IDENTIFYING BOUNDED RATIONALITY WITH PANEL DATA: ITALY'S LABOR MARKET[1] AND A COMPARISON WITH THE GERMAN CASE

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Preliminary Version – Please do not cite!

[Preliminary version, 10 Oct. 2016.
On the FMM conference an update will be presented which will include some further tests of hypotheses related to Bounded Rationality and Full Rationality.]

Abstract: *In this paper I question the hypothesis of bounded rationality against full rationality in the context of job changing behaviour, via simple econometric explorations on microdata drawn from WHIP (Worker Histories Italian Panel). The task requires to face a deep identification problem, as many of the observable data are coherent with both hypotheses of rationality. The identification strategy builds on a quasi-counterfactual experiment in which the performance of each voluntary mover's performance is compared to the average performance of a peer-group of stayers of the same skill group, co-workers in the firm from which the movers' job switch originated. Voluntary movers are identifiable in the WHIP dataset, while it is not possible to do the same among the stayers. Full rationality suggests that the performance of voluntary movers should be superior to the stayers' (both voluntary and involuntary) as the involuntary stayers have a smaller decision set from which to choose. In this exploration I find a clear opposite result, which I take as evidence of bounded rationality of the movers.*

1. Motivation

This paper is not on job changing behaviour *per se.* Nor do I explain the process by which choices take place. It is a novel empirical exploration on field data attempting to test bounded rationality against full rationality. As will be evident in what follows, this task is riddled with difficulties and methodological problems. In a different, unpublished paper of few years ago[3] I attempted to solve the identification problem using an analytical strategy that turned out to be unsuccessful: many of the results were in line with hypotheses of bounded rationality, but, although unlikely, they could have been generated also by fully rational individuals.

[1] I am grateful to D. Card for his encouraging comments on a very old version of this paper (2008), and to C. Flinn for a casual observation at lunch table that led me to readdress from scratch the identification strategy of this study. I also thank an unknown referee for useful comments.
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[3] B. Contini and M. Morini (2007)

In this study I am not suggesting a specific theory of job change behaviour. Nor, I believe, is precision essential if the aim is to show that some forms of bounded rationality provide a more plausible explanation of behaviour than full rationality. Recognizing the specific decision rules that lead individual choices is not my scope, nor is it within my reach. I accept the notion that choice ought to produce a "satisficing" option (à la H. Simon), where the driving forces of job change are future real wages and expected job quality.

. In a sense, what I propose is a fuzzy interpretation of bounded rationality: fuzziness reflects the fact that bounded rationality may embody different factors, none of which is mutually exclusive.

2. Job changing and bounded rationality

Job changing is the context in which economic agents operate: worker histories are observed after a relatively long time since the decision to move or stay, and on such basis an *ex post* assessment on the agents' rationality is formulated.

In order to make analysis operational, I assume a simple model à la Simon where workers set themselves aspirations (reference points) y*, where y* is a two-dimensional vector of future wage growth and risk-on-the-job. Similar examples may be drawn from different settings: buying a house, opening a new plant, writing a sentence involving tragic choices (à la G. Calabresi), and so on.

The scope of this exploration is a hard one, confronting a deep issue of identification. The choice of a reference point within an appropriate local environment may be perfectly reasonable, but no less arbitrary than the decision of where an efficiency frontier should lie in the context of full rationality. Both decisions are driven by assumptions and not by empirically observations of reality.

The test proposed here consists of a quasi-counterfactual comparison where the performance of voluntary movers is compared to that of a peer group of co-worker stayers at the end of a three-year time window that starts when choices are expressed, under the accepted notion that the main driving forces of job change are future real wages and expected job quality. As will be explained, full rationality theory predicts that the voluntary movers ought to perform better than the stayers, but the opposite seems to hold. With all the necessary *caveats*, my conclusion is that workers seem to behave according to principles of rationality that differ from those of "full rationality" assumed in the vast majority of contemporary empirical (and theoretical) studies. "Bounded rationality" seems to prevail, although this exploration falls short of indicating which model of bounded rationality drives the job changers' decisions.

In recent years various papers have provided evidence of bounded rationality in experimental studies as well as a variety of specific case studies reviewed below. The underlying idea here is along similar lines. The novelty of this paper is that I investigate the presence of bounded rationality on panel data that are currently used to test standard theories of job changing behaviour.[4]

[4] B. Contini and C. Villosio (2005), in B. Contini, U. Trivellato (eds.) "Eppur si muove. Dinamiche e persistenze nel mercato del lavoro italiano", Il Mulino, pp. 567-595.

3. Unobserved heterogeneity or bounded rationality?

Any theory of economic behaviour predicts that workers engaged in a dynamic environment may at some point consider mobility as a profitable alternative to their current position, and will evaluate options on the basis of two main elements: future expected earnings and expected job safety.

In the world of utility maximizing agents, everything unrelated to the arguments of the utility function will be hidden within the black box of unobserved heterogeneity. Heterogeneity implies - *inter alia* – that any position in the wage growth – job safety space may correspond to optimal choices derived from some unobservable multi-objective individual preferences: for instance, agent X may renounce to a new job involving higher wage growth and job safety if "he/she loves the amenities of Taormina where he/she is currently working"; agent Y may switch to a new job simply because "he hates his former boss"; agent Z does what she does because she is a fool. Alternative explanations of apparently foolish decisions may depend on the existence of unobservable constraints to individual actions (transaction costs, financial or family constraints, etc.). Unfortunately any of these arguments leads us trapped in a black box where any empirical argument aimed at understanding people's choices becomes irrelevant. Rationality is assumed and cannot be disproved. Even such "maestri" like A. Goldberger (1989) and K.J. Arrow (1986) noted that the utility maximization hypothesis has little empirical content without strong auxiliary assumptions on the utility function and other model ingredients. And, so they added, stating auxiliary assumptions is often little different from stating empirical predictions outright, as a sociologist might. In this sense, the utility maximization hypothesis merely "packages" the prediction.

4. A short review of literature on bounded rationality

The concept of bounded rationality and satisficing behavior was introduced by H. Simon (1955 and 1986) since his early works that earned him the Nobel Prize. R.M. Cyert, J. March, O.E. Willamson were among the first to systematically propound the idea in the Sixties.

H. Simon suggested that individuals set targets / aspiration levels on the basis of "local knowledge", and choose "satisficing" options. Search and choice take place under limited information and computational ability. The agents' happiness depends on the difference between output y and aspiration level y* (*alias* reference point). Learning and adaptation have an important role in Simon's as well as in other authors' view on bounded rationality: if today things have gone wrong, tomorrow they'll go better. Unfortunately there is no general reason to believe that markets automatically render individual decision more rational over time. In long run it may work that way. Learning to improve and re-adapt one's performance by trial and error may, however, take minutes or years, depending on the context. In experimental situations adjustment may take place very rapidly (but this evidence involves stylized laboratory settings with small stakes and inexperienced decision makers who devote little effort to their choices); in shopping at the supermarket it may take a few days after buying and tasting a low quality marmelade. But in domains where the planning horizon is long and the stakes are high, like most life cycle decisions as well as technological evolutions of

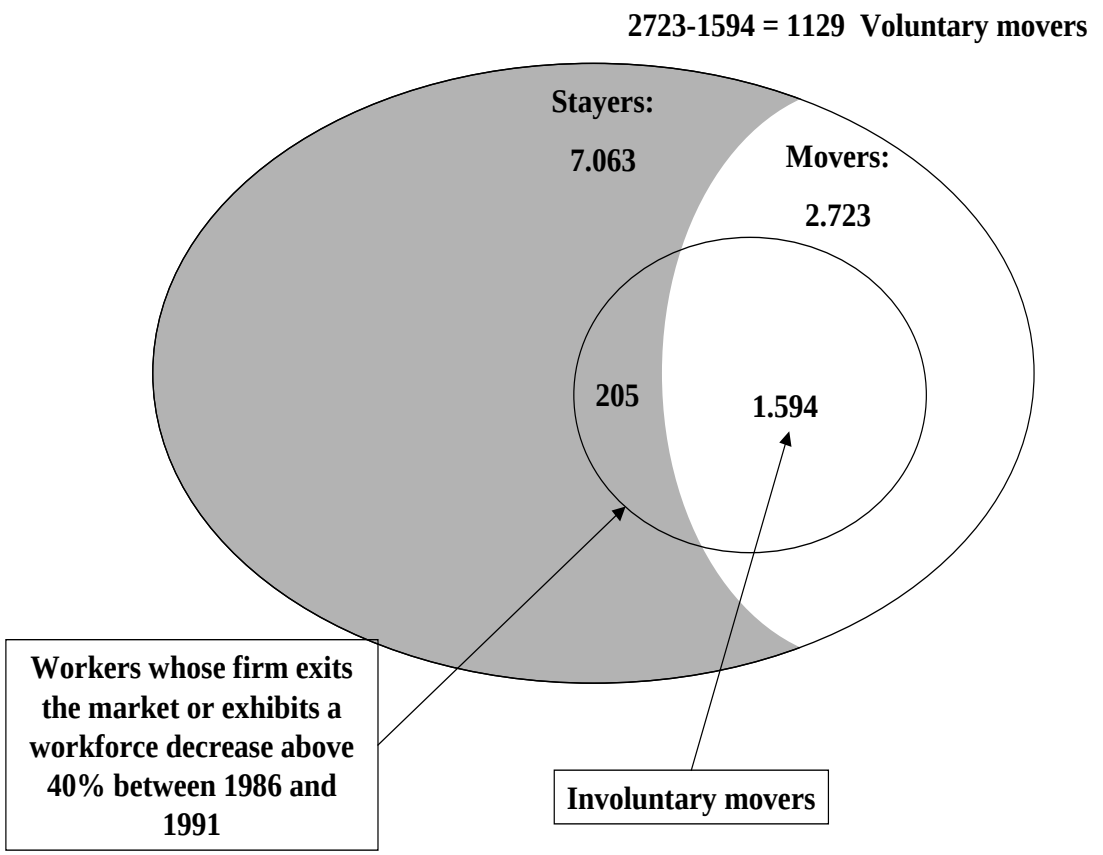
firms, learning and adaptation take time. In the early careers of young persons job changing is frequent for both workers and firms are in search of the right match: here too learning is slow. Finding a job is often costly and risky; "understanding if you like it" could take years; deciding to leave a post for a new one is a hard decision that may have adverse effects on the household's well-being and serenity. Different factors like the above have been indicated as being relevant in a variety of field and experimental studies, but never - to my knowledge - has any author claimed that each alone provides a complete explanation of individual behaviour.

For almost two decades economists ignored Simon's lesson. Not until the Eighties, much to the merit of the growing experimental literature, has there been a true revival of interest in Simon's work, and the recognition that "..... when choice problems are hard, people often resort to simple rules of thumb to help them cope"[5] .

Kahnemann and Tverski (1979) indicate that Simon's leading idea can be represented by kinked preferences at y* embodying "loss aversion". Bounded rationality is reported in a wide variety of real instances documented in the beautiful survey by J. Conlisk (1996), and also in T. Dohman (2013). Investors often appear not to benefit from the possibility to choose portfolios for themselves (S. Benartzi and R.H.Thaler, 2002). The behavior of US health club attendants is difficult to reconcile with standard preferences and beliefs (S. Della Vigna and U. Malmender, 2006). Similar findings are also reported in studies on consumer behavior in the credit card industry (H. Shui and L.M. Ausubel, 2004), portfolio performance (T. Jappelli, L. Guiso and M. Padula (2013), employee choice of 401(k) plans (B.C. Madrian and D.F. Shea, 2001), purchase of large appliances (J. Hausman, 1979), purchase of flood and earthquake insurance (H. Kunreuther et al. 1978), asset prices (D. Cutler, J. Poterba and L. Summers, 1991), the "winner's curse" in real auctions (A. Roth, 1988; O. Ashenfelter and D. Genesove, 1992). Perhaps the most interesting real life experiment is reported by E. Fehr and L. Goette (2007): the setting consists of a bycicle messenger service where workers were free to choose hours worked and effort. The authors document a large negative response of hours to wage increase and explain it with reference dependent preferences.

Several factors are indicated as explanations of bounded rationality: overconfidence about self-control and future efficiency, overestimation of future attendance, distaste for psychological transaction costs, limited memory, fallacious commitment devices, time inconsistency, deliberation costs, forecasting errors. In a series of by now classic contributions G. Akerlof and co-authors (1982, 1984, 1991) introduce concepts well known to sociologists but ignored by his contemporary economists: cognitive dissonance (the bias of fitting beliefs to convenience), salience (the bias of attaching undue weight to recent events), social norms and gift advantages. In his presidential address to the AEA 2007 G. Akerlof writes "The role of norms can be represented in people's preferences by modifying the utility function to include losses of utility insofar as they, or others, fail to live up to their standards". A contribution along these lines is due to G. Becker and L. Rayo (2007): the authors propose a decision model based on utility functions expressed in

[5] S. Benartzi and R.H. Thaler (2002)



terms of distance from a reference point. In my opinion, attempts of this kind, while accepting Simon's basic idea that

Figure 1 - Stayers and movers in the WHIP dataset

reference points are relevant in decision making, defy the very notion of bounded rationality as they postulate an optimization process that is completely alien from such notion.

4. Data

Data are drawn from WHIP (Work Histories Italian Panel), an employer-employee longitudinal random sample of all Italian employees of the private sector, observed at monthly frequency (at the time available from 1985 to 1998, now updated to 2003). The sample-population ratio is 1:90. I use a closed panel of male individuals working full-time in the private sector, aged between 30 and 40 in 1986 (over 7000 individuals), and observe their histories and job changes from 1986 through 1996. The choice of restricting observation to males aged 30-40 respond to the necessity to minimize heterogeneity of behaviour unrelated to job changing activities (maternity and child care, retirement choices, etc.). The post change performance of movers and stayers is recorded through a sliding three-year window ending in 1996.

4.1 *Movers and stayers*

Analysis must be restricted to workers who have made an explicit and voluntary decision to change or retain their job in the recent past: individuals currently at work who received no outside offers, whether after searching or otherwise, should not enter our sample. Upon receiving an outside offer all workers are

faced with move or stay decisions. In longitudinal data information on job offers or other elements that help to distinguish between voluntary and involuntary decisions are usually missing. Under plausible assumptions, it is possible to single out the voluntary movers from those who have been forced to change job, either because laid off or because they decided to pre-empt a future likely layoff. For the stayers, instead, the distinction between voluntary and involuntary decisions is prohibitive: for this reason I choose to neglect the distinction. As will be explained such a decision provides the key for a reasonable identification strategy.

Stringent criteria are used to recognize the voluntary movers from those who switch job for different reasons. Collective layoffs have been frequent in the Eighties and Nineties in the course of industrial restructuring, and are recognizable in our dataset. All individuals who find a new job after such events are left out of the inquiry: in Italy the large majority will take whatever position is in sight, no matter how bad, rather than staying unemployed (Italy's unemployment benefits have been very modest until very recently). In addition I eliminate all individuals who have been "forced" to leave a job in order to pre-empt a likely layoff if the industry or firm is facing a very unfavourable course. These are individuals at work on new jobs at the end of 1991, after having left firms that closed out or underwent major workforce reductions before 1991[6].

"Movers" are individuals observed in one firm in 1986 and in a different firm in 1991, regardless of the number of job changes in the observation period. The "stayers" are observed in the same firm from 1986 to 1994, although their career may have been interrupted by short unemployment (or temporary layoff) spells in between.

4.2 Measuring wage growth and risk-on-the-job

The individual planning horizon is assumed to be a three-year window that starts when choices are expressed: *ex-post* performance is always observed in the 1991-1994 time window.

Real (long run) wage growth (W). For the stayers it is the ratio between the average yearly nominal wage deflated by CPI earned during the 3-year spell started in 1990 and the average wage earned at the end of 1994. For the movers it is the ratio of the average annual wage earned during the 3-year spell after the job switch and the average wage at the end of the period preceding the job switch.

Risk-on-the-job (ROJ). This is measured by the ratio of two elements: the worker-specific predicted likelihood of dismissal in the past 1986-91 time window[7], and a forward looking firm-specific indicator of employment trend over the subsequent three-year period 1991-94. More precisely

[6] "Major" reductions are assumed to be those in excess of 40% of the 1986 workforce.

[7] The likelihood of dismissal 1986-91 was estimated in a previous paper by B. Contini and C.Villosio (2005). Additional findings are reported in: B. Contini, R. Leombruni, L. Pacelli and C. Villosio, "Mobility and wage dynamics in Italy", in E. Lazear and K. Shaw (eds., 2010).

ROJ=[predicted i-th individual's likelihood of dismissal from j-th firm 1986-91] / [j-th firm employment trend 1994-91 for the stayers OR k-th firm employment trend 1994-91 for the movers, k being the firm of post-move destination[8]]

Suppose that the predicted likelihood of (past) dismissal is 0.30 for both Mr. X and Y. Mr. X is a stayer and his employer increases employment by 50% in the 1991-94 period. Mr. X's risk-on-the-job is thereby reduced to 0.30/(1+ 0.5) = 0.20. Mr. Y is a mover, and his current employer cuts workforce 20%: Mr. Y's risk-on-the-job increases to 0.375 = 0.30/(1-0.2).

For the purpose of comparing performance it is useful to introduce a simple Cobb-Douglas utility function (U) in two arguments: the observed (ex-post) real wage growth over the future 3-year window (W), and a proxy of risk-on-the-job (ROJ). For simplicity, we take the utility function to be the ratio of the two arguments, each weighted by two parameters (n, m) reflecting different degrees of preference for W or ROJ.[9]

$$U = [(W^n) / (ROJ^m)]$$

Rationality, whether full or bounded, implies a trade-off between real wage growth and risk-on-the-job, reflecting the fact that workers benefit from high wage growth and low risk-on-the-job. Under full rationality individuals are assumed to make "stay" vs. "move" decisions that will bring them at or near an appropriately defined efficiency frontier. Under bounded rationality the driving mechanism is not the maximization of U, but a set of decision rules aimed at attaining one's aspirations (reference points), the outcome of which can be evaluated also in terms of U. All decisions are taken on the basis of subjective judgements on the future evolution of earnings and risk of job loss.

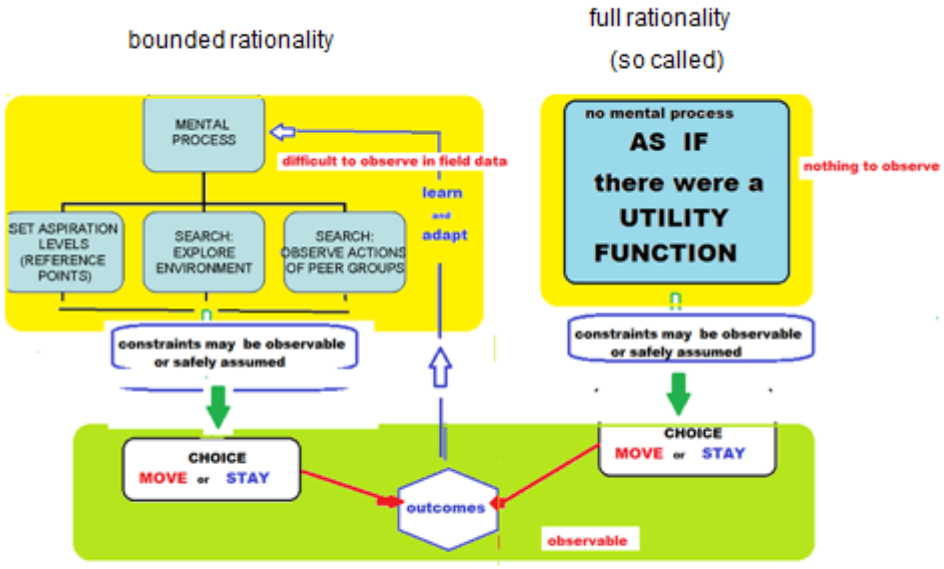
5. Identification

The basic structure of the individual decision making process may be roughly portrayed by the following diagram (fig.1). Under bounded rationality (à la Simon) one-shot decisions involve a mental process that takes place in two or three steps: (i) setting aspiration levels y* (or reference points) in terms of final outcomes; (ii) exploring the nearby environment in search of satisficing options; eventually (iii) observing the actions of peers in order to gain additional information and/or to adjust one's decision following or imitating the peers' decisions. In situations that involve repeated choices in time, two additional steps usually follow: (iv) comparing outcomes with previous aspirations; (v) learning and adaptation of aspiration levels if the gap between aspirations and outcomes is sufficiently wide, whether above or below. Under full rationality, instead, no mental process is activated: individuals make their choices as if they optimized some unobservable utility function, whose parameters may be at times estimated *ex-post* on the basis of observable outcomes.

[8] Some workers may have moved more than once in the observation period: the k-th employer is his last destination.

[9] In section 9 I show that the robustness of the hypothesis of bounded rationality may be tested by letting *n* and *m* take different values.

With field data like the ones available in this study, none of the steps characterizing the decision process are directly observable (while, in principle, they could be observed in carefully designed experimental settings). Only the outcomes of decisions are observable.



Conlisk (1996) correctly suggests that mainstream empirical practice neglects the fundamental question: instead of testing the predicted effect of utility maximization against the predicted effects of competing theories, economists tend to test against the non-substantive null hypothesis of no effect: the former is assigned a tiny type-1 error, say of the order of 0,001, letting type-2 error increase out of control. Consequently, the alternative will never be accepted, and the hypothesis of full rationality will prevail by construction. In his words, this is "something like wrestling a rag doll; it doesn't prove anything, unless the ragdoll wins". This practice amounts to refuting the idea that a non-deniable statement is not "scientific". No paper based on the analysis of field data will ever be published, and no open and public discussion of one of the fundamental questions of economic theory will ever be possible. A number of good case studies and experiments strongly support the idea of bounded rationality[10], but no evidence has – to my knowledge – ever been drawn from empirical explorations based on longitudinal field data.

In my opinion even Conlisk is optimistic on the prospects of empirical research. Indeed, we face a problem of deep identification: whatever is observable by means of field data is identical, whether the outcomes are consequences of bounded rationality or full rationality. Furthermore, any boundedly rational outcome may be embedded in a utility maximization framework, at times very simple, at times more sophisticated, which is often the cause of additional complications.[11]

[10] Especially, Fehr et al. (2007) and Della Vigna and Malmender (2006).

[11] Simple examples are those of Kahnemann and Tverski (1979), where the utility function is kinked in correspondence to the aspiration level; of Akerlof (1991) and Becker, Rayo (2007) who propose a quadratic loss function around the reference point. More sophisticated models are proposed by Gilboa, I., D. Schmeidler, and P. Wakker (2002)., "Utility in Case-Based Decision Theory", Journal of Economic Theory, 105 (2002), 483-502.-

As a consequence, it is often impossible to contrast a null hypothesis supporting one theory of rationality against any alternative theory because, in general, there exists no substantive effect subsumable in only one statistic or functional form that allows to accept one and refute the other.

Consider two examples: in each H(0) and H(1) represent respectively full and bounded rationality.
The first one (A) catches the essence of the dichotomy:

H(A-0): distance from the efficient frontier of U(y) < epsilon (epsilon small)

against

H(A-1): attainment frequency of reference point y* > delta (delta large).

This cannot be statistically tested as the two hypotheses refer to different substantive events. Moreover both statements may be contemporaneously true.
The second one (B) is in appropriate testable form:

H(B-0): distance from the efficient frontier of U(y) < epsilon

against

H(B-1): distance from the efficient frontier of U(y) > epsilon.

Here while H(B-0) may reflect full rationality, H(B-1) is irrelevant for bounded rationality.

In this study the key to identification resides in the possibility to contrast the movers' performance with that of a peer group of stayers in a quasi-counterfactual experiment. The hypothesis of full rationality suggests differences in the outcomes of voluntary movers (the ones to whom we restrict analysis) and of stayers (voluntary or not) that can be exploited to solve the identification problem.
As explained in section X, involuntary movers have been identified as those who switch jobs after the closure of their previous employer, or after a period of collective or otherwise numerous layoffs in the firm of origin. I consider these job changes as "involuntary", as they are either necessary to replace a position terminated by *force majeure,* or measures aimed at pre-empting foreseeable layoffs. In these cases search activity is presumably conducted hastily and the new job taken as soon as it is available. I restrict the analysis to the remaining ones, i.e. to the "voluntary" movers, who have, presumably, invested in search and carefully analyzed a number of options before the decision. The same selection cannot be performed among the stayers: some may have been saved from collective layoffs but have taken no action (or, if they have, they decided against the change); others have never been offered the chance to change, nor expressed the desire to change.
The decision set faced by the voluntary movers is therefore larger (more inclusive) than the one faced by the stayers, voluntary and involuntary. Full rationality suggests that the performance of the voluntary movers ought to be, on average, equivalent to that of the voluntary stayers. It then follows that the performance of the voluntary movers ought to be, on average, superior to that of all stayers, voluntary as well as involuntary. My quasi-counterfactual analysis, as will be illustrated in section Y, indicates the opposite result: voluntary movers appear to do worse than peer groups of stayer coworkers. I interpret this result as evidence of the

fact that the movers are not utility maximizers, but rather behave according to different principles of rationality, which I would describe as "bounded". A different line of interpretation (but is it really different?) suggests that the movers may have incurred in important forecasting errors in the course of their job search during the recessive observation period 1991-94, thus seriously underestimating the risk of job loss.[12]

6. Different performance of movers and stayers

Previous research on these data (B. Contini and C. Villosio, 2005) – relative to the 1986-91 period - established the following results; (i) the mean initial wage (1986) as well as the mean final wage (1991) of the stayers is higher than that of the movers; (ii) the wage growth of the movers is slightly higher than the stayers'[13]; (iii) movers do better than stayers at young age (20-30), but the difference tends to vanish thereafter; (iv) mover-stayer differentials are larger among white-collars than among blue-collars.

Two thirds of the observable firms reduced their workforce in the 1991-94 period that falls around the 1993 recession. A striking 25% of the movers who switched jobs around 1991 ended up in firms that exited the market before the end of 1994 (were thus exposed to a high ROJ), but were able to find another job during our observation window. While none of the firms employing individuals classified as stayers suffered from closure or liquidation, many went through heavy restructuring and workforce reduction: thus, about 10% of the stayers in our sample were exposed to dismissal (but escaped it).

Some results of this investigation are in accord with standard literature, some are not. For instance, as is found in many studies on job changing behavior, movers do somewhat better than stayers in terms of wage growth. But movers are in a worse position in terms of risk-on-the-job. If performance is measured in terms of the benchmark utility function U the comparative outcome depends on the relative weight given to each argument. Unless risk-on-the-job carries a very small weight compared to wage growth, the stayers appear to be better performers than the movers. The implication (not surprisingly) is that the movers have a higher risk propensity than the stayers.

Fig. 2-4 depict the cumulative functions of wage growth, risk-on-the-job and utility for movers and stayers observed in the 3-year window following 1991.

- Wage growth (W)

The cumulative W of the movers lies above the stayers beyond the median. In the low tail of the distribution there is a slight prevalence of the stayers. The same pattern holds for both blue and white collars (fig. 3/A). The variance of the movers is slightly larger than the stayers'.

- Risk-on-the-job (ROJ)

The situation is reversed, with the stayers dominating the movers throughout the whole distribution. Movers appear to be willing to accept a higher pay at considerable cost in terms of job safety. At P50 the

[12] Two thirds of the observable firms reduced their workforce in the 1991-94 period. 25% of the movers ended up in firms that closed before the end of 1994; 10% of the stayers were exposed to dismissal (but escaped it).

[13] (i) and (ii) are widely accepted stylized facts on job changing performance. See Lazear (1998), Topel (1991), and many others who have followed.

stayers' ROJ is 0.12 against 0.16 for the movers among white-collars; and 0.12 against 0.20 among manual workers. At P75 the difference increases to 10 p.p. (0.18 vs. 0.28) and 14 p.p. (0.18 vs. 0.32) respectively. Beyond P75 the differences explode (fig. 2/B). The ROJ variance is much larger among the movers.

- Utility U (under various parametrizations)

With unit elasticities (m= n= 1) the stayers dominate the movers, with the ROJ differential driving the result (fig. 4). About 43% of the movers are found in the first quartile of the U-distribution, against 22% of the stayers. Conversely, 26% of the stayers belong to the upper quartile against less than 20% of the movers. If more weight is given to ROJ, the stayers' dominance is complete among the blue-collars, and nearly complete among the white-collars. In the opposite case (more weight to W, with m=3, n=1), the stayers lie above the movers through P80 of the U-distribution among the blue-collars, and slightly P50 among the white-collars.

Fig. 2 - Risk-on-the-job = ROJ

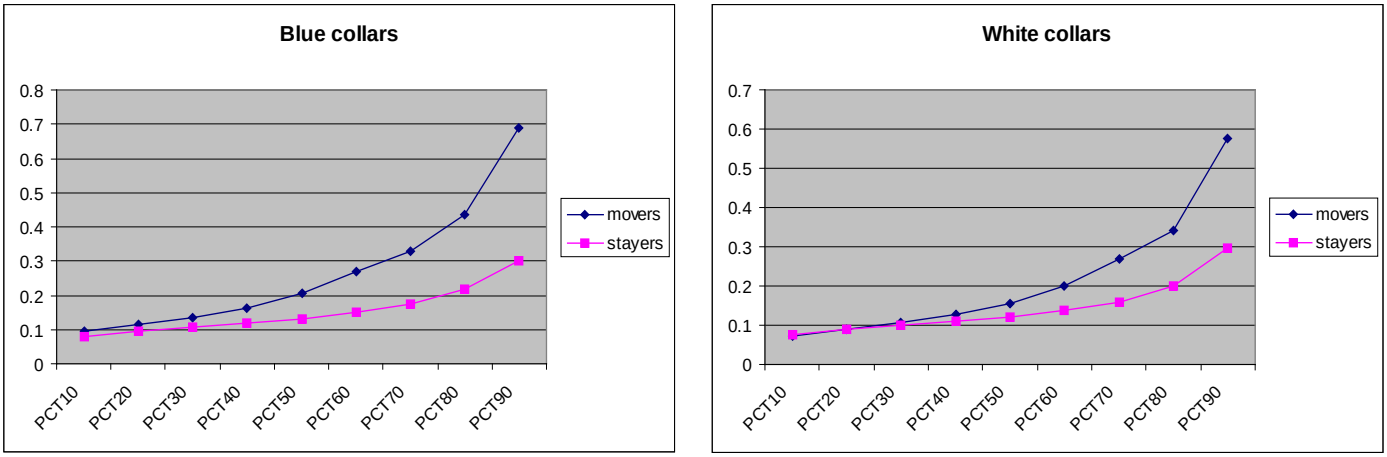


Fig. 3 -Wage growth = (G-w)

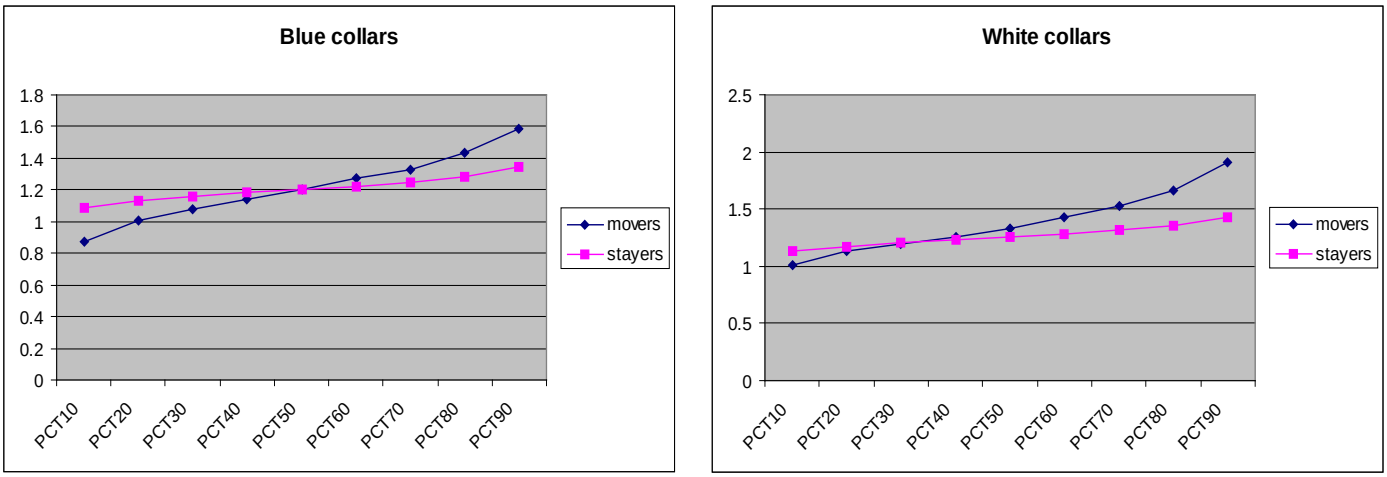
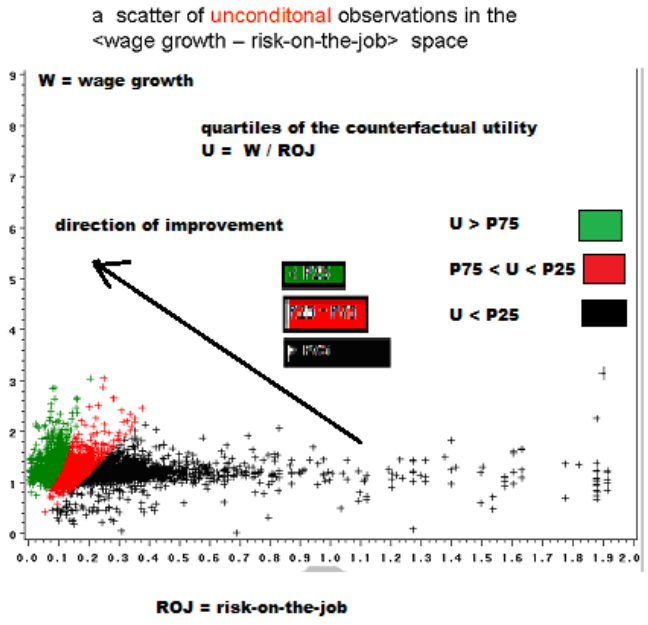


Fig. 4 - benchmark U

7 Reference points in <W - ROJ> space

Fig. 5 depicts the scatter diagram of all the unconditional outcomes in the <W-ROJ> space, measured in terms of the U = W/ROJ counterfactual utility. There is an equal number of observations in the green and black areas corresponding to the upper and lower quartile of the distribution of U, and twice as many in the red area corresponding to the central half. The widely spread distribution reflects the differential performances observed across industries and firm size.

Fig. 5 – Scatter of unconditional observations in the <W- ROJ > space



Bounded rationality – not only à la Simon - suggests that individuals will search for options capable to attain "satisfactory" targets (aspirations levels, standards, norms), based on conditions prevailing in their own local environments. Defining "local environments" helps also to interpret (and reduce) the huge variance of the unconditional outcomes of fig. 5. As a reasonable approximation we build 198 cells defined by the intersection of 11 industries, 3 firm sizes, 2 skill groups, 3 geographical areas. In order to have at

least 10 individuals in each cell, we retain only 42 cells, which leaves us with 978 workers out of 1086 in the original sample. Thus each cell yields the "local environment" of all 978 individuals.

Reference points reflect one's past experience and, possibly, that of one's peer coworkers. It is reasonable to take as reference points moments of the distribution of wage changes and risk-on-the-job prevailing in each person's environment at the beginning of the 3-year time window that defines one's planning horizon. Reference points may be very ambitious or relatively modest, depending on one's personal characteristics and past history. Here I restrict attention to y* defined by the medians of the W and ROJ within-cell 1991 – distributions.[14]

Consider the position of the reference points y* in <W – ROJ> space which reflects the widely dispersed unconditional scatter of individual observations (fig. 6). While wage growth is relatively clustered across cells (on the ordinates), ROJ is widely dispersed, suggesting that some industries have been exposed to much higher risk of job loss than others. The N-W reference points strongly dominate those placed in the S-E region of the plot: industries like banking or public utilities are at the top of the ranking, textiles at the bottom. Also within-industry firm size matter, with the large businesses in better position than the small ones, as they face a smaller risk of closure. Under bounded rationality we expect: (i) individual outcomes to cluster around the respective reference points y*; (ii) a relatively large number to be found in the North-West quadrant of each cell, signalling the joint attainment of the y* reference points.[15]

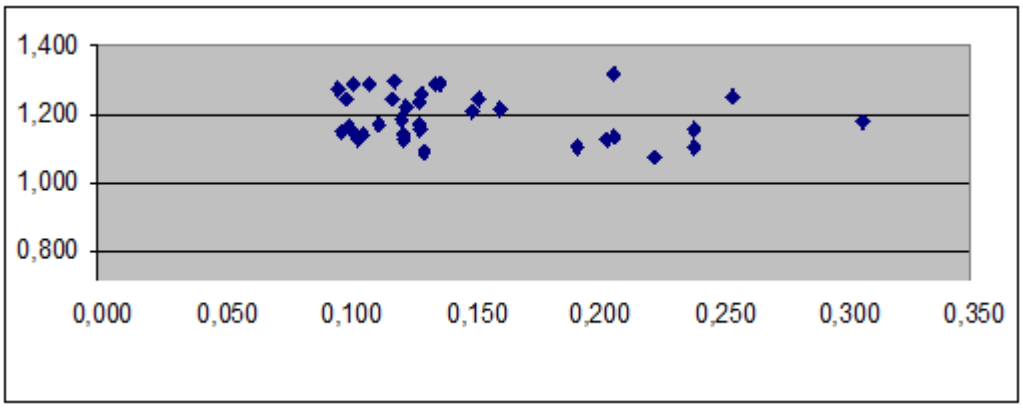


Fig. 6 - Reference points y* in W-ROJ space

[14] Another plausible definition of y* could be in terms of individual earnings growth – say 10% - over each person's past salary W, in alternative to the cell W-median.

[15] If W and ROJ were independently distributed (ellipses collapsing into circles), the expected frequency of outcomes jointly attaining y* (in the N-W quadrant) would be 25%. The larger the positive correlation of W and ROJ, the lower the expected frequency of joint attainment of y*.

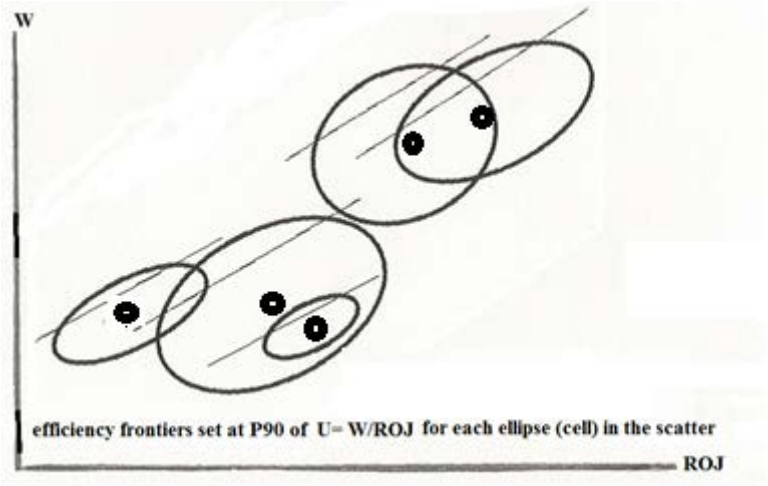


Figure 7- Example of ellipses centered at the reference points y*, with foci proportional to the interdecile range (P90-P10) of the outcome utility. The area of the ellipses is proportional to the outcome dispersion. U-efficiency frontiers are indicated for each cell/local environment, the positive slope being the result of a regression model briefly summarized in section 8. This figure is only representative of actual measures.

Bounded rationality suggests that individuals will search for new opportunities in their own specific environment. Thus intercell mobility of the movers between the beginning and the end of the observation period is expected to be modest. Notice, however, that the same patterns are predicted also by the mainstream theory of specific human capital.[16]

8. The trade-off between wage growth and risk-on-the-job (a quick summary)

A trade-off between real wage growth and risk-on-the-job is to be expected not only among fully rational agents, but also among boundedly rational ones. Among the latter, however, the trade-off is between deviations of wage growth and risk-on-the-job from the relevant Y* reference points. In a different paper (2008) I estimated the tradeoff among the voluntary movers. The estimated specification was as follows:

(1) $$[(W(i,k) - W^*(k)] = \alpha + \beta\,[ROJ(i,k) - ROJ^*(k)] + \gamma\, X(i,k) + d\, I(k) + e\, INTER(i,k) + u(i)$$

where the i-th worker belongs to the k-th cell. X(i,k) are numerical covariates; I(k) dummies of cell indicators: (skill groups, industries, geographical areas, firm size; INTER(i,k) all relevant interactions. Both dependent variables, as well as (ROJ – ROJ*) were normalized. Estimation was performed on the 1991-94 time window, after removing individual fixed effects from W(i,k).

The estimated trade-off β between wage growth and risk-on-the-job deviations is 0.078, positively sloped, indicating that higher wage growth compensates for higher risk of job loss. It is, however, surprisingly small, implying that workers are willing to accept a great deal of ROJ for a very small W – increase. This is a likely consequence of big forecasting errors of the movers who seemingly underestimated the negative impact of a recessive business cycle leading to firm closures and collective layoffs.[17]

[16] Mobility across cells is as follows: 40% of the movers do not change cell; 65% of the movers do not change industry, although they move across firms of different size in the same industry; 88% of the movers from manufacturing sectors find their new jobs in manufacturing; 76% of the movers from service industries remain in the services. In addition, a surprising low, less than 4% of all movers, change geographical area.

[17] Forecasting errors may be embedded in full optimization models, but they are, basically, a consequence of bounded rationality. See B. Contini (2012) for a detailed analysis of this issue. The result reported above raises serious doubts on the possibility of correctly identifying features of individual preferences (like the *m* and *n* parameters of the utility function U) in the presence of forecasting errors. If we were to take seriously the 0.078 estimate of the <W_ROJ> tradeoff, it would imply an unplausibly high risk preference of the movers. Such a small magnitude of the estimated tradeoff rather indicates, in my opinion, a serious underestimation of the negative impact of the business cycle on the movers' choices. As was pointed out before, many workers

9. A quasi-counterfactual analysis: movers vs. matching stayers

The quasi-counterfactual that unequivocally identifies bounded rationality vs. full rationality is extremely simple in this exploration. I address the question "how would the (voluntary) movers have performed had they decided not to move ?". Should the answer be “they would have done better”, it would bring additional support to the hypothesis of bounded rationality.

Direct evidence is, obviously, not available. But the data allow to observe the history and performance of a certain number of individuals of the same skill group, co-workers in the firm from which the movers' job switch originated.

We link each mover to his observable co-workers who have decided to stay. This can be done in two ways: firstly by linking to stayers in the same firm of origin; secondly by linking to stayers in the same cell of origin. In principle the first linkage is more correct than the second. But it leads to a much smaller sample size: 220 groups with at least 3 individuals observed contemporarily (out of 1594 movers in the whole panel). The second is less accurate but the linkage can be done for each mover. We illustrate the results of the second linkage, which turns out to be very similar to the first one.

The stayer co-workers ("matching stayers") of the same skill group represent a quasi-counterfactual: they are as similar as possible to the movers at the beginning of the observation period. We cannot, however, single out the “voluntary” stayers, i.e. those who have been faced with options similar to those offered to his colleague mover (and have turned them down) from the “involuntary” ones. Thus the counterfactual set of “matching stayers” includes both voluntary and involuntary stayers: under full rationality we expect their performance to be no better or possibly worse than the voluntary stayers’ alone as they face a smaller decision set. We are, therefore, comparing the performance of voluntary movers with peer co-workers whose performance is inferior to the one we would expect of a perfect comparative group. This strengthens our conclusion.[18]

The PREMIUM for the i-th individual mover, defined as the ratio between his own performance indicator (benchmark utility, wage growth, risk-on-the-job) and that of his median matching stayers:

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decided for a job change that terminated with a very negative outcome. For similar conclusions in the context of portfolio choice, see T. Jappelli and L. Guiso (2002).

[18] The following exemplifying statistics on all movers and stayers (without sorting the voluntary from the involuntary ones), already indicate the superior performance of the stayers. 98% of the stayers entering in 1988 survive at the end of the 1991-96 window, against 86% of the movers entering in the same year. The real wage growth of the stayers in the same window is 4.3% against 4.9% of the movers. The movers do slightly better in terms of wage growth, and much worse in terms of survival. Restricting the count to the employees of large firms (1000 + workers) in the same observation period the superiority of the stayers is even more marked: the stayers’ survival rate is again 98% vs. 85% of the movers. The real wage growth of the stayers is 11% vs. 7.4% of the movers. Analogous results are obtained selecting different years of entry.

PREMIUM [U(i)] = U[mover(i)] / U[med (matching-stayers(i))]

PREMIUM [W(i)] = W[mover(i)] / W[med (matching-stayers(i))]

PREMIUM [ROJ(i)] = ROJ[mover(i)] / ROJ [med(matching-stayers(i))]

PREMIUM < 1 indicates that the i-th mover is doing worse than his median matching stayers.

The following fig. 8-10 summarize the information derived from the PREMIUM-percentiles, computed separately for blue and white-collars. Among the manual workers, the median mover performs worse than his median matching stayer: in about 60% of the cases we observe PREMIUM < 1. Among the white-collars, instead, the comparative performance is split at the median (PREMIUM reaches 1 at P50).

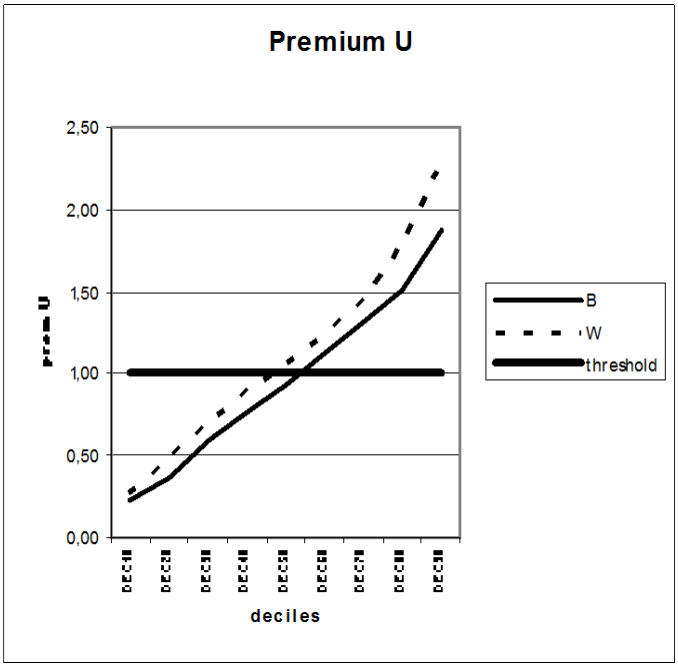
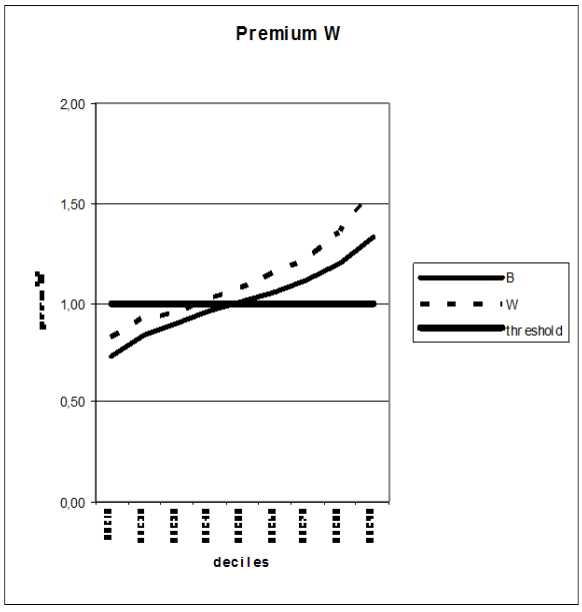


Figure 8: A quasi counterfactual analysis: Premium Utility = W / ROJ



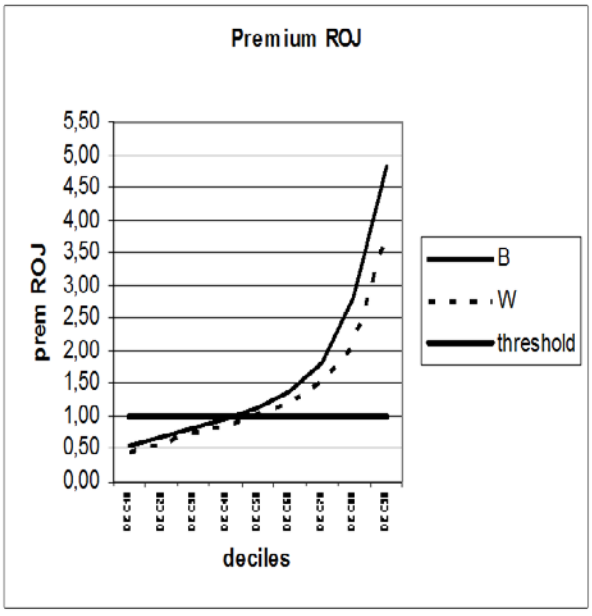
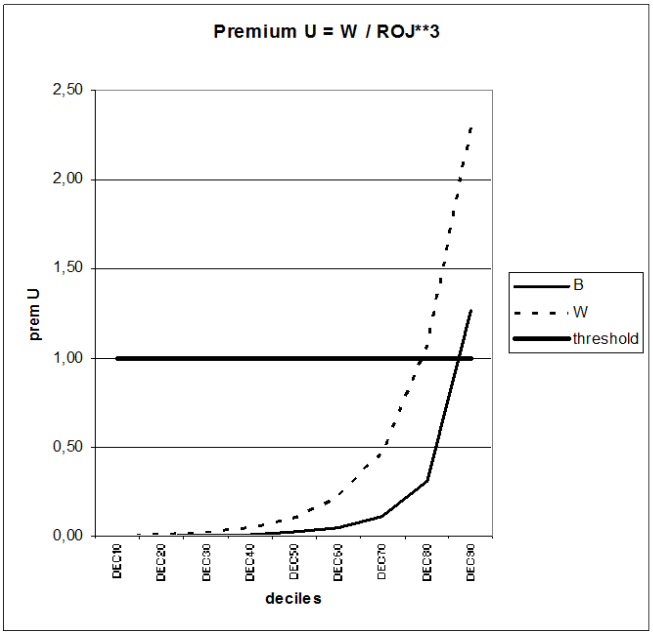
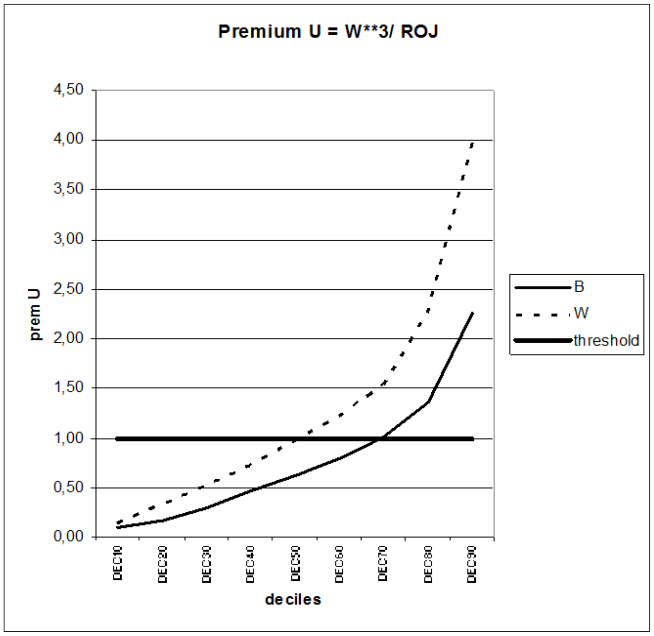


Figure 9: A quasi counterfactual analysis: Premium = IND (movers) / IND (matching stayers)

PREMIUM (UTILITY) with varying parameters *m* and *n*

10.A 10.B





MATCHING STAYERS BETTER OFF THAN MOVERS UNDER ALTERNATIVE PARAMETRIZATION OF UTILITY

Additional results for Germany

A similar selection of movers and stayers was carried out using the SIAB administrative labour market database supplied by IAB. This database is a 2% sample of German dependent employment biographies. It also includes data of the German unemployment administration which makes it possible to use job search registrations for reasons of dismissal and expiring limited contracts for identification of voluntary movers.[19] Moreover, we made every possible effort to single out involuntary movers. Next to using the job search notifications other excluded cases were:

1. changers with employment benefit information before the first spell of the new employment,
2. changers with interruptions of more than 60 days between last work spell in original firm and first spell after switch,
3. changers with less than 1 year work in the 2 years before switch because only workers with at least 1 year work in a 2 year time window qualify for unemployment benefits and therefore can safely assumed to register unemployed at dismissal,
4. changers who were in the max. possible probation time in the original firm (up to half a year) before switch,

[19] As part of the German Hartz reform package, such notifications were made obligatory in July 2003 (with the threat of a blocking time in unemployment benefits payment). In case of dismissal the registration shall be as soon as possible, when there is a limited contract it shall be at least 3 months before the end date of the contract.

5. changers working in industries with a high share of limited contracts according to the job search notifications (education and science, health, public administration).[20]

The values of Fig. 10 – 12 display a premium of wage growth, job uncertainty and utility. The qualitative direction of the results stays the same as in the Italian case:

1. ROJ of movers in Fig. 10 is elevated already in the 3rd decile,
2. Wage growth in Fig. 11 starts to show a premium at the median,
3. Utility premium in Fig. 12 only surpasses unity in the far right of the diagram due to much-elevated ROJ of movers (see Fig 10).

Fig. 10: Risk-on-the-job = ROJ

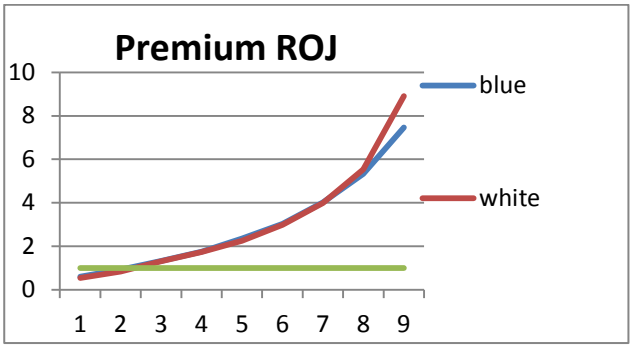


Fig. 11: Wage growth = (G-w)

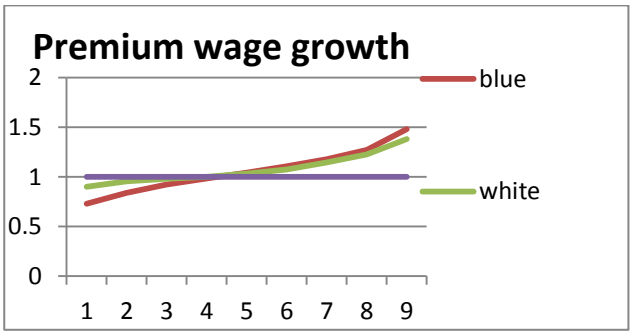
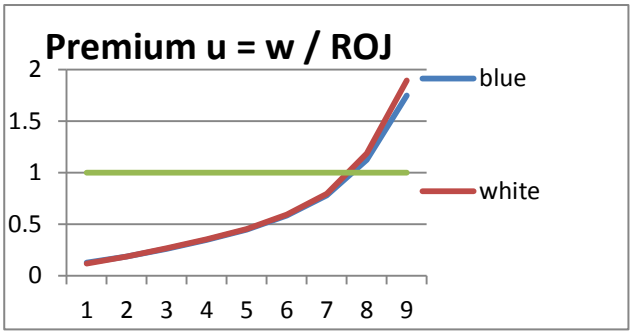


Fig. 12: benchmark U



[20] We calculated the share of work spells followed by a job search notification because of limited contract termination and chose 0.5% as a threshold. The largest share was to be found in education and science with about 3%.

These results suffice to conclude that the hypothesis of "fully rational" decisions of the (voluntary) movers, whether blue or white-collars, should be rejected. According to the theory of full rationality the voluntary movers ought to do better than the stayers who face a smaller decision set. The opposite appears to hold. The movers' rationality is clearly bounded. Under full rationality the answer to the question "how would the movers have performed had they decided not to move" would have to be "often times they might have performed better".

Two arguments reinforce the claim: (i) our matching stayers include the "involuntary" ones, i.e. those who have not been faced with any option other than sticking to their post. Thus the median stayers' performance is lower than that of the median "voluntary" stayers who would provide a more precise counterfactual. Despite this qualification, our results suggest that the matching stayers usually do better than the movers; (ii) alternative parametrizations of the benchmark utility either improve the relative performance of the matching stayers (fig. 10 A; m=1, n=3), or change it only marginally (fig.10 B; m=3, n=1).

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