THEORY AND EVIDENCE CONCERNING WAGE AND PROMOTION DYNAMICS: A SURVEY

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INTRODUCTION

- Early models of internal labor markets/careers in organizations/ personnel economics typically take one of two approaches.
  - Identify and model fundamental factors concerning the operation of internal labor markets.
    - Becker (1962,1964) on human capital.
    - Holmstrom (1979) on agency.
    - Rosen (1982) on the allocation of workers across an employment hierarchy.
  - Models constructed to explain a specific internal labor market "fact".
    - Lazear (1979) on mandatory retirement.
    - Lazear and Rosen (1981) on promotions as an incentive device.
    - Waldman (1984) on large wage increases upon promotion.

- But there should not be a different model for each fact. If facts occur together, there should be a single model that explains the pattern of evidence.

- Much of the more recent literature concerns identifying the facts and patterns in the data and/or identifying models to explain the patterns.
  - Identify facts and patterns in the data.
    - Medoff and Abraham (1980,1981) on the role of performance evaluations.
    - Baker, Gibbs, and Holmstrom (1994a,b) on wage and promotion dynamics.
    - Ichniowki, Shaw, and Prennushi (1997) on human resource practices.
  - Theoretical models that explain the patterns.
    - Milgrom and Roberts (1995) on work practices.
    - Bernhardt (1995) on wage and promotion dynamics.
    - Gibbons and Waldman (1999,2006) on wage and promotion dynamics.

- In my Handbook chapter I focused on this agenda by looking at the progress concerning connecting theory and evidence on a number of related internal labor market issues.
  - Wage and promotion dynamics.
  - Human resource practices.
  - Social relations in the workplace.

- In this lecture I focus on the first of these issues.

PLAN OF PRESENTATION

- Preview
- Evidence Concerning Wage and Promotion Dynamics
  - Basic empirical findings
  - The role of schooling
  - Performance evaluations
- Four Candidate Models
  - Model 1: symmetric learning and insurance
  - Model 2: the tournament approach
  - Model 3: promotions as signals
  - Model 4: symmetric learning with human capital acquisition and job assignment
- Overview and Synthesis
  - So which model is best?
  - What deserves more attention?

PREVIEW

- In this lecture I focus on empirical evidence and theories concerning wage and promotion dynamics in internal labor markets.

- This is a well developed part of the literature and many of the relevant phenomena have multiple competing explanations. For example, large wage increases upon promotion could be due to tournaments or to promotions serving as signals.

- So much of the focus is trying to use the empirical evidence to try to choose across competing theories.

- And I also focus on the idea that there should not be a different model/explanation for each fact, but rather a model is preferred when it explains a pattern of evidence.

Evidence concerning wage and promotion dynamics

- Basic empirical findings
  - Real wage decreases are not rare, but nominal wage decreases and demotions are rare (Baker, Gibbs, and Holmstrom (1994a,b), McLaughlin (1994), Card and Hyslop (1997)).
  - Serial correlation in promotion rates (Baker, Gibbs, Holmstrom(1994a,b), Rosenbaum (1984), Podolny and Baron (1997)).
  - Serial correlation in wage increases (strong evidence in homogeneous samples such as Baker, Gibbs, and Holmstrom (1994a,b), Lillard and Weiss (1979), Baker (1997), but evidence is weak with heterogeneous samples such as Abowd and Card (1989), Topel (1991), Topel and Ward (1992)).
  - Promotions associated with large wage increases (Baker, Gibbs, and Holmstrom (1994a,b), Lazear (1992), McCue (1996)).
  - Wage increases at promotion are small relative to differences between average wages across adjacent job levels (Baker, Gibbs, and Holmstrom (1994a,b), Murphy (1995), Main, O'Reilly, and wage (1993)).

- Basic empirical findings (continued.)
  - Large wage increases early predict subsequent promotions (Baker, Gibbs, and Holmstrom (1994a,b) and suggestive evidence in McCue (1996)).
  - Wages exhibit cohort effects (Baker, Gibbs, and Holmstrom (1994a,b), Oyer (2006), Kahn (2010)).

- The role of schooling
  - Schooling positively affects the starting wage (taken as given).
  - Schooling is positively related to promotion probabilities (Baker, Gibbs, and Holmstrom (1994a,b), McCue (1996), Lluis (2005))).
    - Correlation between schooling and promotion is weaker when a noisy measure of ability to learn on the job is included (Lluis(2005)).
  - Schooling is positively related to the wage even after controlling for experience and job level (Baker, Gibbs, and Holmstrom (1994a,b), Medoff and Abraham (1980,1981)).
  - Mixed evidence on the relationship between schooling and the returns to experience (Farber and Gibbons (1996) find no relationship, while Habermalz (2006) and Rubinstein and Weiss (2007) find results consistent with a positive relationship.

- Performance evaluations
  - Within job wage changes are positively related to labor market experience , but performance evaluations are either unrelated or slightly negatively related to experience (Medoff and Abraham (1980,1981)).
    - Smaller negative relationship between performance evaluation and experience in longitudinal analyses than in the cross section (Medoff and Abraham (1980,1981) and Gibbs (1995)).
  - Within job wage changes are positively related to firm tenure, but performance evaluations are either unrelated to slightly negatively related to firm tenure (Medoff and Abraham (1980,1981)).
  - Performance evaluations predict future promotions (Medoff and Abraham (1980,1981), Dohmen (2004), DeVaro and Waldman (2012)).
    - Holding performance fixed, the probability of being promoted rises with the education level (DeVaro and Waldman (2012)).
  - Performance evaluations predict future wage increases (DeVaro and Waldman (2012)).

Four candidate models

Model 1: Symmetric learning and insurance (as in Harris and Holmstrom (1982))

- Basic set-up
  - Workers vary in terms of ability but, within a schooling group, all workers look observationally equivalent upon labor market entry.
  - Output is a function of ability and a stochastic term, i.e., there is no effort choice in this model and it is as if each firm had a single job assignment.
  - Outputs are publicly observed and firms update their beliefs about a worker's ability during the worker's career as outputs are observed.
  - Workers are risk averse and firms risk neutral.
  - Long term contracts are feasible but a worker cannot commit not to leave a firm for a higher wage elsewhere.

- Results
  - Equilibrium contracts consist of a downward rigid (real) wage, where the wage may increase over time depending on subsequent output realizations.
  - The downward rigid wage provides partial insurance, where full insurance is not feasible because of the inability of workers to commit not to leave.
  - At any date the wage equals the maximum of expected output minus an insurance premium over all dates up to the current date.
  - The insurance premium falls with age and the precision of beliefs about worker ability.

- Theoretical extensions
  - Weiss (1984)
    - Considers a similar set-up where expected productivity grows stochastically and depends on previous productivity.
    - Finds a similar downward rigid wage result where wage increases occur when expected productivity grows sufficiently.

- Empirical tests
  - Beaudry and DiNardo (1991) find results consistent with the prediction that the current wage should be a positive function of the best labor market conditions since the worker was hired.
  - Grant (2003), Devereux and Hart (2007), Clemens, Kriechel and Pfann (2009), and Schmieder and von Wachter (2009) all conduct similar tests and all but the second find similar results.
  - Chiappori, Salanie, and Valentin (1999) extend the model to show that "late beginners" do better than "early starters" and find supporting evidence using French data.
    - But this evidence can be explained if wages equal expected productivity and productivity growth is correlated over time as in, for example, Gibbons and Waldman (1999).

- Pros
  - The theory can explain the Medoff and Abraham (1980,1981) findings that wages on average rise with experience even though performance evaluations do not.
  - The theory captures a number of findings concerning earnings growth such as Mincer's (1974) finding that within a schooling group the variance of earnings increases with experience.
  - Tests of the theory have in general found supporting evidence.

- Cons
  - The evidence does not support downward rigid real wages (the evidence supports downward rigid nominal wages).
  - Because of the lack of a hierarchical structure, the model does not address various empirical findings discussed previously concerning promotions.

Model 2: The tournament approach (as in Lazear and Rosen (1981))

- Basic set-up
  - A single firm employs two risk-neutral identical workers, i.e., heterogeneous worker ability is not part of the basic tournament model.
  - Output is a function of effort and a stochastic term, i.e., it is as if there is a single job assignment in terms of worker productivity.
  - Effort is not directly observable so compensation cannot be based directly on output.
  - The firm commits to a prize for the winner and a prize for the loser, where the winner (loser) is the worker who produces more (less).
  - The prize is independent of the difference between the outputs and the absolute level of the outputs.
  - In their initial analysis, Lazear and Rosen also consider various simple extensions such as n workers rather than two, risk averse workers, and heterogeneous schooling levels.

- Results for the basic set-up
  - The difference between the prizes, i.e., the spread, serves as an incentive for worker effort, where a larger spread means higher equilibrium effort.
  - In equilibrium the spread is chosen to achieve first-best effort.
  - Lazear and Rosen interpret their model as providing an explanation for why promotions are associated with large wage increases, i.e., firms pay large wage increases upon promotion because this serves as an incentive for worker effort.
  - Tournaments may be preferred because they require less information about worker abilities – only ordinal information is required.

- Results for simple extensions
  - Increasing the number of workers increases the spread.
  - With risk aversion tournaments do not achieve the first best.
  - Heterogeneous schooling levels typically result in handicaps where higher ability types are disadvantaged in the promotion process.

- Other theoretical extensions
  - Various papers such as Green and Stokey (1983) and Nalebuff and Stiglitz (1983) focus on tournaments versus contracting but do not consider optimal contracts.
  - Mookherjee (1984) shows that if workers are risk averse, then the optimal contract dominates the optimal tournament.
  - Rosen (1986) and Meyer (1992) investigate multi-round tournaments and, in particular, Rosen shows that the wage structure should be “convex”, i.e., promotion wage increases are larger at higher levels of the job ladder.
  - Lazear (1989) investigates the possibility of sabotage and derives a wage compression result.

- Empirical tests
  - Ehrenberg and Bognanno (1990a,b) and others find that effort is positively related to the size of the spread, although this is a weak test since it basically follows from utility maximization.
  - Main, O'Reilly, and Wade (1993) and (most) others find that the spread is positively related to the number of workers in the pool from which the promoted worker is drawn.
  - Baker, Gibbs, and Holmstrom (1994a,b), Lambert, Larcker, and Weigelt (1993), and Eriksson (1999) find evidence consistent with convex wage structures. Although as argued in Prendergast (1999), there are a number of alternative explanations for why wage structures might be convex.
  - DeVaro (2006a,b) finds evidence consistent with various tournament predictions using a structural estimation approach.

- Pros
  - The argument that wage increases upon promotion serve as incentive role seems very plausible.
  - The theory provides a very plausible explanation for the well-documented finding that promotions are associated with large wage increases, i.e., the large wage increased are used to provide incentives for worker effort.
  - As described above, most tests of the theory find supporting evidence.

- Cons
  - The theory has not been developed in ways that make clear the extent to which the theory can capture the various empirical findings concerning wage and promotion dynamics discussed at the beginning of this lecture.
  - Some of the predictions seem unrealistic. For example, the prize being independent of performance is inconsistent with findings in various papers.
  - Similarly, the market only plays a small role in classic tournament theory which also seems inconsistent with findings in various papers.

Model 3: Promotions as signals (as in Waldman (1984))

- Basic set-up
  - Competitive firms in a two-period setting.
  - Firms are characterized by two jobs – a low level job and a high level job.
  - Workers vary in terms of ability but look observationally equivalent when they enter the labor market.
  - Output in each job is a function of ability and human capital, i.e., there is no effort and no stochastic element, and the return to ability is higher in the high level job.
  - There is asymmetric learning, i.e., at the end of the first period each firm privately learns the ability of its own first period workers.
  - At the beginning of the second period other firms learn about worker ability by observing whether a worker was promoted by the first period employer.
  - Wage are determined by spot market contracting.

- Results
  - Promotions at the beginning of the second period serve as a signal of worker ability, so other firms bid more when a worker is promoted.
  - In order to keep a promoted worker, the first period employer thus offers a large wage increase when a worker is promoted.
  - Fewer workers are promoted than is first best efficient because firms try to avoid the large wage increase associated with promotion.
  - This inefficiency decreases with the degree of firm specific human capital.

- Theoretical extensions
  - Bernhardt (1995)
    - Considers a similar set-up with additional periods multiple schooling groups.
    - Shows various results such as more highly educated workers are favored in the promotion process and promotion fast tracks.
  - Zabojnik and Bernhardt (2001) and Ghosh and Waldman (2010)
    - Show promotion signaling can result in market based tournaments, i.e., promotion incentives can arise from market competition rather than design.
    - The first paper focuses on incentives for human capital acquisition, while the second focuses on incentives for effort.

- Empirical tests
  - Starting with Gibbons and Katz (1991), there is a literature testing for asymmetric learning in labor markets and my reading of this literature is that on net the findings support asymmetric learning.
  - DeVaro and Waldman (2012) directly test the promotion as signaling argument.
    - They first extend Bernhardt's (1995) theoretical results concerning how schooling affects the signaling process.
    - They then investigate the Baker, Gibbs, and Holmstrom (1994a,b) dataset and show strong support for bachelors and masters degree holders and mixed support for high school graduates and PhDs.
  - Belzil and Bognanno (2010) also find evidence consistent with promotion signaling, while a number of more recent papers look at the DeVaro and Waldman tests using other datasets and find supporting evidence.

- Pros
  - The basic argument that promotions serve as signals seems quite plausible, especially given the common practice of workers listing job assignment histories on resumes.
  - The argument that signaling leads to large promotion wage increases also seems quite plausible.
  - There is empirical support both for asymmetric learning and more directly for the promotion signaling argument.

- Cons
  - Some of the findings in the wage and promotion dynamics literature discussed earlier seem inconsistent with asymmetric learning.
    - The theory predicts that wage increases will be completely explained by whether or not a worker is promoted – but the evidence does not support this prediction.
    - The theory does not explain why early wage increases predict speed of promotion.
  - But possibly richer models of promotion signaling would match these empirical findings.

Model 4: Symmetric learning with human capital acquisition and job assignment (as in Gibbons and Waldman (1999))

- Basic set-up
  - Competitive firms.
  - Firms are characterized by three jobs – a low level job, an intermediate level job, and a high level job.
  - Workers vary in terms of ability but all workers look observationally equivalent upon labor market entry.
  - Output in each job is a function of ability, general human capital, and a stochastic term, i.e., there is no effort, and the return to ability is higher at higher job levels.
  - Workers accumulate general human capital with labor market experience, where higher ability workers accumulate general human capital more quickly.
  - Outputs are publicly observed and firms update their beliefs about a worker's ability during the worker's career as outputs are observed.
  - Wages are determined by spot market contracting.

- Results
  - Workers are assigned to jobs efficiently which means promotions occur when the efficient assignment changes to a higher level job because of learning and/or human capital accumulation.
  - Wages equal current expected productivity.
  - This model captures most of the basic findings concerning wage and promotion dynamics described at the beginning of the lecture.
    - Large wage increases upon promotion.
    - Real wage decreases not rare but demotions rare.
    - Serial correlation in wage changes and promotion rates.
    - Large wage increases early on are correlated with quicker promotion.
    - Wage increases at promotion are small relative to difference between average wages across levels.
  - If supervisors evaluate individuals relative to others with the same labor market experience, then the model can also explain most of the Medoff and Abraham (1980,1981) findings.

- Theoretical extensions
  - Gibbons and Waldman (2006)
    - Incorporates schooling and shows the framework can capture most of the schooling findings discussed at the beginning of the lecture.
    - Incorporates task specific human capital and shows the framework is consistent with cohort effects.
  - Clemens (2012)
    - Introduces two types of lower level jobs which vary in terms of speed of human capital acquisition and finds a new fast track result.

- Empirical tests
  - A number of studies such as Lluis (2005) and Hunnes (2011) empirically estimate the model and find results mostly consistent with the theory, although the evidence of learning for older workers is mixed.
  - Gathmann and Schonberg (2010) find strong evidence in favor of task specific human capital.
  - But a number of studies such as Kwon, Meyersson Milgrom, and Hwang (2010) and Schmieder and von Wachter (2010) find results that do not support the Gibbons and Waldman argument concerning task specific human capital and cohort effects.

- Pros
  - The framework explains a wide set of empirical findings in Baker, Gibbs, and Holmstrom (1994a,b) and elsewhere.
  - These include basic empirical findings, findings concerning the role of schooling in wage and promotion dynamics, and findings concerning the role of performance evaluations in wage and promotion dynamics.

- Cons
  - The empirical support for the Gibbons and Waldman (2006) argument concerning cohort effects seems weak.
  - The empirical support for learning for older workers seems weak.
  - But a fuller analysis of the Gibbons and Waldman model should be consistent with this. This is because as workers age beliefs become more precise, so there is little left to learn.

Overview and Synthesis

So which model is best?

- Among the candidate models, the framework that combines symmetric learning, human-capital accumulation, and job assignment is the one the literature currently suggests is best at explaining internal labor market wage and promotion dynamics.

- It is possible this is because the other theories have not been developed in ways that make clear the extent to which they can explain the empirical evidence.

- But I think this is unlikely and the more plausible conclusion is that symmetric learning, human-capital accumulation, and job assignment are all important elements in the operation of real world internal labor markets.

So does the evidence support the idea that the Gibbons and Waldman (1999) framework is sufficient for explaining all the evidence?

- No! The evidence suggests that other factors also play a role.

- Based on real world plausibility and empirical support, task specific human capital as captured in Gibbons and Waldman (2006) also seems important.
  - Although their specific application to cohort effects may not be correct.

- Evidence in favor of asymmetric learning and the promotion-as-signal hypothesis suggests that asymmetric learning is also important.
  - Most models assume either symmetric or asymmetric learning, but maybe the correct approach is a mix of the two (as found in a few papers such as Pinkston (2009) and Kahn (2010).

- Incentives, especially incentives due to promotion, must also be important.
  - But it is unclear whether the correct approach is classic tournaments as in Lazear and Rosen (1981) or market-based tournaments that build on the promotion-as-signal argument in Waldman (1984).
  - Or maybe as argued in Waldman (2012), the correct approach is a hybrid model that combines elements of each approach.

- The spot contracting assumption is likely not fully accurate.
  - Spot contracting is probably more accurate that ignoring the market completely.
  - But empirical evidence concerning nominal wage rigidity, the type of cohort effects found by Beaudry and DiNardo (1991), and Green Card effects suggest deviations from spot contracting are important.
  - But it is unclear how to incorporate this into the framework.

What deserves more attention?

- The connection between internal labor market wage and promotion dynamics and the turnover decision.
  - How a worker's career progresses during a stay at a single employer should be closely related to voluntary involuntary turnover.
  - There is some but limited theoretical and empirical work on this topic.
  - Some new interesting papers on the topic include DeVaro and Morita (JOLE 2013) on promotion from within versus hiring from the outside, and Wang (2013) that uses the turnover decision to test across competing models of promotion.

- More attention should be paid to the role of salary/salary increases versus bonus payments.
  - Papers such as Lin (2005) and Belzil and Bognanno (2008) suggest that they play different roles but there is limited theoretical work on the topic.
  - Ekinci (2012) is a recent interesting paper on the topic that employs the type of hybrid model of the promotion process mentioned earlier.