Recruiting Smarter Teachers

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ABSTRACT
In recent years many states have raised teacher salaries to attract more capable teachers. Since teacher labor markets are typically in a state of excess supply, success of such policies is contingent on containing perverse feedbacks which arise among exit decisions, vacancy rates, and the willingness of prospective teachers to invest in occupation-specific human capital. Using SAT scores as a measure of ability, we find that an across-the-board raise produces modest improvements in the workforce at best. Indeed, under plausible parameter values, it is possible for mean ability to decline.

I. Introduction

A longstanding complaint about American education concerns the quality of the teaching workforce. In 1963 the president of the Council for Basic Education described teacher education in the following terms: “A weak faculty operates a weak program that attracts weak students” (Koerner 1963). Twenty years later the profession was still having trouble attracting bright individuals: “[T]oo many students entering college programs leading to teaching careers are among the lowest achieving graduates of U.S. high schools” (Committee for Economic Development 1985). SAT scores of education majors have ranked near the bottom of all college graduates (Weaver 1983). Substantial proportions of the workforce and even larger percentages of new teacher trainees have been unable to pass teacher examinations that amount to little more than tests of basic literacy.
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(Toch 1991). The better students who do enter the profession tend to be the first to leave (Vance and Schlechty 1982).

Beginning with the report of the National Commission on Excellence in Education in 1983, several prominent study groups and commissions have recommended raising teacher salaries in order to attract more capable persons into the profession. Often these reports propose that higher salaries be linked to teacher performance; however, the latter suggestion has met with opposition from the profession, particularly the leadership of the National Education Association and state affiliates, and despite some well-publicized efforts to create career ladders and merit pay plans, most such efforts have been stymied (Cornett and Gaines 1992). On the other hand, the notion that the work force could be improved by paying all teachers more was warmly received, and between 1979 and 1989 the average salary of American teachers rose 20 percent in real terms.

In this paper we consider the effect of such an across-the-board raise on teacher quality. Some of the negative consequences of this policy are already apparent. Because pay increases have not been targeted to new teachers, it is taking longer to attain the foreseen improvement in the work force.

Even the infusion of new teachers, lured to Rochester by the publicized pay increases, was slowed because the high salaries convinced older teachers to defer retirement. (New York Times, April 10, 1991).

Moreover, higher salaries have exacerbated budget difficulties in many localities, necessitating layoffs of the very teachers whose recruitment was the original objective.

These are short-term problems. In the long run, it might be thought, better teachers are certain to be recruited. Two reasons can be advanced. First, higher wages attract more applicants, allowing school districts to raise the requirements for new hires. This supposes that districts prefer teachers with stronger academic backgrounds if given the choice, a proposition that some find questionable (Kerr 1983; Ballou and Podgursky 1994a). However, such an assumption would not appear to be essential to the argument. Even random hiring produces an improvement in the work force, provided average ability in the applicant pool rises. This in turn would seem to follow from the general proposition that increased pay attracts applicants with higher reservation wages, who tend to be more capable (Weiss 1980; Stiglitz 1987).

It turns out that neither of these conditions is sufficient for the policy to work. Not only is an across-the-board raise not guaranteed to improve the teaching profession by much, it is not guaranteed to improve it at all. The post-raise work force may contain fewer persons with strong academic backgrounds, not more. The problem arises because U.S. labor markets for teachers are typically in a state of excess supply. Since the market does not clear, the success of the policy is contingent on containing perverse feedbacks which arise among exit decisions, vacancy rates, and the willingness of prospective teachers to invest in occupation-specific human capital.

The next section of this paper describes a framework for analyzing the effect of an across-the-board raise for teachers. The discussion shows how the feedbacks just mentioned arise, and why they are particularly likely to be troublesome
for policies aimed at improving the teacher work force. Our results confirm these suspicions: under a range of plausible parameter values, the improvement in work force quality in response to a 20 percent raise is at best quite modest. Indeed, it is even possible for quality to decline.

II. The Model

Recent public discussion of teacher quality has focused on the problem of attracting and retaining persons with stronger academic skills. To preserve this focus, we will use the terms “ability” and “quality” to refer solely to the cognitive abilities manifested in higher standardized test scores and academic records. Furthermore, we will suppose that improvement of the work force in this sense is possible only through recruitment and retention, not through development of existing staff. Simply put, we are investigating whether an across-the-board raise will significantly improve the prospects for recruiting smarter teachers.

To construct a model of work force composition, we make two assumptions which embody important features of the market. First, salary is independent of ability: any wage increase must be paid to all teachers, good and bad alike. Second, teachers retain their jobs at will. Thus it is impossible to circumvent the first constraint by dismissing poor teachers.

These assumptions closely accord with reality. A 1985–86 survey of NEA members found only 5.7 percent received any form of incentive pay. Moreover the payments were small, amounting on average to 1,230 dollars, 5 percent of the mean salary (NEA 1987). The assumption that teachers retain their jobs at will, of course, ignore the reality of layoffs. However, since layoffs are based not on ability, but on seniority, our assumption preserves the relevant feature of the market. Dismissals for incompetence are too infrequent to matter (Bridges 1986).

To facilitate construction and interpretation of the model, we add some technical assumptions governing flows in and out of the teacher work force. Teacher training must be undertaken in college (period 0). New graduates who remain interested in teaching apply for jobs at the beginning of the working life (period

1. A full description of the model, along with derivation of all results mentioned in this paper is provided in a longer version of this paper available from the authors.
2. While this focus seems narrow, we note the conclusion of a study of the relationship of teacher characteristics to student learning: “The only reasonably consistent finding seems to be that ‘smarter’ teachers do better in terms of student achievement.” (Hanushek 1981). However, it is also true that there is more to effective teaching than the kind of cognitive ability measured by test scores and GPA (Murnane et al. 1991). It should therefore be borne in mind that the analysis we provide applies equally well to any set of individual attributes that contribute to teaching effectiveness, provided (1) these attributes are valued in the labor market at large and (2) these attributes are imperfectly revealed at the time the hiring decision is made. We return to this point in the concluding section.
3. Even this overstates the use of incentives to attract persons of higher ability, since these figures included other kinds of incentive payments (for instance, nonuse of sick leave).
1). Unsuccessful candidates pursue fallback options. There are no subsequent opportunities to enter teaching. An individual hired as a teacher works at that position until deciding to quit or until retirement (after 40 periods). Those who exit do not return.

These assumptions oversimplify actual career paths, as many individuals enter late and/or take time off from teaching during their work lives. For the purpose of analyzing steady-state changes in the composition of the work force, however, more realistic assumptions add nothing essential—indeed, we can regard the flows in the model as net of short-term flows in and out of teaching.

Finally, we abstract from changing demographics and flows within the profession by assuming a fixed number of identical teaching positions staffed by teachers drawn from identical cohorts.

We will suppose that salaries of teachers at all stages of their careers are increasing functions of the base or starting pay \((w)\) and that the across-the-board raise takes the form of an increase in \(w\). We assume that \(P_t\) is an increasing function of \(w\) for all \(t\), where \(P_0\) denotes the probability that an individual decides to train as a teacher, \(P_1\) the probability that he seeks a teaching job, having trained, and \(P_t\) (for \(t > 1\)) the probability that he teaches through period \(t\), having taught \(t - 1\) years already. Since acquiring certification is not costless (the opportunity costs include the earnings foregone from failing to train for the best alternative occupation), the decision to acquire certification depends as well on the probability that an offer will be forthcoming \((\gamma)\).

To complete the model, we specify how offers are generated. We suppose that cognitive ability is one of several factors school districts consider when evaluating job candidates. A district's assessment of a candidate's suitability for a position is therefore modeled as the sum of ability plus a random variable representing the contribution of other factors:

\[
s_i = a_i + e_i,
\]

where \(e_i\) is \(N(0, \sigma^2)\) and independent of \(a_i\). An applicant is offered a job if \(s_i\) exceeds a threshold value, determined by equating total hires to total vacancies. (Our calculations assume the need for 2.4 million teachers out of a college-educated work force of 39.6 million.)

Equation (1) makes explicit the dependence of offers on ability. Ability also influences the decision to teach, though for the purpose of this research, the influence remains implicit in the values of \(P_t\). Because smarter individuals have more attractive alternatives outside teaching, the profession attracts proportionately fewer of them. They are also more likely to quit, if they have begun to teach. Thus, \(P_t\) is a declining function of ability, for all \(t\). However, wage responsiveness is another matter. It is likely that the elasticity of these decisions with respect to the teaching wage \((\varepsilon_{w_t})\) increases with ability. This is the same point made in the introduction: increased pay has a disproportionate effect on the behavior of persons with higher reservation wages.

4. A summary of the model's notation as well as the baseline calibration appears in an appendix.
It is straightforward to develop expressions for the number of persons at each level of ability who teach. The probability that someone of ability level $j$ still teaches $t$ years after graduation is

$$\pi_{jt} = \gamma_j \prod_{s=0}^{t} P_{sj}. \tag{2}$$

Since a type $j$ individual has an equal chance of belonging to any of the 40 cohorts that make up the working population, the unconditional probability that he teaches is simply the average of the $\pi_{jt}$:

$$\pi_j = \sum_t (1/40) \pi_{jt} = \sum_t (1/40) \gamma_j P_{0j} \prod_{s=1}^{t} P_{sj}. \tag{3}$$

Therefore, by Bayes’ theorem, a randomly chosen teacher is of ability level $j$ with probability

$$\psi_j = \pi_j n_j / [\sum_j \pi_j n_j], \tag{4}$$

where $n_j$ is the proportion of type $j$ persons in the college educated population.

To determine the effect of a wage change, we differentiate (4) with respect to $w$:

$$d\psi_j/dw = \frac{\partial \pi_j / \partial wn_j + \{\pi_j / P_{0j} \partial P_{0j} / \partial \gamma_j + \pi_j / \gamma_j\} d\gamma_j / dLn_j}{\sum_j \pi_j n_j}. \tag{5}$$

Note that the denominator of (4) has not changed with $w$ since it is constrained to equal the share of the college educated work force employed as teachers. Indeed, from this constraint we find $dL/dw$ via the implicit function theorem:

$$dL/dw = - \frac{\sum_j \partial \pi_j / \partial wn_j}{\sum_j \{\pi_j / P_{0j} \partial P_{0j} / \partial \gamma_j + \pi_j / \gamma_j\} d\gamma_j / dLn_j}. \tag{6}$$

Substituting (6) into (5) and rearranging terms illuminates the channels by which $w$ influences the composition of the work force. First, higher salaries encourage candidates of all levels of ability to enter teaching. The elasticity is greater, as we have noted, among more able persons, which is to the good. However, the same higher salaries also slow the rate of exit from the profession. This changes the steady-state composition of the work force, tilting the balance toward older workers. Since rates of exit are not invariant with respect to ability, this composition effect is not neutral.

In addition, because the applicant pool is growing while the number of vacancies is falling, the probability of receiving an offer declines. Weaver (1983) presents data from teacher training programs indicating that as job prospects for newly certified teachers worsened, the greatest reduction in enrollment occurred among more able students. This is not surprising. The argument which applied to the wage elasticity applies here as well: the more valuable the alternative opportunities, the greater the cost associated with a decline in the offer rate. Conversely, students whose best alternative if they fail to obtain a teaching position is an occupation requiring a college degree but no particular major are much less likely to be put off by poor job prospects. How large the effect is depends
on the degree of sensitivity to offer rates \( (\frac{dP_{Qj}}{d\gamma_j}) \) and on the weight districts give academic ability when screening candidates \( (\frac{d\gamma_j}{dL}) \).\(^5\)

In summary, although more capable individuals are more responsive to wage changes and more likely to be hired when they apply, these effects are at least partly offset by the tendency of other teachers to stay on the job longer and by the greater sensitivity of more capable persons to diminishing offer rates. As a result, not even the direction of change in the \( \psi_j \) can be determined a priori; it depends on the magnitudes of the relevant elasticities.

### III. Calibration of the Model

To provide a quantitative assessment of the likely outcomes, we supply values of the model’s behavioral parameters \( (P_{Qj}, \varepsilon_{Qj}, \text{ and } \varepsilon_{0j}) \) and solve for the endogenous variables determining the change in the composition of the work force \( (L, \gamma, \text{ and } d\gamma/dL) \). Our calculations are suggestive rather than definitive; however, a large number of sensitivity tests indicate that the conclusions are robust to specific assumptions. A brief discussion of the method follows; details are available from the authors.

We distinguish four levels of ability in the college-educated population. Approximately 14 percent of the population is in the highest and lowest groups, with the remainder divided almost evenly between the two intermediate categories. The vector of ability levels is \{700, 900, 1,100, 1,300\}. (The mean is 1,003.) This corresponds to the distribution of SAT scores among college graduates in the NLS-72, a group whose career choices, particularly with respect to teaching, have been thoroughly investigated (Manski 1987; Heyns 1988).

We employ a stylized version of the U-shaped pattern exhibited by quit rates over the work life, dividing each teacher’s career into three parts: an initial seven-year period when exit rates are high, a 23-year middle period in which they are low, and a final ten-year period in which they rise once again, though not to earlier levels. Parameter values reflect what is known of entry and exit rates into the teaching profession by ability, at least as measured by SAT and NTE scores and college GPA (Manski 1987; Vance and Schlechty 1982; Weaver 1983; Schlechty and Vance 1981). Available evidence does not yield precise estimates of elasticities with respect to wages and offer rates. For our baseline estimates we use values from the mid-points of what appear to be plausible ranges. We also report the results of two sensitivity tests.

Several researchers have found that the probability a newly trained teacher will obtain a teaching position is inversely related to academic ability (or, at best, that there is no strong correlation either way; see Gilford and Tenenbaum 1990; Murnane et al. 1991; Pigge 1985). Whether this means that school districts attach

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\(^5\) \( \frac{dP_{Qj}}{d\gamma_j} \) is increasing in ability. It can be shown, given normality of the \( \varepsilon_j \), that \( \frac{d\gamma_j}{dL} \) is decreasing in ability. If a slack labor market has a disproportionate effect on the enrollment of more capable students, the former term must dominate the latter, implying school districts do not give much weight to academic ability when making job offers. We return to this question in the next section.
little value to a strong academic record, or that such persons opt for other careers at the last minute, is uncertain. It should not be assumed that the explanation is invariably the latter. Perry (1981) examined labor market outcomes for a sample of teacher training graduates: among those who sought teaching jobs, she found no significant differences between successful and unsuccessful candidates with respect to grade-point averages, student teaching evaluations, and recommendations. While this was a small and narrowly focused study, other evidence suggests that students may have difficulty conveying their cognitive abilities to potential employers. The interview procedures used by the large urban district described in Gilford and Tenenbaum (1990) do not inspire confidence; for example, candidates were not asked to teach a sample lesson. In addition, course grades and letters of recommendation are often too inflated to provide useful information about applicants' abilities.

As a result, we examine the effects of a salary increase under three alternative cases: when school districts attach great weight to academic ability, moderate weight, and virtually no weight at all. The differences are reflected in \( \text{var}(e) \) [in other words, the ratio of signal to noise in (1)]. Thus, when \( \sigma = 400 \), candidates in the highest ability group start out with a 95 percent chance of obtaining a job, those in the lowest group with only a 54 percent chance. When \( \sigma = 700 \), discrimination on the basis of academic ability is less pronounced. Finally, \( \sigma = 3,000 \) implies that districts take virtually no notice of academic ability in making offers.\(^7\) While one would naturally expect the policy to be more successful in the first case, the third scenario affords the opportunity to investigate the proposition advanced in the introduction, that the work force improves even under random hiring.

### IV. Results

Table 1 contains the results of our analysis.\(^8\) A comparison of Columns 1 and 2 shows the effects of a 20 percent raise in teacher salaries in our baseline scenario, in which school districts attach a moderate degree of importance to the academic ability of prospective teachers.\(^9\) As the comparison shows, paying teachers more does make a difference. However, the changes are rather slight. While there are half again as many very smart persons in the work force,
Table 1
Effect of a 20 Percent Raise on the Teaching Work Force

<table>
<thead>
<tr>
<th>Rank of Group SAT scores (percentile)</th>
<th>(1) Initial Workforce Shares</th>
<th>(2) Baseline Scenario (σ = 700)</th>
<th>(3) High Weight on Academics (σ = 400)</th>
<th>(4) Low Weight on Academics (σ = 3,000)</th>
<th>(5) Targeted Raise (Baseline)</th>
<th>(6) Wage and Offer Elasticities Low, Small Spread</th>
<th>(7) Wage and Offer Elasticities High, Large Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>86%—100%</td>
<td>.051</td>
<td>.076</td>
<td>.090</td>
<td>.054</td>
<td>.092</td>
<td>.071</td>
<td>.054</td>
</tr>
<tr>
<td>52%—85%</td>
<td>.282</td>
<td>.345</td>
<td>.399</td>
<td>.292</td>
<td>.455</td>
<td>.330</td>
<td>.246</td>
</tr>
<tr>
<td>15%—51%</td>
<td>.407</td>
<td>.389</td>
<td>.374</td>
<td>.409</td>
<td>.282</td>
<td>.388</td>
<td>.407</td>
</tr>
<tr>
<td>0%—14%</td>
<td>.260</td>
<td>.191</td>
<td>.136</td>
<td>.245</td>
<td>.171</td>
<td>.212</td>
<td>.294</td>
</tr>
<tr>
<td>Total</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Mean SAT</td>
<td>925</td>
<td>961</td>
<td>991</td>
<td>927</td>
<td>994</td>
<td>952</td>
<td>912</td>
</tr>
<tr>
<td>(percentile)</td>
<td>(100)</td>
<td>(104)</td>
<td>(107)</td>
<td>(100)</td>
<td>(107)</td>
<td>(103)</td>
<td>(99)</td>
</tr>
</tbody>
</table>
they still make up less than 8 percent of the profession: even elastic behavior on their part is incapable of making a big difference, given the low base from which they start. Similarly, while representation of the very poorest students declines substantially, it is still the case that most teachers have SAT scores below the average among all college graduates.

Column 3 presents the outcome assuming that school districts attach great importance to hiring smarter teachers. Not surprisingly, larger changes take place. Even so, teachers’ SAT scores are no higher on average than other college graduates’. Finally, in Column 4 we present results assuming districts place virtually no weight on the academic ability of prospective teachers. The results challenge the notion that the work force can be improved merely by relying on high wages to improve the applicant pool. The problem is that without effective screening, the applicant pool improves very little. Declining offer rates discourage prospective teachers from investing in teacher training. The effect is greatest among those with the highest opportunity costs, for example, the most capable.

To confirm the importance of these feedbacks, we investigate the consequences of restricting the salary increase to teachers at the top two levels of ability. The results, given in Column 5 of the table, show that the targeted raise is considerably more effective than the comparable across-the-board raise in Column 2. Again, the extra improvement is achieved by avoiding the negative feedbacks set in motion when everyone receives a raise. Vacancy rates do not drop as much, the applicant pool is not swollen by an influx of less capable teachers, and offer rates remain relatively high. Indeed, from the standpoint of the smartest teachers, this policy does not look very different from the scenario in Column 3: wages rise without much change in their likelihood of obtaining a job. The scenario in column five is considerably more cost-effective, of course, as the wage bill rises by half the cost of an across-the-board raise. Whether such a scenario is a feasible policy option, given the resistance of teacher unions to incentive pay, is another question.

Finally, we conduct two sensitivity tests in which we vary the values of $e_{0,w}$ and $e_{0,y}$ from their baseline values. These are the elasticities of the certification probability with respect to the wage and the offer rate; as they change, so does the makeup of the pool from which job candidates are drawn. Since it is improbable to suppose that behavior is highly responsive to one of these variables but not to the other, we investigate only two alternative scenarios: one in which these elasticities are small (mean $e_{0,w}$ is 1.0, mean $e_{0,y}$ .27) and vary little by ability, and a second in which they are large (means of 3.26 and 1.80, respectively) and vary

10. A similar phenomenon occurs with respect to retention rates. Although $e_{0}$ increases with ability, the average spell in teaching actually increases more among teachers at the lowest level of ability. This is because they have longer careers to begin with: thus the smaller increment to $P_{t}$ in any one period is multiplied by the larger $P_{t}$ in the other periods. This produces the adverse composition effect mentioned above.

11. This point has not been adequately appreciated. Consider the recent statement by two scholars writing on education reform: “Some analysts argue . . . . that higher salaries will improve the pool of teachers. This argument, with which few would disagree, does not, however, establish that the quality of teaching will improve, because it is still necessary to select and to retain the better people from any enlarged pool.” (Chubb and Hanushek 1990) Our analysis shows that the first statement is problematic after all. If the selection mechanism fails to discriminate, the pool doesn’t improve.
considerably by ability. Taken together, these two sets of assumptions likely represent the extreme limits on plausible calibrations of the model.

Results are reported in the final two columns of Table 1. When both sets of elasticities are low (Column 6), the wage effect dominates: fewer people of all ability levels are drawn into the applicant pool, and the net change in the workforce is smaller than in the baseline case. However, when both wage and offer elasticities are high, with a large spread between persons of high and low ability, the offer elasticities dominate to such a degree that the mean SAT score actually declines.

V. Conclusion

This paper has examined the use of higher pay to attract individuals with stronger academic backgrounds and cognitive skills into teaching. Our estimates of the effect of a 20 percent raise—equal to the increase in teachers' real salaries over the 1980s—are not encouraging. Under plausible assumptions about teacher behavior, average cognitive ability among teachers remains below the mean for the college educated population.

The results are even more discouraging, given that this is an estimate of the steady-state response. Simulations of the transition to the new steady state (not reported here) show that it takes at least ten years to obtain half of the final improvement in the workforce. Thus the prospect for significant improvement in the teaching force in the near term (the politically relevant horizon) is very dim.

Beyond establishing the result that paying teachers more will not improve the workforce by very much, the analysis here helps to show why this is so. Part of the explanation lies in the perverse feedbacks created when raises are granted across the board. Teachers of every type stay on the job longer, restricting the inflow of new teachers. The resulting workforce is, on average, older and less capable. Effectively, the younger and more capable teacher with a shorter spell in the profession is squeezed out. In addition, the increasing ratio of applicants to vacancies lowers the probability of receiving an offer. This is especially discouraging to persons with attractive alternatives to teaching.

It might be argued that this analysis has placed undue emphasis on one set of skills, and that viewed in the proper context, our results offer no reason for concern. After all, a higher wage enables school districts to raise the quality threshold for new teachers; thus they are hiring better candidates, whatever the criteria they employ. That persons with strong academic skills risk not getting teaching jobs simply means that other characteristics also contribute to effective teaching. Districts will hire those who promise to become the best teachers; all that we can ask of the market, as wages rise, is that individuals with the right set of attributes and skills are sent a signal that their chances on the market remain high.

We would reply that this is precisely what the market fails to do. While individual attributes like imagination, energy, dedication are important to teaching, it is surely more difficult to send potential employers a signal about these matters
than to point to high GPA and test scores. What the teaching occupation appears to lack is entry-level positions and long apprenticeships that give persons pursuing other careers the opportunity to reveal their talents. Snap decisions are made about whom to put before a classroom of students and virtually never reconsidered thereafter. Hence the argument we have made about the prospects for attracting teachers with stronger cognitive skills applies with even more force to other valued attributes.

It follows that breaking the linkages between wages, retention rates, and offer probabilities enhances a policy that relies on higher salaries to attract better teachers. This might be accomplished by targeting pay to better teachers or by lowering the costs of acquiring teaching credentials. If one could enter teaching on the strength of a college diploma, there would essentially be no opportunity cost (apart from the effort to apply), and offer rates would cease to affect the decision to pursue this career. Relaxing entry barriers is likely, of course, to have beneficial effects on recruitment even in the absence of a salary increase (Ballou and Podgursky 1994b); however, it would require a more completely specified model of the entry decision than we have employed here to analyze the effects.

Appendix 1

Model Notation (Subscripts $j$ denote ability level)

- $w$ = base pay for beginning teachers.
- $n_j$ = relative frequency of type $j$ in college educated working population.
- $P_{0j}(w, \gamma_j)$ = probability of deciding in college to train for teaching career.
- $P_{1j}(w)$ = probability of seeking a teaching job after graduation.
- $P_{tj}(w), t > 1$ = probability of deciding to teach one more year, conditional on having taught $t - 1$ years.

- $a_j$ = academic ability of type $j$ persons.
- $s_{ij}$ = anticipated teaching effectiveness of person $i$ of type $j$.
- $e_{ij}$ = $N(0, \sigma^2)$ error term.
- $s_{ij} = a_j + e_{ij}$.
- $L$ = hiring threshold, minimum required $s$.
- $\gamma_j$ = probability that someone seeking a job in period 1 receives an offer.
  = $\text{Prob} (a_j + e_{ij} > L)$.
- $e_{0j, w}$ = elasticity of $P_{0j}$ with respect to $w$.
- $e_{0j, \gamma}$ = elasticity of $P_{0j}$ with respect to $\gamma$.
- $e_{0j, L}$ = elasticity of $\gamma_j$ with respect to $L$.

In our baseline case the parameters of the model were assigned the following values:

- $w = 1$ (a normalization)
- $n = \{.14, .34, .38, .14\}$
\[ P_0 = \{0.43, 0.30, 0.22, 0.12\} \]
\[ P_1 = \{0.96, 0.9, 0.8, 0.75\} \]
\[ P_t, 1 < t \leq 7 = \{0.92, 0.90, 0.88, 0.86\} \]
\[ P_t, 8 \leq t \leq 30 = \{0.97, 0.965, 0.96, 0.955\} \]
\[ P_t, 30 < t \leq 40 = \{0.90, 0.90, 0.90, 0.90\} \]
\[ \varepsilon_t, 1 \leq t \leq 7 = \{0.17, 0.22, 0.27, 0.33\} \]
\[ \varepsilon_t, 8 \leq t \leq 30 = \{0.06, 0.07, 0.08, 0.09\} \]
\[ \varepsilon_t, 30 < t \leq 40 = \{0.22, 0.22, 0.22, 0.22\} \]
\[ \varepsilon_{0,w} = \{1.25, 1.5, 1.75, 2.0\} \]
\[ \varepsilon_{0,\gamma} = \{0.8, 1.2, 1.56, 2.0\} \]
\[ \sigma = 700 \]
\[ a = \{700, 900, 1,100, 1,300\} \]

The solutions for the endogenous variables were:
\[ \gamma = \{0.62, 0.72, 0.81, 0.88\} \]
\[ L = 483 \]
\[ \varepsilon_{\gamma, L} = \{0.87, 0.66, 0.48, 0.33\} \]

References


