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The Role of Economic Space in Decision Making : Response

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1 Response to Professor Flachaire's Comments

Professor FLACHAIRE's comments are well-taken and appreciated. My response will address Professor FLACHAIRE's idea to condition on the location of each observation i. The thought of creating a model based on location rather than distance (relative location) had occurred to us. There are instances in which such a model would be preferable, but these would typically correspond to a class of applications different from ours.

Professor FLACHAIRE's model is a model of *spatial heterogeneity* rather than one of *spatial interaction* (more "contamination" than "contagion"). At a superficial level the two models are equivalent since if the ε_i 's in equation (6) of his article are such that $E(\varepsilon_i \mid z_j) = 0$ a.s. for all i, j, then

$$E(y_i \mid z_i) = \sum_{j=1}^{n} E\big(\lambda(z_i, z_j) y_j \mid z_i\big) = n\ell(z_i) = f(z_i) \tag{1}$$

where ℓ, f are implicitly defined. In fact, the model described in (1) is more general since no assumptions are made about the nature of the function g or indeed the vector of distance metrics d_{ij} in equation (7) of Professor FLACHAIRE's paper. Knowing f, the function g can still be inferred if one specifies d_{ij}.

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The problems arise when one intends to estimate the function *f*. Professor FLACHAIRE implicitly assumes that *f* is a fixed object which does not vary with the sample size. This is problematic since it requires ℓ to change with the sample size in a peculiar and exceedingly restrictive fashion. In the context of a product space, if a new product is introduced an implicit assumption is that the function ℓ is scaled by the same constant (i.e. $(n/(n+1))$) at all locations, irrespective of the location of that new product. This implies that the location of other products does not matter for the demand for any given product and neither does their number ! Note also that if d_{ij} contains discrete metrics, *f* will be discontinuous and hence will be difficult to estimate nonparametrically.

These and similar criticisms (see e.g. the introduction of PINKSE, SHEN and SLADE, 2003) apply equally to any other paper using a fixed *random field* interpretation of the data, i.e. the bulk of spatial econometrics papers currently in existence. In all these papers space is regarded more or less as a multidimensional time series. As mentioned above, there are examples in which such an interpretation is appropriate, e.g. when samples are taken from some geological anomaly. In applications in which outcomes y_i depend on the relative locations of other products, outlets, etcetera, however, the fixed random field interpretation falls short.

Please also note that the conditions of the PINKSE, SHEN and SLADE (2003) continuous updating estimator allow for the fixed random field possibility as a special case.

2 Response to Professor Waelbroeck's Comments

I would like to thank Professor WAELBROECK for his thoughtful comments. Professor WAELBROECK's discussion contains several criticisms of the methodology developed by Margaret SLADE and me. The first point relates to the difficulty of finding suitable instruments. However, it is no more difficult to find suitable instruments with our method than it is with any alternative. In many applications good instruments only exist by virtue of strong orthogonality assumptions. This is a general problem in empirical work in economics — and particularly in industrial organization — and is not a flaw of our methodology. One always needs a source of exogenous variation, either explicitly or implicitly.

The second comment relates to MANSKI's (1993) *reflection problem*. The reflection problem arises if one tries to deduce the response of an "individual" to changes in average characteristics in a large reference group. This is decidedly not our case. In large groups individual characteristics of other group members are irrelevant and one can only examine the effects of changes in the average exogenous characteristics of the entire group and individual characteristics of the observed individual. We look at the characteristics of individual "neighbors", and can use individual *locally measured* exogenous covariates of such neighbors in addition to group and individual characteristics for identification. The fact that we sum over all rival products is irrelevant provided that the (nonparametrically estimated) weights decline sufficiently fast with distance. In fact, in the case of a discrete distance measure the sum typically contains only a small number of nonzero terms.

Third, while it is true that nonparametric estimators perform poorly when the number of observations is small and the dimension of the distance vector is large, the effect would be that one would choose a small number of terms in the non-parametric expansion and one would effectively be back in the parametric case. In fact, our proofs encompass the case in which weights depend parametrically on distance.

Fourth, the example of technological spillovers only demonstrates that if one chooses the wrong distance metric then the results will be wrong, also.

Finally, there appear to be a few misunderstandings. Please note that our non-parametric expansion is global in nature, we do not use local smoothing. Further, our methodology allows for endogenous metrics and the unknown function of these metrics can change with the sample size. It would moreover be straightforward to accommodate distance measures which can change with the sample size, including endogenous ones. Finally, even fully dynamic structural models will involve reactions by one firm to the actions of another, where the strength of the reaction depends on the relative characteristics of their products, i.e. one will arrive at some variant of our model. ■

References Cited

MANSKI Charles F. (1993). – "Identification of Endogenous Social Effects : The Reflection Problem", *Econometrica*, 60-3, pp. 531-542.

PINKSE JORIS, Lihong SHEN and Margaret SLADE (2003). – "Dynamic Spatial Probit with Fixed Effects using One Step GMM: An Application to Mine Operating Decisions", *Pennsylvania State University*, working paper.