2011 Economics Honors Symposium Presentations

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Reinforcement Learning

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Thesis Supervisor: Dale Stahl
The University of Texas at Austin
April 2011

Reinforcement Learning
The Motivation

- How does utility maximizing agent learn objective function and find its global maximum?
- When learning by trial and error agent deals with following limitations:
  1) data collection is costly and with finite samples;
  2) indirect observations of true objective function;
  3) sampling process may be endogenous;
- Given above limitations we are interested in following questions:
  1) Will learning process converge to the true objective function?
  2) Will the sequence of choices converge to a true global maximum?
- Agent is assumed to learn by Reinforcement
Reinforcement Learning

**The Model**

- Objective function \( u(a) \) defined on \( \mathcal{A} \)
- Unique global max \( u(a^*) \)
- \( \mathcal{A} \) is discretized into \( n \) bins
- \( a_i \) is a midpoint of \( i^{th} \) bin
- \( u(a) \) is Lipschitz Continuous
- Bins in \( \epsilon \)-large neighborhoods are similar

![Graph showing \( u(x) \) and \( v_i(x) \)]

- Subsequent configurations of potential function \( v_i(x) \) record progress of learning
- Next bin is chosen by means of \( p_i(v_i) \)
\[
p_i(t) = \frac{\exp(v_i(a_i))}{\sum_{j=1}^{n} \exp(v_i(a_j))}
\]

Reinforcement dynamic

**WITHOUT counterfactual updating**

- Inertia parameter
- Reinforcement

\[
 v_i(t + 1) = (\beta_0 v_i(t) + r_i(t) \text{ update sampled bin; otherwise })
\]

11/13/2012
Reinforcement dynamic
without counterfactual updating

\[ v_i(t+1) = \begin{cases} \beta_0 v_i(t) + \beta_1 u_i & \text{if } a(t) = i, \\ v_i(t) & \text{if } a(t) \neq i, \end{cases} \]

\[ p_i(t) = \frac{\exp(v_i(a_i))}{\sum_{j=1}^{n} \exp(v_i(a_j))} \rightarrow \text{choose } a(t+1) \]

**Analytical result:** \( \forall i \in X, \lim_{t \to \infty} v_i(t) = U_i \), where \( U_i = \frac{\beta_i u_i}{1 - \beta_0} \)

Reinforcement dynamic
WITH counterfactual updating

Learning without counterfactual thinking is costly!

**Case 1** – Update bin that was selected in period \( t \)
\[ v_i(t+1) = \beta_0 v_i(t) + \beta_1 u_i \]

**Case 2** – Update the rest of the bins
\[ v_i(t+1) = \beta_0 v_i(t) + s_i(a_i)\beta_1 u_i + (1 - s_i(a_i))(1 - \beta_0)v_i(t) \]

- Reinforcement weighted by similarity;
- Weighted "new information"
- "Resistance factor"
Reinforcement dynamic

with counterfactual updating

\[ v_i(t + 1) = \begin{cases} 
\beta_0 v_i(t) + \beta_1 u_i \\
\beta_0 v_i(t) + s_i(a_i) \beta_1 u_i + (1 - s_i(a_i))(1 - \beta_0) v_i(t) 
\end{cases} \]  

if \( a(t) = i \);

\[ s_i(a_i) = \frac{A^2_i}{A^1_i} \]

\[ p_i(t) = \frac{\exp(v_i(a_i))}{\sum_{j=1}^{n} \exp(v_i(a_j))} \]

choose \( a(t + 1) \)

Convergence

with counterfactual updating

\[ g(t) = u(a^*) - \hat{v}(t) \]

\[ h(t) = a^* - \hat{a}(t) \]
\( \hat{u}(t) \) location of current maximum of potential function
Direction for further research

Find sufficient conditions to analytically prove convergence in learning with counterfactual updating.
A TALE OF TWO CRISSES:
THE EFFECT OF THE GREAT RECESSION ON THE CALIFORNIA AND TEXAS GENERAL FUNDS

LILY VO
ECONOMICS HONOR SYMPOSIUM
APRIL 27, 2014
SUPERVISOR: JAMES K. GALBRAITH

CALIFORNIA VS. TEXAS

CALIFORNIA
• 2009: $21.3 billion deficit initially
• 2011: $25.4 billion projected deficit (24.7% of budget)
• Several desperate program cuts to avoid default
  - health care programs
  - drug abuse programs
  - child welfare programs

TEXAS
• "Model citizen" state?
• 2008: $4.5 billion surplus
• 2009: -$1 billion deficit and $9 billion Economic Stabilization Fund
• 2012-2013: $26.8 billion deficit (27.1% of budget)
• New cuts for 2012-2013
  - Medicaid (33%)
  - Education (23%)
THE GREAT RECESSION

- December 2007-June 2009
- Caused by Financial Crisis of 2007-2011
- Recovery slow
- California's Economy
  - Weakened earlier than Texas’s prior to recession
- Texas’s Economy
  - Entered the recession relatively late
  - Affected less severity by recession

CALIFORNIA’S ECONOMY

Figure 17
Number of California Foreclosures

Source: RAND
TEXAS'S ECONOMY

Energy Prices
- Stayed high
- Kept Texas out of recession

Chart 1
EMPLOYMENT GROWTH IN THE ENERGY VS. NON-ENERGY STATES IN THE RECENT RECESSION

No housing bubble

Source: Bureau of Labor Statistics

 TEXAS'S ECONOMY

No housing bubble

Source: Bureau of Labor Statistics


House Price Index for California (CAHPI)
House Price Index for Texas (TXHPI)

Shaded areas indicate US recessions. 2011 research associated way
CALIFORNIA'S BUDGET AND RECESSIONS

Total Surplus/Deficit for California (Billions)

CALIFORNIA'S BUDGET AND TAX STRUCTURE

- State Personal Income Tax
  - 52% of California's tax revenues in 2009
  - Capital Gains (volatile)
    - Around 40% of personal income tax in expansionary years
  - Progressive
    - 2006: wealthiest 1% paid over 48% of taxes
    - Exemption for near-poor and working-poor

Capital gains tax: an unstable revenue for Calif.

The capital gains tax — revenue generated from profit made on selling property or stocks and bonds — has been a particularly unstable source of income for California, with ranges of much than 50 percentage over fiscal years. In comparison, the state's sales tax and property taxes have generally remained consistent with percentage changes ranging to under 3% percent.
CALIFORNIA’S BUDGET AND TAX STRUCTURE

- Personal Income Tax
  - 28% decline between 2008 and 2009
- Sales and Corporate Tax less problematic

TRENDS IN REVENUE

Annual Revenues for California (in Billions)
COSTS OF SERVICE

- $99 billion requested (26% increase from 2010-2011)
- No new programs
- Federal Funds
  - Loss of ARRA funds
  - Ambiguity on how much of it was used to cover state operating costs ($6.4 to $8.34 billion)
- Population Growth and Inflation
  - Remaining $12.06 to $14.2 billion of projected expenditures $\rightarrow$ 13.9% to 16.7% growth in discretionary expenditures
  - Population has increased by 3.9% over past 2 years
- More reasonable assumption: $3.5 to $9 billion increase

THE CONSUMER SPENDING ASSUMPTION

- $3.74 billion added if spending rates stay the same
- $11.2 billion if spending rates increase by even 1%

Actual and Projected Sales Tax Revenue (1998-2013)

- Actual Sales Tax Revenue (Thousands of Dollars)
- Projected Sales Tax Revenue (Thousands of Dollars)
- Projected Sales Tax Revenue with 3% Spending Growth (Thousands of Dollars)
**ECONOMIC RECOVERY**

- Only $5 B more for next biennium despite projected population growth
- Continued stagnation unlikely
- CBO projects 5.6% American GDP growth per year between 2012-2013
  - Texas is an energy state and probably will do better
  - Population growing (revenues grow with tax base)

---

**THE CONTRIBUTORS TO THE DEFICIT**

Reevaluating the Texas Budget Situation

Changes in General Fund Revenue from the 2010-2011 Biennium to the 2012-2013 Biennium:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Texas Comptroller's Projected Change in General Fund Revenue from 2010-2011</th>
<th>Alternative Projected Change in General Fund Revenue from 2010-2011</th>
<th>OPPS Projected Change in General Fund Expenditures from 2010-2011</th>
<th>Alternative Projected Change in General Fund Expenditures from 2010-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Growth</td>
<td>$12.2 billion</td>
<td>$15.9 to 17.4 billion</td>
<td>$2.06 billion</td>
<td>$13.5 to 19 billion</td>
</tr>
<tr>
<td>Projected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discretionary Revenues</td>
<td>$1.9 billion</td>
<td>$1.9 billion</td>
<td>$2.06 billion</td>
<td>$13.5 to 19 billion</td>
</tr>
<tr>
<td>Property Tax</td>
<td>$1.9 billion</td>
<td>$1.9 billion</td>
<td>$2.06 billion</td>
<td>$13.5 to 19 billion</td>
</tr>
<tr>
<td>Insurance Premiums</td>
<td>$174 million</td>
<td>$174 million</td>
<td>$2.06 billion</td>
<td>$13.5 to 19 billion</td>
</tr>
<tr>
<td>Summer Drought Relief</td>
<td>$1.2 billion</td>
<td>$1.2 billion</td>
<td>$2.06 billion</td>
<td>$13.5 to 19 billion</td>
</tr>
<tr>
<td>Total</td>
<td>$16.4 billion</td>
<td>$16.6 to 18.6 billion</td>
<td>$4.4 billion</td>
<td>$31.6 to 34.6 billion</td>
</tr>
</tbody>
</table>

Texas Comptroller's General Fund Estimates: $5.9 billion - $9 billion = $4.8 billion (deficit)
Alternative General Fund Estimates: $15.9 billion - $17.4 billion = $13.5 billion (deficit)

If the 9 billion Economic Stabilization Fund is used:

Texas Comptroller's General Fund Estimates: $6.8 billion - $9 billion = $7 billion (deficit)
Alternative General Fund Estimates: $16.8 billion - $17.4 billion = $13.4 billion (deficit)

< $4.8 billion + $9 billion = $4.8 billion (surplus)
CONCLUSIONS: CALIFORNIA

- Severe recession and volatile tax structure
  - Depended too much on Financial Crisis-related areas
- Unsustainable deficit problems (no return of tech or finance industry)
  - Discretionary spending cuts hard
  - Need for additional revenues (raising tax rates, expanding sales tax, closing corporate tax loopholes, broadening tax base, eliminating various income tax preferences)
  - Economic stabilization fund like Texas
  - Only gradual expansion of services

CONCLUSIONS: TEXAS

- Insufficient explanations for supposed budget crisis
- Current approach
  - Austerity measures (like California)
  - Gov. Perry refuses to use more than $6 billion from ESF, preferring to cut services
  - Problem: few luxury items; Texas is low-tax, low-service
- Better solutions:
  - Use Economic Stabilization fund
  - Raise tax rates
  - New taxes (state income tax, more comprehensive sales tax, more comprehensive corporate tax)
BP *Deepwater Horizon* Oil Spill: Economic Effect on Louisiana’s Leisure and Hospitality Industry

Ashley Haustein  
Dr. Richard Chiburis, Thesis Advisor

Timeline & Magnitude

- April 20 – July 15, 2010  
- Five million barrels of oil  
- Macondo well declared dead on September 19
Environmental Impact

- Effect on sea life remains unknown
- Louisiana’s fishing industry generates $3 billion annually
  - Source of one third of the seafood consumed in US

Emotional Impact

- Many fishermen took jobs working for BP
- Wave of depression and anxiety

Economic Summary

- BP had spent over $8 billion by October 2010
- Louisiana estimates that oil spill is responsible for the loss of 27,000 jobs
- 68% of people with plans to travel to the Gulf region kept their plans
### Summary Statistics - Unemployment

<table>
<thead>
<tr>
<th></th>
<th>Coastal</th>
<th>Non-Coastal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Parishes</td>
<td>10</td>
<td>54</td>
</tr>
<tr>
<td>Average Unemployment Rate – June 2009</td>
<td>7.50%</td>
<td>9.79%</td>
</tr>
<tr>
<td></td>
<td>(1.25%)</td>
<td>(2.41%)</td>
</tr>
<tr>
<td>Average Unemployment Rate – June 2010</td>
<td>7.75%</td>
<td>9.76%</td>
</tr>
<tr>
<td></td>
<td>(1.52%)</td>
<td>(2.50%)</td>
</tr>
</tbody>
</table>

### Data Analysis - Unemployment

![Graph showing unemployment rates over time](graph.png)

Legend:
- coastalavg
- noncoastalavg
Data Analysis - Unemployment

- January 2010
- June 2010

Coastal
-2.03%***
(0.58%)

After
-0.22%
(0.13%)

Affected
0.02%
(1.99%)

Summary Statistics - Tourism

<table>
<thead>
<tr>
<th></th>
<th>Coastal</th>
<th>Non-Coastal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Parishes</td>
<td>10</td>
<td>54</td>
</tr>
<tr>
<td>Average Number of Establishments – 2009Q2</td>
<td>344</td>
<td>119.41</td>
</tr>
<tr>
<td></td>
<td>(493.17)</td>
<td>(198.58)</td>
</tr>
<tr>
<td>Average Number of Establishments – 2010Q2</td>
<td>374.7</td>
<td>127.98</td>
</tr>
<tr>
<td></td>
<td>(541.51)</td>
<td>(212.53)</td>
</tr>
<tr>
<td>Average Employment – 2009Q2</td>
<td>6808.5</td>
<td>2454.19</td>
</tr>
<tr>
<td></td>
<td>(10794.3)</td>
<td>(4628.43)</td>
</tr>
<tr>
<td>Average Employment – 2010Q2</td>
<td>6942.3</td>
<td>2365.37</td>
</tr>
<tr>
<td></td>
<td>(11183.74)</td>
<td>(4554.61)</td>
</tr>
</tbody>
</table>
Data Analysis - Tourism

- 2009Q4
- 2010Q2

<table>
<thead>
<tr>
<th></th>
<th>Level</th>
<th>Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal</td>
<td>4350.17</td>
<td>104.42%*</td>
</tr>
<tr>
<td></td>
<td>(3384.34)</td>
<td>(62.18%)</td>
</tr>
<tr>
<td>After</td>
<td>34.54</td>
<td>-3.21%</td>
</tr>
<tr>
<td></td>
<td>(47.18)</td>
<td>(6.18%)</td>
</tr>
<tr>
<td>Affected</td>
<td>226.76</td>
<td>11.33%</td>
</tr>
<tr>
<td></td>
<td>(156.18)</td>
<td>(7.07%)</td>
</tr>
</tbody>
</table>
What is happening now?

- Bureau of Ocean Energy Management, Regulation, and Enforcement approved deepwater drilling permit
  - Early March 2011

Conclusion

- Economic effect far from devastating
  - Update with more recent data
- Negative environmental and emotional effects
- Government regulations for off-shore oil drilling must be clearly stated and enforced
Differential Information and Subcontractor Acquisition

Tlek Zeinullayev
Honors Thesis Presentation
Supervisor: Maxwell Stinchcombe

Motivation: Manufacturer Buy Out Project
- Goal: We would like to know when it is better for the manufacturer to buy out the subcontractor. Specifically, we will concentrate on informational reasons behind.
Motivation: Project

- Method:
  - Mechanism Design: Revelation Principle
  - Nonlinear constrained optimization
  - Efficient trade regions as a function of differential information and transaction costs

Structure

- Imagine that some party must procure $q$ units of a particular item and we will call this party "the contractor".
- Only one firm could supply these units and we will call it "the subcontractor".
Problem

- On two sides of the market we have players with private information and we need both pieces to maximize total profit. Moreover, each of the players uses her private information strategically by getting the highest possible reward.

Assumptions

- The demand function of the contractor is linear and has the form $A - bq$, where the value of $b$ is either 1 or 2.
- Where $b=1$ means good demand conditions and $b=2$ means bad demand conditions
- We assume that $Pr(b=1) = \beta$
Assumptions

- The subcontractor has a non-linear cost structure with marginal cost $c$. The value of $c$ can be either 1 or 2.
- Where $c=1$ means low marginal cost and $c=2$ means high marginal cost.
- We also assume that $\Pr(c=1) = \gamma$.

Question

- What are the efficient trade zones and when the manufacturer will buy out the subcontractor?
Graphical Illustration 1

Graphical Illustration 2
### Game Matrix

<table>
<thead>
<tr>
<th>Pr (c=1) = y</th>
<th>Pr (c=2) = 1-y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr (b=1) = β</td>
<td>( t_{11}, q_{11} )</td>
</tr>
<tr>
<td>Pr (b=2) = 1-β</td>
<td>( t_{21}, q_{21} )</td>
</tr>
</tbody>
</table>

### Nonlinear Programming Problem

- Next, we consider what are the requirements if participation and truth telling are to be a Nash equilibrium for a given revelation mechanism. So, we have four constraints for each of the players.
Participation Constraints

Under this constraint each party involved in the game will get profit of at least zero.

(P1-1) $\gamma[(A - q_{11}) q_{11} - t_{11}] + (1-\gamma)(A - q_{12}) q_{12} - t_{12}] \geq 0$

(P1-2) $\gamma[(A - 2q_{21}) q_{21} - t_{21}] + (1-\gamma)(A - 2q_{22}) q_{22} - t_{22}] \geq 0$

(P2-1) $\beta[t_{11} - q_{11}] + (1-\beta)[t_{21} - q_{21}] \geq 0$

(P2-2) $\beta[t_{12} - 2q_{12}] + (1-\beta)[t_{22} - 2q_{22}] \geq 0$

Incentive Constraints

This constraint ensures that each party gets more profit if it tells truth instead of lying.

(IC1-1) $\gamma[(A - q_{11}) q_{11} - t_{11}] + (1-\gamma)(A - q_{12}) q_{12} - t_{12}] \geq$

$\gamma[(A - q_{21}) q_{21} - t_{21}] + (1-\gamma)(A - q_{22}) q_{22} - t_{22}] \geq$

(IC1-2) $\gamma[(A - 2q_{21}) q_{21} - t_{21}] + (1-\gamma)(A - 2q_{22}) q_{22} - t_{22}] \geq$

$\gamma[(A - 2q_{11}) q_{11} - t_{11}] + (1-\gamma)(A - 2q_{12}) q_{12} - t_{12}] \geq$

(IC2-1) $\beta[t_{11} - q_{11}] + (1-\beta)[t_{21} - q_{21}] \geq$

$\beta[t_{12} - q_{12}] + (1-\beta)[t_{22} - q_{22}]$

(IC2-2) $\beta[t_{12} - 2q_{12}] + (1-\beta)[t_{22} - 2q_{22}] \geq$

$\beta[t_{11} - 2q_{11}] + (1-\beta)[t_{21} - 2q_{21}]$
Profit Constraints

- (PR1-1) \((A - q_{11} - 1) \leq (A - 1)^2 / 4\)
- (PR1-2) \((A - q_{12} - 2) \leq (A - 2)^2 / 4\)
- (PR2-1) \((A - 2q_{21} - 1) \leq (A - 1)^2 / 8\)
- (PR2-2) \((A - 2q_{22} - 2) \leq (A - 2)^2 / 8\)

Remark...

- A nonlinear system of equations may give no efficient outcome at all.
- This information is **NOT** known a priori
- Therefore, system *sometimes* may fail to give an efficient solution.
Result

\[\gamma \quad 1\]
\[0 \quad 0 \quad 1\]
\[\text{Buy out}\]
\[\text{No Trade}\]
\[\text{Trade}\]

Conclusion

- Manufacturer acquires subcontractors in two cases:
- 1) Subcontractor is getting too much of the total profit
- 2) Good cost and bad demand region
Measuring Residential Housing Price Levels Using Hedonic Regressions

Juan Salem

Supervisor:
Dr. Valerie Bencivenga

Special thanks to the following organizations for providing data and feedback:

Background: Residential Real Estate

Significance of Residential Real Estate
- 16% of U.S. GDP (5% investment, 11% consumption goods & services)
- Largest component of personal wealth (44% of total U.S. wealth)
- Local property taxes (#1 revenue source for municipalities)

Measurement Complications
- Composite good with unique and shifting characteristics
  - Sales Price = Location + Structural Attributes + Macroeconomic Conditions
- Incomplete/unreliable information
  - Limited public data, hidden information, recording inconsistencies

Metro Area Price Level Publishing Sources
- County Property Tax Appraisal Districts
  - Limited and outdated data; methodology prevents significant depreciation
- National Association of Realtors Median Sales Price Index
  - Does not control for housing variables; subject to large compositional bias
S&P/Case-Shiller Housing Price Index

Methodology
- Search county deed records for repeat home sales with no physical improvements to the house between transactions.
- Adjust for change in quality by weighting observations according to length of time between transactions.

Application Problems
- < 4% of home sales qualify for Case-Shiller Index
- Aggregate city samples required (small markets problematic)
- Selection criteria biases index towards high turnover properties
- Unreliable when sales volume is low (distressed markets)

Research Problem

Question: How can a metro area housing price index be constructed that
- Can reliably measure both small and large markets
- Incorporates most sales and uses accurate real-time information
- Controls for housing quality and location
- Robust against swings in transaction volume

Proposed Solution: Construct a hedonic sales price index for each city neighborhood using the Board of Realtors’ MLS database and scale up the results to measure city price level
- Austin Board of Realtors MLS Exchange:
  - Proprietary network maintained by specialized sales brokers; 40 variables collected for each listing; captures 88% of all sales; enforced for accuracy with fines.
Hedonic Sales Index Methodology

(1) Calculate median house attributes for a group of neighborhoods with similar economic and geographic characteristics

(2) Run quarterly regressions with robust std. errors on all sales in neighborhood group

\[
\text{Sales Price} = \beta_0 + \beta_1 \text{Bedrooms} + \beta_2 \text{Bathrooms} + \beta_3 \text{Year Built} + \beta_4 \text{Sq. Ft.} \\
+ \beta_5 \text{Land Sq. Ft.} + \beta_6 \text{Garage Spots} + \beta_7 \text{Stories} + \beta_8 \text{Excellent Condition} \\
+ \beta_9 \text{Brick Siding} + \beta_{10} \text{Window Unit A/C} + \beta_{11} \text{Remodeled Kitchen} + \beta_{12} \text{Pool}
\]

(3) Holding median attributes from step 1 fixed, use a linear combination of the regression coefficients to compute sales price of neighborhood group's representative house each quarter

MLS Zone 4: North/Central Austin

3 Bed + 2 Bath + 1948 Year Built + 1,370 SF + 1 Story + 6,969 SF Land
Median Sales Price: $290,000 (Mar – 2013)
Zone 4: North/Central Austin

- Listings: 4,326
- Sales: 1,489
- Avg. R-squared: .79
- Avg. SF: $15,456 (6%)

- Sales Price
- Original List Price
- Final List Price

% Sales Price Change (Year on Year)

MLS Zone 5: East Austin

3 Bed + 1 Bath + 1953 Year Built + 1,138 SF + 1 Story + 6,534 SF Land
Zone 5: East Austin

Listings: 3,566
Sales: 2,763
Avg. R-squared: .62
Avg. SE: $14,982 (10%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales Price</th>
<th>Original List Price</th>
<th>Final List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
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<td>2010</td>
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<tr>
<td>2011</td>
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</tr>
</tbody>
</table>

% Sales Price Change (Year on Year)

Austin Area Index

4 MLS Zones—31 Neighborhoods
Limitations of Hedonic Approach

- Location not entirely controlled for
  - Proximity to negative/positive externalities
    - busy road, park, shopping center, lakeside view.

- Selection Bias
  - 12% of transactions are “sale by owner” and not captured in Board of Realtors MLS database.

- Compositional Bias
  - Demand shift towards particular kind of house
  - Intra-neighborhood stratification
    - Gentrification, gated premium subdivisions.
Conclusion: Extension

List Price / Sales Price Strategy Analysis

- Construct price index for a particular house

Questions & Answers
Supplemental Slides

Sample STATA output
Excel table with edited data
Westlake Index
South Austin Index
Case-Shiller for Dallas
Case-Shiller for US

Sample STATA output
```
* regress sp_hed in yr at 1st dec 99 2 h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11, robust
Linear regression  Number of obs = 62
                  F( 11,  49) = 79.48
                  Prob > F = 0.0000
                  R-squared = 0.7820
                  Root MSE = 65.702

                  Country         Coef.   Std. Err.     t    P>|t|     [95% Conf. Interval]
--- ------------------- -------- ----------- ------ -------- -----------------...
    hed               -10354.66   3603.24   -2.89   0.005    -17570.07   -3139.26
    sp_h1             29653.40   2777.36    10.59   0.000    24206.10   35100.70
    sp_h2             47962.96   3339.54    14.33   0.000    41384.66   54541.27
    sp_h3             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h4             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h5             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h6             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h7             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h8             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h9             110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h10            110.00   133.37    0.83   0.415     -133.37   253.37
    sp_h11            110.00   133.37    0.83   0.415     -133.37   253.37

* lincom _cons + 3*sp_h1 + 2*sp_h2 + 1*sp_h3 + 1*sp_h4 + 1*sp_h5 + 1*sp_h6 + 1*sp_h7 + 1*sp_h8 + 1*sp_h9 + 1*sp_h10 + 1*sp_h11
( 1) 3*_cons + 2*sp_h2 + 1*sp_h3 + 1*sp_h4 + 1*sp_h5 + 1*sp_h6 + 1*sp_h7 + 1*sp_h8 + 1*sp_h9 + 1*sp_h10 + 1*sp_h11 = 0

                  Country         Coef.   Std. Err.     t    P>|t|     [95% Conf. Interval]
--- ------------------- -------- ----------- ------ -------- -----------------...
    _cons              253692.4    26395.45    9.59   0.000    220161.7    287223.1
```

Sample MLS Excel File

MLS Zone 6: South Austin

Sales Price - Final Sales Price - Original List Price

% Sales Price Change (Year on Year)
Trade Dispute Cases in the World Trade Organization: Is the Dispute Settlement Mechanism working for Brazil?

MATEO CLARKE
University of Texas at Austin
Dept. of Economics & Dept. of Latin American Studies

Functions of the WTO

Negotiation
- Multilateral forum for trade liberalization negotiations
- Uruguay Round
- Doha Round

Administration
- Transparency
- Monitoring
- Gathering Data on trade policies (World Bank)

Litigation
- Supreme Judiciary for international trade law
- Dispute Settlement Understanding
Trade Barriers and the Prisoner’s Dilemma

<table>
<thead>
<tr>
<th>US &amp; China Agree to Limit Trade Restrictions</th>
<th>US Cooperates</th>
<th>US Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>China Cooperates</strong></td>
<td>WIN - WIN</td>
<td>LOSE MORE - WIN MORE</td>
</tr>
<tr>
<td><strong>China Defects</strong></td>
<td>WIN MORE – LOSE MORE</td>
<td>LOSE - LOSE</td>
</tr>
</tbody>
</table>

"It is in each country's interest to impose restrictions, but the result of such individually rational policies is inefficient"
- Hoekman and Kostecki
What is the Dispute Settlement Mechanism?

- Consultation (60 days)
- Panel (9 months)
- Appellate Body (90 days)
- Implementation (15 months)
Research Question

- Does Brazil’s participation in DSM result in greater market access?

- Hypothesis: YES, active participation in DSM should increase liberalization in markets for export
Brazil

- GDP of Brazil is $2 Trillion
- 8th largest economy in the world (GDP)
- 2nd largest economy in Western Hemisphere
  - 1. US $14 Trillion
  - 2. Canada $1.6 Trillion
  - 3. Mexico $1 Trillion
    - (IMF Data)
- Large, emerging economy
  - Expanding middle class
- "Middle Power"
  - growing influence is the shaping of multilateral institutions
    - WTO
    - G20
    - BRICs

---

**Brazil Exports from 1964-2010**
*(in US$ million)*

![Graph showing Brazil's exports from 1964 to 2010](chart.png)
Top 10 Complainant Countries

<table>
<thead>
<tr>
<th>Country</th>
<th># times complainant</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>91</td>
</tr>
<tr>
<td>EU</td>
<td>78</td>
</tr>
<tr>
<td>Canada</td>
<td>31</td>
</tr>
<tr>
<td>Brazil</td>
<td>24</td>
</tr>
<tr>
<td>Mexico</td>
<td>20</td>
</tr>
<tr>
<td>India</td>
<td>18</td>
</tr>
<tr>
<td>Argentina</td>
<td>14</td>
</tr>
<tr>
<td>Japan</td>
<td>13</td>
</tr>
<tr>
<td>Korea</td>
<td>13</td>
</tr>
<tr>
<td>Thailand</td>
<td>13</td>
</tr>
</tbody>
</table>
Map of Trade Dispute Directions

Literature Review

  - Measures "economic success" by comparing trade within sector before and after dispute. Finds that developing country plaintiffs have had more success under WTO legal system than GATT
- Busch and Reinhardt (2003)
  - Same data, opposite finding, different measures
- Holmsten (2009)
  - Trade flows, formal regional partnerships, political relationships correlate with "economic success"
- Davis and Bermeo (2009)
  - Start up costs of participation for developing countries act as barrier to the potential benefits of WTO
- Davis
  - Legal framing of negation works better than for developing countries than bilateral negotiations
Data

- WTO, case dispute record
  - Horn & Mavroidis 1995-2006
- UNCTAD trade data
- UN comtrade (Commodity Trade Statistics Database)
- OECD
- World Bank, GDP growth

Measures & Methods

- Measure mean LIBERALIZATION (market access)
  - Ratio of T+3 to t-1, where t=start year & T=end year
  - If defendant liberalized sector under dispute, we expect LIBERALIZATION > 1
Figure 1: Timeline for Case and Trade Volume Data Points

Dispute Settlement Cases with Brazil as Complainant

<table>
<thead>
<tr>
<th>DS Case/Case Year</th>
<th>Respondent</th>
<th>Product(s) Under Dispute</th>
<th>LIBERALIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>US</td>
<td>Reformulated and Conventional Gasoline</td>
<td>1.225</td>
</tr>
<tr>
<td>170</td>
<td>Canada</td>
<td>Civilian aircraft</td>
<td>14.127</td>
</tr>
<tr>
<td>71</td>
<td>Canada</td>
<td>Civilian aircraft</td>
<td>6.098</td>
</tr>
<tr>
<td>112</td>
<td>Peru</td>
<td>Banan</td>
<td>1.405</td>
</tr>
<tr>
<td>14</td>
<td>EU</td>
<td>Sugar coffee</td>
<td>0.465</td>
</tr>
<tr>
<td>190</td>
<td>Argentina</td>
<td>Woven fabrics of cotton and cotton mixtures</td>
<td>0.788</td>
</tr>
<tr>
<td>208</td>
<td>Turkey</td>
<td>Steel and iron pipe fittings</td>
<td>0.188</td>
</tr>
<tr>
<td>209</td>
<td>EU</td>
<td>Sugar coffee</td>
<td>0.691</td>
</tr>
<tr>
<td>216</td>
<td>Mexico</td>
<td>Electric transformers having a power of more than 16,000 KVA</td>
<td>1.066</td>
</tr>
<tr>
<td>218</td>
<td>US</td>
<td>Certain carbon steel products</td>
<td>0.938</td>
</tr>
<tr>
<td>219</td>
<td>EU</td>
<td>Malleable cast iron tube or pipe fittings</td>
<td>2.381</td>
</tr>
<tr>
<td>220</td>
<td>Canada</td>
<td>Regional aircraft</td>
<td>387.323</td>
</tr>
<tr>
<td>241</td>
<td>Argentina</td>
<td>Poultry</td>
<td>0.009</td>
</tr>
<tr>
<td>250</td>
<td>US</td>
<td>Processed orange and grapefruit products produced from citrus fruit</td>
<td>2.569</td>
</tr>
<tr>
<td>259</td>
<td>US</td>
<td>Certain steel products</td>
<td>1.328</td>
</tr>
<tr>
<td>265</td>
<td>EU</td>
<td>Sugar and sugar containing products</td>
<td>1.046</td>
</tr>
<tr>
<td>267</td>
<td>EU</td>
<td>Hybrid cotton and cotton products</td>
<td>0.875</td>
</tr>
<tr>
<td>269</td>
<td>EU</td>
<td>Frozen banana chicken cut</td>
<td>1.681</td>
</tr>
</tbody>
</table>

Mean: 2.233
Median: 1.065

% of Cases Resulting in LIBERALIZATION: 61%
Gains vs. Loses

Average gain from +LIB
+ $198,545,537

Average lose from -LIB
- $29,941,600

Next Steps

- Linear Regression for determinants of LIBERALIZATION
  - Case victory
  - Bilateral trade (Defendant's exports received by plaintiff)
  - Political & Economic ties (Regional Trade Agreements)
  - GDP growth (defendant), demand growth
  - Developing/ed dummy
- Mean LIBERALIZATION for other countries
Do any of these cases really affect market access?

- International Organizations notoriously have limited enforcement
- Even though a defendant loses a case, may drag feet on implementation
- Outside settlements may not increase liberalization within disputed sector

Limitations

- No causation argument
- Hard to find disaggregated and comprehensive data set for international trade over time
  - By product and country
  - Drawing from several sources
    - inaccuracies in reporting?
- Limited sample size
  - Based on number of cases
- “Successful” cases resolved through negotiations may include liberalization in other products
The Effects of Sibship Size on Intergenerational Occupational Mobility

Rachelle Wang
Supervisor: Dr. Jason Abrevaya
Department of Economics, University of Texas at Austin

Motivation

- Intergenerational mobility involves the change in social status that occur from the parents' to the children's generation.
- Understanding occupational mobility is important because changes in labor force composition explain substantial proportions of modern observed earning changes.
Research Questions

- How do family structure and demographics affect intergenerational occupational mobility?
- Is a child with more siblings less likely to follow in his or her parents' footsteps with respect to occupation?
  - Time Investment
  - Financial Investment

Data Set

- NLSY79 provided by the Bureau of Labor Statistics.
- A nationally representative sample of 12,686 young men and women who were 14-22 years old when they were first surveyed in 1979.
- Data are collected on respondents' gender, racial/ethnic identification, and number of siblings.
Occupational Categories

<table>
<thead>
<tr>
<th>Group#</th>
<th>Occupation Categories</th>
<th>Female Frequency</th>
<th>Male Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Professional, Technical and kindred</td>
<td>11.96</td>
<td>11.34</td>
</tr>
<tr>
<td>2</td>
<td>Managers, Officials and Proprietors</td>
<td>3.97</td>
<td>12.32</td>
</tr>
<tr>
<td>3</td>
<td>Sales Workers</td>
<td>4.33</td>
<td>4.48</td>
</tr>
<tr>
<td>4</td>
<td>Clerical and kindred</td>
<td>23.64</td>
<td>4.15</td>
</tr>
<tr>
<td>5</td>
<td>Craftsmen, Foremen, and kindred</td>
<td>2.36</td>
<td>24.95</td>
</tr>
<tr>
<td>6</td>
<td>Armed Forces</td>
<td>0.08</td>
<td>2.72</td>
</tr>
<tr>
<td>7</td>
<td>Operatives and kindred</td>
<td>20.29</td>
<td>20.13</td>
</tr>
<tr>
<td>8</td>
<td>Laborers, except Farm</td>
<td>0.97</td>
<td>6.58</td>
</tr>
</tbody>
</table>

12-CATEGORY CLASSIFICATION

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Daughter</th>
<th>Son</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child follows Mother</td>
<td>28.42%</td>
<td>29.75%</td>
<td>27.14%</td>
</tr>
<tr>
<td>Child follows Father</td>
<td>20.37%</td>
<td>28.81%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Child follows Either</td>
<td>40.98%</td>
<td>40.39%</td>
<td>41.56%</td>
</tr>
</tbody>
</table>

Regression Analysis

- Either Parent-Child Model
- \( G = \text{Daughter-Control} + \text{Son-Control} + \alpha \text{NumSib} + \beta \text{BirthOrd} + \epsilon \)

| Explanatory Variables | All \( (p<0.05)**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Siblings</td>
<td>Daughter</td>
<td>Son</td>
</tr>
<tr>
<td>0.034</td>
<td>0.0088 (0.0065)</td>
<td>0.0126 (0.0263)</td>
</tr>
<tr>
<td>Birth Order</td>
<td>(0.0033)</td>
<td>(0.0239)</td>
</tr>
</tbody>
</table>
Regression Analysis

- Full Regression

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Either Parent/Child</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AT</td>
<td>Daughter</td>
<td>Son</td>
</tr>
<tr>
<td>Daugm</td>
<td>0.0011</td>
<td>0.0011*</td>
<td>0.0047</td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td>(0.0007)</td>
<td>(0.0008)</td>
</tr>
<tr>
<td>Sogne</td>
<td>-0.0003</td>
<td>-0.0003</td>
<td>-0.0003</td>
</tr>
<tr>
<td></td>
<td>(0.0003)</td>
<td>(0.0003)</td>
<td>(0.0003)</td>
</tr>
<tr>
<td>Log(Income)</td>
<td>0.0127</td>
<td>0.0125**</td>
<td>0.0156</td>
</tr>
<tr>
<td></td>
<td>(0.0111)</td>
<td>(0.0156)</td>
<td>(0.0157)</td>
</tr>
<tr>
<td>Mother's Education</td>
<td>0.0045</td>
<td>0.0055**</td>
<td>0.0038</td>
</tr>
<tr>
<td></td>
<td>(0.0030)</td>
<td>(0.0032)</td>
<td>(0.0025)</td>
</tr>
<tr>
<td>Father's Education</td>
<td>0.0187***</td>
<td>0.0135**</td>
<td>0.0065**</td>
</tr>
<tr>
<td></td>
<td>(0.0035)</td>
<td>(0.0032)</td>
<td>(0.0023)</td>
</tr>
<tr>
<td>Number of Siblings</td>
<td>-0.0003</td>
<td>-0.0004</td>
<td>-0.0013**</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0005)</td>
<td>(0.0005)</td>
</tr>
<tr>
<td>Birth Order</td>
<td>0.0053</td>
<td>0.0011</td>
<td>0.1168</td>
</tr>
<tr>
<td></td>
<td>(0.0053)</td>
<td>(0.0073)</td>
<td>(0.0077)</td>
</tr>
<tr>
<td>Non-White</td>
<td>0.0509***</td>
<td>0.0450**</td>
<td>0.0594***</td>
</tr>
<tr>
<td></td>
<td>(0.0156)</td>
<td>(0.0077)</td>
<td>(0.0035)</td>
</tr>
<tr>
<td>Female</td>
<td>0.0868***</td>
<td>0.0071</td>
<td>0.0384**</td>
</tr>
<tr>
<td></td>
<td>(0.0961)</td>
<td>(0.0071)</td>
<td>(0.0035)</td>
</tr>
</tbody>
</table>

Conclusions

- There is little evidence of a causal relationship between birth order and occupational transmission.
- Sons with more siblings are less likely to follow in their parents' footsteps.
- Daughters are 9.69% more likely to work in the same occupation with her parent(s), and minorities are 6.36% more likely to follow in their parents' footsteps.