Measuring Rice Competitiveness: New Evidence Using an Extension of the Policy Analysis Matrix

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INTRODUCTION

The advent of free trade agreements, including the Asean Free Trade agreement (AFTA) and WTO accession, pose challenges for the Malaysian rice sector as it must compete with low-cost exporting countries. This implies not only structural changes in trade, but also adjustments at the farm level to improve efficiency and competitiveness. Further developments in the rice sector will therefore depend on the availability of sufficient, relatively low-cost and high-quality rice, or in other words, on the competitiveness of rice production. However, the measurement of competitiveness in agriculture is often based on average farms. If the farms that are summarised in this manner are heterogeneous, inferences based on aggregated measures can be misleading. Therefore, we propose an extension to the Policy Analysis Matrix by Monke and Pearson (1989). This extension allows us to take farm-level heterogeneity into account and draws distribution of competitiveness scores for each rice farm.

STUDY AREA

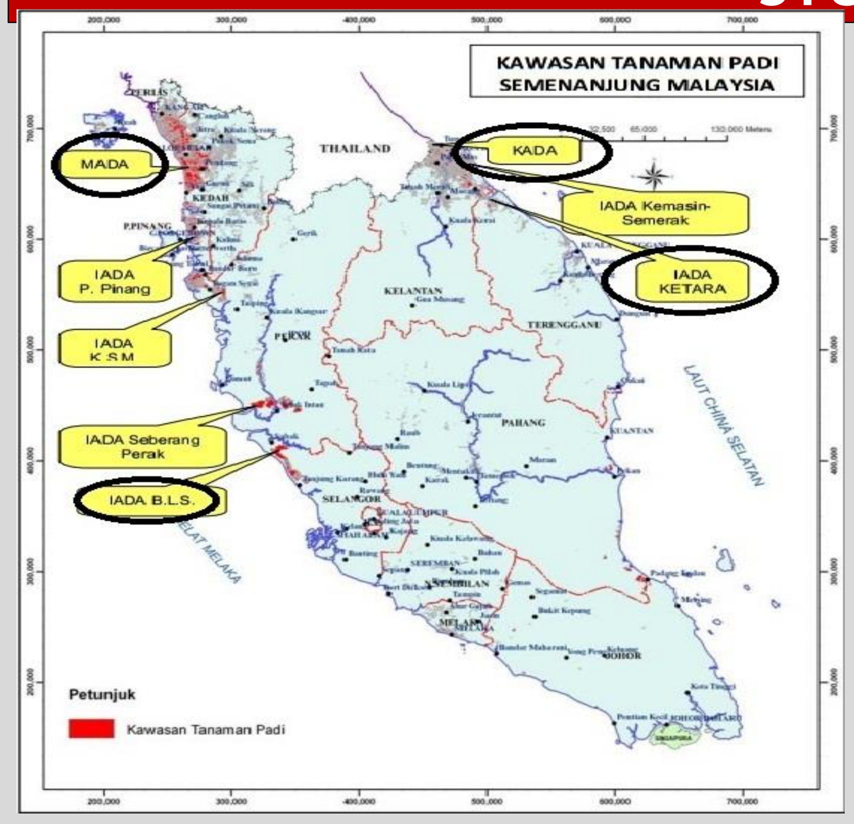


Fig. 1 Distribution of major granary areas in Malaysia

- Muda Agricultural Development Authority (MADA), which is the largest granary area (Fig.1)
- The farm level data is collected twice a year and each survey period includes a balanced sample of 675 farming households (~6750 households)
- The panel is composed of ten cross-sections covering main and off-seasons, from 2010 to 2014
- This data set provides comprehensive information, including input use, output and corresponding prices

AIMS

- To understand the driving forces behind competitive rice production in Malaysia using an extension to the Policy Analysis Matrix
- To examine factors influencing rice competitiveness using dynamic panel regression or System of Generalized Method of Moment (SGMM)

METHODOLOGY

Our approach relies on the extension to the 'Policy Analysis Matrix' proposed by Monke and Pearson, (1984). This extension makes it possible to determine for each product a) the proportion of the farms that producing it that is competitive and b) the proportion of the total production that derives from competitive/uncompetitive farms. Correspondingly, the proceeding and results presented here are part of a sequence of the following necessary steps:

Social Cost Benefit Ratio

One of the indicators that can be calculated to measure competitiveness using the PAM framework:

$$\mathbf{SCB} = [\textstyle\sum_{j=1}^{k} a_{ij}P_j^S + \sum_{j=k+1}^{n} a_{ij}W_j^S\,] \,/\, P_i^S$$

- ratio of the social cost of producing one unit of an output to the social value of that unit of output.
- **0<SCB<1 → Competitive**
- **SCB>1 → Uncompetitive**

Bootstrapping method

This method can generate distributional properties of the indicators and thus allow the calculation of standard deviations and confidence intervals for PAM indicators.
Using kernel methods proposed by Cramon-Taubadel and Nivyevskyi (2008, 2009), we estimate SCB distributions for each rice farms and estimate the proportion of farms that produces competitively for each product and the proportion of the total production of that product that is produced competitively.

Kernel distribution

Results were transformed into kernel distribution (Figure 2) and summarised in (Table 1).

System Generalized Method of Moment (SGMM)

To identify factors that explain the variation in competitiveness between rice farms and that could be used to improve the competitiveness of individual farms, we use a dynamic panel regression model defined by:

$$Y_{it} = B_1 Y_{it-1} + B_2 X_{it-1} + a_i + \varepsilon_{it}$$

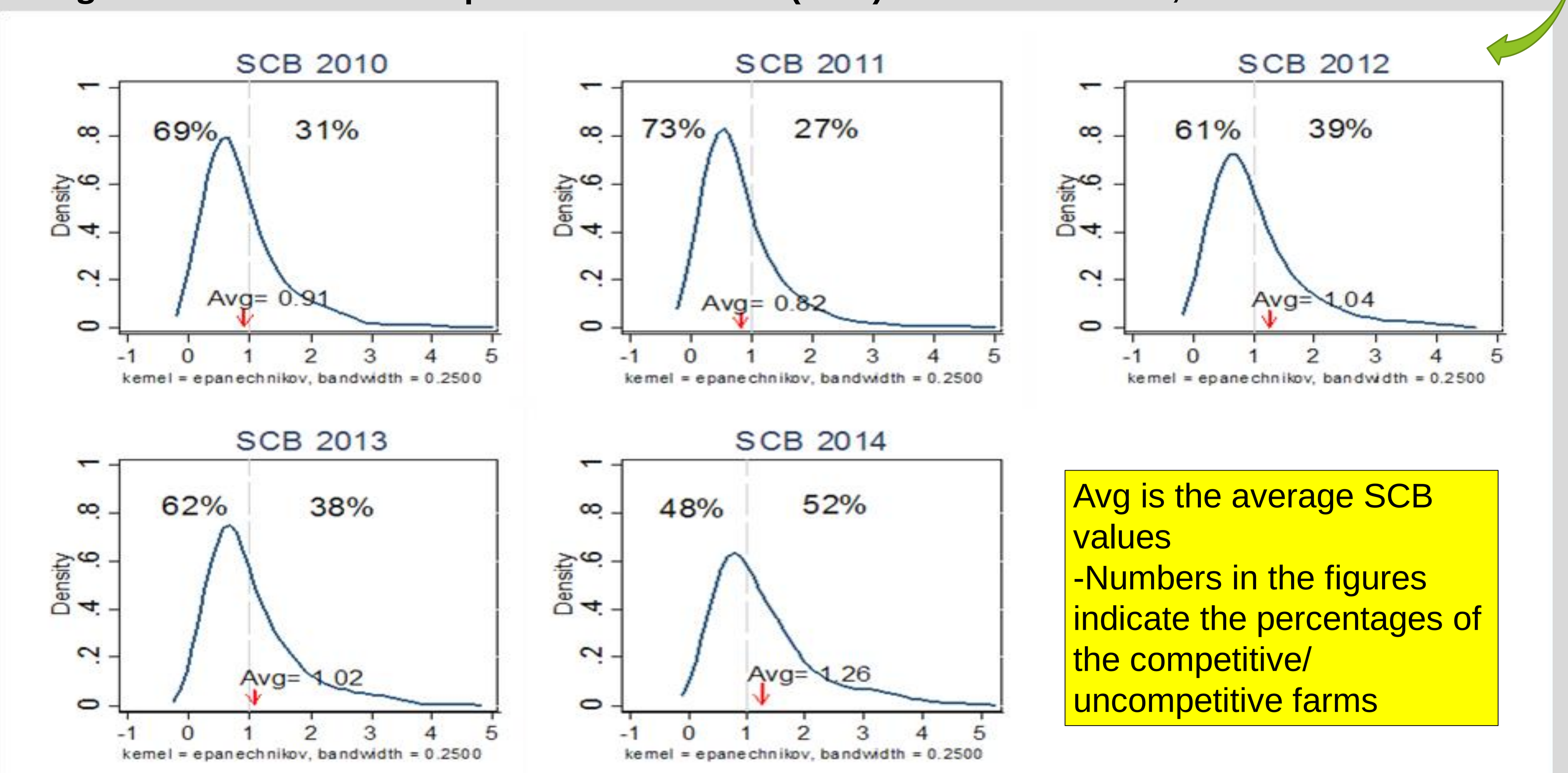
where Y_{it} is farm i's SCB score in period t, X_{it-1} is a vector of exogenous explanatory variables (farm size, distance to milling factories, access to credit, off-farm income, landownership, hired cost labor, farmers' organization, land ownership and a time trend), and a_i and ε_{it} are error terms (a_i captures unobserved and time constant farm specific effects and ε_{it} is an idiosyncratic error term) (Figure 3).

RESULTS

Table 1: Summary of SCB results by share of individual farms and total rice production

Year	Distribution by	Competitive (SCB<1)	Uncompetitive (SCB>1)
2010	Weighted average SCB	0.65	2.33
	Share of the individual farms in the sample (%)	69.19	30.81
	Share of the total production volume in the sample (%)	86.14	13.86
2011	Weighted average SCB	0.61	2.30
	Share of the individual farms in the sample (%)	73.04	26.96
	Share of the total production volume in the sample (%)	89.89	10.11
2012	Weighted average SCB	0.66	2.66
	Share of the individual farms in the sample (%)	60.74	39.26
	Share of the total production volume in the sample (%)	81.83	18.17
2013	Weighted average SCB	0.67	2.28
	Share of the individual farms in the sample (%)	62.37	37.63
	Share of the total production volume in the sample (%)	83.49	16.51
2014	Weighted average SCB	0.67	2.28
	Share of the individual farms in the sample (%)	47.70	52.30
	Share of the total production volume in the sample (%)	71.13	28.87

Fig. 2. Distribution of competitiveness scores (SCB) for the rice farms, 2010-2014



Dependent variable: SCB score		
Explanatory variables	**Coefficient**	**Standard errors**
SCB$_{it-1}$	-0.294	0.400
Hired cost labor	**4.e-04*** **	6.e-05
Distance to the rice mill	**0.077** **	0.025
Access to credit	2.e-05	1.e-05
Landowner	0.038	0.035
PPK member	**-0.354** **	0.159
Male	**-0.077* **	0.046
Off income	**5.e-05* **	3.e-05
Farm size	**-0.081*** **	0.011
Input subsidies$_{it-1}$	-2.e-04	0.001
Bonus payment$_{it-1}$	-4.e-04	0.001
Main season	**-0.268*** **	0.055
Observations	5400	
Number instruments	29	
Year and system control	Yes	
Arellano-Bond test AR(1)	-1.84	[0.065]
Arellano-Bond test AR(2)	-0.74	[0.459]
Difference-in-Hansen tests of exogeneity of instrument subsets	2.61	[0.855]

Fig. 3. Results of SGMM for rice competitiveness

CONCLUSION

- Our results demonstrate that considering the aggregate data or average Social Cost Benefit alone may conceal important variations across the farms.
- Many farmers are shown to be competitive; however these competitive farms account for a disproportionately large share of rice production when using disaggregate data.
- For example, in 2013, the average ton of paddy was produced at a SCB of 1.02, i.e. not competitive (Fig. 2). This result obscures the fact that more than half of the farms (62%) in this region were competitive, and that these competitive farms together accounted for 83% of the total rice production (Tab. 1).
- We concluded participation in the farmers' organization, gender and farm size are the major determinants of rice competitiveness, while the increasing distance to rice mills, off-farm income and the use of hired labor may reduce competitiveness (Fig. 3).

References

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