Exploiting Compulsory Crop Insurance for Assessing Adverse Selection: Evidence from the Israeli Citrus Program

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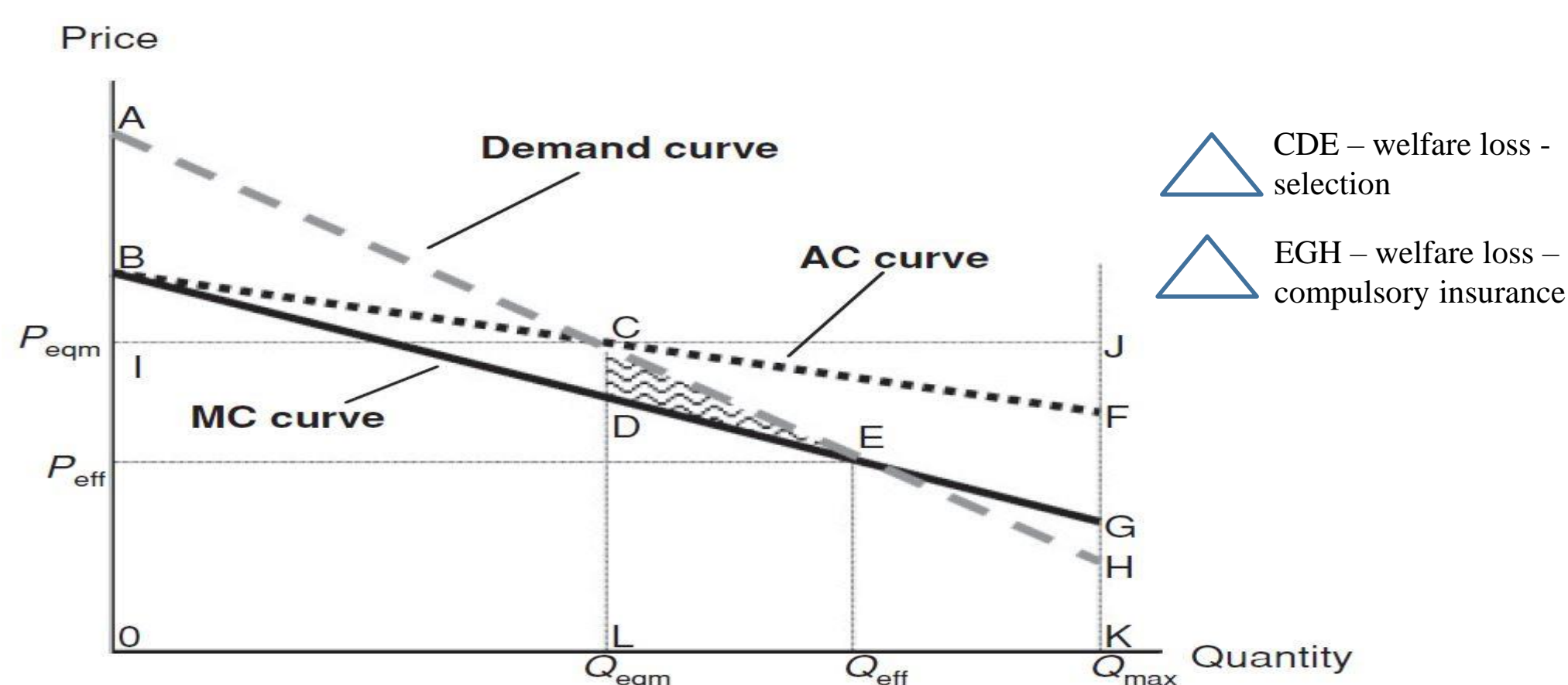
1. Introduction and Main Idea

- Despite a large subsidy, 60% of Israel's citrus growers chose not to purchase multiple peril crop insurance (MPCI) program, why?

- Akerlof's (1970) and the literature that follows predicts that the "good guys" select to stay out the market.

- However, testing this conjecture is a difficult task since usually the risk of the uninsured population is not observed.

- 2 main challenges in the empirical literature of insurance markets:
1. To distinct between adverse selection and moral hazard.
2. To quantify welfare loss associated with asymmetric information.

In this paper:
- In 2004 the Israeli government established a compulsory crop insurance program for citrus. => All growers are in the insurance pool!

- By using 2004-16 grower-level insurance data and exploiting the exogenous change in the insured population, we can separate adverse selection from moral hazard and quantify the welfare loss associated with selection.

2. Welfare Analysis – Triangle Calculations

- Einav et al. (2010a,b): methodological breakthrough: quantifying the welfare loss associated with adverse selection:

CDE – welfare loss - selection

EGH – welfare loss – compulsory insurance
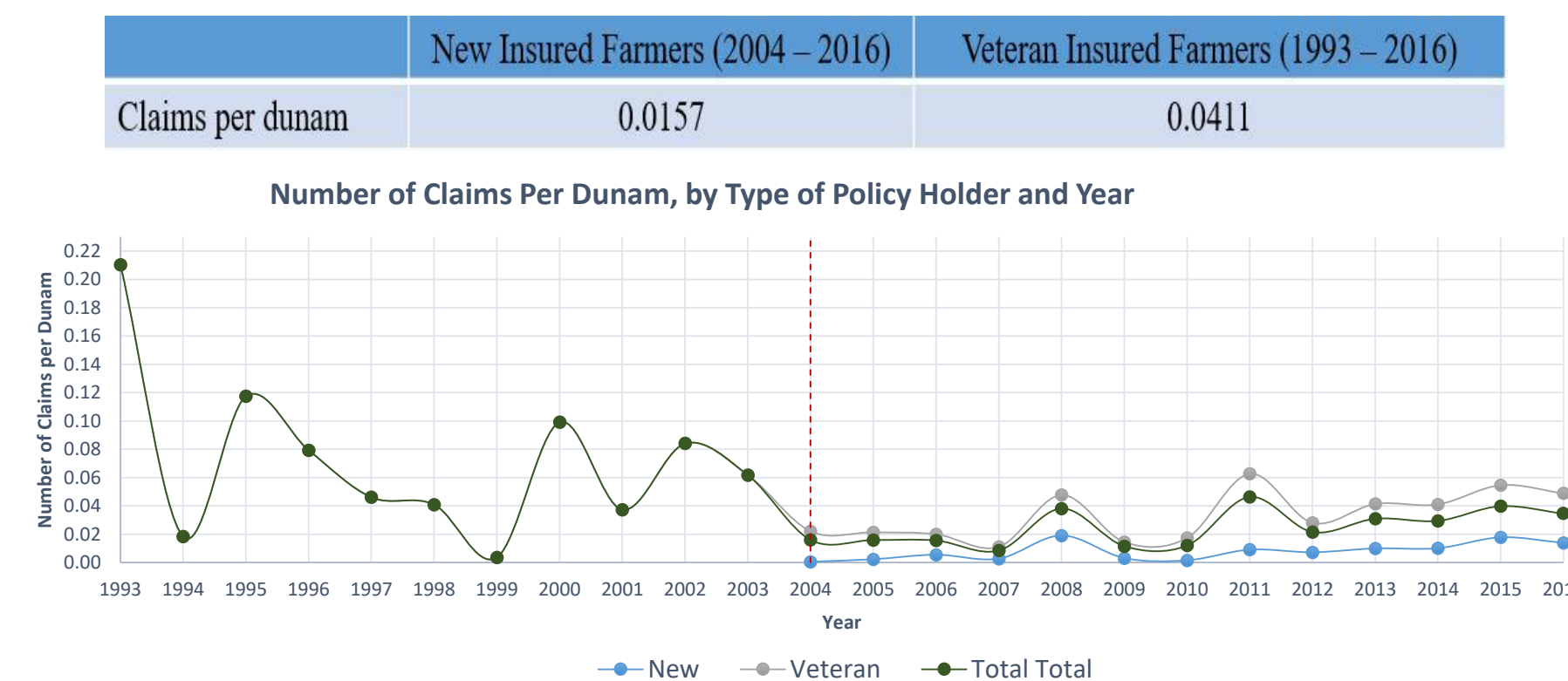
Source: Einav et al. (2010a)

3. Research Questions

- Does the introduction of compulsory crop insurance reduce the average risk? => Does adverse selection identifiable?

- If yes, what are the welfare consequences of adverse selection?

- And does the compulsory crop insurance increase welfare => A Pareto dominant (Dahlby 1981)?
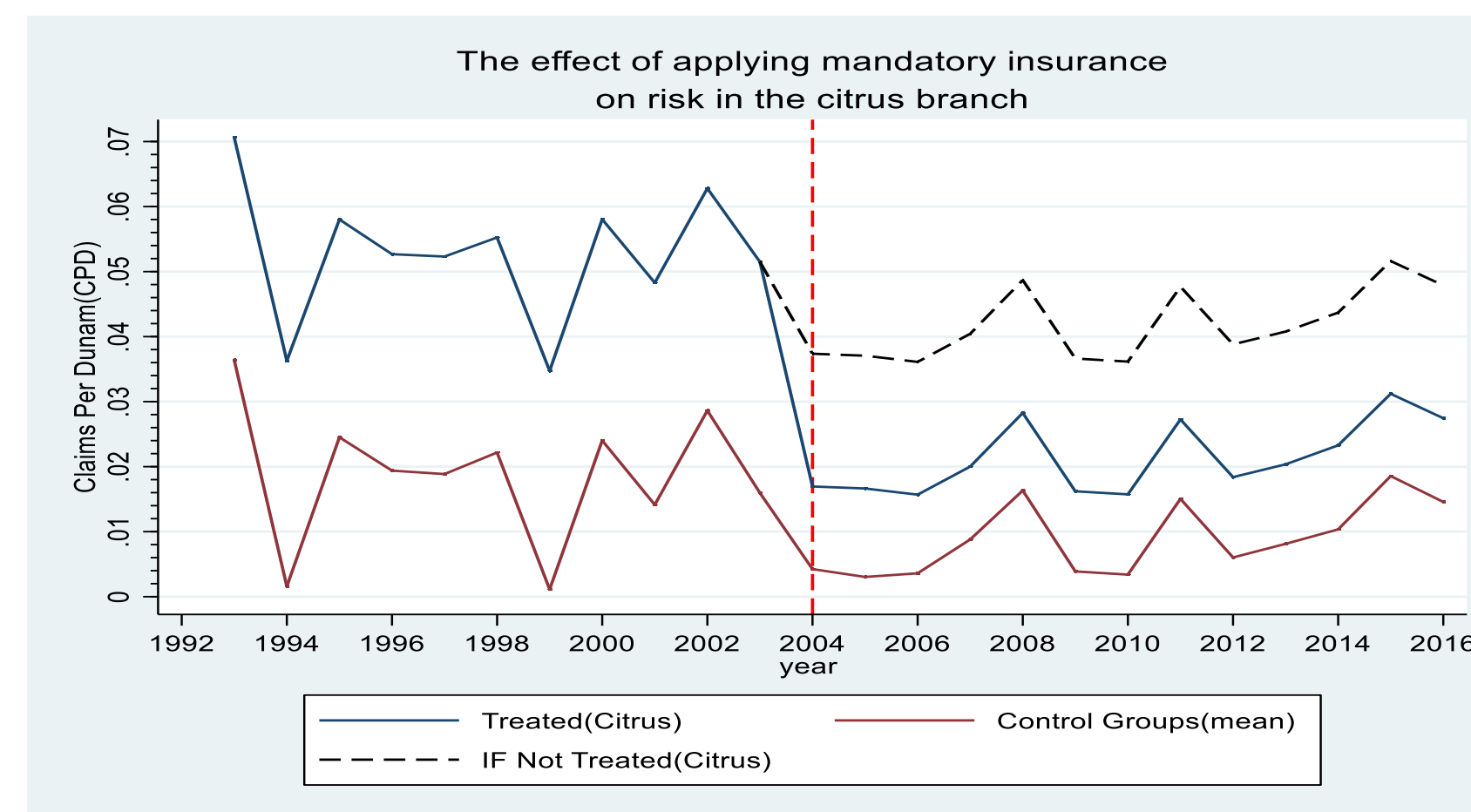
4. Data and Preliminary Analysis

- Source: Israel's government agricultural insurance company – KANAT
- Grower-level data: 139,993 individual insurance contracts for citrus over the 1993-2016 period. 28,437 loss events were recorded.

	New Insured Farmers (2004 – 2016)	Veteran Insured Farmers (1993 – 2016)
Claims per dunam	0.0157	0.0411

Number of Claims Per Dunam, by Type of Policy Holder and Year

New   Veteran   Total Total

- Growers who voluntarily participated in the program are 2.6 fold riskier!

5. Identifying Adverse Selection

- Introduction of compulsory insurance = a quasi-natural experiment

$$Risk_{it} = \beta_0 + \beta_1 D_{citrus} + \beta_2 D_{post} + \beta_3 D_{citrus} x D_{post} + \varepsilon_{it}$$

- Methods: we use Difference-in-Difference (DID) and Regression Discontinuity (RD) design methods to estimate its effects on risk:

The effect of applying mandatory insurance on risk in the citrus branch

Treated(Citrus)   Control Groups(mean)
IF Not Treated(Citrus)

- Data was aggregated to locality i – year t level.
- Regressions also include locality and year FE.
- Treated group: citrus; Treatment time: 2004-present; Control group: other fruits and vegetables, field crops, and flowers.
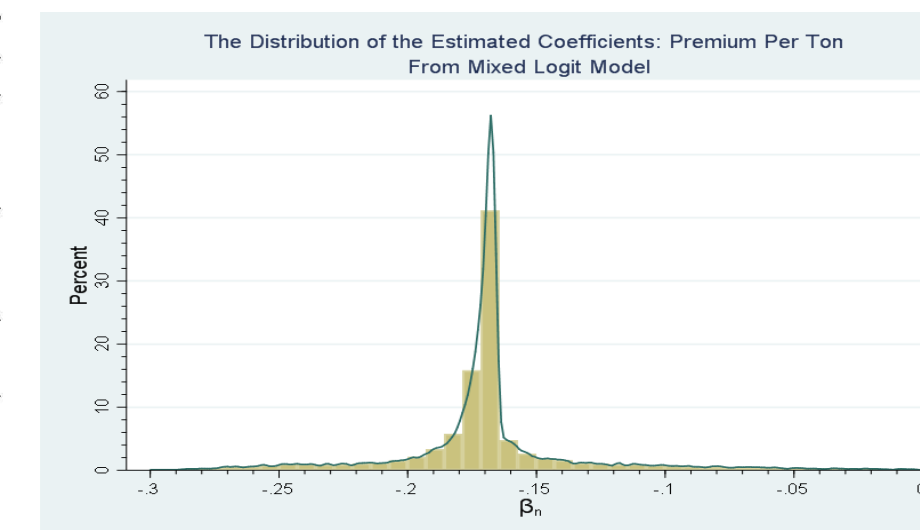
Results:
- Significant reduction in risk due to the introduction of compulsory insurance => Number of claims per dunam reduced by 40% => **Adverse selection**

- Similar significant reductions in risk were estimated by:
1. Other risk variables: indemnity per dunam; indemnity per claim.

2. Regression Discontinuity analysis.

6. Demand Estimation

- **Method:** mixed logit model - growers can choose between compulsory insurance and 3 levels of upgraded insurance plans. The utility of grower n from alternative j: $U_{nj} = \beta'_n x_{nj} + \varepsilon_{nj}$
- Where x_{nj} are observed variables relate to the alternative and grower.

RESULTS OF MAIN VARIABLES FROM MIXED LOGIT DEMAND

Variable	Coefficients
Mean	
Net Premium Per Ton	−0.166 ***
Liability Per Dunam	0.003 ***
SD	
Net Premium Pet Ton	0.151 ***
Liability Per Dunam	0.002 ***
N	258,793
Log likelihood	−31,961

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Notes: Mandatory insurance level has been normalized to zero and defined as the base alternative.
Regression also includes grower-level variables such as risk level and wealth level indexes. Moreover, we also include demographic-region, citrus variety and year fixed effects.

The Distribution of the Estimated Coefficients: Premium Per Ton From Mixed Logit Model

- Control Function was used to account for endogeniety (e.g., net premium).

7. Welfare Analysis

- Demand, AC and MC are needed to perform the welfare analysis.
- **Cost:** expected indemnity - function of choice prob. which are function of net premiums. By changing net premiums => expected indemnity curve is derived by simulation => AC and MC are derived:

Before Compulsory Insurance:
- 20% welfare loss due to adverse selection

After Compulsory Insurance:
- Welfare loss due to adverse selection has vanished => mainly due to increase in premium subsidy.

- Total welfare of the entire population has more than doubled.

Welfare Analysis - Upgraded Insurance – After 2004

Welfare Analysis - Compulsory Insurance
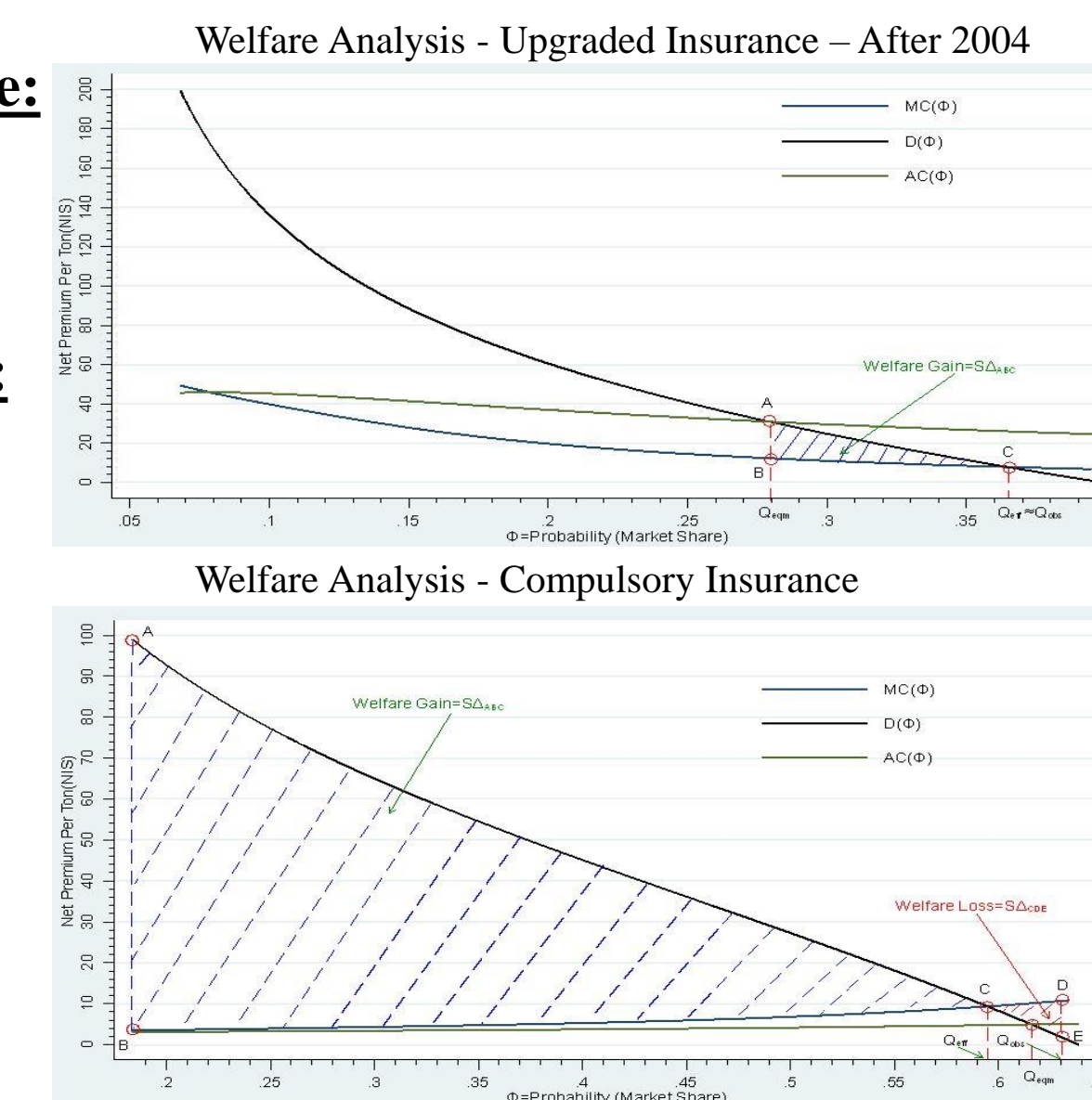
8. Conclusions

- By exploiting the compulsory insurance, adverse selection is identified

- We estimate large welfare loss associated with adverse selection

- Compulsory insurance created large welfare gain compensating the welfare loss associated with asymmetric information.

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