

Using Time Series Analysis to Explain Prescription Drug Utilization Trends Among Beneficiaries with Private Insurance

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Express Scripts Overview

- **Pharmacy benefit manager covering approximately 100 million members**
- **Respected and recognized**
 - **Combined behavioral science and clinical specialization to develop meaningful solutions to major healthcare challenges**



- **Key corporate facts**
 - **Revenue of \$93 billion**
 - **Market cap: more than \$45 billion**
 - **30,000 employees**
 - **Manage 1.4 billion prescriptions**
 - **Trusted by 3,500 clients**

**At Express Scripts, we work
to make the use of prescription drugs
safer and more affordable**

Today's Agenda

- Problem Statement
- Time Series Data
 - Dependent
 - Explanatory
- Modeling Methodology
- Results
- Conclusions
- Discussion

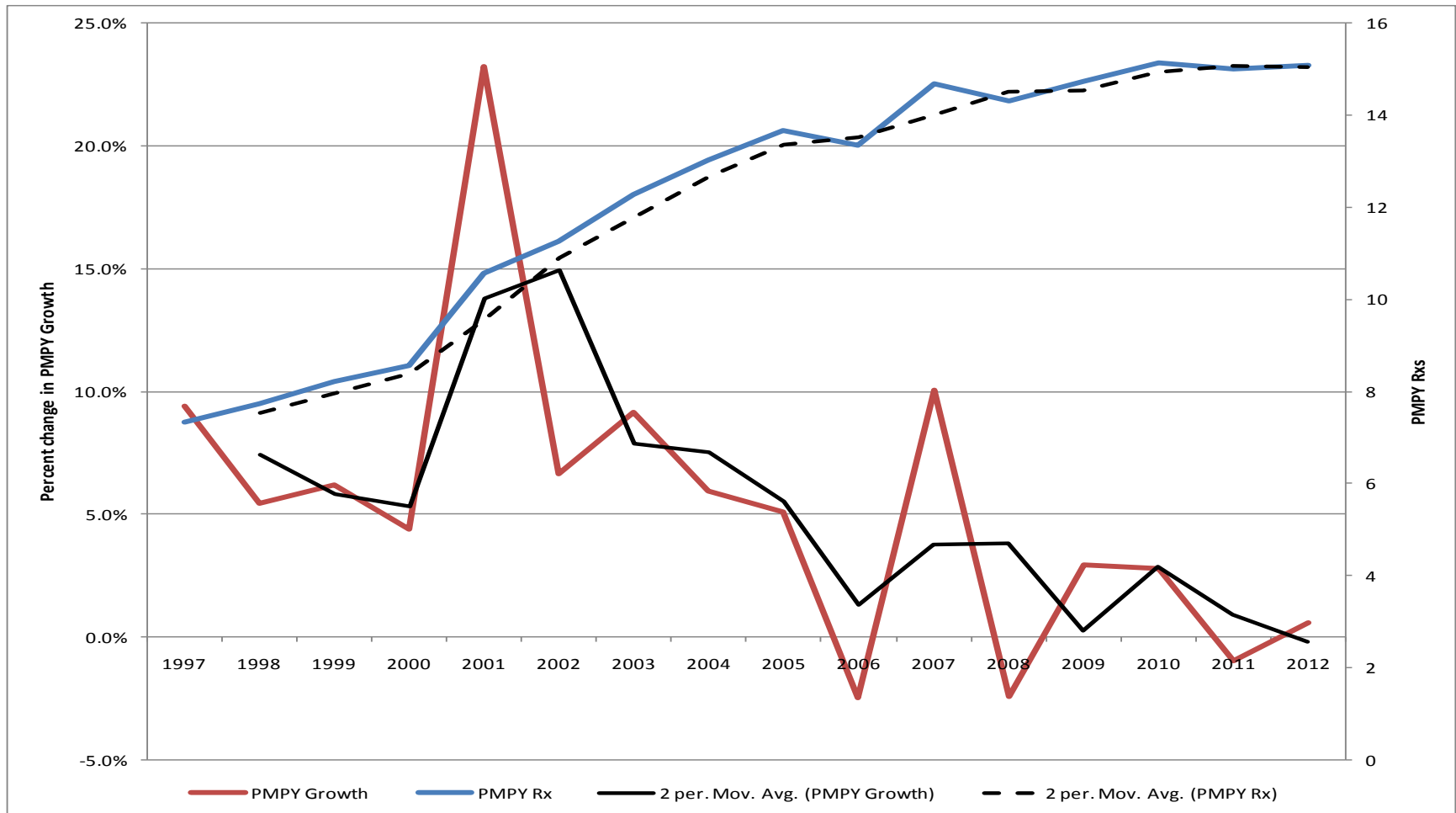
Problem Statement:

- The rate of Per Member Per Year (PMPY) utilization is slowing down
- In the past 6 years, Y/Y utilization growth has decreased in 50% of those years
- ***Why would a population who***
 - A. has coverage;
 - B. is experiencing a growing prevalence of obesity and diabetes and other chronic diseases; ***and***
 - C. has an increased selection of lower cost generic therapies***not be increasing utilization of prescription drugs?***

Recent Headlines

- **“Health Care Cost Growth May Be Slowing Long-Term, New Studies Show” Forbes, May 7, 2013¹**
- **Health care spending growth is at a record low. Here's the catch. CNN. April 29, 2013²**
- **Is the health-care spending slowdown for real? By Robert J. Samuelson, Washington Post. May 19, 2013³**
- **Slowdown in Health Costs’ Rise May Last as Economy Revives. By Annie Lowrey, The New York Times, May 6, 2013⁴**
- **Our Amazing Slowdown in Healthcare Spending Growth, By Kevin Drum. Mother Jones, May 14, 2013⁵**

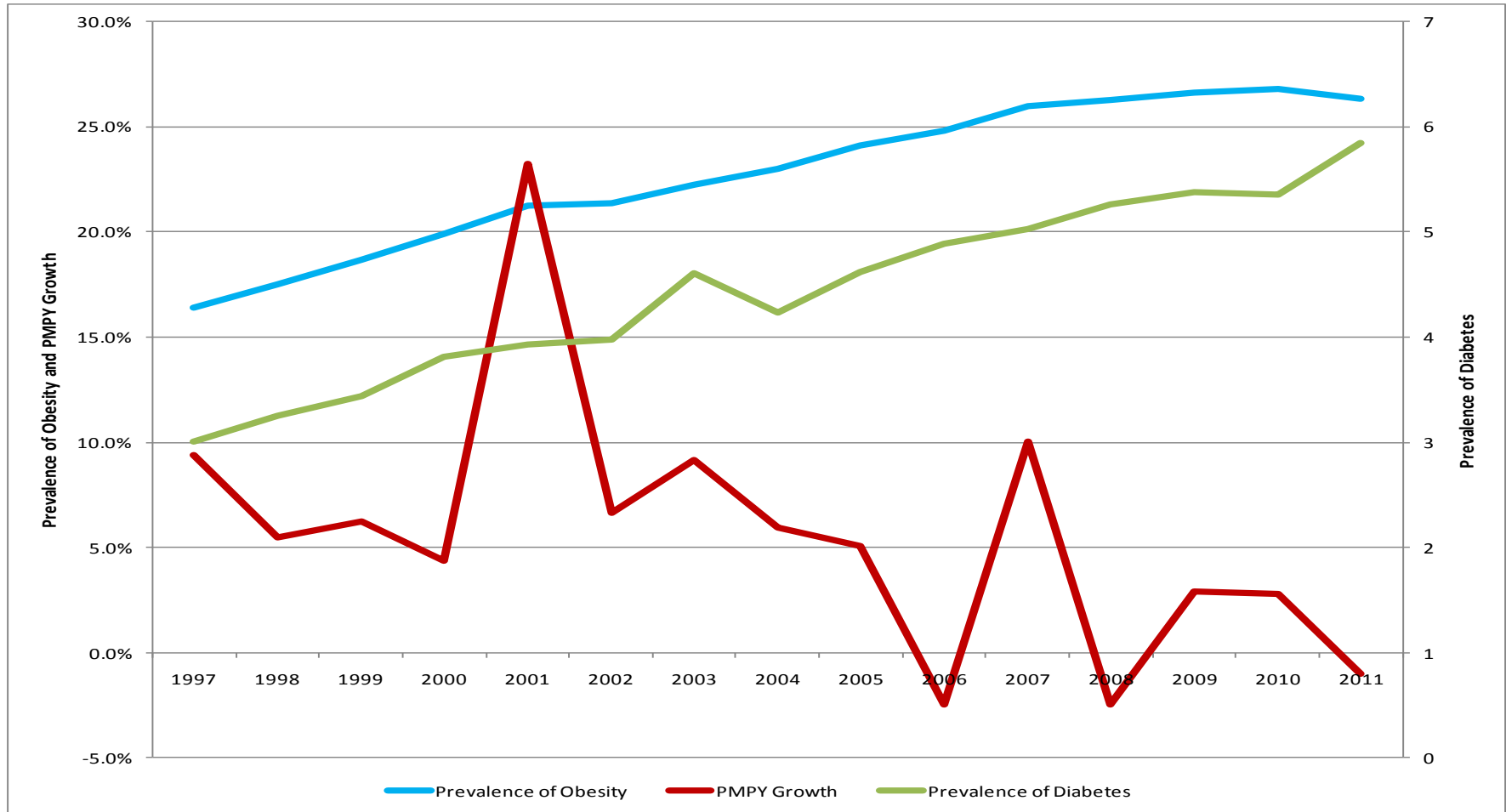
PMPY Utilization 1997-2012



Possible Explanations for Slowdown in Growth

- Economic conditions affecting household income and wealth
 - Housing crisis
 - Recession
- Benefit Design
 - Higher cost share for beneficiaries for premiums, copayments, and deductibles
 - Fewer office visits mean fewer prescriptions
- Changes in Promotion
 - Lower DTC spend due to loss of patent protection
- Demographics

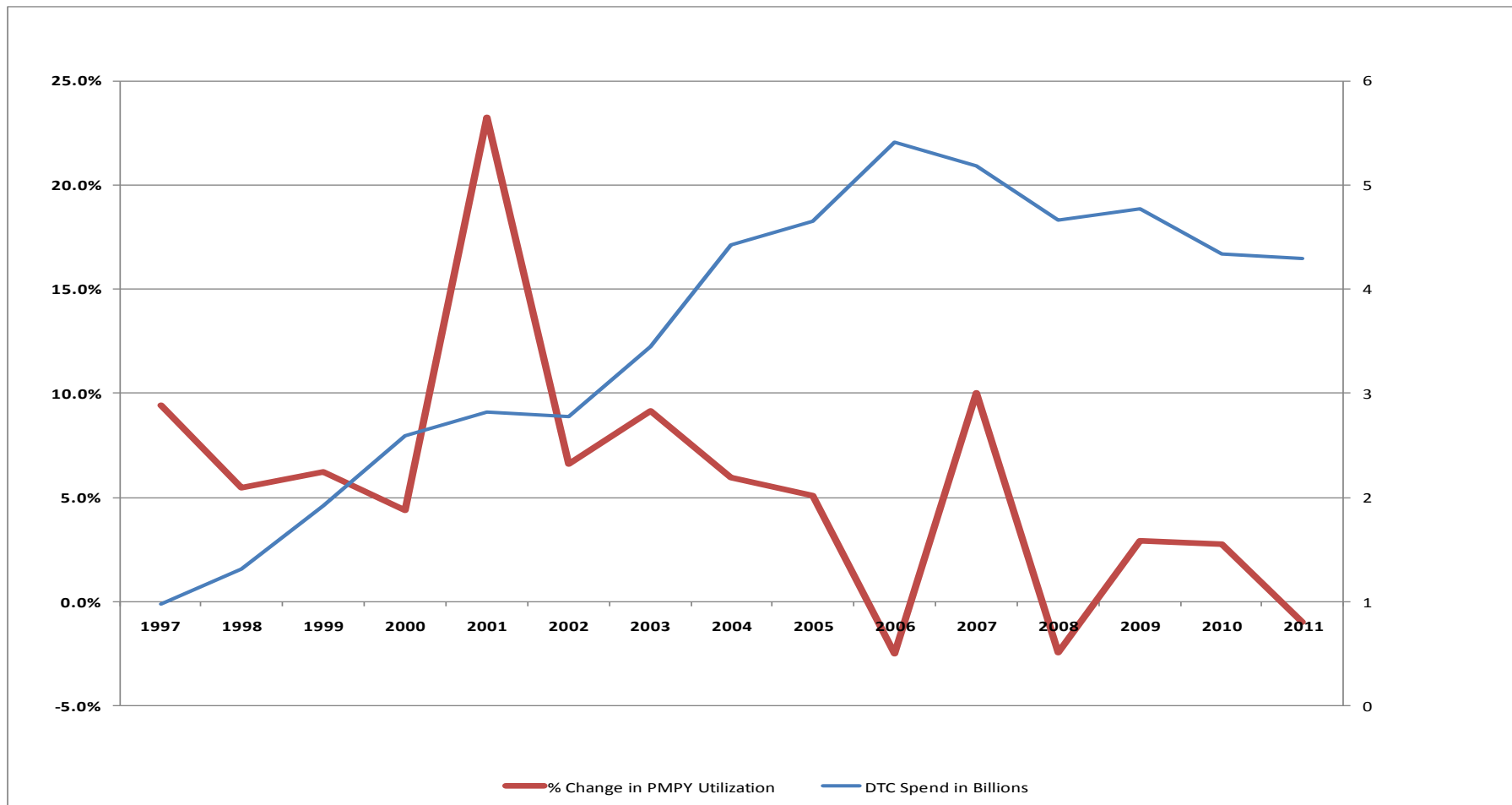
Drivers of Utilization versus PMPY Growth



Possible Explanatory Variables?



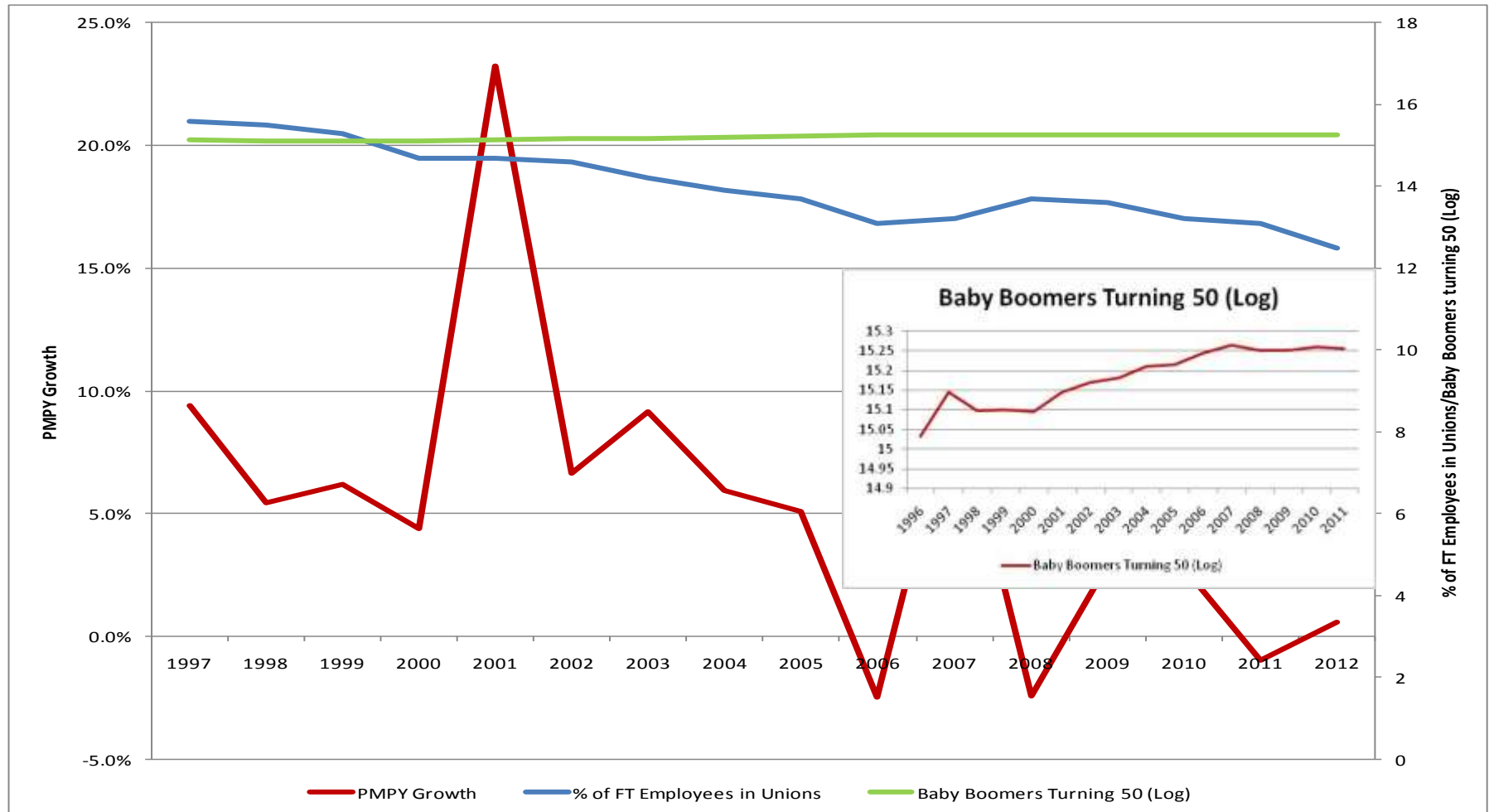
Could DTC Spend be a factor?



Time Series Regression

- Controlling for auto-correlation
 - First order autoregressive term used
 - Limited number of observations (15 with 12 Degrees of Freedom)
- De-trending for stationarity
 - Differenced dependent variable and explanatory variable
 - Percent of Full-Time Employees in Unions utilized as time trend
 - Union membership highly co-linear with time trend but more significant
- Regime switches
 - Considered but not utilized

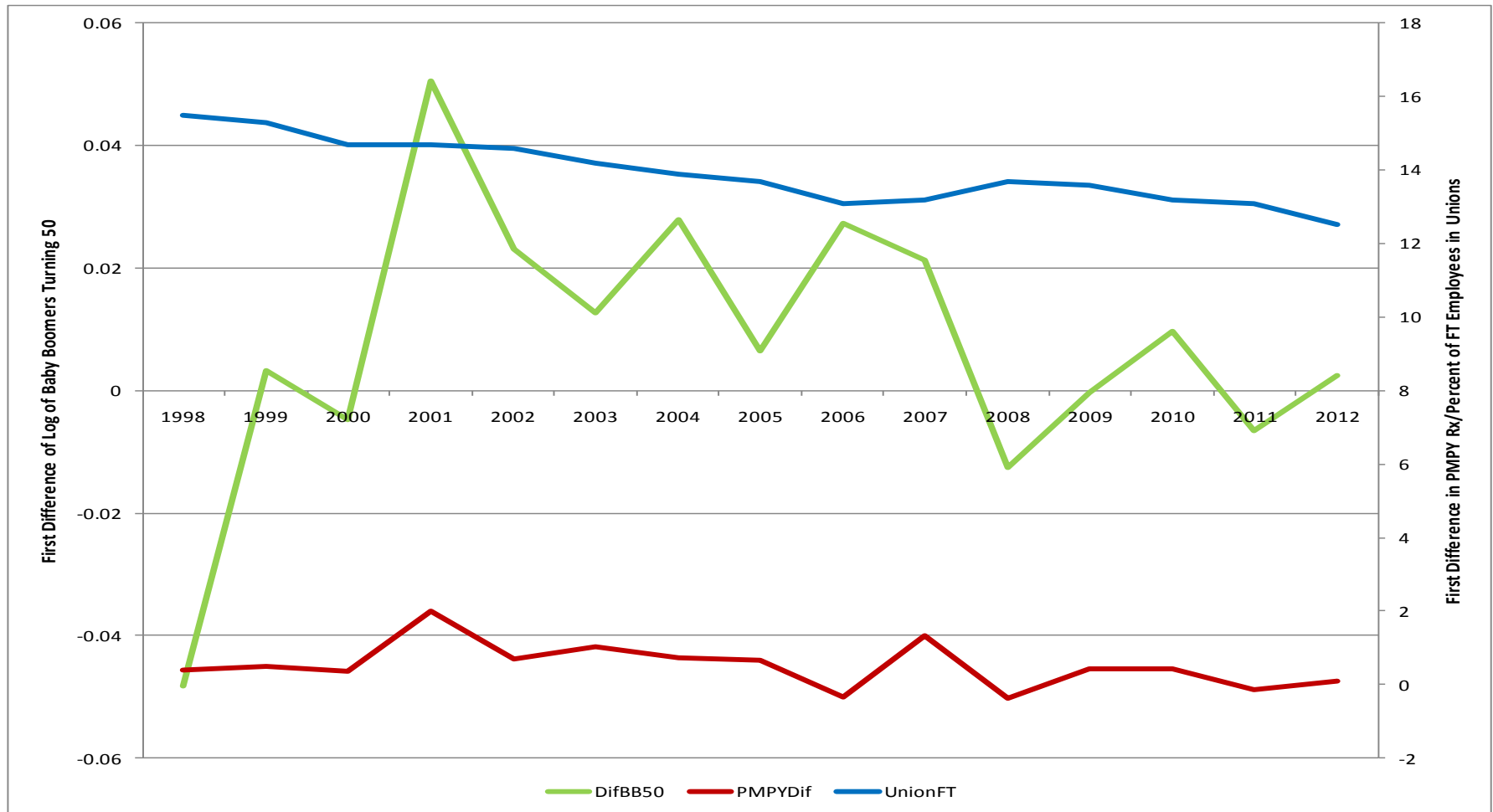
Final Explanatory Variables



Explanatory Variables

- Percentage of Full-Time Employees in Labor Unions (from Bureau of Labor Statistics)
 - Labor unions have traditionally negotiated for zero cost health care for their members
 - Non-labor employees in same company tend to get benefits that closely match the union employees
- First difference of the log of the number of Baby Boomers turning 50 each year (99% of actual births to allow for deaths)
 - 50 is a “milestone” age in which chronic conditions begin to be diagnosed due to recommended screenings.
- One period lag of the dependent variable: first difference of PMPY utilization

Final Form of Model



Actual Parameter Estimates

PMPYdif = difbb50 unionft 10:32 Wednesday, June 12, 2013 52

The AUTOREG Procedure

Maximum Likelihood Estimates

SSE	1.18957965	DFE	11
MSE	0.10814	Root MSE	0.32885
SBC	16.2014027	AIC	13.3692019
MAE	0.20854347	AICC	17.3692019
MAPE	50.649589	HQC	13.3390331
Log Likelihood	-2.684601	Regress R-Square	0.8233
Durbin-Watson	2.3327	Total R-Square	0.7742
		Observations	15

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > t	Variable Label
Intercept	1	-3.9598	0.9192	-4.31	0.0012	
difbb50	1	18.8865	3.2619	5.79	0.0001	
UnionFT	1	0.3106	0.0656	4.73	0.0006	UnionFT
AR1	1	0.7474	0.1940	3.85	0.0027	

Autoregressive parameters assumed given

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > t	Variable Label
Intercept	1	-3.9598	0.9153	-4.33	0.0012	
difbb50	1	18.8865	3.2618	5.79	0.0001	
UnionFT	1	0.3106	0.0654	4.75	0.0006	UnionFT

Utilization Model Equation

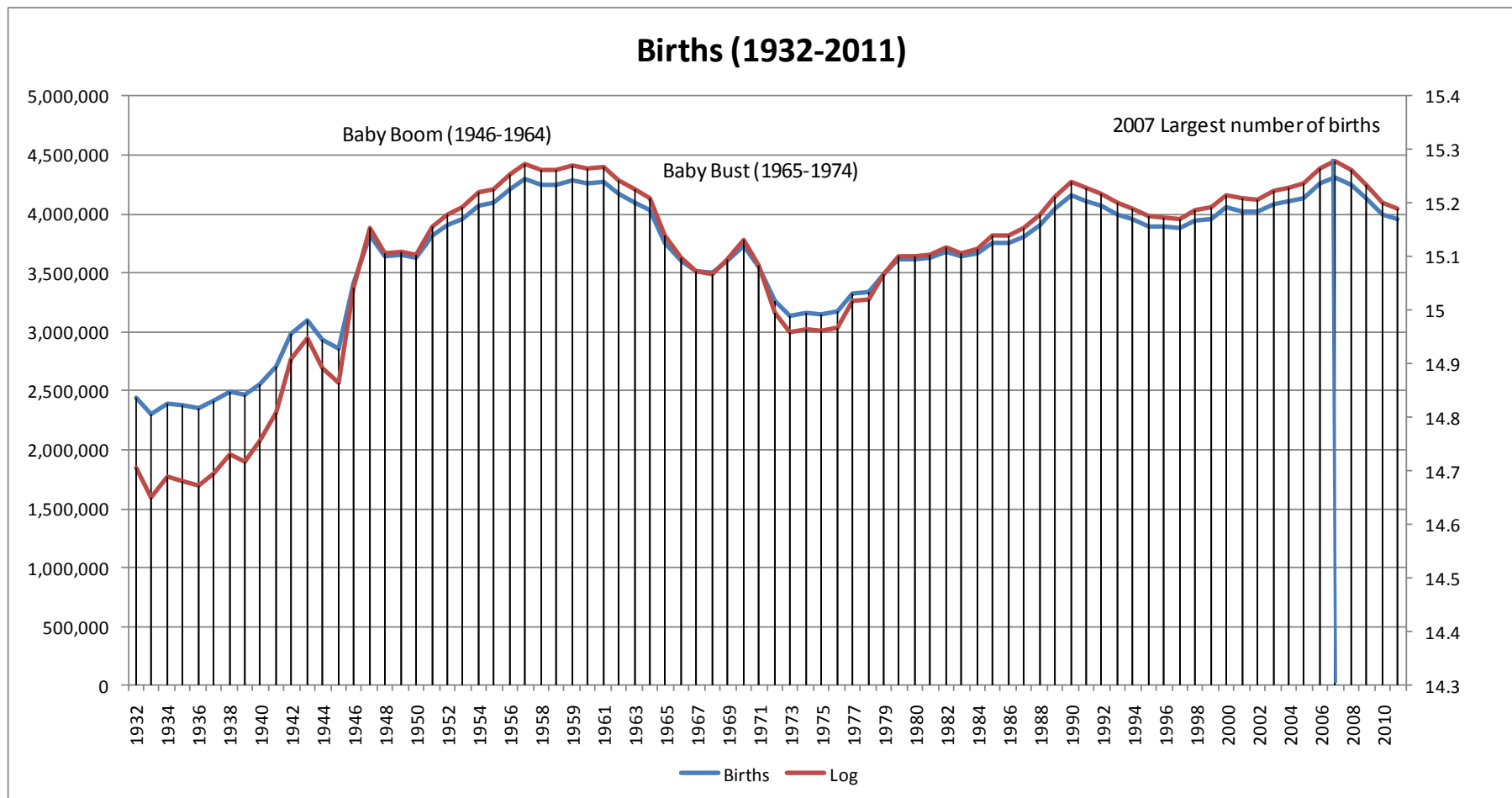
$$\begin{aligned} \text{PMPY}_y - \text{PMPY}_{y-1} = & -3.9598 + \\ & 18.8865 * (\log(\text{BB50})_y - \log(\text{BB50})_{y-1}) + \\ & 0.3106 * \text{UnionFT} + \\ & 0.7474 * (\text{PMPY}_y - \text{PMPY}_{y-1})_{t-1} \end{aligned}$$

PMPY = Rxs per Member per Year

BB50 = Number of Baby Boomers turning age 50

UnionFT = Percent of FT Employees in Unions

Demographic “Roller Coaster”



Conclusions

- We believe the slowdown in growth of prescription drug utilization in the privately insured population can be explained by two major factors:
 - Demographic shift: the aging out of Baby Boomers into Medicare and the lack of similar numbers of Baby Bust generation to take their place.
 - General erosion of benefits as employees must assume a greater proportion of their health care costs.
 - Global competition
 - Shift to Service Economy from Manufacturing

Discussion

- Other explanatory variables might have given the same results except that obtaining annual consistent time series for the same period is difficult.
- Labor Unions were unique in their negotiating ability to negotiate zero cost healthcare and their declining popularity may indicate changing sentiments towards cost-sharing.
- A mini-baby-boom occurred in 2007 with the largest number of births on record. That cohort will reach age 50 in 2057!

References

1. <http://www.forbes.com/sites/frederickallen/2013/05/07/health-care-cost-growth-may-be-slowing-long-term-new-studies-show/>
2. <http://money.cnn.com/2013/04/29/news/economy/health-care-spending/index.html>
3. http://articles.washingtonpost.com/2013-05-19/opinions/39376698_1_affordable-care-act-affordable-health-coverage-health-affairs
4. http://www.nytimes.com/2013/05/07/business/slowdown-in-rise-of-health-care-costs-may-persist.html?pagewanted=all&_r=0
5. <http://www.motherjones.com/kevin-drum/2013/05/our-amazing-slowdown-healthcare-spending-growth>

Thank You