HOUSEHOLD EXPENDITURES, PRICES, AND RATE DESIGN FOR
UTILITY SERVICES: TRENDS AND DISTRIBUTIONAL EFFECTS

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Celebrating 50 years of service to the regulatory policy community

MICHIGAN STATE UNIVERSITY

The Institute of Public Utilities at MSU

- IPU-MSU has served the regulatory policy community since 1965
  - More than 20,000 domestic and international program alumni
- IPU’s mission
  - To support informed, effective, and efficient regulation of the electricity, natural gas, telecommunications, and water industries
- Neutral and integrative educational programs and research
  - A principled approach to regulatory practice
  - An empirical approach to regulatory analysis
  - A reasoned approach to structural and regulatory change
- We teach the “ideal” of economic regulation in the public interest
  - Balancing act theory of regulation – regulators are “in the middle”
  - Regulatory culture and how to apply critical thinking as a regulator
  - Commitment to lifelong learning and appreciating what we don't know
Topics

- Trends in consumer expenditures for utilities
- Trends in consumer prices for utilities
- Combining expenditure and price trends
- Inter-class price trends and distributional effects
- Intra-class price trends and rate structure issues
- Implications for regulatory policy

Household expenditures on utilities (U.S.)
Household expenditures on utilities over time

Annual consumer expenditures on utilities for a four-person household ($)

- Water and other public services
- Fuel oil and other fuels
- Natural gas
- Telephone
- Electricity

Utilities expenditures by income level and regressivity

Consumer expenditures on utilities by income quintile (all consumers 2013)

- Water and other public services
- Fuel oil and other fuels
- Natural gas
- Telephone
- Electricity

Consumer expenditures on utilities by income quintile (all consumers 2013%)
Trends in consumer expenditures on utilities by income quintile (% of total expenditures)

Changes in percentage of consumer expenditures on utilities by income quintile (2003-2013)
CPI trends for utilities (U.S.)

Average annual change in CPI

Source: IPU-MSU based on BLS data.
Expenditure and price trends telecommunications

Household expenditures and CPI for telecommunications

Expenditure and price trends for natural gas

Household expenditures and CPI for natural gas
Expenditure and price trends for electricity

Expenditure and price trends for water
Natural gas price trends by customer class

Average natural gas prices in the U.S. ($/thousand cubic feet)

- Residential (up 58.1% since 1997; down 21.0% since 2008)
- Commercial (up 53.4% since 1997; down 27.2% since 2008)
- Industrial (up 54.0% since 1997; down 42.7% since 2008)

Electricity price trends: regulated and retail access

- Avg. regulated (n=31; up 51.8% for 2002-2014)
- Avg. retail access (n=14; up 41.2% for 2002-2014)
- Avg. all jurisdictions (n=51; up 44.9% for 2002-2014)
Electricity prices: residential, commercial, industrial

Electricity price trends for regulated and retail-access jurisdictions

Changes in electricity prices by customer class for regulated and retail-access jurisdictions
Water price trends by customer class (AWK only)

Distributional effects across sectors (2008-2014)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Residential</th>
<th>Commercial</th>
<th>Industrial</th>
<th>Difference (Ind-Res)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>-21.0%</td>
<td>-27.2%</td>
<td>-42.7%</td>
<td>21.7</td>
</tr>
<tr>
<td>Electricity</td>
<td>Overall</td>
<td>11.0%</td>
<td>4.7%</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Regulated</td>
<td>15.2%</td>
<td>13.0%</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>Retail access</td>
<td>2.4%</td>
<td>-10.1%</td>
<td>13.4</td>
</tr>
<tr>
<td>Water</td>
<td>53.0%</td>
<td>50.3%</td>
<td>36.7%</td>
<td>16.3</td>
</tr>
</tbody>
</table>
Ratio of residential to industrial prices for water (AWR):

Ratio of residential to industrial price for natural gas:

Ratio of residential to industrial price for electricity:

Ratio of residential to industrial price for electricity by ownership:
The large-volume advantage

- Possible explanations for residential and large-volume price differential
  - A significant shift in the cost of service by class – is there evidence?
  - Unwinding of embedded interclass subsidies (re-balancing and de-skewing)
  - Increasing political and economic power of large-volume users
  - Post-recession economic-development goals of commissions (jobs)
  - Weakening representation of residential ratepayer interests before regulators
  - Weakening regulatory orientation toward residential ratepayers

- Price trends are suggestive of Ramsey pricing
  - Also known as the “inverse elasticity rule”
  - Use pricing policies to allocate costs toward price-inelastic usage
  - Favored by competitive markets and thus deregulation
  - Tempered by regulation’s pursuit of “just and reasonable” rates
  - “[T]he application of Ramsey pricing should be tempered with an appreciation for the distributional consequences of such pricing in any particular situation. The fact that Ramsey prices obtain the greatest total surplus does not guarantee that they are ‘best’ or even ‘good’ by other social criteria that the regulator might consider relevant” (K. Train, 1991).

Aggregate industry growth trends

- Five-year growth rates for natural gas
- Five-year growth rates for electricity
- Five-year growth rates for water
Raising fixed charges for electricity

Utility Proposals to Increase Fixed Charges

Source: Sierra Club.

Fixed Monthly Fees Across Investor-Owned Electric Utilities in the Midwest

Source: Midwest Energy News.

Recent cases

<table>
<thead>
<tr>
<th>Utility</th>
<th>Old fixed</th>
<th>Proposed fixed</th>
<th>% Increase</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madison Gas &amp; Electric</td>
<td>$10.44</td>
<td>$69.00</td>
<td>560.9%</td>
<td>$19 (82%)</td>
</tr>
<tr>
<td>Peco Energy Co.</td>
<td>$7.13</td>
<td>$12.00</td>
<td>68.3%</td>
<td>pending</td>
</tr>
<tr>
<td>PPL Electric</td>
<td>$14.13</td>
<td>$20.00</td>
<td>41.5%</td>
<td>pending</td>
</tr>
<tr>
<td>Pacific Power</td>
<td>$7.75</td>
<td>$14.00</td>
<td>80.6%</td>
<td>rejected</td>
</tr>
<tr>
<td>Xcel</td>
<td>$8.00</td>
<td>$9.25</td>
<td>15.6%</td>
<td>rejected</td>
</tr>
</tbody>
</table>
Fixed v. variable costs and charges

- Fixed and variable tariff charges may not match fixed and variable costs
  - Many utilities recover some fixed costs through variable charges
  - Improves price signals about capacity requirements
  - Environmental and consumer advocates both prefer higher variable charges,
  - Consumer advocates also worry about higher bills overall

- Functional unbundling of infrastructure and commodity costs
  - Restructured gas markets and growing interest in electricity and water
  - Infrastructure pricing is still generally usage based

- Straight fixed-variable pricing and the impulse to raise fixed charges
  - More problematic in water than energy due to very high fixed costs
  - Alters incentives for efficiency and innovation and undermines equity
  - Alternative pricing means may be needed (especially for capacity costs)
  - Suggests adjustment to allowed returns due to lower revenue risk

<table>
<thead>
<tr>
<th></th>
<th>Fixed charge</th>
<th>Variable charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer costs</td>
<td></td>
<td>Capacity costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commodity costs</td>
</tr>
</tbody>
</table>

Survey of 50 largest U.S. cities (Black & Veatch, 2013)

Fixed and variable charges for water and sewer (top 50 cities)
Fixed v. variable charges: tradeoffs

<table>
<thead>
<tr>
<th>Recovering more from fixed charges</th>
<th>Recovering more from variable charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the short run, many costs are fixed (static world view)</td>
<td>In the long run, all costs are variable (dynamic world view)</td>
</tr>
<tr>
<td>Enhances revenue stability (less sales risk)</td>
<td>Reduces revenue stability (more sales risk)</td>
</tr>
<tr>
<td>Weakens price signals (less resource efficiency)</td>
<td>Strengthens price signals (more resource efficiency)</td>
</tr>
<tr>
<td>Less affordable for low-income (more regressive)</td>
<td>More affordable for low-income households (less regressive)</td>
</tr>
<tr>
<td>Slight advantage for combined households (sharing the fixed charge)</td>
<td>Sound rate design (informed by elasticities) and efficiency enhance revenue stability</td>
</tr>
</tbody>
</table>

Pricing self-supply (electricity)

- **Persistent equity and efficient issues**
  - Alternative conceptions of value and fairness

- **Three-part tariffs**
  - Fixed customer or meter charge (including dual meter costs)
  - Variable capacity allocated based on system usage (with a minimum)
  - Variable commodity charges based on usage at system cost

- **Solar households with net metering or feed-in tariffs benefit from**
  - Tax subsidies for socially beneficial activities (including solar installations)
  - Lower utility bills due to avoided energy commodity costs
  - Avoidance of short-term capacity costs based on usage
  - Compensation for generated power at avoided marginal (system) costs
  - Reductions in long-term capacity costs (benefitting all users)
  - Access to the grid network for reliability (should support costs)
Multi-objective pricing (water)

- Multi-objective rates can help achieve both equity and efficiency
  - Lifeline rate at lowest block for affordable access to meet basic needs
  - Graduated capacity charge based on property value (related to fire protection)
  - Increasing block rate based on usage to encourage efficiency

Utility poverty, disparity, and divide

<table>
<thead>
<tr>
<th>Low-income</th>
<th>High-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepaid service</td>
<td>Smart service</td>
</tr>
<tr>
<td>Service limiters</td>
<td>Service enhancements</td>
</tr>
<tr>
<td>Low-speed access</td>
<td>High-speed access</td>
</tr>
<tr>
<td>Self-disconnection</td>
<td>Self-supply</td>
</tr>
<tr>
<td>Service outage</td>
<td>Back-up and storage</td>
</tr>
<tr>
<td>Negative discrimination</td>
<td>Positive discrimination</td>
</tr>
<tr>
<td>Discomfort</td>
<td>Comfort</td>
</tr>
<tr>
<td>Inconvenience</td>
<td>Convenience</td>
</tr>
</tbody>
</table>
Observations

- Utility rates are regressive and averages mask disparities
- Utilities and regulators cannot solve intractable poverty
- Prices for utility services are rising, especially for water
- Household expenditures and bills are relatively stable for now
- Price trends across customer classes are uneven
- Overall trends and restructuring favor large-volume customers
- Raising fixed charges has efficiency and equity consequences
- Rising costs and prices bring attention to allocation policies
- Regulators need to be diligent about cost and risk shifting
- Affordability matters to financial sustainability and performance
- Utility poverty, disparity, and divide are potential long-term risks
- Universal network service remains a worthy consideration

Thanks!