

How Career Concerns Influence Teachers' Effort



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DECEMBER 9, 2009

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Teachers Not Rewarded for Output



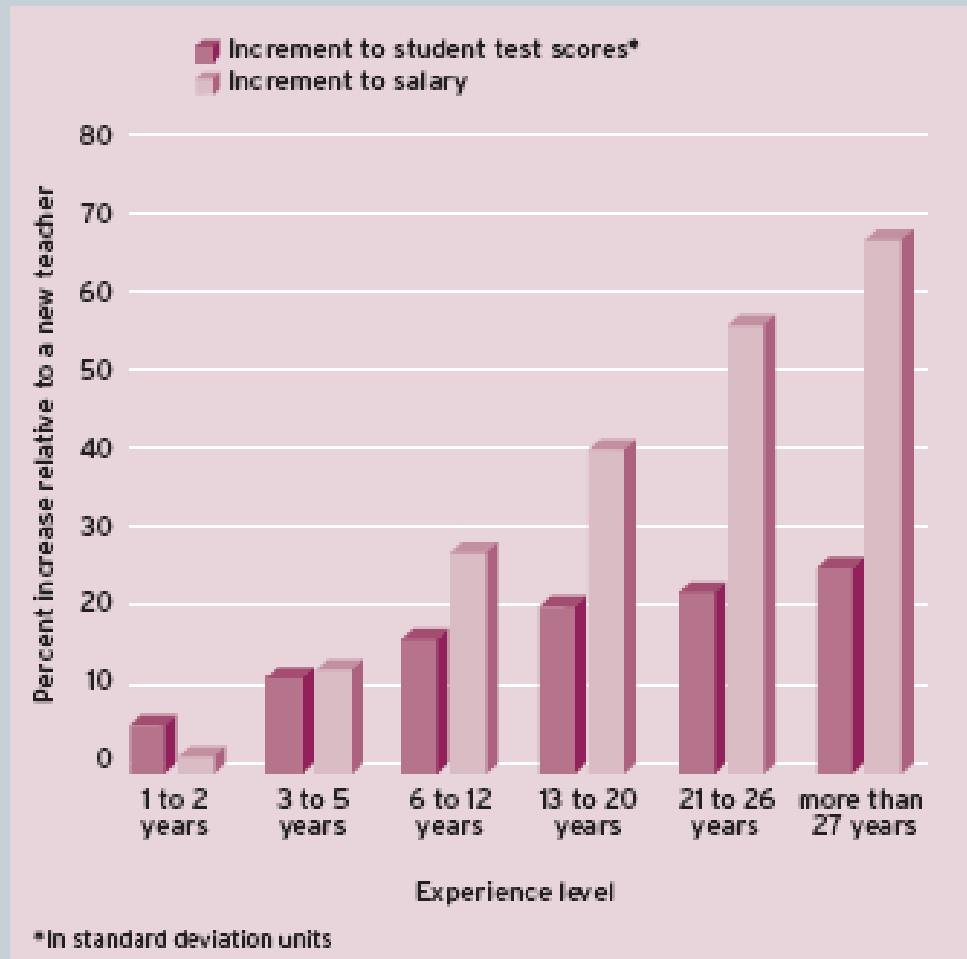
- Input-based
- Not contingent on outcome
- Could create moral hazard where shirking is optimal

FY 2009 TEACHER SALARY SCALE 194-day

<i>Initial Placement with the following years of experience</i>	Degree Step	BA	BA+15	BA+30	MA	MA+30	PhD
0	1	44,789	46,225	47,681	50,223	51,624	53,642
1	2	45,640	47,076	48,532	51,074	52,475	54,493
2	3	46,553	47,989	49,445	51,987	53,388	55,406
3	4	47,577	49,013	50,469	53,011	54,412	56,430
4	5	48,956	50,393	51,849	54,391	55,792	57,810
5	6	50,474	51,910	53,367	55,909	57,309	59,328
6	7	52,089	53,525	54,982	57,524	58,924	60,943
7	8	53,756	55,192	56,649	59,191	60,592	62,610
8	9	55,476	56,913	58,369	60,911	62,311	64,330
9	10	57,252	58,688	60,144	62,687	64,087	66,106
10	11	59,084	60,520	61,976	64,519	65,919	67,938
11	12	60,974	62,410	63,867	66,409	67,809	69,828
12	13	62,926	64,362	65,818	68,360	69,761	71,779
13	14	64,939	66,375	67,831	70,373	71,774	73,792
14,15	15*	67,017	68,453	69,909	72,451	73,852	75,870
	16	69,161	70,597	72,054	74,596	75,997	78,015
	17	71,374	72,810	74,267	76,809	78,209	80,228
	18	73,658	75,095	76,551	79,093	80,494	82,513
	19	76,016	77,452	78,908	81,451	82,851	84,870
	20	78,449	79,885	81,341	83,894	85,284	87,302
	Long 1**			82,907	85,467	86,849	88,869
	Long 2**			84,506	87,071	88,447	90,465
	Long 3**			86,136	88,708	90,076	92,094

Source: Fairfax County School District, Fiscal Year 2009

Teacher Outputs Weakly Correlated with Inputs



Source: Jacob Vigdor, 2008. Scrap the Sacrosanct Salary Schedule. Education Next 8(4).

Research Questions and Answers



1. Q: Do teachers' effort levels respond to incentives?
A: Yes, teachers respond as predicted by theory.
2. Q: Are the effects causal?
A: Yes, external variation and additional measure of effort both show similar patterns.

Overview of Today's Discussion



- **Career Concerns, Incentives, and Teacher Effort**
 - Theoretical predictions
 - Empirical evidence
- **Generalized Model of Career Concerns**
 - Career concerns on two dimensions
 - Discrete jump in effort
- **Data and Methods**
 - Teacher absences proxy effort
 - Teacher and school-year fixed effects
 - Exogenous variation from principal turnover
 - Unobservable measure of effort corroborates findings
- **Conclusion and Discussion**

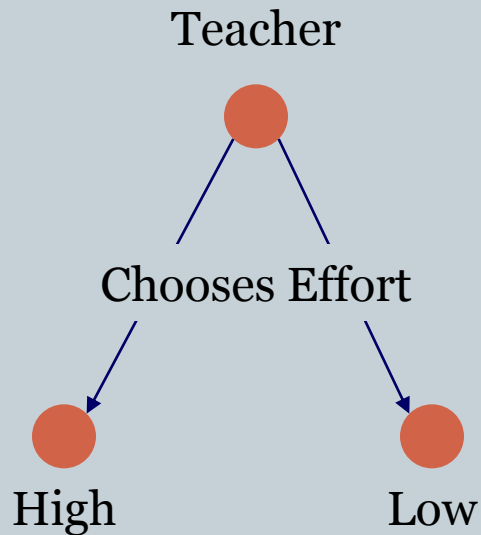
Do Teachers Respond to Incentives?



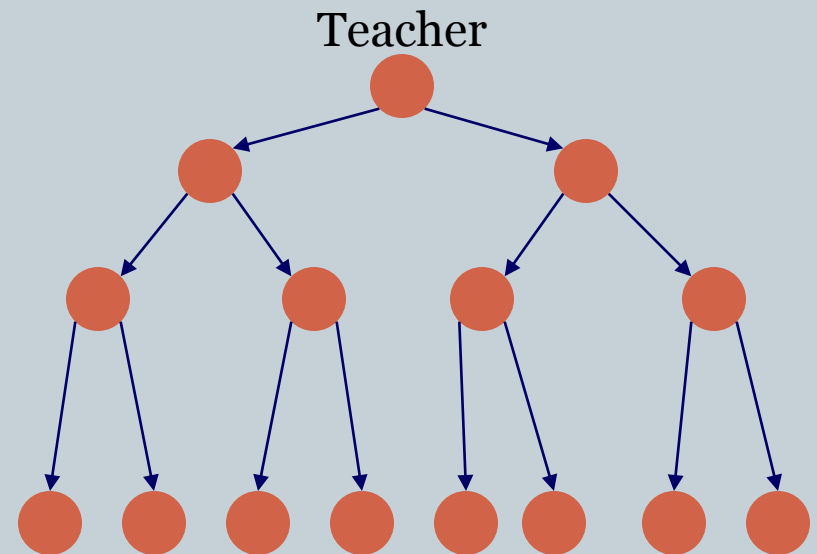
- Most evidence is *output* based
 - Scores increase when rewarding on scores
 - You get what you pay for
- Few studies have addressed how teachers' effort changes
 - Few available studies rely on reported measures
 - Only evidence from America shows adverse outcomes

Is Teacher Effort Driven by Career Concerns?

Standard Approach



Career Concerns Approach



Choices today affect every subsequent payoff

Hölmstrom's Model of Career Concerns



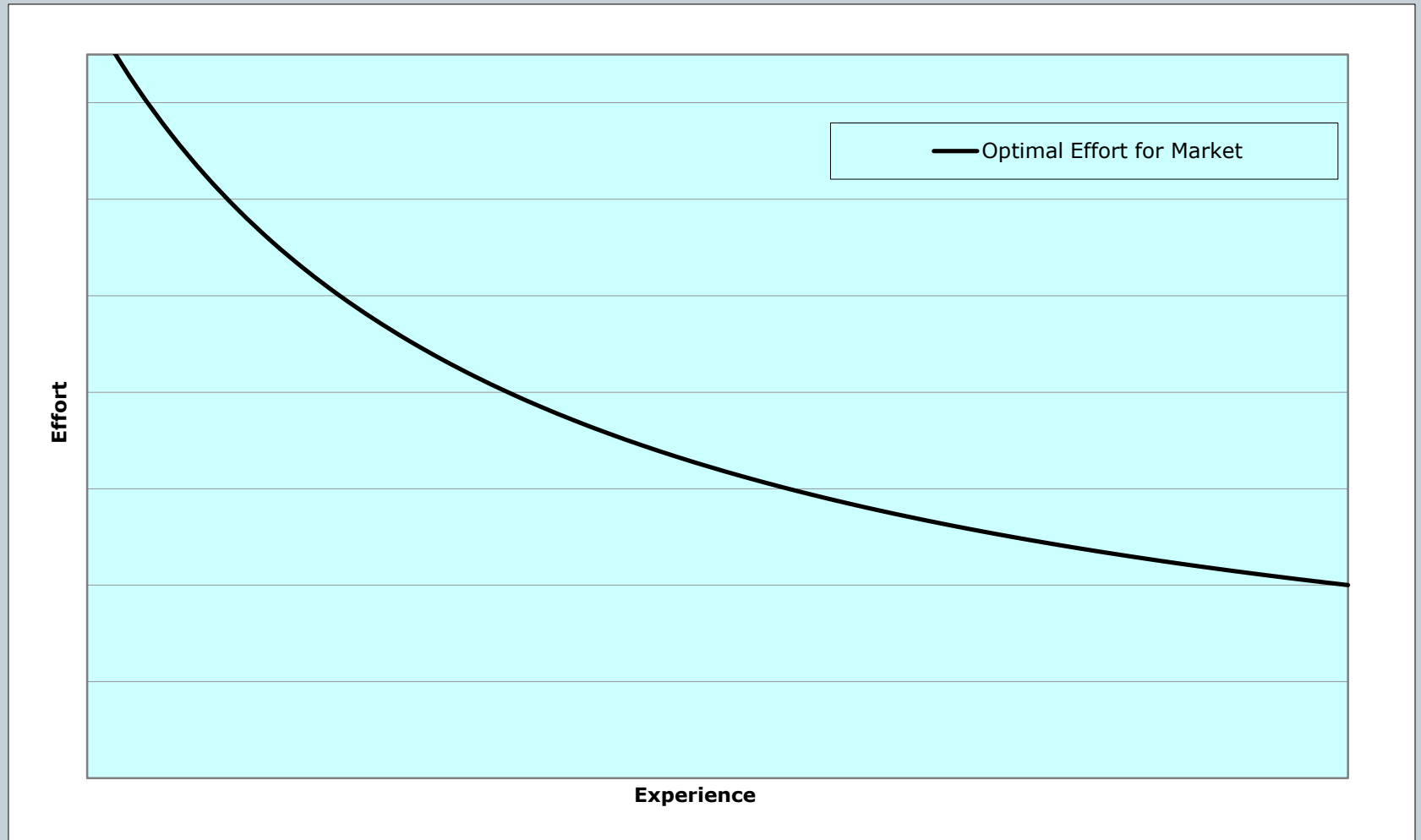
How it works:

1. The market learns of teachers' ability over time.
2. Each observation increases the precision on ability.
3. Rewards are based on past performance.

What it predicts:

1. Incentives decline naturally with experience.
2. Effort declines accordingly over time.

Optimal Effort Path Under Career Concerns



Review of Career Concerns Literature



- **Persist across multiple types of contracts**
 - Explicit Incentives (Gibbons & Murphy 1992)
 - Implicit Incentives (Murharjee 2008)
 - Multitask Moral Hazard (Dewatripont et al. 1999)
- **Argued even more important in public sector**
 - Lack of more formal output-based rewards (Tirole 1994)
 - Enhance intrinsic motives in inducing effort (Dixit 2002)

Generalized Model of Career Concerns



- Output is random, but directly observable to teacher and school only:

$$y_t = \theta + e_t + \varepsilon_t$$

- Outcomes are reported to market, but imperfectly:

$$z_t = \theta + e_t + \varepsilon_t + \eta_t$$

Predictions of General Model



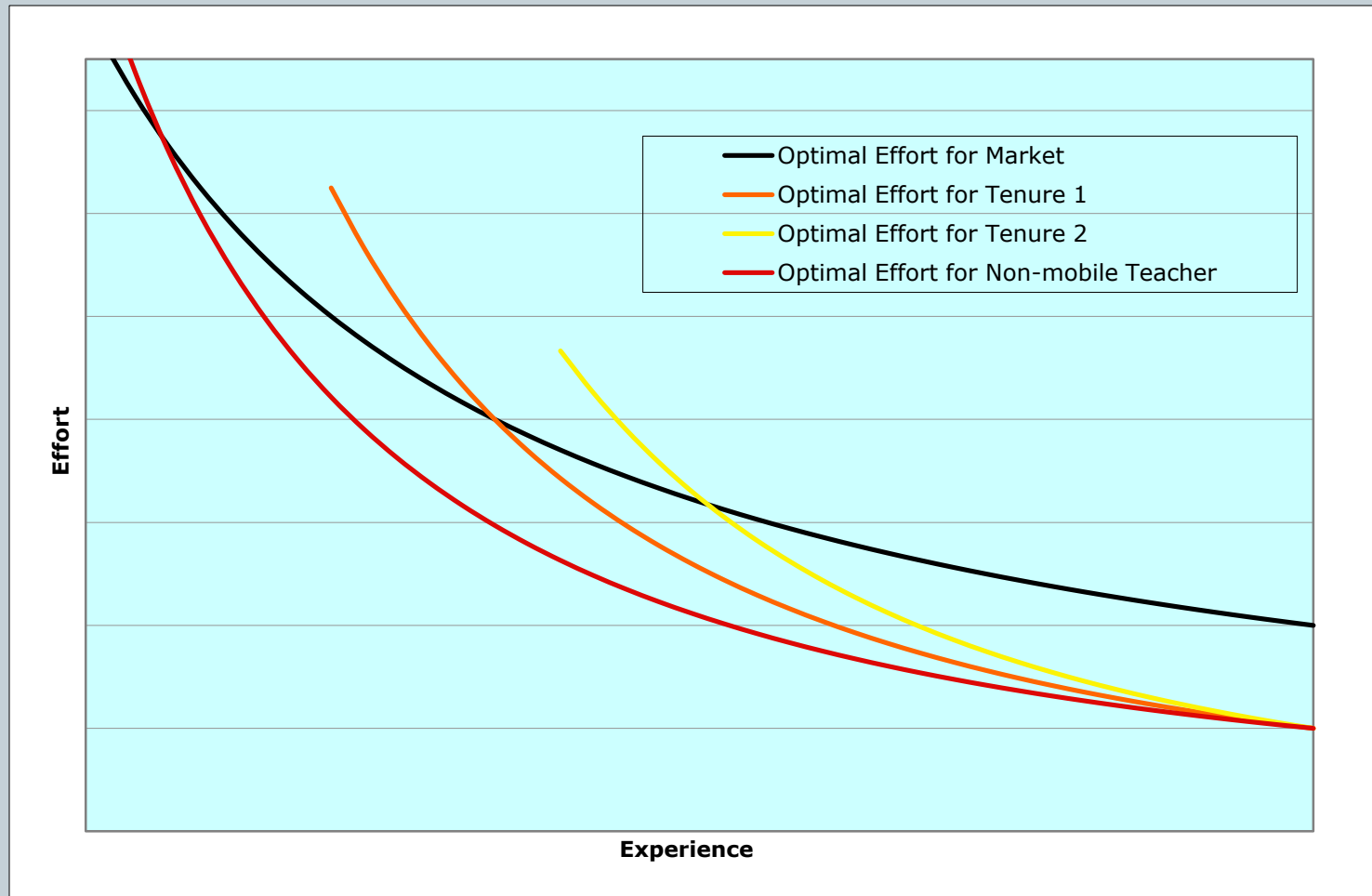
- Market and school hold separate estimates of teacher ability

$$\text{Market optimization : } \sum_{j=t}^{\infty} \beta^{j-t} \frac{h_{(\varepsilon+\eta)}}{h_j^m} = g'(e_t^*)$$

$$\text{School optimization : } \sum_{j=t}^{\infty} \beta^{j-t} \frac{h_{\varepsilon}}{h_j^s} = g'(e_t^*)$$

- Transferring to a new school renews a teacher's career concerns incentives—*resulting in higher initial effort that collapses relatively quickly*

Optimal Effort on Two Dimensions



NCERDC Data



- Covers universe of public school teachers in North Carolina, spanning 14 years to 2008
- Observe teacher variables including pay period and reason for teacher absences
- Personnel files document administrative turnover

Teacher Absences as Proxy for Withholding Effort



- **Teacher sick leave absences:**
 - Are considerably higher than other industries
 - Show strong evidence of being non-random
 - Are costly to schools
 - Suggest a causal relationship with student learning
- **But—**
 - Are noisy measures of effort

Descriptive Statistics for Data



	All sick data	Sample	2005 Sample
Sick absences	7.190 (6.937)	6.173 (4.268)	6.370 (4.297)
Experience	13.736 (9.468)	13.719 (9.469)	13.252 (9.643)
Female	0.799 (0.401)	0.794 (0.404)	0.792 (0.406)
White	0.845 (0.362)	0.846 (0.361)	0.845 (0.362)
Highest degree is BA	0.701 (0.458)	0.701 (0.458)	0.707 (0.455)
NBPTS certified	0.077 (0.267)	0.076 (0.266)	0.085 (0.280)
Elementary teacher	0.527 (0.499)	0.526 (0.499)	0.523 (0.499)
Age	41.150 (10.941)	41.161 (10.937)	40.761 (11.206)
Observations (teachers)	425,282	403,331	63,479

Career Concerns Estimates

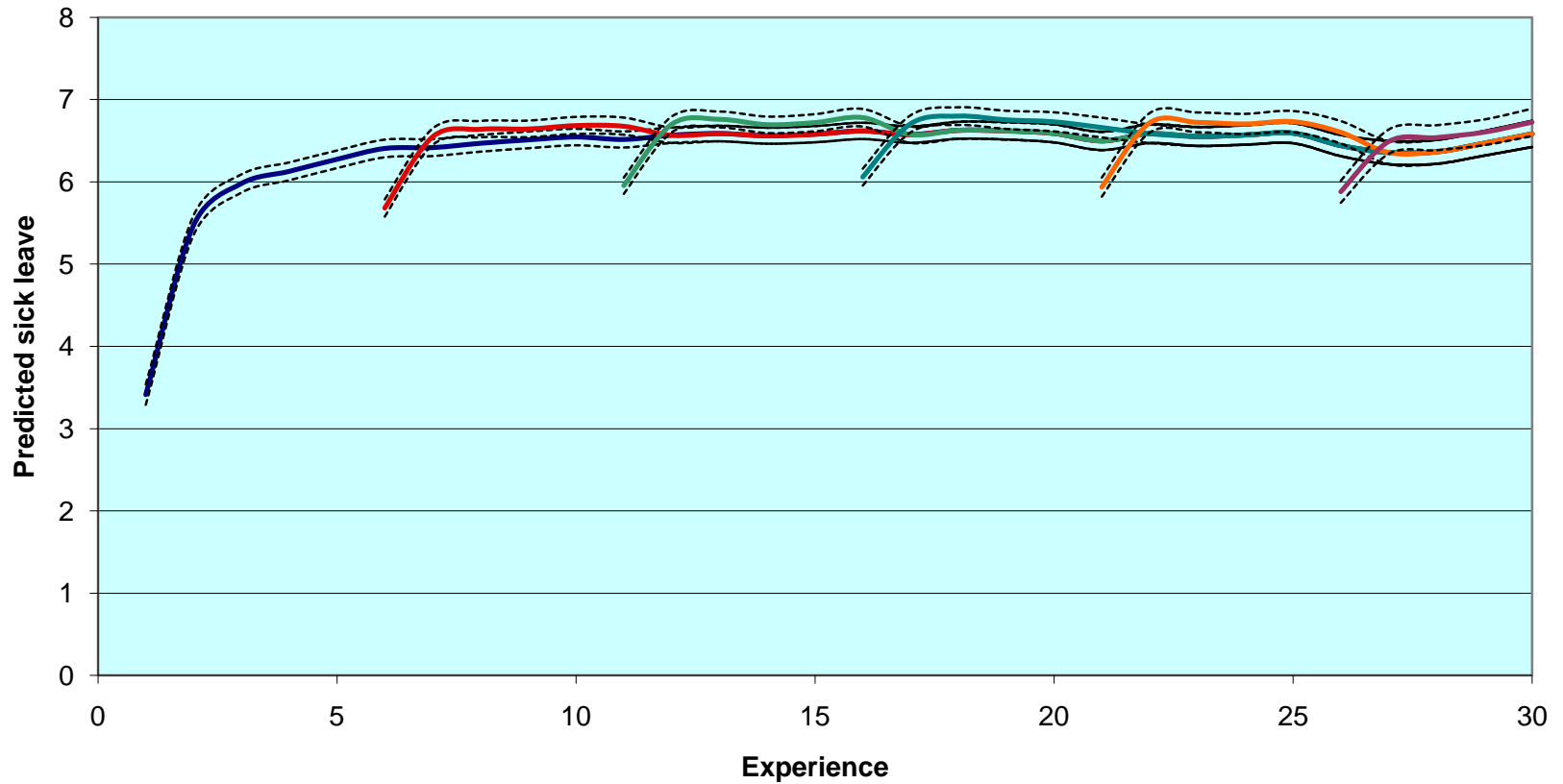


Panel B. Tenure and Experience Entered as Indicator Variables			
	1	2	3
Omitted category is teacher in year 1 of tenure			
Year 2 of school tenure	0.693** (0.022)	0.678** (0.029)	0.760** (0.021)
Year 3 of school tenure	0.733** (0.025)	0.718** (0.030)	0.973** (0.023)
Year 4 of school tenure	0.695** (0.028)	0.675** (0.031)	1.040** (0.026)
Year 5 of school tenure	0.702** (0.031)	0.690** (0.034)	1.134** (0.029)
Indicator variables for experience and tenure after year 5 are included in regression but omitted in output			
Observations	403,331	403,331	403,331
R-squared	0.05	0.04	0.05
Year fixed effects	√		√
School-year fixed effects		√	
Teacher fixed effects			√
<p>Note: * significant at 5%; ** significant at 1%. Robust standard errors in parentheses. Teacher controls include the following: gender, race and ethnicity, highest degree, NBPTS certification, elementary teacher, imputed age, fertility, and retirement eligibility.</p>			

Predicted Shape of Absences



Predicted Sick Leave



— Non-mobile teacher — Renews tenure after 5 years — Renews tenure after 10 years
— Renews tenure after 15 years — Renews tenure after 20 years — Renews tenure after 25 years

Are Career Concerns Causal?



Tenure variable is potentially endogenous:

- Teachers choose where to teach and how long to stay
- Need exogenous variation in career concerns

Natural experiment arises from principal turnover:

- New principals have uninformed prior
- Teachers exert effort to influence principals' perception
- Principal turnover is strictly exogenous

Principal Turnover for Exogenous Variation



Table 4. Causal Test of Career Concerns: Principal Tenure

	1	2	3
Omitted category is year 1 of principal tenure			
Year 2 of principal tenure	0.073** (0.018)	0.090** (0.022)	0.177** (0.016)
Year 3 of principal tenure	0.047* (0.023)	0.090** (0.028)	0.199** (0.020)
Year 4 of principal tenure	0.060* (0.029)	0.105** (0.036)	0.237** (0.025)
Year 5 or more of principal tenure	0.019 (0.029)	0.090* (0.041)	0.192** (0.024)
Observations	402,713	402,713	402,713
R-squared	0.05	0.04	0.05
Year fixed effects	√	√	√
Principal-school fixed effects		√	
Teacher fixed effects			√

Note: * significant at 5%; ** significant at 1%. Robust standard errors in parentheses. Teacher controls include the following: gender, race and ethnicity, highest degree, NBPTS certification, elementary teacher, experience (entered as vector of indicators), tenure in school (when less than principal's), and imputed age, fertility, and retirement eligibility.

Criticism of Evidence



- Correlation between absences and effort assumed, but not verified
- Absences observable, but may be manipulated
- Findings replicable using an alternate measure in different data?

Using Evidence from SASS



- Nationally representative: 40,000+ teachers
- Number of hours worked outside of school time on school-related work (not directly involving students)
- Most likely subject to inflationary bias among those who work least (Li et al. 2003); magnitude of effects lower bound

SASS Effort Measures Corroborate Results



Table 11. Teachers' Self-reported Work Hours

Omitted categories are year 1 of tenure and experience

Year 2 of school tenure	0.980 (0.026)	0.961* (0.015)
Year 3 of school tenure	0.930* (0.028)	0.944** (0.016)
Year 4 of school tenure	0.927* (0.029)	0.911** (0.017)
Year 5 of school tenure	0.910** (0.028)	0.928** (0.019)
Indicator variables for experience and tenure after year 5 are included in regression but omitted in output		
Observations	38,375	38,095
District Conditional Fixed Effects		√

Note: * significant at 5%; ** significant at 1%. Robust standard errors in parentheses. Source: 1999-2000 Schools and Staffing Survey. Coefficients are estimated incidence rate ratios from negative binomial regression. Teacher controls include the following: race, class organization, degree, outside income level, school enrollment, month of survey completion and cubic polynomial on age.

Conclusion: Does Teacher Effort Respond?



- Teachers' behavior conforms to model predictions
- Findings suggest effort responds in *levels*
- Magnitude of absence differentials is large

Caveats:

- Learning of ability may happen over many channels
- Uncertain how broad explicit incentives must be

Policy Discussion



- Rewarding teachers' performance (and perhaps inputs) could increase effort inputs overall
- Policy intervention may influence teacher absences
- Explicit performance incentives could counter those from declining career concerns incentives