The Economics of GM Labeling and Implications for Trade

Jill J. McCluskey

Washington State University

and

Jason A. Winfree

University of Idaho

GMCC AMSTERDAM 17-20 NOVEMBER 2015

GM Labeling Policy Options

- GM free country: Official ban on GM food imports and cultivation.

- Mandatory GM Labeling

- Voluntary GM Labeling

- Ban on GM Labeling

You can determine if produce is organic, conventional, or GMO by the digits on the stickers.

GMO means "Genetically Modified Organism"

5 Digit Code Starting With 9 means: **ORGANIC** (Grown Naturally. No chemicals.)

4 Digit Code Starting With 4 means: **CONVENTIONAL** (Grown with chemicals and pesticides.)

5 Digit Code Starting With 8 means: **GMO** (Grown Unnaturally. Genetically modified.)

Why all the Fuss over Labeling? Consumer Rejection of GM Foods

- Benefits are associated with GM foods
  - production-cost reducing
  - product attribute enhancing.
- Scientific consensus: GM products are safe.
- Lack of public acceptance of GM food products is well documented and has resulted in reduced or curbed demand for GM food products.
- Consumer skepticism based on perceived risks of unknown environmental and health consequences of GM crops; ethical concerns. Other consumers prefer to consume "natural" foods whenever possible.

Aside: News Media and GMOs

- *"Not that the media lie…in fact, they have incentives not to lie. Instead, there [are] selection, slanting, decisions as to how much or how little prominence to give a particular news item." -Posner*

- McCluskey et al 2015. "You Get What You Want: the Economics of Bad News," *Information Econ. and Policy*.

  - **Bad News is demand driven.** Consumers get greater marginal utility from bad news because it can helps them avoid an adverse event and utility is concave.
    - Profit-maximizing media companies respond by supplying more bad news than good news.
  - **Downside:** creates heightened fear of risks that often differ from the scientific consensus.
    - **GMOs**: 88% of scientists think GM foods are safe. Yet only 37% of the public agrees.

- McCluskey et al 2016. News Media Coverage & Public Perceptions: Insights from New Food Technologies. *An. Rev. Res. Econ.*

 - Media translates new science to consumers. Negative reporting affects perceptions.

Trans-Pacific Partnership (TPP) Trade Agreement

- On October 5, 2015, trade ministers from twelve Pacific Rim countries reached a final agreement on the TPP trade agreement.

- Within the 12 TPP countries, there is great variation of GM labeling policies.

- Voluntary GM labeling –Not Mandatory
  - U.S., Mexico, Canada, Chile, Singapore, and Brunei

- Mandatory GM labeling requirements
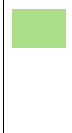 - Peru, Australia, New Zealand, Japan, Vietnam, and Malaysia

TRANS-PACIFIC PARTNERSHIP

UNLOCKING OPPORTUNITY THROUGHOUT THE ASIA PACIFIC
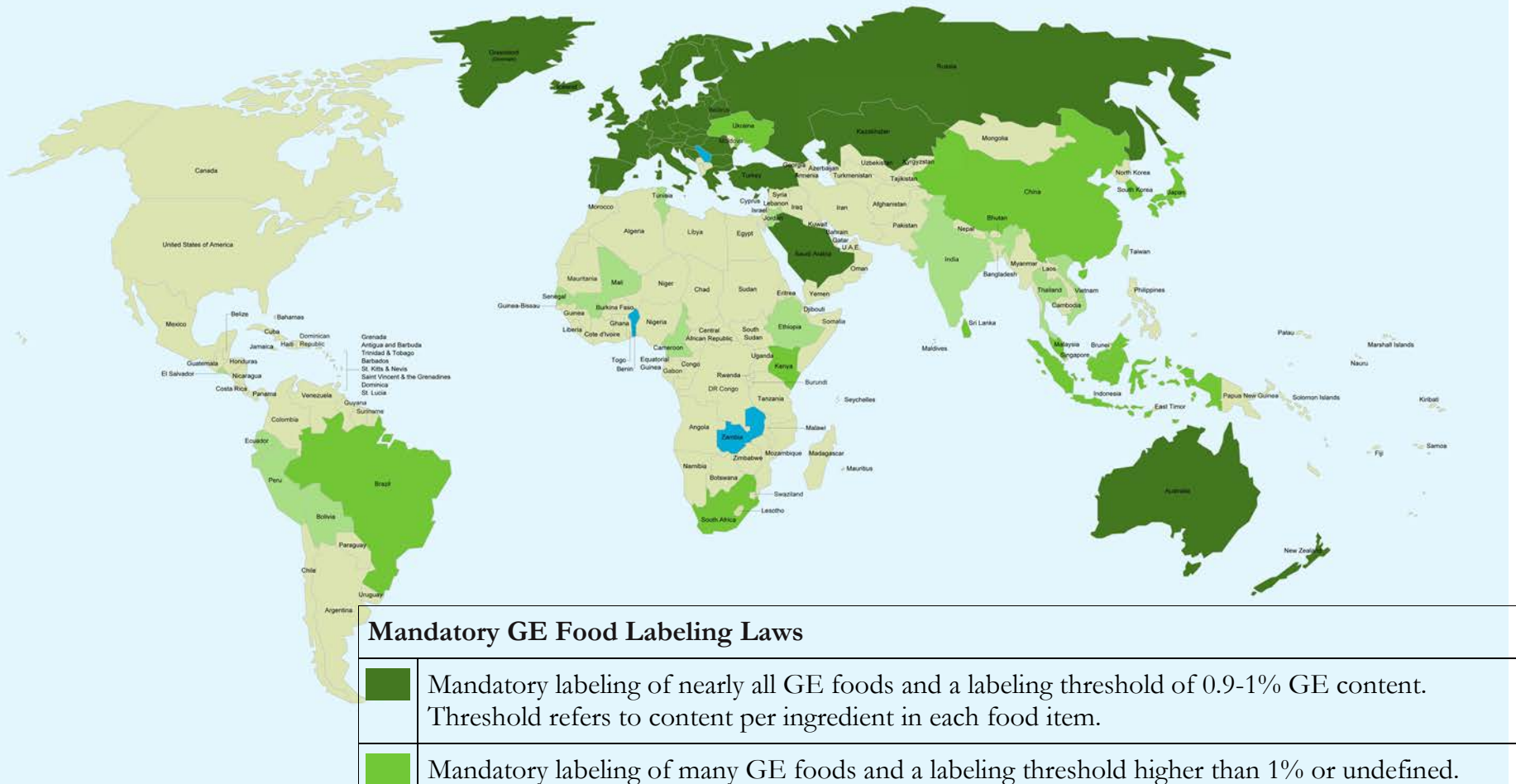
Mandatory GE Food Labeling Laws

Mandatory labeling of nearly all GE foods and a labeling threshold of 0.9-1% GE content. Threshold refers to content per ingredient in each food item.

Mandatory labeling of many GE foods and a labeling threshold higher than 1% or undefined. This includes laws with a threshold of 1% for the entire food item.

Mandatory labeling of some GE foods, but with numerous exceptions and no labeling threshold defined; or a vague mandatory GE food labeling law that lacks implementation and enforcement provisions.

No GE Food Labeling Laws

Voluntary Labeling Allowed

Source: Center for Food Safety http://www.centerforfoodsafety.org/ge-map/

Labeling Policies Impacts?

- What are the effects of voluntary and mandatory GM labeling on profits and consumer welfare?

- Focus on 1st-generation GM products
  - Cost-reducing traits, such as insect resistance & herbicide tolerance.
  - Only potential benefits for consumers are lower prices.
  - Potential drawbacks are consumers' perceptions of elevated risk.

- Contrast with 2nd generation GM products
  - Product-enhancing attributes, such as enhanced nutrition.
  - Consumers may pay a premium for 2nd generation products
    - Consumers should weigh how much they value the enhanced attributes against how risky they perceive the product to be.
  - Labeling of 2nd generation should be less controversial because firms will want to market the enhanced attribute.

Previous Literature

- **Crespi and Marette (2003)** model the market with heterogeneous consumers who are imperfectly informed.
  - Find that mandatory labeling should be used if the ratio of consumers with a strong reluctance for consuming GMO goods to indifferent consumers is high.

- **Fulton and Giannakas (2004)** examine the market and welfare effects of different labeling and regulatory regimes for GM food products.
  - Consumer welfare decreases when the aversion to GM products and the costs of segregating the GM and the non-GM product are high.
  - Producer welfare may decrease as a result of introduction of GM food partly due to consumer aversion and partly due to life science companies who price the GM seed so that the GM technology is not fully adopted.

- **Lapan and Moschini (2005)** investigate grading, minimum quality standards, and labeling of GM foods in a vertical product differentiation framework with a purity level for non-GM products.

Model Setup

- Cournot oligopoly of N firms
  - N^{GM} identical firms producing GM food
  - N^{NGM} identical firms producing non-GM food

- No exit or entry in the market and firms do not switch types.

- Only cost is a constant marginal cost $c^{NGM} > c^{GM} > 0$

- Demand is $P^i = a^i - bQ$, where $i = \{\text{NGM}, \text{GM}\}$
  - $a^{NGM} > a^{GM}$.
  - a^{NGM} is influenced by the consumers' awareness of whether the food is non-GM and perceived risk.
  - $Q = Q^{NGM} + Q^{GM}$

Profit Maximization

- Both types of firms choose their quantity levels to maximize profits.

$$\max_{q^i} q^i \left(a^i - bQ \right) - q^i c^i.$$

- The first-order conditions are given by

$$\frac{\partial \pi^i}{\partial q^i} = a^i - b \left(Q + q^i \right) - c^i = 0$$

Voluntary GM Labeling

- Voluntary labeling, L; $0 \leq L \leq 1$

- L is the effectiveness of non-GMO labeling
  - Zero indicates no labeling and 1 indicates perfect labeling with no GM contamination (i.e. a zero threshold level).
  - While choosing to label is voluntary, we assume that the minimum level of L, if it is greater than zero, is set by the government, which eliminates potential free-riding problems.
  - This means that non-GM firms can choose whether or not to label, but they choose to do so, it must be at least at a minimum level of effectiveness.

Effects of Voluntary Labeling

Direct effects on the non-GM firms' profits

1. Increases WTP for non-GM food $\dfrac{\partial a^{NGM}(L)}{\partial L} > 0$

2. Increases costs for non-GM producers $\dfrac{\partial c^{NGM}(L)}{\partial L} > 0$

DAVE GRANLUND © www.davegranlund.com

Comparative Statics

- The effects of voluntary labeling on quantities for the two types of firms is given by

$$\frac{dq^{NGM}}{dL} = \left(\frac{\partial a^{NGM}(L)}{\partial L} - \frac{\partial c^{NGM}(L)}{\partial L} \right) \frac{\left(N^{GM} + 1 \right)}{b(N+1)} > 0$$

$$\frac{dq^{GM}}{dL} = -\left(\frac{\partial a^{NGM}(L)}{\partial L} - \frac{\partial c^{NGM}(L)}{\partial L} \right) \frac{N^{NGM}}{b(N+1)} < 0$$

- We can determine the signs because $\frac{\partial a^{NGM}(L)}{\partial L} - \frac{\partial c^{NGM}(L)}{\partial L} > 0$ is necessary for the non-GM firms to choose to label, since it is voluntary.

Market Effects of Voluntary Labeling

- The total quantity in the market will increase.

$$\frac{dQ}{DL} = \left(\frac{\partial a^{NGM}(L)}{\partial L} - \frac{\partial c^{NGM}(L)}{\partial L} \right) \left(\frac{N^{NGM}}{b(N+1)} \right) > 0$$

- Define social welfare as consumer surplus + profits

$$W = a^{NGM} Q^{NGM} + a^{GM} Q^{GM} - \frac{b}{2} Q^2 - c^{NGM} Q^{NGM} - c^{GM} Q^{GM}$$

- The effect of voluntary labeling on welfare is unclear

$$\frac{\partial W}{\partial L} = \left(\frac{\partial a^{NGM}}{\partial L} - \frac{\partial c^{NGM}}{\partial L} \right) \frac{\left[Q^{NGM}(N + N^{GM} + 2) - Q^{GM} N^{NGM} \right]}{N+1}$$

- Even if labeling has a larger impact on demand than costs for non-GM producers, it could still decrease welfare.

- If GM producers represent a large portion of production, then social welfare could possibly decrease.
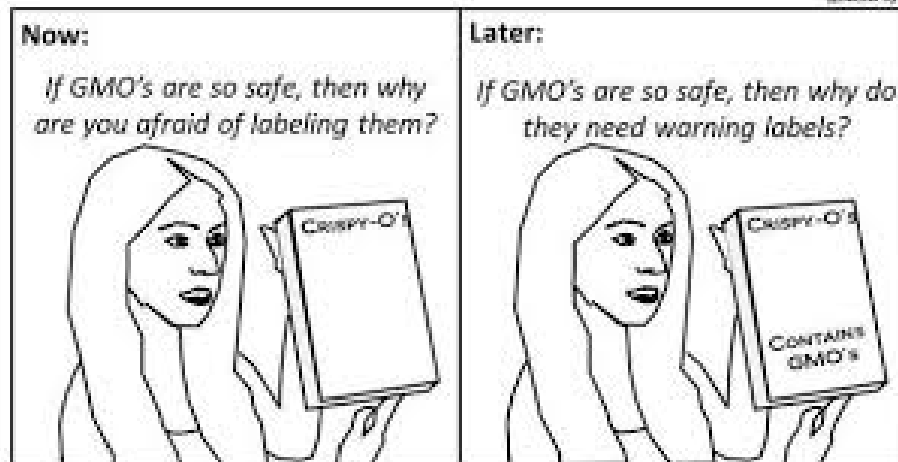
Discussion of Voluntary Labeling

- Voluntary labeling will only be undertaken if it is profitable for non-GM producers to do so.

- Non-GM firms weakly benefit from having the option to voluntarily label their product and will increase their quantity produced if labeling makes their non-GM product more valuable to consumers relative to the increased costs of labeling.

- GM producers make lower profits when non-GM firms voluntarily label because of increase in non-GM firms production.

- The effect of voluntary labeling on social welfare is likely positive, but it depends on the relative sizes of effects.

Mandatory GM Labeling

- Assume that GM producers are forced to label their products as GMO, which is represented by L^m.

- GM firms incur the cost of labeling.

- Mandatory labeling increases WTP for Non-GM $\dfrac{\partial a^{NGM}\left(L^m\right)}{\partial L} > 0$

- Mandatory labeling may decrease WTP for the GM product
  - Consumers who do not seek out non-GMO products, may view the mandatory label as a warning on GM products. $\dfrac{\partial a^{GM}\left(L^m\right)}{\partial L} \leq 0$

Now: If GMO's are so safe, then why are you afraid of labeling them?

Later: If GMO's are so safe, then why do they need warning labels?

Comparative Statics for Mandatory Labeling

- Effects of mandatory labeling on quantities is

$$\frac{dq^{NGM}}{dL^m} = \left(\frac{\partial a^{NGM}\left(L^m \right)}{\partial L^m} \right) \frac{\left(N^{GM} + 1 \right)}{b\left(N+1 \right)} - \left(\frac{\partial a^{GM}\left(L^m \right)}{\partial L^m} - \frac{\partial c^{GM}\left(L^m \right)}{\partial L^m} \right) \frac{\left(N^{GM} \right)}{b\left(N+1 \right)} > 0$$

$$\frac{dq^{GM}}{dL} = \frac{\left(N^{NGM} + 1 \right)}{b\left(N+1 \right)} \left(\frac{\partial a^{GM}\left(L^m \right)}{\partial L^m} - \frac{\partial c^{GM}\left(L^m \right)}{\partial L^m} \right) - \frac{N^{NGM}}{b\left(N+1 \right)} \frac{\partial a^{NGM}\left(L^m \right)}{\partial L^m} < 0$$

- The net effect on quantity and welfare depends on the size of the parameters.

Discussion of Mandatory Labeling

- The costs of mandatory labeling are borne by the GM producers, and the benefits are reaped by the non-GM producers as it differentiates their product.

- Possibility that consumers will view the mandatory GM labels as a warning, such as a mandatory health label on cigarettes.

- The combination of increased costs along with decreased WTP could be very damaging to GM producers. In the extreme, it could drive them out of the market.

Table 1: Evaluation of GM Labeling Policies

Policy Option	Consumers perceive high risk	Consumers perceive low risk
Voluntary labeling	▪ Non-GM firms will label their product. GM firms will make lower profits because non-GM firms increase their sales.	▪ Non-GM firms will not label/certify if it is too costly. If non-GM firms choose to label, there will not be a major impact.
Mandatory labeling	▪ Not very different from voluntary labeling, except that GM firms bear the cost of labeling.	▪ Labeling cost is imposed on GM firms without significant benefit to consumers. Consumers may view labels as a warning, hurting GM firms' sales.

Who pays for the information?

- Proponents of mandatory labeling cite the potential dangers of GMOs for human health and the environment.

- However, in 30 years that GMOs have been consumed, no threat has been scientifically documented.

- "consumer sovereignty" vs. human and/or environmental safety.
  - "Right-to-know" if their food contains GMOs.
  - With voluntary labeling, the non-GM product will likely be more expensive, so consumers must "pay to know."
  - Thus, with labeling policies, we are considering a **property right**.

Labeling Costs and Recent U.S. initiatives on Mandatory Labeling

- Estimated that mandatory labeling would increase the cost of food to CA households by $400/year. When CA consumers understood that the right to know would be costly, they voted against it (Zilberman, 2012).

- Ballot initiatives to require mandatory labeling have failed in WA (2013), CO(2014), and OR (2012 and 2014).

- VT and ME both passed mandatory labeling in 2014.
  - ME's law is contingent upon 5 nearby states passing mandatory GM labeling laws.

- In Aug. 2015, U.S. Congress passed *the Safe and Accurate Food Labeling Act,* to prohibit state-level mandatory GM labeling.
  - To become law, Senate must pass and a signature of the President or a veto override.

Implications for the TPP

- Mandatory labeling is more costly in terms of social welfare if the citizenship perceives low risk from consuming GM foods.

- If producers in one country are required to label their products to sell in another country, then the costs will be imposed on the producers in the first country.

- "Raising rivals costs" idea (Salop and Scheffman, 1983).

- If U.S. firms mainly produce GM products and the producers in many of the trade partner countries are non-GM, then we have the effects for producers in each country.

Thank you!

- Questions?

Ingredients: chocolate, sugar, chocolate liquor, cocoa butter, soy lecithin, roasted arabica coffee beans, confectioners glaze

Contains soy. May contain traces of peanuts.

Partially produced with genetic engineering.