HEALTH ECONOMICS
Health Econ. **17**: 733–749 (2008)
Published online 12 October 2007 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/hec.1293

YOUTH SMOKING, CIGARETTE PRICES, AND ANTI-SMOKING SENTIMENT

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SUMMARY

In this paper, we develop a new direct measure of state anti-smoking sentiment and merge it with micro-data on youth smoking in 1992 and 2000. The empirical results from the cross-sectional models show two consistent patterns: after controlling for differences in state anti-smoking sentiment, the price of cigarettes has a weak and statistically, insignificant influence on smoking participation, and state anti-smoking sentiment appears to have a potentially important influence on youth smoking participation. The cross-sectional results are corroborated by results from the discrete time hazard models of smoking initiation that include state-fixed effects. However, there is evidence of price-responsiveness in the conditional cigarette demand by youth and young adult smokers.

Received 21 December 2004; Accepted 26 July 2007

JEL classification: I1

INTRODUCTION

Despite many encouraging trends, public health policy makers continue to be concerned about youth smoking. Although the prevalence of smoking among high school seniors in the US has fallen from its 1997 peak of 36.5% to about 22%, it still has a way to go to reach the *Healthy People 2010* national health objective of 16% (Johnston, 2006; USDHHS, 2004). And the most recent data suggest that the rate of decline in smoking among US youth may have stopped or even reversed (Johnston, 2006; CDC, 2006). The most recent trend data led the President of the American Legacy Foundation – the anti-smoking organization established by the 1998 legal settlement with the tobacco industry – to conclude that 'Today's news from the CDC is a warning sign: act now to support tobacco-prevention work across our nation, and we can drive down youth smoking rates. If we wait, the percentage of youth smokers will continue to rise' (American Legacy Foundation, 2006). Higher cigarette prices are widely seen as one of the most effective ways to reduce youth smoking (USDHHS, 2000). In fact, another *Healthy People 2010* objective is for combined federal and state excise taxes to average $2.00 per pack. As of 1 November 2006, combined federal and state excise taxes reached or almost reached $2.00 per pack in only 9 states (Orzechowski and Walker, 2006).

Some research calls into doubt the policy prescription that higher prices are an effective way to reduce youth smoking (Wasserman *et al.*, 1991; Douglas, 1998; Douglas and Hariharan, 1998; DeCicca *et al.*, 2001, 2002). Most research that supports the policy prescription uses variation across states in cigarette taxes as a natural experiment to identify the price-responsiveness of youth smoking (e.g., Lewit *et al.*,

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1981; Chaloupka and Grossman, 1996; Harris and Chan, 1999; Ross and Chaloupka, 2003; 2004). However, tax rates are not randomly set, but result from the political process that reflects public sentiment towards smoking. Warner (1982, p. 483) concludes that 'The fluctuations in new-[cigarette] tax activity do not appear to have occurred randomly. To the contrary, they correspond closely to the evolution of public concerns about the link between cigarette smoking and illness....' As evidence supporting this hypothesis, he points out that from 1921 to 1952 tobacco-producing states and other states taxed cigarettes similarly; but as public awareness of the smoking-and-health issue grew, other states were much more likely to increase cigarette taxes than were the tobacco states. Similarly, on the basis of their econometric analysis of 1946–1989 data, Hunter and Nelson (1992, p. 215) conclude that 'public policy concerns ... contribute positively to the level of tobacco excise taxation in a state.' These findings suggest that in the political process taxes are seen as an anti-smoking policy and hence probably reflect anti-smoking sentiment. If anti-smoking sentiment is itself an important determinant of youth smoking, failing to control for differences in anti-smoking sentiment across states will yield biased estimates of the price-responsiveness of youth smoking.

In this paper, we extend previous work (DeCicca *et al*., 2002) to explore in much greater depth the role of state anti-smoking sentiment in empirical models of youth and young adult smoking. In the second section we analyze data from the Tobacco Use Supplements of the Current Population Survey (TUS-CPS) to develop a new direct measure of state anti-smoking sentiment during the 1990s. The third section describes the National Education Longitudinal Study (NELS), a nationally representative micro-data set that contains youth smoking information. In the fourth section we use the 1992 and 2000 waves of NELS to re-examine the impact of prices in models of youth smoking that include the new measure of anti-smoking sentiment. The fifth section explores whether our main results are robust to several sensitivity checks. In the sixth section we explore other approaches to control for anti-smoking sentiment in cross-sectional data, and we also estimate hazard models of smoking initiation over time that include state-fixed effects. The last section concludes.

MEASURING ANTI-SMOKING SENTIMENT

Data from the TUS-CPS provide a unique opportunity to directly measure anti-smoking sentiment at the state level. We use data from three cycles of the TUS-CPS: 1992–1993, 1995–1996, and 1998–1999, which roughly span the period of our smoking data. The TUS were sponsored by the National Cancer Institute and administered as part of the CPS, the US Census Bureau's continuing labor force survey (Hartman *et al*., 2002). In addition to questions about smoking behaviors, respondents were asked about their opinions on topics such as policies restricting smoking, the promotion and advertising of tobacco products, and whether they allow smoking in their homes. Table I shows the proportion of the samples in agreement with the nine anti-smoking attitudes we use in our analysis. Another key advantage of the TUS-CPS data is the large total sample size, providing representative samples and decent sample sizes at the state level. For example, in the 1995–1996 cycle of the TUS-CPS 194 243 persons over the age of 15 reported their smoking attitudes, providing sample sizes by state ranging from 1611 (Hawaii) to 14 038 (California).

From responses to the attitude questions, we created nine variables indicating the extent of agreement with an anti-smoking attitude (e.g. agreeing with more restrictions on smoking). Two recent studies in public health and economics use responses to a subset of the TUS-CPS questions to measure public sentiment/voter preferences. In a public health study of trends in attitudes towards smoking in public places, Gilpin *et al*. (2004) suggest that 'the population's beliefs about where smoking should not be allowed can be considered an indicator of its attitudes towards smoking in general.' Similarly, Hersch *et al*. (2004) use responses to the TUS-CPS questions to measure voter preferences in a political economy model of state regulation of smoking.

DOI: 10.1002/hec

Extending the approach of Gilpin *et al*. (2004) and Hersch *et al*. (2004), our factor analysis is based on the idea that an unobserved latent variable (or common factor) is responsible for the correlation among the nine observed variables created from the TUS-CPS responses (Harman, 1976). In the spirit of using all available information, we pool data from the three cycles of the TUS-CPS and conduct the factor analysis on a sample of 616 796 observations. The results are reported in Table II. The factor analysis of the answers to the nine anti-smoking attitude questions suggests that they reflect a common source, which we term anti-smoking sentiment. The eigenvalues above one for the first factor, and the sharp dropoff in eigenvalues for additional factors, point clearly to a single factor solution as the best representation of the data. The factor loads positively on all nine of the anti-smoking attitudes, and the factor loadings are higher than 0.4, a commonly used cutoff value in factor analysis. The measures of uniqueness range from about 0.43 to 0.75, suggesting that the factor explains between 25 and 57% of the variance of the observed variables, depending on the measure of anti-smoking attitudes.

We use the results of the factor analysis to create a measure of state anti-smoking sentiment as follows. Retaining the first factor, we use Stata's 'score' command to estimate the first factor for every

Table I. Anti-smoking attitudes

	1992–1993 TUS-CPS	1995–1996 TUS-CPS	1998–1999 TUS-CPS
In (Public area), do you think that smoking should be allowed in all areas, allowed in some areas, or not allowed at all? (% responding not allowed at all)			
Restaurants	44.12	47.53	50.82
Hospitals	74.11	77.38	81.7
Indoor work areas	56.89	61.22	66.71
Bars and cocktail lounges	23.54	25.47	28.22
Indoor sporting events	67.63	68.42	71.54
Indoor shopping malls	54.23	61.63	68.69
Do you think (Industry practice) should be: always allowed, allowed under some conditions, or not allowed at all? (% responding not allowed at all)			
Giving away free samples	55.26	57.33	60.29
Avertising of tobacco products	38.64	38.87	41.28
Which statement best describes the rules about smoking in your home? (% responding no one is allowed to smoke anywhere)			
Smoking at home	41.97	51.96	59.9
Sample Size	238 637	194 243	183 916

Table II. Results from the factor analysis of the TUS-CPS smoking attitude questions

Variable	Factor 1 loading	Uniqueness	Scoring coefficient
Restaurant	0.7195	0.44	0.2093
Hospital	0.6061	0.5908	0.1289
Work	0.7017	0.4889	0.1838
Bar	0.5786	0.602	0.1204
Sporting event	0.6758	0.4839	0.1691
Shopping	0.7255	0.4335	0.207
Home	0.472	0.7507	0.0846
Free samples	0.5318	0.5581	0.1257
Advertising	0.4926	0.5753	0.1124

Notes: Eigenvalues for factors one through four are as follows: 3.4435, 0.4207, 0.1677, and 0.0449. The scoring coefficients listed are for the estimated first factor. The data are from the 1992–1993, 1995–1996, and 1998–1999 waves of the TUS-CPS, providing a pooled sample size of 616 796 observations.

DOI: 10.1002/hec

individual respondent. The scoring coefficients are also reported in Table II. The estimated first factor is simply a linear combination of the individual's responses to the nine attitude questions. We then calculate the average of the estimated factor for the TUS-CPS respondents in each state for each cycle.

Table III presents estimates by state and cycle of the first factor, which is what we are terming as state anti-smoking sentiment. The estimated first factor is normalized to have a mean of zero across all three

Table III. Estimated state anti-smoking sentiment

State	Anti-smoking sentiment		
	1992–1993	1995–1996	1998–1999
AL	−0.0577	−0.0488	0.1075
AK	−0.0249	0.0568	0.1558
AZ	−0.0174	0.1171	0.2088
AR	−0.1902	−0.1044	−0.0116
CA	0.1262	0.3184	0.431
CO	−0.0918	0	0.1753
CT	0.0293	0.0723	0.1802
DE	−0.2335	−0.0828	−0.0132
DC	−0.2074	0.016	0.1095
FL	−0.073	0.0712	0.164
GA	−0.0892	−0.0313	0.0801
HI	−0.0305	0.1639	0.2791
ID	0.05	0.1858	0.276
IL	−0.1467	−0.0632	−0.002
IN	−0.2429	−0.1807	−0.0858
IA	−0.0916	0.0384	0.1305
KS	−0.1204	−0.05	0.1152
KY	−0.5399	−0.4515	−0.3737
LA	−0.1478	−0.0763	−0.0171
ME	−0.0483	0.1909	0.2658
MD	−0.0687	0.0622	0.2048
MA	−0.0883	0.0689	0.271
MI	−0.1871	−0.1128	0.0275
MN	−0.109	0.0924	0.2013
MS	−0.0421	−0.0415	0.012
MO	−0.2581	−0.2272	−0.0319
MT	−0.0662	0	0.1139
NE	−0.1472	0.0318	0.1397
NV	−0.2608	−0.2599	−0.0287
NH	−0.1269	0.0568	0.2454
NJ	−0.0346	−0.003	0.0981
NM	0.0027	0.0615	0.1868
NY	−0.0618	0.0345	0.1476
NC	−0.3581	−0.377	−0.2053
ND	−0.1016	0.0387	0.1277
OH	−0.2676	−0.2245	−0.112
OK	−0.1238	−0.1145	0.0482
OR	0.037	0.1848	0.2739
PA	−0.1665	−0.0934	0.046
RI	−0.0684	0.02	0.2432
SC	−0.1462	−0.2283	0.0565
SD	−0.0957	0.0363	0.1226
TN	−0.2609	−0.1583	−0.1151
TX	−0.0632	0.067	0.1666
UT	0.1546	0.3957	0.488
VT	−0.0515	0.1742	0.272
VA	−0.2551	−0.1194	−0.0159
WA	0.1072	0.1654	0.2516
WV	−0.3883	−0.2675	−0.1957
WI	−0.164	−0.0574	0.0613
WY	−0.1487	−0.0552	0.0976

DOI: 10.1002/hec

TUS-CPS cycles. This allows meaningful comparisons across states at a point in time and meaningful comparisons across the cycles over time. Table I shows that anti-smoking attitudes generally increased over the 1990s; correspondingly, there is a general upward trend in the estimated first factor in Table III. Despite the general upward trend, the relative rankings of states by the level of the estimated first factor tend to persist over time. For example, Kentucky has the lowest level of the estimated first factor in each wave. In fact, despite the increase over the 1990s, the estimated level of the first factor in Kentucky in 1998–1999 is still lower than the level in all but one of the states (West Virginia) in 1992–1993. To further explore the persistence, we estimate state-level regressions of the changes in the first factor over the 1990s as a function of the baseline level in the first TUS-CPS cycle. The results (available upon request) provide evidence that during the early 1990s the levels of the estimated first factor tended to diverge somewhat across states. That is, in states where the estimated first factor at baseline is already higher than average, it also tended to increase by a larger-than-average amount.

Although we do not have a benchmark measure for comparison, several pieces of evidence support the interpretation of the estimated first factor as a measure of state anti-smoking sentiment. A striking pattern in Table III is that the lowest levels of the estimated first factor are in states in the southeast tobacco-producing region such as Kentucky, North Carolina, Tennessee, South Carolina, and Virginia. This pattern is consistent with several micro-level studies which find that youths whose families are involved in tobacco production have more favorable attitudes toward smoking (Higgins *et al.*, 1984, Noland *et al.*, 1990, 1996). Similarly, it is consistent with surveys of public attitudes and state legislators' attitudes. These surveys were conducted across a limited number of states and find less support for tobacco control policies in North Carolina – the only tobacco-producing state included – than in the other states considered (Cummings *et al.*, 1991, Goldstein *et al.*, 1997).

It is also interesting to use Table III results to re-visit Fuchs' (1974) famous comparison of health and lifestyles in the neighboring states of Nevada and Utah. Consistent with Fuchs' observations about the influence of the Mormon religion and other differences between the two states, while Nevada has one of the lower values of the estimated first factor, Utah has the highest value in the country. Finally, it is notable that the estimated first factor tends to be high in states that launched major tobacco control programs, especially California. From these patterns, we conclude that it is reasonable to interpret the average estimated first factor by state as a measure of state anti-smoking sentiment.

DATA FOR MODELS OF YOUTH SMOKING

Our study uses micro-data from the NELS. NELS administered questionnaires and subject-specific achievement tests to 24 599 eighth graders in more than 1000 public and private schools in the spring of 1988, with follow-ups in 1990, 1992, 1994, and 2000. In the fourth section we use data from the 1992 wave and the 2000 wave to estimate two-part models of youth smoking. NELS follows the same students over time but in the fourth section we treat data from the two waves as cross sections. In the sixth section we use the longitudinal nature of the NELS data to estimate discrete time hazard models of smoking initiation. Study design, attrition between waves, and missing data mean that the useable sample consists of 16 730 observations for the 1992 NELS and 11 490 observations for the 2000 NELS. (For more discussion of data issues in NELS see DeCicca *et al.*, 2002, 2005).

The dependent variables for the empirical models of youth smoking are measures of smoking participation and demand conditional upon participation. Table IV provides descriptive statistics for these and the key explanatory variables. In NELS the relevant smoking-related question took the form: 'How many cigarettes do you currently smoke in a day?' The possible response categories were 0, 1–5, 6–10, 11–40, and 40 or more. To measure conditional demand we assigned values of 2.2, 7.5, 25, and 45 for the categories above zero, based on the corresponding conditional means from data on young adult cigarette smoking in the 2000 National Health Interview Survey.

DOI: 10.1002/hec

Table IV. Definitions and descriptive statistics for key variables

Variable	Mean	Standard deviation
1992 cross section (*NELS*): $N = 16\,730$		
Smoking participation	0.188	0.391
Conditional cigarette demand ($N = 3149$ smokers)	12.394	11.256
Price (cents/pack, 1992)	202.913	17.819
Index of youth access laws	7.993	4.394
2000 cross section (*NELS*): $N = 11\,490$		
Smoking participation	0.233	0.423
Conditional cigarette demand ($N = 2678$ smokers)	13.231	9.586
Price (cents/pack, 2000)	335.803	39.923
Index of youth access laws	16.613	6.738

Self-reported measures of cigarette consumption like those in NELS are known to substantially under-state actual consumption (Warner, 1978; Hatziandreu *et al.*, 1989). However, while smokers under-report how much they smoke, a meta-analysis of studies that compared self-reported smoking status and biochemical markers suggests that smokers are much more accurate about whether they smoke (Patrick *et al.*, 1994). These patterns suggest that there should be relatively little misclassification error in our models of smoking participation, but more measurement error in our models of demand conditional upon participation. Kenkel *et al.* (2003, 2004) provide more analysis and discussion of the usefulness of self-reported smoking measures.

The key explanatory variables are measures of cigarette prices, an index of state laws restricting youth access to tobacco products, and the measure of state anti-smoking sentiment developed in the second section. The restricted use version of NELS provides state-level geocodes which allows us to link individual respondents to appropriate state-level variables, including state cigarette price data from Orzechowski and Walker (2006). The cigarette price, measured in November of the survey year, is an average cigarette price per package of 20 cigarettes weighted by market share, and includes state and federal excise taxes. We use the average price exclusive of generic brands, because most youths smoke brand name cigarettes (Johnston *et al.*, 1999). The models that use the 1992 NELS include an index of state laws restricting youth access to tobacco as an additional state-level explanatory variable . The index is from Alciati *et al.* (1998), as updated by ImpacTeen (2004). It scores the strictness of regulations in nine dimensions: minimum purchase age, packaging, clerk intervention, photo identification, vending machines, free distribution, graduated penalties; random inspections, and statewide enforcement. The 2000 NELS models do not include the index because it measures laws specific to younger teens. In all models, because youth residing in the same state are assigned identical values of the state-level variables we report robust standard errors that account for clustering at the state level.

The models also include additional control variables, such as gender, age, race/ethnicity, and region of residence. Appendix Table AI reports descriptive statistics for these variables and subsequent Appendix Tables AII–AV contain full estimates from several of the models described in the following sections.

CROSS-SECTIONAL MODELS OF YOUTH SMOKING

Table V presents the main results from alternative models of youth smoking estimated using the 1992 and 2000 cross sections from the NELS. We use the standard two-part model, where the first part is a probit model of smoking participation and the second part is an ordinary least-squares model of demand conditional upon participation. The probit model is based on the assumption that there is an underlying latent variable model:

$$y^* = X\beta + u \qquad (1)$$

DOI: 10.1002/hec

Table V. Two part models of youth smoking

	1992 NELS		2000 NELS	
	Model 1	Model 2	Model 1	Model 2
Smoking participation				
Price	−0.0027*** (0.0011)	0.0003 (0.0013)	−0.0014*** (0.0005)	−0.0002 (0.0005)
Youth access	−0.0048 (0.0055)	−0.0042 (0.0049)	—	—
Sentiment	—	−0.7089*** (0.1781)	—	−0.5021*** (0.1521)
Price elasticity of participation	−0.763	0.082	−0.586	−0.111
Conditional demand				
Price	−0.0186 (0.0140)	0.0011 (0.0181)	−0.0262*** (0.0054)	−0.0206*** (0.0067)
Youth access	0.0492 (0.0318)	0.0526 (0.0292)	—	—
Sentiment	—	−4.5553 (2.991)	—	−2.5445 (1.5655)
Price elasticity of conditional demand	−0.302	0.022	−0.658	−0.518
Overall price elasticity	−1.065	0.104	−1.244	−0.629

Notes: In the models of smoking participation, the sample sizes are 16 730 for the 1992 NELS and 11 490 for the 2000 NELS. In the models of conditional demand, the sample sizes are 3149 for the 1992 NELS and 2678 for the 2000 NELS. Values in parentheses are robust standard errors that have been corrected for clustering within states. *Significant at 10%; **Significant at 5%; ***Significant at 1% (two-tailed tests). The models estimated with the 1992 and 2000 NELS also control for gender, race/ethnicity, birth year, and region of country. Complete results are presented in Appendix Tables AII and AIII.

In Equation (1), y^* is the net utility gain from smoking participation, X is a vector of explanatory variables, u is a random error term, and β is the parameter vector to be estimated. We observe the discrete outcome of smoking participation, denoted by y, only if the continuous latent variable is positive: $y = 1$ if $y^* > 0$ and $y = 0$ otherwise. For smokers ($y = 1$), the second part of the model is an ordinary least-squares model of the quantity of cigarettes smoked per day:

$$C = X\alpha + w \tag{2}$$

For each cross section and part of the model, Table V reports two sets of results: first, the results from a benchmark specification that does not include the measure of state anti-smoking sentiment and second, the results from our preferred specification that does include the measure. For purposes of comparison, Table V also reports the implied price elasticities.

In the benchmark models that do not include the measure of state anti-smoking sentiment, cigarette prices are negatively and statistically significantly associated with smoking participation and conditional cigarette demand. The implied price elasticities of smoking participation range from about −0.59 to −0.76. These estimates are quite similar to previous cross-sectional studies, with a commonly cited consensus estimate of around −0.7 for the price elasticity of youth smoking participation (Treasury Department, 1998; GAO, 1998; CBO, 1998). The implied price elasticities of conditional cigarette demand listed in Table VI range from −0.3 to −0.66. The baseline estimates of the overall price elasticity of youth cigarette demand, which equals the sum of the participation and conditional demand elasticities, are again quite consistent with the consensus range of −0.9 to −1.5 (Ross and Chaloupka, 2004).

When the measure of anti-smoking sentiment is included in the models of smoking participation, the estimated coefficients on the price of cigarettes fall substantially in magnitude and lose statistical significance. The implied price elasticities range from −0.11 to +0.08. The pattern is similar in the model of conditional cigarette demand in the 1992 NELS, where in the models that include the sentiment measure the implied price elasticity also becomes positive (0.022) but is statistically insignificant. The pattern is somewhat different in the model of conditional cigarette demand estimated in the other cross section. In the 2000 NELS cross section, the estimated coefficient remains negative and statistically significant when the measure of anti-smoking sentiment is included. These results imply the price elasticity of conditional demand is −0.52. The patterns of results across the models suggest that the

DOI: 10.1002/hec

Table VI. Correlations between the state-level variables

Cross section	Corr (price, sentiment)	Corr (price, access)	Corr (sentiment, access)	R^2 : Price $= a + b$ (sentiment) $+ c$(access)
1992	0.530	0.383	0.210	0.359
2000	0.595	−0.031	0.176	0.373

large price elasticities of youth smoking participation in previous studies may be due to the failure to control for state anti-smoking sentiment. However, there is some evidence of price-responsiveness on the intensive smoking margin by young adults, even after controlling for state anti-smoking sentiment.

In the models reported in Table V, state anti-smoking sentiment is estimated to have a negative and statistically significant association with smoking participation. Its association with conditional demand is weaker and not statistically significant. To illustrate the magnitude of the estimated relationship between anti-smoking sentiment and smoking participation, we use the model results from the 2000 cross section to predict smoking participation at several different levels of state anti-smoking sentiment, but holding all other influences constant. Our first prediction is based on the trend in anti-smoking sentiment over the 1990s. The mean of the anti-smoking sentiment measure increases from −0.117 in the 1992–1993 TUS-CPS cycle to 0.105 in the 1998–1999 cycle. On the basis of our model results, this increase in anti-smoking sentiment (i.e. roughly 0.22 units) is associated with a reduction of about 3.2% points in smoking participation. Our second prediction is based on the differences in anti-smoking sentiment across states at a point in time. Compared with the level of anti-smoking sentiment in California in the 1998–1999 cycle (see Table III), the lower anti-smoking sentiment in Kentucky is predicted to increase smoking participation by about 12% points. Given that the observed rate of smoking participation in the 2000 cross section is about 23%, the predicted impacts of both the trend and the cross-state differences are sizeable. The results tend to suggest that anti-smoking sentiment has an important influence on youth smoking participation. However, as is discussed in more detail in the next section, our results should be cautiously interpreted because we have not necessarily isolated the causal treatment effect of sentiment on youth smoking.

SENSITIVITY CHECKS

The patterns of results in Table V are robust to a number of sensitivity checks that explore several issues. (Our detailed results from these checks are not reported but they are available upon request.)

The first issue is whether multicollinearity between the three state-level variables – cigarette prices, the index of youth access laws, and anti-smoking sentiment – makes it difficult to obtain precise estimates of their separate effects. Table VI presents the pairwise correlations and the R-squared from an auxiliary regression that uses prices as the dependent variable and the other two state-level variables as independent variables. The evidence in Table VI suggests that there is some multicollinearity between the state-level variables. The youth access laws are widely perceived to have been ineffective in the early 1990s due to the lack of enforcement (USDHHS, 1994, p. 181). As a result, the index of youth access laws might be considered a doubtful explanatory control variable (in the sense of Leamer, 1983). When we re-estimate the models in Table V without the index of youth access laws, the main results are robust: after controlling for state anti-smoking sentiment, the estimated impacts of cigarette prices on smoking participation are small and statistically insignificant, while anti-smoking sentiment itself continues to have a strong negative effect. However, the inclusion of the index of youth access does appear to reduce the precision of the estimated coefficients on prices in some of the benchmark models that do not control for anti-smoking sentiment.

Additional issues arise based on the possibility that cigarette prices and state anti-smoking sentiment could be econometrically endogenous, i.e. these variables might be correlated with the error terms u and

DOI: 10.1002/hec

w in the two-part smoking demand model (Equations (1) and (2)). Under plausible assumptions, endogeneity due to omitted variables or unobserved heterogeneity biases our results toward over-estimating the negative effects of both cigarette prices and state anti-smoking sentiment. For example, our models may omit other important state-level influences on youth smoking such as the activities of tobacco control programs. To the extent that states with strong tobacco control programs also have higher cigarette prices and greater anti-smoking sentiment, endogeneity implies that our estimated coefficients on price and anti-smoking sentiment are biased in a negative direction. This possibility does not change our conclusion about the lack of price-responsiveness of youth smoking participation, because it suggests the true price-responses are even smaller (closer to zero) than what we have estimated. The possible endogeneity bias does suggest that we should be cautious about the conclusions we draw from the results for anti-smoking sentiment. Instead of identifying the causal impact of anti-smoking sentiment, our more cautious conclusion is that we include the measure as a control variable to obtain an unbiased estimate of the causal impact of price on youth smoking.

Another source of endogeneity is the possibility that state-level smoking, prices, and anti-smoking sentiment are determined by a recursive or fully simultaneous system of equations. This possibility is important both for the interpretation and for the estimation of the parameters in our individual-level model. Regarding interpretation, because of feedback in the system of equations, variables can have both direct and indirect effects. For example, to the extent higher cigarette prices reduce adult smoking and thus increase state anti-smoking sentiment, cigarette prices can have an indirect effect on youth smoking. Interpreting the results in Table V in this light, our estimates of an insignificant direct price effect suggest that controlling for anti-smoking sentiment, the individual-level demand curve for smoking participation is price inelastic. In a state-level system of equations higher prices may also cause sentiment to change and shift the individual-level demand curve, but our individual-level model does not provide estimates of the feedback channels for possible indirect price effects.

Regarding estimation of our individual-level model, simultaneous equations bias depends on the extent to which feedback creates correlations between the explanatory variables and the error terms u and w. In particular, a key question is whether simultaneous equations bias causes our approach to under-estimate the size of the negative effect of price on youth smoking participation. One possible feedback mechanism is that market forces may cause cigarette prices to be higher in states with strong cigarette demand. While Keeler *et al.* (1996) find evidence consistent with the existence of this feedback mechanism, their estimates suggest that the magnitude of the effect is very small. To further explore the importance of this possible feedback mechanism, we re-estimate the individual-level models and replace the price variable with the state cigarette tax rate, which is not subject to market-forces simultaneity. In the re-estimated models, the qualitative pattern of results is unchanged from that in Table V. Hence, several pieces of evidence suggest that simultaneous equations bias due to market forces probably does not explain the insignificance of price in the models of youth smoking participation.

Another possible feedback mechanism that could lead to simultaneous equations bias is between state-level smoking and anti-smoking sentiment. To explore the importance of this feedback mechanism, we develop an alternative measure of state anti-smoking sentiment based only on responses of people living in 'never-smoking' households. This measure of the strength of non-smokers' anti-smoking sentiment is less likely to pick up indirect effects of higher prices through adult smoking. When the models reported in Table V are re-estimated using this alternative sentiment measure, the main results are unchanged. The estimated effects of prices on youth smoking become slightly more negative but remain small in magnitude and statistically insignificant.

We also consider simultaneity bias due to possible feedback mechanisms between cigarette prices and anti-smoking sentiment, conducting basic analyses of state-level data. In one simple regression, we find that the level of anti-smoking sentiment in 1992 predicts future changes in cigarette taxes or prices between 1992 and 2000. In another simple regression, we find that the level of cigarette taxes or prices in 1992 does *not* predict future changes in state anti-smoking sentiment between 1992 and 2000. The results

DOI: 10.1002/hec

of these regressions, which are similar to Granger causality tests (Berndt, 1991, pp. 380–383), support a political economy model where anti-smoking sentiment drives increases in cigarette taxes and thus prices. The results do not support the reverse causality from prices to sentiment. Because we find evidence that the causality or feedback is in the direction from sentiment to prices, it suggests simultaneity biases our results towards *over*-estimating the negative effect of cigarette prices on youth smoking.

A final specification issue is that our individual-level model of youth smoking fails to control for peer pressure. Social psychology research suggests that peers have a powerful influence on youth smoking (Tyas and Pederson, 1998), but identifying causal peer effects in an econometric study is extremely challenging (Manski, 1993). Econometric studies of peer effects on youth smoking reach mixed results; for example using an instrumental variables approach Powell *et al.* (2005) find large peer effects, but using alternative identification strategies Eisenberg (2004) and Krauth (2004) find smaller peer effects. Regarding the results listed in Table V, the measure of state anti-smoking sentiment may be correlated with peer pressure. Although the sentiment measure is based on adults' attitudes about smoking, youth who live in states where adult sentiment is strongly against smoking probably experience less peer pressure to smoke. To the extent that peer pressure remains an omitted influence on youth smoking, it raises an issue for the interpretation of the price effects in Table V. In a model with peer effects, the total price elasticity of youth smoking participation can be decomposed into a direct effect and an indirect effect through peer effects. Because our models do not include peer effects, the corresponding price elasticities in Table V reflect the total impact of prices, both directly and through peers. Powell *et al.* (2005) suggest there is a social multiplier effect where the indirect price effects reinforce the direct effects. In this case, the direct effect of price controlling for peer pressure is even smaller (closer to zero) than our statistically insignificant estimates of the total effect.

ALTERNATIVE APPROACHES TO CONTROLLING FOR STATE ANTI-SMOKING SENTIMENT

In this section, we explore several alternative approaches to control for state anti-smoking sentiment in models of youth smoking. Because until now researchers have lacked a direct measure of state anti-smoking sentiment, previous studies that use cross-sectional data have relied on indirect proxy measures. Wasserman *et al.* (1991) suggest that an index of state regulations restricting smoking in public places may serve as a proxy for anti-smoking sentiment. DeCicca *et al.* (2002) suggest that residence in one of the tobacco-producing states may be a useful indicator of a low degree of anti-smoking sentiment. It is interesting to compare the results obtained when using these simpler proxies with the results obtained in Table V.

Table VII presents estimates from models of youth smoking that use alternative approaches to control for state anti-smoking sentiment. For the sake of brevity, we use only the NELS 2000 cross section, and we report only the estimated coefficient (standard error) on the price and the proxy variables. Models 1 and 2 are repeated from Table V. In Models 3–5 we follow Ross and Chaloupka (2004) and try several alternative measures of state regulations restricting smoking in public places. Model 3 includes a set of four indicator variables measuring state bans on smoking in private workplaces, restaurants, stores, or other places. Model 4 replaces the four indicator variables with a simple index that is the sum of the four indicator variables reflecting either a partial or a full ban on smoking in those places. Model 5 uses a similar index, except that it only reflects full bans. Models 6 and 7 explore using information on residence in a tobacco state; Model 6 uses an indicator for residence in a tobacco-producing state as a proxy for anti-smoking sentiment; Model 7 eliminates residents from the tobacco-producing states from the sample.

The results in Table VII show that controlling for state bans on smoking in public places has only a modest effect on the estimated coefficients on price. The estimated coefficients on price from Models 3–5 are slightly smaller (in absolute value) than in the baseline Model 1, but they generally remain

DOI: 10.1002/hec

Table VII. Two part models of youth smoking: alternative approaches to control for anti-smoking sentiment

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Smoking participation							
Price	−0.0014*** (0.0005)	0.0002 (0.0005)	−0.00132* (0.0007)	−0.0011** (0.0005)	−0.0010** (0.0005)	−0.00126** (0.00051)	−0.0012** (0.0005)
Smoking ban in private workplace			−0.0228 (0.0381)				
Smoking ban in restaurants			−0.05107 (0.04361)				
Smoking ban in stores			0.00802 (0.05978)				
Smoking ban in other places			0.01362 (0.04664)				
Index of bans – full or partial				−0.01259 (0.01100)			
Index of bans – only full					−0.02946 (0.01520)		
Residence in tobacco state						0.03528 (0.06872)	
Conditional demand							
Price	−0.0262*** (0.0054)	−0.0206*** (0.0067)	−0.0243*** (0.00791)	−0.0242*** (0.00594)	−0.0224*** (0.00506)	−0.0274*** (0.00555)	−0.0263*** (0.00554)
Smoking ban in private workplace			−0.06329 (0.52487)				
Smoking ban in restaurants			0.4035 (0.47467)				
Smoking ban in stores			−0.00488 (0.68537)				
Smoking ban in other places			−0.70486 (0.48614)				
Index of bans – full or partial				−0.12187 (0.21429)			
Index of bans – only full					−0.40873*** (0.18179)		
Residence in tobacco state						−0.48818 (0.68097)	

Data are from NELS 2000 cross section; see notes to Table V. Complete results are presented in Appendix Tables AIV and AV.

statistically significant at conventional levels. Similar to Ross and Chaloupka (2004), the estimated coefficients on the ban measures themselves vary somewhat across the models. Taken at face value the results for the index reflecting full bans imply that such bans may reduce smoking participation and conditional demand; however, because the ban index may proxy for anti-smoking sentiment, this causal interpretation is invalid and the results should not be taken at face value. Either including an indicator variable for residence in a tobacco-producing state (Model 6) or excluding those residents from the sample entirely (Model 7) also has a small impact on the magnitude and statistical significance of the coefficients on price. In Model 6 there is no evidence that residents in tobacco-producing states smoke more. To sum up the results in Table VII, compared with Model 2 – which uses a direct measure of state anti-smoking sentiment – the results from Models 3–7 suggest that these indirect proxy measures are not adequate controls for the role of anti-smoking sentiment in youth smoking.

To explore another approach to controlling for differences in state anti-smoking sentiment, we take advantage of the additional information in NELS to estimate discrete time hazard models of smoking initiation. The dependent variable in these models represents the conditional probability of starting to smoke in period t, given that the youth had not smoked regularly at period $t-1$ (Allison, 1984). Because youth can be at a risk of initiating smoking for multiple years, we can include state-fixed effects in these models. The state effects control for fixed differences in anti-smoking sentiment across states, hence, the models rely on within-state variation to identify the effect of prices on smoking initiation.

We use pooled data from the four waves of NELS with smoking information to estimate the probability of starting to smoke in 1988, 1990, 1992, and 2000. Note that since cessation is possible, a respondent can initiate smoking multiple times. For example, someone who starts smoking in 1988 and quits by 1990 is again at risk of initiation in 1992 and 2000.

Table VIII reports the results from the hazard models of smoking initiation. In Model 8 that does not include either state-fixed effects or the anti-smoking sentiment measure, cigarette prices are estimated to have a negative and statistically significant association with the probability of starting to smoke. However, when state-fixed effects are included (Model 9), the estimated coefficients on price fall substantially in magnitude and lose statistical significance. The results (available upon request) are similar when the anti-smoking sentiment measure is used instead of state-fixed effects. As reflected in the estimated standard error, including state-fixed effects does not seem to be associated with a substantial loss of precision of estimated coefficient on price.

The results in Table VIII suggest that in the models without state-fixed effects, the estimated effect of prices reflects some unmeasured influence at the state level, such as anti-smoking sentiment. To further explore this, we correlated the estimated fixed effects with our direct measures of state anti-smoking sentiment. The simple correlations range from -0.30 to -0.41, depending on which year anti-smoking sentiment is measured. Because NELS is not designed to be representative at the state level, the estimated fixed effects will reflect influences that are specific to its state sub-samples. In contrast, the measures of anti-smoking sentiment from the TUS-CPS should reflect attitudes in the state more generally. Given this difference, the correlations between the state-fixed effects and the measures of anti-smoking sentiment seem reasonably strong, consistent with the argument that the estimated state-fixed effects are picking up the influence of state anti-smoking sentiment.

Table VIII. Discrete time hazard analysis: coefficients on price

	Model 8: No state-fixed effects	Model 9: state-fixed effects
	NELS (1988–2000)	
Price	-0.0015^{***} (0.0005)	-0.0005 (0.0006)
Sample size (person years)	37 937	

Values in parentheses are standard errors that have been corrected for clustering within states. *Significant at 10%; **significant at 5%; ***significant at 1% (two-tailed tests)

CONCLUSIONS

We develop a new direct measure of state anti-smoking sentiment and merge it with micro-data that contain information on youth smoking. The empirical results from the cross-sectional models show two consistent patterns: after controlling for differences in state anti-smoking sentiment, the price of cigarettes has a weak and statistically insignificant influence on smoking participation, and state anti-smoking sentiment may have an important influence on youth smoking participation. The cross-sectional results are corroborated by results that use the longitudinal nature of our data. In particular, estimates from discrete time hazard models of smoking initiation that include state-fixed effects to control for differences in state anti-smoking sentiment exhibit the same pattern. We also find that indirect proxies for anti-smoking sentiment used in several previous cross-sectional studies do not seem to adequately control for differences in anti-smoking sentiment across states.

Our results add to a growing body of research, suggesting that it may be time to re-examine the consensus among health policy makers that youth smoking participation is highly price-responsive. Overall, higher prices potentially reduce cigarette consumption through three channels: by decreasing initiation, by increasing cessation, and by decreasing daily consumption by continuing smokers. Initiation decisions are typically made in adolescence and may be driven more by the desire for peer acceptance and other non-economic factors (Tyas and Pederson, 1998). Economic factors may play more of a role in decisions about cessation and daily demand. Our results provide some support for this in that we tend to find evidence of negative price effects on the conditional demand for cigarettes even after controlling for anti-smoking sentiment, while anti-smoking sentiment itself seems to have a smaller impact on conditional demand. Hence while higher prices reduce smoking, it is less clear that they operate through the channel of reducing youth smoking initiation.

Another approach to develop unbiased estimates of the price-responsiveness of youth smoking relies on repeated cross sections (CDC 1998, Gruber, 2000). These studies can then include state-fixed effects to control for hard-to-observe influences such as state anti-smoking sentiment. This general approach faces a dilemma. On the one hand, there may be insufficient within-state variation in taxes or prices to allow precise estimates. On the other hand, the within-state variation that does exist may itself be associated with changes in unobserved influences. In addition, when possible, it seems generally useful to explicitly measure important state-level influences, rather than letting them be swept into state-fixed effects. We believe that an important direction for future work is to merge our (or similar) measures of anti-smoking sentiment with other data sets that contain information on youth and adult smoking.

ACKNOWLEDGEMENTS

We thank Pam Baxter and Carol Murphree at CISER for the administration of data from CPS Tobacco Use Supplements, and Feng Liu for outstanding research assistance.

APPENDIX A

The discriptive statistics for control variables included in smoking is given in Table AI. Complete results for Tables V and VII smoking participation models and conditional (demand) models are given in Tables AII–AV.

Table A1. Descriptive statistics for control variables included in smoking models

	1992 cross section	2000 cross section
Male	0.491 (0.500)	0.474 (0.499)
Birth year 1972	0.052 (0.222)	0.054 (0.226)
Birth year 1973	0.293 (0.455)	0.293 (0.455)
Birth year 1974	0.644 (0.479)	0.642 (0.479)
Birth year 1975	0.011 (0.105)	0.011 (0.102)
Hispanic	0.123 (0.329)	0.132 (0.339)
Black	0.097 (0.296)	0.096 (0.294)
White	0.702 (0.458)	0.691 (0.462)
West	0.198 (0.399)	0.219 (0.414)
Midwest	0.268 (0.443)	0.248 (0.432)
Northeast	0.191 (0.393)	0.173 (0.378)
South	0.344 (0.475)	0.360 (0.480)
# of obs.	16730	11490

Table AII. Complete results from Table V smoking participation models

	Smoking participation			
	1992		2000	
	Model 1	Model 2	Model 1	Model 2
Price	−0.0027*** (0.0011)	0.0003 (0.0013)	−0.0014*** (0.0005)	−0.0002 (0.0005)
Youth access	−0.0048 (0.0055)	−0.0042 (0.0049)	—	—
Sentiment	—	−0.7089*** (0.1781)	—	−0.5021*** (0.1521)
Male	0.0345 (0.0356)	0.0350 (0.0355)	0.1362*** (0.0264)	0.1372*** (0.0260)
Black	−0.7938*** (0.0615)	−0.7850*** (0.0602)	−0.3811*** (0.0475)	−0.3804*** (0.0454)
Hispanic	−0.3507*** (0.0676)	−0.3451*** (0.0687)	−0.2638*** (0.0588)	−0.2429*** (0.0581)
Other race	−0.3910*** (0.0523)	−0.3935*** (0.0513)	−0.2818*** (0.0482)	−0.2774*** (0.0491)
Born 1972	0.4727*** (0.0566)	0.4780*** (0.0571)	0.4026*** (0.0546)	0.4062*** (0.0539)
Born 1973	0.1782*** (0.0308)	0.1798*** (0.0309)	0.1837*** (0.0329)	0.1880*** (0.0335)
Born 1975	−0.4261*** (0.1556)	−0.4251*** (0.1557)	−0.0695 (0.1155)	−0.0608 (0.1169)
Northeast	0.1299** (0.0604)	0.0356 (0.0597)	0.2477*** (0.0523)	0.1521*** (0.0458)
Midwest	0.1228* (0.0651)	0.0007 (0.0653)	0.2230*** (0.0582)	0.1172** (0.0584)
South	0.0480 (0.0579)	−0.0533 (0.0600)	0.0653 (0.0553)	−0.0183 (0.0520)

Notes: Omitted categories include: 'Female', 'White', and 'Born in 1974'. See notes to Table V.

Table AIII. Complete results for Table V conditional demand models

	Conditional demand			
	1992		2000	
	Model 1	Model 2	Model 1	Model 2
Price	−0.0186*** (0.0140)	0.0011 (0.0181)	−0.0262*** (0.0054)	−0.0206*** (0.0067)
Youth access	0.0492 (0.0318)	0.0526* (0.0292)	—	—
Sentiment	—	−4.5553 (2.9906)	—	−2.5445 (1.5655)
Male	2.6512*** (0.3934)	2.6728*** (0.3942)	2.4736*** (0.3362)	2.4736*** (0.3362)
Black	−5.7125*** (0.8799)	−5.7189*** (0.8813)	−6.3447*** (0.5933)	−6.3428*** (0.5938)
Hispanic	−4.2956*** (0.7103)	−4.2616*** (0.7171)	−5.2418*** (0.4906)	−5.2401*** (0.4905)
Other race	−2.4306*** (0.9092)	−2.4871*** (0.9045)	−2.2729*** (0.6045)	−2.2715*** (0.6040)
Born 1972	3.3245*** (1.0255)	3.3443*** (1.0234)	2.8347*** (0.8370)	2.8345*** (0.8371)
Born 1973	1.0027* (0.5351)	0.9919* (0.5344)	1.1812*** (0.2810)	1.1803*** (0.2810)
Born 1975	1.0104 (2.9061)	0.9563 (2.8951)	3.0825 (1.9211)	3.0823 (1.9207)
Northeast	0.4242 (0.4630)	−0.1808 (0.7255)	1.8616*** (0.4851)	1.3895*** (0.5468)
Midwest	1.8397*** (0.5900)	1.0383 (0.9287)	1.2089* (0.6427)	0.6709 (0.6490)
South	0.6505 (0.5869)	−0.0286 (0.8342)	0.9533 (0.5790)	0.5226 (0.6509)

Notes: See notes to Table V.

Table AIV. Complete results for Table VII smoking participation models

	Smoking participation						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Price	−0.0014*** (0.0005)	−0.0002 (0.0005)	−0.00132* (0.0007)	−0.00110** (0.0005)	−0.00100** (0.0005)	−0.00126** (0.0005)	−0.00120** (0.0005)
Male	0.1362*** (0.0264)	0.1372*** (0.0260)	0.1365*** (0.0263)	0.1362*** (0.0264)	0.1366*** (0.0263)	0.1362*** (0.0264)	0.1251*** (0.0269)
Black	−0.3811*** (0.0475)	−0.3804*** (0.0454)	−0.3841*** (0.0480)	−0.3806*** (0.0478)	−0.3746*** (0.0486)	−0.3824*** (0.0481)	−0.3691*** (0.0579)
Hispanic	−0.2638*** (0.0588)	−0.2429*** (0.0581)	−0.2664*** (0.0558)	−0.2646*** (0.0585)	−0.2594*** (0.0566)	−0.2602*** (0.0602)	−0.2720*** (0.0607)
Other race	−0.2818*** (0.0482)	−0.2774*** (0.0491)	−0.2808*** (0.0485)	−0.2812*** (0.0485)	−0.2737*** (0.0498)	−0.2821*** (0.0482)	−0.2798*** (0.0521)
Born 1972	0.4026*** (0.0546)	0.4062*** (0.0539)	0.4013*** (0.0554)	0.4002*** (0.0554)	0.3972*** (0.0557)	0.4048*** (0.0552)	0.3989*** (0.0599)
Born 1973	0.1837*** (0.0329)	0.1880*** (0.0335)	0.1843*** (0.0335)	0.1828*** (0.0331)	0.1824*** (0.0334)	0.1843*** (0.0332)	0.1940*** (0.0365)
Born 1975	−0.0695 (0.1155)	−0.0608 (0.1169)	−0.0665 (0.1172)	−0.0680 (0.1160)	−0.0685 (0.1161)	−0.0692 (0.1154)	−0.0588 (0.1232)
Northeast	0.2477*** (0.0523)	0.1521*** (0.0458)	0.2369*** (0.0441)	0.2367*** (0.0498)	0.2097*** (0.0454)	0.2477*** (0.0519)	0.2454*** (0.0518)
Midwest	0.2230*** (0.0582)	0.1172** (0.0584)	0.2159*** (0.0645)	0.2247*** (0.0556)	0.1869*** (0.0526)	0.2273*** (0.0577)	0.2282*** (0.0579)
South	0.0653 (0.0553)	−0.0183 (0.0520)	0.0441 (0.0527)	0.0500 (0.0538)	0.0246 (0.0503)	0.0582 (0.0558)	0.0620 (0.0562)

Notes: Data are from NELS 2000 cross section; see notes to Table VI for additional details. First two columns replicate price coefficients from Table VI. Omitted categories are female, white, born in 1974, and West region.

Table AV. Complete results for Table VII conditional demand models

	Conditional demand						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Price	−0.0262*** (0.0054)	−0.0206*** (0.0067)	−0.0243*** (0.0079)	−0.0242*** (0.0059)	−0.0224*** (0.0051)	−0.0274*** (0.0056)	−0.0263*** (0.0055)
Male	2.4736*** (0.3362)	2.4736*** (0.3362)	2.4545*** (0.3403)	2.4598*** (0.3414)	2.4627*** (0.3409)	2.4582*** (0.3429)	2.4549*** (0.3489)
Black	−6.3447*** (0.5933)	−6.3428*** (0.5938)	−6.2982*** (0.5885)	−6.3633*** (0.5860)	−6.2460*** (0.6194)	−6.3438*** (0.5940)	−6.2205*** (0.6966)
Hispanic	−5.2418*** (0.4906)	−5.2401*** (0.4905)	−5.2565*** (0.5152)	−5.3922*** (0.5134)	−5.2917*** (0.5179)	−5.3680*** (0.5033)	−5.4416*** (0.5140)
Other race	−2.2729*** (0.6045)	−2.2715*** (0.6040)	−2.2537*** (0.6081)	−2.2840*** (0.6063)	−2.1841*** (0.6242)	−2.2620*** (0.6056)	−2.1330*** (0.6542)
Born 1972	2.8347*** (0.8370)	2.8345*** (0.8371)	2.8125*** (0.8439)	2.8139*** (0.8433)	2.7719*** (0.8487)	2.8200*** (0.8458)	3.1242*** (0.9484)
Born 1973	1.1812*** (0.2810)	1.1803*** (0.2810)	1.1609*** (0.2775)	1.1617*** (0.2781)	1.1515*** (0.2819)	1.1619*** (0.2781)	1.1893*** (0.3092)
Born 1975	3.0825 (1.9211)	3.0823 (1.9207)	2.9461 (1.9095)	3.0572 (1.9215)	3.1333 (1.8933)	3.0659 (1.9257)	2.8914 (2.1494)
Northeast	1.8616*** (0.4851)	1.3895*** (0.5468)	1.7116*** (0.5250)	1.7632*** (0.4901)	1.4070*** (0.4892)	1.8676*** (0.4767)	1.8522*** (0.4818)
Midwest	1.2089* (0.6427)	0.6709 (0.6490)	1.2067* (0.6614)	1.2248** (0.6068)	0.7555 (0.6125)	1.1584* (0.6469)	1.1986* (0.6471)
South	0.9533 (0.5790)	0.5226 (0.6509)	0.8265 (0.6847)	0.8102 (0.7012)	0.4402 (0.6808)	1.0668 (0.5948)	1.0831 (0.6007)

Notes: Data are from NELS 2000 cross section; see notes to Table V for additional details. First two columns replicate price coefficients from Table V. Omitted categories are female, white, born in 1974, and West region.

DOI: 10.1002/hec

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DOI: 10.1002/hec