



A spatial merger estimator with an application to school district consolidation [☆]

Nora Gordon ^a, Brian Knight ^{b,*}

^a Department of Economics, University of California, San Diego, United States

^b Department of Economics, Brown University, United States

ARTICLE INFO

Article history:

Received 27 June 2008

Received in revised form 23 December 2008

Accepted 13 February 2009

Available online 1 March 2009

Keywords:

Local public finance

Fiscal federalism

School district consolidation

Matching games

ABSTRACT

This paper develops a spatial merger estimator to explain political integration generally and then applies this method to a wave of school district mergers in the state of Iowa during the 1990s. Our estimator is rooted in the economics of matching and thus accounts for three important features of typical merger protocol: two-sided decision making, multiple potential partners, and spatial interdependence. Rather than simply explaining when a particular region is likely to experience a wave of political integration, our method allows us to explore the factors driving which specific subregional mergers take place. This allows us to explore how those districts that merge choose with which of their neighbors to do so. Our results highlight the importance of state financial incentives for consolidation, economies of scale, diseconomies of scale, and a variety of heterogeneity measures in this particular application. We also demonstrate the power of our estimator, relative to existing estimators, to detect a statistically significant role for heterogeneity factors. While our application is limited to school district consolidation, our method can be adapted to include the salient features of many spatial integration problems.

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

Economists have made considerable progress in the analysis of matching problems. In some applications, such as in the choice of roommates, there are few restrictions on who can match with whom. In many applications, however, spatial considerations place important restrictions on the set of potential partners. The political integration of contiguous jurisdictions, such as countries or school districts, are examples of such spatial matching problems. The annexation of suburbs by neighboring cities is another prominent example. Similar issues arise when considering mergers of firms for whom geographic location is an important characteristic. Hospitals (see [Dranove and White, 1994](#)) and real estate multiple listing services are two examples of industries with recent merger activity and in which the mergers are strongly influenced by firm location. In this paper, we develop a method for analyzing patterns of spatial mergers. To provide an example of the methodology,

we examine school district consolidation activity in Iowa in the 1990s. As [Fig. 1](#) shows, the number of school districts in the United States has declined precipitously over the twentieth century, so the application to school district mergers is a historically salient one. The method could, however, be applied in any spatial merger context for which the researcher has access to the complete map of jurisdictional borders or the boundaries of firm-level territories.

The theoretical literature on endogenous borders has flourished: [Alesina and Spolaore \(1997, 2003\)](#), [Bolton and Roland \(1997\)](#), and [Persson and Tabellini \(2000\)](#) have focused on the role of potential cost-savings associated with integration as well as the role of heterogeneity in discouraging integration. There is less empirical work, however, examining why political integration occurs in some cases but not others. One reason for the slow progress in this area is the lack of econometric models of jurisdictional merger decisions, reflecting methodological challenges associated with three standard features of merger protocol. First, mergers must typically be approved by voters in both districts (that is, there is two-sided decision making); standard discrete choice models, such as the logit, are designed for single agent decision making. Second, in addition to deciding *whether or not* to merge, districts typically have multiple borders and thus must decide *with whom* to merge. Third, merger decisions are spatially interdependent. That is, if two districts 1 and 2 merge, then the choice set is altered for all districts sharing a border with either 1 or 2. While the bivariate probit model of [Poirier \(1980\)](#) accounts for the first feature and the multinomial logit model accounts for the second feature, we know of no estimators that simultaneously account for all three of these features of merger protocol. These three features are all relevant in the institutional

[☆] We thank two anonymous referees, Andrew Foster, Vernon Henderson, Sean Campbell, Kim Sau Chung, Jose Alvaro Rodrigues-Neto, Hal White, and seminar participants at several universities for helpful comments. We are grateful to Svetla Vitanova for research assistance, Lynn Carlson for GIS coding, Xiaoping Wang for assistance with administrative data, and Guy Ghan for sharing his extensive institutional expertise. Gordon thanks the Advanced Studies Fellowship program, and Knight's research was supported by a Salomon Award. We are solely responsible for the content of this paper, which does not reflect the views of the Advanced Studies Fellowship program or its funders, the Spencer Foundation and the William and Flora Hewlett Foundation.

* Corresponding author.

E-mail addresses: negordon@ucsd.edu (N. Gordon), Brian_Knight@brown.edu (B. Knight).

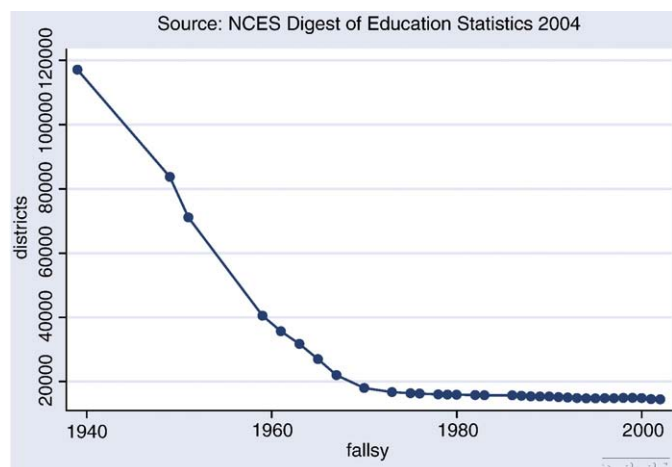


Fig. 1. Number of school districts over time.

context of school district consolidation; they are likely to be relevant, if in weaker forms, for nearly all spatial merger applications.

To overcome these limitations of existing estimators, we first develop an econometric model of discrete choice that accounts for these three key features of the merger protocol. We model this merger environment as a matching game in which jurisdictions choose a partner from the set of adjacent districts, and our approach thus allows for two-sided decision making, multiple potential partners, and spatial interdependence. While existence and uniqueness of equilibrium are not generally guaranteed in such models, we show that under a seemingly reasonable restriction on preferences, which we refer to as *symmetry in match quality*, a unique stable matching exists. Moreover, this stable matching can be calculated via a simple iterative algorithm. Finally, we develop a simulation-based estimator, which we refer to as a spatial merger estimator, which uses this iterative algorithm in order to calculate the probability of a merger between any two adjacent districts in stable matchings.

To illustrate the value of the spatial merger estimator, we then apply this methodology through an analysis of school district mergers in Iowa during the 1990s. Over 50 mergers involving more than 100 districts occurred during this period (see Fig. 2), and, due to these mergers, the number of districts fell from 430 in 1991, the first year included in the analysis, to 371 in 2002, the final year in the analysis. Our findings highlight the role of potential factors in these merger decisions. First, regarding the role of size, small districts are much more likely to merge, suggesting that they benefit from any economies of scale associated with consolidation due to the spreading of fixed costs over more taxpayers. On the other hand, large districts may experience diseconomies of scale. Second, we find that like districts are more likely to merge, suggesting an important role for heterogeneity. We also find an important role for state financial incentives in encouraging these mergers. Finally, we show that our estimator is significantly better than existing methods in terms of detecting the role of heterogeneity in driving merger decisions.

The paper proceeds as follows. In Section 2, we describe the methodology and findings of the existing literature. Sections 3 and 4 develop the theoretical and econometric framework, which is then applied to school districts mergers in Iowa in Section 5. Finally, Section 6 concludes.

2. Existing literature

Several existing empirical studies shed light on the role of factors underlying political integration. A first literature examines the incidence of mergers without focusing on the identity of merger partners. Nelson (1990) shows that both income heterogeneity of the

local population and permissiveness of state-level regulations towards local government are correlated with greater numbers of local jurisdictions within a metropolitan area. Alesina et al. (2004) examine the number of jurisdictions, including school districts, within U.S. counties over the period 1960–1990 and find evidence for a trade-off between economies of scale and heterogeneity in both race and income. That is, counties with high levels of heterogeneity in these dimensions tend to have more school districts, all else equal. On the other hand, they find little effect of heterogeneity in religion or ethnicity. Regarding the role of state governments, the authors find that the strength of annexation laws matter in determining the number of school districts within a state. In a study analyzing the role of state characteristics in determining the number of school districts within a state, Kenny and Schmidt (1994) find that the decline in the number of school districts between 1950 and 1980 can be explained by the decline in farming and corresponding increase in population density, the increased importance of state aid, and the increased prominence of teacher unions.

Relative to this literature, which examines the number of school districts within larger geographic units, such as states and counties, we are focused on specific individual merger decisions involving adjacent school districts. Our approach thus arguably better accounts for constraints on the availability of potential partners that are imposed by existing boundaries; variation in these constraints could lead two otherwise identical districts to have different merger patterns. Given that we are able to account for how state-specific school finance regimes would affect potential mergers and given the computational difficulty of predicting interdependent mergers for a large number of jurisdictions, our approach is most appropriate within a single state. The reduced-form methodologies of Kenny and Schmidt (1994) and Alesina et al. (2004) are more naturally suited to an examination of multiple states. Thus, we view our analysis as complementary to this existing line of research.

The only studies of which we are aware that examine the identities of merger partners, as captured by the decisions of adjacent school districts to consolidate, are a series of papers by Brasington. Brasington (1999) identifies 298 pairings of Ohio communities that either do or potentially could jointly provide education services through a single school district. He then estimates a bivariate probit model developed by Poirier (1980); this model allows for both communities to have veto power over the merger decision and thus a merger is observed only if it is supported by both districts. Using this econometric methodology, he fits a specification that is quadratic in students and finds that small and large districts were most likely to merge, while medium-sized communities do not enter such arrangements.¹ Neither racial heterogeneity nor income levels explain these patterns. In two follow-up papers, Brasington uses the same dataset from Ohio but allows for the coefficients to vary between the larger and smaller potential merger partner (Brasington, 2003b), between the richer and poorer community (Brasington, 2003a), and between the more and less white community (Brasington, 2003a).

Relative to these papers by Brasington, our method provides several contributions. First and most importantly, while all of Brasington's papers account for the two-sided nature of mergers, they do not account for the two other key features described above: districts must choose only one merger partner from several potential partners, and merger decisions are spatially interdependent.² A failure to account for these features of merger decisions may lead to specification errors. For example, with only two-way mergers and three districts 1, 2, and 3, there are three possible mergers: (1,2), (1,3), and (2,3). Nothing restricts Brasington's approach from internal inconsistencies such as Pr

¹ Note that this quadratic specification includes only own-district students and thus, as will be seen below, does not violate our symmetry assumption.

² To be clear, Brasington's analysis does account for each district having multiple borders, and he does correctly account for all of the possible pairwise combinations.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات