Double Moral Hazard and the Energy Efficiency Gap

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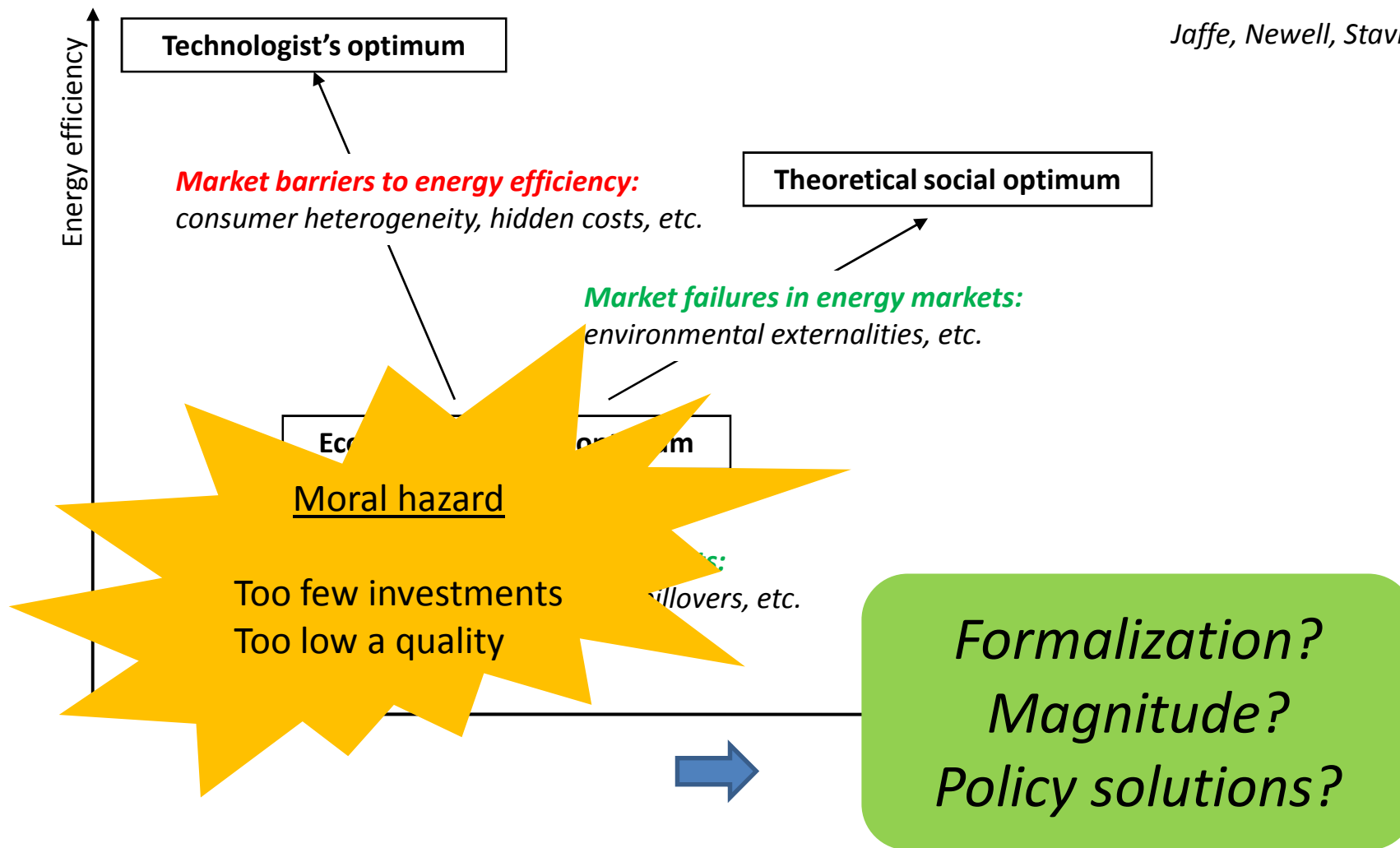# Moral Hazard: *e.g.* Home Energy Retrofit

2013 Winner
"Best Construction Defect"
Photo Contest
Awarded by AQC, the French
Construction Quality Agency

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In a sample of 546 "low-consumption" buildings: 5.1 defects per building on average
(Severity: 70% minor, 26% intermediate and 4% major)

The Energy Efficiency Gap

Jaffe, Newell, Stavins (2004)

Energy efficiency

Technologist's optimum

Market barriers to energy efficiency:
consumer heterogeneity, hidden costs, etc.

Theoretical social optimum

Market failures in energy markets:
environmental externalities, etc.

Ec... ...m

Moral hazard

Too few investments
Too low a quality

...illovers, etc.

Formalization?
Magnitude?
Policy solutions?

A Model of Insulation

Consumer data: RECS (US)

Two Hidden Actions

Energy use for space heating

$$\tilde{E}(s, q)$$

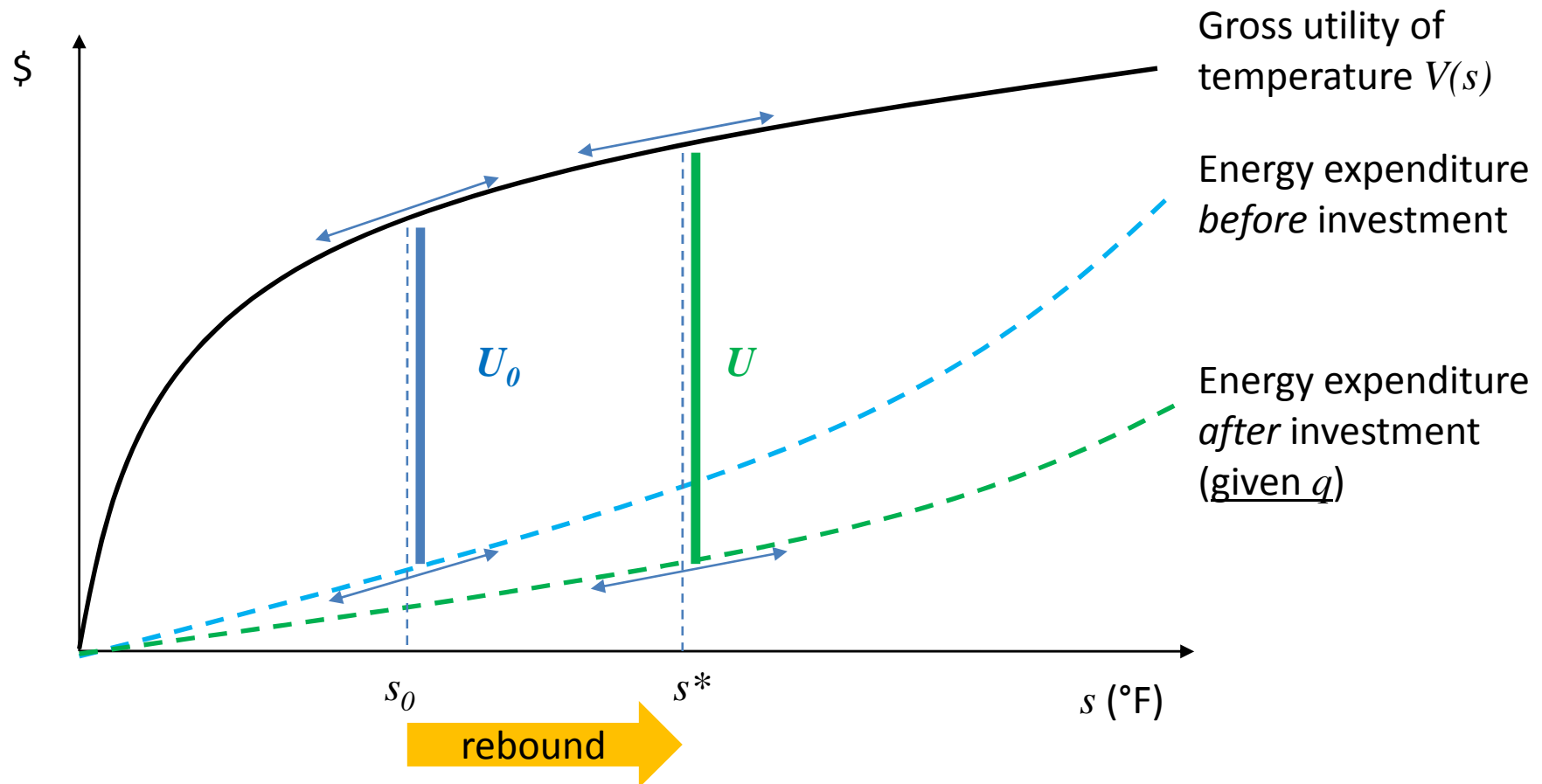Homeowner's **energy service**

→ *unobservable to the contractor*

Contractor's **quality** of installation

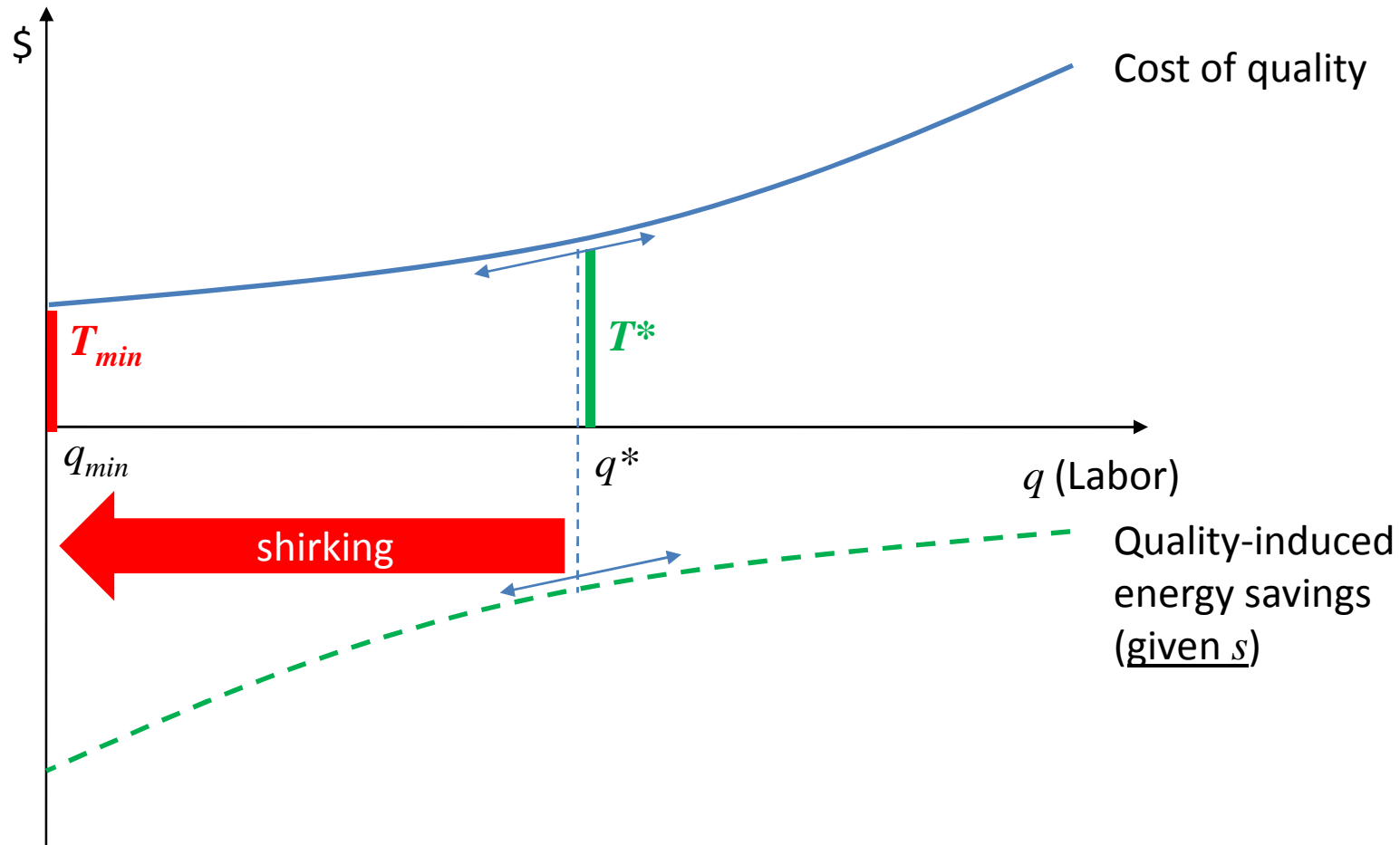→ *unobservable to the homeowner*

Consumer sets s, given q

Stage 2

$

Gross utility of temperature $V(s)$

U_0

U

Energy expenditure *before* investment

Energy expenditure *after* investment (<u>given q</u>)

s_0

$s*$

s (°F)

rebound

Stage 1   Participation   iif $U - U_0 \geq T$

Stage 2

$

Cost of quality

T_{min}

T^*

q_{min}

q^*

q (Labor)

shirking

Quality-induced energy savings (given s)
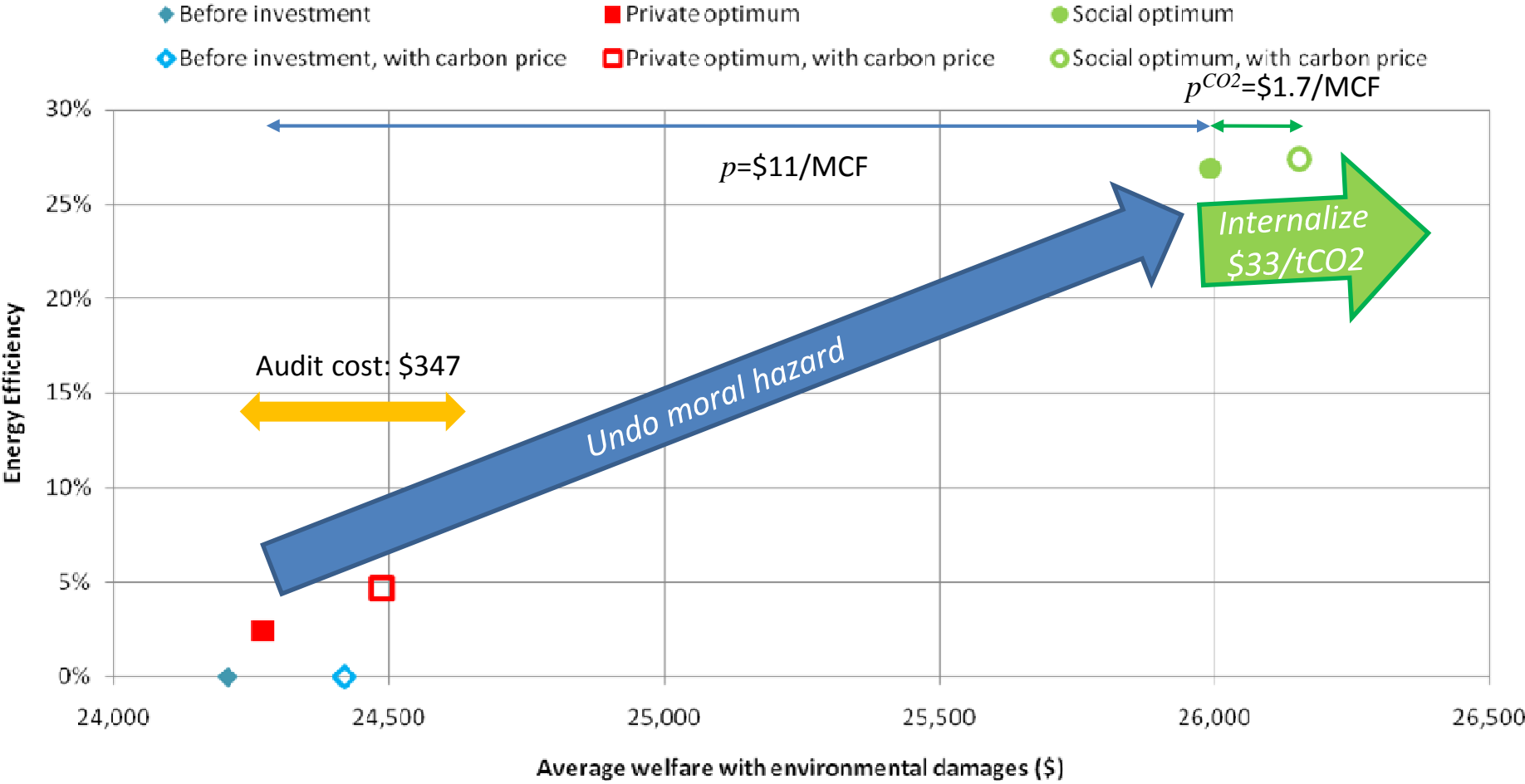
Stage 1

$$T = C(q)$$

Assumption: Perfect competition
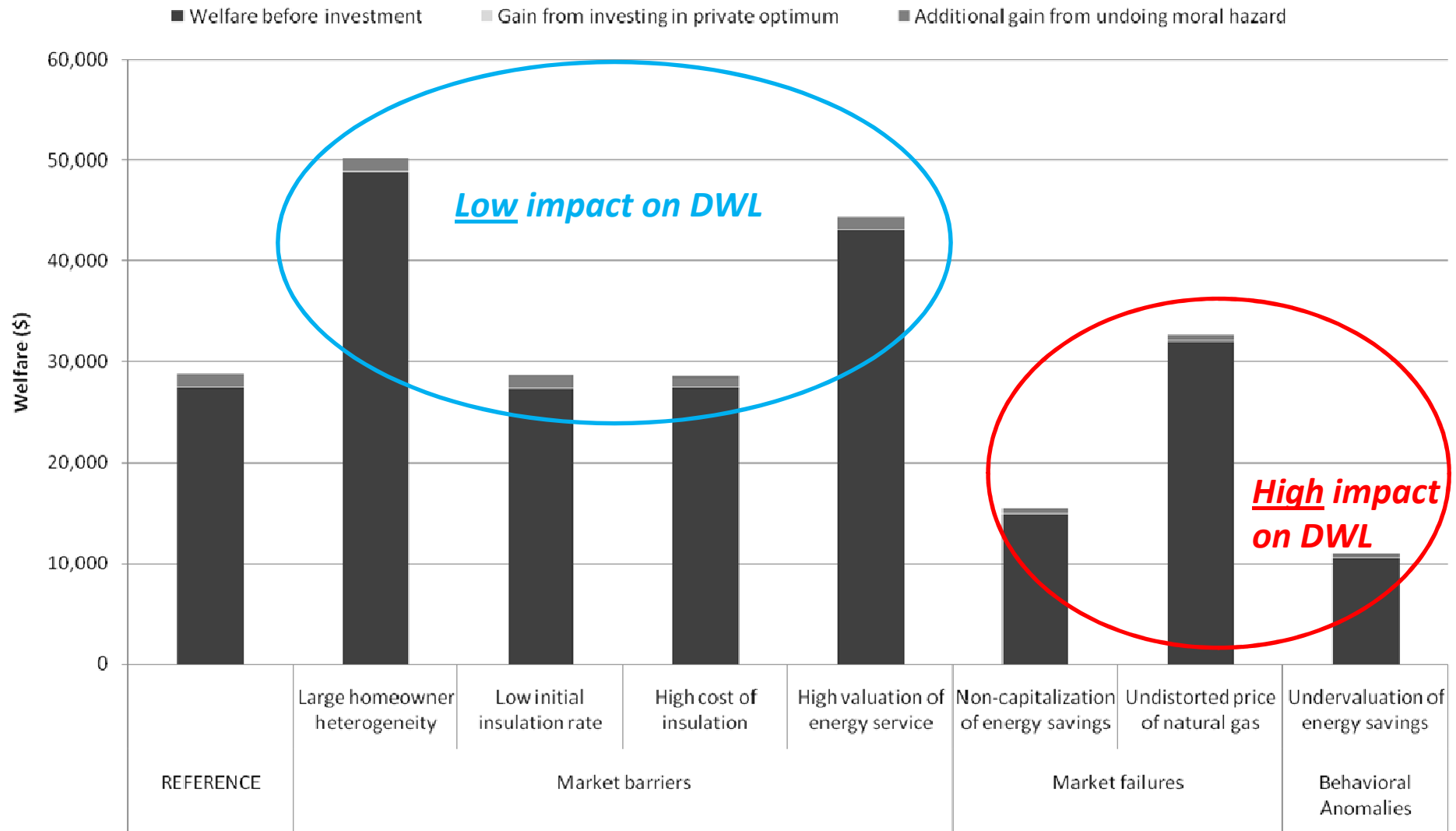
Best Response Equilibria
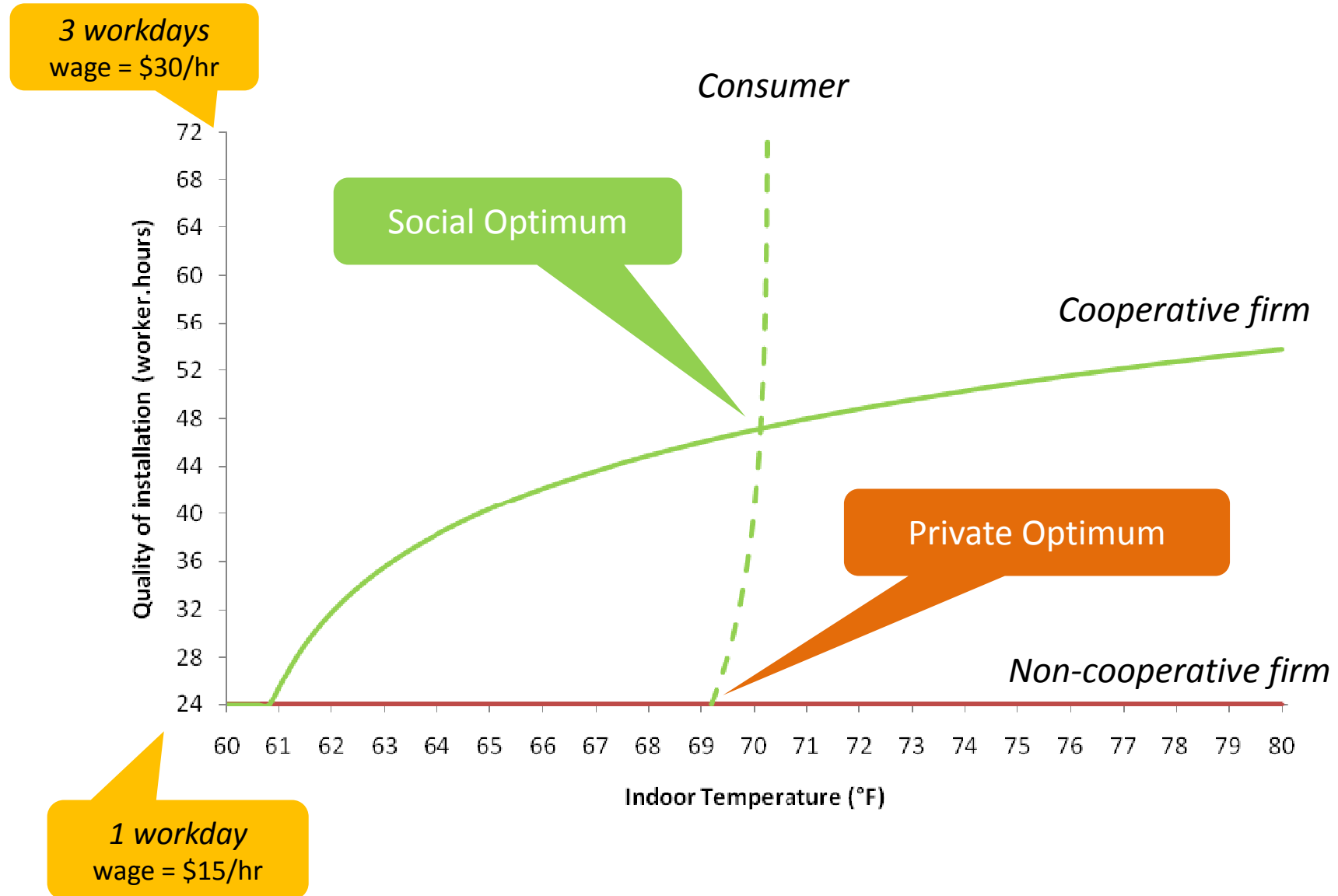
Magnitude

Energy Efficiency Gap

Sensitivity Analysis of Deadweight Loss

Implied discount rates: 15-35% (against 7%)

Engineer's Heuristics as a Sufficient Statistic

$$\Delta_q W \geq -p\Delta_q E(s,q)\Gamma(r,l) - \Delta_q C(q)$$

Discounted monetary savings   *Upfront* cost

Economic information needed

NOT needed: Rebound effect ($V(s)$)

Scenario	REF	1	2	3	4	5	6	7	8
Exact DWL	1,258	1,239	1,206	1,085	1,260	517	486	289	1,258
Suff. Stat.	1,158	1,158	1,158	997	1,158	473	443	263	1,158
Approxi-mation	*-7.9%*	*-6.5%*	*-3.9%*	*-8.1%*	*-8.1%*	*-8.6%*	*-9.0%*	*-9.1%*	*-7.9%*

Policy solutions

Remedies Found in the Marketplace (U.S.)

Voluntary certifications

Incentives

Energy-Savings Insurance
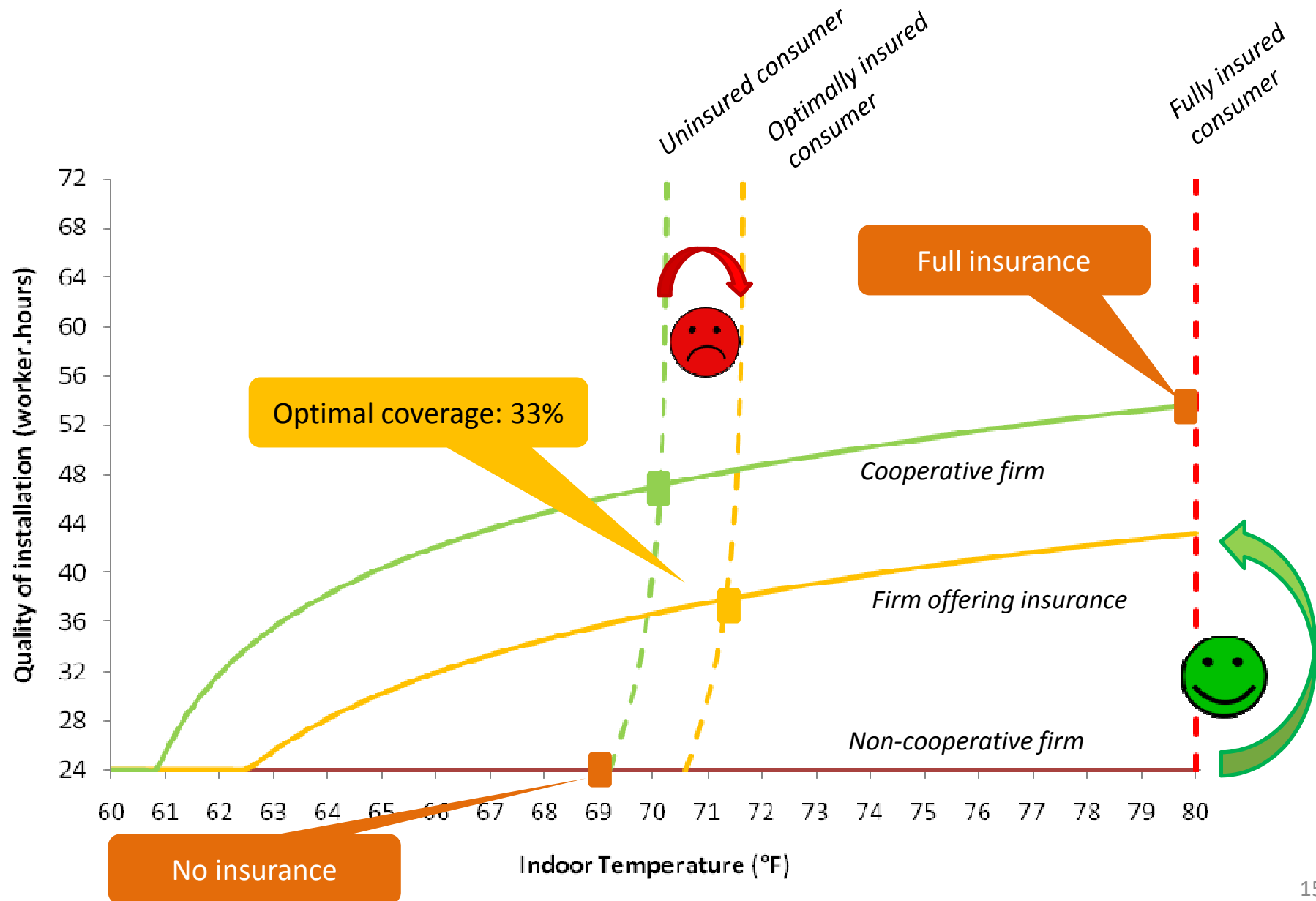
Minimum Quality Standard

5th percentile

Median consumer

95th percentile

Cooperative firm

Minimum standard

Non-cooperative firm

Quality of installation (worker.hours)

Indoor Temperature (°F)
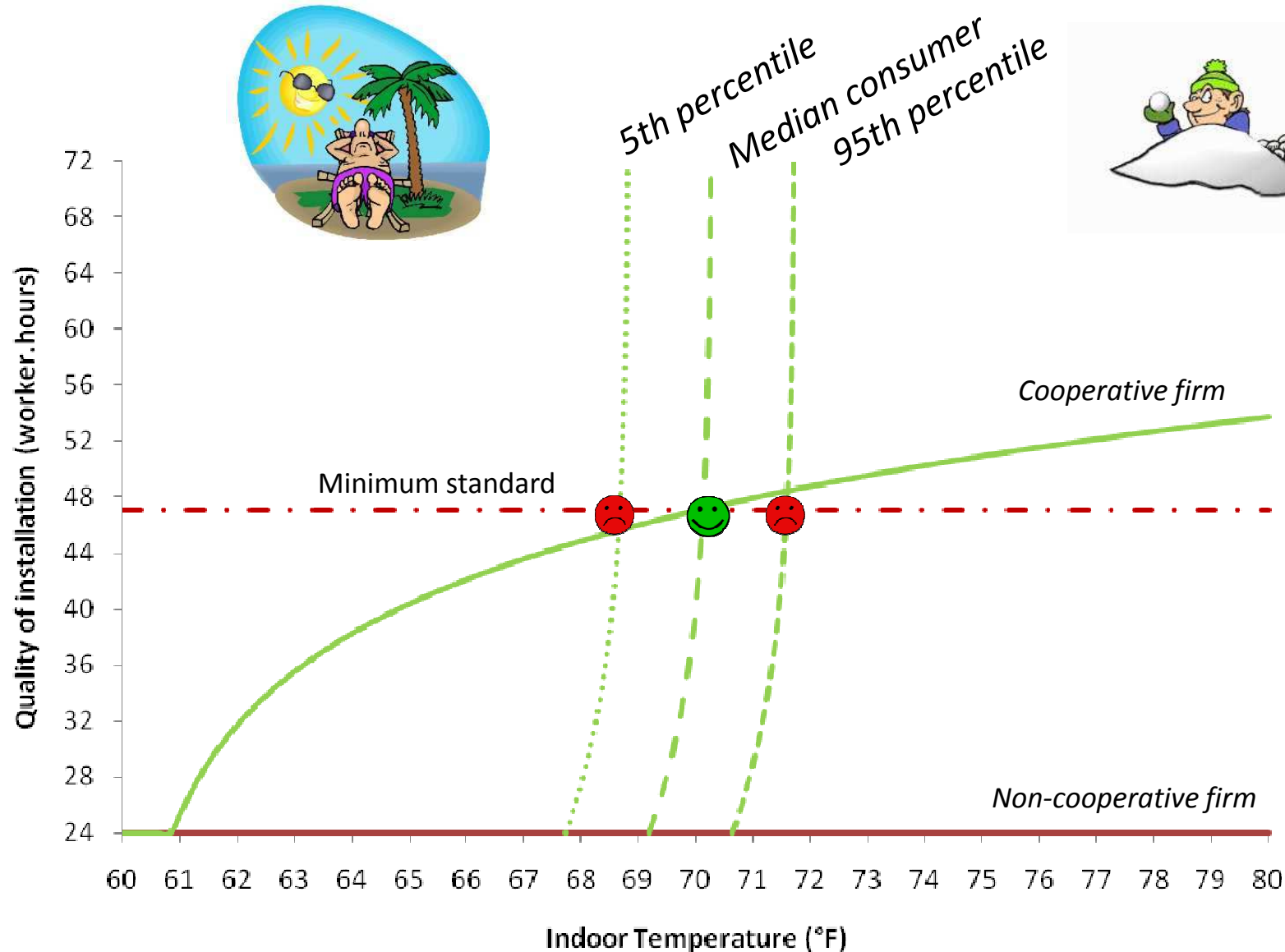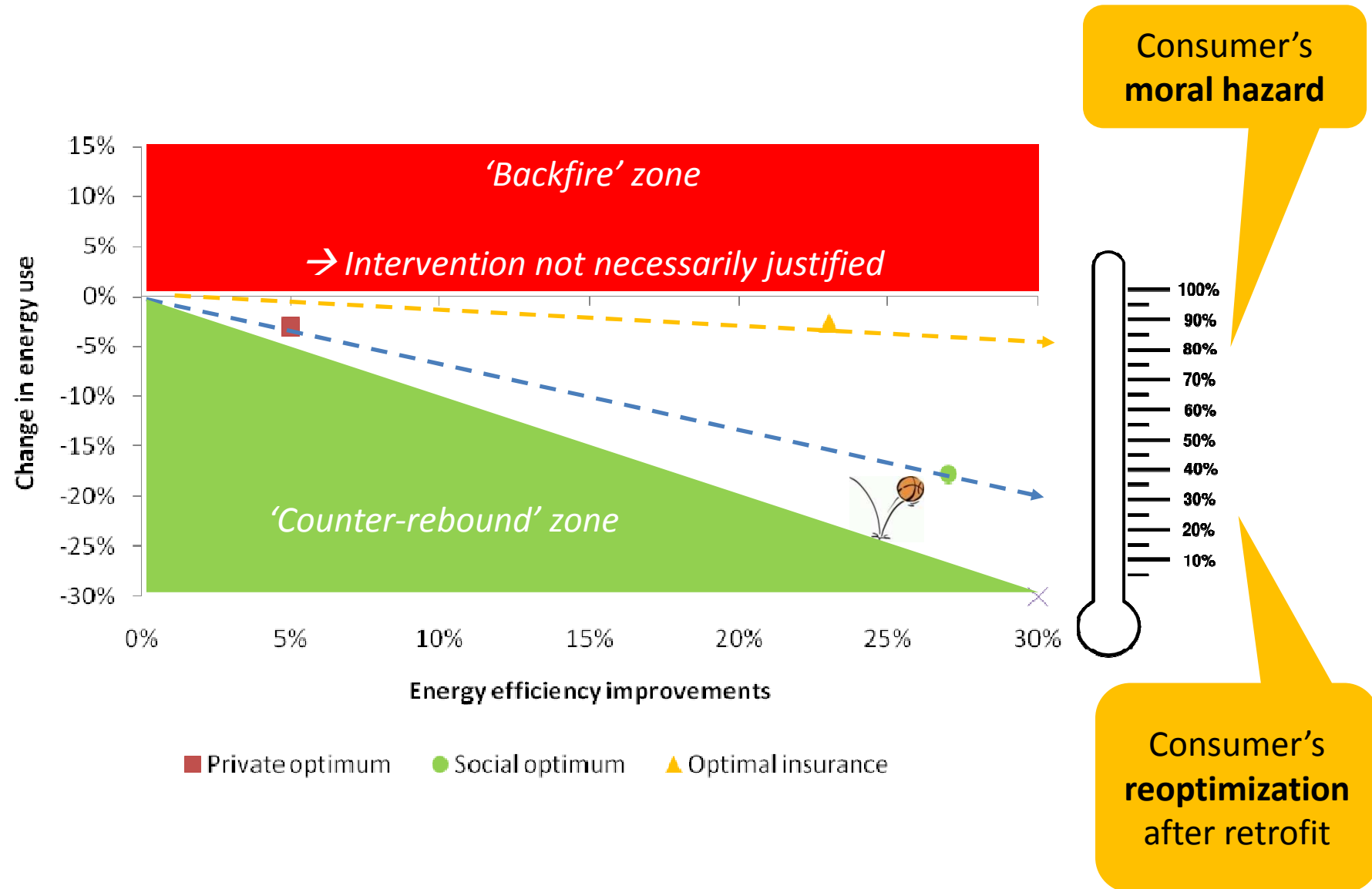
Uniform Standards and Insurance
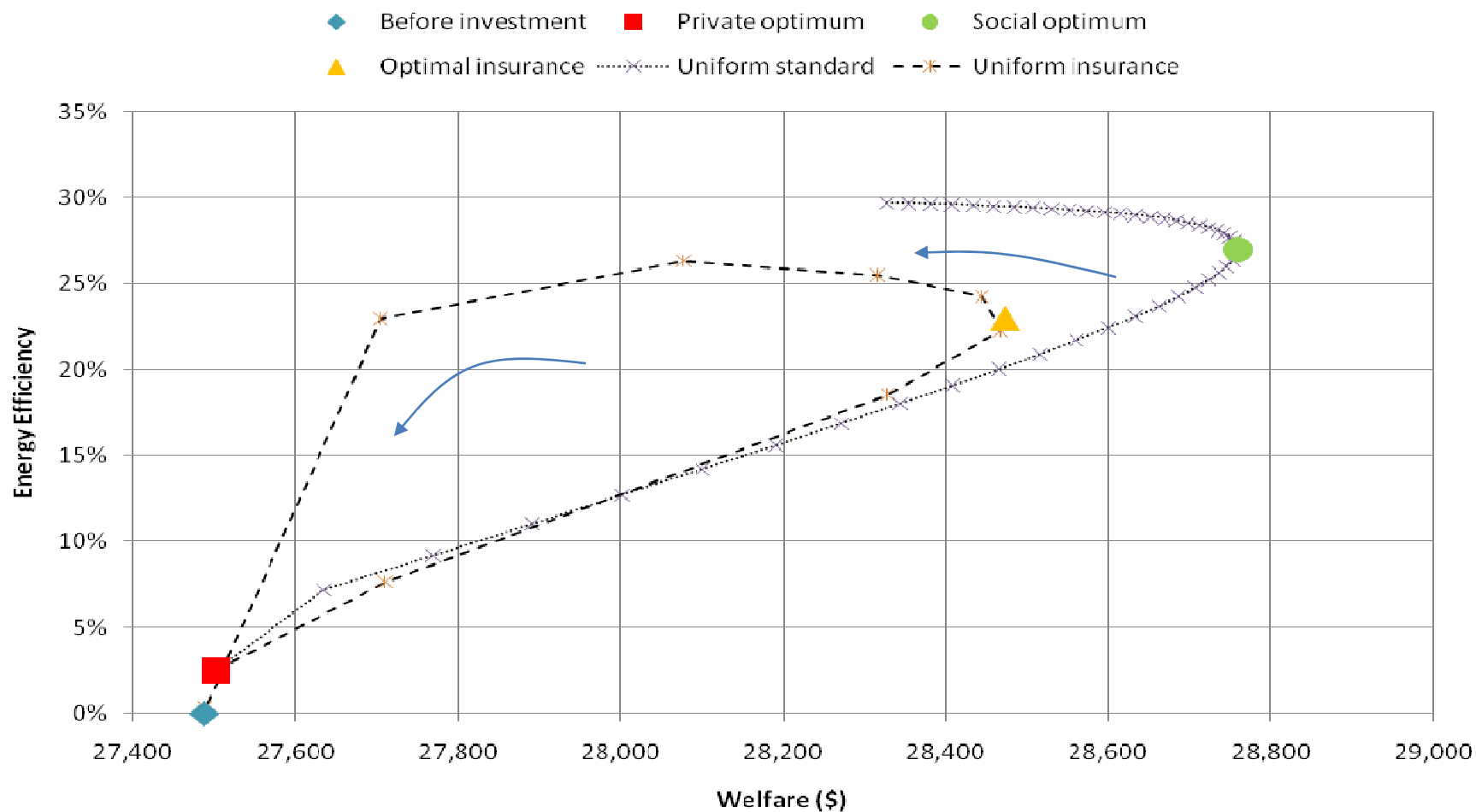
Deadweight loss from second moral hazard with insurance…
but, unlike standard, no control cost.

Rebound Effects

Conclusions

$\Rightarrow$ *Formally*, moral hazard can plausibly cause an energy efficiency gap (too low a quality, too few investments)

$\Rightarrow$ *Quantitatively*, it motivates public intervention beyond what is needed to internalize energy-use externalities

$\Rightarrow$ *Policy solutions* are only second-best. The merit order depends on control costs versus second moral hazard