

**BEFORE THE TENNESSEE REGULATORY AUTHORITY  
NASHVILLE, TENNESSEE**

Petition of B&W Pipeline, LLC  
For an Increase in Rates

)  
)

DOCKET NO. 15-00042

**PRE-FILED DIRECT TESTIMONY OF**

**CHRISTOPHER C. KLEIN, PH.D.**

**ON BEHALF OF THE TENNESSEE ATTORNEY GENERAL  
CONSUMER ADVOCATE AND PROTECTION DIVISION**

**August 11, 2015**

BEFORE THE TENNESSEE REGULATORY AUTHORITY


IN RE: )  
PETITION OF B&W PIPELINE, LLC )  
FOR AN INCREASE IN RATES ) DOCKET NO. 15-00042

---

AFFIDAVIT

---

I, Dr. Christopher C. Klein, Regulatory Economist, on behalf of the Consumer Advocate Division of the Attorney General's Office, hereby certify that the attached Direct Testimony represents my opinion in the above-referenced case and the opinion of the Consumer Advocate Division.

  
CHRISTOPHER C. KLEIN

Sworn to and subscribed before me  
this 11<sup>th</sup> day of Aug, 2015.

  
NOTARY PUBLIC

My commission expires: May 6, 2019

**BEFORE THE TENNESSEE REGULATORY AUTHORITY  
NASHVILLE, TENNESSEE**

**August 11, 2015**

**DOCKET NO. 15-00042**

**PRE-FILED DIRECT TESTIMONY OF  
DR. CHRISTOPHER C. KLEIN**

1   **Q.     Please state your name and your current position.**

2   **A.**My name is Christopher C. Klein. I am a Professor in the Economics and Finance  
3           Department at Middle Tennessee State University (MTSU) in Murfreesboro, Tennessee.

4   **Q.     What is your educational background?**

5   **A.**I received a B. A. in Economics from the University of Alabama in 1976 and I received a  
6           Ph. D. in Economics from the University of North Carolina at Chapel Hill in 1980.

7   **Q.     What is your professional experience involving regulated industries?**

8   **A.**I was employed as an Economist in the Antitrust Division of the Bureau of Economics at  
9           the Federal Trade Commission (FTC) in Washington, D.C., for six years starting in 1980.  
10          In 1986, I was hired as the first Economist for the Tennessee Public Service Commission  
11          (TPSC). Although my title changed over the years, I functioned as the Chief Economist  
12          for the TPSC and, after 1996, the Tennessee Regulatory Authority (TRA), until August of  
13          2002, when I assumed my current position with MTSU.

14   **Q.     What were your duties at the FTC?**

15   **A.**I performed the economic analysis in antitrust investigations involving more than 20  
16          industries and contributed to staff reports on mergers in the petroleum industry,  
17          competition in grocery retailing, and the economics of predatory, or “sham,” litigation.

18   **Q.     What was your primary responsibility at the TPSC?**

1 A. I was an expert witness for the staff of the TPSC in rate cases and other similar  
2 proceedings involving telecommunications, natural gas, electric, and water utilities, as  
3 well as motor carriers. I testified in 36 dockets before the TPSC on the issues of cost of  
4 capital, rate design, and competitive effects. I also filed testimony before the Federal  
5 Communications Commission (FCC).

6 **Q. How did your responsibilities change when the TRA supplanted the TPSC?**

7 A. I oversaw the Utility Rate Division and then the Economic Analysis Division. The TRA  
8 staff no longer testified in proceedings before the agency, but provided analysis and  
9 advice to the TRA Directors. I was responsible for all such advice and analysis provided  
10 to the Directors by these Divisions, either individually or in concert with other TRA staff,  
11 in all proceedings that came before the agency for resolution. These proceedings  
12 included rate cases and tariff filings by public utilities, as well as those associated with  
13 the implementation of the federal Telecommunications Act of 1996.

14 **Q. Were you a member of any regulatory committees or boards while you worked for**  
15 **the TPSC and the TRA?**

16 A. Yes. I was a member of the National Association of Regulatory Utility Commissioners  
17 (NARUC) Staff Subcommittee on Gas. I was a member of, and Chaired, the Research  
18 Advisory Committee to the Board of Directors of the National Regulatory Research  
19 Institute (NRRI). I also served on the State Staff of the FCC's Federal-State Joint Board  
20 in CC Docket No.80-286 (the "Separations" Joint Board) and as a Group Leader on the  
21 NARUC Staff Subcommittee on Accounts Multi-state Audit Team that produced the  
22 1988 Report on Bell Communications Research.

23 **Q. What is your primary responsibility at MTSU?**

1    **A.**     I teach classes in the general area of applied microeconomics, including Principles of  
2           Microeconomics, Intermediate Microeconomic Theory, Managerial Economics,  
3           Economics of Antitrust and Regulation, and Econometrics. I also undertake scholarly  
4           research, participate in various university committees, and serve on dissertation  
5           committees.

6    **Q.     Have you taught at any other universities?**

7    **A.**     I taught classes in the Economics of Regulation and in Antitrust Economics in the  
8           Economics Department at Vanderbilt University for several years while I was employed  
9           at the TRA.

10   **Q.     Are you a member of any professional organizations?**

11   **A.**     I am a member of the American Economic Association, the Southern Economic  
12           Association, the Industrial Organization Society, and Alpha Pi Mu: the National  
13           Industrial Engineering Honor Society, as well as Beta Gamma Sigma: the International  
14           Honor Society for Collegiate Schools of Business.

15   **Q.     Have you published articles in professional or academic journals and presented**  
16           **papers at professional meetings?**

17   **A.**     More than 40 of my articles have appeared in professional or academic journals such as  
18           *Energy Economics, Utilities Policy, The Electricity Journal, The Journal of Applied*  
19           *Regulation* and many others. I have made more than 80 presentations at professional  
20           meetings.

21   **Q.     Have you testified before any other governmental bodies in Tennessee?**

22   **A.**     Yes. I have testified before various committees of the Tennessee General Assembly on  
23           regulatory issues, especially issues involving competition in the telecommunications

1 industry, as well as before the Tennessee Advisory Commission on Intergovernmental  
2 Relations and the Tennessee Regulatory Authority. A complete list is provided in my  
3 Vita beginning on page 5 of my Exhibit.

4  
5 **PURPOSE OF TESTIMONY**

6 **Q. What is the purpose of your testimony?**

7 A. I will address the Cost of Capital for B&W Pipeline, LLC, (B&W) and recommend an  
8 allowed rate of return for ratemaking purposes. This includes issues regarding capital  
9 structure, cost of debt, and cost of equity.

10 **Q. Can you summarize your testimony pertaining to capital structure and cost of debt?**

11 A. Yes. I concur with B&W's witness Mr. Novak that B&W is 100% equity financed.  
12 Discovery revealed that the only debt in the capital structures of B&W, its parent and  
13 affiliated companies, all organized as Limited Liability Corporations (LLCs), consists of  
14 intercompany no-interest loans. I take this to indicate that B&W and its related LLCs are  
15 managed as a single entity that has no outside debt at this time.

16 **Q. Can you summarize your testimony on cost of equity?**

17 A. I recommend a cost of equity of 8.5% based on the overall allowed returns of other  
18 natural gas companies in Tennessee.

19 **Q. What overall cost of capital do you recommend for use as the allowed rate of return**  
20 **for B&W?**

21 A. Since B&W is all equity financed, my recommended overall rate of return is the same as  
22 my recommended equity return of 8.5%.

1 Q. How is your testimony organized?

2 A. I will address the concept of cost of capital first, then the cost of equity.

3

4 **COST OF CAPITAL**

**5 Q. What do you mean by cost of capital?**

6     A.     I mean the rate of return necessary to induce investors to hold the debt and stock, or  
7           equity, of a company. This rate of return should be equal to that available to investors on  
8           alternative investments of similar risk.

9     **Q.     How is the cost of capital related to the legal principles of determining the allowed**  
10     **rate of return for regulated utilities?**

A. The cost of capital concept embodies the economic principles for determining the allowed rate of return set out by the U.S. Supreme Court in *Bluefield Water Works v. P.S.C.* (262 U.S. 679, 1923) and *F. P. C. v. Hope Natural Gas Co.* (320 U. S. 591, 1944). For instance, the Court stated in *Hope* that, "...the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital." (320 U.S. 603) In my opinion, the allowed rate of return on the capital employed by B&W should be set equal to its cost of capital.

20     **Q.     What are the consequences of not setting the allowed rate of return equal to the cost**  
21     **of capital?**

22     A.     If the allowed rate of return is set below the cost of capital, then the company's credit  
23           rating will fall and its cost of debt will rise. The price of its stock will decline to reflect

1 the lower expected return. Eventually, the company may face difficulties in financing  
2 investments in new plant and equipment, causing the quality of its products and services  
3 to decline.

4 If the allowed rate of return is set above the cost of capital, then the firm's owners  
5 may realize a capital gain as the value of the firm's equity rises to reflect the higher  
6 return. Moreover, the capital gain is paid for by the firm's customers in the form of  
7 excessively high prices.

8 Clearly, failure to set the allowed rate of return equal to the firm's cost of capital  
9 is detrimental to the firm's customers as well as its stockholders.

#### 11 COST OF EQUITY

12 **Q. How do you estimate B&W's cost of equity?**

13 A. I first reviewed the testimony of Mr. Novak for B&W. He recommends an equity return  
14 of 10.12% based on an average of the equity returns from three TRA dockets involving  
15 Tennessee natural gas distribution companies. See page 8 of Mr. Novak's testimony and  
16 Company Exhibit, Schedule 6. There are at least three errors in Mr. Novak's approach  
17 that led me to reject his recommendation.

18 **Q. What are the errors in Mr. Novak's approach to B&W's cost of equity?**

19 A. First, the three firms in the three dockets that he examines are not comparable to B&W.  
20 These are Atmos Energy, Piedmont Natural Gas, and Chattanooga Gas Company. They  
21 are all relatively large gas distribution operations whose stock, or that of their parent  
22 corporations, is publicly traded. B&W operates a relatively short gas transportation  
23 pipeline with only a single unrelated customer. It is an LLC owned by another LLC (Fir

1 Energy), owned by another LLC (MI Energy), owned by another LLC (ID Energy),  
2 owned by several trust funds. None of these entities has stock that is publicly traded.

3 Secondly, Mr. Novak ignores the difference in capital structure between the  
4 distribution companies and B&W. The distribution companies all have about 50% debt  
5 in their capital structures, while B&W is 100% equity financed. It is a well-established  
6 principle of Finance that the more debt a company has, the riskier its equity becomes.  
7 Since investors demand a higher return to compensate them for holding riskier  
8 investments, a higher return on equity is required to compensate the equity owners for the  
9 increased risk associated with debt financing. By using the equity returns of firms with  
10 about 50% debt in their capital structures, Mr. Novak overestimates the equity return  
11 required for a firm financed with 100% equity.

12 Finally, Mr. Novak ignores the most recent equity return in a docket involving a  
13 gas company in Tennessee and he ignores the gas company most comparable to B&W.  
14 Earlier this year the TRA approved a settlement involving Atmos Energy (14-00146) that  
15 involved an equity return of 9.80% and an overall return of 7.73% as shown on page 3 of  
16 my Exhibit. Moreover, the Tennessee gas company most comparable in risk to B&W is  
17 Navitas, B&W's sole unrelated customer. The settlement in Navitas's most recent rate  
18 case before the TRA resulted in a return on equity of over 15%, but an overall return of  
19 only 8.71% as shown on page 2 of my Exhibit.

20 **Q. Why is the overall return, rather than the equity return, important in these cases?**

21 A. To illustrate my answer, I have computed a number of examples shown on page 4 of my  
22 Exhibit. My first example shows how a 100% equity financed firm can increase its  
23 equity return by borrowing money for part of its financing, say 50%. If the firm borrows

1 at an interest rate of 6% for 50% of its capital, then its equity return rises from 10% to  
2 14%, even though the overall return remains at 10%. If the firm can borrow at a lower  
3 interest rate than its overall rate of return, then financing some of its capital with debt will  
4 increase its equity return.

5 **Q. If firms can increase their equity return by holding more debt, then why are not**  
6 **most firms almost 100% debt financed?**

7 A. The answer hinges on the principle that increased debt financing increases the riskiness  
8 of, and the required return on, the firm's equity. As the firm takes on more debt, initially  
9 the increased equity return more than compensates the equity holders for the increased  
10 risk. But as the firm acquires more debt financing, at some point the required return on  
11 equity due to the increased risk exceeds the increase in the equity return as a result of the  
12 additional debt financing. The balancing of these effects leads firms to their optimal  
13 capital structure. For most gas companies in Tennessee, this amounts to about 50% debt  
14 financing.

15 **Q. How does this help estimate the required equity return for B&W?**

16 A. If we know that the optimal capital structure for gas companies is generally in the area of  
17 50% debt and 50% equity, then the resulting overall return minimizes the firm's cost of  
18 capital. This overall return then serves as a lower bound on the firm's required equity  
19 return when it is 100% equity financed. I have provided examples of overall returns for  
20 firms with 50% debt at different interest rates and a 10% return on equity on page 4 of  
21 my Exhibit.

1   **Q.     What is the resulting range of overall return estimates for B&W?**

2   A.     My examples 2 through 4 on page 4 of my Exhibit result in overall returns between 8%  
3           and 9%. This suggests a reasonable range of equity returns for the all-equity financed  
4           B&W is 8% to 9%.

5   **Q.     What equity return do you recommend for B&W?**

6   A.     I recommend the midpoint of this range, or 8.5%.

7   **Q.     Why can't you use the usual cost of equity estimation methods, such as the**  
8           **discounted cash flow (DCF) method or the capital asset pricing model (CAPM), for**  
9           **B&W?**

10  A.     B&W and its related LLCs do not have equity in the form of stock that is publicly traded.  
11           Without a stock price, dividend, and growth rate, the DCF cannot be implemented.  
12           Without stock price data that can be used to compute a Beta, the key element of the  
13           CAPM, the CAPM cannot be implemented.

14  **Q.     What methods are usually applied to estimate a cost of equity when regulated firms'**  
15           **stock is not traded?**

16  A.     When a firm's stock is not traded, I prefer the interest-coverage method to estimate a cost  
17           of equity. In this case, an equity return is calculated such that the firm earns a sufficient  
18           overall return to cover the interest on the firm's debt by a certain multiplier (such as 2, for  
19           example). This is the method I applied in Navitas's most recent rate case (12-00068).  
20           Since B&W and its related LLC's have no outside debt, this method is not applicable to  
21           B&W.

22

1 **Q. What confidence do you have that your recommended return for B&W is**  
2 **reasonable?**

3 A. I am confident that the range of 8% to 9% overall return is reasonable for B&W, because  
4 the overall return for Navitas in its most recent rate case of 8.71% falls within this range.  
5 Navitas is the most comparable gas distribution company to B&W in Tennessee.

6 **Q. Why is Navitas comparable in risk to B&W?**

7 A. Navitas is B&W's only unrelated customer for gas transportation service. The operating  
8 risk for Navitas comes from fluctuations in the wholesale price of gas, in the volumes its  
9 customers purchase, and in other input prices. B&W's operating risks come mainly from  
10 the variations in the volumes that Navitas requires and from other input prices. B&W  
11 only transports gas, so fluctuations in the price of natural gas are not a factor. Navitas is  
12 also a relatively small company that is related to a number of other companies, none of  
13 whom have stock that is traded. Among regulated gas distribution companies in  
14 Tennessee, Navitas is the most comparable to B&W.

15  
16 **CONCLUSION**

17 **Q. Please summarize your recommendations.**

18 A. I find that a reasonable range for overall rates of return for B&W is 8% to 9%. Since  
19 B&W is 100% equity financed, this is also a reasonable range for returns on equity for  
20 B&W. I recommend the midpoint of this range, 8.5%, as the return on equity and overall  
21 allowed return for B&W.

22 **Q. Does this conclude your testimony at this time?**

23 A. Yes.

**BEFORE THE TENNESSEE REGULATORY AUTHORITY  
NASHVILLE, TENNESSEE**

Petition of B&W Pipeline, LLC	)	
For an Increase in Rates	)	DOCKET NO. 15-00042

**PRE-FILED DIRECT EXHIBIT OF**

**CHRISTOPHER C. KLEIN, PH.D.**

**ON BEHALF OF THE TENNESSEE ATTORNEY GENERAL  
CONSUMER ADVOCATE AND PROTECTION DIVISION**

**August 11, 2015**

**Navitas Consolidated  
Capital Structure and Cost of Capital  
Docket 12-00068 Settlement**

<u>Component</u>	<u>Amount</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Short Term Debt	\$481,889	4.26%	6.89%	0.293%
Long Term Debt	\$7,631,609	67.5%	6.02%	4.064%
Common Equity	\$3,187,038	<u>28.24%</u>	15.40%	<u>4.35%</u>
Total	\$11,300,536	100%		8.71%

**Atmos Energy Corporation**  
**Capital Structure and Cost of Capital**  
**14-00146 Settlement**

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Short Term Debt	5.01%	1.07%	0.05%
Long Term Debt	41.86%	5.90%	2.47%
Common Equity	<u>53.13%</u>	9.80%	<u>5.21%</u>
Total	100%		7.73%

### Examples of 50% Debt, 50% Equity Financing

- 1) Suppose the firm is 100% equity financed earning a 10% rate of return on equity, but can borrow funds at a rate of 6%.

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Equity	<u>100%</u>	10%	<u>10%</u>
Total	100%		10%

If the firm chose to finance with 50% debt and 50% equity, then it's return on equity increases to 14% with the same overall return of 10%.

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Debt	<u>50%</u>	6%	<u>3%</u>
Equity	<u>50%</u>	14%	<u>7%</u>
Total	100%		10%

- 2) Cost of debt is 6%, equity return is 10%

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Debt	<u>50%</u>	6%	<u>3%</u>
Equity	<u>50%</u>	10%	<u>5%</u>
Total	100%		8%

- 3) Cost of debt is 7%, equity return is 10%

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Debt	<u>50%</u>	7%	<u>3.5%</u>
Equity	<u>50%</u>	10%	<u>5%</u>
Total	100%		8.5%

- 4) Cost of debt is 8%, equity return is 10%

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Debt	<u>50%</u>	8%	<u>4%</u>
Equity	<u>50%</u>	10%	<u>5%</u>
Total	100%		9%

VITA

**CHRISTOPHER C. KLEIN**

**EDUCATION:**

Ph. D. (Economics), University of North Carolina - Chapel Hill (1980)  
B. A. (Economics), University of Alabama - Tuscaloosa (1976)

**EXPERIENCE:**

2002-Present	<b>Middle Tennessee State University</b> Professor of Economics, 2013-Present Associate Professor of Economics, 2002-2013
2002-Present	<b>Consultant</b> Clients included: AGL Resources, Inc.; Reseller Coalition; Tennessee Advisory Commission on Intergovernmental Relations; Tennessee American Water Company, Inc.; Tennessee Attorney General, Consumer Advocate and Protection Division; Tennessee Department of Environment and Conservation; US LEC of Tennessee, Inc.; Verizon Wireless; West Virginia American Water Company, Inc.; Z-Tel Communications, Inc.
1996-2002	<b>Tennessee Regulatory Authority</b> Chief, Economic Analysis Division, 1997-2002 Chief, Utility Rate Division, 1996-97
1998-2001	<b>Vanderbilt University</b> Adjunct Associate Professor of Economics
1986-1996	<b>Tennessee Public Service Commission</b> Director, Utility Rate Division, 1994-96 Economist & Research Director, 1993-94 Commission Economist, 1986-1993
1990-1994	<b>Middle Tennessee State University</b> Adjunct Faculty, Department of Economics and Finance
1980-1986	<b>Federal Trade Commission</b> Economist, Bureau of Economics - Antitrust Division

**PROFESSIONAL ACTIVITIES:**

Editor, *Journal for Economic Educators*, 2007 to present.  
Member 1994-96, State Staff, Federal-State Joint Board, Federal Communications Commission  
CC Docket No.80-286 ("Separations" Joint Board).  
Chair 1993-95, member 1990-95, Research Advisory Committee to the Board of Directors of the  
National Regulatory Research Institute at Ohio State University.

Member 1990-95, Staff Subcommittee on Gas, National Association of Regulatory Utility Commissioners.  
Group Leader: Economics, Contracts, and Non-affiliate Revenue; NARUC\* Staff Subcommittee on Accounts Multi-state Audit Team, 1988 Report on Bell Communications Research.  
Referee: *Applied Economics, Contemporary Economic Policy, Eastern Economic Journal, Land Economics, Management and Decision Economics, Media Economics, Review of Industrial Organization, Social Science Quarterly, Southern Economic Journal.*  
Memberships: American Economic Association (AEA, since 1981), Southern Economic Association (1982), Industrial Organization Society (1986), Western Economic Association (2003).

#### **HONORS:**

Beta Gamma Sigma, International Honor Society for Collegiate Schools of Business, 2008  
Top 30 Score, 2003-2004 Student Evaluation of Faculty Performance, Jones College of Business, Middle Tennessee State University.  
Resolution of Recognition, National Regulatory Research Institute, 1995  
Listed in various Who's Who publications, 1990-  
Certificate of Commendation, Federal Trade Commission, 1985  
First in my class to complete the Ph. D., 1980  
Alpha Pi Mu, National Industrial Engineering Honorary, 1973

#### **GRANTS RECEIVED:**

MTSU Jones College Summer Research Grant: 2004, 2005, 2007, 2012.  
MTSU Faculty Research and Creative Activity Academic Year Grant: 2004-2005 (with Reuben Kyle)  
MTSU Faculty Research and Creative Projects Committee Summer Salary Grant: 2006, 2009.

#### **TEACHING** **At MTSU**

ECON 2420, Principles of Economics – Microeconomics  
ECON 3520, Intermediate Microeconomic Theory  
ECON 4400, Economics of Antitrust and Regulation  
ECON 4570, Managerial Economics  
ECON 4620/5620, Econometrics and Forecasting  
ECON 4720, Economic Issues in the Music Industry  
ECON 7121, Seminar in Applied Microeconomic Theory (Ph.D. Program)  
ECON 7250, Methods of Outcome Assessment (Ph.D. Program)  
Student Internships (ECON/FIN 4890, ECON/FIN 5890, ECON/FIN 6440)

#### **At Vanderbilt University**

ECON 252, Antitrust Economics  
ECON 283, Economics of Regulation

#### **MTSU Dissertation Committees**

Shea W. Slonaker, Chair, *Three Essays on the Recorded Music Industry*, Ph. D. 2009.

Hua Liu, *U.S. Trade Deficit, Productivity Growth and Offshore Outsourcing*, Ph. D. 2006.

Jennifer Wilgus, *A Life-Cycle Approach to Human Capital Investment and Skill-Biased Technological Change*, Ph. D. 2005.

Anealia Sasser, *A Theoretical Examination of Title IV Financial Aid for Higher Education*, D.A. 2004.

**Vanderbilt University Dissertation Committees:**

Aster Adams, *The Impact of Deregulation and Competition on Efficiency, Financial Performance, and Shareholder Wealth of Electric Utilities in the United States*, Ph. D. 2009.

David B. Sapper, *Trial Selection and the Effects of Sentencing Reform in Criminal Antitrust Cases: A Theoretical and Empirical Analysis*, Ph. D. 2006.

T. Randolph Beard, *Bankruptcy, Safety Expenditure, and Safety Regulation in the Motor Carrier Industry*, Ph. D. 1988

**PUBLICATIONS**

"The Music Industry as a Vehicle for Economic Analysis," *Journal of Economic Education*, forthcoming, 2015.

"Education Production Functions," *Encyclopedia of Educational Theory and Philosophy*, D. Phillips ed., Sage: Los Angeles, 2014.

"Econometrics as a Capstone Course in Economics," *Journal of Economic Education*, 2013.

"Identifying the Best Buys in U.S. Higher Education," with E. Anthon Eff and Reuben Kyle, *Research in Higher Education*, 2012.

"Chart Turnover and Sales in the Recorded Music Industry: 1990-2005," with Shea W. Slonaker, *Review of Industrial Organization*, 36:351-372, 2010.

"What Can We Learn from Education Production Studies?" with E. Anthon Eff, *Eastern Economic Journal*, 36:450-479, 2010.

"Public Transportation Ridership Levels," with Christopher R. Swimmer, *Journal for Economic Educators*, 10(1): 40-46, Summer 2010.

"Analysis of U.S. Foreign Aid Determinants for 2003," with Joshua M. Hill, *Journal for Economic Educators*, 9(1): 48-52, Summer 2009.

"Intra-district Public School Funding Equity and Performance in Nashville, Tennessee," *Journal of Education Finance*, Summer 2008.

"A Tale of Three Inputs: Cost and Production Duality with Time Utilization of Capital," *Applied Economics Research Bulletin*, 1(1) 2008.

"Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster R. Adams and David B. Sapper, *Journal of Applied Regulation*, 2, November 2004, pp. 87-108.

"A Switching Regime Approach to Measuring the Effects of Technological Change in Ocean Shipping," with J. David Bass and Reuben Kyle, *Journal of Productivity Analysis*, 22:1-2, July-September,

2004, pp. 29-49..

"The Financial Implications of Unbundling on Bell Company Profits: A Review of the Evidence," with T. Randolph Beard and George S. Ford, *CommLaw Conspectus: The Journal of Communications Law and Policy*, v. 12 n.1, Fall/Winter 2003.

"Bell Companies as Profitable Wholesale Firms: The Financial Implications of UNE-P," with T. Randolph Beard, *Phoenix Center Policy Paper No. 17*, November 2002, [www.phoenix-center.org](http://www.phoenix-center.org).

"Connecting Tennessee: Bridging the Digital Divide," with Rose M. Gregory, *NRRI Quarterly Bulletin*, vol. 21 no. 3, Spring 2001.

"Regulation vs. Deregulation: It's All in the Externalities," *Tennessee's Business*, Middle Tennessee State University, v. 11, n. 3 (November), 2001.

"The Role of Public Power in a Restructured Electric Power Industry," with David Sapper, *The Electricity Journal*, August/September 2001.

"Regulator Preferences and Utility Prices: Evidence from Natural Gas Distribution Utilities," with George Sweeney, *Energy Economics*, vol. 21, n. 1, 1999.

"Competition in Telecommunications: A Progress Report for Tennessee," *Tennessee's Business*, Middle Tennessee State University, Murfreesboro, TN; vol. 9, n. 1, 1999.

"Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, *Review of Industrial Organization*, December 1997.

"The Haunting of Universal Service: Open Markets, Efficient Funding and the Ghost of the Fair Rate of Return," *Proceedings of Tenth NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1996.

"Productivity Growth in Telecommunications: The Case of Tennessee," *Proceedings of Tenth NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1996.

"Capture vs. Compromise: Entry Regulation of Intrastate Trucking," with Reuben Kyle and Jennifer Wilgus, *Logistics and Transportation Review*, v. 32 n. 3, September 1996.

"Price Discrimination: What is 'Undue' for a U.S. Utility?" *Utilities Policy*, vol. 4 no. 4, October 1994.

"Single Service Price Variations and 'Subsidies' in the Pricing of Telecommunications Services," *Proceedings of Ninth NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1994.

"What Is Undue Price Discrimination by a Regulated Utility?" *NRRI Quarterly Bulletin*, March 1994.

"A Comparison of Cost-Based Pricing Rules for Natural Gas Distribution Utilities," *Energy Economics*, July 1993.

"Negotiating a Transportation Rate Under Threat of Bypass: A Case Study," *Proceedings of the Eighth Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1992.

"A Multinomial Logit Model of Intrastate Trucking Regulation in Tennessee," with Jennifer Jose and Reuben Kyle, *Papers and Proceedings of the Nineteenth Annual Meeting of the Midsouth Academy of Economics and Finance*, v. 16, 1992.

"Ramsey Prices for Natural Gas Distribution Utilities," *Proceedings of the Seventh NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1990.

"Intervention as Entry Deterrence: Evidence from Sham Litigation Cases," *Proceedings of the Seventh NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1990.

Book Review, *Changing the Rules: Technological Change, International Competition, and Regulation in Communications*, Edited by Robert W. Crandall and Kenneth Flamm, Brookings 1989; *Review of Industrial Organization*, Fall 1990.

"Double Leverage and Strategic Financing Decisions," *NRRI Quarterly Bulletin*, v. 11, n. 3, September 1990.

"Predation in the Courts: Legal Versus Economic Analysis in Sham Litigation Cases," *International Review of Law & Economics*, June 1990.

"Rate Design for Natural Gas Utilities: A Comparison of Ramsey and Cost of Service Pricing," *NRRI Quarterly Bulletin*, December 1989.

"Dissecting Divestiture: A Telecommunications Book Review Article," *Review of Industrial Organization*, October 1989.

*The Economics of Sham Litigation: Theory, Cases, and Policy*, Bureau of Economics Staff Report, Federal Trade Commission, April 1989.

"New Agreements, Non-affiliate Revenues, and Economic Issues," with Mike Amato and Francis Fok, in *Report on Bell Communications Research*, National Association of Regulatory Utility Commissioners, 1988.

"Merger Incentives and Cost of Capital Regulation of Subsidiaries," *Midsouth Journal of Economics and Finance*, March 1988.

"Strategic Sham Litigation: Economic Incentives in the Context of the Case Law," *International Review of Law & Economics*, December 1986.

"Is There a Principle for Defining Industries? Comment," *Southern Economic Journal*, October 1985.

"A Note on Defining Geographic Markets," with Ed Rifkin and Noel Uri, *Regional Science and Urban Economics*, February 1985.

"Process Analysis, Capital Utilization, and the Existence of Dual Cost and Production Functions," FTC Bureau of Economics Working Paper No. 116, May 1984.

"A General Theory of Hedonic Pricing of Capital as a Factor of Production," FTC Bureau of Economics Working Paper No. 105, December 1983.

"The International Market for Crude Oil," with Fred Lipson and Harvey Blumenthal, in *Mergers in the Petroleum Industry*, Federal Trade Commission, 1982.

## PRESENTATIONS

- “The Music Industry as a Vehicle for Economic Analysis,” Southern Economic Association Annual Conference, Atlanta, GA, November 2014.
- “The Music Industry as a Vehicle for Economic Analysis,” American Economic Association National Conference on Teaching Economics, Chicago, IL, May 2013.
- “Supply Innovation and Sales of Recorded Music: 1990-2010,” Southern Economic Association Annual Conference, New Orleans, LA, November 2012.
- “Econometrics as a Capstone Course in Economics,” American Economic Association National Conference on Teaching Economics, Boston, MA, May 2012.
- “Music Supply, Chart Turnover, and the Random Copying Hypothesis in the Digital Age,” with Shea Slonaker, International Industrial Organization Conference, Arlington, VA, March 2012.
- “Econometrics as a Capstone Course in Economics,” Southern Economic Association Annual Conference, Washington, DC, November 2011.
- “Do State Funded Merit Scholarships for Higher Education Reduce High School Dropout Rates for All Students?” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Washington, DC, November 2011.
- “Do State Funded Merit Scholarships for Higher Education Improve Pre-College Academic Performance?” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Atlanta, GA, November 2010.
- “The Effect of State Funded Merit Scholarships for Higher Education on Pre-College Academic Performance,” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, San Antonio, TX, November 2009.
- “The Effect of State Funded Merit Scholarships for Higher Education on High School Graduation Rates,” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Washington, DC, November 2008.
- “Identifying the Best Buys in U.S. Higher Education,” with E. Anthon Eff and Reuben Kyle, Southern Economic Association Annual Conference, Washington, DC, November 2008.
- “Product Variety and Sales in the Recorded Music Industry: 1990-2005,” with Shea Slonaker, International Industrial Organization Conference, Arlington, VA, May 2008.
- “Identifying the Best Buys in U.S. Higher Education,” with E. Anthon Eff and Reuben Kyle, Academy of Economics and Finance Annual Meeting, Nashville, TN, February 2008.
- “Product Variety and Sales in the Recorded Music Industry: 1990-2005,” with Shea Slonaker, Academy of Economics and Finance Annual Meeting, Nashville, TN, February 2008.
- “Do State Funded Merit Scholarships Induce Students to Learn more in High school?” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, New Orleans, LA, November 2007.
- “The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education,” with Reuben Kyle, Southern Economic Association Annual Conference, New Orleans, LA, November 2007.

- "The Shifting Appeal of Sham Litigation: Evidence from Appellate Decisions 1971-2006," International Industrial Organization Conference, Savannah, GA, April 2007.
- "The Shifting Appeal of Sham Litigation: Evidence from Appellate Decisions 1980-2006," Scholar's Week Poster Fair, MTSU, April 2007
- "Causality Tests for Public School Funding and Performance," Southern Economic Association Meeting, Charleston, SC, November 2006.
- "The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, Southern Economic Association Meeting, Washington, November 2005.
- "The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, International Industrial Organization Conference, Atlanta, April 2005.
- "Anticompetitive Litigation and the "Baselessness" Standard for Antitrust Liability," Southern Economic Association Meeting, New Orleans, November 2004.
- "The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, Southern Economic Association Meeting, New Orleans, November 2004.
- "VoIP: Let's Ask the Right Questions," Tennessee Regulatory Authority Forum on VoIP, Nashville Public Library, April 30, 2004.
- "Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster Rutibablira and David B. Sapper, Southern Economic Association Meeting, San Antonio, TX, November 2003.
- "Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster Rutibablira and David B. Sapper, International Industrial Organization Conference, Boston MA, April 4-5, 2003.
- "A Critique of Educational Production Functions," Southern Economic Association meeting, New Orleans, LA, November 2002.
- "Connecting Tennessee: Bridging the Digital Divide," with Rose M. Gregory, American Economic Association meeting, joint session with the Transportation and Public Utilities Group, Atlanta, GA, January 2002.
- "Long Term Contracts as Anticompetitive Devices in Telecommunications," Southern Economic Association Annual Meeting, Tampa, FL, November 2001.
- "The Role of Public Power in a Restructured Electric Power Industry," American Economic Association meeting, joint session with the Transportation and Public Utilities Group, Boston, MA, January 2000.
- "Universal Telephone Service in Tennessee: A Pre-Competition Assessment," with David Sapper, Southern Economic Association meeting, New Orleans, LA, November 1999.
- "Trucks, Planes, Trains, and Wires? Short-haul vs. Long-haul Long Distance Rates in Telecommunications," with Reuben Kyle, Southern Economic Association meeting, Baltimore, MD, November 1998.
- "The Economics of Time as a Resource," Southern Economic Association meeting, Atlanta, GA, November 1997.
- "Cost and Production Duality with Capital Utilization," Department of Economics Seminar Series, Vanderbilt University, February 1997.

- "Maximum Impropriety: The 'Baselessness' Standard for Improper Litigation," Southern Economic Association meeting, Washington, November 1996.
- "Cost and Production Duality with Capital Utilization," Southern Economic Association meeting, Washington, November 1996.
- "The Haunting of Universal Service: Open Markets, Efficient Pricing, and the Ghost of the Fair Rate of Return," Tenth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1996.
- "Productivity Growth in Telecommunications: The Case of Tennessee," Tenth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1996.
- "Productivity Growth in Telecommunications: The Case of Tennessee," Advanced Workshop in Regulation and Public Utility Economics, 15th Annual Conference, Lake George, NY, May 1996.
- "A Switching Regime Approach to Measuring the Effects of Technological Change in Ocean Shipping," with Reuben Kyle, Southern Economic Association meeting, New Orleans, November 1995.
- "Productivity Growth in Telecommunications: The Case of Tennessee," Southern Economic Association meeting, New Orleans, November 1995.
- "Local Service Price Variations and 'Subsidies' in Telecommunications," Southern Economic Association meeting, Orlando, November 1994.
- "Dynamic Effects of Regulatory Policy on Intrastate Long Distance Telephone Rates," Southern Economic Association meeting, Orlando, November 1994.
- "Single Service Price Variations and 'Subsidies' in the Pricing of Telecommunications Services," Ninth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1994.
- "Suit, Countersuit, and Settlement in Sham Litigation," Annual Meeting of the Midsouth Academy of Economics and Finance, Nashville, February 1994.
- "New Evidence on the Effect of Regulation on Intrastate Long Distance Telephone Rates," Annual Meeting of the Midsouth Academy of Economics and Finance, Nashville, February 1994.
- "What is Undue Price Discrimination for a Public Utility?" Southern Economic Association meeting, New Orleans, November 1993.
- "Regulated Utility Prices and the Preferences of Regulators," with George Sweeney, Southern Economic Association meeting, New Orleans, November 1993.
- "A Test for Strategic Behavior Under Rate of Return Regulation," Southern Economic Association meeting, Washington, November 1992.
- "New Evidence on the Effect of Regulatory Policy on Intrastate Long Distance Telephone Rates," Southern Economic Association meeting, Washington, November 1992.
- "Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, Atlantic Economic Association meeting, Plymouth, MA, October 1992.
- "Negotiating a Transportation Rate Under Threat of Bypass: A Case Study," Eighth Biennial Regulatory Information Conference, Columbus, OH, September 1992.

- "A Multinomial Logit Model of Intrastate Trucking Regulation in Tennessee," with Jennifer W. Jose and Reuben Kyle, Midsouth Academy of Economics and Finance annual meeting, Mobile, February 1992.
- "Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, Southern Economic Association meeting, Nashville, November 1991.
- "Suit, Countersuit, and Settlement in Sham Litigation Cases," Southern Economic Association meeting, Nashville, November 1991.
- "Implementing Third Best Pricing Rules for Natural Gas Distribution Utilities," Southern Economic Association meeting, Nashville, November 1991.
- "Trucking Regulation in Tennessee," with Jennifer Jose and Reuben Kyle, Southern Economic Association meeting, Nashville, November 1991.
- "Research and Development in Regulated Markets: The Case of Bell Communications Research," Southern Economic Association meeting, New Orleans, November 1990.
- "Incentives for Trial and Settlement in Sham Litigation," Southern Economic Association meeting, New Orleans, November 1990.
- "Ramsey Prices for Natural Gas Distribution Utilities," Seventh NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1990.
- "Intervention as Entry Deterrence: Evidence from Sham Litigation Cases," Seventh NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1990.
- "Funding Research and Development in Regulated Industries: The Case of Bell Communications Research," Ninth Annual Conference of the Advanced Workshop in Regulation and Public Utility Economics, New Paltz, NY, May 30 - June 1, 1990.
- "Incentives for Trial and Settlement in Sham Litigation," Bureau of Economics Seminar, Federal Trade Commission, February 1990.
- "Estimating Ramsey Prices for Natural Gas Utilities," Southern Economic Association meeting, Orlando, November 1989.
- "Incentives for Trial and Settlement in Sham Litigation," Department of Economics Seminar Series, Auburn University, November 1989.
- "Natural Gas Rate-Making: Now and In the Future," Associated Valley Industries Natural Gas Seminar, Nashville, October 1989.
- "Estimating Ramsey Prices for Natural Gas Utilities," Advanced Workshop in Regulation and Public Utility Economics, Eighth Annual Conference, Newport, RI, May 29-31, 1989.
- "The Role of Bell Communications Research in the Telecommunications Markets," Midsouth Academy of Economics and Finance Annual Conference, Nashville, February 1989.
- "The Organizational Structures of Public Utilities Under Different Regulatory Regimes," Southern Economic Association meeting, San Antonio, November 1988.

"New Agreements, Non-affiliate Revenues, and Economic Issues," Report on Bell Communications Research, NARUC Multi-state Audit Team, presented to NARUC Staff Sub-committee on Accounts, Kalispell, Montana, September 1988.

"Predation in the Courts: Empirical Analysis of Sham Litigation Cases," Joint Session of the Industrial Organization Society and the American Economic Association, Chicago, December 1987.

"Rate of Return on Equity," National Conference on Unit Valuation Standards, Nashville, December 1987.

"Merger Incentives and Organizational Structures Under Cost of Capital Regulation," Southern Economic Association meeting, Washington, November 1987.

"Merger Incentives and Cost of Capital Regulation of Subsidiaries," Midsouth Academy of Economics and Finance Annual Conference, Mobile, February 1987.

"The Incidence of Predatory Sham Litigation," Southern Economic Association meeting, New Orleans, November 1986.

"A Welfare Analysis of the Department of Justice Merger Guidelines," Southern Economic Association meeting, Dallas, November 1985.

"A Duality Approach to Labor Costs and Shiftwork," Southern Economic Association meeting, Atlanta, November 1984.

"Strategic Sham Litigation: Economic Incentives in the Context of the Case Law," Southern Economic Association meeting, Atlanta, November 1984.

"A General Theory of Hedonic Pricing of Capital as a Factor of Production," Southern Economic Association meeting, Washington, November 1983.

## **ECONOMIC TESTIMONY**

Testimony before the Public Service Commissions of Alabama, Louisiana, North Carolina, and South Carolina on behalf of the Reseller Coalition, various docket numbers, August 2010-May 2011.

In the United States District Court for the Middle District of Tennessee: Owner-Operator Independent Drivers Association Inc. v. Keith Bissell, No. 3-90-0251, March 1992, (Affidavit).

Before the Federal Communications Commission: Represcribing the Authorized Rate of Return for Interstate Services of Local Exchange Companies, CC Docket No. 89-624, March 1990.

Before the Tennessee General Assembly: various Committees, 1994 - present.

Before the Tennessee Advisory Commission on Intergovernmental relations:  
"Report on Pole Attachment Rate Study," with Reuben Kyle, January 18, 2007.

Before the Tennessee Regulatory Authority (docket numbers in parentheses):

Petition of Atmos Energy Corporation for a General Rate Increase (14-00146), April 2015.

Petition of Piedmont Natural Gas Company, Inc. for Approval of a CNG Infrastructure Rider to Its Approved Rate Schedules and Service (14-00086), December 2014.

Petition to Revise Performance Based Ratemaking Mechanism Rider in Atmos Energy Corporation's Tariff (13-00111), November 2013.

Petition of Navitas TN NG, LLC for a General Rate Increase (12-00068), November 2012.

Petition of Laurel Hills Condominiums Property Owners Association for a Certificate of Convenience and Necessity (12-00030), October 2012.

Petition of Atmos Energy Corporation for an Adjustment of Rates (12-00064), September 2012.

Petition of Berry's Chapel Utility, Inc. to Change and Increase Rates and Charges (11-00198), April 2012.

Petition of Piedmont Natural Gas, Inc. for an Adjustment to Its Rates, Approval of Changes to Its Rate Design, Amortization of Certain Deferred Assets, Approval of New Depreciation Rates, Approval of Revised Tariffs and Service Regulations, and Approval of a New Energy Efficiency Program and GTI Funding, (11-00144), December 2011.

Petition of Tennessee American Water Company to Change and Increase Certain Rates and Charges so as To Permit It to Earn a Fair and Adequate Rate of Return on Its Property Used and Useful in Furnishing Water Service to Its Customers, (11-00189), April 2011.

Petition of Chattanooga Gas Company for General Rate Increase, Implementation of the EnergySmart Conservation Programs, and Implementation of a Revenue Decoupling Mechanism, (09-00183), April 2010.

Petition of Piedmont Natural Gas Company, Inc. to Implement a Margin Decoupling Tracker (MDT) and Related Energy Efficiency and Conservation Programs, (09-00104), December 2009.

Tennessee Rural Coalition Petition for Suspension and Modification Pursuant to 47 U.S.C. 1251(f)(2), (06-00228), May 2007.

Complaint of US LEC of Tennessee, Inc. against Electric Power Board of Chattanooga (02-00562), Feb. 2004.

Before the Tennessee Public Service Commission\* (docket numbers in parentheses):

BellSouth D/B/A South Central Bell (95-02614) October 1995.\*\*

United Telephone - Southeast (95-02615) September 1995.

United Telephone - Southeast (93-04818) January 1994.\*\*

Chattanooga Gas Company (93-06946) December 1993.

South Central Bell Tariff 93-039 (93-03038) May 1993.\*\*

South Central Bell (92-13527, et al) April 1993.\*\*

Kingsport Power Co. (92-04425) October 1992.

United Cities Gas Co. (92-02987) Sept. 1992.

L & L Trucking, Inc. (91-06786) February 1992.\*\*

Chattanooga Gas Company (91-03765) October 1991.

GTE South (91-05738) August 1991.\*\*

Nashville Gas Company (91-02636) August 1991.

Intra-LATA "Competition" (89-11065, et al) Feb. 1991.

---

\* Written (prefiled) testimony on cost of capital, rate design, competitive effects, and/or other issues.

\*\* Oral testimony as well as written.

United Intermountain Tel. Co.(90-07832) Dec. 1990.\*\*  
Kingsport Power Company (90-05736) Nov. 1990.\*\*  
AT&T - South Central States (90-07460) Oct. 1990.\*\*  
L & L Trucking (90-03514; 90-04786) August 1990.\*\*  
South Central Bell Tel. Co. (90-05953) August 1990.\*\*  
GTE South (90-01273) June 1990.  
Radio Common Carriers (89-11234) Nov. 1989.\*\*  
Nashville Gas Co. (89-10491) Oct. 1989.  
United Cities Gas Co. (89-10017) Sept. 1989.  
Crockett Telephone Co. (89-02325) May 1989.  
ALLTEL Tennessee (89-02324) May 1989.  
West Tennessee Telephone Co. (89-02323) May 1989.  
Peoples Telephone Co. (89-02322) May 1989.  
Ooltewah-Collegedale Telephone Co. (89-02321) May 1989.  
Kingsport Power Co. (89-02126) March 1989.\*\*  
Chattanooga Gas Co. (88-01363) February 1989.\*\*  
Tennessee-American Water Co. (U-87-7534) March 1988.  
Tellico Telephone Co. (U-87-7532) February 1988.  
Claiborne Telephone Co. (U-87-7508) November 1987.\*\*  
Nashville Gas Co. (U-87-7499) October 1987.\*\*  
Kingsport Power Co. (U-86-7472) May 1987.\*\*  
United Cities Gas Co. (U-86-7442) February 1987.\*\*  
General Telephone of the South (U-86-7437) Nov. 1986.\*\*

