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Marginal willingness to pay for indirect procurement program attributes

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Abstract

Last world food crisis of 2008-2009, was a trigger to West-African countries, which have re-launched procurement programs and rebuilt food stocks. Although States interventions on markets are known to lead to distortions. Last food crisis have revealed free economy limits to provide food for all citizens and to handle shocks. Then, states and free economy cooperation is advocated to overcome these challenges. Indirect procurement program is implemented in Benin, under a Public-Private Partnership (PPPs) agreement. The study proposes designs to improve PPPs agreement to strength its actors' loyalty. The objective is to identify the factors preventing traders to participate or to stay in the program. Data were collected on three agricultural markets in northern Benin from a total of 210 respondents surveyed in Discrete Choice Experiment (DCE). Using main effects orthogonal design 16 profiles (or choice cards) were presented to respondents; from a combination of five attributes (3^1 x 2^2 x 4^2). Choice cards present two alternatives and an ASC alternative referring to "Free market". Results revealed that private actors are better off in a free market. However, they are willing to join or stay in the partnership with State if the following improvements are made on the program characteristics. Use of supply chain (*L3*) involving all actors (i.e. assemblers + small-whole sellers + whole sellers); provision of incentives: 1) prices information and 2) transport means; and reduction of payment waiting time.

Keywords: discrete choice experiment, marginal willingness to pay**,** indirect procurement program.

Introduction

Accounting for food crisis encountered during the last decade by West-Africa region; the Economic Community of West-Africa States (ECOWAS) Commission has launched in 2016 a Regional Food Reserve (RFR) program. Thus, West-African countries have re-launched procurement programs and rebuilt food stocks. In Benin the procurement program was launched in 2008 after the world food crisis. States interventions on markets are known to lead to distortions. Then, states and free economy cooperation is advocated to minimize competition distortion**.** In food security and agricultural markets sector and specifically in food reserve policy frame, public-private partnership (PPPs) is the most applied market-based method (IFC, 2012).

In Benin market-based procurement program is implemented, the partnership involves the National Office of Support to Food Security (NOSFS/ONASA) and cereal (i.e. maize, rice, sorghum, etc.) traders. But there is a problem of supply from private sector actors. In fact traders' participation in PPPs has reduced leading to a decrease in quantities of staples (i.e. maize) bought and stored by state. The direct consequence is state incapacity to implement the stabilization program on long-run, leading to a probable increase of food insecurity. To ensure the program durability, it is important to identify factors preventing traders to participate or to stay in the program. From current program characteristics and using Discrete Choice Experiment (DCE) approach study proposes hypothetical designs to improve program attractiveness towards maize traders.

Methods

Stated Preference Discrete Choice Experiment (SPDCE) approach was used. 210 maize traders were interviewed. Relevant attributes and their respective levels were identified based on focus group discussions. Main effects orthogonal design method was used to determine the number of profiles to present to respondent. Mixlogit model (McFadden and Train, 2000; Campbell et al., 2008) estimates were used to evaluate maize traders' willingness to pay for change in attributes levels (Colombo et al., 2005). Accounting for heterogeneity effects on respondents' participation decision, two models (i.e. [1] and [2]) were used based on the following assumption:

First, assumption of no correlation between PPPs program design preferences and traders socio-economic characteristics. The so-called no interaction or homogeneity model is:

$$Y_{ijk} = \beta_0 + \beta_1 L_{ijk} + \beta_2 P_{ijk} + \beta_3 Pinf_{ijk} + \beta_4 D_{ijk} + \beta_5 T_{ijk} + \beta_6 ASC + \varepsilon_{ijk} \quad [1]$$

Where L, P, $Pinf$, D and T are the PPPs attributes; ASC refers to the preference to sell maize to normal market. A positive ASC would imply a general interest for free market.

Second assumption tests the influence of traders' socio-economic characteristics on their preferences. The model is:

$$Y_{ijk} = \beta_0 + \beta_1 L_{ijk} + \beta_2 P_{ijk} + \beta_3 Pinf_{ijk} + \beta_4 D_{ijk} + \beta_5 T_{ijk} + \beta_6 ASC + \gamma(ASCxTr) + \alpha(SDxTr) + \varepsilon_{ijk} \quad [2]$$

Where Tr is a vector of traders socio-economic characteristics, SD attributes having significant Standard Deviation; γ and α parameters quantifying each interaction value.

After AIC and BIC post-estimation, estimates of the best fit model are used to obtain WTP values of each attributes; as follow:

$$Mwtp = -(\frac{\beta_i}{\beta_{price}}) \quad [3]$$

To interpret this value, one has to keep in mind the original question related: "what price are you willing to pay?" In our case, traders sell maize to the program, then prices are offered to them. Thus the question, here, is "what price a trader is willing to accept?".

Results and Discussion

Hypothetical program designs have some attributes already existing (price information, prices, payment delay); but improvements are introduced in their levels. And two new were added: ***"supply chain"*** attribute, referring to the number of links and type of traders involved in the partnership. It has three levels: link1 (*L1*) for assemblers, only; link2 (*L2*) for assemblers + small-whole sellers; and link3 (*L3*) for assemblers + small-whole sellers + whole sellers. The second attribute is "***transport"*** offered by the program. Five attributes were used: 1 of 3 levels, 2 of 2 levels and 2 of 4 levels. The full-factorial design (3^1 x 2^2 x 4^2) gives 192 profiles, reduced to 16 profiles, using main effects orthogonal design. Choice cards present two alternatives (*Pa* and *Pb*) and ASC alternative "Free market". ASC captures respondents not interested to participate.

Both models are statistically significant (i.e. model 1 Chi^2 = 160.36 for p<0.00) and (i.e. model 2 Chi^2 = 145.63 for p<0.00). Also, in both models ASC values are positive (i.e. $ASC_1 = 3.37$ and $ASC_2 = 3.86$) meaning that traders preferred free market and are not interested to participate in PPPs program. However, attributes estimates from both models reveal they are willing to participate under improved designs. Then, traders are interested in improved procurement designs. From goodness of fit tests used (i.e. AIC and BIC) model 1, has a better fit; then it is used to estimate the economic values of PPPs attributes.

Marginal Willingness To Pay **(**Mwtp) allows quantifying, in monetary value, respondents preferences levels for a unit change in a given attribute. Usually the term "willingness to pay" is related to consumers, but here, respondents are traders. Then, question is no more "how much are you willing to pay?" but it is "which prices are you willing to accept?" Thus, a trader prefers an attributes if he accepts a price lowered by the monetary value if this attribute (i.e. negative value of Mwtp). If he is not interested, he will request higher price as compensation (i.e. positive value of Mwtp). Simply, to the price mean, Mwtp values are added when positive; or deducted when negative; to obtain attributes economic values. Table 1 presents the model estimates.

Table 1: Marginal Willingness To Pay for PPPs attributes

Policy attributes	Mwtp	Confidence Intervals
L_1	0.42	-5.57 to 6.83
L_2	3.15	-1.80 to 7.96
L_3	-5.25	-12.64 to 1.40
Information by FSP	-2.68	-6.07 to 0.56
Transport by FSP	-1.97	-17.03 to -12.14
Payment delay	1.47	0.75 to 2.24
ASC	-39.41	-73.36 to -10.27

Source: Own estimation

Regarding ***supply chain***, traders will require 0.42 fcfa[1]/kg and 3.15 fcfa/kg higher to join PPPs for supply chains "L1" and "L2", respectively. But they accept 5.25 fcfa/kg lower for "L3". They accept lower prices for ***price information*** (-2.68 fcfa/kg); and ***transport means*** (-1.97 fcfa/kg), respectively. For longer ***payment delay***, traders will require 1.47 fcfa/kg higher. Considering ***ASC***, traders will require -39.41 fcfa/kg higher to quite or not to join the agreement. Accordingly, traders have some disutility in staying in PPPs and are more interested in free market, as referred to by ASC alternative values in model 1 and 2. Schipmann and Qaim (2011) also found that sweet pepper producers in Thailand preferred free market than trading with state or having a contract with private firms.

Conclusion

To increase maize traders' participation, market-based procurement program implemented in Benin should have the following characteristics:

- Supply chain involving three connections (or links), between maize farmers and the Grain Reserve: L_3 (Assemblers+ small-whole seller + whole-seller);
- As incentive: provision of price information provided on weekly basis to participants through mobile phones Short Message Service "SMS";
- As incentive: provision of transport means bounded to criteria such as quantities gathered and the distance from the warehouse to the picking place (remote areas are favored);
- Shorter payment delay.

This design of procurement program is preferred under a specified range of prices, meeting the program purchase price 138.96 (± 0.16) Fcfa, on average.

References

Campbell, D., Hutchinson, W.G. and Scarpa, R. (2008). Incorporating discontinuous preferences into the analysis of discrete choice experiments. Environmental and Resources Economics 41, 401-417.

Colombo, S., Hanley, N. and Calatrava-Requena, J. (2005). Designing Policy for Reducing the off-farm effects of soil erosion using choice experiments. Journal of Agricultural Economics 56(1), 81-95.

IFC (2012). Public-Private Partnerships in Agricultural Storage. International Finance Corporation, Workshop in Bhubaneswar. 21.

McFadden, D. and Train, K. (2000). Mixed MNL models for discrete response. Journal of Applied Econometrics 15, 447-470.

Schipmann, C. and Qaim, M. (2011). Supply chain differentiation. Contract agriculture and farmers marketing preferences: The case of sweet pepper in Thailand. Food Policy 36, 667-677.

[1] 1 Fcfa = 655 Euro