The Economics of Contract Quality

Part 1: Defining an Index Insurance Quality Standard

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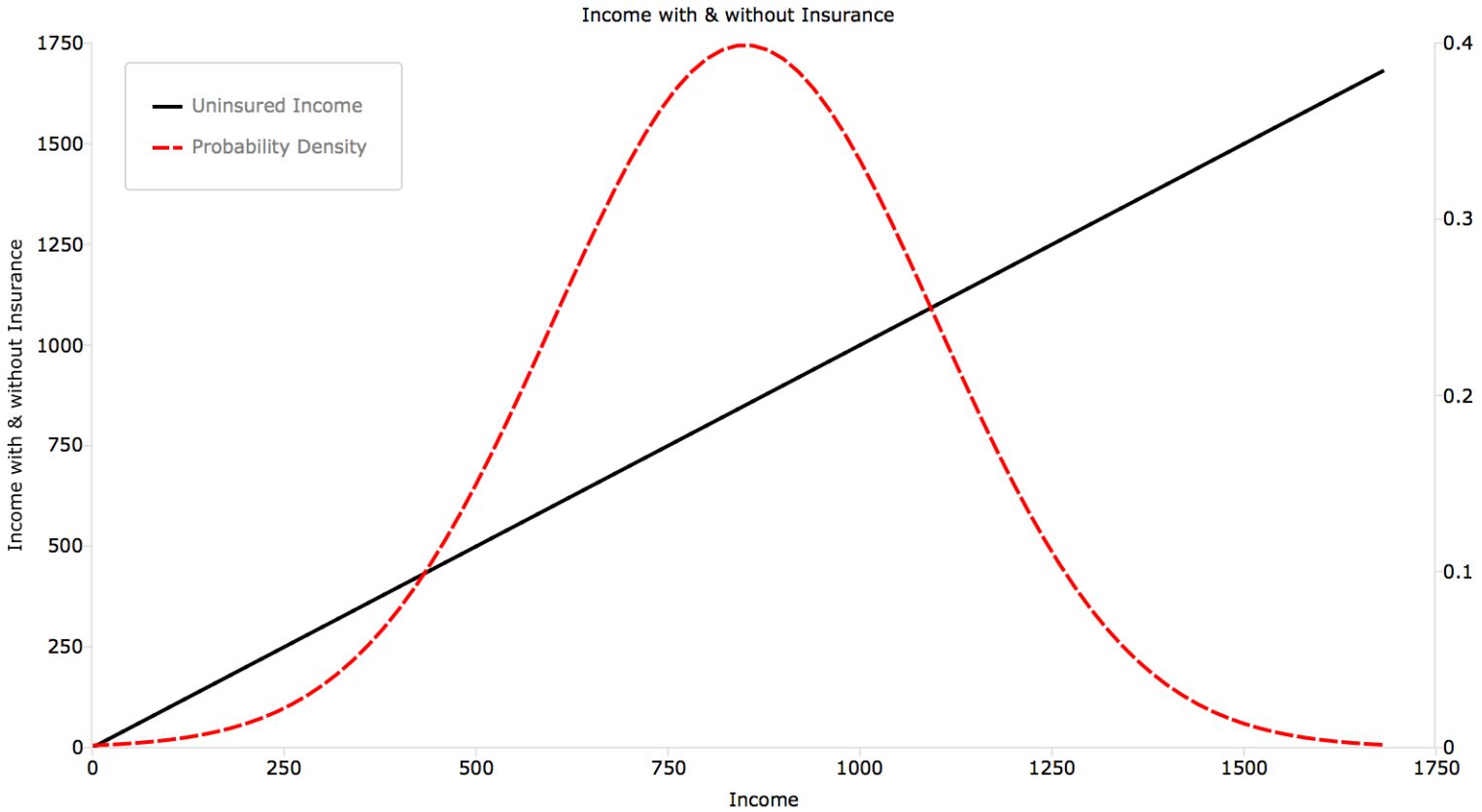
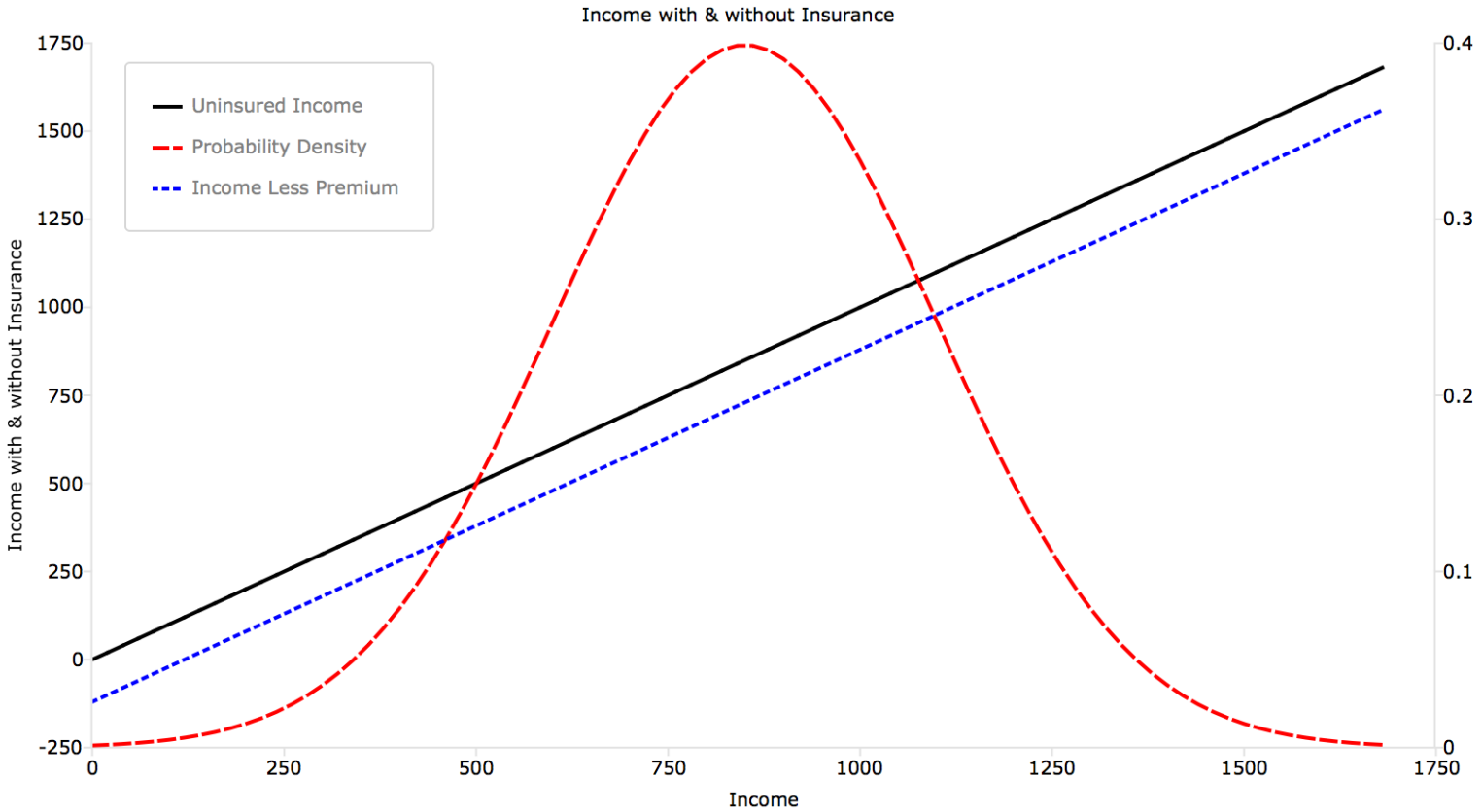
The Agenda for Today

- Yesterday we discussed two key points:
  1. Agricultural insurance can crowd-in investment & play a social protection role
  2. Insurance can also fail leaving the farmer worse off than if she had no insurance
- So as we design, subsidize and promote agricultural insurance, how do we know if it is good enough to achieve its goals and do no harm
- Over the course of today, we will discuss a minimum quality standard, how to measure it, and how to design contracts that meet it

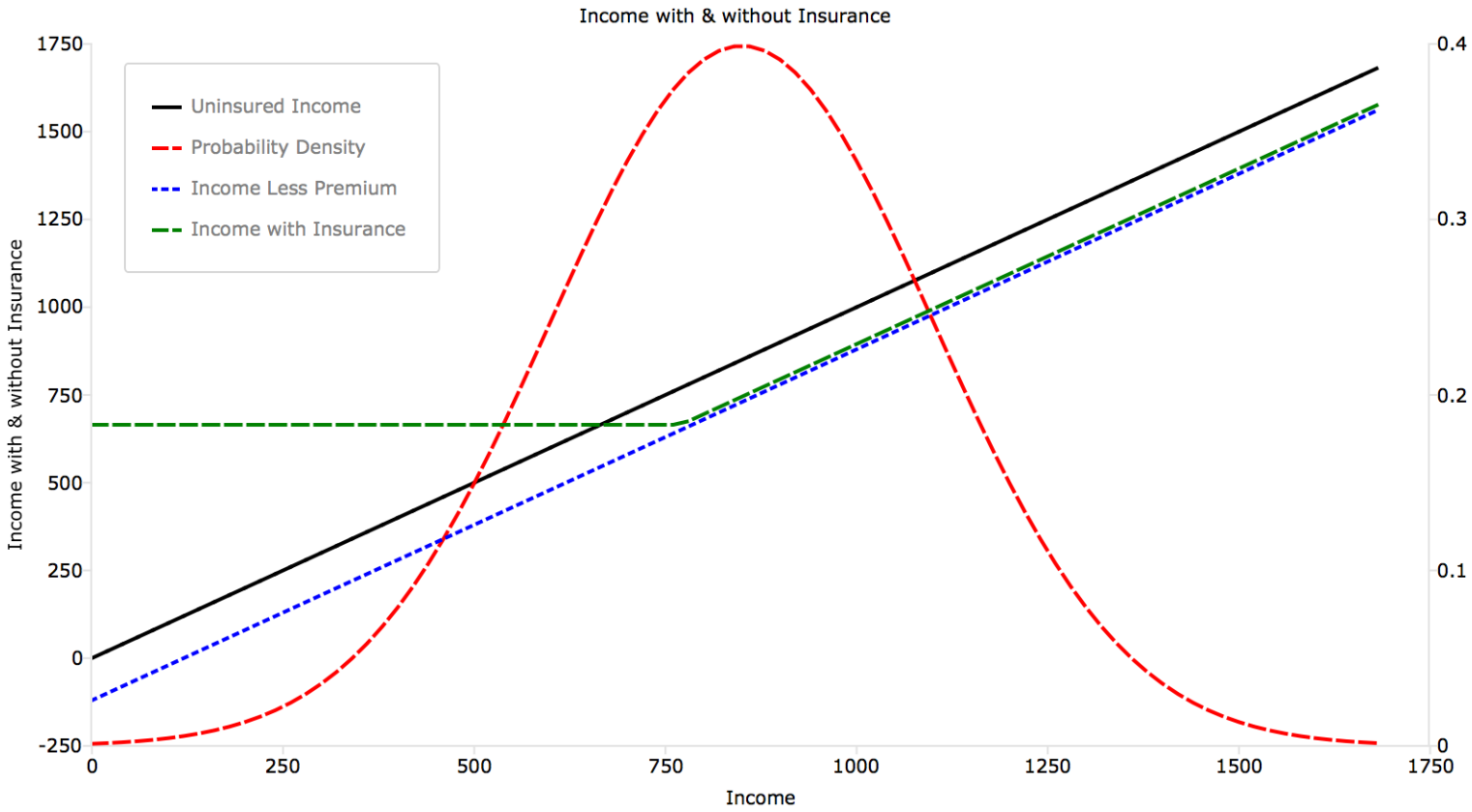
Risk & Income without Insurance



Paying the Premium



Net Income with Insurance

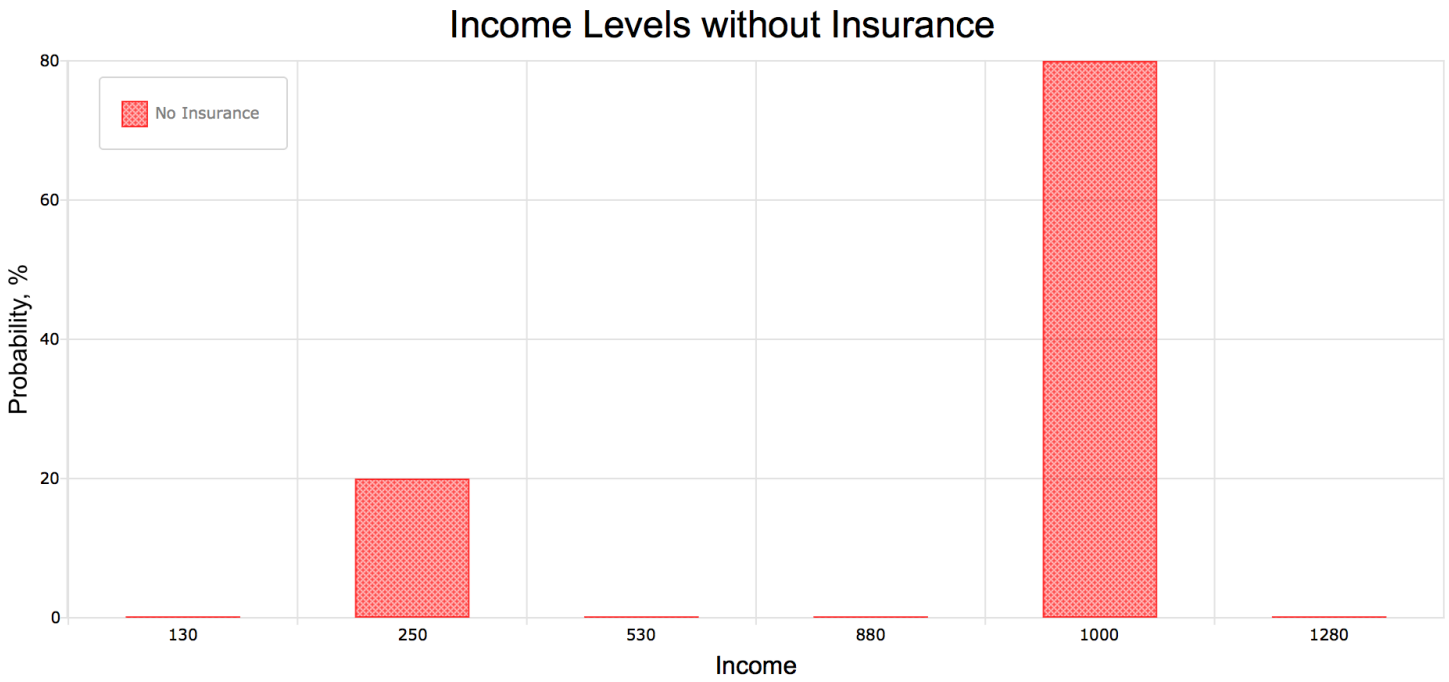


- Perfect insurance puts a floor under the farmer (but costs money–is it worth it?)
- What about index insurance?
- Is it worth it?

Defining (Index) Insurance Quality

- As a first step, we need clear, conceptually sound minimum quality standard
- Define the Minimum Quality Standard (MQS) as:
  - The expected economic well-being of the insured is no lower with the insurance than without the insurance (*i.e.*, Quality insurance does not hurt people by making them worse off)
  - Need to make this measurable & certifiable just like germination & yield rates for seeds:
    The 'certainty equivalent' of the insured's income stream with insurance is no lower than the certainty equivalent of her income stream without insurance
- First, use a simple numerical example to explain the quality problem and the minimum quality standard
- Later give a real world examples of measuring and testing to see if a contract meets the MQS

Stylized Agricultural Setting



Stylized Agricultural Setting

- Let's assume that a farm household can experience either a good year or a bad year:
  - Good years happen 80% of the time and the household earns \$1000
  - Bad years happen 20% of the time and the household earns only \$250
  - Note that the farmer's average or expected income is \$850 (= 80% x \$1000 + 20% x \$250)
- So what is the "certainty equivalent" of this risky income stream or lottery?
  - The amount of money if received for sure that makes the farmer indifferent between taking the certain money and playing the farmer "lottery"
  - Most people would be willing to take less than the average or expected value of the lottery (\$850) in order to avoid the risk of the bad (\$250) outcome
  - Expect the certainty equivalent to be less than \$850, but how much less?
  - Let's play with real money and find out with a volunteer!

Risk Aversion & Dreading Bad Outcomes

- In economics, we say that a person who has a low certainty equivalent for this lottery is highly "risk averse"
- The highly risk averse person is willing to give up a lot of money on average to avoid the bad state of the world which they dread (e.g., not being able to feed their family)
- Put differently, a highly risk averse person really needs and highly values money in the bad state of the world and therefore is willing to give up some money on average to avoid the bad state
- So while we could value a lottery by its expected or average return:

$$\bar{y} = 80\% \times \$1000 + 20\% \times \$250 = \$850$$

most of us do not do that (as we just saw!)

Risk Aversion & Dreading Bad Outcomes

- We need a weighting function that accounts for the fact that we feel really bad when we face low incomes
- The economist's utility function plays exactly that role and tell us how much we dread the bad state of the world
- We might instead say that we value a lottery not by its expected or average value but by its dread-weighted expected utility level:

$$\bar{u} = 80\% \times u(\$1000) + 20\% \times u(\$250)$$

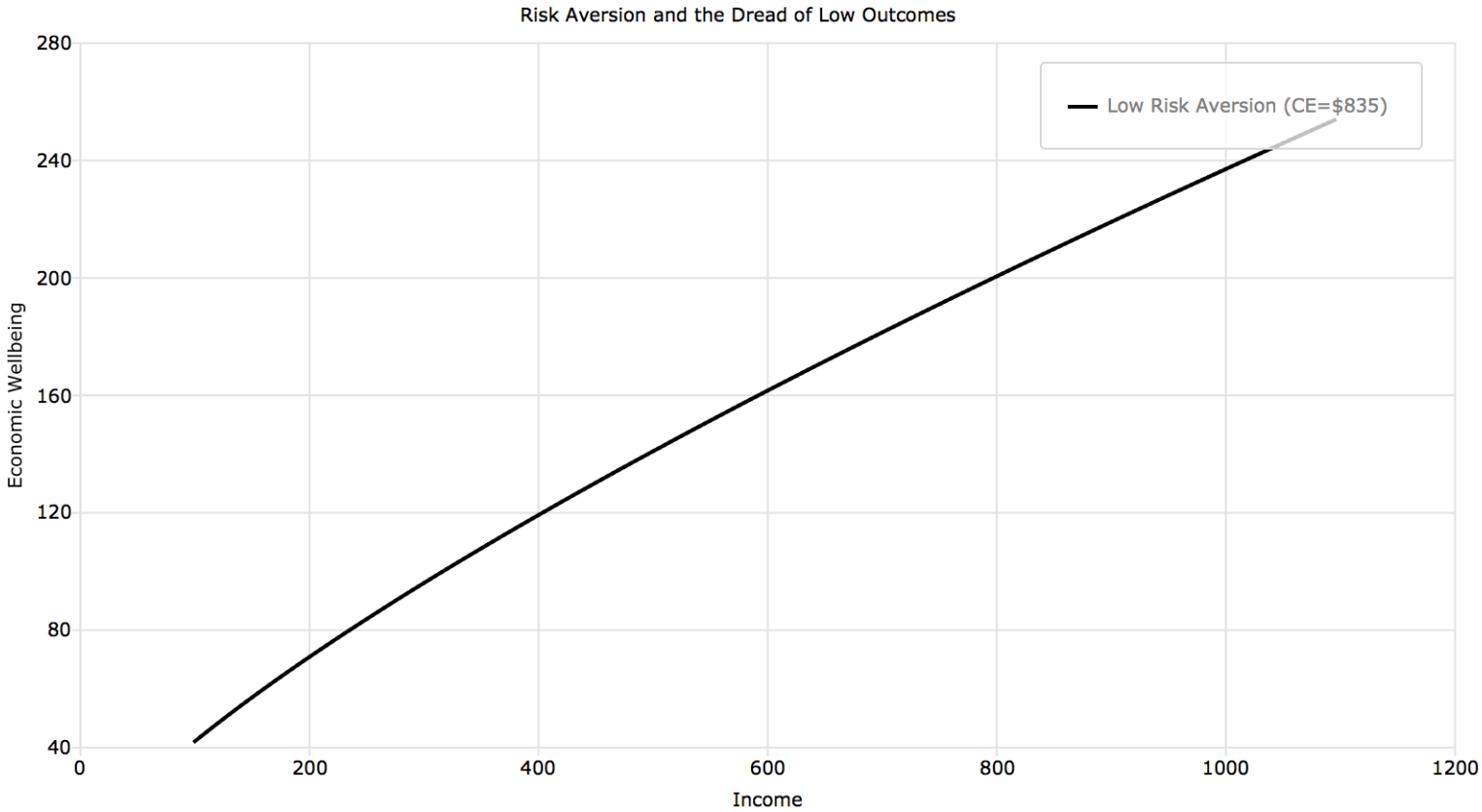
where the weighting might look like:

$$u(income) = \frac{1}{(1 - crra)} income^{(1-crra)}$$

where *crra* is the coefficient of relative risk aversion

- This is not entirely intuitive for most of us, so let's look at a picture

Stylized Agricultural Setting



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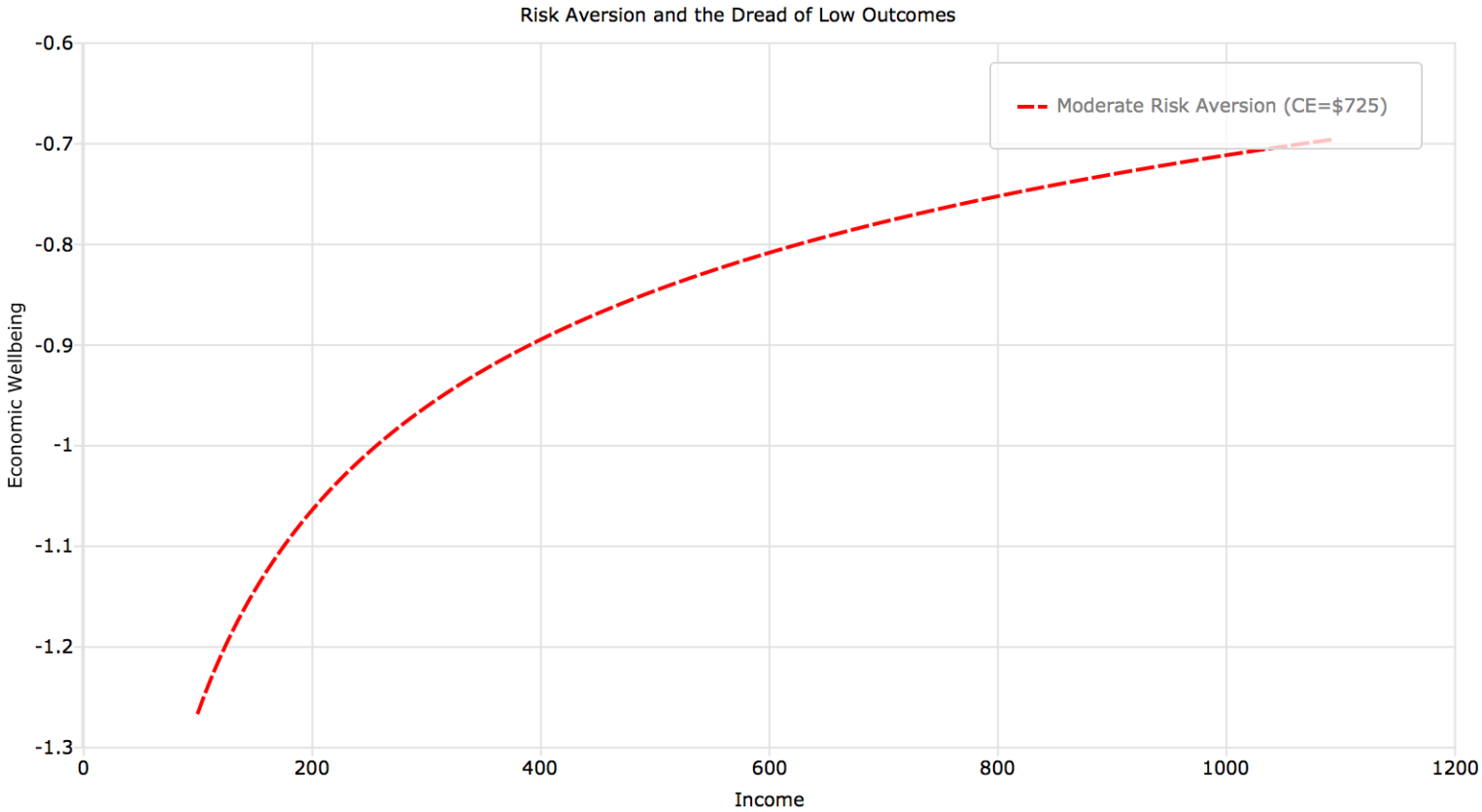

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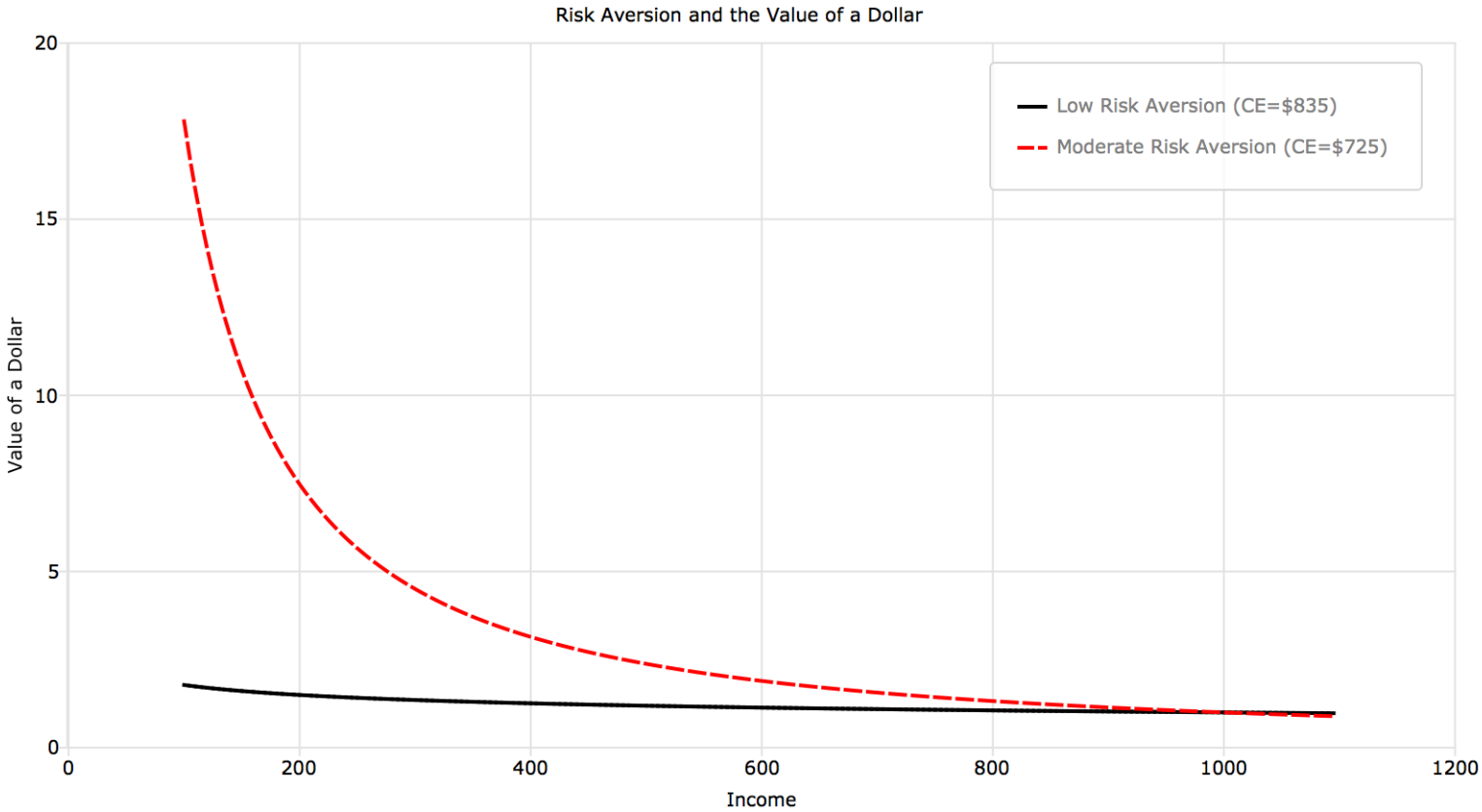
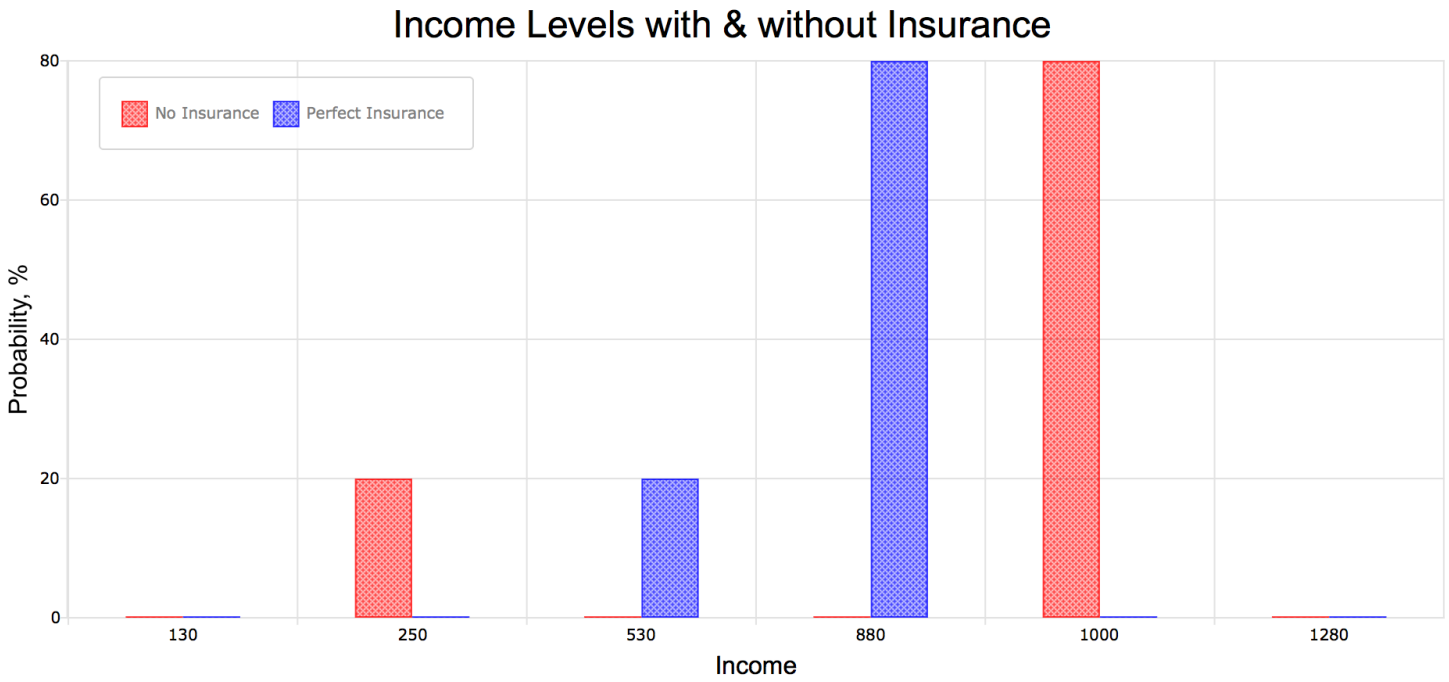


Go It Alone or Buy Insurance?

- The farm household can either go it along and absorb this risk, or it can buy an insurance contract designed to pay the family \$400 in bad years
  - Let's initially assume a perfect insurance contract that always works, always paying off when the farm experiences a bad year
  - The "pure" or "actuarially fair" premium for this insurance will be the probability a payment is made (20%) times the amount paid (\$400): 20% x \$400 = \$80
  - Let's assume that the market price of the insurance after a 50% markup (reinsurance, taxes, marketing and admin costs) will be 150% x \$80 = \$120
- The question we want to ask is:
  - *Would the farm household be better off going it alone without insurance, or would they be better off with insurance?*
- If the household would be better off economically buying insurance, then we will say that the insurance contract meets the Minimum Quality Standard (MQS)
- Let's look at a picture to fix ideas:

Go it Alone or Buy Insurance?

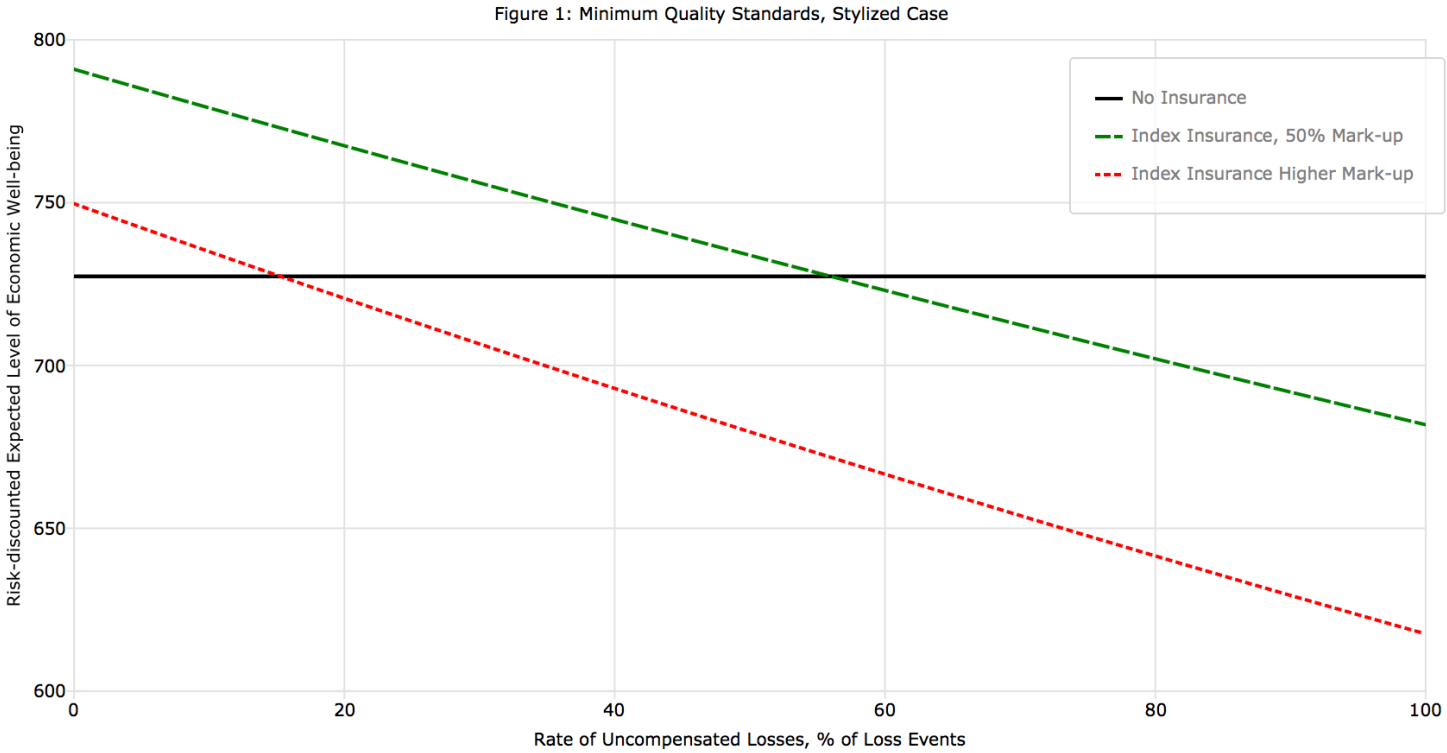


- Note that without insurance, average household income will be $850
- With perfect insurance, average income will be $810 (a ~5% decrease)
- *Is the stabilization effect of insurance worth this lower average income?*

Go it Alone or Buy Insurance?

- *Is the stabilization effect of insurance worth the lower average income?*
  - It can be if a dollar in times of stress is worth more than a dollar in times of plenty?
  - In this case, will a farmer give up a \$1.50 in times of plenty to have \$1 in times of stress?
- Economists have a standard way of thinking about and measuring this: a person with higher "risk aversion" is willing to give up more in times of plenty to have that \$1 in times of need
- Our volunteer was willing to give up X KSH ($= 850KSH - CE$) in order to insure against low outcomes
- Using our stylized agricultural economy, we can answer our core question for perfect insurance assuming a moderate level of risk aversion & expected utility maximization
- Return later to other ways of thinking about behavior under risk

Perfect Insurance Exceeds the MQS

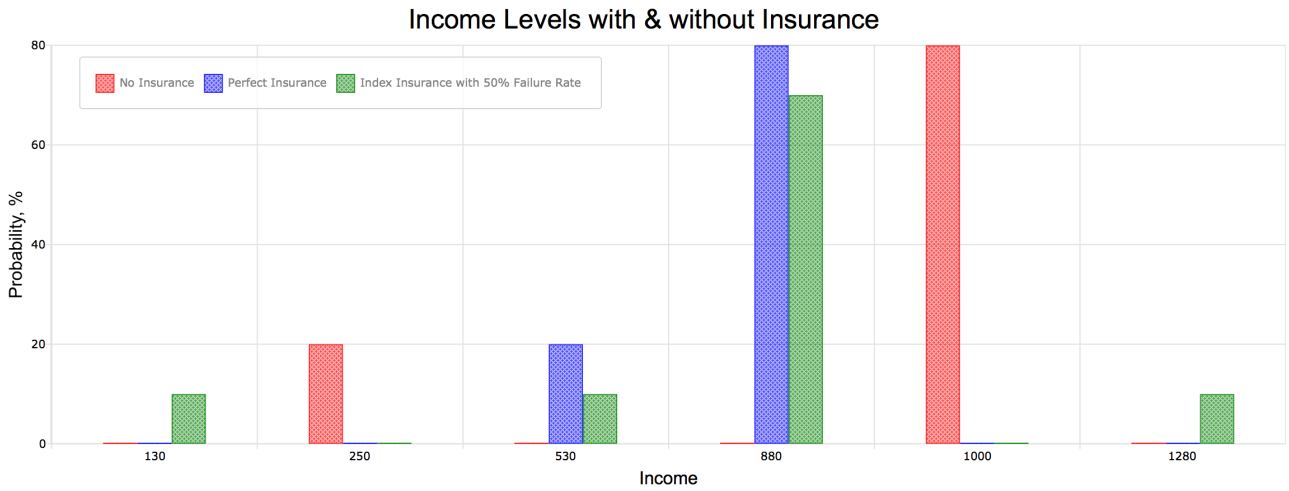


- Perfect insurance has zero failure probability
- Measured well-being in certain income equivalent (*e.g.*, the go it alone strategy has an average income of \$850, but its risk-discounted certainty equivalent is only \$730 for a typically risk averse farmer)

What about Imperfect Index Insurance?

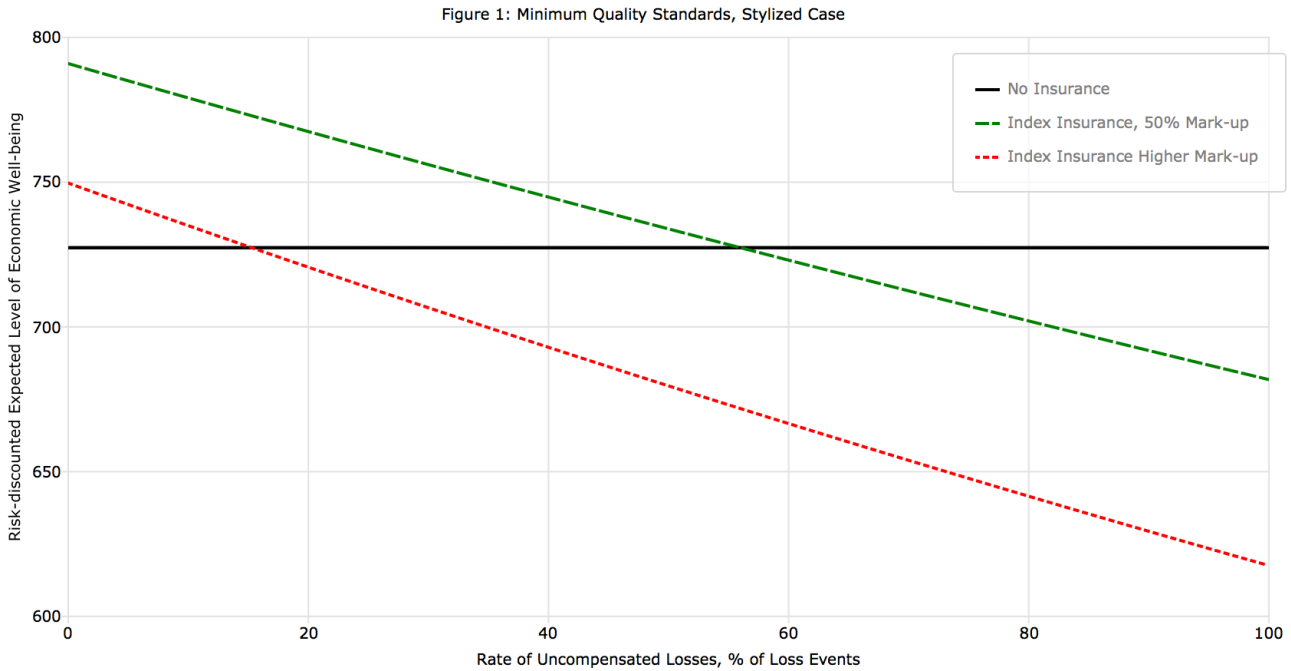
- Index insurance can be a great tool because it reduces administration costs that make conventional (loss-adjusted) insurance infeasible for small-scale farmers
- But, its achilles heal is that it sometimes fails farmers, not paying when the farmer truly has a loss that is not due to farmer negligence (*non-compensated losses or false negative*)
- It can also pay farmers when they have not had a loss (*compensated non-losses or false positive*)
- To keep things simpler, we will assume that the false negative probability equals the false positive probability
- We have seen that a risk averse farmer will be better off with perfect insurance rather than going it alone, even when insurance is marked up by 50%
- Let's examine whether a farmer would rather go it alone or have index insurance as we increase the failure rate for index insurance:

Go it Alone or Buy Index Insurance?



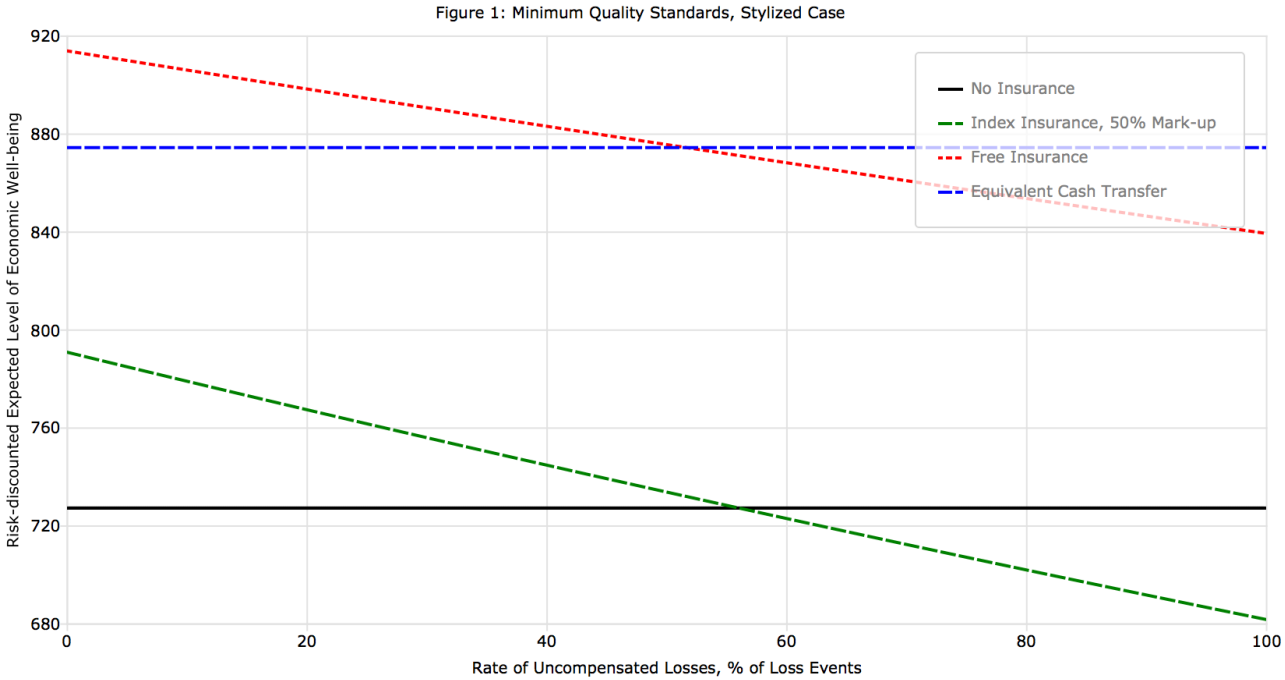
- Note that the worst thing that can happen gets worse with index insurance
- Note also that money is transferred from high value bad years to low values good years
- This is not free money! The farmer paid \$1.50 for every dollar received, with a fraction of the dollars coming in bad years when the farmer really needed that money
- *So Is lower income worth the imperfect stabilization effect of INDEX insurance?*

Index Insurance Passes the MQS if Failure Rate Not "Too High"



- In this example, if failure rate approaches 50%,, the farmer is better off going it alone
- Is 50% a high failure rate–not in the world of rainfall contracts based on CHIRPS data
- Before going further, Tara is going to help us dig further into the sources of contract failure

What about Subsidies?



- Easy to say that who cares about MQS if the farmer does not pay because the insurance is subsidized
- That intuition is faulty
- Consider the following thought experiment: *would farmers rather have failure-prone insurance for free or be given the cost of the failure-prone insurance as an annual transfer?*
- Implications for smart public policy