Adverse Selection and an Individual Mandate: When Theory Meets Practice

Martin Hackmann, Economics Department, Yale
Jonathan Kolstad, Wharton School, UPenn and NBER
Amanda Kowalski, Economics Department, Yale and NBER

June 3, 2014

Adverse Selection and an Individual Mandate *in Theory*

- Theory has long held that there is a welfare loss from adverse (or advantageous) selection
  - Akerlof (1970), Rothschild and Stiglitz (1976)
- Important in health insurance markets
  - Consumers hold private information
  - Regulations restrict price differentiation by health type
- One theoretical way to reduce the welfare loss from selection is a mandate that requires both the healthy and the sick to purchase coverage

Adverse Selection and an Individual Mandate *in Practice*

- Individual mandate is a centerpiece of the
  - Massachusetts health reform of 2006 and the
  - ACA of 2010 (at the heart of Supreme Court challenges)
- In this paper, we
  - test for selection in Massachusetts individual insurance market
  - quantify the welfare impact of the individual mandate from the reduction of adverse selection

Literature

- Early literature tested for presence of asymmetric information in insurance markets
  - Chiappori and Salanie (2000)
  - Finkelstein and Poterba (2006)
- Small but growing literature on the welfare impact of adverse selection in health insurance markets
  - Einav, Finkelstein, Levin (2011) review
  - Bundorf, Levin, and Mahoney (2012)
  - Handel (2013)

Literature: Limitations for Application to Policy

- Previous studies focus on welfare impact of adverse selection on the intensive margin (e.g. which plan to choose among employer plans)
  - Find small welfare impact: welfare loss of $10 per employee or 3% of total surplus from efficient pricing at Alcoa (Einav, et al., 2010)
- Policy relevant estimates may differ
  - Welfare impact plausibly larger on extensive margin (whether to have insurance at all) and in individual market
  - Empirical challenge: no variations from mandates

This Paper

- Develop a simple model of the individual health insurance market
- In this framework, we model the individual mandate (tax penalty) as an exogenous shifter in the demand for health insurance
- Capture the welfare effects of the mandate in terms of a small number of empirical moments
- Combine
  - data on insurance coverage, premiums, and average costs
  - with a difference-in-differences estimation strategy
- Allows us to estimate key parameters and the welfare implications of the individual mandate

Outline

- Introduction
- **Institutional Background**
- Theoretical Approach
- Empirical Approach
- Results
- Robustness
- Conclusion

Institutional Background: Pre-Reform

- Community Rating Regulations
  - All consumers charged the same price
  - Baseline Model: Assume common price within a plan
- Guaranteed Issue Regulations
  - Offer insurance to all comers
  - Baseline model: Expect selection to be adverse

Institutional Background: Reform

- Individual mandate: pay-or-play
  - Consumers that don't have health insurance that meets minimum coverage criteria must pay a tax penalty of $1,260
  - Mandate is particularly important for individuals who do not have access to employer sponsored health insurance
  - Focus analysis on individual markets
- Introduction of health insurance exchange markets
  - Expect lower post-reform markups
- CommCare program
  - Free or subsidized health insurance for lower income residents (up to 300% of FPL)

Outline

- Introduction
- Institutional Background
- **Theoretical Approach**
- Empirical Approach
- Results
- Robustness
- Conclusion

Demand for Insurance

- Model builds from Einav, Finkelstein and Cullen (2010)
- Consumer problem:

$$\max_{H_i}\{X_i + v(\theta_i) * H_i\} \; s.t. \; Y_i = X_i + P * H_i,$$

- Consumer type $\theta_i \sim G_\theta$ in the population
- Market demand:

$$I := \int_{v(\theta)>P} dG_\theta.$$

- Incorporate individual mandate:

$$I := \int_{v(\theta)>P-\pi} dG_\theta.$$

- Market level demand curve: $P = D(I, \pi)$.

Cost Curves

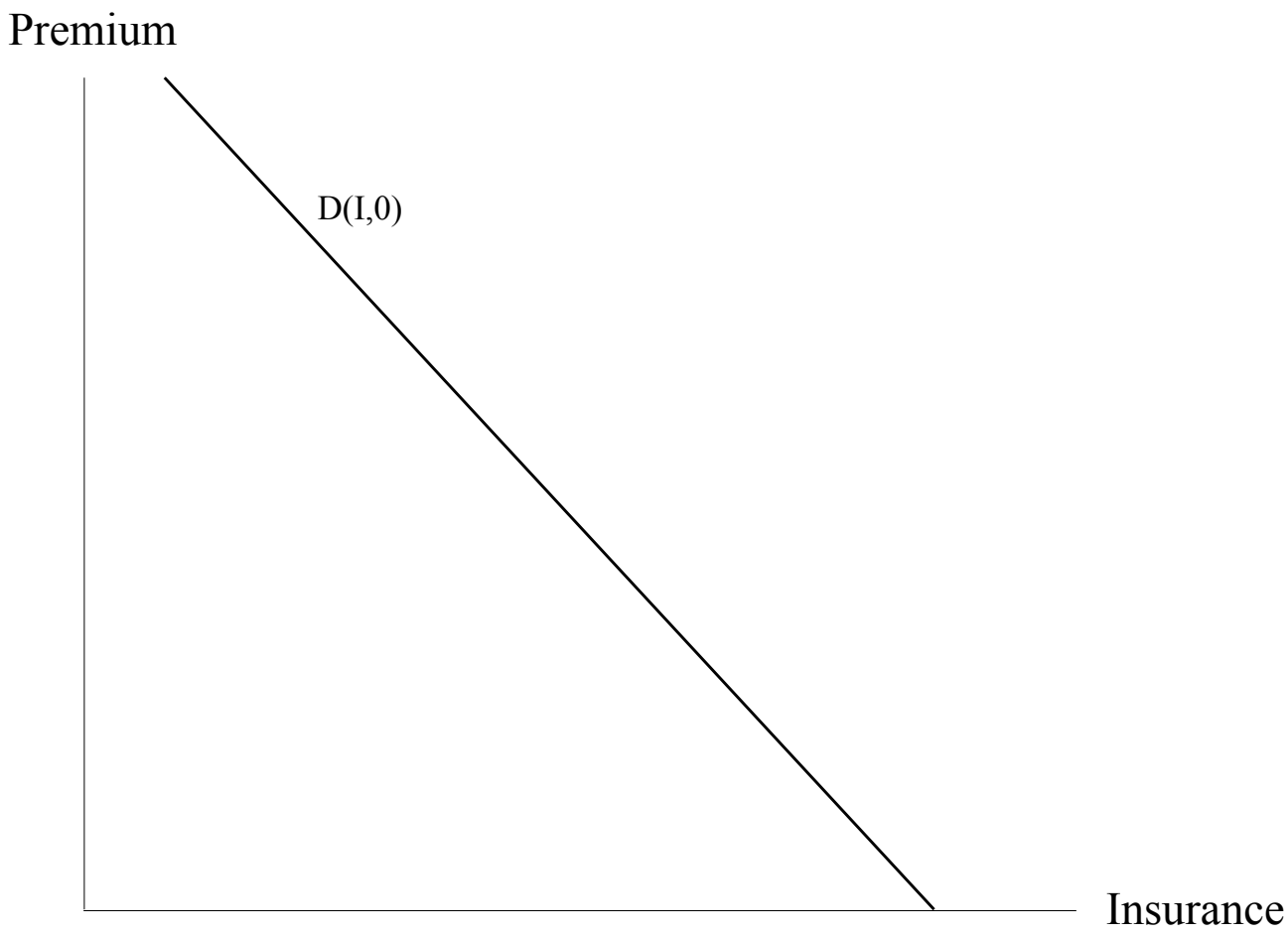
Average cost is a function of market level insurance coverage:

$$AC(I) = \frac{1}{I} \int_{v(\theta) > D(I,0)} c(\theta)\, dG_\theta.$$

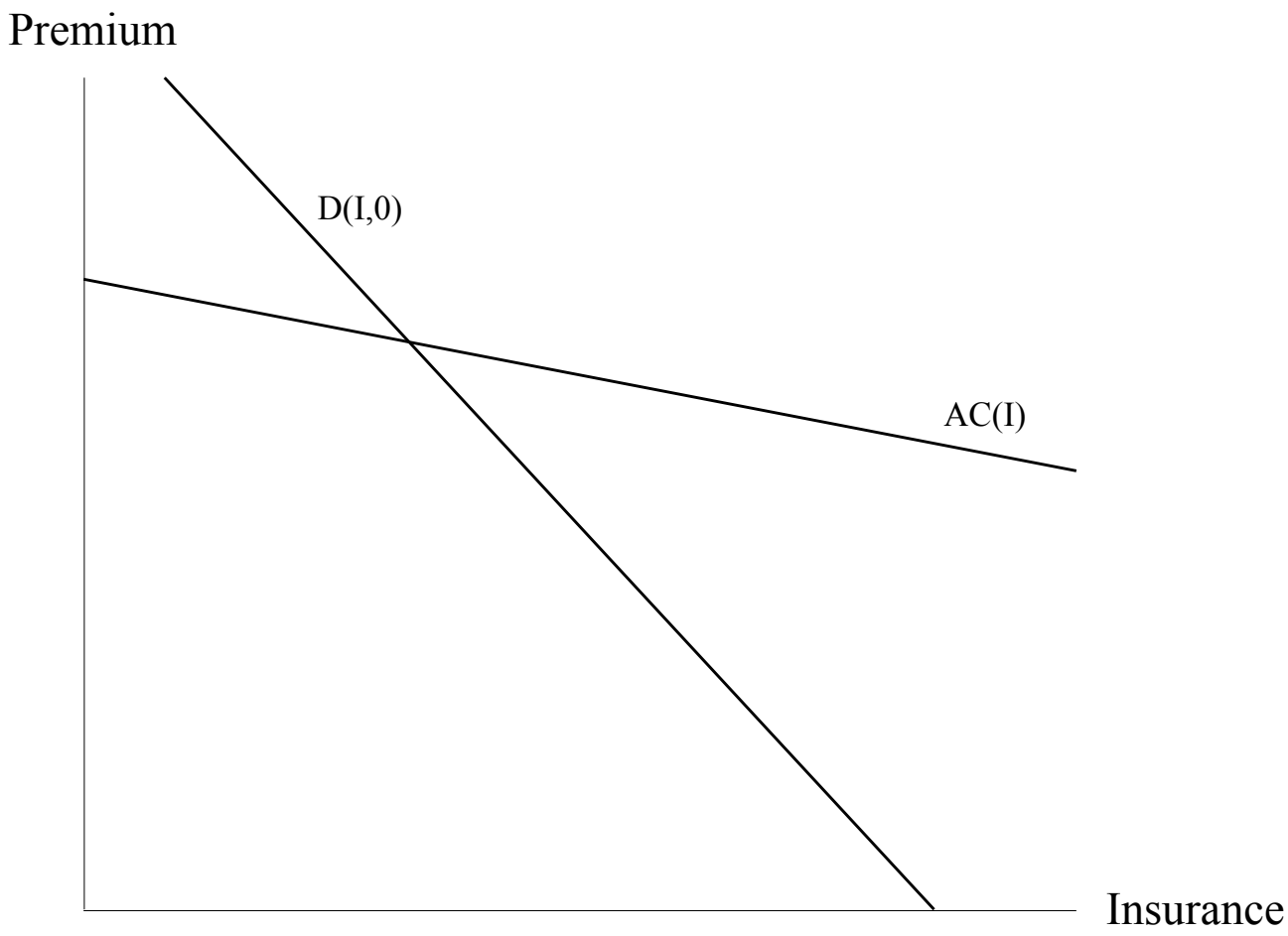
Analogously, the marginal cost curve is given by

$$MC(I) = E[c(\theta) | v(\theta) = D(I, 0)].$$

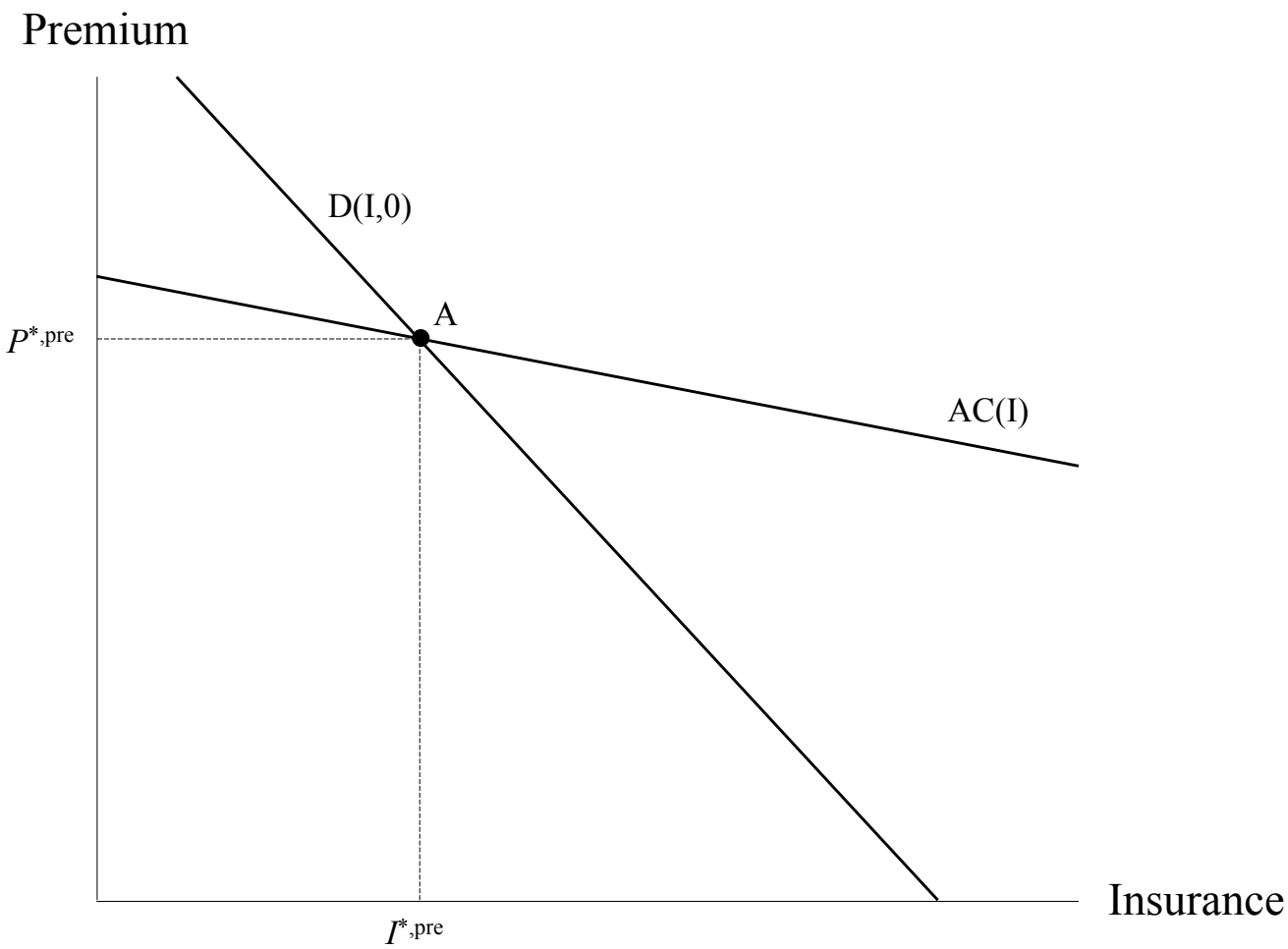
Demand



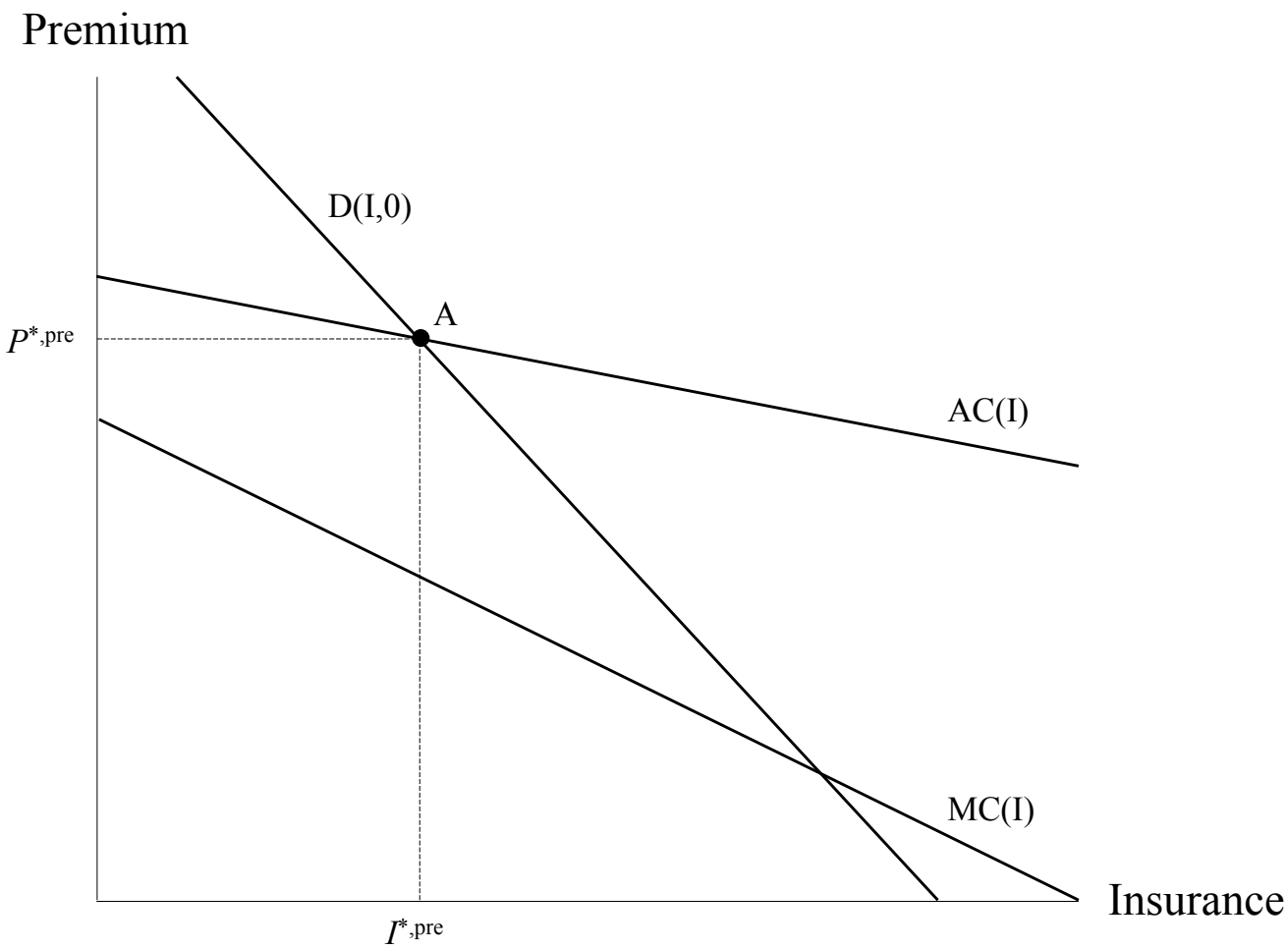
Average Cost



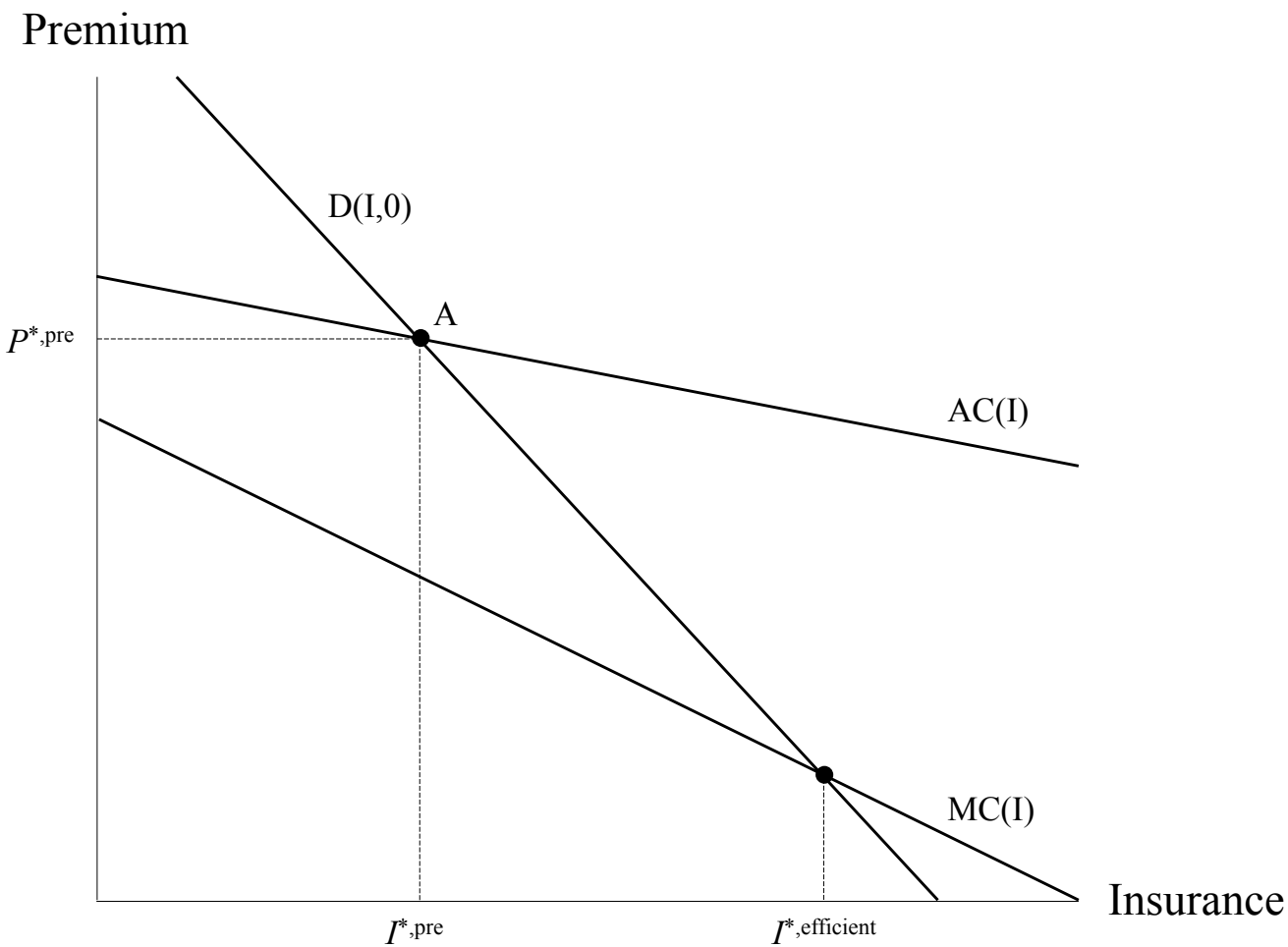
Pre-Reform Equilibrium



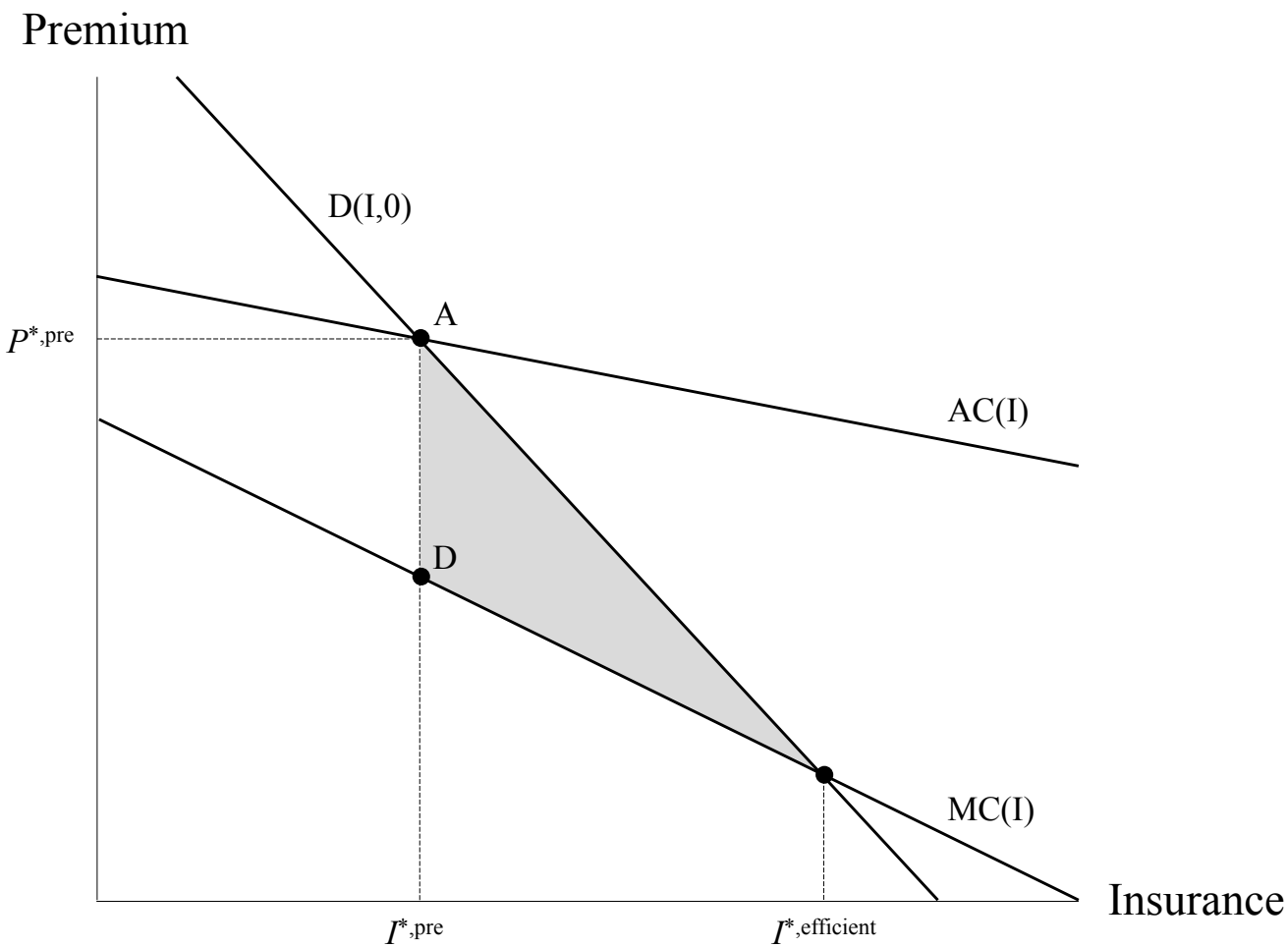
Marginal Cost



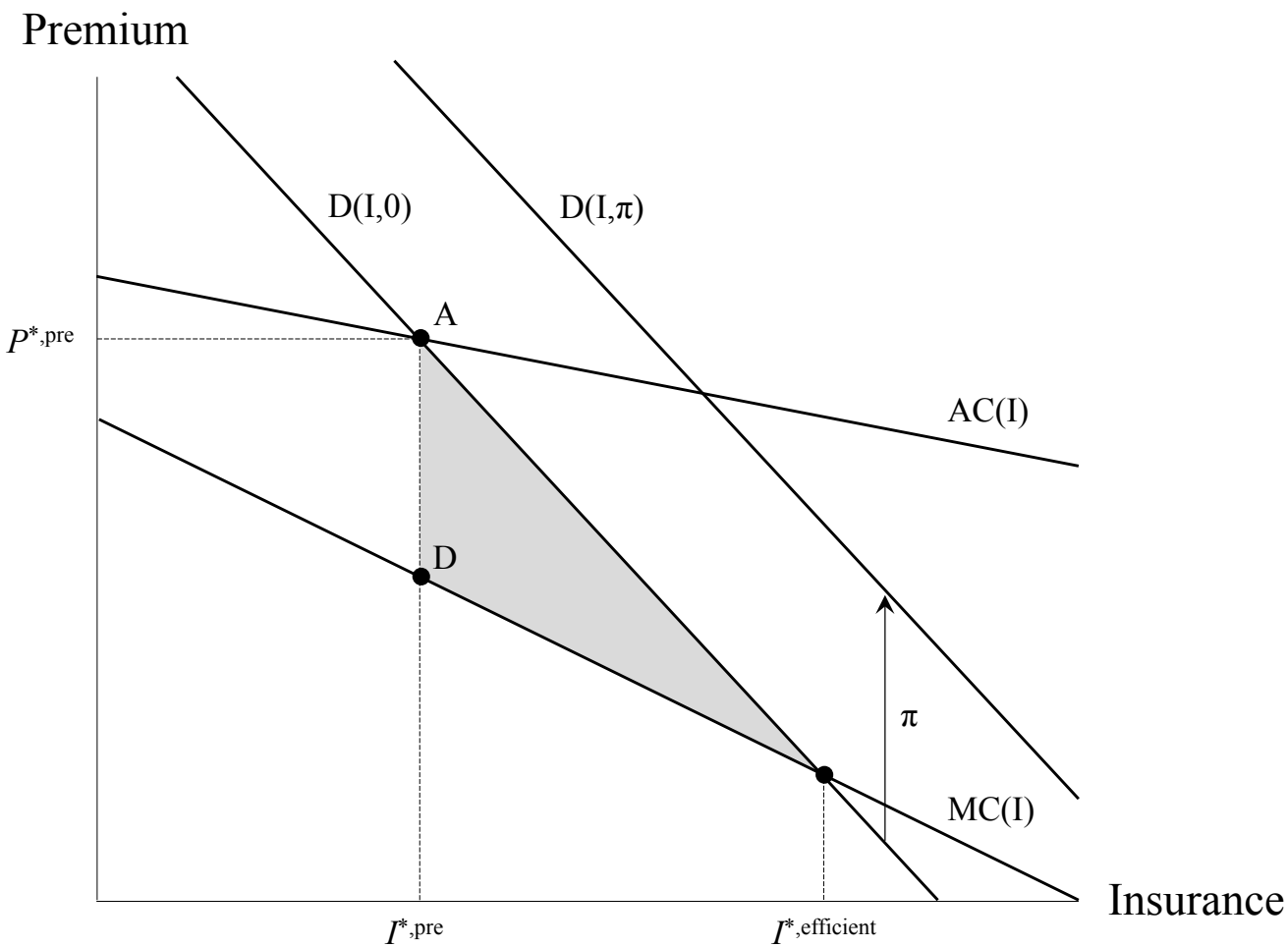
Efficient Coverage



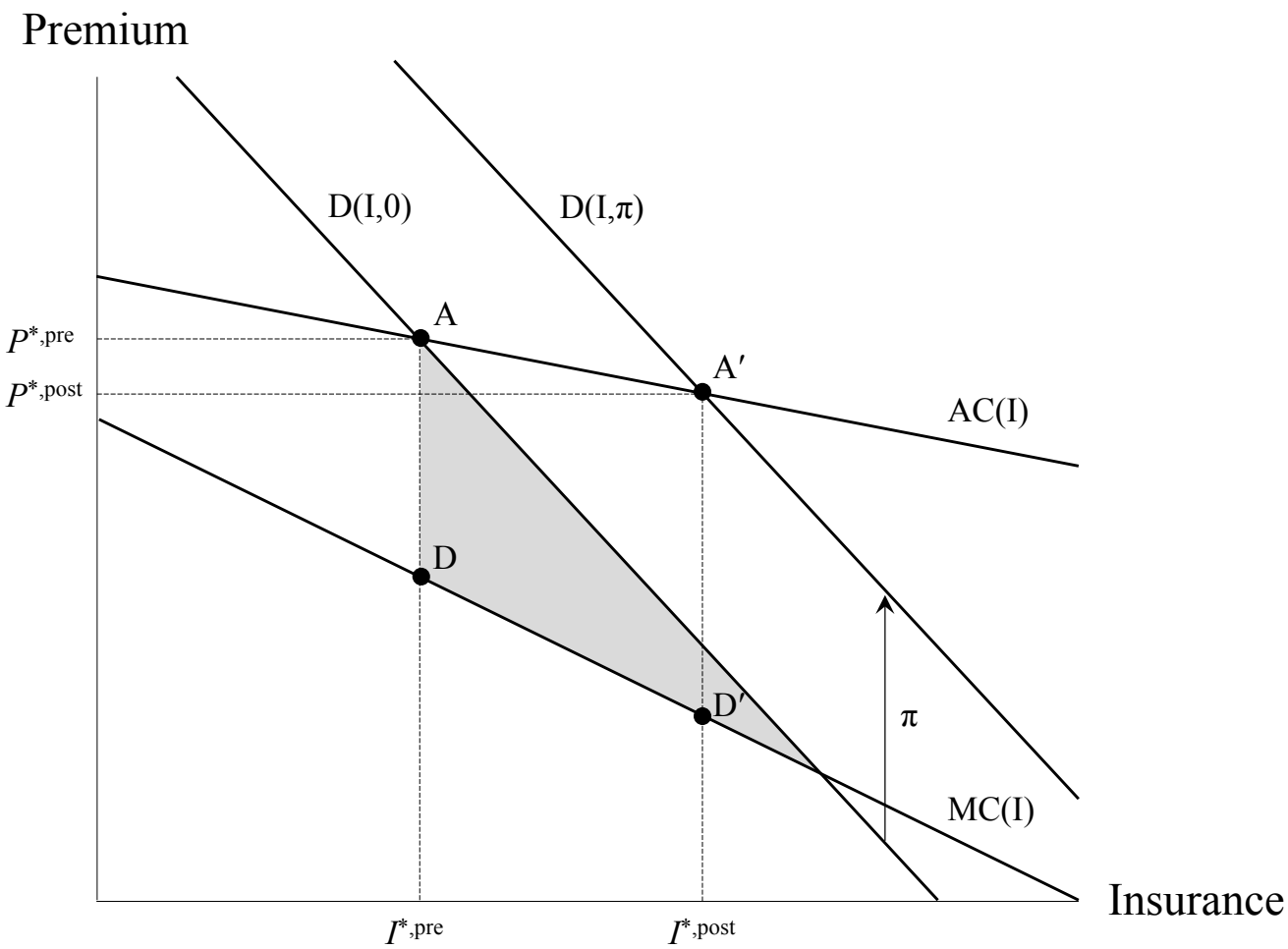
Welfare Loss of Adverse Selection



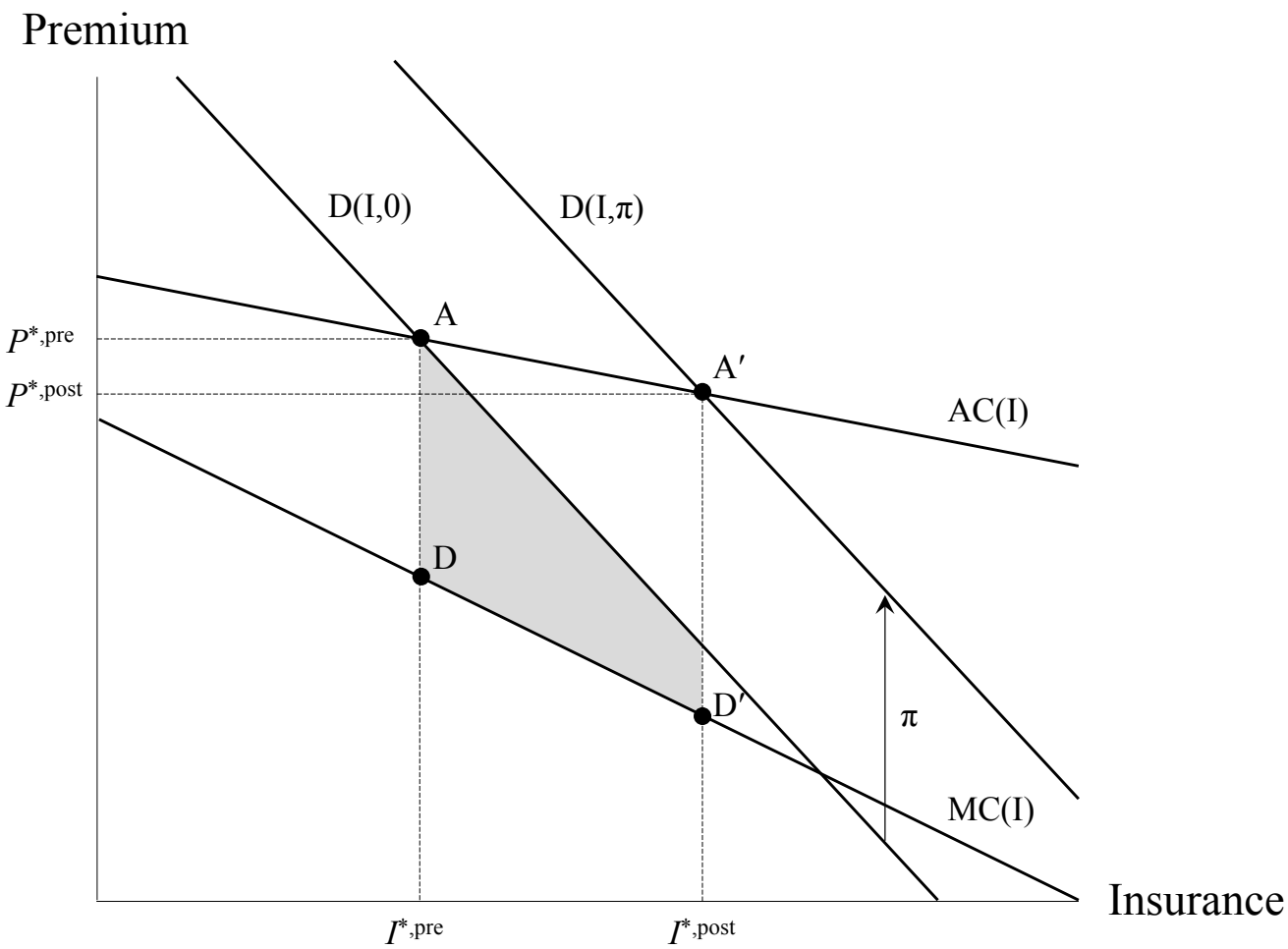
Individual Mandate: Tax Penalty



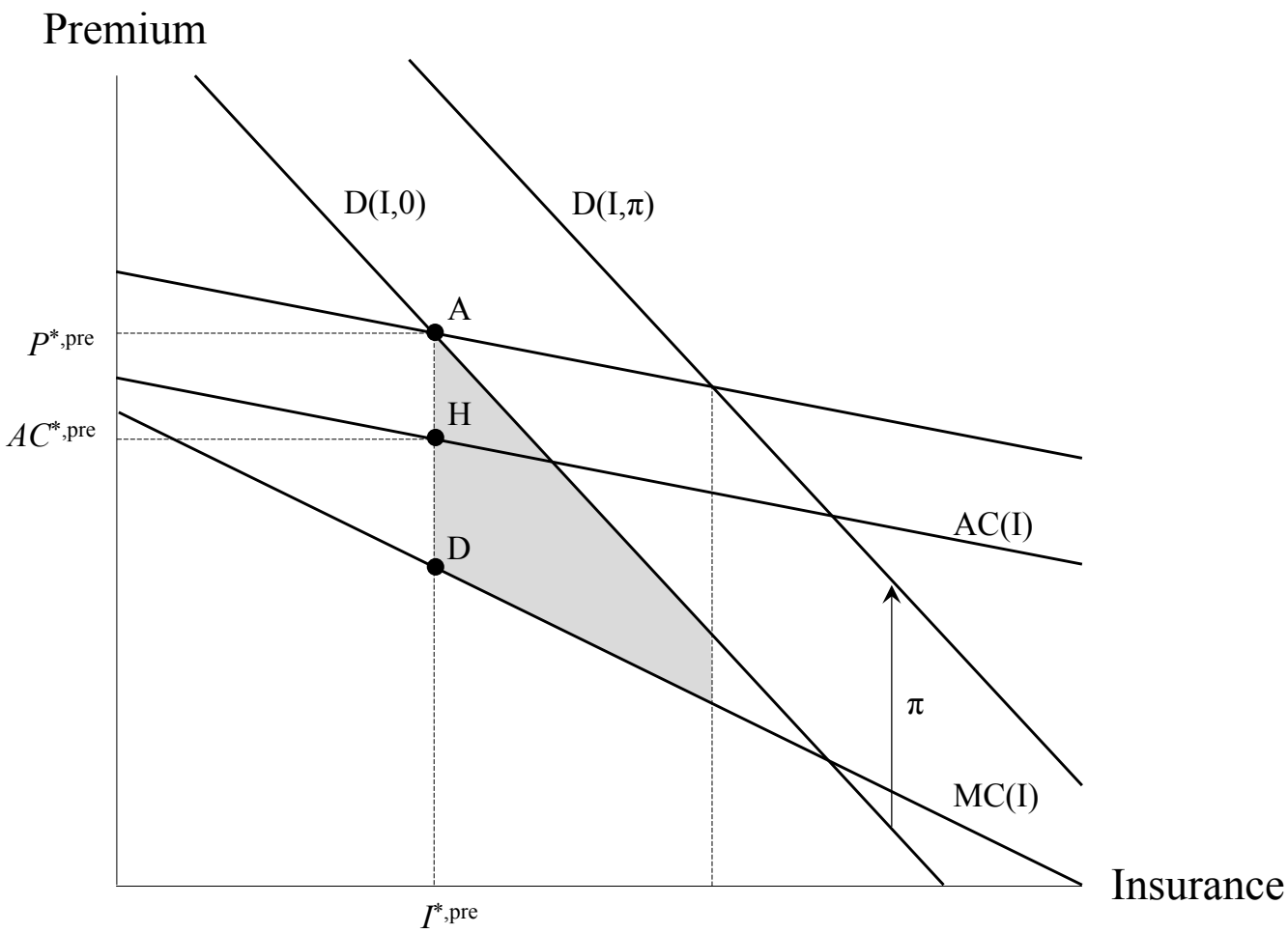
Post-Reform Equilibrium



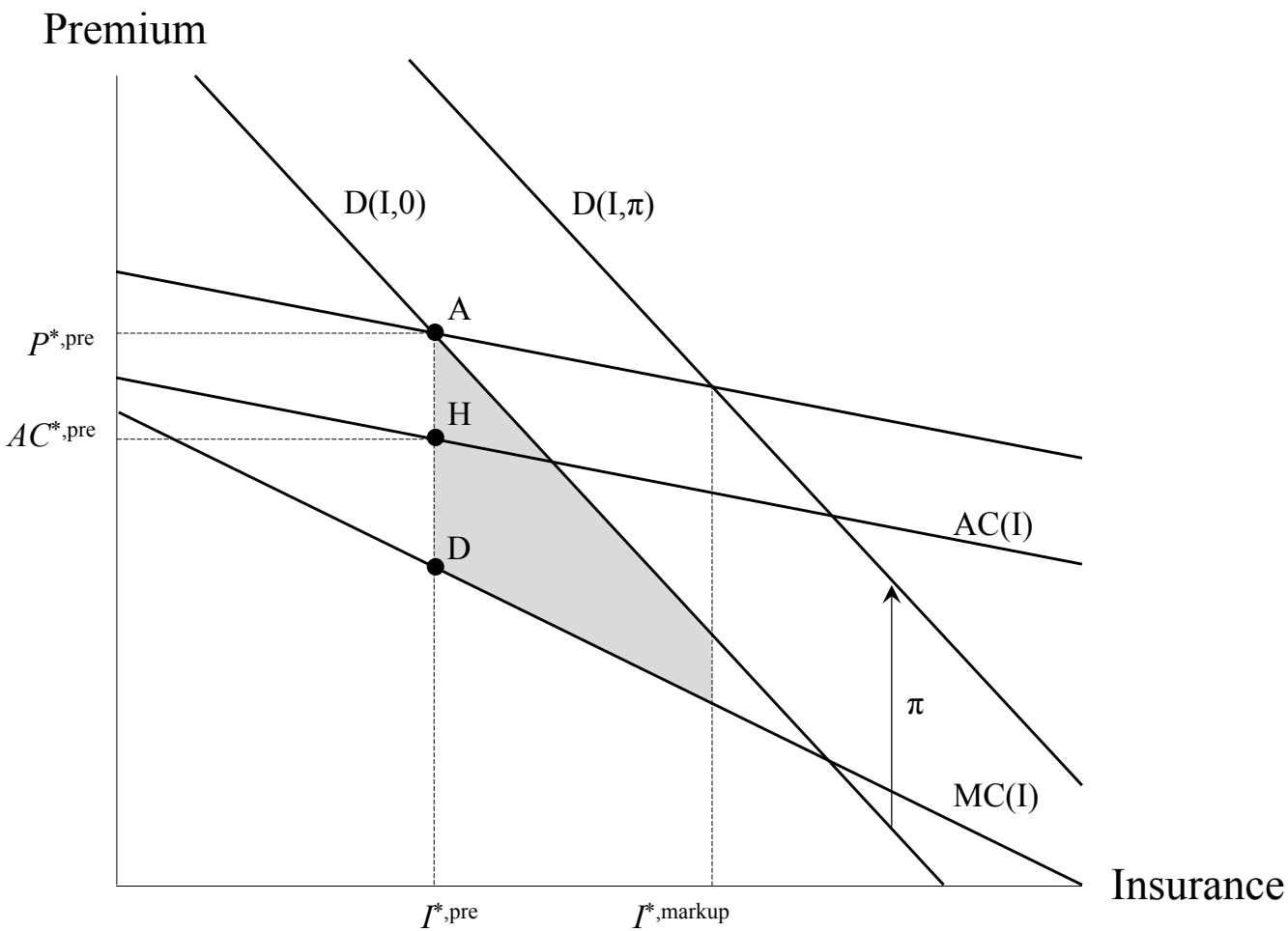
Welfare Gain from Individual Mandate



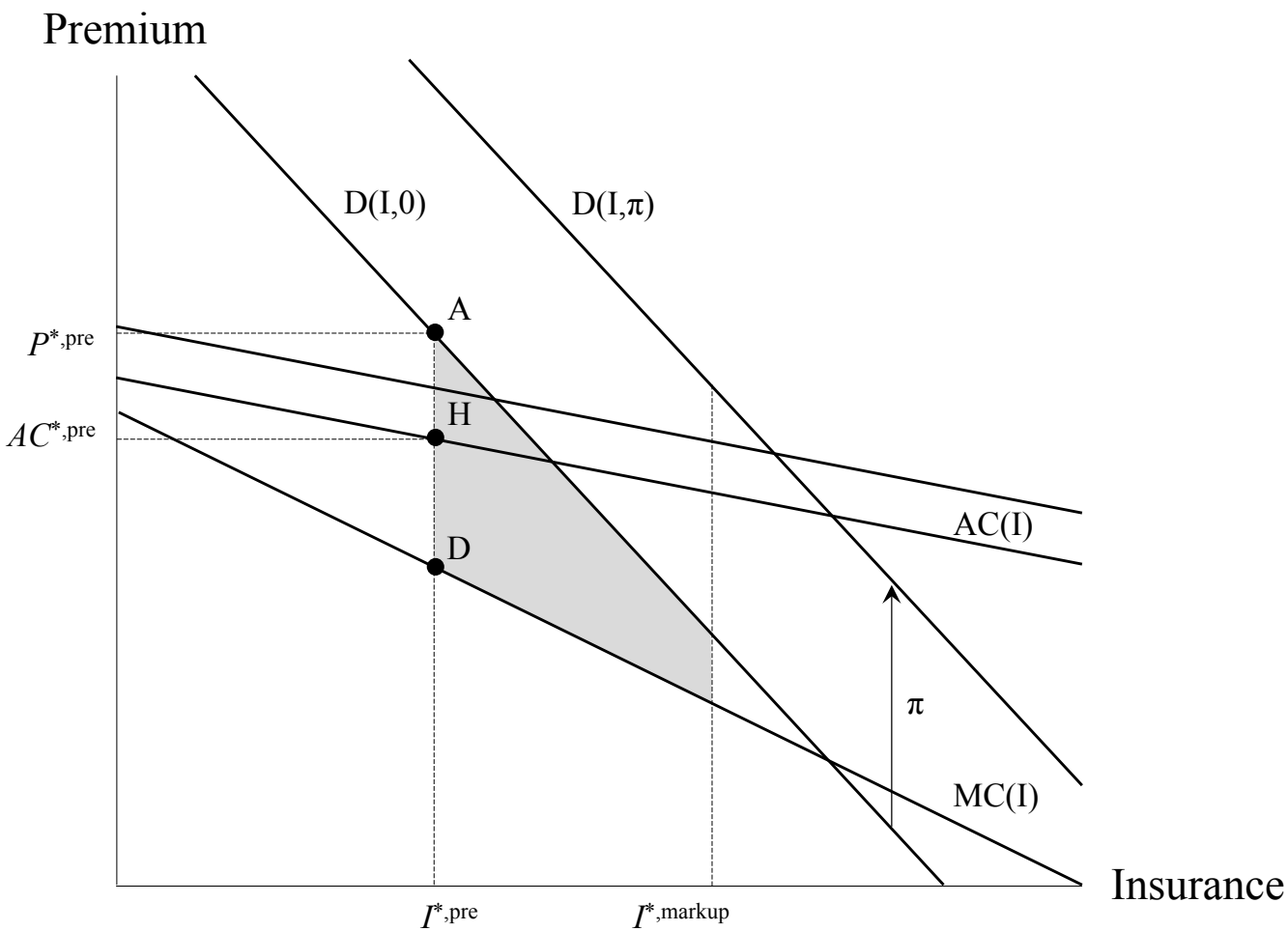
Introduce Markup



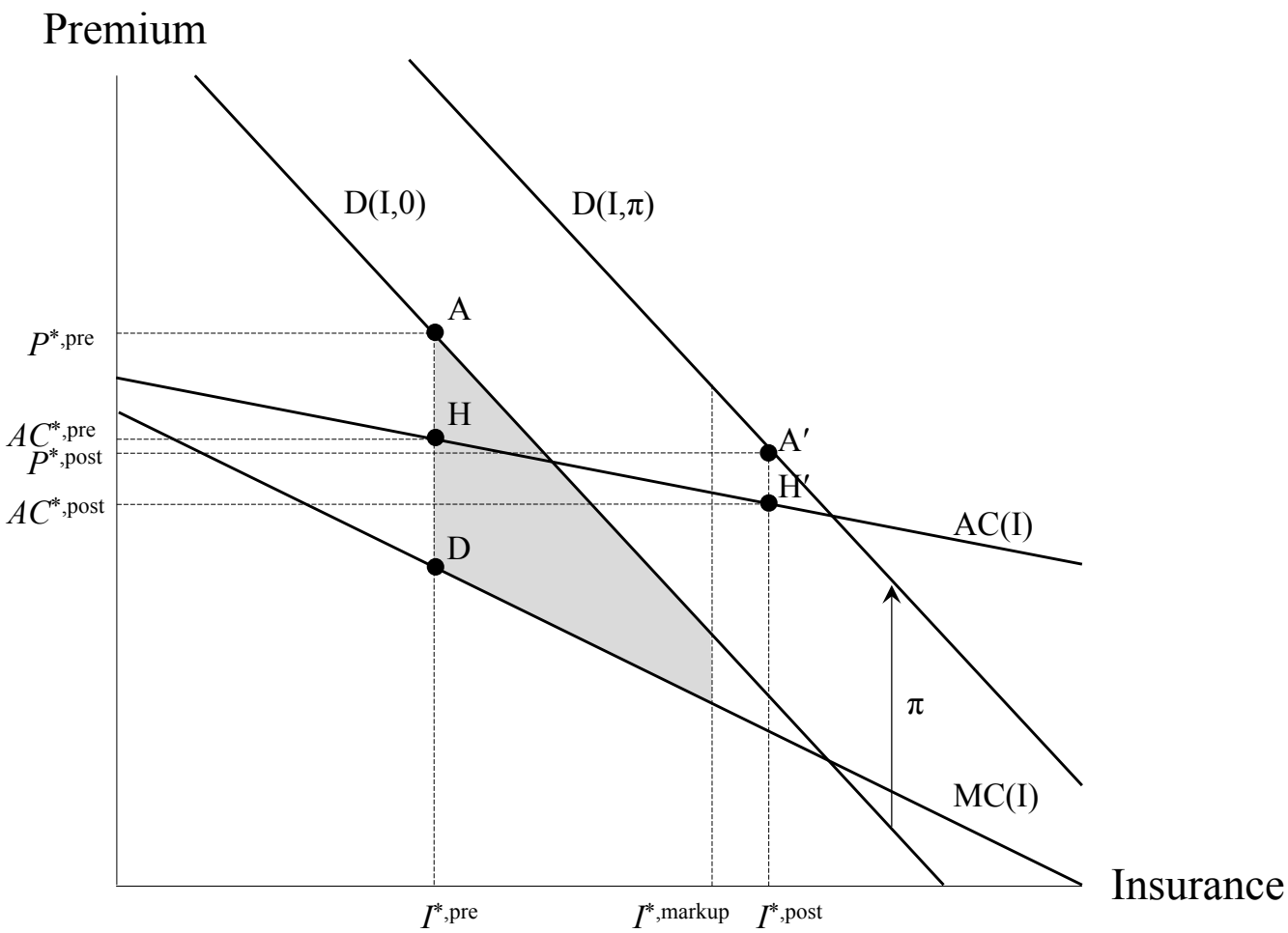
Coverage Under Pre-Reform Markup



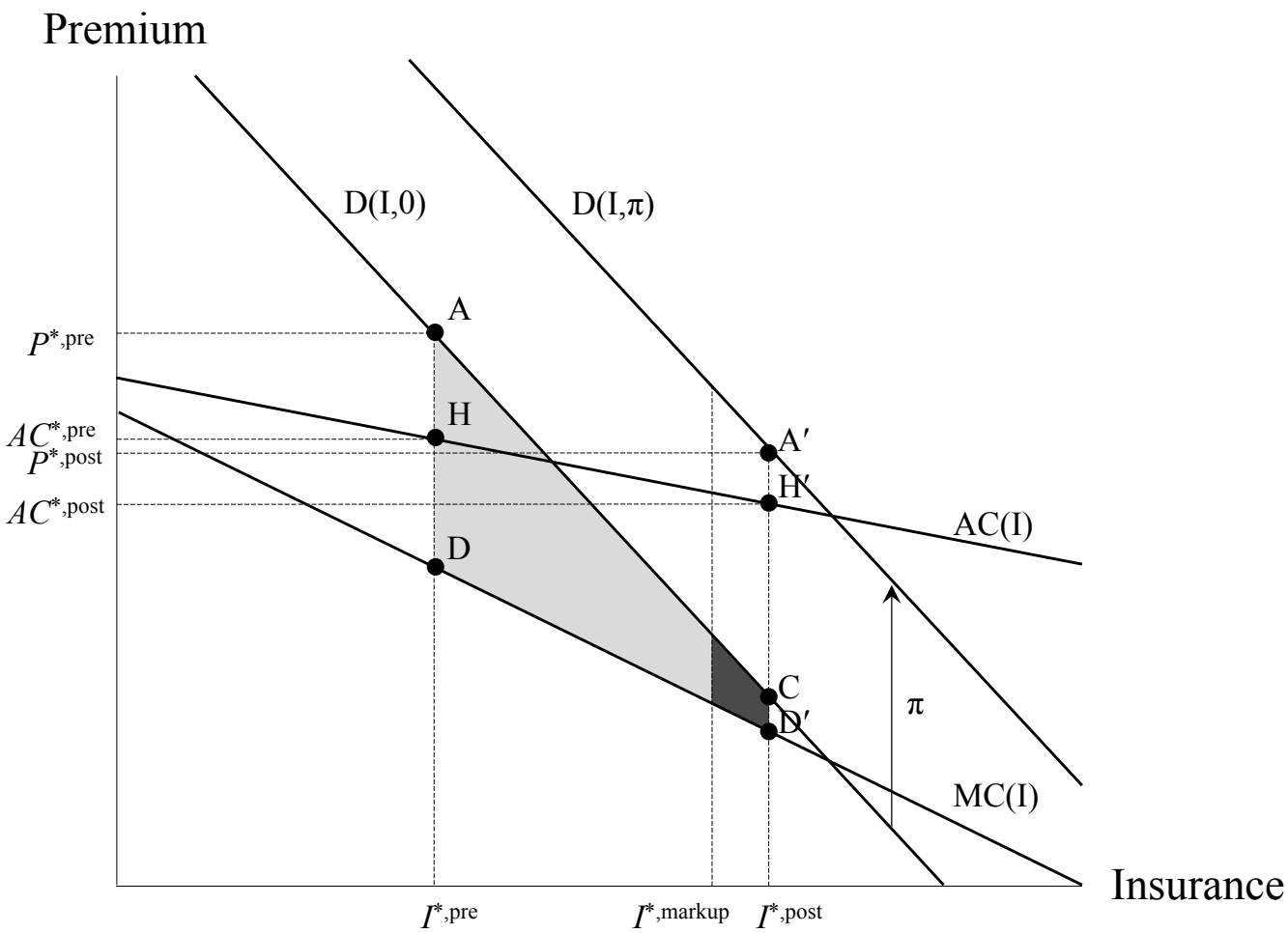
Smaller Post-Reform Markup



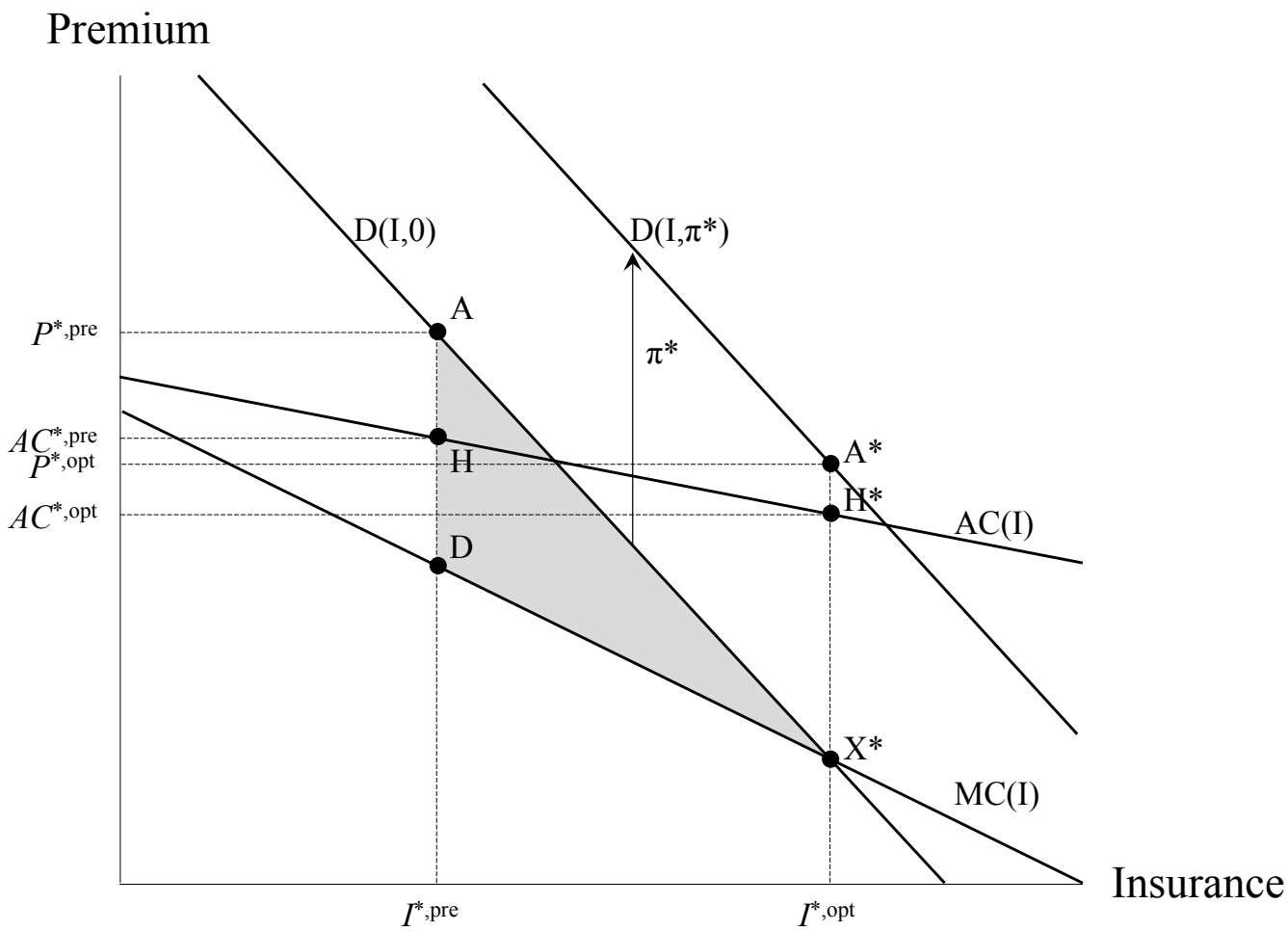
Post-Reform Equilibrium



Welfare Gain from Smaller Markup



Optimal Tax Penalty



Welfare Analysis

- Estimating welfare changes and optimal penalty requires only estimates of pre-reform levels and changes in
  - Insurance Coverage
  - Premiums
  - Average Costs
- Example:

$$\begin{aligned}
\Delta W_{full} &= (P^{*,\,pre} - AC^{*,\,pre}) * (I^{*,\,post} - I^{*,\,pre}) \\
&- (AC^{*,\,post} - AC^{*,\,pre}) * (I^{*,\,pre} + (I^{*,\,post} - I^{*,\,pre})) \\
&+ \frac{1}{2}((P^{*,\,post} - \pi) - P^{*,\,pre}) * (I^{*,\,post} - I^{*,\,pre})
\end{aligned}$$

Mapping Theory in Empirics for Welfare Analysis

- Along with size of penalty, pre-reform levels and changes in coverage, premiums, and average costs allow us to pin down the structural objects of our empirical analysis
  - Demand curve
  - Average cost curve
- Why do we need 6 moments to pin down 4 structural parameters (intercept and slope of the demand and AC curve)?
  - Two additional moments identify the pre-reform and the post-reform markup

Outline

- Introduction
- Institutional Background
- Theoretical Approach
- **Empirical Approach**
- Results
- Robustness
- Conclusion

Empirical Approach

- Use a difference-in-differences estimation strategy to quantify reform-related changes in coverage, premium, and average costs between the pre- and the post-reform years
  - Compare changes in Massachusetts with changes in other states between the pre-reform and the post-reform years
  - Controls for common national demand and average cost shocks that may shift the demand/average cost curve
  - Construct synthetic control group (Abadie and Gardeazabal, 2003)
    - Coverage, premiums, cost
    - Pre-reform levels and trends

Regression Model

$$
\begin{aligned}
Y_{st}^k &= \gamma^k * (MA * After)_{st} + \rho_1^k * (MA * During)_{st} + \rho_2^k * MA_s \\
&+ \rho_3^k * After_t + \rho_4^k * During_t + \epsilon_{st}^k
\end{aligned}
$$

- where $Y_s t$ is measured at the state-year level and refers to the log of
  - Coverage
  - Annual premium
  - Annual average costs

Data

- SNL Financial Database: 2004-2011
  - Compiled from National Association of Insurance Commissioners reports
  - Detailed data at the firm-market-year level on
    - premiums,
    - expenditures,
    - enrollment in member-months
- Universe of insurers in the individual market
- Drop insurers that offer Commonwealth Care Plans

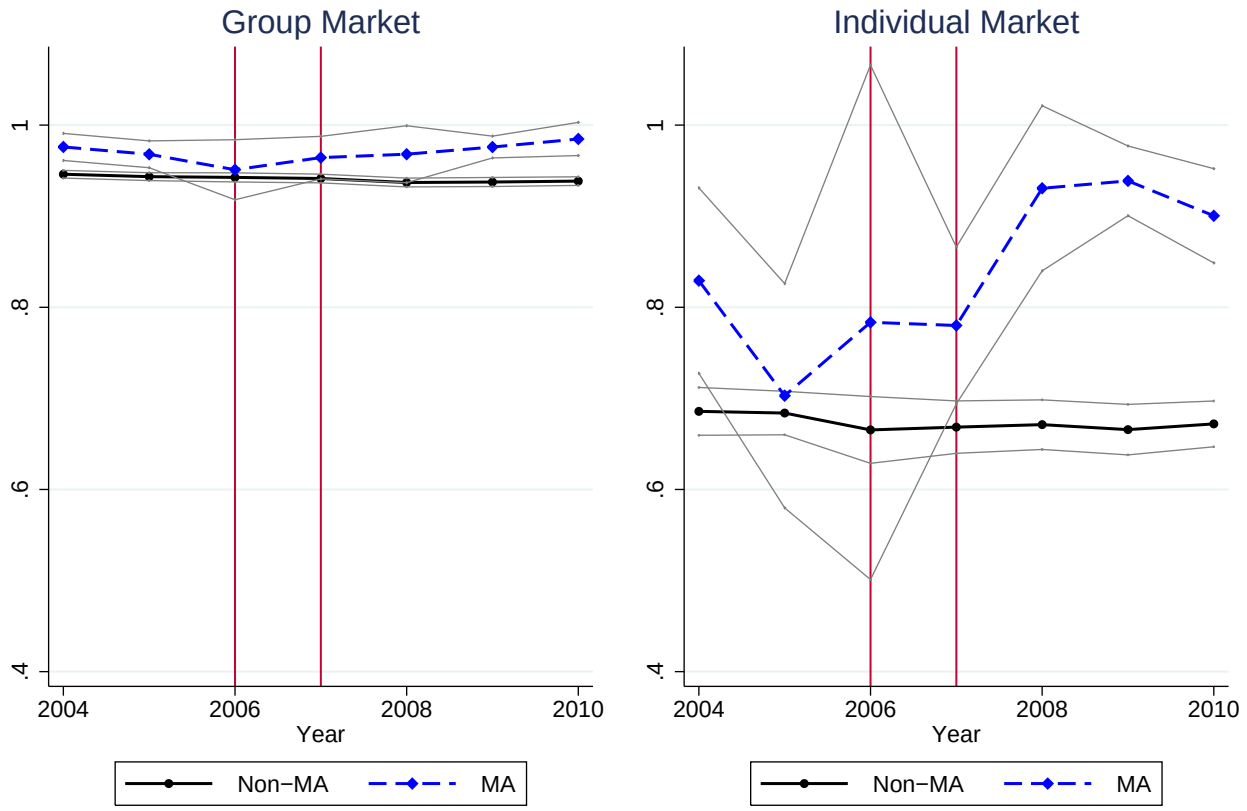
Data

- National Health Interview Survey (NHIS)
  - Allows us to express insurance coverage in percentages
  - To match the SNL population, we restrict the sample to individuals 18-64 earning more than 300% of the FPL to avoid
    - Medicaid expansions
    - Commonwealth Care plan expansion
    - Ensure homogeneous tax penalty

Outline

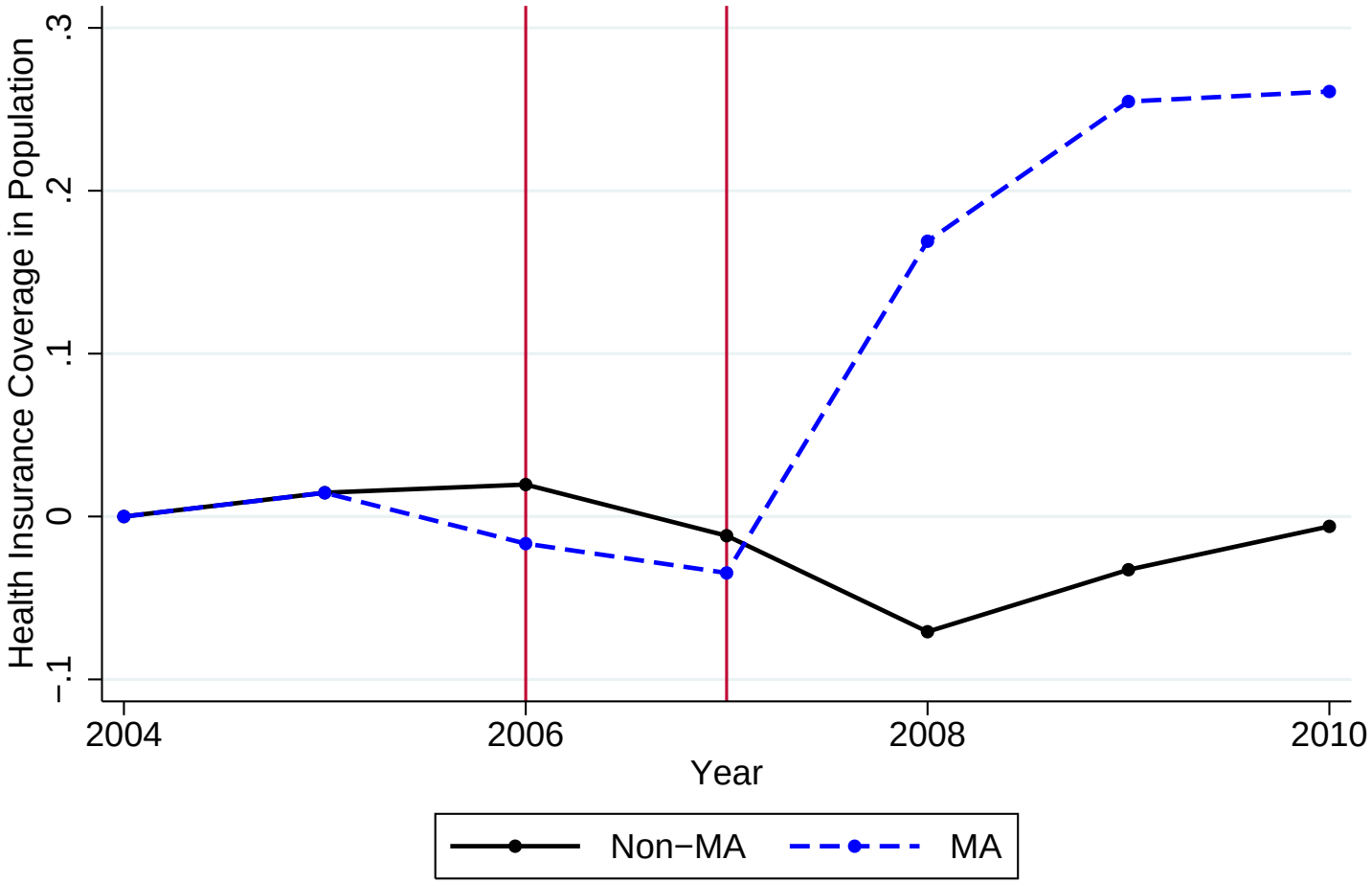
- Introduction
- Institutional Background
- Theoretical Approach
- Empirical Approach
- **Results**
- Robustness
- Conclusion

Impact on Coverage: Group vs. Individual Market



Source: NHIS data

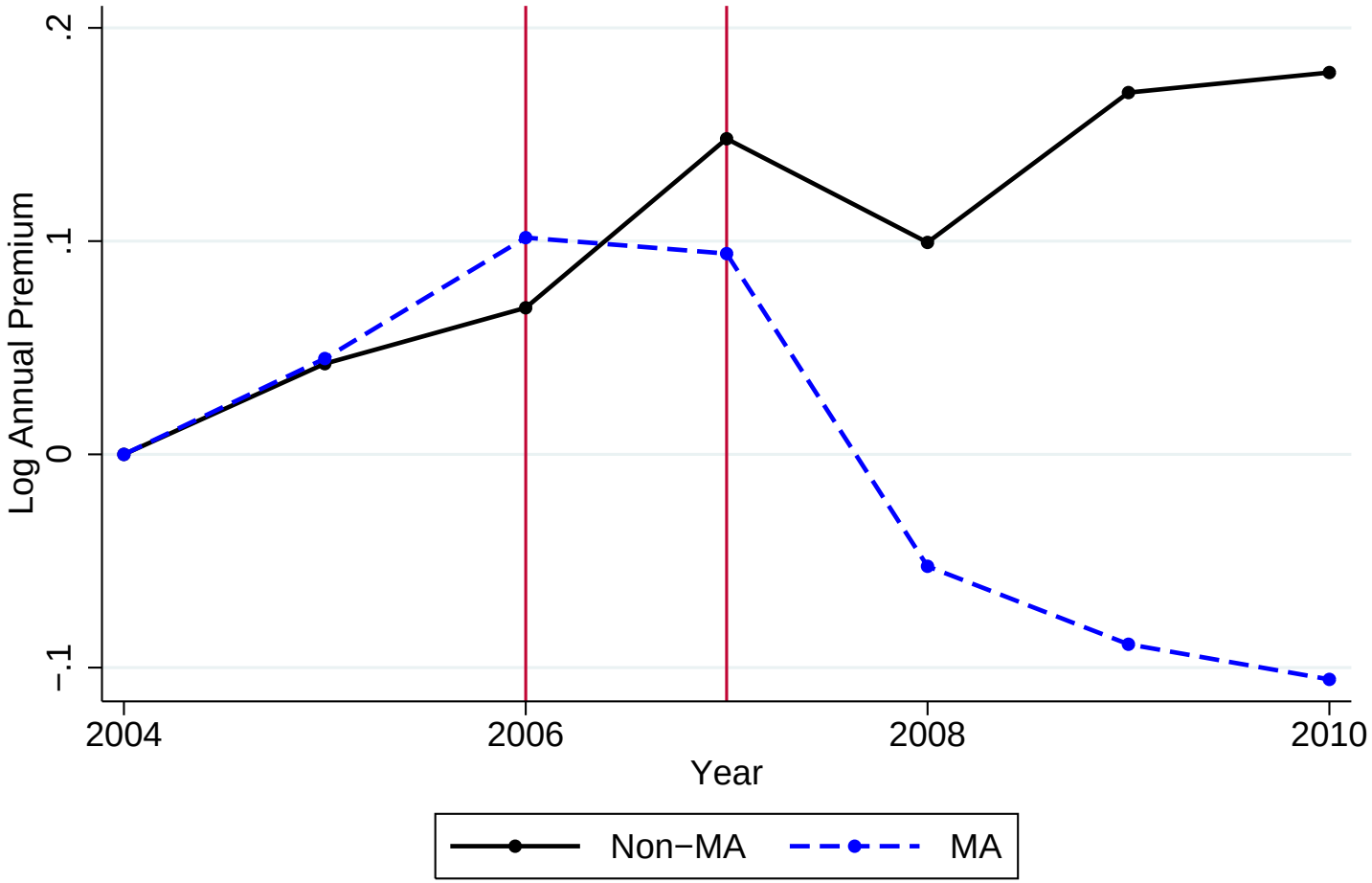
Impact on Coverage: SNL



Impact on Coverage: SNL

		(1) Coverage
γ^k	MA*After	0.265***
		[0.175, 0.362]
ρ_1^k	MA*During	-0.030*
		[-0.066, 0.003]
ρ_2^k	MA	0.112*
		[-0.010, 0.238]
ρ_3^k	After	-0.044
		[-0.139, 0.046]
ρ_4^k	During	-0.003
		[-0.036, 0.033]
ρ_{11}^k	Constant	0.591***
		[0.467, 0.713]
Pre-Reform Value (levels)		0.703

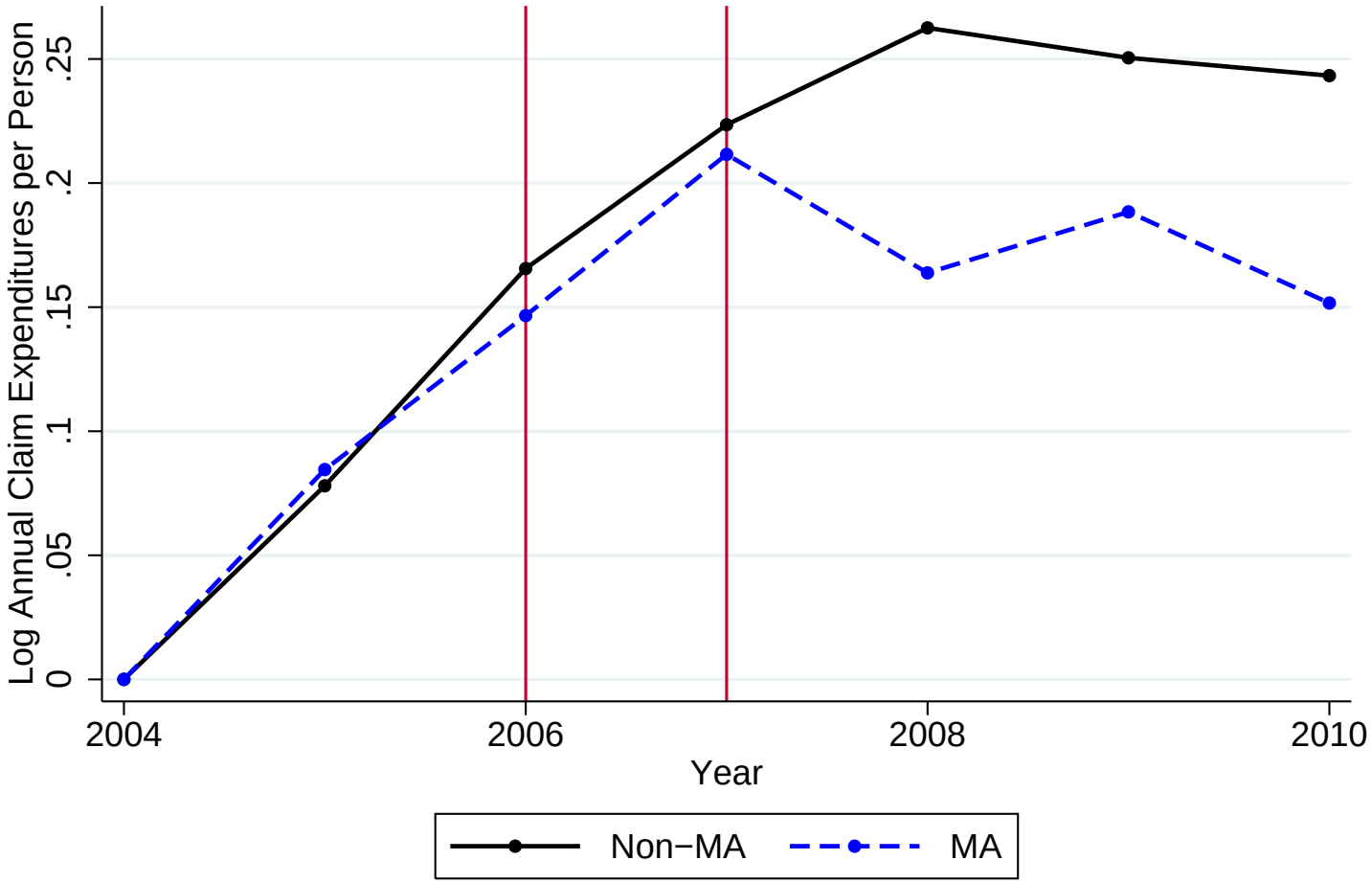
Impact on Premiums



Impact on Costs

		(1) Coverage	(2) Log Premium
γ^k	MA*After	0.265***	-0.233***
		[0.175, 0.362]	[-0.286, -0.176]
ρ_1^k	MA*During	-0.030*	-0.012
		[-0.066, 0.003]	[-0.063, 0.036]
ρ_2^k	MA	0.112*	0.700***
		[-0.010, 0.238]	[0.622, 0.779]
ρ_3^k	After	-0.044	0.128***
		[-0.139, 0.046]	[0.072, 0.182]
ρ_4^k	During	-0.003	0.087***
		[-0.036, 0.033]	[0.040, 0.138]
ρ_{11}^k	Constant	0.591***	7.978***
		[0.467, 0.713]	[7.899, 8.056]
Pre-Reform Value (levels)		0.703	5,871.33

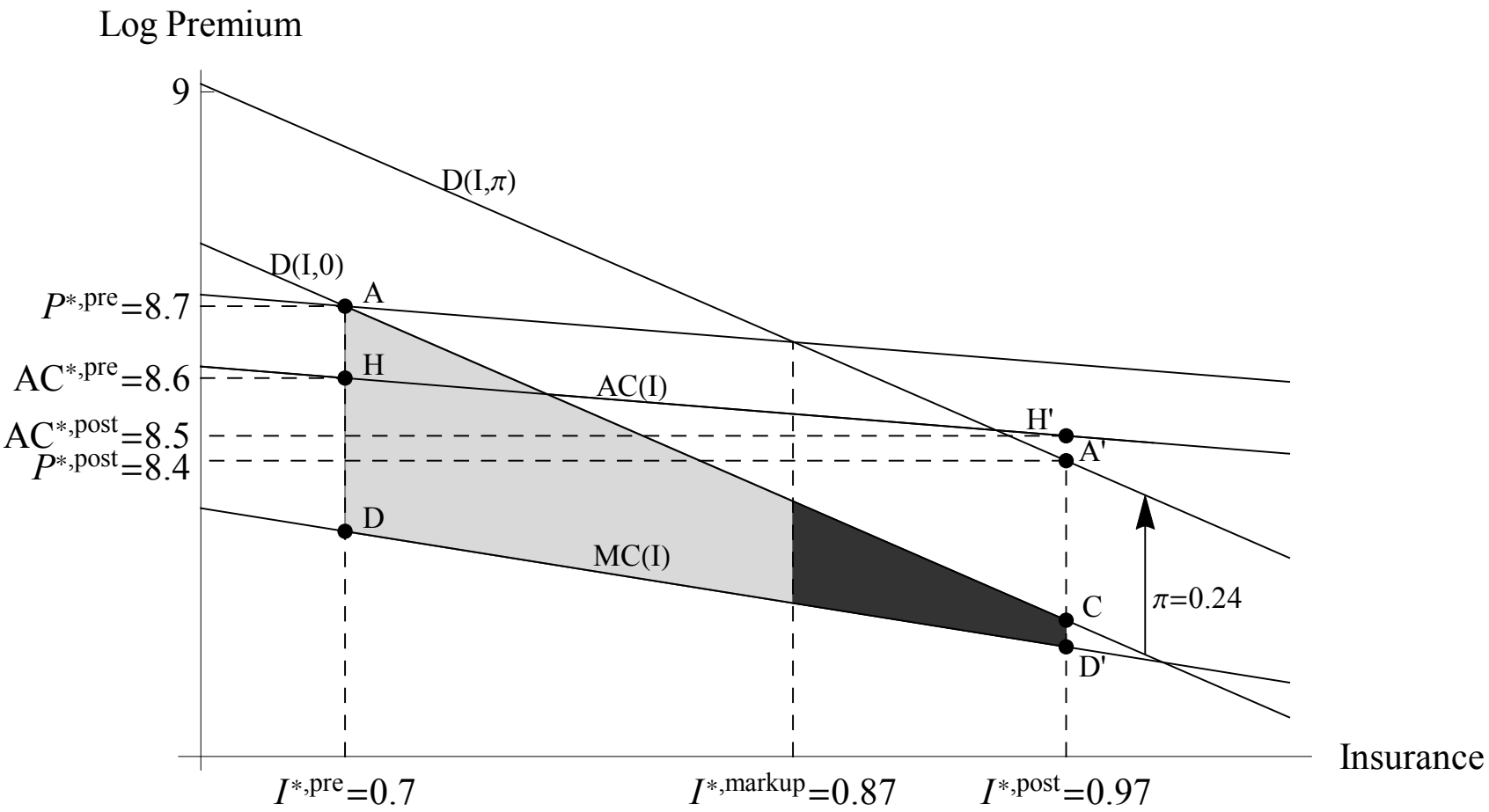
Impact on Coverage: SNL



Impact on Coverage: SNL

	(1) Coverage	(2) Log Premium	(3) Log Claim Exp
γ^k MA*After	0.265***	-0.233***	-0.087***
	[0.175, 0.362]	[-0.286, -0.176]	[-0.143, -0.025]
ρ_1^k MA*During	-0.030*	-0.012	-0.019
	[-0.066, 0.003]	[-0.063, 0.036]	[-0.076, 0.038]
ρ_2^k MA	0.112*	0.700***	0.761***
	[-0.010, 0.238]	[0.622, 0.779]	[0.662, 0.870]
ρ_3^k After	-0.044	0.128***	0.213***
	[-0.139, 0.046]	[0.072, 0.182]	[0.151, 0.269]
ρ_4^k During	-0.003	0.087***	0.156***
	[-0.036, 0.033]	[0.040, 0.138]	[0.099, 0.213]
ρ_{11}^k Constant	0.591***	7.978***	7.808***
	[0.467, 0.713]	[7.899, 8.056]	[7.699, 7.907]
Pre-Reform Value (levels)	0.703	5,871.33	5,270.64

Empirical Graph Corresponding to Theory



Translating Empirical Estimates into Welfare

- Use estimates to compute full welfare effects:

$$\begin{aligned}\Delta W_{full} &= \Big(\$8.68 - \$8.57\Big) * 26.5\% \\ &- (-\$.087) * \Big(70.3\% + 26.5\%\Big) \\ &+ \frac{1}{2}(-\$.233 - \$.239) * 26.5\% = .051.\end{aligned}$$

- \$299 per person (=.051*\$5,870)
- Putting estimates together gives us the welfare change per individual in the individual health insurance market
  - 212,000 people in the non-Medicaid individual market
  - Total welfare gain of \$63.5mm per year
  - Total welfare gain equal to 5.7% of insurer medical expenditures

Changes in Markup vs. Adverse Selection

- Changes in health insurance coverage
  - 4.1% because of removal of adverse selection
  - 1% because of smaller post-reform markup
- Changes in Welfare
  - $241 because of removal of adverse selection
  - $59 because of smaller post-reform markup
- Population net welfare gain: $51.1mm per year

Optimal Mandate

- Our estimates suggest that universal coverage is optimal
- The penalty must be sufficiently large such that every consumer buys health insurance
- The minimal tax penalty is $1,462

Outline

- Introduction
- Institutional Background
- Theoretical Approach
- Empirical Approach
- Results
- **Robustness**
- Conclusion

Robustness

- Consider a number of robustness checks
  - Relax linear demand
  - Perceived penalty magnitude (e.g. Ericson and Kessler, 2014)
  - Alternate control group with guaranteed issue included in matching
  - Allow for age bands rather than pure community rating
  - Changes in plan generosity
  - Changes to health care delivery due to reform in MA (Kolstad and Kowalski, 2012)
  - Expand sample to include insurers offering CommCare plans (population under 300% FPL)
  - Incorporate estimates for key parameters from other work on MA reform (Graves and Gruber (2012), Ericson and Starc (2012), Hackmann, et al. (2012))

Relax Linear Demand

- Consider L-shaped and Inverse L-shaped demand
  - Full Welfare Effect
    - Baseline: 5.1%
    - Lower Bound: -1.2%
    - Upper Bound: 11.3%
  - Net Welfare Effect
    - Baseline: 4.1%
    - Lower Bound: 0%
    - Upper Bound: 11.3%

Tax Penalties

Tax Penalty	% Tax Penalty	Full Welfare Effect	Net Welfare Effect
Baseline: 1250	21.3%	0.051**	0.041**
		[0,0.099]	[0.01,0.072]
450	7.7%	0.072**	0.03***
		[0.017,0.124]	[0.011,0.05]
550	9.4%	0.07**	0.033***
		[0.015,0.121]	[0.012,0.055]
650	11.1%	0.067**	0.036***
		[0.013,0.118]	[0.012,0.06]
750	12.8%	0.064**	0.038***
		[0.011,0.115]	[0.013,0.064]
850	14.5%	0.062**	0.039***
		[0.009,0.112]	[0.012,0.067]
950	16.2%	0.059**	0.04***
		[0.007,0.108]	[0.012,0.069]
1050	17.9%	0.056**	0.041***
		[0.005,0.106]	[0.012,0.071]
1150	19.6%	0.054**	0.041**
		[0.003,0.102]	[0.011,0.072]
1350	23.0%	0.048*	0.041**
		[-0.003,0.095]	[0.009,0.073]
1450	24.7%	0.045*	0.04**
		[-0.005,0.092]	[0.008,0.072]
1550	26.4%	0.042*	0.039**
		[-0.008,0.089]	[0.006,0.072]
1650	28.1%	0.039	0.038**
		[-0.011,0.085]	[0.005,0.071]
1750	29.8%	0.036	0.037**
		[-0.014,0.082]	[0.003,0.07]
1850	31.5%	0.032	0.035**
		[-0.017,0.078]	[0.001,0.069]
1950	33.2%	0.029	0.033*
		[-0.021,0.074]	[0,0.067]
2050	34.9%	0.026	0.031*
		[-0.024,0.07]	[-.003,0.065]
GI: 1250	21.3%	0.056*	0.044***
		[0,0.107]	[0.013,0.075]

Alternate Control Group: Guaranteed Issue States

Table : Difference-in-Differences Regression Results

		(1) Coverage	(2) Log Premium	(3) Log Claim Exp
γ^k	MA*After	0.305***	-0.266***	-0.099***
		[0.205, 0.402]	[-0.319, -0.213]	[-0.157, -0.033]
ρ_1^k	MA*During	-0.012	-0.028	-0.051
		[-0.048, 0.022]	[-0.082, 0.028]	[-0.110, 0.012]
ρ_2^k	MA	0.154**	0.559***	0.609***
		[0.018, 0.301]	[0.497, 0.626]	[0.539, 0.682]
ρ_3^k	After	-0.084*	0.161***	0.225***
		[-0.182, 0.016]	[0.109, 0.214]	[0.159, 0.282]
ρ_4^k	During	-0.021	0.103***	0.188***
		[-0.054, 0.015]	[0.047, 0.157]	[0.125, 0.247]
ρ_{11}^k	Constant	0.549***	8.119***	7.960***
		[0.403, 0.682]	[8.052, 8.180]	[7.887, 8.030]
Pre-Reform Value (levels)		0.703	5,871.33	5,270.64

The bootsrapped 95% confidence interval is displayed in brackets.

Standard errors are clustered at the state level. Abadie weights depend on member month enrollment, an indcator variable that takes on the value of one for guaranteed issue states as well as changes in coverage, relative changes in average costs, and relative changes in premiums between 2004 and 2005.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Perfect Community Rating Assumption

Table : Average Age in Massachusetts by Market Segment

	2005	2006	2007	2008	2009	2009-2005
Individual	36.9	36.8	37.3	37.1	37.3	0.4
Small Group	33.1	33.3	33.5	33.7	34.1	1.0
Mid-Size Group	32.6	33.0	33.2	33.2	33.3	0.7
Large Group	33.3	33.4	33.7	33.7	34.8	1.5

Change in the Generosity of Plan Design

- Measure HMO enrollment via name of insurer. Controlling for HMO enrollment, we find even larger welfare estimates
- Evidence from Mass DHCFP on plan generosity suggests, if anything, more generous coverage

Change in the Generosity of Plan Design

Table : Plan Generosity

	2007			2008		
	Minimum	Median	Maximum	Minimum	Median	Maximum
Actuarial Value	0.578	0.694	0.726	0.635	0.726	0.860
Deductible	$2000	$2000	$2000	$2000	$2000	None
Coinsurance	N/A	N/A	N/A	N/A	N/A	N/A
PCP Office Visit	$35	$25	$25	$35	$25	$25
SPC Office Visit	$50	$25	$25	$50	$25	$25
Inpatient Copay	Deductible	Deductible	$500	Deductible	$500	$800
Outpatient Surgery Copay	Deductible	Deductible	$250	Deductible	$250	$250
Emergency Room Copay	$200	$100	$75	$200	$75	$100
Pharmacy Deductible	N/A	None	None	$250	None	None
Retail Generic	N/A	$10	$10	$20	$10	$15
Retail Preferred	N/A	$50	$30	$50	$30	$30
Retail Non-Preferred	N/A	$100	$60	$75	$60	$50

Welfare Effects using Estimates from the Literature

- Use premium estimates from Graves and Gruber (2012)
- Use demand elasticities from Ericson and Starc (2012)
- Use average cost estimates from Hackmann, Kolstad, and Kowalski (2012)

Table : Welfare Gains Using Demand Estimates From the Literature

	Full Welfare Effect	Net Welfare Effect
Baseline Estimates	0.051	0.041
Graves and Gruber (2012)	0.035	0.030
Ericson and Starc (2012): Premiums	0.075	0.088
Ericson and Starc (2012): Coverage	0.059	0.051
Hackmann , Kolstad, and Kowalski (2012)	0.125	0.100

Outline

- Introduction
- Institutional Background
- Theoretical Approach
- Empirical Approach
- Results
- Robustness
- **Conclusion**

Conclusion 1

- Develop a simple model of the individual insurance market in MA
- Model allows us to analyze the impact of the individual mandate on adverse selection
- Use the model to derive sufficient statistics formulas, which allow us to express the welfare effects and the optimal penalty in terms of a small number of empirical moments
- Use Massachusetts reform to identify these moments and to quantify the welfare effects/optimal penalty
- Findings
  - Welfare gains through the reduction of adverse election: \$241 per person (\$51.1 million)
  - Welfare gains because of smaller post-reform markups: \$59 per person (\$12.4 million)
  - Optimal tax penalty of \$1,462 induces universal coverage

Conclusion 2

- Predictions for the ACA
  - Suggests individual mandate (the focus of the SCOTUS challenge) is fundamental to mandate-based reform at the national level
  - Suggests that individual mandate enhances welfare due to reductions in adverse selection
  - Important limitation: May depend considerably on existing state-level insurance regulation and how states implement exchanges