation for our analysis is the literature on firm size and on-the-job search, which consists largely of labor market wage posting models, beginning with Burdett and Mortensen (1998).[3] In their seminal model, more productive businesses post higher wages, attracting and retaining more workers than less productive, lower-paying firms.[4] When a higher-paying firm makes an offer to a worker at a lower-paying firm, the worker leaves their employer to join the new firm. Workers do not all move to the highest-paying firm due to search frictions; offers arrive stochastically, and there is an exogenous separation rate. This model establishes a theoretical basis for the empirical phenomenon documented by Brown and Medoff (1989) that

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[1] See, among others, Topel and Ward (1992), Keith and McWilliams (1999), Bjelland et al. (2011), Hyatt and McEntarfer (2012b), and Fallick, Haltiwanger, and McEntarfer (2012).

[2] Movements between employers are also called "employer-to-employer flows" by some authors. In this paper, we will refer to such movements as "job-to-job flows."

[3] These include Coles (2001), Postel-Vinay and Robin (2002), van den Berg (2003), Cahuc et al. (2006), Moscarini and Postel-Vinay (2013a, 2013b), Coles and Mortensen (2012), and Lise and Robin (2013).

[4] Note that the Burdett and Mortensen (1998) framework generates firm size and wage dispersion for ex ante identical firms and workers, and so larger firms offer higher wages even in the absence of any productivity differences for employers.

larger businesses pay higher wages. The model also implies that smaller firms largely hire from the pool of unemployed, as they lose workers via poaching while not being able to offer sufficiently high wages to poach themselves.

Burdett and Mortensen (1998) limit their analysis to the consideration of the steady-state of their wage posting model. However, recent papers by Moscarini and Postel-Vinay (2009, 2010, 2013a, 2013b) propose dynamic versions of Burdett and Mortensen that include predictions about employment dynamics by firm size. These models are motivated by an empirical finding in Moscarini and Postel-Vinay (2009, 2012) that large firms have more cyclically sensitive employment. In their model, firms have a technology that generates output that is linear in employment, and a firm's rank order in the productivity distribution is fixed, but fluctuates with changes in aggregate productivity. Their model predicts that larger firms engage in more intensive poaching of workers from small firms in times of low unemployment. Because smaller firms rely more on the unemployed for recruiting purposes, they are more constrained in their ability to grow in times of low unemployment.[5] Through this poaching mechanism, they derive the prediction that employment at large businesses is more sensitive to the state of the cycle than the employment at small businesses.[6]

Our main contribution to this literature is the use of linked employer-employee data to test the implications of these models for the reallocation of workers across small and large firms

[5] It is important to note that Moscarini and Postel-Vinay (2013a) include vacancy posting as an extension of their core model, and this extension is what they estimate in Moscarini and Postel-Vinay (2013b). This drives a wedge between recruiting flows from nonemployment for large and small businesses, allowing a larger business to, realistically, have more flows from nonemployment than a smaller one.

[6] Moscarini and Postel-Vinay's finding that large businesses are more cyclically sensitive than small businesses stands in contrast to such studies as Gertler and Gilchrist (1994) and Sharpe (1994), who articulated the now conventional wisdom that small firms are more cyclically sensitive because they are more likely to be credit constrained in economic contractions. Fort et al. (2013) present evidence on this for young businesses. The latter paper also emphasizes that this result is potentially sensitive to the choice of the cyclical indicator. We find this to be true in our analysis as well.

directly. We find that some core aspects of the Burdett and Mortensen (1998) model hold up fairly well when taken to the data. Larger businesses poach a majority share of their hires from other firms, while small businesses rely more on the pool of nonemployed for new workers. That poaching of workers from other firms increases in expansions and falls in recessions is also found to be true for both large and small businesses in the data.

The prediction that on-the-job search generally reallocates workers from small firms to large, however, is not supported by the data. Instead, we find that workers who move directly from one job to another tend to move *from large firms to small firms* more frequently than the reverse. Rather than contributing to employment growth at large firms, large employers actually lose workers on net from on-the-job search. This apparent contradiction, that large firms both poach more workers than smaller firms yet on net lose workers through poaching, is partly explained by the strong tendency of firms to largely poach workers from firms within their own size class. So while large firms poach extensively, increasing poaching intensity in booms, they are largely poaching workers from other large firms.

That reallocation tends to move workers from large to small in aggregate does not necessarily indicate that this reallocation is constant over the business cycle. When we examine worker reallocation over the business cycle, we do find, consistent with Moscarini and Postel-Vinay (2012), that net employment growth responds to the difference of the unemployment rate from its H-P trend more for large businesses than for small. But it is poaching of workers from small firms to large that is the key mechanism for the differential cyclicality of employment growth in their model. That this is the mechanism for their empirical finding is largely rejected by the data. When considering the channels through which this net employment growth occurs, we find little evidence that the differential ability to poach workers is the primary mechanism for any excess sensitivity of the employment of large firms: we consistently find that net hires from nonemployment is the dominant mechanism for this pattern.

These results together suggest that researchers should exercise some skepticism when considering models where poaching generally reallocates workers from small businesses to larger businesses. Some aspect of the real economy is driving a wedge between the predictions of these models and how workers are reallocated across firms in the labor market. One possible culprit we investigate here is the role of firm age in breaking the size-productivity relationship – i.e. that some new firms start small are highly productive. We find that firm age matters quite a bit - younger, smaller firms are net gainers from worker reallocation through job-to-job moves, while mature firms generally lose workers via job-to-job moves. These results suggest an important avenue for extending the Burdett and Mortensen (1998) model is the inclusion of business entry, as in Coles and Mortensen (2012).

The paper proceeds as follows. We begin by discussing the implications of the Burdett and Mortensen (1998) model for how firms of different sizes obtain their workers, and how these hiring rates respond to labor market conditions. Next, we describe the data we use to identify flows of workers across employers. Thereafter, we examine direct flows of workers across employer size classes. We then decompose net employment growth at large and small firms by poaching flows versus flows from and to nonemployment over the time-series. Then, we perform a state- by quarter-level analysis of the relationship between poaching and the unemployment rate. A brief conclusion follows.

II. Conceptual Underpinnings

The Burdett and Mortensen (1998) model is a natural starting point for considering how job-to-job flows might vary by firm size. This is a model of on-the-job search that includes a profit-maximizing firms that make offers to continuously lived agents, who accept any wage higher than their current one. Its equilibrium is quite useful for explaining wage dispersion, as it generates wage dispersion even for *ex ante* identical firms and workers.

In what follows, we sketch out a simplified version of the Burdett and Mortensen (1998) model, basically following Manning's (2003) simplified version. There is a unit measure of workers in the economy, who have a non-work option that provides utility b, and profit-maximizing firms offer some wage w. We make the standard assumption that no firm offers a wage such that it provides a worker with utility $u(w) < b$. There is a distribution of wages across firms $F(w)$, and $G(w)$ is the distribution of wages across workers. There is job separation: employed and nonemployed workers receive offers randomly at rate λ, which are equally likely to come from any firm (note that we have not introduced vacancy posting into this framework). Employed workers leave to nonemployment at rate δ, and the share of workers nonemployed is the unemployment rate u.

From this framework, we can write down exact formulations of hires from nonemployment and employment, as well as separations to nonemployment and other employers. The rate at which employees separate to nonemployment has already been defined as δ, and is proportional to employment, both for the economy as a whole, and for any particular employer. The rate q at which an firm's employees quit their jobs because they have received a better wage offer is simply the offer arrival rate λ multiplied by the fraction of businesses that pay a higher wage, or

$$q(w;F) = \lambda\left(1 - F(w)\right). \tag{1}$$

And so the rate at which employees separate from a given firm is simply $\delta + q(w;F)$. The number of workers any given firm hires from unemployment is simply the rate at which it makes offers multiplied by the number of unemployed:

$$E = \lambda u. \tag{2}$$

Finally, the poaching inflows for a given firm are simply the offer arrival rate multiplied by the number of workers employed at other firms that pay a lower wage, or

$$P(w;F) = \lambda(1-u)G(w;F). \tag{3}$$

Because, in steady state equilibrium, inflows must equal outflows, we can derive equilibrium employment N (and hence the implied size distribution across firms) by comparing the number of its inflows to the rate of its separations, or

$$N(w;F) = \frac{E + P(w;F)}{\delta + q(w;F)}. \tag{4}$$

This model is quite tractable, and produces a steady-state equilibrium with many interesting implications, the formal demonstration of which we show in Appendix A. First, this model implies that higher-paying firms are larger. This is the most well-known implication of the Burdett and Mortensen model, and is consistent with the evidence presented by Brown and Medoff (1989), Haltiwanger et al. (2012), and others that workers at larger firms earn higher wages. Second, turnover is higher at smaller businesses. That is, as a share of employment, hire and separation rates are greater as a fraction of their steady-state employment are higher at smaller businesses than larger business.[7] The intuition for this result is that all businesses that

[7] Moscarini and Postel-Vinay (2009, 2013b) provide some evidence on the share of hires from other employers (vs. nonemployment) at large firms is higher than at small firms during economic expansions, using data from the

post low wages have more of their workers poached, which increases this component of their separation rates. Hire and separation rates must balance in equilibrium, so lower wage (smaller) firms have higher overall turnover. We recently confirmed the higher turnover rate of smaller firms in an earlier paper (Haltiwanger et al., 2012) and we find higher turnover at small and young firms in this analysis as well.

Third, the shares of hires that come from nonemployment are higher at smaller than at larger firms. This is because, by assumption, the flow of hires from nonemployment are the same for every business, regardless of size.[8] However, when businesses make wage offers (recall that this is a model of random, rather than directed, search), larger businesses have more of their offers accepted than small businesses. Fourth, there is a "firm size job ladder." That is, over the course of a worker's employment spell, the worker moves from lower wage businesses that are smaller to higher wage firms that are larger. This implication of the Burdett and Mortensen (1998) model is given considerable attention by Moscarini and Postel-Vinay (2013b). Finally, we note that a property of the steady-state is that aggregate net poaching flows and net flows into nonemployment are zero.

Of particular interest for our analysis is the dynamic implications of this type of model with changes in economic conditions, as has been explored in a series of papers by Moscarini and Postel-Vinay (2009, 2010, 2012, 2013a, 2013b). We especially are indebted to their formal development of a version of Burdett and Mortensen (1998) with a stochastic economic environment, which is presented in its most complete form in Moscarini Postel-Vinay (2013a). They show that the long-run steady state in the absence of aggregate shocks converges to the size

Survey of Income and Program Participation. We find a level difference that changes only in degree over the business cycle.

[8] This aspect of the Burdett and Mortensen (1998) model is, of course, relaxed in extensions that allow for costly vacancy posting.

distribution in a standard Burdett and Mortensen (1998) model (analogous to the implied size distribution in our equation (4)). The rather daunting challenge that this recent work accomplishes is to characterize the search equilibrium for this type of model where there are stochastic shocks in the economic environment (e.g., aggregate shocks to productivity). To do so, they develop what they term a Rank Preserving Equilibrium, and introduce the assumption that firms offer contracts that specify wages under any economic condition. The resulting Markov Perfect Nash Equilibrium is rank preserving in that a firm's position in the wage and size distribution never changes, and it is the firms that are higher in the productivity distribution who are larger and offer a higher wage. When economic conditions change, firm sizes move toward the new long-run steady-state, but each firm maintains its firm size rank order. As an extension, they also then add vacancy posting, which allows them to endogenize the job offer arrival rate, and this enhanced version of the model is what they calibrate in Moscarini and Postel-Vinay (2013b).

The main empirical implication that they develop and in turn emphasize in their own empirical analysis is that the net employment growth of large firms will be more cyclically sensitive to changes in economic conditions. A corollary prediction from their analysis is that this greater variation of net employment growth by large firms over the cycle will be driven by an increase in the poaching from small to large firms during times of economic expansions. These are the two key predictions that we take to the data. In Appendix A, we trace through the comparative statics of equation (4) to help provide some additional guidance about the underlying mechanisms.[9]

[9] We consider the relative responsiveness of small and large firms to changes in the arrival rate of offers λ and the rate at which workers exit to nonemployment δ. Appropriate caution is required in interpreting the implications of such comparative static predictions but we think they help provide some helpful insights on the role of poaching as

With this discussion as a background, we now turn to our empirical analysis which takes advantage of rich longitudinal matched employer-employee data that permits directly tracking the movement of workers across small and large firms. Before turning to our empirical work, we note some of the limitations of the core Burdett and Mortensen (1998) framework and the subsequent literature that are relevant as the predictions are taken to the data. Perhaps the most apparent limitation is that the theoretical and empirical relationship between size and productivity is complex. As we have noted, some of the predictions regarding poaching flows across firms of different sizes from this class of models hold even if there are no differences in productivity across firms. But empirical evidence has found large differences in productivity across firms within the same industry, that such differences in productivity are closely related to the size of firms, but that the relationship between size and productivity is complicated by several factors (see Syverson (2011) for a recent survey of the literature and for references beyond those provided below).

Theory and evidence suggests firms exhibit rich life cycle dynamics. Firms are born small and then exhibit an up or out dynamic that takes some time to unfold.[10] This pattern suggests there are young firms that may be highly productive but small. Such firms are on their way to becoming large but that process takes time for reasons relating to learning, adjustment costs, building a customer base or other frictions.[11] Productivity differences at the firm level are persistent but firms are subject to a continuous and substantial variance of new productivity

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the mechanism relevant in this context. Readers should also note that the unemployment rate, which will be our cyclical indicator, is an endogenous variable in Burdett and Mortensen (1998), but the unemployment rate has a straightforward relationship with the offer arrival rate and the rate at which workers separate to nonemployment, which are exogenous.

[10] See, e.g., Haltiwanger, Jarmin and Miranda (2013).

[11] See, among others, Jovanovic (1982), Dunne, Roberts, and Samuelson (1989), Dinlersoz, Greenwood, and Hyatt (2013), and Foster, Haltiwanger and Syverson (2013).

shocks.[12] Those with positive shocks expand while those with negative shocks contract or exit but this process takes time. Finally, it is worth noting that while there is a positive correlation between firm size and productivity in the cross section, this positive correlation is present within industries.[13] Between industry variation in firm size reflect differences in factors (e.g., minimum efficient size, market segmentation) not well captured by productivity.

Factors that drive a wedge between the relationship size and productivity in turn potentially drive a wedge in the predictions about the reallocation of workers across employer size. As this discussion highlights, one possible factor is the role of firm age. As such in what follows, after considering the empirical patterns considering firm size alone we also consider the role of firm size and firm age together.

III. Data

We use linked employer-employee data from the LEHD program at the U.S. Census Bureau to examine the flows of worker across firms. The LEHD data consist of quarterly worker-level earnings submitted by employers for the administration of state unemployment insurance (UI) benefit programs, linked to establishment-level data collected for the Quarterly Census of Employment and Wages (QCEW) program. As of this writing, all 50 states, DC, Puerto Rico, and the Virgin Islands share QCEW and UI wage data with the LEHD program as part of the Local Employment Dynamics (LED) federal-state partnership. LEHD data coverage is quite broad; state UI covers 95% of private sector employment, as well as state and local government.[14]

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[12] See, Foster, Haltiwanger and Syverson (2008).
[13] See, e.g., Bartelsman, Haltiwanger, and Scarpetta (2013).
[14] For a full description of the LEHD data, see Abowd et al. (2009).

We longitudinally link workers' job histories across firms using the approach described in Hyatt and McEntarfer (2012b), which we will briefly summarize here. This approach links the main jobs of an individual's quarterly work history, where main jobs are those with the highest earnings in the quarter. We then identify main job changes where the separation from a former main job and accession to a new main job occur in the same quarter. These transitions between main jobs we call direct job-to-job flows. In practice, some of these job transitions may include short nonemployment spells. However, short spells of nonemployment are not inconsistent with a flow being a job-to-job flow. Workers may take at least a short break between their last day on one job and their first day on a new job even if the decision to leave the original job is based on having accepted a new job offer from the firm they are joining.

For our main analysis, we pool these direct job-to-job flows together with job transitions where the new main job begins in the quarter *after* the previous main job separation.[15] The remainder of job transitions, those that include at least one quarter of zero earnings between job spells, are classified as flows to and from nonemployment. For robustness purposes, we conduct our regression analysis in Appendix C using only the more restrictive definition of poaching flows where adjacent quarter job transitions are excluded (and so in turn counted as separations to non-employment and hires from non-employment). Our findings are largely robust to this alternative (results shown in the appendix).

[15] This decision reflects analysis (see, Fallick, Haltiwanger and McEntarfer (2012), Hyatt and McEntarfer (2012b), and Hyatt, McEntarfer, and Tibbets (2013)) showing that within-quarter and adjacent-quarter job transitions exhibit similar secular and cyclical patterns. Both Fallick, Haltiwanger and McEntarfer (2012) and Hyatt and McEntarfer (2012b) find that the median earnings change for workers who make within and adjacent quarter job transitions is positive – while it turns sharply negative for a worker with a full quarter of nonemployment. Both series are also procyclical (a known pattern for quits) while separations to nonemployment are countercyclical (similar to the known pattern for layoffs).This evidence is suggestive that adjacent quarter job-to-job transitions are also highly likely to be voluntary quits to new jobs.

Employment coverage in the LEHD data is broad, but not complete, and in some cases we will erroneously classify a job-to-job transition as a flow to (or from) nonemployment. This includes flows to and from federal employment (approximately 2% of employment) and to parts of the non-profit and agriculture sectors. We will also misclassify some transitions that cross state boundaries. We start our time-series in 1998, when there is data available for 33 states, and states continue to enter the LEHD frame during our time series.[16] While we restrict our analysis to a pooled 28-state sample, we do allow flows into and out of that sample to be identified as poaching flows. For example if a worker changes employers from a firm in Ohio to one in New Jersey within the same quarter, this will be classified as a poaching hire in New Jersey, even though Ohio is not in the sample.

Firm size and firm age in the LEHD data is defined at the national level using Census Bureau's Longitudinal Business Database (LBD).[17] Firm size is the national size of the firm in March of the previous year; we use three size categories: "large" firms employ 500 or more employees, "medium" firms employ 50-499 employees, and "small" firms employ 0-50 employees. Firm age is the age of the national firm, defined as the age of the oldest establishment in the first year of a firm's existence, and aging naturally afterwards. We use two age categories: "young" firms are those up to 10 years of age, while firms who are 11 or more years of age are "mature." To limit the number of categories when considering results by size and age, we group the medium and small categories into a single "SME" category that consists of all businesses that employ fewer than 500 workers.

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[16] Our 28 states are CA, FL, GA ,HI, ID, IL, IN, KS, ME, MD, MN, MO, MT, NC, NJ, ND, NM, NV, PA, OR, RI, SC, SD, TN, VA, WA, and WV. Other states have data series that start in subsequent years. The omission of states has a discernable but small effect on job-to-job flow rates, see Henderson and Hyatt (2012).

[17] Haltiwanger et al. (2013) describes the methodology for linking the LBD and LEHD data.

For the cyclical indicators, we consider two alternatives reflecting different perspectives that have emerged in the empirical literature about capturing the cycle. Specifically, we consider the change in the unemployment rate and deviations in the unemployment rate from an HP-filtered trend. The change in unemployment rate is much more closely linked to the NBER reference cycles than is the HP-filtered unemployment rate. During NBER contractions, the change in unemployment tends to be positive while it is tends to be negative during NBER expansions.

IV. Empirical Analysis of the Reallocation of Workers Across Firm Size and Firm Age Classes.

A. Aggregate Patterns

It is useful to start with the following simple identities:

$$Net\ Job\ Flows\ (NJF) = H - S = H_p - S_p + H_n - S_n \quad (5)$$

Where H is hires, S is separations, H_p is poaching (job-to-job) hires, S_p is poaching separations (workers that separate via a job-to-job flow), H_n is hires from nonemployment and S_n is separations into nonemployment. Overall hires are about 16 percent of employment each quarter with poaching flows accounting for about half of hires.[18] By construction, poaching hires and poaching separations balance out at the aggregate level (although with our timing conventions including adjacent quarter flows they don't quite balance out in practice in any given quarter –

[18] The flow rates are based on the ratio of the number of flows divided by a measure of employment defined as the number of main jobs in that quarter. Our hires and separation rates are lower than those reported in the public domain QWI because we focus on main jobs only. However, we note that the net employment growth rates from the public domain QWI closely match our net employment growth rates.

but the difference in practice is less than 3/10th of a percent in any given quarter).[19] While poaching hires and separations balance out at the aggregate level, they need not balance out for any sub-group. For example, consistent with the theoretical models discussed in section II, poaching flows could primarily reflect poaching separations from small businesses to poaching hires to large businesses. Much of our empirical analysis focuses on such net poaching flows across employer size and employer age classes.

Before turning to the patterns of the flows by firm age and firm size class, Figure 1 presents the decomposition of private sector hires and separations into their poaching and nonemployment components.[20] It is readily seen that, even with our inclusion of adjacent quarter flows as poaching flows, poaching hires and separations largely balance out each quarter. The poaching hires and separations exhibit a pronounced downward trend (which has been discussed in the recent literature[21]) and evident procyclicality. Hires from nonemployment rise during expansions and separations to nonemployment increase substantially early in contractions (this is especially evident in the Great Recession). By construction, at the aggregate level net job flows are driven by these flows into and out of nonemployment. While this is by construction, Figure 1 helps highlight that the procyclical component of separations has no direct consequences for the fluctuations in net job flows (and in turn fluctuations in either nonemployment or

[19]This balancing out of poaching hires and poaching separations holds for any given sample given our definitions. For example, hires in our 28-state sample that are job-to-job flows from jobs held previously in states out of our sample are counted as hires from nonemployment. Henderson and Hyatt (2012) show that such flows are relatively small so our estimate of job-to-job flows is reasonable.

[20] All rates are as fractions of employment.

[21] The secular decline in job-to-job flows has been noted by Hyatt and McEntarfer (2012a, 2012b) in the LEHD data. Hyatt and Spletzer (2013) show that this decline is also apparent in the CPS job-to-job flows data, and that it reflects a trend in declining dynamics seen in many other measures of employment dynamics. Moscarini and Postel-Vinay (2013b) consider this decline as well.

unemployment). This is because the procyclical component of separations is driven by poaching flows.[22]

With this as a background, we now turn to flows by firm size. We begin with a decomposition of the hires into poaching hires and hires from nonemployment as well as separations into those that reflect poaching hires and those that reflect flows into nonemployment. The top panel of Table 1 shows this decomposition by employer size classes. Large firms have a higher fraction of hires from poaching but also a higher fraction of separations from poaching. The flip side is that small firms have a higher fraction of hires from nonemployment and in turn separations to nonemployment.

The lower panel of Table 1 shows the poaching flows (direct job-to-job transitions) across three firm size categories, pooled across the time-series. Each cell in the lower panel represents the percentage of overall poaching flows to and from private sector firms.[23] The largest cell sizes are on the diagonal, which represent firms poaching workers from employers within the same size category. The large diagonal elements highlight that each category largely "eats their own". However, Table 1 also shows that overall, large firms are net job losers from direct job-to-job flows (compare the total poaching hires percentage share of 43.9 to the total poaching separations share of 44.5 for large firms). Large firms lose to firms in both the medium

[22] Figure C.1 shows the poaching hires and separations and the hires and separations from nonemployment when poaching flows only include within quarter transitions. This reduces the rate of poaching hires and separations and also yields balancing out of poaching hires and separations in each quarter. The secular and cyclical patterns are similar to Figure 1 although now there is more variation for both the trend and the cycle captured by hires and separations from nonemployment.

[23] In most of our analysis, we include in poaching hires and separations for the private sector the poaching hires from the State and Local Sector and the poaching separations to the State and Local Sector. However, in the lower panel of Table 1 (and later in Table 2) we focus on poaching flows onto to and from private sector firms. Table D.1 (and Table D.2) show the analogous versions of the lower panel of Table 1 (and Table 2) with State and Local components included. The same inferences can be inferred in part because there are relatively small poaching flows to and from the State and Local sector from the private sector. The version we present in the main text makes it transparent that large private sector firms are net losers in terms of poaching to small and medium private sector firms.

and small size categories. Small businesses gain workers (comparing totals again, poaching hires share of 32.7 vs. poaching separations share of 31.8 for small firms). Of particular interest, they gain more workers from the large size category than they lose (10.2 to 9.7). Medium businesses exhibit little gain or loss, gaining slightly from the large category and losing some to the small category.

Figure 2 illustrates these components of net growth over our sample period from 1998-2013. Panel 2a shows the patterns for large firms, Panel 2b for medium firms and Panel 2c for small firms. The gross poaching rates in all panels are large in magnitude and fluctuate systematically over time.[24] Poaching hires are greater than hires from nonemployment for large firms and the opposite is true for small firms. These patterns are consistent with Table 1. It is also evident that overall hires and separation rates (adding up the hires from poaching and nonemployment) rates are substantially higher for small firms relative to large firms. For all firm size classes, gross poaching flows exhibit a downward trend and are highly procyclical (this statement is true for either cyclical indicator we consider).[25] But consistent with Table 1, each size class largely "eats its own" so that net poaching rates are relatively small in magnitude with relatively little variation over time. Observe also that in all periods, net poaching for small firms is positive and net poaching for large firms is negative.

Since net poaching rates are small for each size class, by the simple decomposition above fluctuations in net employment growth rates for each of the size classes is dominated by the net difference between hires and separations from nonemployment. The ratio of the standard

[24] Rates in Figure 2 and in the subsequent analysis are as fractions of employment in the respective firm size or firm size/firm age class.

[25] The correlation between poaching hires and the change in the unemployment rate is about -0.3 and between poaching hires and the HP-filtered unemployment rate is about -0.6. This holds for all size groups. In our empirical analysis that follows, we always consider specifications taking into account trends. Doing so here by using an HP-filtered poaching flows yields a correlation of -0.9 with the HP-filtered unemployment rate.

deviation of net hires from nonemployment to net poaching flows is about 4 for each size class. Hires from nonemployment is evidently procyclical while separations to nonemployment are counter-cyclical for each size class.[26] The dominant role of the flows to and from nonemployment in accounting for overall net fluctuations for each size class and their different cyclical properties relative to the poaching flows (which are consistently procyclical) implies caution in drawing inferences about poaching flow patterns from net job flows alone.

These basic facts alone provide considerable perspective about the predictions from the wage posting literature that follows from Burdett and Mortensen (1998). Clearly, the prediction that worker movements from poaching would generally be from small to large firms is not consistent with the evidence we have presented. There is considerable movement of poached workers across firm size categories, and more workers move from large to small than vice versa. Burdett and Mortensen (1998) also imply that small businesses should rely more on hires from nonemployment than large businesses, who in turn should rely more on poaching. This prediction is consistent with our evidence.

Turning to the dynamic predictions of Moscarini and Postel-Vinay (2013a), the relatively small time series sample limits the inferences that we can make and so we turn to exploiting the state by quarter variation in the next section to explore those predictions. However, some aspects of Figure 2 already raise questions about those predictions. First, for the 54 observation sample of Figure 2, we find that the net job flow differential between large and small firms is inversely correlated with the HP-filtered unemployment rate but the correlation is

[26] This statement is particularly evident using the change in unemployment indicator. The correlation between net hires from nonemployment and the change in the unemployment rate is -0.84 for large firms and -0.87 for small firms. This is not surprising since the correlation between overall net job flows and net hires from nonemployment is 0.97 for both large and small firms. Note that the correlation between overall net job flows and net poaching flows is -0.12 for large firms and -0.20 for small firms.

weak (-0.15 which is not statistically significant for this sample size). Moreover, the prediction that poaching flows are a primary driver of net employment increases at large firms during times of economic expansions is not consistent with the evidence in Figure 2. The key point here is that both poaching hires and poaching separations are higher during times of economic expansions for large firms.

Before turning to the state by quarter analysis to investigate cyclicality, we first repeat the exercises of Table 1 and Figure 2 using cells classified by both firm size and firm age. The motivation here is to determine whether the predictions regarding the reallocation from small to large are sensitive to controlling for firm age. To facilitate this analysis, we have collapsed small and medium firms together in the size class distribution and have two age classes young and mature (young is for establishments belonging to firms less than 11 years old, mature is for 11+). We note that we have examined the patterns for young/small and young/medium separately and find that they exhibit very similar patterns so for ease of exposition we collapse the small and medium. We call the collapsed small/medium size class "SME". In our analysis, we exclude young/large firms as they account for a relatively small share of hires and employment.

The top panel of Table 2 shows that establishments of large, mature firms have a higher share of both hires and separations from poaching relative to young/SME or mature/SME firms. The lower panel echoes the findings of Table 1. Each age/size class largely "eats their own". But mature/large firms are net losers from poaching while young/SME firms are net gainers from poaching. Mature/SME firms are also net losers from poaching. Focusing on only mature firms, net poaching flows between large and SME firms largely balance out so neither group is a net gainer/loser from poaching relative to the other. This implies the net loss from poaching for large firms is primarily driven by the net gain from poaching by young/SME firms.

Figure 3 shows the time series patterns of the components of net growth using the same firm size and firm age classes as in Table 2. Distinguishing between firm size and firm age yields additional insights. Of particular interest is the finding in panel 3c showing that substantial net gains from net poaching by young/SME firms. Comparing panel 3c to panels 3a and 3b, young/SME firms are net gainers by poaching from mature firms of both large and SME firms. It is also notable that poaching hires are often higher than hires from nonemployment for young/SME firms in the years prior to the Great Recession. This contrasts with the depiction in Figure 2 where poaching hires are always lower than hires from nonemployment for small firms. In terms of cyclicality, we still observe that for all firm size/age groups that poaching hiring and separation rates are procyclical and exhibit a downward trend. Moreover, hires from nonemployment are procyclical while separations to nonemployment are countercyclical for all size/age groups. There is a notably large increase in separations to nonemployment for young/SME firms (especially relative to mature/large firms) in the Great Recession.

These findings at the aggregate level highlight the potential importance of distinguishing between firm size and firm age. In the empirical analysis of the cyclicality of these flows in the next section, we also explore patterns by firm size alone and in turn by firm size and firm age.

B. The Cyclicality of Poaching Flows by Firm Size and Firm Age: Using State-Level Variation

We employ state-level variation in the job flows as well as the cycle to quantify the nature of cyclical differences between the components of the net job flows by firm size and by firm age. We employ variants of the following empirical specification:

$$Y_{st} = \lambda_s + \lambda_{qt} + \beta * CYC_{st} + \epsilon_{st}$$

where s is state t is quarter, CYC_{st} is the cyclical indicator at the state by quarter level. We use the state-level unemployment rate to construct two alternative cyclical indicators: the change in the unemployment rate and the HP-filtered unemployment rate. We consider three alternative specifications for λ_{qt}. One specification (called model 1) just includes seasonal dummies and a time trend.[27] The second specification (called model 2) includes dummies for every quarter. The latter specification controls for national trends, national cyclical effects and national seasonal effects. The third specification (called model 3) includes a time trend and the seasonal dummies interacted with the state dummies. Hence, in the third specification we permit the seasonality to vary by state. For the dependent variable Y_{st}, we focus on a variety of measures. First we consider the hires and separation rates – both from poaching and from nonemployment. Second, we consider the net flows – overall net job flows, net poaching flows and net hires from nonemployment. Finally, we consider various net differentials across firm size and age classes – e.g., the difference in net job flows between large and small firms, the difference in net poaching flows between large and small firms, and related differentials across firm size and age classes. In all of these cases, we permit the effects to differ by firm size and firm age classes following the firm size and age classes we used in the previous section.

For the cyclical indicators, we consider two alternatives reflecting different perspectives that have emerged in the empirical literature about capturing the cycle. Figure 4 illustrates the two alternatives we consider at the national level. Specifically, we consider the change in the unemployment rate and deviations in the unemployment rate from an HP-filtered trend. As is evident from Figure 4, the change in unemployment rate is much more closely linked to the

[27] We have also considered specifications where instead of including time trends we use HP-filtered versions of the dependent variables. The results are very similar to those we report here.

NBER reference cycles than is the HP-filtered unemployment rate. During NBER contractions, the change in unemployment tends to be positive while it is tends to be negative during NBER expansions. Consistent with this pattern, we note that the correlation between the net employment growth rate for our 28-state sample and the change in the unemployment rate is -0.90. The HP-filtered unemployment rate exhibits a related but different pattern. The HP-filtered unemployment rate rises during contractions but remains high long after recoveries are underway. This holds not only for the Great Recession but also for the 2001 downturn. The correlation between the HP-filtered unemployment rate and the change in the unemployment rate is only 0.15 and the correlation between the HP-filtered unemployment rate and the net employment growth rate (for our 28 state sample) is -0.24.

These patterns in Figure 4 highlight the well-known differences between characterizing cycles in terms of periods of expansion and contraction vs. periods of being above or below trend. In the recent literature exploring differences in the cyclicality of net job flows by employer size, this distinction has been shown to matter by both Moscarini and Postel-Vinay (2012) and Fort et. al. (2013). For our purposes, we consider both indicators as these two alternatives provide different pictures of the cycle. We note that Moscarini and Postel-Vinay (2012) focused their empirical analysis on the HP-filtered unemployment rate as the cyclical indicator.

Table 3a shows the results for the gross hires and separation rates by firm size groups. For both large and small businesses, the poaching rate for hires and separations are both clearly higher when the unemployment rate is falling (using the change measure) or below trend (using the HP-filtered unemployment rate). This is consistent with evidence on the cyclicality of churn as in Davis, Faberman, and Haltiwanger (2012) and Hyatt and Spletzer (2013).

The relative cyclical sensitivity of poaching hires across small and large firms depends on the cyclical indicator. Using the HP-filtered unemployment rate, poaching at large firms tends to be more cyclically sensitive than at small firms (although for model 2 where we control for the national cycle the coefficient estimates are about the same). However, the opposite is true when using the change in unemployment as the cyclical indicator (although for model 3 when we control for state-specific seasonality the coefficient estimates are about the same). In considering these patterns on the cyclicality of gross poaching hires it is important to also consider the cyclicality of gross poaching separations. Poaching separations for large and small firms are also highly procyclical with, for example, the cyclical sensitivity greater for large firms when using the HP-filtered unemployment rate for models 1 and 3. This cyclical sensitivity of both poaching hires and poaching separations of large firms suggests that there is only limited scope for the cyclicality of net poaching flows of large firms. Similar remarks apply to small firms.

Hires from nonemployment are decreasing in the change in the unemployment rate and the HP-filtered unemployment rate for both large and small firms. Small firms hires from nonemployment have an especially large response to the change in unemployment. Separations to nonemployment are increasing in the change in the unemployment rate for both large and small firms. The estimated responses are larger for small firms. The estimated effects are mitigated substantially when including a full set of time dummies for all quarters – that is, when we control for the national cycle. There is a much less systematic relationship between separations to nonemployment and the HP-filtered unemployment rate. These patterns on the separations to nonemployment are consistent with the patterns observed in Figure 1 that show that separations to nonemployment rise early in an economic contraction and recover relatively quickly.

Table 3b takes the next step by examining the cyclicality of overall net job flows and the net poaching and net hires from nonemployment. The patterns for net job flows are sensitive to which cyclical indicator is used. Net job flows for small firms respond much more to the change in unemployment rate (i.e., they decline with a change in the unemployment rate) than do large firms. This relationship flips for the HP-filtered unemployment rate – that is, net job flows for large firms decline more with the HP-filtered unemployment rate than do small firms.

The cyclical patterns for net hires from nonemployment largely mimic those for net job flows. This is not surprising since variation in net job flows is dominated by variation in net hires from nonemployment for each of the size groups. The cyclical patterns for net poaching flows are less systematic. For large firms, there is some tendency for net poaching flows to actually rise with changes in the unemployment rate while they decline with increases in the HP-filtered unemployment rate. The estimated effects tend to be smaller in magnitude than those for overall net job flows or for net hires from nonemployment. For small firms, results are also sensitive to specification although there is some tendency for net poaching flows to decline with increases in the change in the unemployment rate and with increases in the HP-filtered unemployment rate.

The cyclical responsiveness of the overall net job flows is additive in the cyclical responsiveness of net poaching flows and net hires from nonemployment given the additive nature of the decomposition of net job flows into net poaching flows and net hires from nonemployment. For large firms, the contribution of the responsiveness of net hires from nonemployment to the overall net job flows cyclicality exceeds 1 for all the specifications with the change in the unemployment rate and exceeds 0.7 for all but one of the specifications (model 2) using the HP-filtered unemployment rate.[28]

The differential responses of overall net job flows and the net components between large and small firms is presented in Table 3c. For overall net job flows, large firms are more sensitive to the cycle using the HP-filtered unemployment rate while the opposite is true using the change in the unemployment rate. These patterns are consistent with those in Fort et. al. (2013) and Moscarini and Postel-Vinay (2012). For the differential response of net hires from nonemployment we observe very similar patterns (although with less statistical significance). For the differential response of net poaching, small firms net poaching falls more with an increase in the unemployment rate (captured by the change variable) than large firms using models 1 and 2. For an increase in the HP-filtered unemployment rate, there is some modest evidence (model 1) that large firms net poaching falls more with an increase in the HP-filtered unemployment rate. Otherwise, we don't find any statistically significant evidence.

The quantitative implications of Table 3c are revealing. For the change in unemployment indicator, the contribution of net hires from nonemployment to the overall cyclical sensitivity of the net job flows differential always exceeds 0.7. For the HP-filtered unemployment rate, the contribution of net hires from nonemployment always exceeds 0.59. Observe also that the coefficient estimates for the specifications with the change in the unemployment rate tend to be much larger than those associated with the HP-filtered unemployment rate. Consider the differential response of large vs. small firms net job flows. An increase in the unemployment rate of 1 percentage point yields close to a percentage point (0.97) increase in the differential between large and small businesses net job flows. In contrast, if the unemployment rate is 1

[28] These calculations are based on the ratio of the estimated coefficient for net hires from nonemployment to the estimated coefficient for net job flows.

percentage point above trend this leads a decrease in the differential between large and small businesses net job flows by only 0.23 of a percentage point using the analogous model 1 specification for the HP-filtered unemployment rate.

Overall, then, there is mixed evidence regarding the cyclical sensitivity of small vs. large firms in terms of net job flows based on the cyclical indicator. This mixed evidence carries over to the cyclicality sensitivity of net hires from nonemployment. There is not strong evidence on the differential response of net poaching flows between large and small firms to the cycle. Using the HP-filtered unemployment rate, in only one specification do we find evidence of a statistically significant relationship. The conclusion we draw is that the finding that the net job flows of large firms are more cyclically sensitive to an increase in the HP-filtered unemployment rate is driven primarily by the greater responsiveness of net hires from nonemployment and not from differential responses of net poaching of large and small firms to this cyclical indicator. This suggests that the findings of Moscarini and Postel-Vinay (2012) are not primarily being driven by differential responses of net poaching flows.

In appendix Tables C.1a-C.1c, we show the results of analogous specifications where we use the more restrictive definition of job-to-job flows (only within quarter transitions). The results are largely similar to those reported above. However, using only within quarter poaching flows implies that net job flows are even more dominated by net hires from nonemployment. For example, in Table C.1c, there is no evidence that net poaching flows at large firms increase relative to small firms in times of low unemployment.

As our descriptive statistics in section IV.A suggest, it may be important to distinguish between firm size and firm age. Table 4 shows the results for the dependent variables and specifications of Table 3 but now using the firm size and age categories in Table 2. For the sake of brevity, Table 4 only includes the firm size and firm age equivalent of Table 3c (the equivalents of Table 3a and 3b for the firm age and firm size cases are in Appendix E). In Table 4, we find that the greater sensitivity of net job flows to the change in the unemployment rate for small firms relative to large firms (as found in Table 3c) is primarily driven by young/SME firms. Similarly, we find the greater sensitivity of net hires from nonemployment and net poaching flows of small firms relative to large firms to the change in the unemployment rate is driven primarily by young/SME firms. These patterns can be discerned by the very large and positive coefficients on the net differential between large/old and SME/young for net job flows and for net hires from nonemployment when using the change in unemployment indicator.

Turning to the results for the HP-filtered unemployment rate, we find results that provide the most support for the predictions of Moscarini and Postel-Vinay (2012, 2013) when we focus on mature firms. For all models for mature firms, we find that net poaching of large firms increases relative to small firms in times of low unemployment and these results are statistically significant for models 1 and 3. Moreover, the contribution of the cyclicality of the differential net poaching variation to the overall differential net job flow variation is above 0.5 for models 1 and 3 for mature firms (and even for model 2 net poaching accounts for about 0.47 of the overall net job flows cyclical sensitivity).

Thus, distinguishing between firm size and firm age sheds additional light on the conclusions we drew based upon the size results alone. In particular, it is for the mature firms that we observe net poaching from small to large firms increase in times of tight labor markets (as captured by the HP-filtered unemployment rate) and that this is of sufficient magnitude that it accounts for a substantial share of overall net job flow cyclical sensitivity between small and large (mature) firms. But we note even in this case the quantitative implications are relatively small. For example, using the largest coefficient estimate in the first row of Table 4 (model 1) implies that in a period with the unemployment rate 1 percentage point above trend then the net job flows differential between mature large and small firms declines by only 0.115 of a percentage point. While 57 percent of this decline is due to net poaching this implies that the net poaching differential declines by only 0.07 of a percentage point. This effect is statistically significant but relatively small.

V. Conclusion

We have presented new evidence on how large and small employers hire workers. Our data allows us to distinguish between job-to-job flows and employment inflows and outflows for firms of different sizes. This evidence has implications for the literature on wage posting that follows from Burdett and Mortensen (1998). Consistent with its predictions, we found that large employers tend to hire employees from other firms rather than from nonemployment, for small businesses the opposite is true. However these flows do not generally redistribute employment from smaller firms to large employers.

We conclude that the predictions of the Burdett and Mortensen (1998) model regarding the reallocation of workers from small to large firms and the recent theoretical advances about the differential responsiveness of large businesses receives only limited support when we consider only firm size effects. We replicate the Moscarini and Postel-Vinay (2012) finding that net job flows are more responsive to the deviation of the unemployment rate from its H-P trend for large than small businesses, but there the similarities end. We find that the hypothesized mechanism for these differential flows, poaching, does not account for most of this change. And indeed, when we consider the responsiveness of employment flows to changes in the unemployment rate, we find that the employment of small businesses is much more responsive than large businesses. Overall, it is difficult for poaching to explain much of the variation in net job flows, since the poaching hires and poaching separations almost perfectly balance along the time series for each size category we consider. However, we find more supportive evidence that net poaching from small to large firms plays a significant role in the cyclicality of the differences in net job flows between small and large during times of tight labor markets if we focus only on mature firms. Even then the quantitative implications for net job flows and net poaching flows are small.

Our analysis suggests some new directions for the literature on labor market search and matching with on-the-job search and firm size that starts with Burdett and Mortensen (1998). Clearly, the fact that there is not strong evidence of a firm size job ladder suggests that business entry, as in Coles and Mortensen (2012), is key for getting the direction of net poaching flows. We have also uncovered a potential deficiency of the "random search" framework of the Burdett and Mortensen (1998) model when we found that firms of different sizes tend to "eat their own." This suggests that workers search in relatively narrow submarkets, and that this literature may want to borrow some notion of directed search, perhaps following Menzio and Shi (2011).

We think our evidence highlights the contribution that longitudinal matched employer-employee data can make to understanding the reallocation of workers across firm. While we think our evidence is novel, it is by no means the last word on how job-to-job flows reallocate workers between large and small firms. We have left the role of industry largely unexplored which might be important since between industry variation in firm size may capture factors beyond the scope of these search and matching models. We have also not explicitly distinguished between job-to-job flows that involve a wage increase from those that do not.

Recent analysis by Kahn and McEntarfer (2013) suggests that job-to-job flows are consistent with workers moving from low wage to high wage firms.

One might interpret our results as primarily a caution about using firm size as a proxy for productivity. An obvious future direction for research is to explore the reallocation of workers across firms of different productivities. We know from the work on job reallocation and productivity that firms with positive productivity shocks tend to increase employment while those with less favorable productivity shocks contract or exit. But we also know the evidence on firm-level productivity dynamics that while shocks are persistent that all firms are continually subject to new productivity innovations. Such dynamics of firm level productivity contributes to the imperfect relationship between size and productivity that is observed in the data. As noted, some aspects of these dynamics can potentially be captured by considering firm age as well as firm size. However, we believe that there is a lot more to learn about job-to-job flows across firms by firm size, firm age and in turn other firm characteristics such as productivity.

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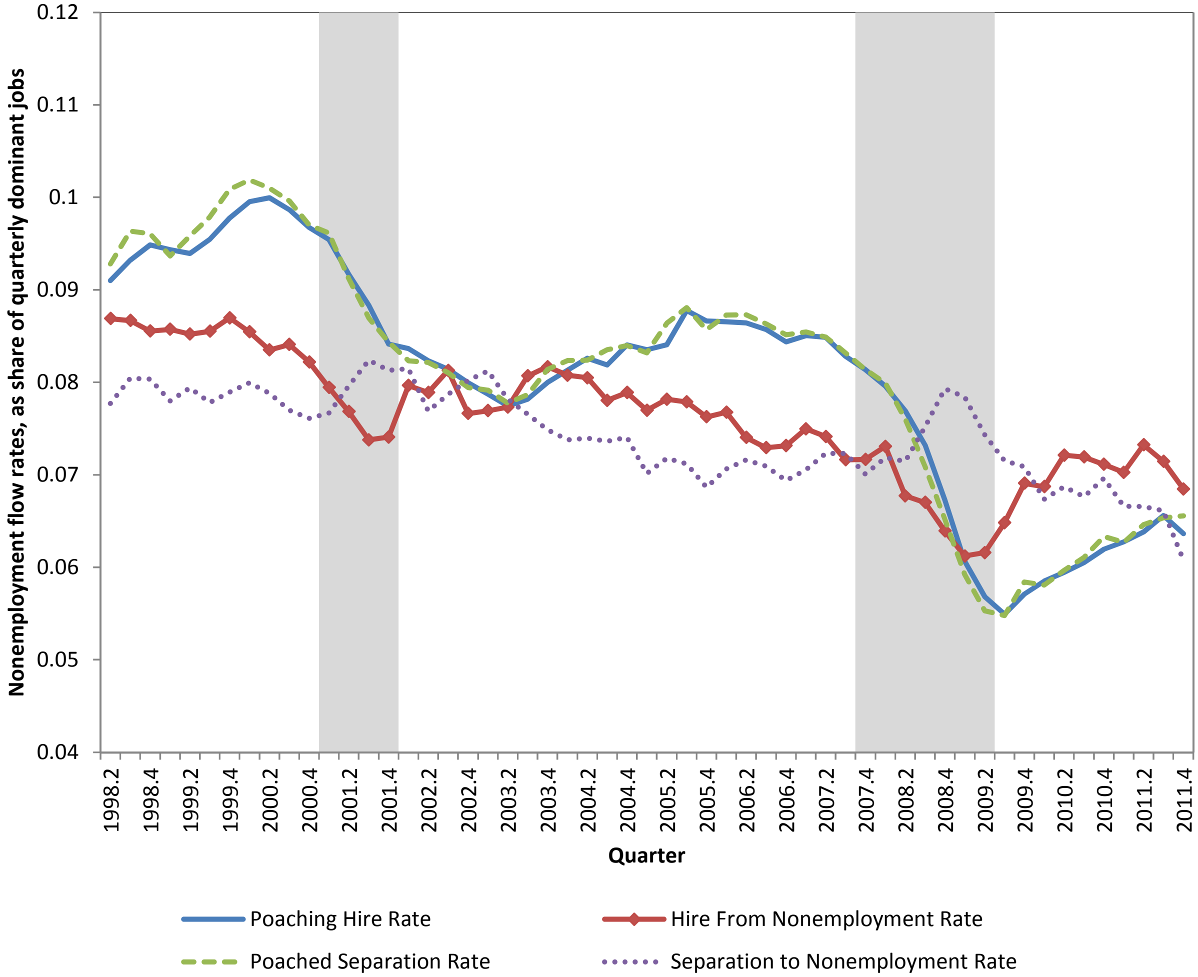
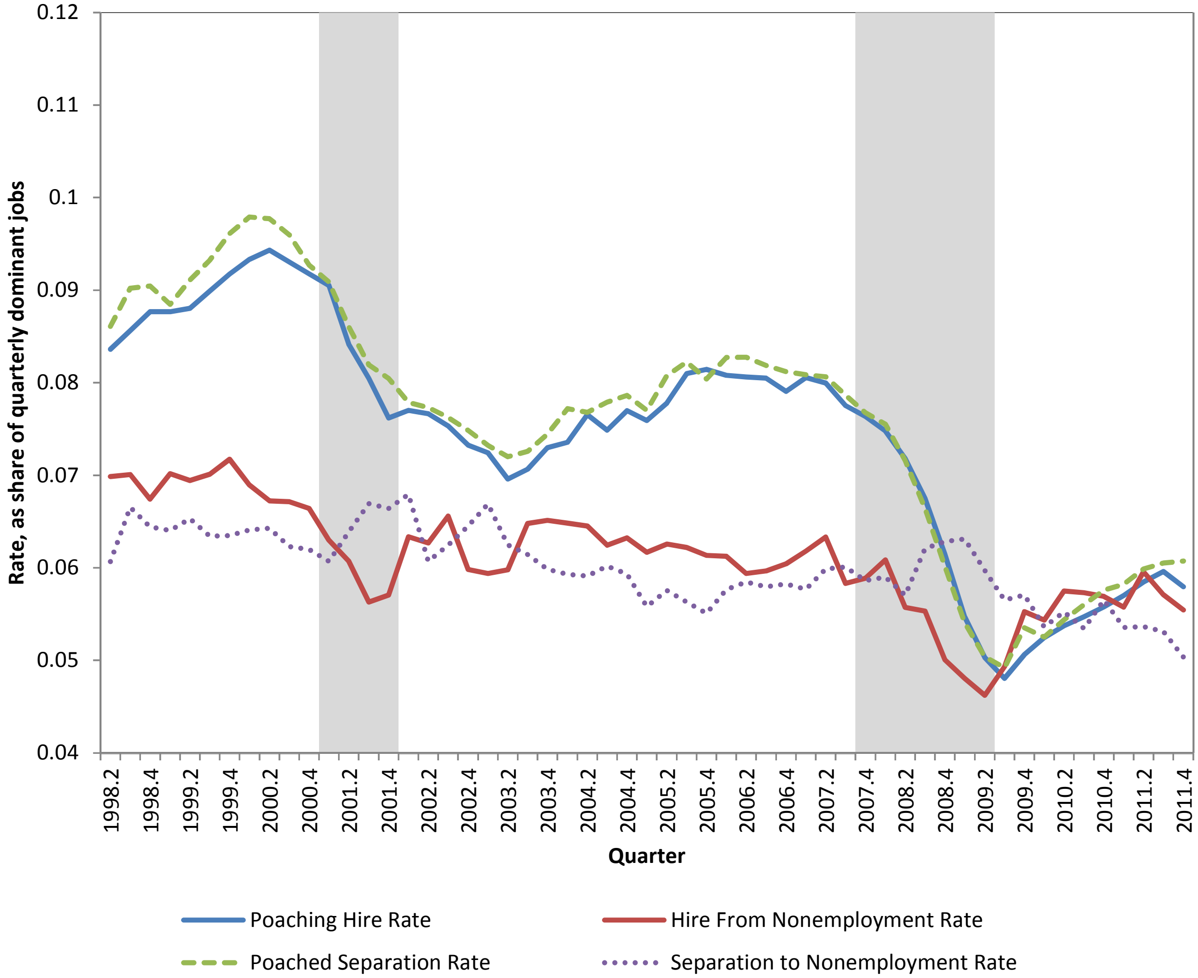
Figure 1: Hires and separations: poaching vs. flows to and from nonemployment



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

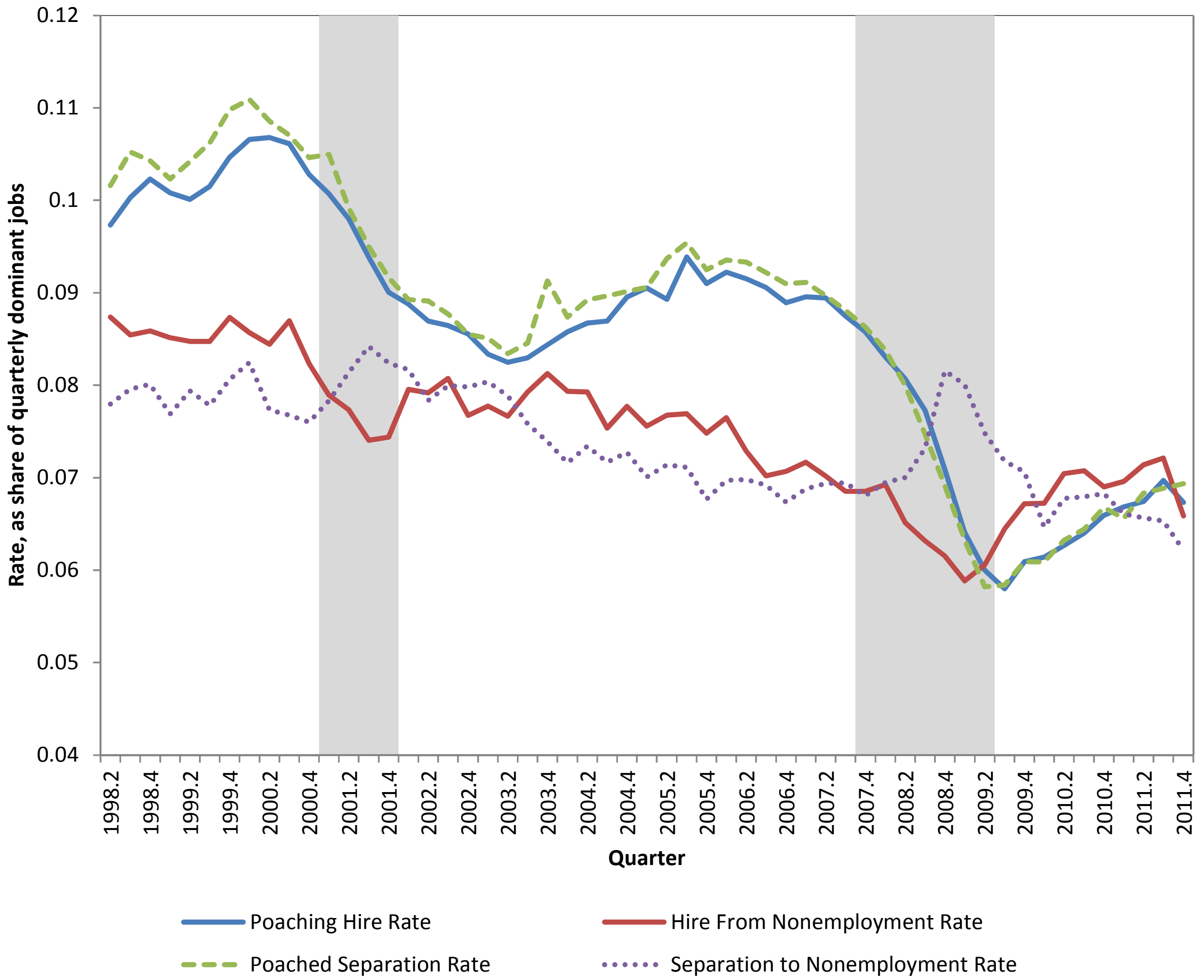
Figure 2: Hires and separations: poaching vs. flows to and from nonemployment, by size

Figure 2a: Large Firms



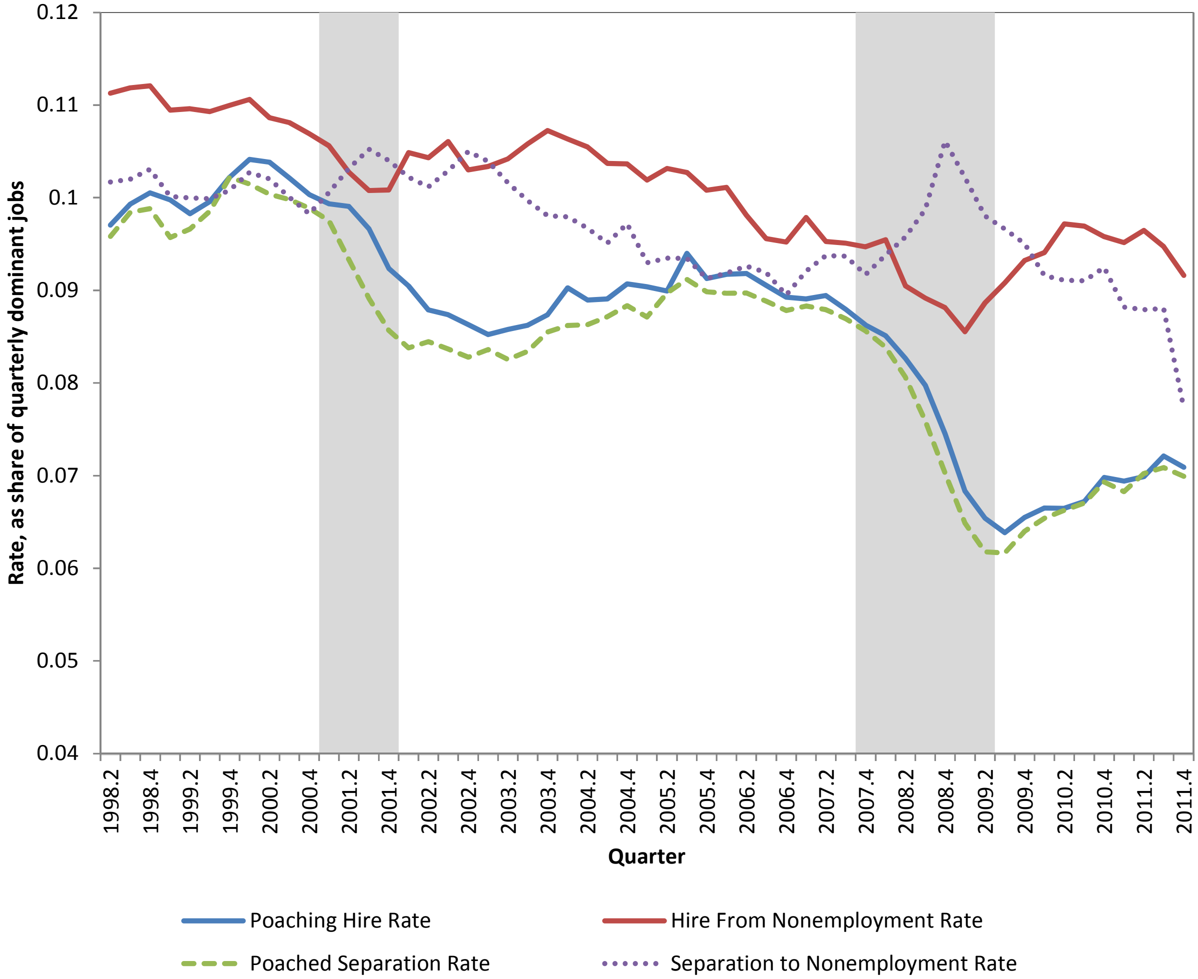
Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure 2b: Medium Firms



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

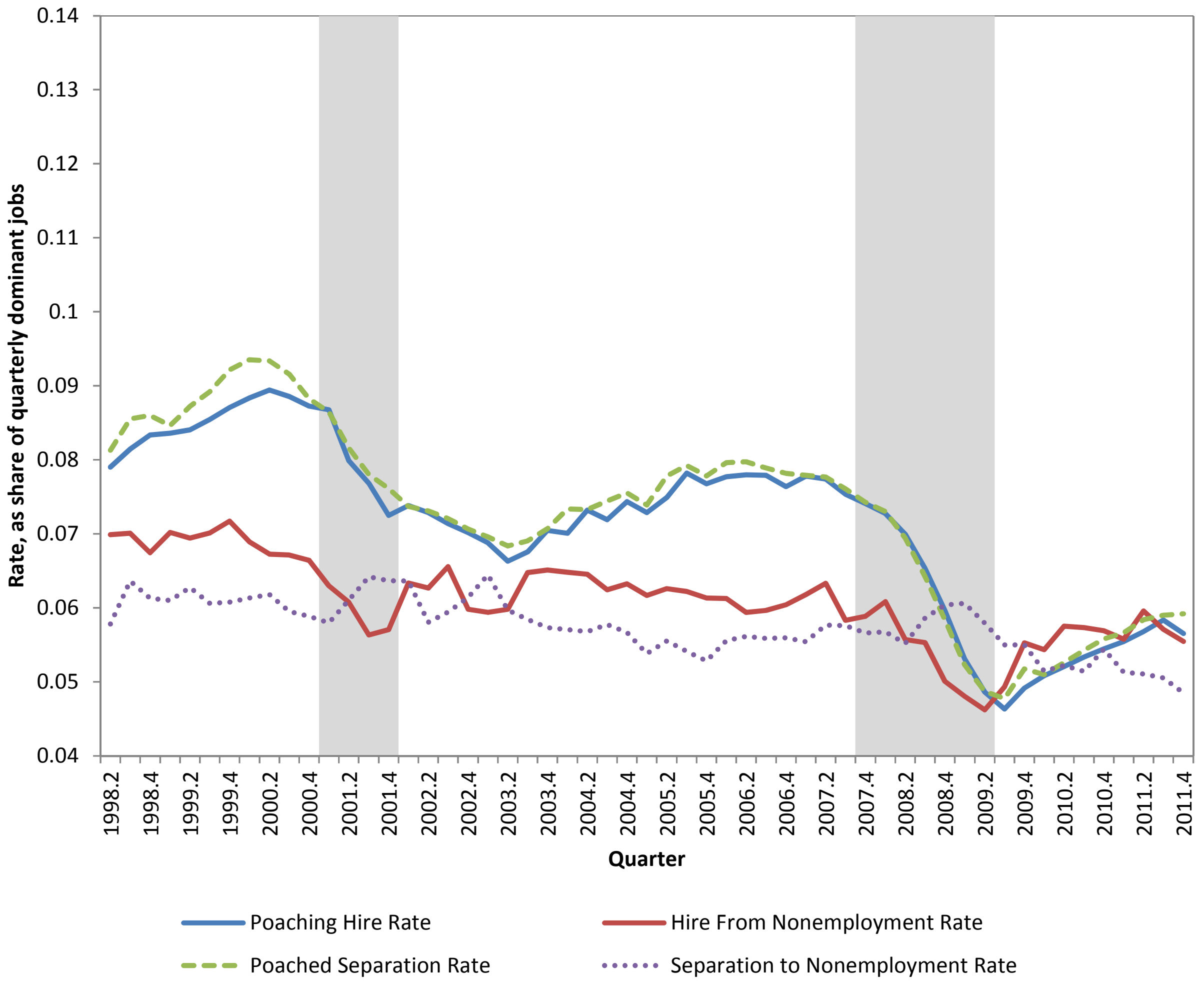
Figure 2c: Small Firms



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

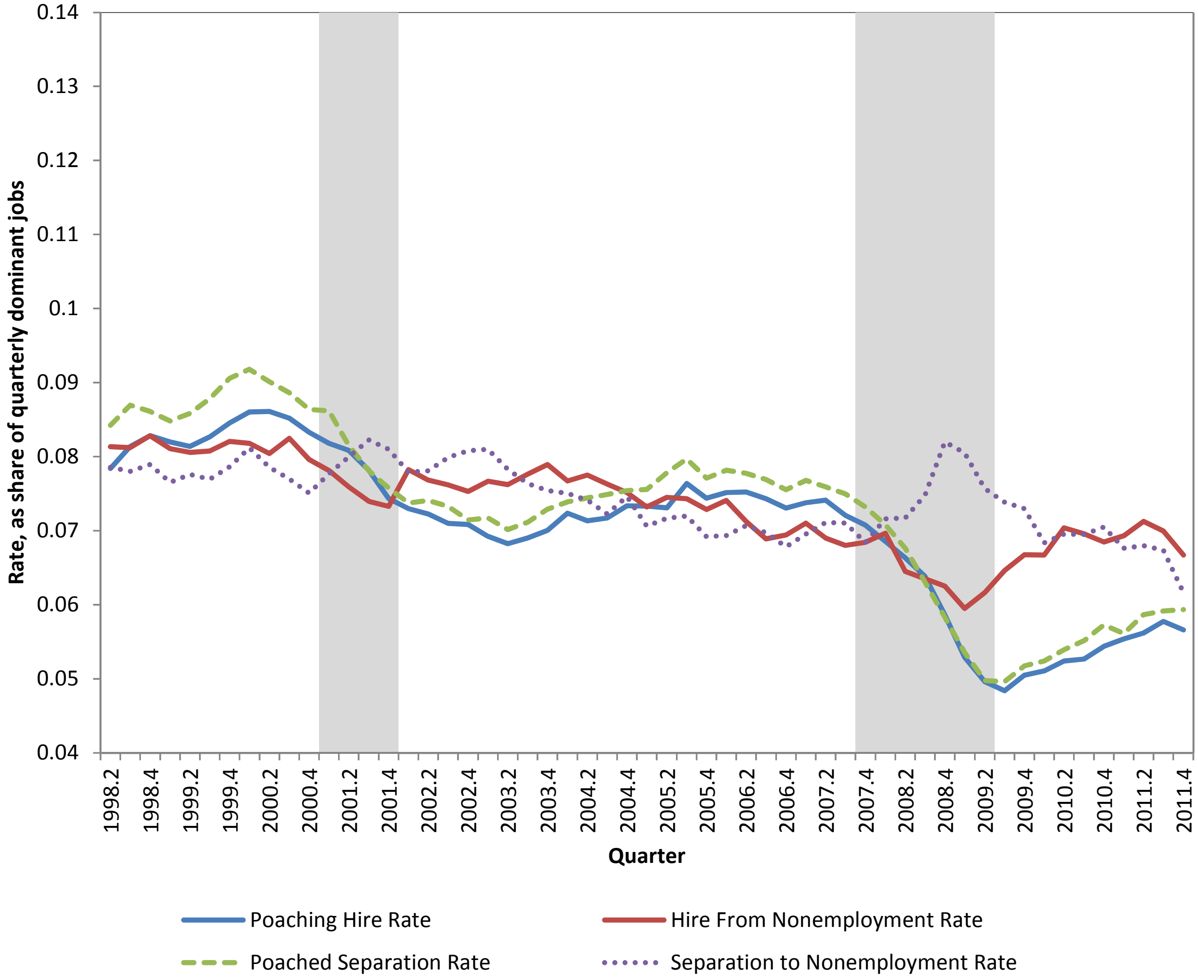
Figure 3: Hires and separations: poaching vs. flows to and from nonemployment, by size and age

Figure 3a: Large, Mature



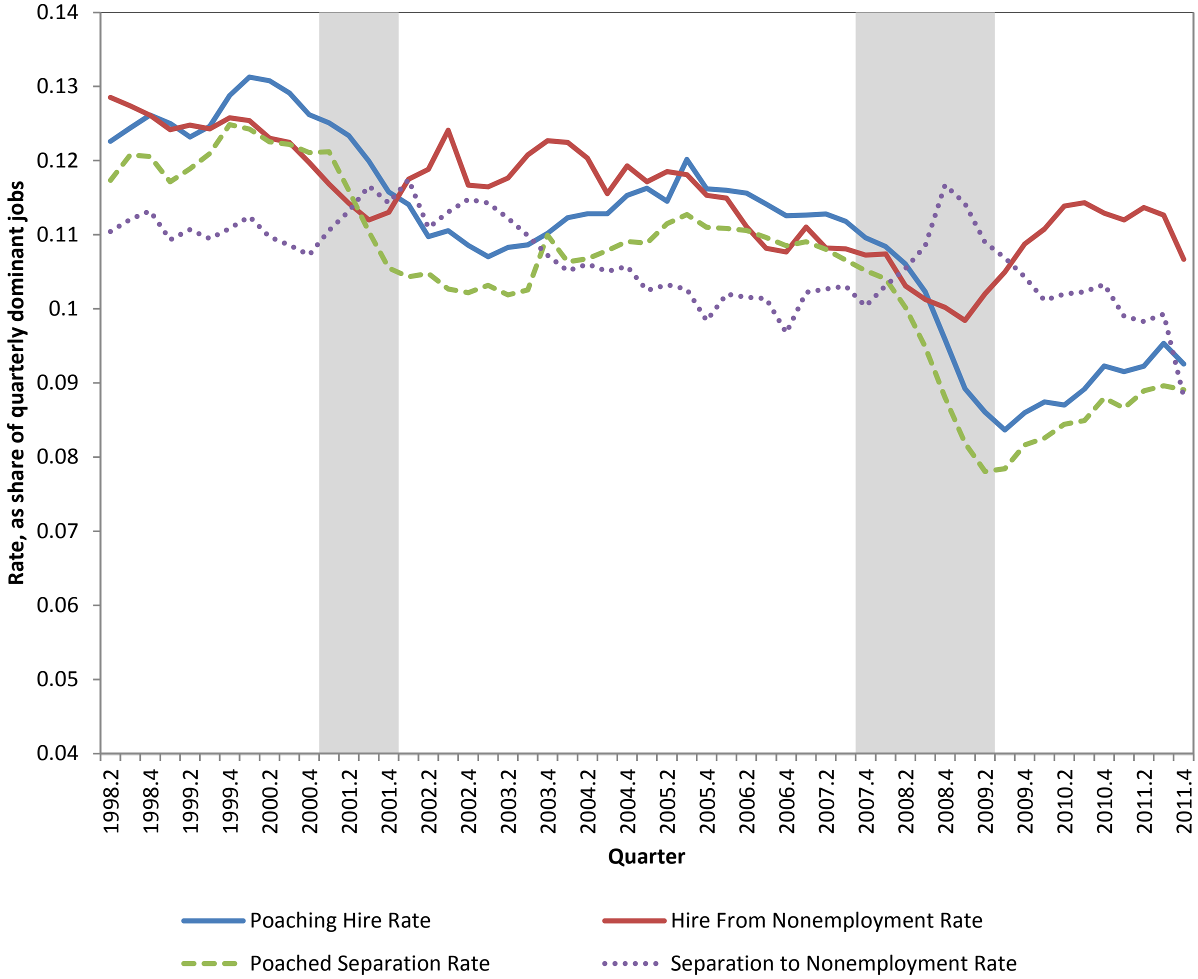
Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure 3b: SME (Small or Medium), Mature



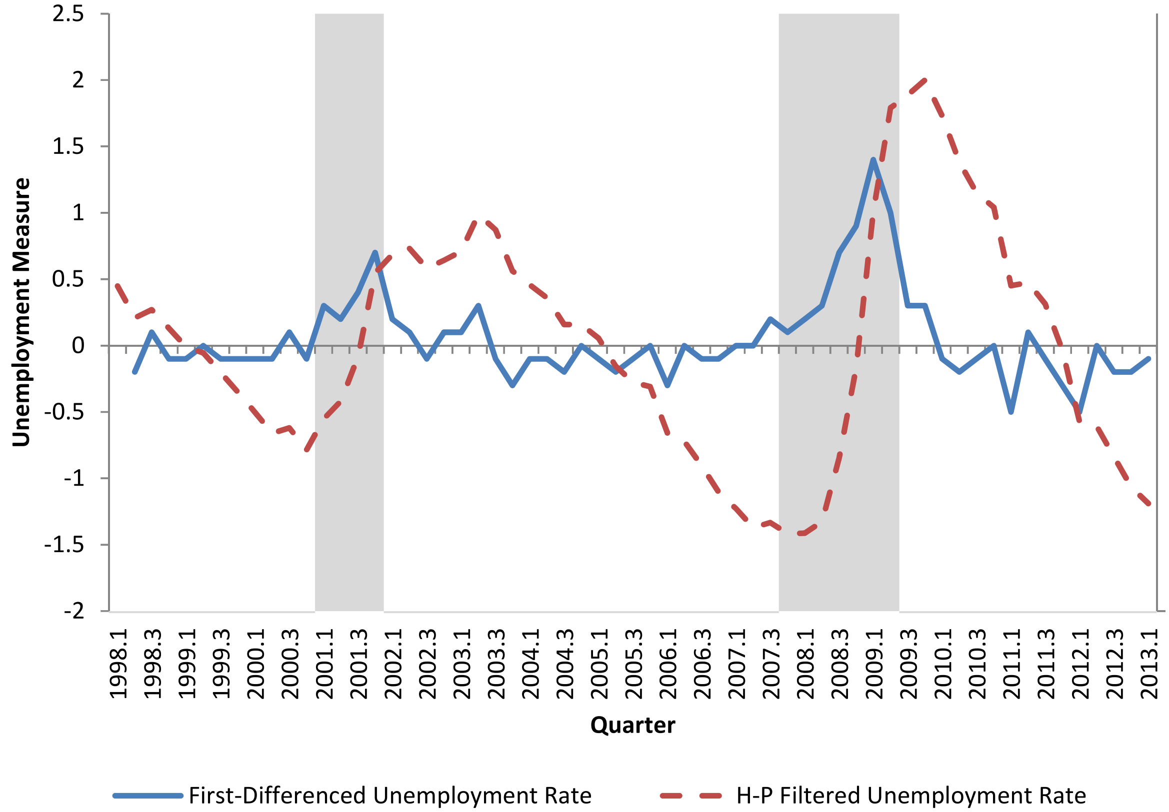
Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure 3c: SME (Small or Medium), Young



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure 4: Cyclical Indicators: H-P Filtered and First-Differenced Unemployment Rate



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Table 1: Poaching Flows, by Firm Size

		Small	Medium	Large	Total Flows
Share of hires, from other firms		41.8	48.8	50.6	623 million
Share of separations, to other firms		43.0	50.8	52.4	609 million
Share of private poaching hires, private firm sources only		Destination firm size			Row
		Small	Medium	Large	Total
Origin firm size	Small	15.0	7.0	9.7	31.7
	Medium	7.5	6.9	9.3	23.7
	Large	10.2	9.4	24.9	44.5
	Column Total	32.7	23.4	43.9	100.0

Notes: "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees.

Table 2: Poaching Flows, by Firm Size and Firm Age

		SME, Young	SME, Mature	Large, Mature	Total Flows
Share of hires, from other firms		44.6	44.3	50.7	596 million
Share of separations, to other firms		46.2	45.8	52.4	582 million
Share of private poaching hires, private firm sources only		Destination firm size and age			
		SME, Young	SME, Mature	Large, Mature	Row Total
Origin firm size and age	SME, Young	10.7	7.7	8.1	27.7
	SME, Mature	8.5	9.5	8.7	27.8
	Large, Mature	8.7	8.7	20.6	39.8
	Column Total	29.1	27.0	39.4	*

Notes: "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old. *: The row and column totals are not equal: shares do not add up to 100 because not shown are Large Firms less than 11 years old, which are a small category constituting 4.6% of destination firms and 4.7% of origin firms.

Table 3a: Worker Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Hiring rates						
through Poaching						
by Large	-0.748**	-0.563**	-0.912**	-0.291**	-0.191**	-0.653**
	(0.020)	(0.042)	(0.031)	(0.051)	(0.048)	(0.089)
by Small	-0.609**	-0.557**	-0.783**	-0.524**	-0.635**	-0.645**
	(0.029)	(0.062)	(0.038)	(0.059)	(0.067)	(0.099)
from nonemp.						
by Large	-0.144**	-0.238**	-0.209**	-0.534**	-0.342**	-0.759**
	(0.029)	(0.062)	(0.032)	(0.052)	(0.066)	(0.071)
by Small	-0.007	-0.320**	-0.057+	-1.157**	-1.375**	-0.849**
	(0.037)	(0.079)	(0.032)	(0.061)	(0.078)	(0.069)
Separation rates						
to Poaching						
by Large	-0.687**	-0.415**	-0.892**	-0.355**	-0.223**	-0.740**
	(0.021)	(0.042)	(0.033)	(0.049)	(0.046)	(0.091)
by Small	-0.617**	-0.478**	-0.785**	-0.392**	-0.218**	-0.802**
	(0.026)	(0.054)	(0.037)	(0.054)	(0.060)	(0.095)
to nonemp.						
by Large	0.022	-0.160**	-0.017	0.242**	0.042	0.282**
	(0.028)	(0.059)	(0.029)	(0.050)	(0.064)	(0.067)
by Small	0.060+	-0.403**	0.090**	0.395**	0.084	0.486**
	(0.034)	(0.070)	(0.028)	(0.061)	(0.076)	(0.064)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. “Small” indicates that a firm has 0-50 employees, “Medium” indicates that a firm has 50-499 employees, and “Large” indicates that a business has 500+ employees.

Table 3b: Net Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flows						
by Large	-0.227**	-0.225**	-0.212**	-0.712**	-0.352**	-0.954**
	(0.039)	(0.081)	(0.038)	(0.069)	(0.087)	(0.085)
by Small	-0.058	0.003	-0.144**	-1.684**	-1.876**	-1.178**
	(0.060)	(0.130)	(0.033)	(0.101)	(0.131)	(0.070)
Net Poaching Flows						
by Large	-0.061**	-0.147**	-0.021	0.063*	0.031	0.087**
	(0.014)	(0.031)	(0.013)	(0.026)	(0.033)	(0.030)
by Small	0.008	-0.079*	0.003	-0.132**	-0.417**	0.157**
	(0.018)	(0.039)	(0.013)	(0.033)	(0.041)	(0.029)
Net Nonemp. Flows						
by Large	-0.166**	-0.077	-0.191**	-0.775**	-0.384**	-1.041**
	(0.035)	(0.070)	(0.034)	(0.060)	(0.075)	(0.074)
by Small	-0.067	0.082	-0.147**	-1.553**	-1.459**	-1.335**
	(0.050)	(0.105)	(0.032)	(0.082)	(0.106)	(0.065)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. “Small” indicates that a firm has 0-50 employees, “Medium” indicates that a firm has 50-499 employees, and “Large” indicates that a business has 500+ employees.

Table 3c: Differential Net Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flows:	-0.169**	-0.228+	-0.068+	0.972**	1.524**	0.224**
Large minus Small	(0.062)	(0.137)	(0.037)	(0.110)	(0.142)	(0.085)
Net Poaching Flows:	-0.070**	-0.068	-0.023	0.195**	0.448**	-0.070+
Large minus Small	(0.023)	(0.049)	(0.016)	(0.041)	(0.052)	(0.036)
Net Nonemp. Flows:	-0.099*	-0.160	-0.044	0.777**	1.075**	0.294**
Large minus Small	(0.045)	(0.100)	(0.030)	(0.081)	(0.104)	(0.068)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees.

Table 4: Differential Net Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Diff. in Net Job Flows						
Large, Mature vs.	-0.127**	-0.115	-0.073*	0.595**	0.955**	0.123
SME, Mature	(0.046)	(0.102)	(0.035)	(0.083)	(0.107)	(0.080)
Large, Mature vs.	-0.155**	-0.114	-0.082*	1.034**	1.368**	0.513**
SME, Young	(0.056)	(0.123)	(0.040)	(0.099)	(0.128)	(0.091)
Net Poaching Rate						
Large, Mature vs.	-0.073**	-0.053	-0.054**	0.107**	0.255**	-0.059+
SME, Mature	(0.018)	(0.039)	(0.014)	(0.033)	(0.042)	(0.032)
Large, Mature vs.	-0.050*	0.013	-0.025	0.130**	0.356**	-0.095*
SME, Young	(0.022)	(0.046)	(0.018)	(0.039)	(0.049)	(0.042)
Net Nonemp. Rate						
Large, Mature vs.	-0.054	-0.062	-0.019	0.487**	0.700**	0.182**
SME, Mature	(0.035)	(0.077)	(0.028)	(0.062)	(0.081)	(0.065)
Large, Mature vs.	-0.105**	-0.127	-0.057+	0.905**	1.012**	0.609**
SME, Young	(0.042)	(0.092)	(0.031)	(0.073)	(0.096)	(0.069)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment. “SME” indicates that a firm has 0-499 employees, while “Large” indicates that a business has 500+ employees. “Young” indicates that a business is 10 or fewer years old, while “Mature” indicates that a business is 11 or more years old.

Appendix A: Formal Implications of the Burdett and Mortensen (1998) Model

In this appendix, we explore some of the implications of the simplified Burdett and Mortensen (1998) model that we sketch out in Section II. The exact formulations for hires from nonemployment and other employers, as well as separations to nonemployment and other employers, are as in Section II, see especially equations (1) to (3). Equation (4) gives an equilibrium definition of firm size.

A. Properties of the stationary equilibrium

Proposition 1. *Higher-paying firms are larger.*

Proof. The unemployment rate is

$$u = \frac{\delta}{\delta + \lambda}. \tag{A1}$$

Given an initial allocation of workers to firms, the rate of change in the mass of workers earning a wage at most w is

$$\frac{dG(w,t;F)\big(1-u(t)\big)}{dt} = \lambda F(w)u(t) - \big[\delta + \lambda\big(1-F(w)\big)\big]G(w,t;F)\big(1-u(t)\big). \tag{A2}$$

In a stationary equilibrium, this time derivative must be equal to zero. Therefore,

$$G(w) = \frac{\delta F(w)}{\delta + \lambda\big(1-F(w)\big)} \tag{A3}$$

Using (4) and the definition of $G(w)$, a firm's employment is given by

$$N(w;F) = \frac{\lambda\delta}{\left[\delta + \lambda\big(1 - F(w)\big)\right]^2}, \tag{A4}$$

which is strictly increasing in w. ■

Proposition 2. *Separation and hiring rates are higher at smaller firms.*

Proof. The separation rate can be written as the sum of separation rate to nonemployment, δ, and the rate of losses to other firms, $\lambda\big(1 - F(w)\big)$

$$\delta + q(w;F) = \delta + \lambda\big(1 - F(w)\big), \tag{A5}$$

which is strictly decreasing in w. The result then follows by Proposition 1. Since the hiring and separation rates must be equal in steady-state, hiring rates too must be higher at smaller firms. ■

Proposition 3. *The share of hires from poaching is higher at larger firms.*

Proof. Using the definitions of $P(w;F)$ and E, total hires by a firm can be written as

$$P(w;F) + E = \lambda\frac{\delta}{\delta + \lambda} + \lambda\frac{\lambda}{\delta + \lambda}\frac{\delta F(w)}{\delta + \lambda\big(1 - F(w)\big)}. \tag{A6}$$

The share of poaching hires is then

$$\frac{P(w;F)}{P(w;F) + E} = \frac{\frac{\lambda}{\delta + \lambda}\frac{\delta F(w)}{\delta + \lambda\big(1 - F(w)\big)}}{\frac{\delta}{\delta + \lambda} + \frac{\lambda}{\delta + \lambda}\frac{\delta F(w)}{\delta + \lambda\big(1 - F(w)\big)}}, \tag{A7}$$

which is increasing in w, and hence, in a firm's employment, by Proposition 1. ■

Proposition 4. *Poaching flows move from smaller to larger firms.*

Proof. A higher wage w implies a higher position in the wage distribution $F(w)$, and higher employment, by Proposition 1. Therefore, a worker only accepts an offer from any firm larger than his current employer, and rejects any other offer. ■

In addition, in the stationary equilibrium the following must hold.

Proposition 5. *Aggregate net poaching flows and net flows into nonemployment are zero.*

B. Comparative statics with respect to offer arrival and separation rates

Consider now some comparative statics at the stationary equilibrium with respect to labor market conditions as summarized by the exogenous offer arrival and separation rates. Formal treatment of the transitional dynamics of the model is beyond the scope of this paper and has been developed by Moscarini and Postel-Vinay (2009, 2010, 2013a). Note that, in order to characterize the employment change at any particular firm, we must follow the Rank-Preserving Equilibrium assumption that these authors introduce.

i. <u>Steady-state employment</u>

Proposition 6. *The sensitivity of firm size to the offer arrival and separation rates is higher for larger firms.*

Proof. Note that the derivative of a firm's size with respect to offer arrival rate is

$$\frac{dN(w;F)}{d\lambda} = \frac{d}{d\lambda}\frac{\lambda\delta}{\left[\delta + \lambda\big(1 - F(w)\big)\right]^2}, \tag{A8}$$

which is equal to

$$\frac{\delta\left(\delta - \lambda\big(1 - F(w)\big)\right)}{\left[\delta + \lambda\big(1 - F(w)\big)\right]^3}. \tag{A9}$$

The semi-elasticity of employment with respect to the growth rate is then

$$\frac{dN(w;F)}{d\lambda}\Big/_{N(w;F)} = \frac{\delta - \lambda\big(1 - F(w)\big)}{\delta + \lambda\big(1 - F(w)\big)}. \tag{A10}$$

Note that the semi-elasticity is positive if and only if

$$1 - \frac{\delta}{\lambda} < F(w). \tag{A11}$$

The last inequality holds for firms that satisfy $F^{-1}\left(1 - \frac{\delta}{\lambda}\right) < w$ (provided that $\frac{\delta}{\lambda}$<1). Therefore, larger firms experience an increase in employment in percentage terms in response to a rise in offer arrival rate, whereas smaller firms shrink. Note, also, that the semi-elasticity of firm size is decreasing in $\big(1 - F(w)\big)$, implying that the semi-elasticity increases in firm size. Overall, then, smaller firms tend to have small negative changes in employment when the offer arrival rate increases, while the largest firms tend to have the largest proportionate increases.

Similarly, the derivative of a firm's employment with respect to the exogenous job destruction rate δ is given by

$$\frac{dN(w;F)}{d\delta} = \frac{d}{d\delta}\frac{\lambda\delta}{\left[\delta+\lambda\left(1-F(w)\right)\right]^2} = \frac{\lambda^2\left(1-F(w)\right)-\lambda\delta}{\left[\delta+\lambda\left(1-F(w)\right)\right]^3} \quad \text{(A12)}$$

The semi-elasticity of an employer's size with respect to the job destruction rate is therefore

$$\frac{\left(1-F(w)\right)-\delta}{\delta\left[\delta+\lambda\left(1-F(w)\right)\right]}, \quad \text{(A13)}$$

which is positive for smaller firms, i.e., for those that satisfy $F^{-1}(1-\delta) > w$. Again, taking the derivative of the semi-elasticity with respect to $\left(1-F(w)\right)$, one obtains

$$\frac{2\lambda}{\left[\delta+\lambda\left(1-F(w)\right)\right]^2} > 0, \quad \text{(A14)}$$

which implies that the semi-elasticity is decreasing in firm size.

ii. <u>Importance of the poaching mechanism</u>

Consider now the response of firm size to a change in the unemployment rate

$$\frac{dN}{du} = \frac{\left(\delta+q(w;F)\right)\left(\frac{dE}{dx}+\frac{dP(w;F)}{dx}\right)-\left(E+P(w;F)\right)\left(\frac{d\delta}{dx}+\frac{dq(w;F)}{dx}\right)}{[\delta+q(w;F)]^2}. \quad \text{(A15)}$$

In semi-elasticity form, one can write

$$\frac{dN}{dx}\Big/_N = \frac{1}{s(w;F)}\left(\frac{dE}{dx}\Big/_N + \frac{dP(w;F)}{dx}\Big/_N - \frac{d\delta}{dx} - \frac{dq(w;F)}{dx}\right) \quad \text{(A16)}$$

Examining the four derivatives inside the brackets yield the following conclusions (see Tables A1 and A2 for the related calculations).

1. When the separation rate increases (see Table A1):
   a. Hires from nonemployment increase for all firms, and but more so for smaller firms as a share of their employment. However, outflow rates increase uniformly for all firms. On net, small firms may actually expand when non-employment increases.
   b. Poaching hire rates increase for small firms but decrease for large firms. Poaching losses do not change since these losses are tied to a firm's position in the wage offer distribution, and the rank ordering of those positions do not change.
   c. Overall, smaller firms expand and larger firms contract when the separation rate increases. The contraction is proportionately larger for larger firms.

2. When the offer arrival rate increases (see Table A2):
   a. Hires from nonemployment increase for all firms. These will be larger as a share of employment for smaller firms. Separations to nonemployment are not affected (by assumption, the job destruction rate is constant). Net hiring from nonemployment, as a share of employment, is therefore higher for smaller firms.
   b. Poaching hire rates increase for all firms, but disproportionately for large firms. Poaching loss rates are disproportionately large for small firms. Overall, net

employment changes from poaching are positive for large firms but negative for smaller ones.

c. The poaching channel dominates. Firms above a certain size expand, and the proportionate change is larger for larger firms. Smaller firms shrink when the offer arrival rate is higher.

Table A.1: Responsiveness of Firm Size When the Job Destruction Rate Increases

Component	Definition	Derivative in Equation (A16)*	How does it vary by firm size?
Steady-State Employment $N(w;F)$	$\frac{P(w;F)+E}{\delta+q(w;F)}$	$\frac{\left(1-F(w)\right)-\delta}{\delta\left[\delta+\lambda\left(1-F(w)\right)\right]}$	Positive for small firms, negative for large ones.
Poaching Hires Inflow $P(w;F)$	$\lambda(1-u)G(w;F)$	$\frac{\lambda F(w)\left(\lambda^2\left(1-F(w)\right)-\delta^2\right)}{\delta(\lambda+\delta)^2}$	Small firms have more poaching flows, large have fewer.
Poaching Separation Rate $q(w;F)$	$\lambda\left(1-F(w)\right)$	0	Does not vary by firm size.
Net Poaching Hires	$\frac{1}{N(w;F)}\frac{dP}{d\delta}-\frac{dq}{d\delta}$	$\frac{\lambda F(w)\left(\lambda^2\left(1-F(w)\right)-\delta^2\right)}{\delta(\lambda+\delta)^2}$	Small firms have more poaching flows, large have fewer.
Hires from nonemployment E	$\lambda u=\frac{\lambda\delta}{\lambda+\delta}$	$\frac{\lambda\left(\delta+\lambda\left(1-F(w)\right)\right)^2}{\delta(\lambda+\delta)}$	Proportionate increases of greater magnitude for small firms than large.
Separations to nonemployment Rate δ	δ	1	Does not vary by firm size.
Net Hires from Nonemployment	$\frac{1}{N(w;F)}\frac{dE}{d\delta}-\frac{d\delta}{d\delta}$	$\frac{\lambda\left(\delta+\lambda\left(1-F(w)\right)\right)^2}{\delta(\lambda+\delta)}-1$	Increases for small firms, decreases for large ones.

*: Divided by employment N for poaching hires and hires from nonemployment.

Table A.2: Responsiveness of Firm Size When the Offer Arrival Rate Increases

Component	Definition	Derivative in Equation (A16)*	How does it vary by firm size?
Steady-State Employment $N(w;F)$	$\frac{P(w;F)+E}{\delta+q(w;F)}$	$\frac{\delta-\lambda(1-F(w))}{\delta+\lambda(1-F(w))}$	Positive for large firms, negative for the small ones.
Poaching Hires Inflow $P(w;F)$	$\lambda(1-u)G(w;F)$	$\frac{F(w)(\delta\lambda^2(1-F(w))+\lambda^2\delta+\lambda\delta^2)}{\lambda(\delta+\lambda)^2}$	This is positive for all firms, but is a quadratic in the firm's position.
Poaching Separation Rate $q(w;F)$	$\lambda\left(1-F(w)\right)$	$(1-F(w))$	Higher wage firms have larger increases.
Net Poaching Hires	$\frac{1}{N(w;F)}\frac{dP}{d\lambda}-\frac{dq}{d\lambda}$	$\frac{F(w)(\delta\lambda^2(1-F(w))+\lambda^2\delta+\lambda\delta^2)}{\lambda(\delta+\lambda)^2}-(1-F(w))$	Large firms are more sensitive.
Hires from nonemployment E	$\lambda u=\frac{\lambda\delta}{\lambda+\delta}$	$\frac{\delta\left(\delta+\lambda(1-F(w))\right)^2}{\lambda(\lambda+\delta)}$	Positive for firms of any size, but proportionately larger for small firms.
Separations to nonemployment Rate δ	δ	0	Does not vary by firm size.
Net Hires from Nonemployment	$\frac{1}{N(w;F)}\frac{dE}{d\lambda}-\frac{d\delta}{d\lambda}$	$\frac{\delta\left(\delta+\lambda(1-F(w))\right)^2}{\lambda(\lambda+\delta)}$	Positive for firms of any size. Proportionately larger for small firms.

*: Divided by employment N for poaching hires and hires from nonemployment.

Appendix B: Additional Data Details

A. LEHD Data

We use linked employer-employee data for the U.S. maintained by the Longitudinal Employer-Household Dynamics (LEHD) program at the U.S. Census Bureau. For background about the LEHD data, see Abowd et al. (2009). We use two recent enhancement to these data: the construction of a multi-state database of job-to-job flows, as well as national firm age and size data. This appendix provides additional background on these recent enhancements, and also provides more detail on the final construction of our analysis dataset.

i. Job-to-Job Flows

Our paper uses prototype data on worker flows across employers under development at the Longitudinal Employer-Household Dynamics (LEHD) program at the U.S. Census Bureau, as described by Hyatt and McEntarfer (2012a, 2012b). A public use job-to-job flows data product is currently scheduled for release by the LEHD program in late 2014. Our paper uses a prototype of this pending public use product to examine flows of workers across employers.

We longitudinally link the flows of workers across firms, industries, and geographies, using an enhanced version of the methodology described in Hyatt and McEntarfer (2012b). This earlier paper was analyzed a dataset constructed from a nine "reference state" database of job-to-job flows; coverage in the database we consider is more comprehensive. The methodology to construct the job-to-job flows database we analyze links the jobs across each quarter of an individual's work history. For workers who hold multiple jobs in a quarter, the highest-earnings employer is the reference employer. These job transitions include categories for the separation and accession events occurring in the same quarter, as well as events where the separation and accession events occur in adjacent quarters. These flows include workers with short duration jobs (less than a quarter) but only if this is the main job in the quarter.

Our quarterly nonemployment measure is a subset of those workers who experience nonemployment in a quarter. For most of our analysis, flows to and from nonemployment have at least a full-quarter of nonemployment (Appendix C reports results where individuals are allowed to have much shorter spells), so these are flows from fairly persistent nonemployment spells. In cases where a job separation is to a job in a state whose data is not available yet, we can misclassify this flow as a flow to nonemployment (and similarly for hires that are inflows from an unavailable states). We also miss flows to and from federal employment, which was not available at the time of this writing. Note that short spells of nonemployment are not inconsistent with a flow being a job-to-job flow. Workers may take at least a short break between their last day on one job and their first day on a new job even if the decision to leave the original job is based on having accepted a new job offer from the firm they are joining. Our definitions and measurement methods are consistent with such possibilities.

Recalls are treated as follows. Short recalls are omitted because one needs to receive no pay from a particular employer for a full quarter to meet our definition of nonemployment. Recalls across full quarter nonemployment are movements into and from nonemployment.

ii. Firm size and age

Our firm age and size characteristics are also a relatively new enhancement to the LEHD data, documented in Haltiwanger et al. (2013). Over the last two years, the LEHD program has integrated Business Dynamics Statistics microdata on firm age and size derived from the Census Bureau's Longitudinal Business Database, as described in Haltiwanger et al. (2013).

Firm size is based on the total employment in all establishments belonging to the firm on March 12th of the previous year (or the current year for new firms). For any given consecutive two-year period, size is defined as the employment-weighted sum of firm size on March 12 in year t-1 of all establishments that are part of an EIN on March 12 in year t. This definition automatically covers mergers, divestitures, acquisitions, etc. For instance, if a firm in year t has three establishments belonging to three different firms in year t-1, initial firm size in year t is the weighted sum (where the weights are based on the year t size of each establishment) of the firm sizes in year t-1 of each of these three establishments. Firm age is based on the age of the oldest establishment in the year of the firm's birth, and ages naturally over its lifetime. This definition addresses issues of ownership changes. For example, a new legal entity (i.e., firm) that results from some M&A activity is not necessarily considered a young firm; instead, it is assigned the age of its oldest establishment at the time of its birth. We also note that we are not the first to consider job-to-job flows by firm size. For our analysis, we group these into three size 'buckets': large (>=500 workers), medium (50-499), and small (<50 workers).

Firm age is the age of the national firm, defined as the age of the oldest establishment in the first year of a firm's existence, and aging naturally afterwards. An establishment is age zero in the first year that it reports any positive payroll. We use two age categories: those 0-10 years of age are called "Young" firms, and those of 11 or more years of age are called "Mature" firms. Note that in supplementary analyses excluded from this paper or any of its Appendices, we further sub-divided the "Young" category into 0-1 vs. 2-10 years of age. Finding that firms in these two age categories behaved similarly in their hiring activity, we combined them for expositional purposes.

iii. Final LEHD dataset construction

Our sample and definitions are as follows. The LEHD data provides employment information for private UI-covered employment for all 50 states. As the first year of data availability varies by state, our sample consists of 28 states whose histories extend back to 1998, and we are then able to follow workers and firms through 2012. Our 28 states are CA, FL, GA ,HI, ID, IL, IN, KS, ME, MD, MN, MO, MT, NC, NJ, ND, NM, NV, PA, OR, RI, SC, SD, TN, VA, WA, and WV. By 2000, data is available for 44 states. A handful of states, mostly small southern states (AL, AR, MS, DC) enter the LEHD data in the 2000s, and Massachusetts is missing in entirety at the time of this writing. Henderson and Hyatt (2012) have studied the geographic bias in the job-to-job flow statistics calculated in Hyatt and McEntarfer (2012b) and found that it diminishes rapidly once the last large cohort of states enters the data in 2000. Based on this analysis, we believe the misclassification of cross-state jobs as flows to or from nonemployment is a minimal source of error over our time series.

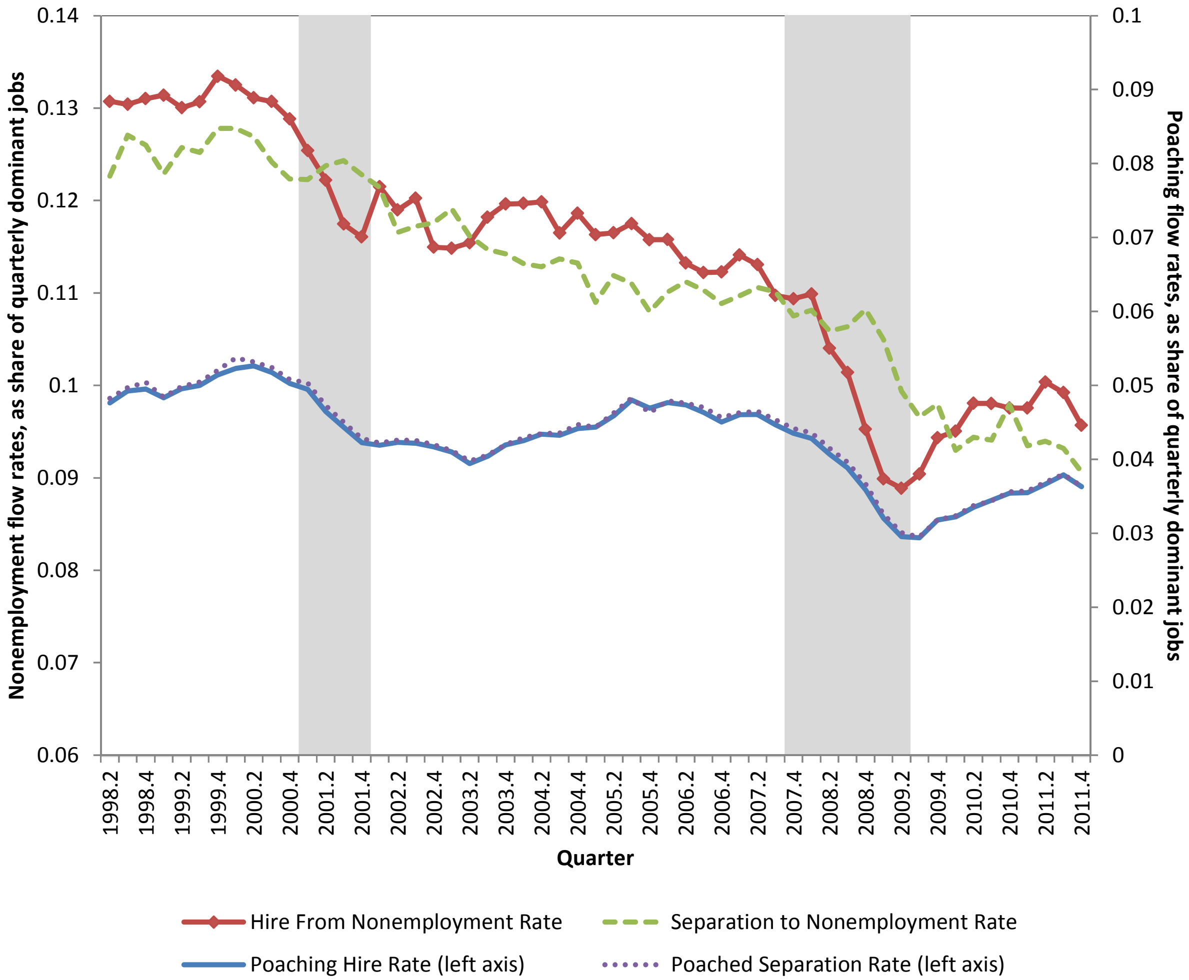
We start our time-series in 1998 to limit geographic availability bias, which is small and diminishes as more states enter the data in the early 2000s; see Henderson and Hyatt (2012). We focus our analysis for hires and separations for private sector firms. But we note that we include the contribution (which turns out to be modest) of poaching hiring flows at private sector firms that originate from state and local government entities and poaching separation flows from private sector firms that have as the destination state and local government entities.

B. Cyclical indicators

We exploit indicators of the cyclicality of the labor market using transformations of the unemployment rate. The unemployment rate aggregates responses to the Current Population Survey (CPS), and state- and national-level rates were downloaded from the BLS website, http://www.bls.gov. Our flow data from the LEHD are not seasonally adjusted so we start with not seasonally adjusted unemployment rate quarterly series from the CPS. But in all of our empirical specifications we include seasonal controls (mostly in the form of seasonal dummies).

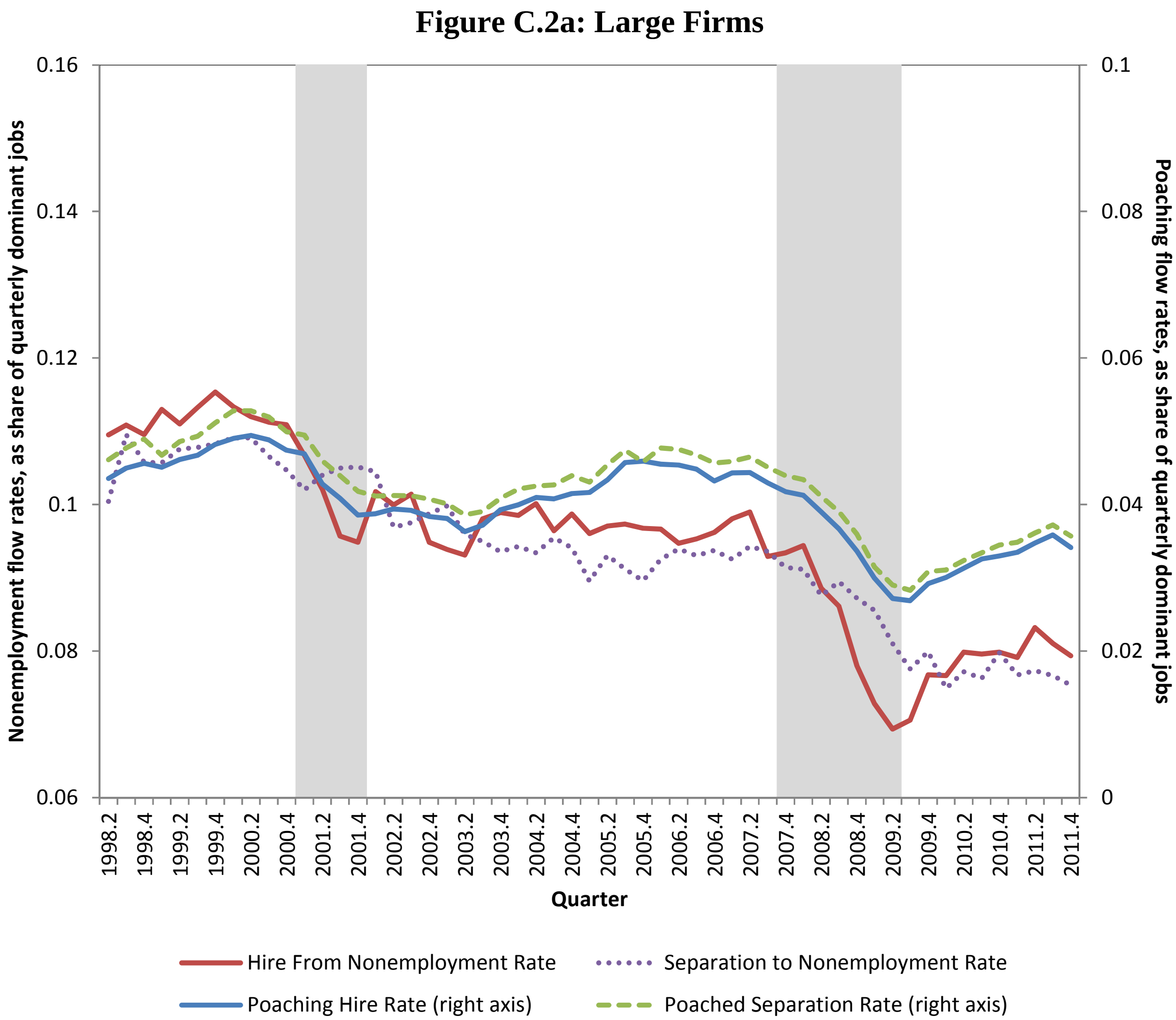
Appendix C: Robustness Figures and Tables with alternate Poaching Definition

Figure C.1: Hires and separations: poaching flows vs. flows to and from nonemployment (direct flows as poaching flows only)



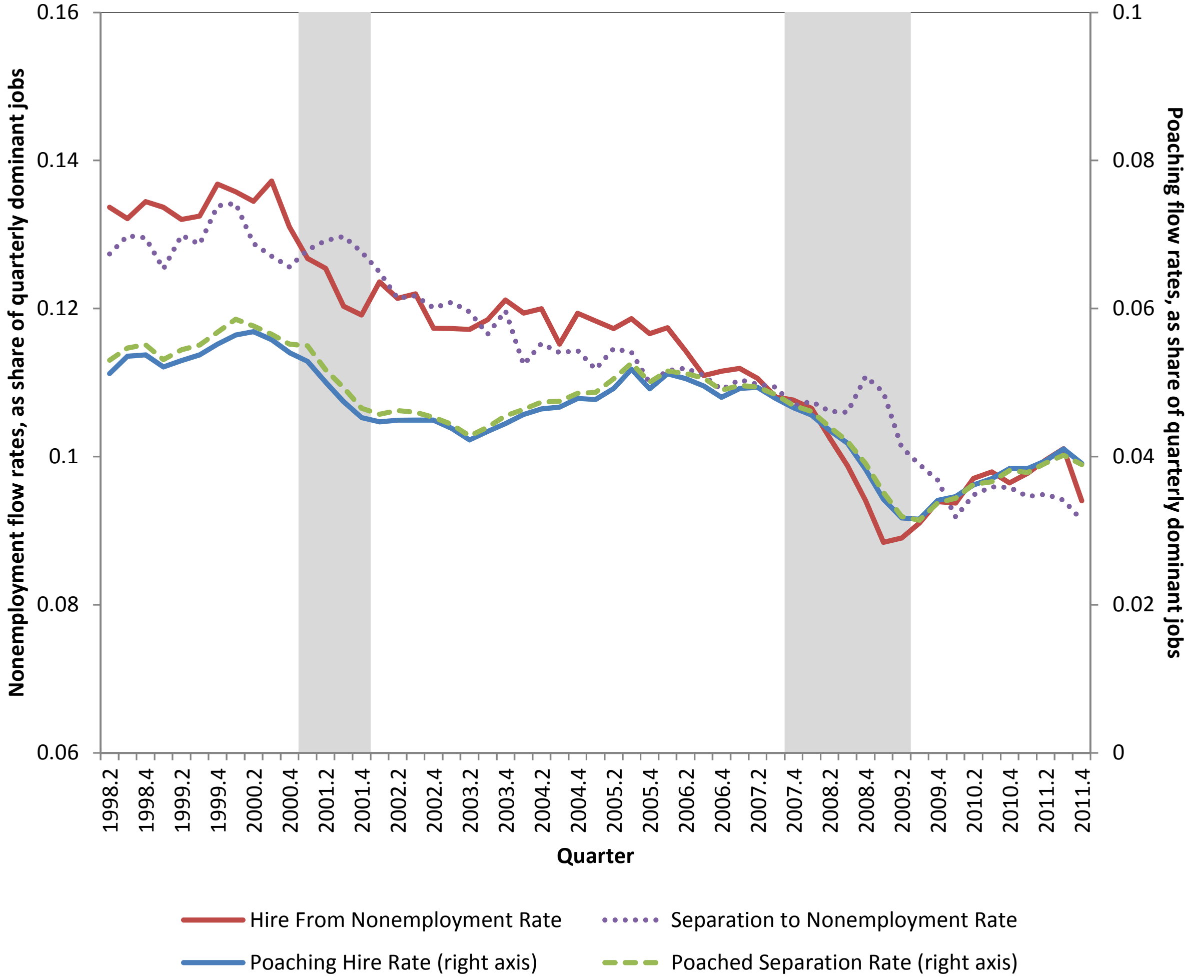
Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure C.2: Hires and separations: poaching flows vs. flows to and from nonemployment by firm size (direct flows as poaching flows only)



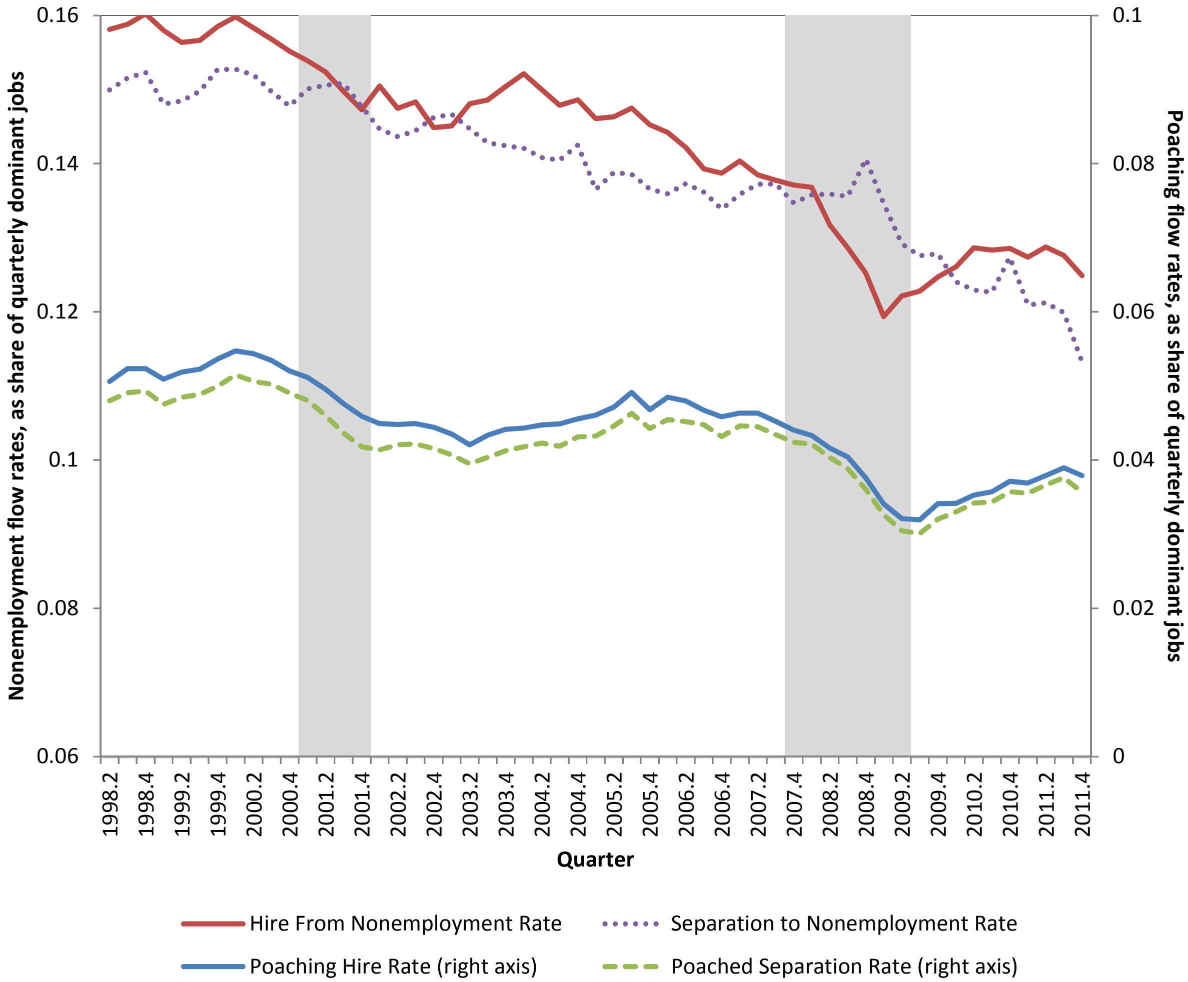
Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure C.2b: Medium Firms



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Figure C.2c: Small Firms



Note: Shaded regions indicate NBER recession quarters. All data are seasonally adjusted.

Table C.1a: Worker Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Hiring rates						
through Poaching						
by Large	-0.426**	-0.302**	-0.480**	-0.276**	-0.177**	-0.420**
	(0.011)	(0.021)	(0.013)	(0.028)	(0.024)	(0.041)
by Small	-0.336**	-0.279**	-0.414**	-0.399**	-0.434**	-0.421**
	(0.013)	(0.028)	(0.016)	(0.027)	(0.029)	(0.043)
from nonemp.						
by Large	-0.466**	-0.498**	-0.641**	-0.549**	-0.356**	-0.992**
	(0.034)	(0.074)	(0.044)	(0.065)	(0.081)	(0.105)
by Small	-0.279**	-0.598**	-0.426**	-1.282**	-1.576**	-1.073**
	(0.046)	(0.101)	(0.049)	(0.079)	(0.102)	(0.113)
Separation rates						
to Poaching						
by Large	-0.413**	-0.259**	-0.489**	-0.250**	-0.182**	-0.379**
	(0.011)	(0.021)	(0.014)	(0.027)	(0.023)	(0.043)
by Small	-0.336**	-0.255**	-0.396**	-0.237**	-0.150**	-0.400**
	(0.010)	(0.019)	(0.013)	(0.023)	(0.022)	(0.038)
to nonemp.						
by Large	-0.251**	-0.317**	-0.420**	0.137*	0.001	-0.079
	(0.033)	(0.072)	(0.042)	(0.061)	(0.079)	(0.100)
by Small	-0.221**	-0.625**	-0.299**	0.240	0.016	0.084
	(0.042)	(0.091)	(0.045)	(0.078)	(0.100)	(0.105)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Table C.1b: Net Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flows						
by Large	-0.227**	-0.225**	-0.212**	-0.712**	-0.352**	-0.954**
	(0.039)	(0.081)	(0.038)	(0.069)	(0.087)	(0.085)
by Small	-0.058	0.003	-0.144**	-1.684**	-1.876**	-1.178**
	(0.060)	(0.130)	(0.033)	(0.101)	(0.131)	(0.070)
Net Poaching Flows						
by Large	-0.012*	-0.044**	0.009+	-0.026*	0.005	-0.041**
	(0.006)	(0.013)	(0.005)	(0.011)	(0.014)	(0.011)
by Small	-0.001	-0.025	-0.017**	-0.163**	-0.284**	-0.021
	(0.010)	(0.022)	(0.006)	(0.018)	(0.023)	(0.014)
Net Nonemp. Flows						
by Large	-0.215**	-0.181*	-0.221**	-0.686**	-0.357**	-0.913**
	(0.036)	(0.076)	(0.036)	(0.065)	(0.081)	(0.080)
by Small	-0.058	0.028	-0.127**	-1.522**	-1.592**	-1.157**
	(0.053)	(0.112)	(0.031)	(0.088)	(0.114)	(0.065)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Table C.1c: Differential Net Flows, Coefficient on Cyclical Variable, by Size

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flows:	-0.169**	-0.228+	-0.068+	0.972**	1.524**	0.224**
Large minus Small	(0.062)	(0.137)	(0.037)	(0.110)	(0.142)	(0.085)
Net Poaching Flows:	-0.012	-0.019	0.026**	0.136**	0.289**	-0.020
Large minus Small	(0.013)	(0.029)	(0.008)	(0.024)	(0.030)	(0.019)
Net Nonemp. Flows:	-0.157**	-0.209+	-0.094**	0.836**	1.235**	0.244**
Large minus Small	(0.051)	(0.113)	(0.033)	(0.091)	(0.118)	(0.075)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Table C.2a: Worker Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Hiring rates						
through Poaching						
by Large, Mature	-0.419**	-0.288**	-0.466**	-0.275**	-0.173**	-0.408**
	(0.011)	(0.021)	(0.013)	(0.027)	(0.023)	(0.040)
by SME, Mature	-0.274**	-0.239**	-0.303**	-0.432**	-0.485**	-0.355**
	(0.012)	(0.026)	(0.012)	(0.024)	(0.026)	(0.032)
by SME, Young	-0.389**	-0.337**	-0.457**	-0.448**	-0.440**	-0.490**
	(0.015)	(0.032)	(0.018)	(0.032)	(0.033)	(0.048)
from nonemp.						
by Large, Mature	-0.466**	-0.494**	-0.622**	-0.527	-0.349	-0.922**
	(0.034)	(0.074)	(0.042)	(0.065)	(0.080)	(0.101)
by SME, Mature	-0.300**	-0.498**	-0.449**	-0.957**	-1.074**	-0.983**
	(0.034)	(0.074)	(0.041)	(0.059)	(0.076)	(0.095)
by SME, Young	-0.259**	-0.613**	-0.428**	-1.310**	-1.456**	-1.307**
	(0.047)	(0.100)	(0.054)	(0.079)	(0.103)	(0.123)
Separation rates						
to Poaching						
by Large, Mature	-0.407**	-0.253**	-0.476**	-0.254**	-0.183**	-0.375**
	(0.011)	(0.021)	(0.013)	(0.027)	(0.023)	(0.042)
by SME, Mature	-0.288**	-0.223**	-0.318**	-0.347**	-0.330**	-0.363**
	(0.012)	(0.023)	(0.013)	(0.023)	(0.025)	(0.034)
by SME, Young	-0.385**	-0.292**	-0.447**	-0.297**	-0.209**	-0.453**
	(0.011)	(0.022)	(0.014)	(0.027)	(0.025)	(0.042)
to nonemp.						
by Large, Mature	-0.258**	-0.338**	-0.406**	0.132*	-0.007	-0.054
	(0.033)	(0.072)	(0.040)	(0.062)	(0.079)	(0.096)
by SME, Mature	-0.193**	-0.449**	-0.299**	0.234**	0.065	0.044
	(0.033)	(0.071)	(0.038)	(0.060)	(0.077)	(0.090)
by SME, Young	-0.199**	-0.582**	-0.314**	0.253**	0.013	0.071
	(0.042)	(0.091)	(0.048)	(0.077)	(0.100)	(0.113)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Table C.2b: Net Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flow Rate						
for Large, Mature	-0.220**	-0.191*	-0.206**	-0.680**	-0.332**	-0.901**
	(0.039)	(0.082)	(0.039)	(0.071)	(0.089)	(0.087)
for SME, Mature	-0.093*	-0.076	-0.133**	-1.274**	-1.287**	-1.025**
	(0.043)	(0.092)	(0.029)	(0.072)	(0.093)	(0.061)
for SME, Young	-0.065	-0.077	-0.124**	-1.714**	-1.700**	-1.414**
	(0.057)	(0.119)	(0.039)	(0.093)	(0.121)	(0.083)
Net Poaching Rate						
for Large, Mature	-0.012+	-0.035**	0.009+	-0.021+	0.010	-0.033**
	(0.006)	(0.013)	(0.005)	(0.011)	(0.014)	(0.012)
for SME, Mature	0.013*	-0.027*	0.017**	-0.083**	-0.148**	0.002
	(0.006)	(0.013)	(0.004)	(0.011)	(0.014)	(0.009)
for SME, Young	-0.005	-0.045*	-0.010	-0.151**	-0.231**	-0.037+
	(0.010)	(0.023)	(0.009)	(0.019)	(0.024)	(0.020)
Net Nonemp. Rate						
for Large, Mature	-0.209**	-0.156*	-0.216**	-0.659**	-0.342**	-0.868**
	(0.037)	(0.077)	(0.036)	(0.066)	(0.083)	(0.082)
for SME, Mature	-0.106**	-0.049	-0.150**	-1.191**	-1.139**	-1.027**
	(0.039)	(0.082)	(0.028)	(0.064)	(0.083)	(0.058)
for SME, Young	-0.061	-0.032	-0.114**	-1.563**	-1.469**	-1.378**
	(0.050)	(0.105)	(0.036)	(0.083)	(0.106)	(0.074)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Table C.2c: Net Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Diff. in Net Job Flows						
Large, Mature vs.	-0.127**	-0.115	-0.073*	0.595**	0.955**	0.123
SME, Mature	(0.046)	(0.102)	(0.035)	(0.083)	(0.107)	(0.080)
Large, Mature vs.	-0.155**	-0.114	-0.082*	1.034**	1.368**	0.513**
SME, Young	(0.056)	(0.123)	(0.040)	(0.099)	(0.128)	(0.091)
Net Poaching Rate						
Large, Mature vs.	-0.025**	-0.009	-0.007	0.062**	0.158**	-0.035*
SME, Mature	(0.009)	(0.021)	(0.006)	(0.017)	(0.022)	(0.015)
Large, Mature vs.	-0.007	0.010	0.019+	0.130**	0.241**	0.004
SME, Young	(0.013)	(0.028)	(0.010)	(0.023)	(0.030)	(0.024)
Net Nonemp. Rate						
Large, Mature vs.	-0.102**	-0.106	-0.066*	0.532**	0.797**	0.158*
SME, Mature	(0.039)	(0.086)	(0.031)	(0.070)	(0.091)	(0.071)
Large, Mature vs.	-0.148**	-0.124	-0.101**	0.904**	1.127**	0.510**
SME, Young	(0.047)	(0.103)	(0.034)	(0.083)	(0.107)	(0.078)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old. Poaching is defined as within-quarter only, adjacent-quarter job-to-job flows are reclassified as flows into nonemployment.

Appendix D: Poaching Flows including State and Local Government

Table D.1: Poaching Hires, by Firm Size, including State and Local Govt.

Share of private poaching hires, private firm sources only		Destination firm size: Small	Medium	Large	Row Total
Origin firm size	Small	14.5	7.0	9.4	30.7
	Medium	7.2	6.7	9.0	22.9
	Large	9.9	9.1	24.0	43.0
Origin job in state or local govt.		1.1	0.81	1.5	3.5
	Column Total	32.7	23.4	43.9	100.0

Notes: "Small" indicates that a firm has 0-50 employees, "Medium" indicates that a firm has 50-499 employees, and "Large" indicates that a business has 500+ employees. Size is undefined for state and local government.

Table D.2: Poaching Hires, by Firm Size and Firm Age, including State and Local Govt.

Share of private poaching hires, private firm sources only		Destination firm size and age: SME, Young	SME, Mature	Large, Mature	Row Total
Origin firm size and age	SME, Young	10.4	7.6	8.0	27.1
	SME, Mature	8.21	9.2	8.4	26.8
	Large, Mature	8.3	8.4	19.8	38.4
Origin job in state or local govt.		0.8	0.9	1.2	3.1
	Column Total	27.8	26.0	37.5	*

Notes: "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old. *: The row and column totals are not equal: shares do not add up to 100 because not shown are Large Firms less than 11 years old, which are a small category constituting 4.6% of destination firms and 4.7% of origin firms. Size and age are undefined for state and local government.

Appendix E: Firm Age and Firm Size Results on Cyclicality of Worker and Net Flows

Table E.1.a: Worker Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
		Model			Model	
	1	2	3	1	2	3
Hiring rates						
through Poaching						
by Large, Mature	-0.738**	-0.541**	-0.884**	-0.285**	-0.184**	-0.613**
	(0.020)	(0.041)	(0.028)	(0.050)	(0.047)	(0.084)
by SME, Mature	-0.467**	-0.396**	-0.557**	-0.558**	-0.637**	-0.558**
	(0.020)	(0.043)	(0.025)	(0.041)	(0.044)	(0.066)
by SME, Young	-0.703**	-0.645**	-0.892**	-0.533**	-0.592**	-0.748**
	(0.032)	(0.069)	(0.043)	(0.066)	(0.075)	(0.111)
from nonemp.						
by Large, Mature	-0.147**	-0.241**	-0.204**	-0.516**	-0.338**	-0.717**
	(0.029)	(0.062)	(0.031)	(0.052)	(0.067)	(0.070)
by SME, Mature	-0.041	-0.268**	-0.099**	-0.866**	-0.950**	-0.763**
	(0.029)	(0.062)	(0.028)	(0.048)	(0.062)	(0.062)
by SME, Young	0.054	-0.306**	0.007	-1.225**	-1.304**	-1.049**
	(0.037)	(0.077)	(0.034)	(0.060)	(0.076)	(0.074)
Separation rates						
to Poaching						
by Large, Mature	-0.681**	-0.413**	-0.866**	-0.354**	-0.221**	-0.709**
	(0.020)	(0.041)	(0.030)	(0.049)	(0.045)	(0.086)
by SME, Mature	-0.486**	-0.345**	-0.587**	-0.538**	-0.476**	-0.683**
	(0.020)	(0.041)	(0.028)	(0.041)	(0.044)	(0.071)
by SME, Young	-0.696**	-0.504**	-0.899**	-0.473**	-0.273**	-0.939**
	(0.029)	(0.060)	(0.041)	(0.061)	(0.066)	(0.106)
to nonemp.						
by Large, Mature	0.016	-0.177**	-0.016	0.232**	0.031	0.280**
	(0.028)	(0.060)	(0.029)	(0.051)	(0.065)	(0.067)
by SME, Mature	0.068*	-0.266**	0.070**	0.370**	0.119+	0.416**
	(0.028)	(0.058)	(0.026)	(0.050)	(0.063)	(0.058)
by SME, Young	0.113**	-0.369**	0.138**	0.429**	0.077	0.557**
	(0.033)	(0.067)	(0.029)	(0.059)	(0.074)	(0.065)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old.

Table E.1.b: Net Flows, Coefficient on Cyclical Variable, by Size and Age

	Difference from H-P Trend			First Difference		
	Model			Model		
	1	2	3	1	2	3
Net Job Flow Rate						
for Large, Mature	-0.220**	-0.191*	-0.206**	-0.680**	-0.332**	-0.901**
	(0.039)	(0.082)	(0.039)	(0.071)	(0.089)	(0.087)
for SME, Mature	-0.093*	-0.076	-0.133**	-1.274**	-1.287+	-1.025
	(0.043)	(0.092)	(0.029)	(0.072)	(0.093)	(0.061)
for SME, Young	-0.065	-0.077	-0.124**	-1.714**	-1.700**	-1.414**
	(0.057)	(0.119)	(0.039)	(0.093)	(0.121)	(0.083)
Net Poaching Rate						
for Large, Mature	-0.057**	-0.127**	-0.018	0.069**	0.037	0.096**
	(0.014)	(0.031)	(0.013)	(0.026)	(0.033)	(0.030)
for SME, Mature	0.016	-0.074**	0.036**	-0.038	-0.218**	0.155**
	(0.013)	(0.028)	(0.011)	(0.024)	(0.030)	(0.024)
for SME, Young	-0.007	-0.141**	0.007	-0.061+	-0.319**	0.191**
	(0.019)	(0.040)	(0.017)	(0.035)	(0.043)	(0.038)
Net Nonemp. Rate						
for Large, Mature	-0.163**	-0.064	-0.188**	-0.749**	-0.369**	-0.997**
	(0.035)	(0.071)	(0.034)	(0.061)	(0.076)	(0.075)
for SME, Mature	-0.109**	-0.002	-0.169**	-1.236**	-1.069**	-1.180**
	(0.038)	(0.078)	(0.028)	(0.062)	(0.079)	(0.058)
for SME, Young	-0.058	0.063	-0.131**	-1.653**	-1.381**	-1.606**
	(0.050)	(0.099)	(0.036)	(0.079)	(0.101)	(0.072)
Time trend	X		X	X		X
Fixed effects						
State	X	X		X	X	
Season	X			X		
Quarter		X			X	
State by Season			X			X

Notes: +, *, ** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. "SME" indicates that a firm has 0-499 employees, while "Large" indicates that a business has 500+ employees. "Young" indicates that a business is 10 or fewer years old, while "Mature" indicates that a business is 11 or more years old.