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Estimating Investment Risk and Market Potential for Greenhouse Gas Abatement

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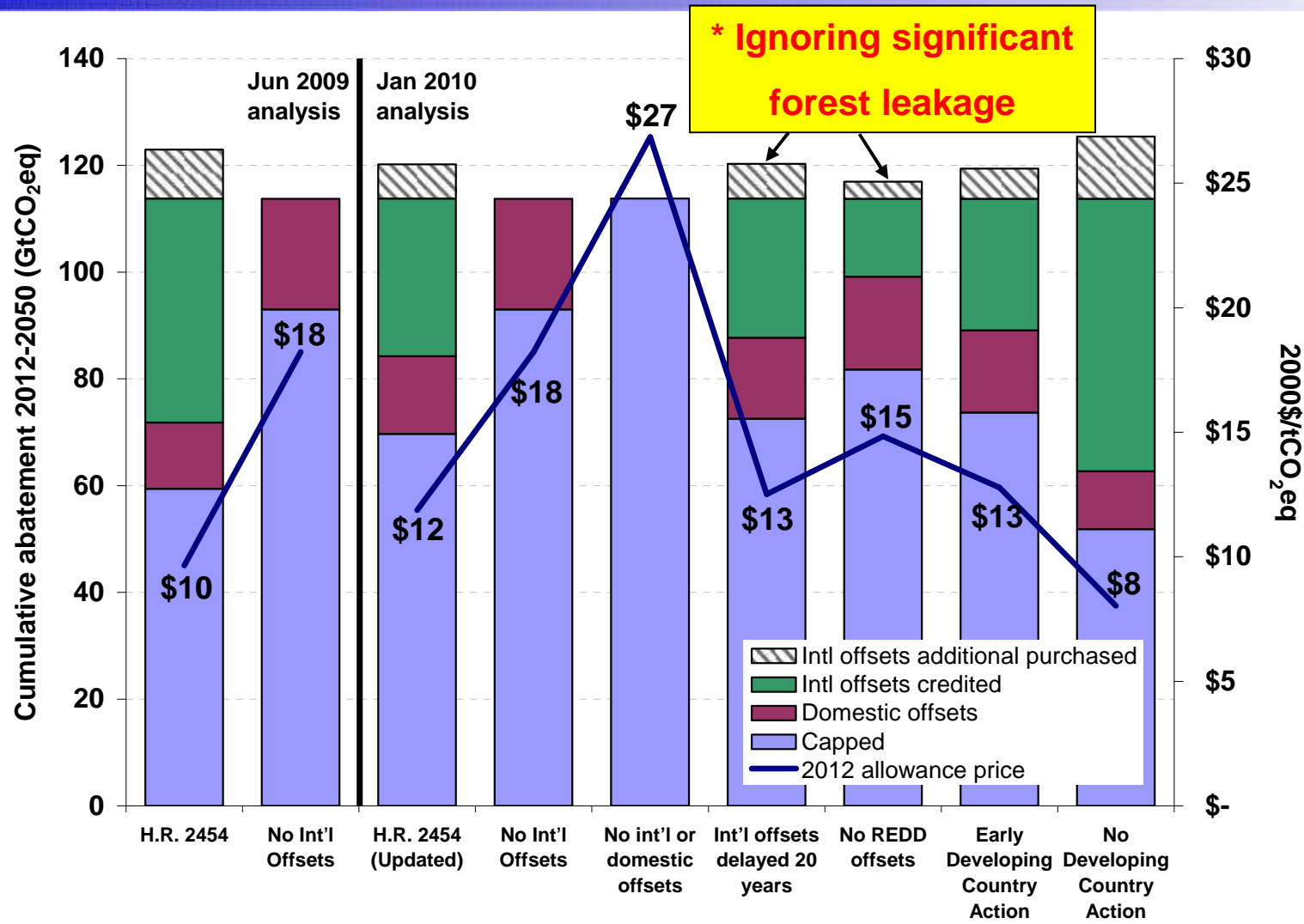
Objective

- Generate more market (and policy) realistic estimates of GHG abatement potential

Motivation

- Waxman-Markey (H.R. 2454) and Kerry-Lieberman (S.1733) rely heavily on large-scale domestic and international offsets for “cost containment” and uncertainty management – other countries as well
- To date, legislative analysis has been based on offset supply estimates of economic potential, some with ad hoc adjustments
- There is a lack of analytic information available about the “market potential” of domestic and international offset supplies, particularly in the critical near-term (2012-2020).

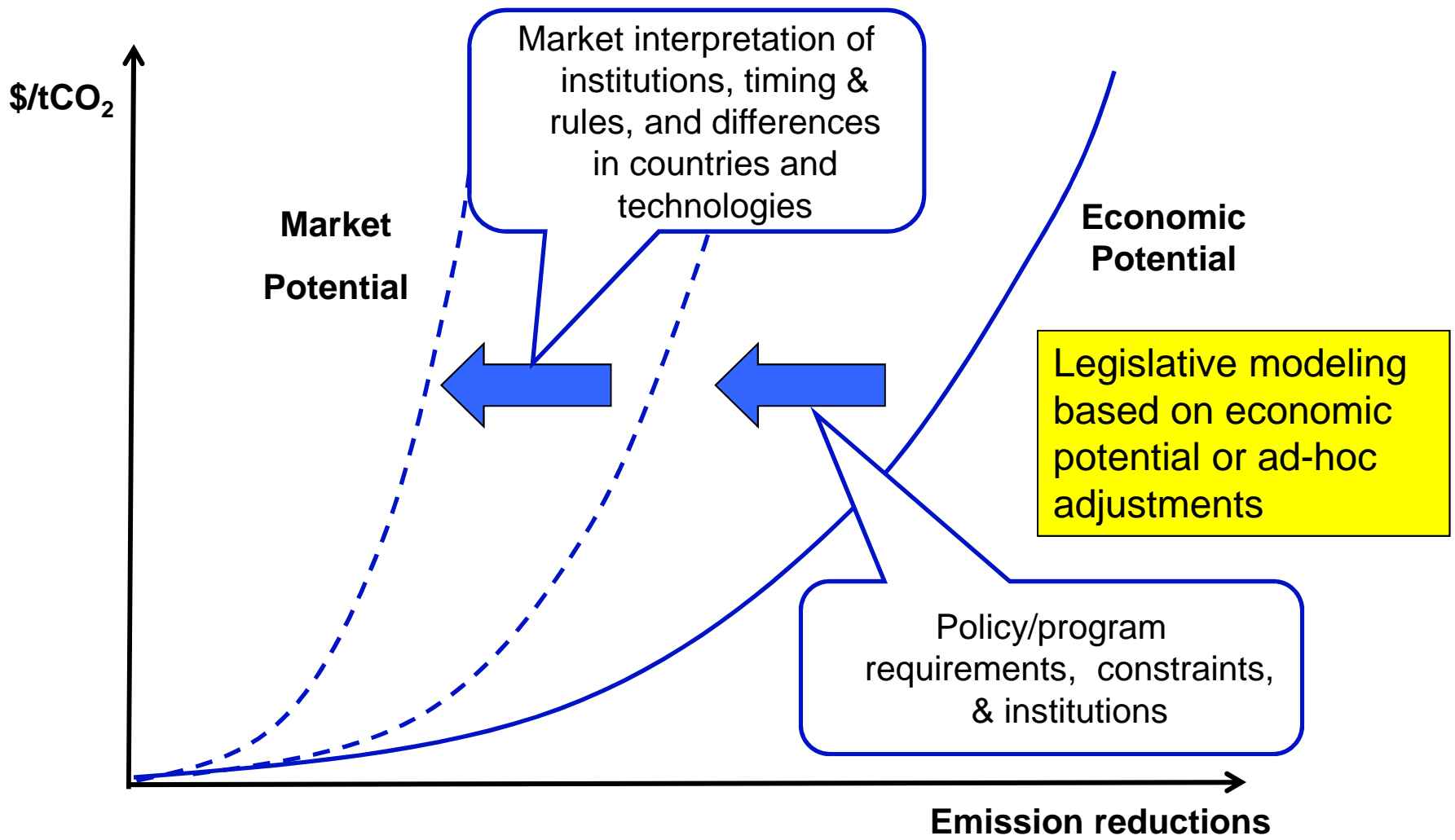
Capped Abatement and Costs Extremely Sensitive to Offset Supply (& Intl Assumptions)



Source: Derived by S Rose from original and supplemental EPA Analysis H.R. 2454

* See Rose and Sohngen (2011)

Moving from Economic to Market Abatement Potential



Generating Market Potential Estimates

1. Developing data to capture **country risks, technology risks, implementation realities, and transaction cost**
2. Estimating new GHG abatement supplies that reflect:
 - Project risk, implementation realities, transaction cost
 - Alternative policy & institutional contexts
 - Interactions between technologies and regions due to changes in the relative values of activities

Scope and Collaborators

- **Non-CO₂ GHG abatement**
 - Jeff Petrusa, Robert Beach (RTI International)
- **International energy CO₂ abatement**
 - Kate Calvin, Leon Clarke, Jae Edmonds (PNNL)
 - And, EPRI modeling
- **Forest and agricultural abatement**
 - U.S. forest and agriculture modeling (Bruce McCarl, Texas A&M University)
 - Global forest and land-use modeling (Brent Sohngen, Ohio State University)
 - Global forest and agriculture economy-wide and trade modeling (Alla Golub & Tom Hertel, Purdue University)
- **Investment Risk Data**
 - Natsource LLC



New Data for Economic Modeling – Investment Risk

Five Risk Factors Affect Delivery Rate

Country

- **Country Investment Risk (CI)** – Risk to the project’s continuing operations created by the “host” country’s macro-economic and fiscal policies.
- **Country Carbon Regulatory Risk (CCR)** – Risk the host country is unable to bring forward an offset project as a CDM/JI project.

Project

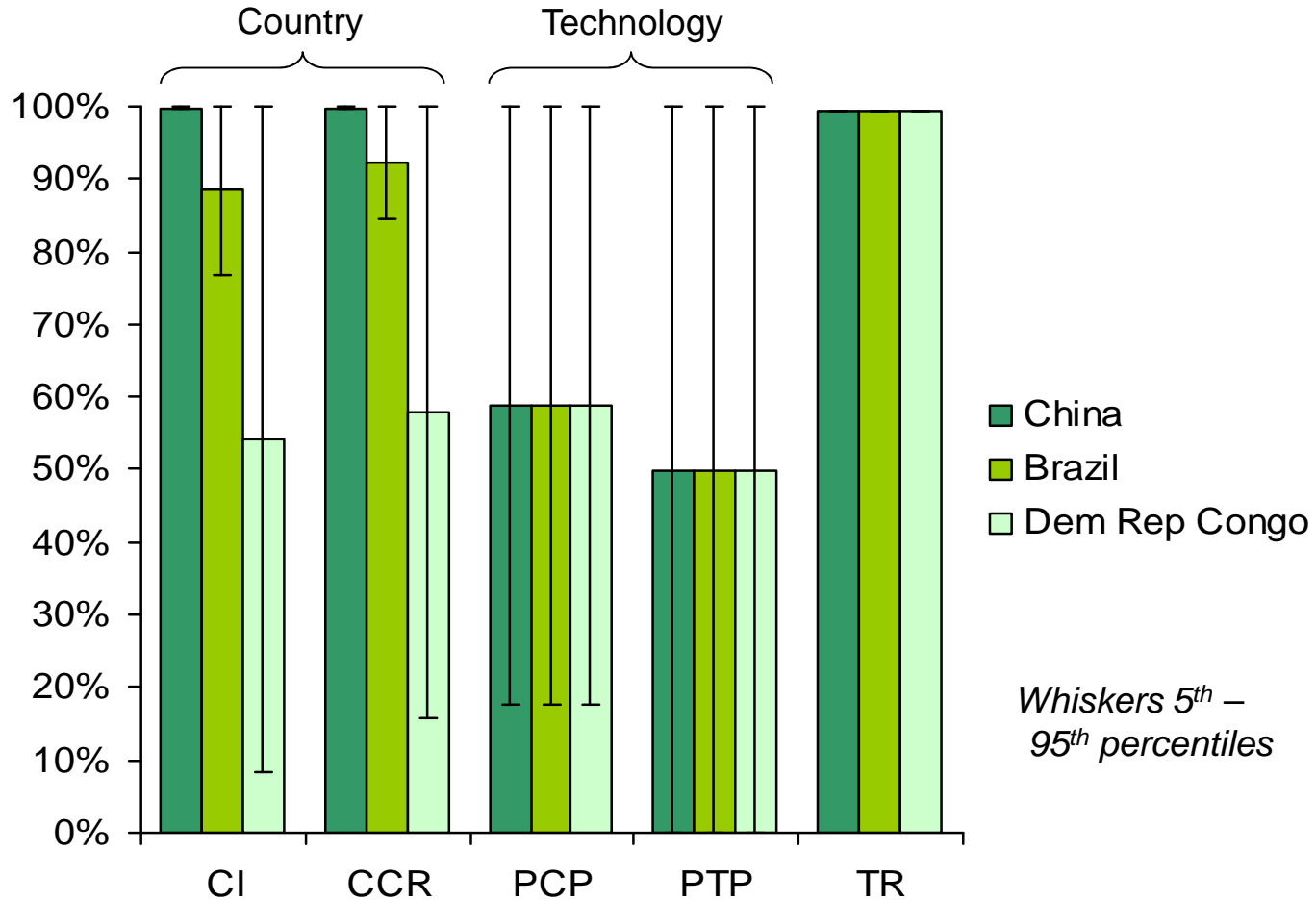
- **Project Carbon Performance Risk (PCP)** – Risk that changes in the CDM/JI regulatory process may affect a project’s ability to produce the contracted volume.
- **Project Technology Performance Risk (PTP)** – Risk that project implementation takes longer than planned, and/or the technology underperforms operationally.

Generic

- **Transaction Risk (TR)** – Inherent additional risk that a financial transaction could be cancelled.

Delivery Rate Factors

e.g., China, Brazil, DR Congo Afforestation/Reforestation



Whiskers 5th – 95th percentiles

Preliminary. Not for citation.

Delivery Rate Data

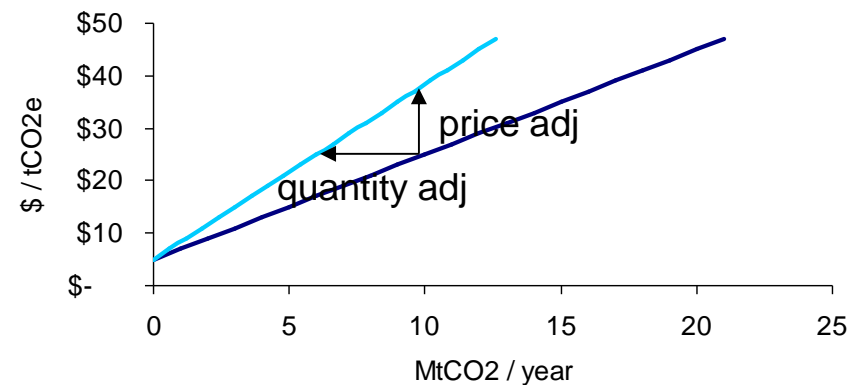
- Developed with Natsource LLC – Natsource managed two large compliance funds that purchased offsets (CERs, ERUs) for firms limiting emissions under EU ETS & Kyoto Protocol
- Default risk assessments informed by expertise with countries and project types, and updates reflecting regulatory & other developments
 - Evaluation of over 1000 projects: ~900 CDM projects (56 countries, 48 technologies), ~100 JI projects (12 countries, 24 technologies)
- Generated expected delivery rates and standard deviations for a **project-based environment** based on **CDM/JI**
 - 65 technologies and 200 countries (161 CDM, 39 JI)
 - Not all technology-project combinations covered by evaluated projects, but defaults can be estimated from assessments
- Result is **benchmark** data – raw material for entertaining alternative abatement contexts (policies, institutions, experience, scientific understanding)



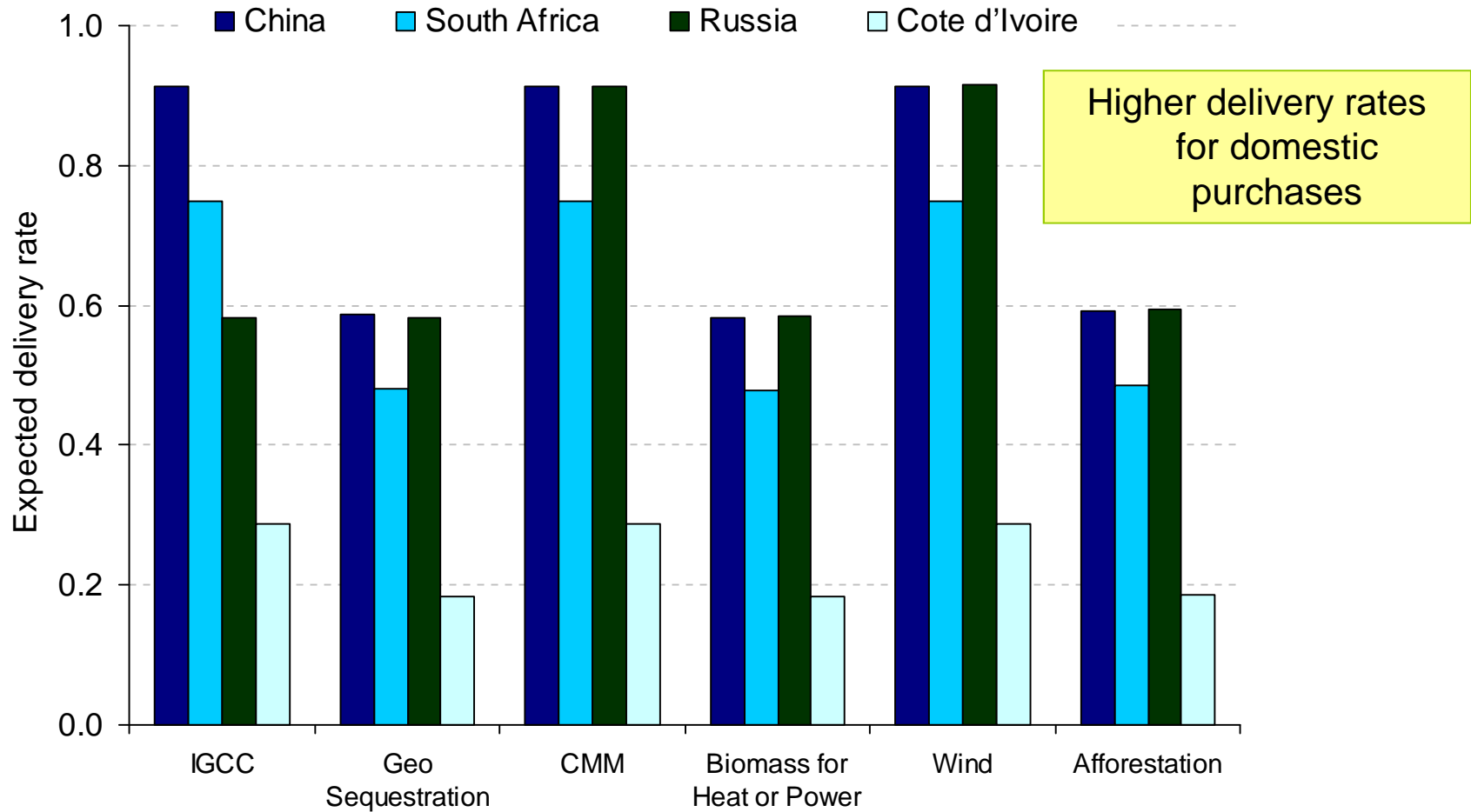
Implementation and Scenarios

Steps

- Computed overall delivery rates
 - Conceptually appropriate?
 - Risks captured in modeling?
- Economic model implementation
 - Interpretation?
 - Mechanics? Quantity, price, or cost adjustments
 - Scenarios?



International purchase delivery rates sample



Preliminary. Not for citation.

Scenario Dimensions

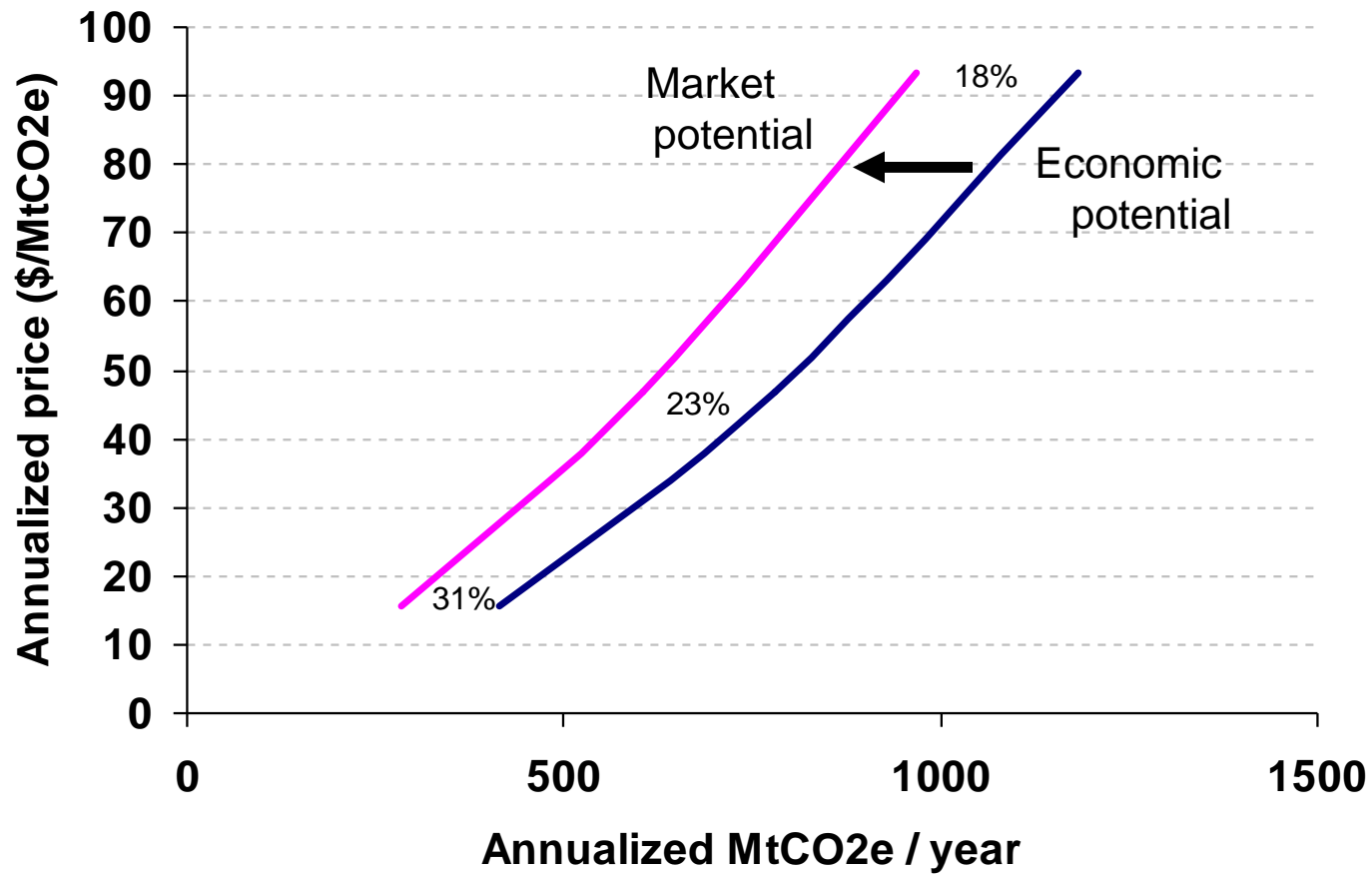
- Want a scenario set that is parsimonious with broad policy applicability (beyond offsets)
- *Four dimensions shape mitigation supply*
 - Generic investment risk
 - Greenhouse gas market investment risk
 - Greenhouse gas policy type
 - Greenhouse gas policy mechanism
- With a strategic set of plausible variations in these dimensions, we can generate a useful set of insights on the mitigation supply and market implications of investment risk and voluntary incentives



Sample of Latest Results

US Agriculture & Forestry




Offset Market Potential Supply



Preliminary. Not for citation.

Market Potential Effects on Mitigation Technologies

	Delivery rate factor	Resulting delivery rate (\$15+5% scenario)
Afforestation	58.8%	80.1%
Forest Management	58.8%	83.5%
Ag Soil N2O	58.8%	71.4%
Ag Fuel	100.0%	74.0%
Manure Emissions	99.8%	99.2%
Enteric Emissions	58.8%	82.8%
Grain Ethanol	58.8%	-9.5%

Reduction relative to factor:  More  Less  Emissions increasing

- Resulting delivery rates not equal to Delivery Rate factor – interactions between technologies important
- Current approaches making ex-poste adjustments miss interactions

Preliminary. Not for citation.

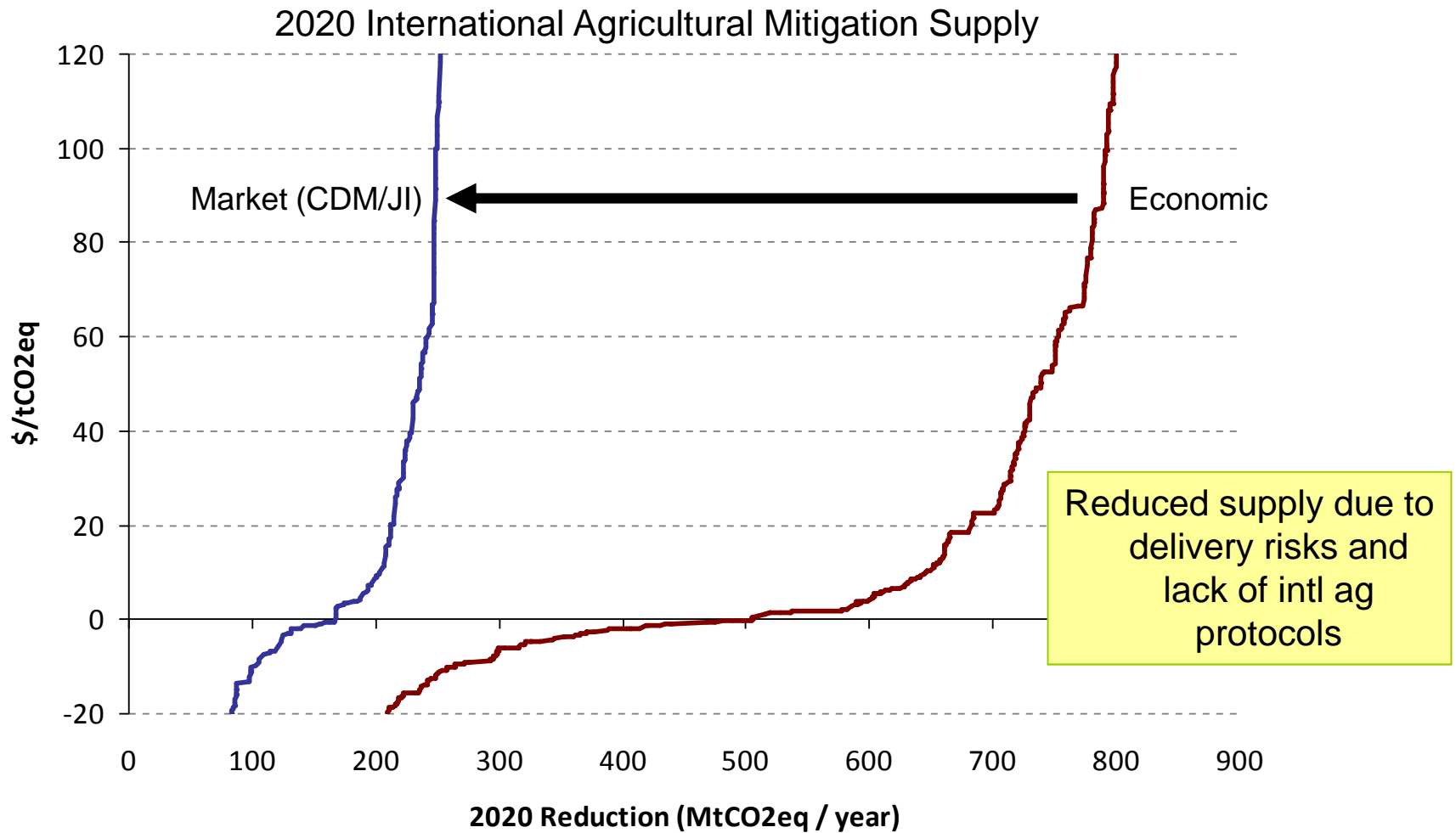


Sample of Latest Results

International Agricultural Non-CO₂

Offset Market Potential Supply

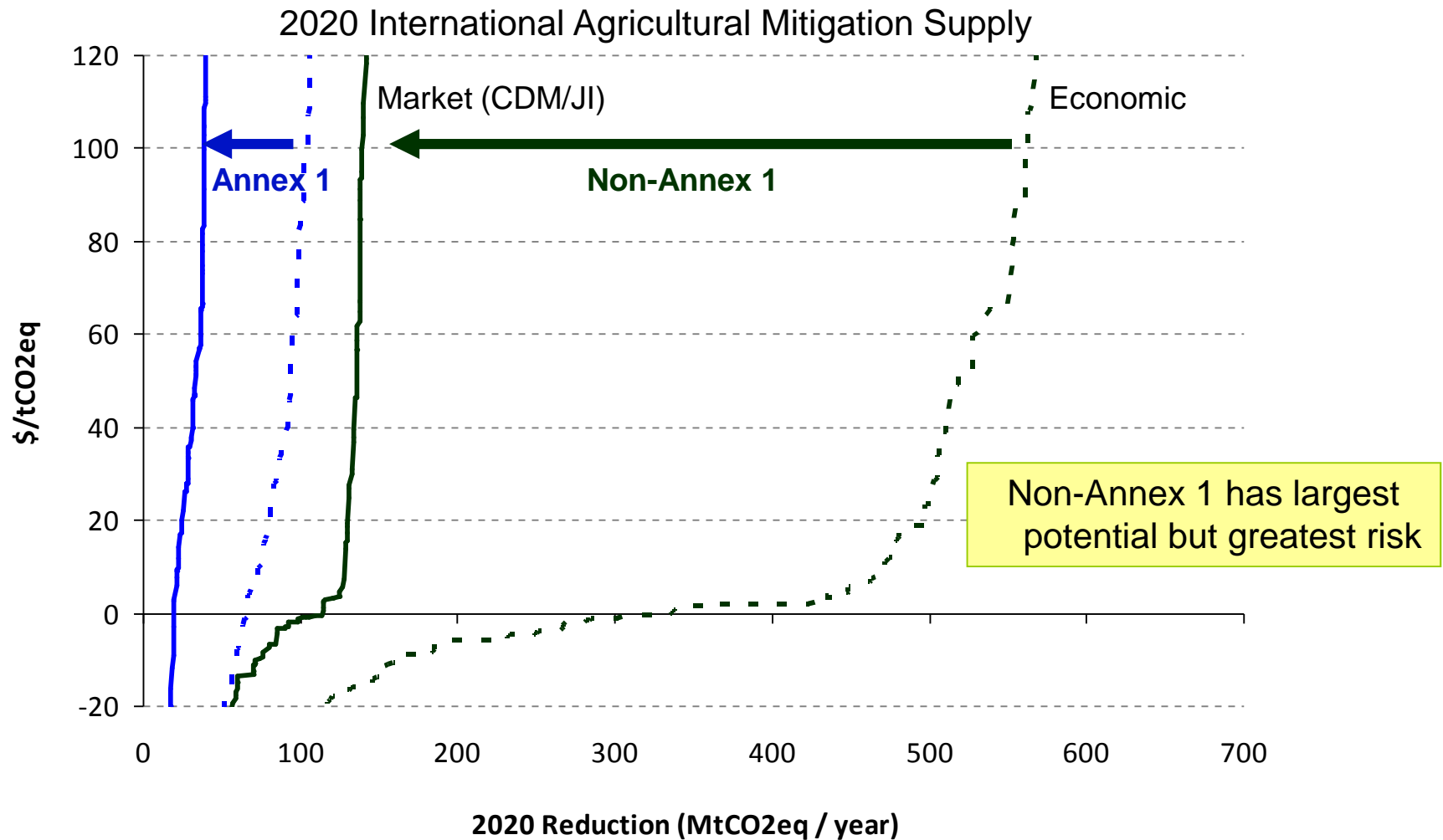
e.g., International Agriculture (Crops, Rice Paddies, Livestock)



Preliminary. Not for citation.

Offset Market Potential Supply

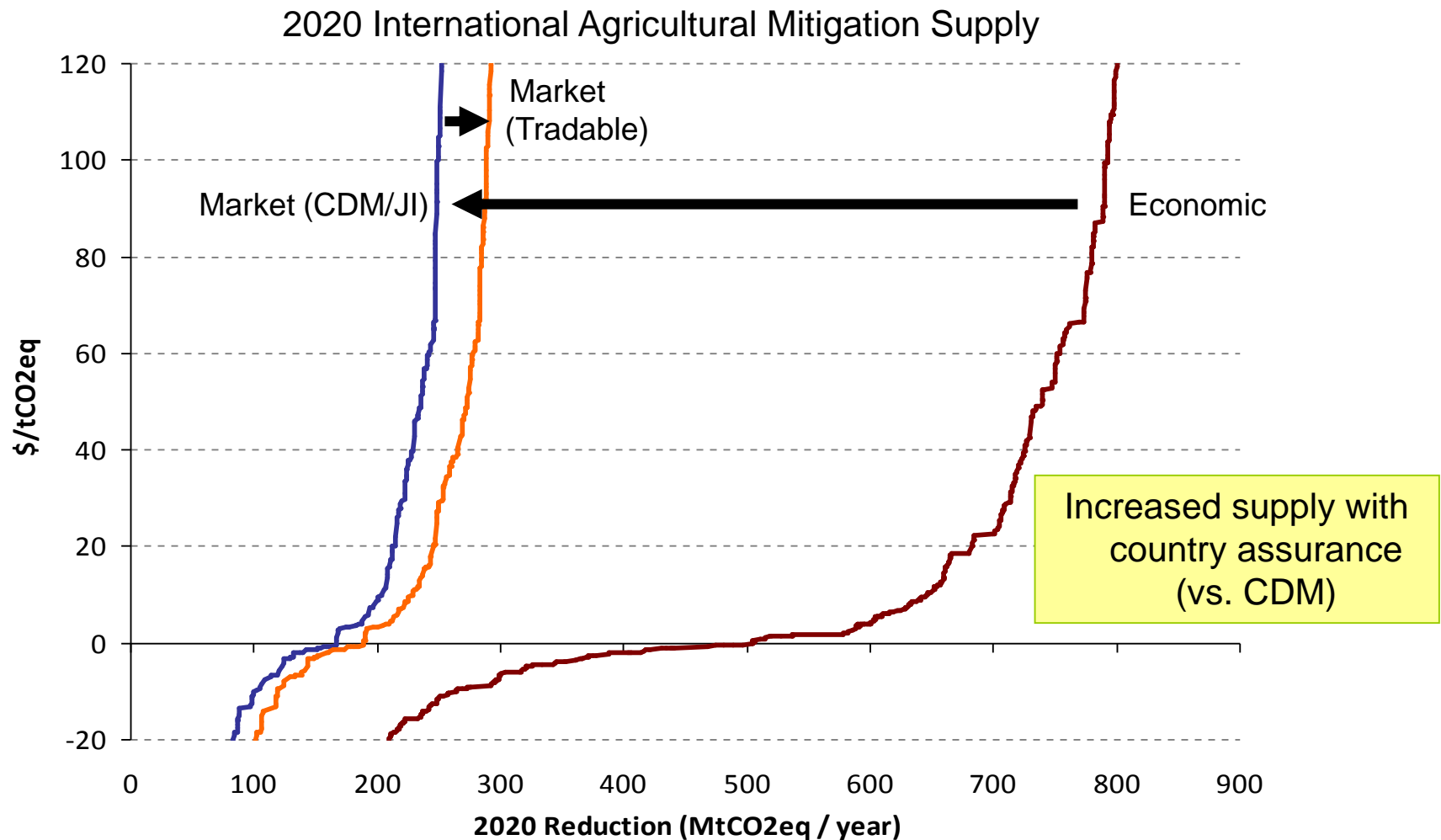
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Offset Market Potential Supply

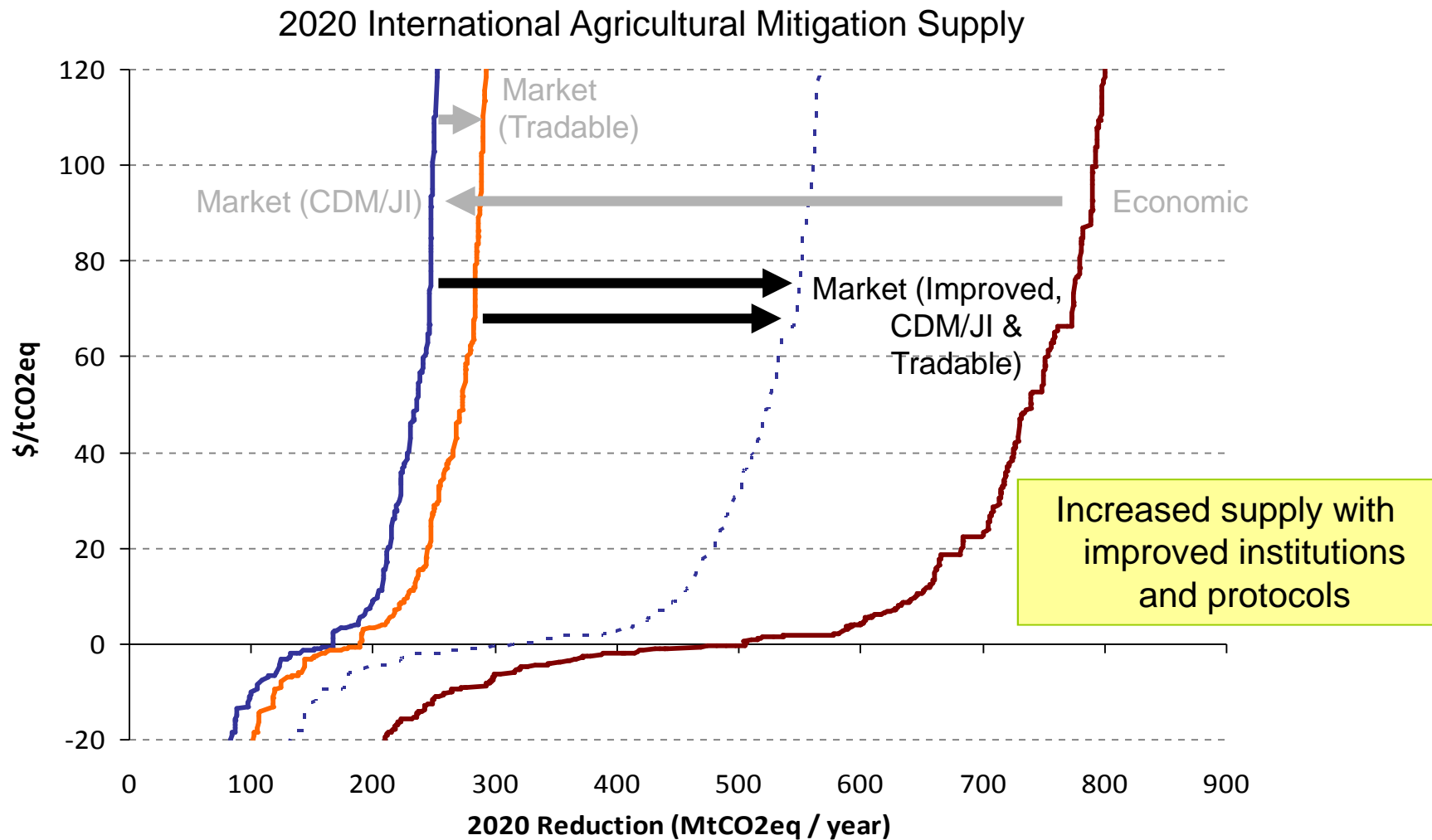
e.g., International Agriculture (Crops, Rice Paddies, Livestock)



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Offset Market Potential Supply

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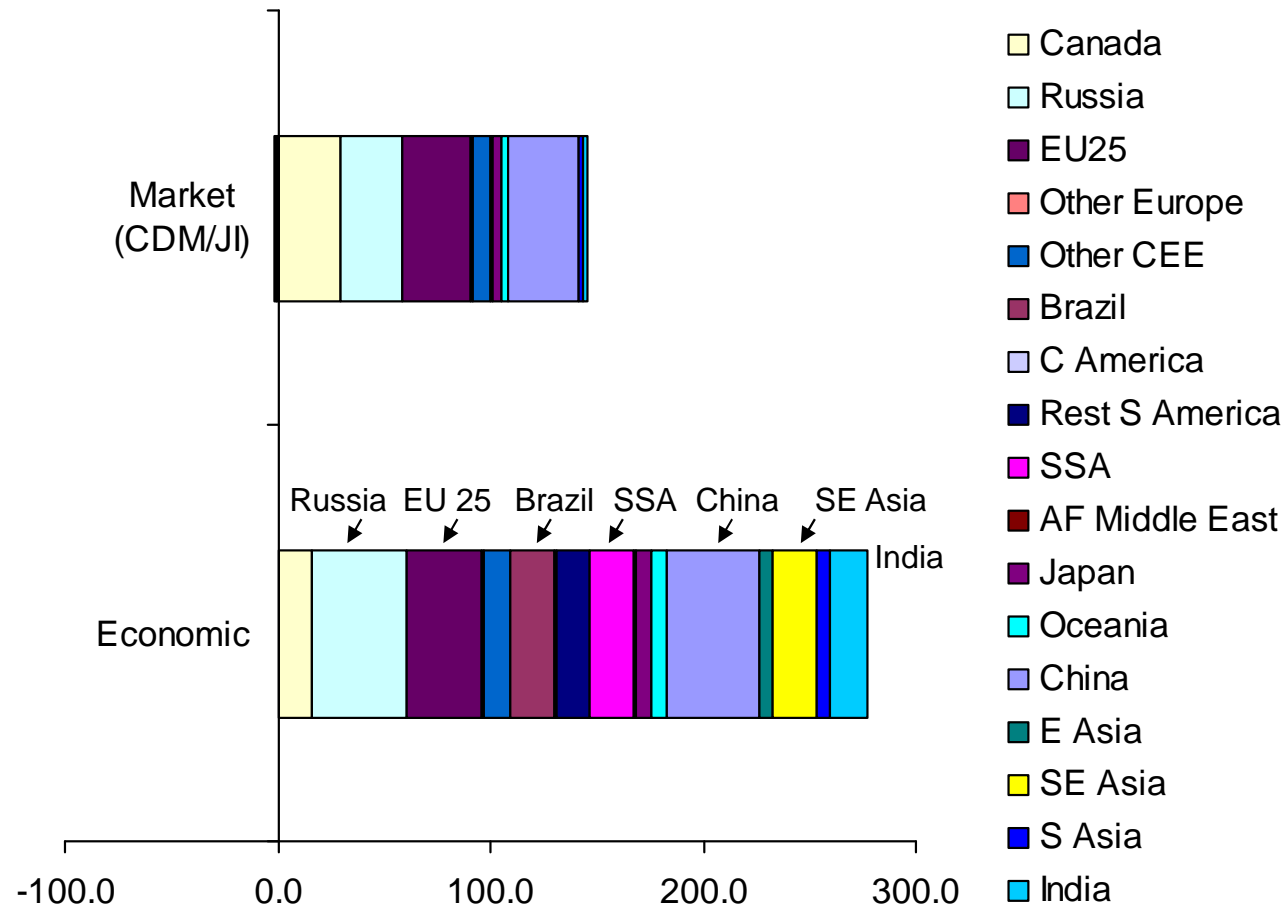
Sample of Latest Results

International Forestry

Offset Market Potential Supply

e.g., International Forest Carbon

Cumulative Additional Forest Carbon (through 2090)



Preliminary. Not for citation.

Offset Market Potential Supply

e.g., International Forest Carbon

Cumulative Additional Forest Carbon (through 2090)

	Delivery rate factor	Resulting delivery rate (\$15+5% scenario)
China	0.29	0.77
Brazil	0.24	-0.02
Canada	0.17	1.86
Russia	0.29	0.66
EU25	0.17	0.89
Other Europe	0.17	1.60
Other CEE	0.15	0.58
C America	0.15	1.24
Rest S America	0.24	-0.01
SSA	0.09	-0.04
SE Asia	0.26	-0.01
Oceania	0.09	0.38
Japan	0.17	0.49
AF Middle East	0.17	-1.92
E Asia	0.17	0.06
S Asia	0.15	0.27
India	0.26	0.11

Reduction relative to factor:



Preliminary. Not for citation.

Final Thoughts

Preliminary insights...

- Investment risks
 - Vary by country-technology pair, policy and institutions
 - Are a “cost” absent from previous modeling of GHG mitigation supply
 - Can significantly affect the cardinal and ordinal value of abatement technologies
- NAMAs likely reduce international abatement supply further
- Voluntary participation – a one-sided incentive that could have perverse effects
- Transactions costs work slow going – limited information
- Preliminary results



Discussion

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