Economic Modelling and Econometrics of the Rice Industry

PAEDA Conference 2021

Resiko, Tariffication, and Market Power

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Motivation for this Presentation

- We (the Economics Office) have been conducting research on the Rice Industry
  - Support for Case Work
  - Rice TWG
  - Personal Research Efforts
- My goal in this presentation is to share some of my research in progress, as well as feature the research by EO in general in this space.
  - *Resiko* Vertical Contracting Practice
  - Regression Discontinuity in Tariffication
  - Market Power
  - Reduced form relationship of Rice Price and Stocks

Resiko Vertical Contracting Practice

- During our market investigation in Rice, we learned that:

    1. *Resiko*, a practice where palay purchases are marked down due to expected shrinkage due to processing.

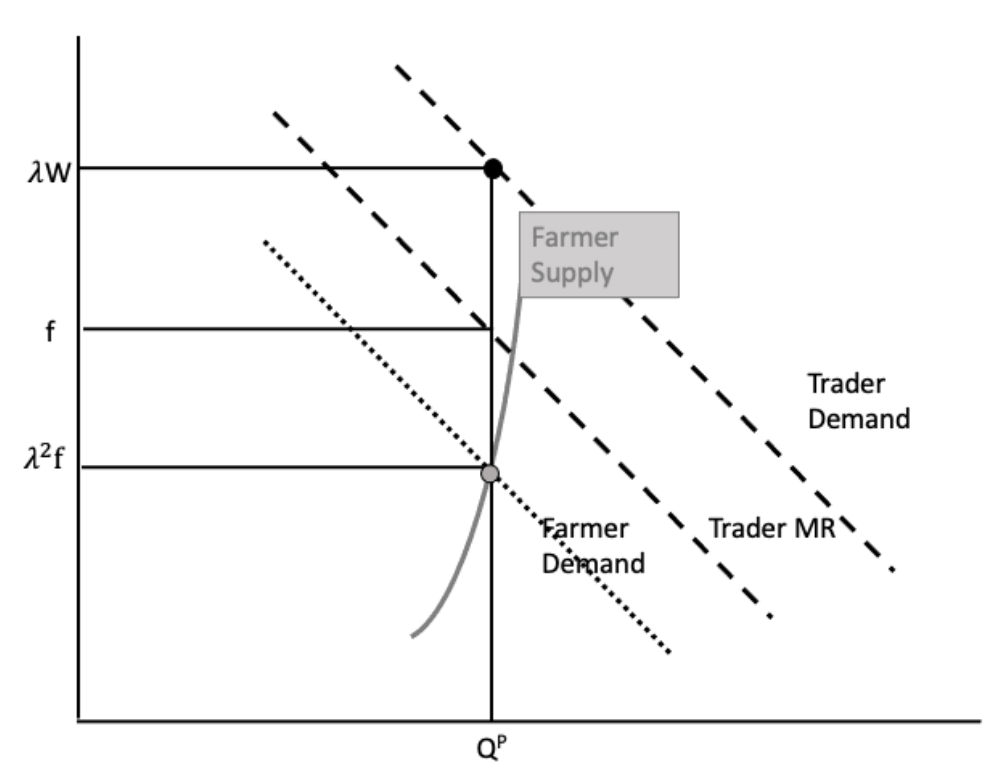
    2. There may be multiple stages in the palay stage of the Rice supply chain. (Bataia, et al., 2018)

    3. We have identified instances where there are multiple linkages in the palay production stage, *Resiko* is applied as many times along the chain.

Resiko Vertical Contracting Practice

- Globally, we have *resiko*, but is levied only once, as the processing reduces the mass of the product once.
- Modelling using a vertical industry, typically used to analyze double marginalization
  - See, the description in the textbook Pepall, Richards, and Norman (2008) among others
- Assumption, there are 2 levels of the palay supply chain, and *resiko* is applied twice.

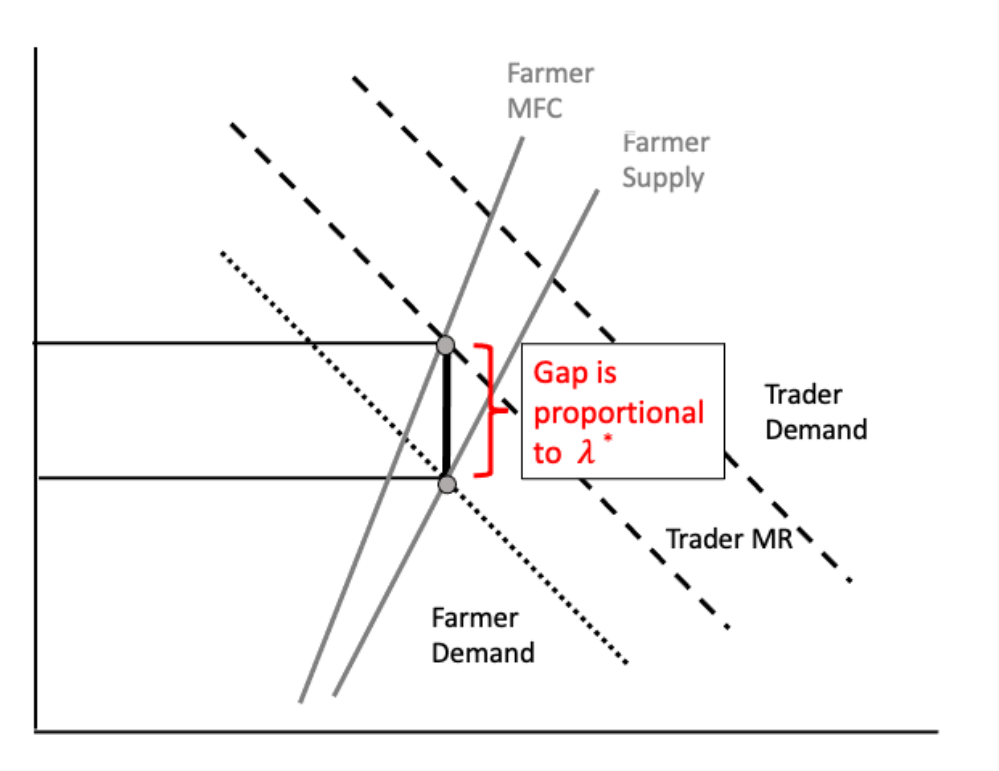
Resiko Results



Result 1: *Resiko* is like a tax on sellers in that it pushes down prices received by sellers, creates a gap between demand of upstream and MR of downstream player

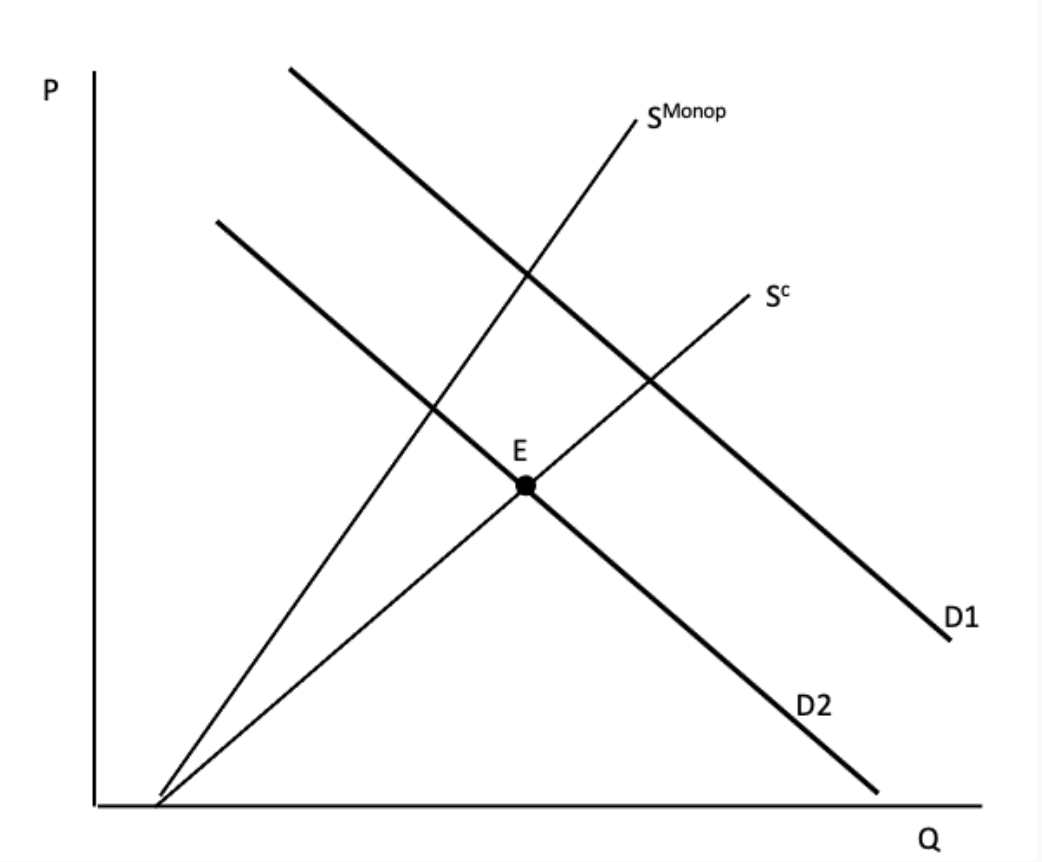
Resiko Results

Result 2: *Resiko* allows the trader level, even if they do not have buyer power, to collectively have buyer power and establish the trader profit maximizing buying price as if it were a monopsonist.



Future Work with *Resiko*: Structural Estimation

- Here, the monopsonist equilibrium is consistent with D2, and the perfectly competitive buyer is consistent with a higher demand, D1. (Bresnahan, 1982)
- To identify the conduct parameter, we would need a variable which changes the slope of supply the supply function.



Market Power Study Overview

- Structural Econometrics
  - Demand Estimation
  - Together with Conduct Parameter Estimation
- Price Tests using Cointegration, Asymmetry
  - Along the supply chain
  - Across geographic markets to test for economic integration, law of one price.
  - Tests use Cointegration, Error Correction, Price Adjustment Asymmetry

Market Power: Structural Estimation of Conduct

- A structural approach would look like the following Genesove and Mullin (2010).
- They use the markup equation with a conduct parameter for market power:
  - $$\frac{P - MC}{P} = \frac{\theta}{\eta_d}$$
- We use actual measurements for the left hand side, with an assumed general form for marginal cost of $MC = a + b_f P_f$, where we use (Bataia, Beltran, Manalili, et al., 2018) to estimate a (marketing costs) and b_f, inverse of milling efficiency. We further use η from (Lantican, Sombilla, and Quilloy, 2013)
- We get measured markups of 2 to 12%, and implied θ's of 1 to 6%.

Market Power: Price Tests in the Philippines

- To my knowledge, there has been no structural model of Rice markets for market power, although there is a literature of demand and (older studies on) supply elasticities estimation.
- There's a broader literature on Price Tests in Philippine Rice, which seeks to test market power via the (lack of) economic integration and the presence of price asymmetry.
- Reeder (2000) tests the asymmetry of rice price changes of positive and negative price changes from farmgate to wholesale.
- Briones (2018) tests for border cointegration and regional price coordination of rice prices.
- In other countries, there has been many price tests on cointegration and newer techniques for vertical price tests (such as TAR models).

Market Power: Price Tests

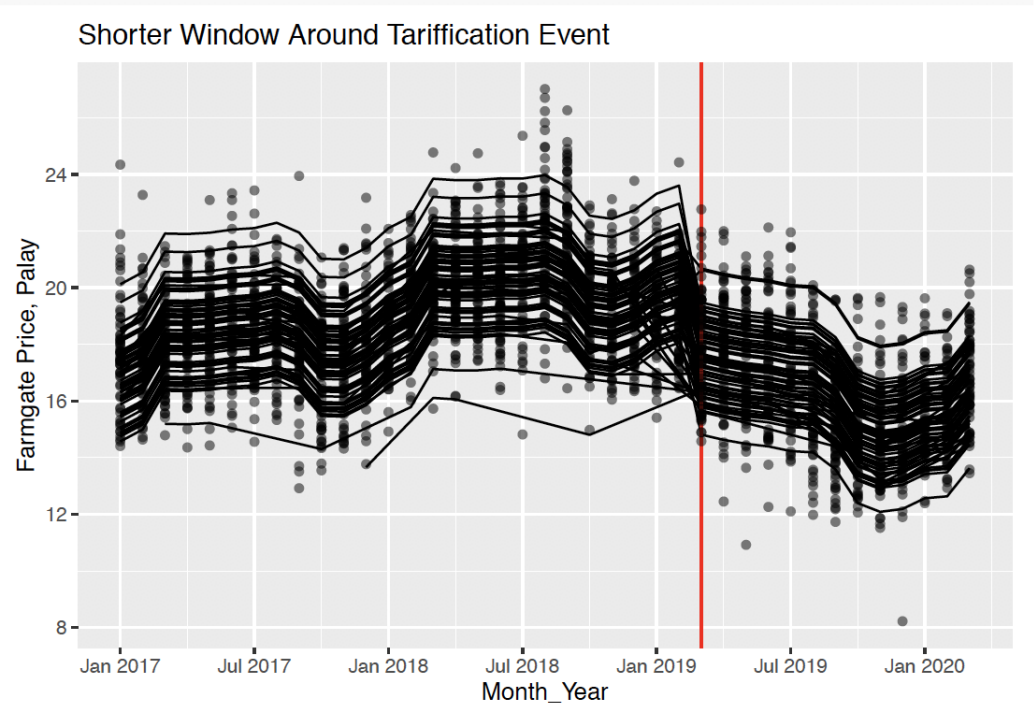
- There have been tests of the "Equilibrium Displacement" theory, which looks at the long-run (error-correction) relationship between upstream and downstream in agricultural markets. [Papers from McCorriston and Lloyd for example, a summary in (Lloyd, 2017)]
- To my knowledge, there are no papers on pass-through, or modified parity bounds on domestic, regional market price differentials.
- I conducted a cointegration exercise between national averages of wholesale to retail, and then on farmgate (after adjusting for the efficiency rate) and wholesale. I find that that farmgate and wholesale are not cointegrated, while wholesale and retail are cointegrated.
- As an application on *unfair pricing*, we conducted a Nearest-neighbors matching estimator using the Palay Cost and Returns Survey. Here, we matched our target provinces with provinces with covariates that are most similar to it.

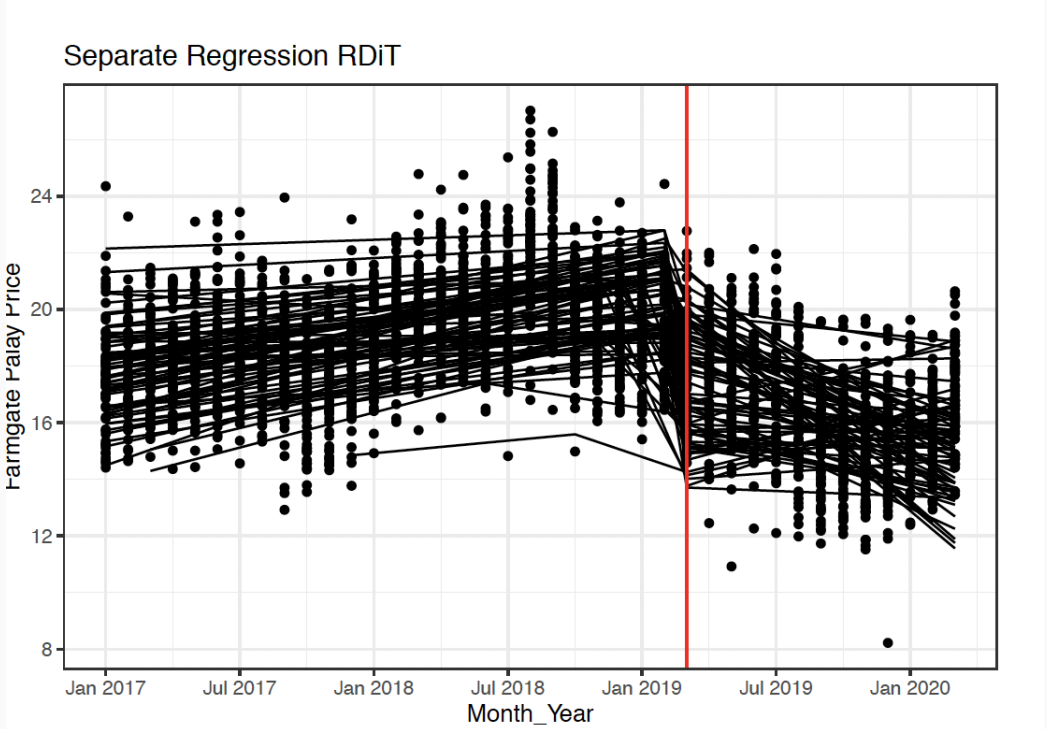
Regression Discontinuity in Time

- The Policy Discontinuity is the Rice Tariffication Change, which was put into effect March 2019.
- Regression Discontinuity is a reduced form technique to identify treatment effects based on a continuous forcing variable (Hausman and Rapson, 2018)
- RD in Time is when the forcing variable is Time. There is usually no cross sectional variation. as in a typical application, the policy change affects all cross-sectional units simultaneously. A typical example is Davis (2008), who looks at a vehicle reduction scheme's effects on various pollutants in Mexico City.
- For the Philippines, there is no debate on whether there has been an effect of tariffication. But this exercise allows us to quantity the effect, and check how different provinces reacted [heterogeneity].

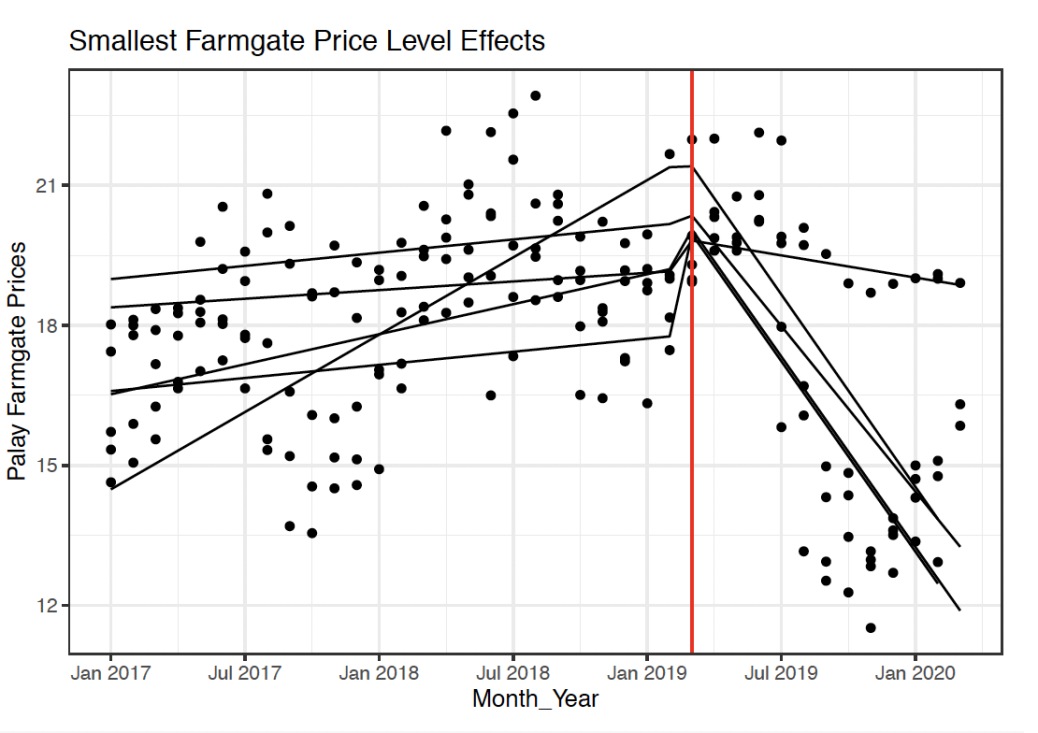
RD in Time Tariffication

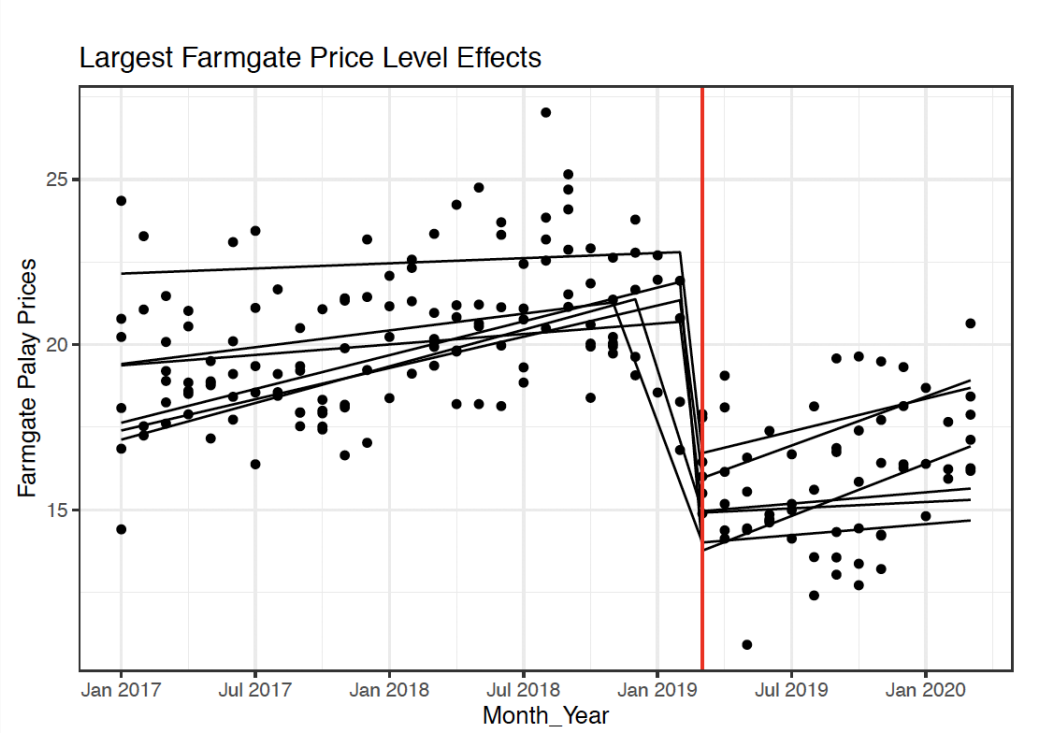
Average Effect of almost 4 Pesos on the left, 3 pesos on the right.





RD in Time Tariffication





The next step is to understand the heterogeneity in effects.

Econometrics of Wholesale Rice Prices

- Our TWG has an analysis of Wholesale Rice Prices, Stocks and Imports. In theory, rice stocks are associated with higher future rice prices.
    - But can be negatively related to prices in the present
    - Higher stocks tend to raise the future price as supply is taken out of the market
- We are interested in the relationship between wholesale prices and stocks, controlling for local production. We believe stocks is endogenous, and we implement a 2SLS model to deal with it.
- Instrument Rice Stocks using lagged palay production and imports. Quarterly Data on Average Wholesale/farmgate prices, production, imports, foreign prices.

Econometrics of Wholesale Rice Prices

1st Stage		2nd Stage	
D.lnqm1totalstocks		D.lnqavewholesale_rmr	
LD.lnlocalrice	0.341****	D.lnqm1totalstocks	-0.107***
	(7.75)		(-2.88)
L2D.lnlocalrice	0.215****	D.lnlocalrice	-0.0331***
	(4.25)		(-2.65)
L3D.lnlocalrice	0.0852**	D.lnqsumriceimports	-0.000362
	(2.03)		(-0.15)
LD.lnqsumriceimports	0.0253**	D.lnqavefarmgate	0.298****
	(2.56)		(4.86)
L2D.lnqsumriceimport	0.0126	D.lnqavehpvietnam5	0.0359
	(1.26)		(0.75)
LD.lnqavefarmgate	-0.571**		
	(-2.04)		
_cons	0.00353	_cons	0.00557
	(0.22)		(1.61)
R-sq	0.6688	R-sq	0.6027
N (1st Quarter 2009 to 4th Quarter 2019)		44	
t statistics in parentheses *p<0.10, ** p<0.05, *** p<0.01, **** p<0.001			

- 1st Stage:
  - First lag of imports is significant
  - Instrumented by lags of production
  - Imports significant
- 2nd Stage:
  - Imports not signifcant
  - Instrumented Stocks is negative

Thanks and References

Thank you for your attention and feedback. and we hope to continue working on market power and supply chain issues in other agricultural industries as well.

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