

# Capacity Constrained Multi-regional Oligopoly

## Motivation

Many markets are dominated by a small number of firms, which compete in producing and supplying goods to different geographic regions. This imperfect multi-regional competition is observed in many commodity markets including energy, metals, agricultural and livestock. In these markets, firms operate under resource constraints and have limited production capacity. We develop a model of multi-regional Cournot competition between capacity constrained firms.

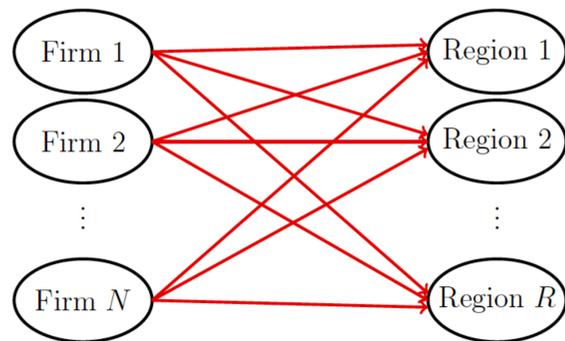
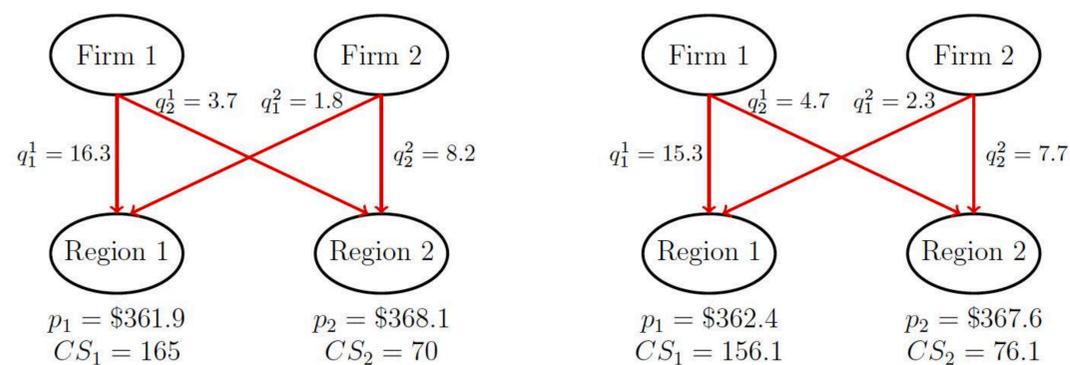


Figure 1. Sales network structure.

## Methodology and Results

We establish a one-to-one transformation between the original  $N \times R$  dimensional problem and a  $N$  dimensional problem. We show the existence of a unique equilibrium and provide a convergent algorithm for computing it. We find that a reduction in import-export taxes may reduce consumer surplus when firms are capacity constrained.



Consumer Welfare=235

Consumer Welfare=232.2

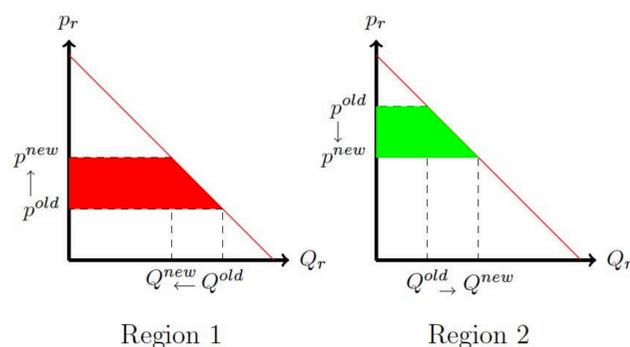
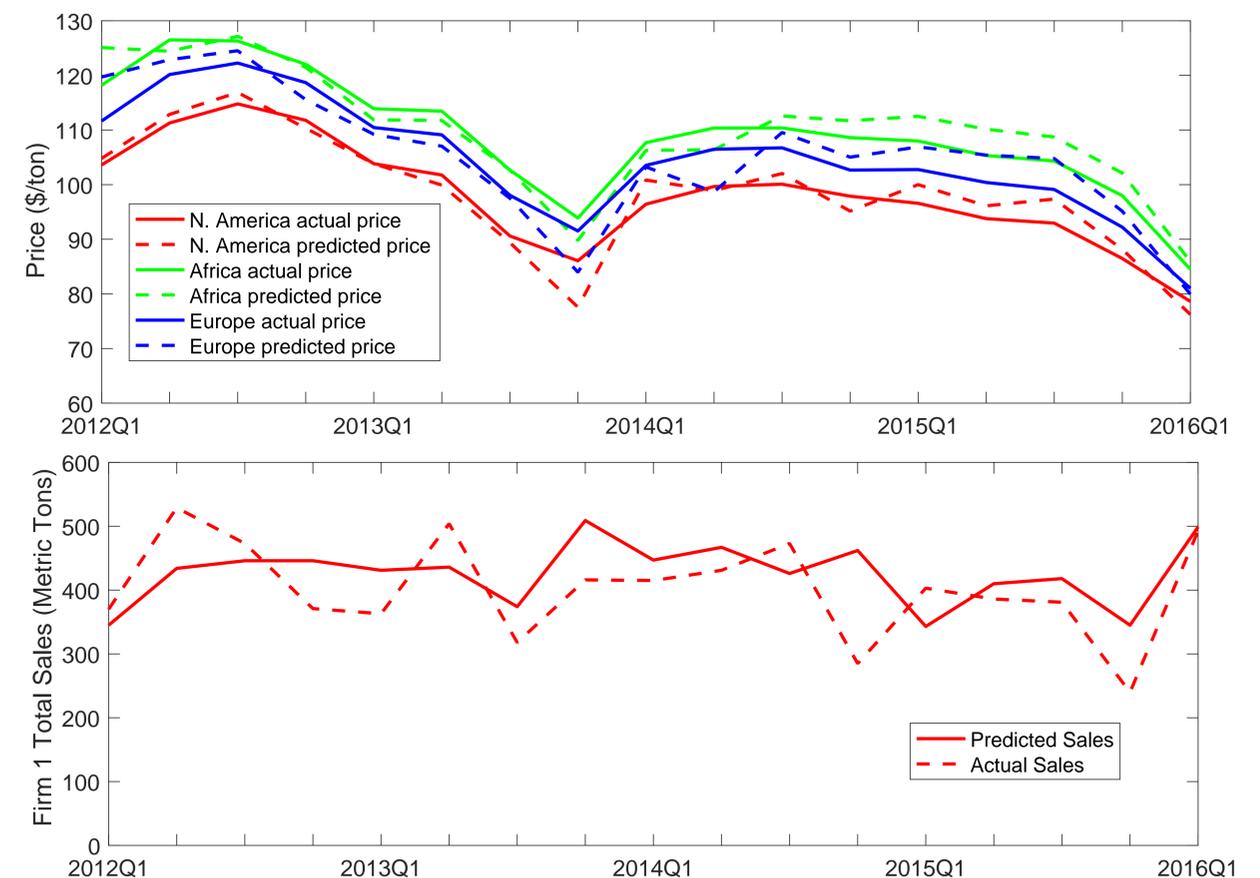


Figure 2. Reduction in transportation costs reduces consumer surplus.

## Empirical Analysis

We calibrate our model to the global market of fertilizers. There are 13 major firms in this industry, covering a wide range of geographic locations. Our dataset covers the period 2012Q1 through 2016Q1.



Actual Allocation

Predicted Allocation

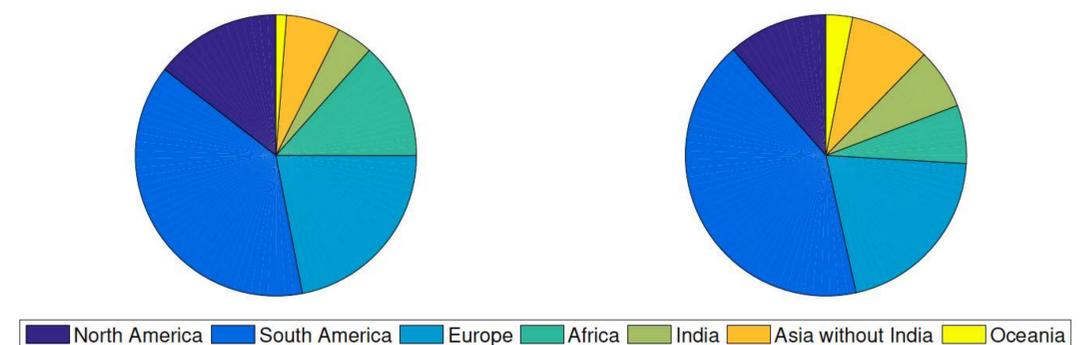


Figure 3. Assessing the model's predictive accuracy.

## Conclusion

Our results imply that policies promoting free trade (e.g. NAFTA, European Union) may have the unintended consequences of reducing consumer surplus in capacity constrained industries. Our model captures the market complexity, and can be used to inform the development of policies on import/export bans.