

**Immigration, Financial Stability
and
Municipal Bond Ratings**

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Abstract

Municipal bond ratings provide a summary of the overall financial condition of a city. As such, they furnish information about the net financial impact of various characteristics. Previous studies have shown that both financial as well as demographic variables can influence the bond rating of a municipality. The results described above indicate that in 1980, cities with a higher percentage of foreign born citizens were likely to receive lower municipal bond ratings from Moody's than similar cities with smaller numbers of immigrants. However, by 1990, this difference disappears. The relative improvement in the bond rating for cities with larger foreign born populations does not appear to be due to an overall decrease in the importance of demographic characteristics. Likewise, it does not seem that either internal or foreign migration to cities with higher bond ratings can explain this difference. Together, these results are at variance with those from studies that indicate that the influx of immigrants during the 1980's has placed an increasing strain on the financial resources of municipalities.

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1. Introduction

Over the past decade, the issue of immigration has become increasingly controversial, with the debate encompassing a wide range of concerns. Among economists, a primary area of interest has been the extent to which immigrants make use of public services such as welfare, education and health care, while a smaller number of studies have been focused on the benefits provided by immigration. However, relatively little work has been done to analyze the net effect of immigration by investigating simultaneously both the costs and benefits that arise from increases in the foreign born population. The purpose of this paper is to address this issue by estimating the net effect of immigration on the financial well being of municipalities, as measured by their municipal bond rating. Studies that have analyzed the impact of immigration on the demand for public services have produced mixed conclusions. Borjas and Trejo (1991) show that immigrants are more likely to receive welfare benefits, while Jensen (1988) argues that they are less likely to make use of public assistance. In addition, Butcher and Piehl (1994) show that immigrants are less likely than natives to be incarcerated. While studies such as these have been concerned with the costs of immigration, much less research has been concentrated on the benefits that increases in immigration might provide. Notable exceptions to this are Borjas (1995) who estimates that immigrants increase gross domestic product by approximately .1 percent, and a study by Svorny (1991) who estimates that an increase in the number of physicians in the late 1960's increased consumers' surplus by \$2.9 billion, or from one to twelve percent of physician expenditures. It is likely however, that immigration has both positive and negative consequences. One of the few studies attempting to estimate the costs as well as the benefits of immigration is Simon (1989) who finds that immigrants pay more in taxes than they use in public services. However, Borjas (1996) and Simon (1996) continue to dispute these results.

A common feature of many of the studies described above is their focus on a single issue such as rates of welfare recipientcy or unemployment. In light of current and proposed legislation concerned with reducing the number of immigrants, it is important to consider more general measures of the impact of immigration. One such measure is the municipal bond rating of a community. If the net fiscal effect of immigration is negative, municipalities with larger immigrant populations would be expected to have a weaker financial position than cities with smaller numbers of immigrants, other things equal.

The paper is organized as follows. A summary of the bond rating literature is provided in section 2, an econometric model of bond ratings is described in section 3, and the data used in his study are summarized in section 4. In section 5, empirical results are provided and a summary of the results is given in section 6.

2. Previous Research A commonly used measure of the financial strength of a community is its municipal bond rating. A bond rating is an assessment of the probability of timely repayment of debt produced by an independent rating agency (Lamb and Rappaport, 1987). Virtually all municipal bond ratings are provided either by Moody's or Standard and Poors. These rating agencies use various information to determine the rating of a particular municipal bond issue. Models developed to predict or explain municipal bond ratings rely on a combination of financial and socioeconomic variables (Ingram, 1985; Wilson and Howard, 1985; Raman, 1986). The socioeconomic variables used in municipal studies are assumed to reflect the resource base and service demands on the community. If a variable influences the financial well being of a municipality, it is likely to be associated with the bond rating as well.

Of the many socioeconomic variables used to explain or predict bond ratings, one of the most common is the percentage of the population that is non-white. Cluff and

Farnham (1985) and Moon and Stotsky (1993) show that cities with a higher proportion of non-white residents are more likely to receive lower bond ratings, all else equal. These results indicate that population composition can have a significant effect on the financial well being of a municipality. With these results in mind, the bond rating model used in this study includes the percentage of the population that is foreign born. If an increase in the immigrant population creates a net drain on the resources of a community, municipalities with higher percentages of immigrants would be expected to have lower bond ratings *ceteris paribus* due to the greater risk of default. By examining the effect of immigrants on the bond rating of a municipality, this study expands the previous research on immigration to include a multidimensional measure of the net fiscal impact of this variable on a specific municipality.

3. Econometric Model

Moon and Stotsky (1993) develop a model for bond ratings that considers two important sources of bias present in previous studies. The outline provided here is a summary of the complete model.¹ The first consideration is that not all municipalities receive bond ratings. A municipality opts to be rated in the hope that a favorable rating will lower the rate of interest and therefore the cost of maintaining debt. Ziebell and Rivers (1992) present a model of the decision to receive a rating, while Cluff and Farnham (1984) provide a comparison of municipalities that receive ratings by either Moody's or Standard and Poors. The model described by Moon and Stotsky (1993) is based on the idea that cities that choose to be rated by Moody's are not likely to be selected randomly from all municipalities. They argue that the potential savings from

¹ A more detailed description is provided by Moon and Stotsky (1993).

obtaining a rating, and therefore the probability of being rated, depends on the level of debt as well as the rating that the city might expect to receive.

A higher bond rating indicates less risk of default, and in turn, a lower interest rate. Moon and Stotsky (1993) hypothesize that those cities with a higher level of total debt will benefit more from receiving a favorable rating and are therefore more likely to incur the cost of doing so. The reason that total debt rather than per capita debt is used to identify the decision to be rated is that in obtaining a rating the municipality incurs a cost paid to the rating agency. The amount of money that the municipality saves by obtaining a higher rating depends on the total debt outstanding, since it is this amount that will be subject to the presumably lower rate of interest. On the other hand, it is the per capita debt that determines the ability of the municipality to raise the necessary revenue to pay off its debt, and therefore influences the bond rating itself, once the choice to be rated has been made.

While the total debt outstanding determines in part the decision to be rated, the potential savings are realized only for those cities that actually receive a favorable rating. This means that the anticipation of a higher rating will increase the probability of being rated. However, Moon and Stotsky (1993) also show that the potential rating in an equation that determines the probability of being rated is correlated with the disturbance from the equation that determines the rating itself. This introduces a simultaneity bias into the estimates of the determination of whether to receive a rating.

In response to these issues, Moon and Stotsky (1993) estimate a model of municipal bond ratings that takes the sample selection bias into account. In addition, the simultaneity of the potential and actual ratings is also considered. For the complete model, the decision to be rated as well as the actual rating are estimated simultaneously using maximum likelihood. The likelihood function can be written as:

```

                                0func{stack {L~ ~
                                PROD from {i:y_i=0} to ~
                                ~~~~~~ Left\{ ~ SUM from {j=0} to J
                                INT from {gamma_{j}+Z_{1i}^\ beta_1} to INF
~INT from {X_{2 i}^\ beta_2-alpha_{j+1}} to {X_{2 i}^\ beta_2 - alpha_j }
                                f(u_1,u_2)` du_2 `du_1 Right\}~ #~#~#
x ~~PROD from{i:{y}_{i}=1} to {~}~~ Left\{ ~SUM from {j=0} to J I\{ y_i
                                ~=~j\} Right. #~#~#
                                Left. horz 450 x~
                                INT from {-inf} to {gamma_{j}+Z_{1i}^\ beta_1}
~INT from {X_{2i}^\ beta_2-alpha_{j+1}} to {X_{2 i}^\ beta_2 - alpha_j }
                                f(u_1,u_2)` du_2 `du_1 Right\}
                                }}

```

where:

0

```

                                func{STACK{INT from {gamma_j+Z_{1i}^\ beta_1} to INF
~~INT from {X_{2i}^\ beta_2 ~~~ alpha_{j+1}} to {X_{2 i}^\ beta_{2} ~~~ alpha_{j}}
                                f(`u_1,u_2`)d{u} SUB {2}d{u} SUB {1}~=#~#
                                ~~~ Phi`(X_{2 i}^\ beta_2 ~~~ alpha_j `)#~#
                                ~~~~~ Phi`(X_{2 i}^\ beta_{2} ~~~ alpha_{j+1} `)#~#
~~~~~~ Phi_2 `( gamma_j ~~~ Z_{1 i}^\ beta_1 ,X_{2 i}^\ beta_2 ~~~ alpha_j
                                ,rho )#~#
~~~~~~+~Phi_2 ( gamma_j ~~~ Z_{1i}^\ beta_1 ,X_{2 i}^\ beta_2 ~~~
                                alpha_{j+1} ,rho )}}

```

and

```

0func{STACK {INT from {- INF} to {gamma_j +~Z_{1i}^\ beta_1 }~
INT from {X_{2i}^\ beta_2 - alpha_{j+1}} to {X_{2i}^\ beta_2 - alpha_{j}}
                                ~f(`u_1 ,u_2`)du_2 du_1 ~=#~#
horz 1000 Phi_2 ( gamma_j ~~~ Z_{1i}^\ beta_1 ,X_{2i}^\ beta_2 ~~~
                                alpha_j , rho)#~#
horz 1000 - ~ Phi_2( gamma_j ~~~ Z_{1i}^\ beta_1 ,X_{2i}^\ beta_2 ~~~
                                alpha_{j+1} , rho )}}

```

The errors, u_1 and u_2 are assumed to have a bivariate normal distribution, each with zero mean, variance one, and correlation coefficient ρ . $I\{\cdot\}$ is an indicator function

set equal to one if the argument is true, and zero otherwise, while the term $I: y_i=1$ denotes those observations for which a bond rating exists. The vectors Z_1 and X_2 are the explanatory variables in the equation that determines the probability of obtaining a rating and the rating equation, respectively, while β_1 and β_2 are the corresponding parameters to be estimated. In the decision to be rated equation, $\gamma_j, j = 0, 1, \dots, J$, allows the intercept to vary, depending on the anticipated rating for the municipality, while γ_j delineates the $J+1$ bond quality categories in the rating equation. Finally, ϕ and Σ represent the distribution function of the standard normal and bivariate normal distributions, respectively.

The likelihood function can be understood as follows. The first term in (1) designates those cities that were not rated. The inner integral determines the potential, or expected rating for the municipality, while the outer integral designates the conditional probability of receiving a rating, given the expected rating. Thus the probability of observing a city that has an expected rating of $j, j = 0, 1, \dots, J$, and is not rated is the joint probability that $X_{2i} - \beta_{2j} < u_{2i} < X_{2i} - \beta_{2j+1}$ and $u_{1i} > Z_{1i} + \beta_{1j}$. This joint probability is given by (2). Since the potential rating is not observed, the probability of observing a city that does not obtain a rating is the sum of the $J+1$ joint probabilities described above. For those cities that receive a rating, the contribution to the likelihood function is given by the second term in the likelihood function. In this case, the only relevant category is the rating actually obtained by the municipality, which is designated by the indicator function. The probability of observing a municipality that is rated and receives a rating of $j, j = 0, 1, \dots, J$ is then the joint probability that $X_{2i} - \beta_{2j+1} < u_{2i} < X_{2i} - \beta_{2j}$ and $u_{1i} < Z_{1i} + \beta_{1j}$, which is given by (3).

4. Data

The model described above was estimated for 1980 and 1990. The County and City Data Book includes information on all cities with a population of at least 25,000.

For 1980, all data was obtained from the 1983 County and City Data Book, excluding the percentage of foreign born, which was supplied directly by the Bureau of the Census. The 1990 data was obtained from the 1994 County and City Data Book, except for the type of city government, total debt outstanding, and the municipal bond ratings. The type of government was obtained from The Municipal Yearbook (1996), and total debt from The County and City Extra Annual Metro, City and County Databook (1996). The 1990 bond ratings were obtained directly from Moody's Bond record for 1991, since they were not published in the 1994 County and City Data Book.

The data is summarized in Table 1, with a glossary of terms provided in the appendix. Financial variables for 1980 and 1990 are measured in nominal terms. Of particular note is the increase in the percentage of foreign born and non-white population from about 7% and 16% respectively in 1980, to 9% and 20% in 1990. In addition, the number of cities receiving ratings is substantially lower in 1990. While Moody's confirmed this decline, they were unable to provide an explanation for the lower number of rated cities in the latter period. This decrease in the sample size for the rating equation emphasizes the importance of controlling for sample selection. Despite the decrease in the number of cities rated, consistent estimates of the parameters of the bond rating equation can still be obtained.

5. Results

The results of the estimation are presented in Tables 2 through 5. One aspect of the immigration debate that has received a great deal of attention is the extent to which the skills of new immigrants have deteriorated over time. Borjas (1992) argues that this decline in the 'quality' of immigrants is due in large part to increases in the number of immigrants who enter from countries with low levels of education. On the other hand LaLonde and Topel (1992), and Simon (1989) contend that immigrant quality did not

decline significantly during the 1980's. In order to address the issue of changing cohort quality, the impact of increases in the immigrant population on municipal bond ratings was considered for both 1980 and 1990.

In Table 2, the correlation between the municipal bond rating and the percentage of the population that is foreign born is analyzed. Among those cities rated in 1980, the percentage of foreign born is similar to that for all cities, while this proportion is slightly lower in 1990. For those cities that are rated, the correlation between the observed bond rating and the percentage of foreign born is positive for 1980. This indicates that those cities with lower bond ratings are more likely to have larger immigrant populations.² Further investigation reveals that much of this correlation appears to be the result of the low percentage of foreign born for those cities receiving a bond rating of Aa1 and a very high percentage of immigrants for those cities in the lowest category, Baa.

The results for 1990 indicate essentially no correlation between the percentage of foreign born and the observed bond rating. Although the lowest two categories have the largest proportion of immigrants, it is also the case that those cities with a Aaa rating have a higher than average percentage of foreign born residents among those cities receiving ratings. Together, the results for the two periods indicate that any potential negative effects of increases in the immigrant population on municipal bond ratings did not become more severe over the decade.

Ordered probit results are reported for 1980 and 1990 in Table 3. These results take into account the influence of other explanatory variables and therefore isolate the effects of immigration more completely. However, they still do not account for the sample selection and simultaneity problems discussed above. For 1980, increases in the immigrant population have a significant negative influence on bond ratings. While the

² ²In accordance with Moon and Stotsky (1993), the dependent variable is ordered from best (Aaa), to worst (Baa).

effect is negative for 1990 as well, the point estimate is much smaller, and not statistically significant. Therefore, the results from the ordered probit estimation are consistent with the computations of the simple correlation between the observed bond ratings and the size of the foreign born population.

While the effect of larger immigrant populations is more moderate in 1990 than for 1980, this is not true for the proportion of the population that is non-white. The point estimate and estimated standard errors are similar for both 1980 and 1990, indicating that cities with larger non-white populations could expect to receive significantly lower bond ratings in both periods. This provides evidence that the reduction in the influence of the immigrant population is not due entirely to the smaller sample size or a reduction in the influence of demographic factors in general.

Although the results described above control for the effect of many of the explanatory variables included in other studies, they do not address the issues of sample selection and simultaneity discussed by Moon and Stotsky (1993). Estimation results for this model are presented in Table 4. In general, the results for 1980 are consistent with those reported by Moon and Stotsky (1993). As expected, those cities with higher total debt are more likely to obtain a rating. As in Moon and Stotsky (1993), the estimates of β_j , $j = 0, 1, \dots, J$ do not decline monotonically, which indicates that there is little systematic relationship between the expected rating and the probability of receiving a rating.

Turning to the rating equation, the results are again similar to those reported by Moon and Stotsky (1993). Of particular interest are the results based on population composition. The estimated coefficient for the percentage non-white is 1.26, and significant at the .01 level of significance, which indicates that those cities with a higher percentage of non-whites were more likely to receive a lower bond rating. Similarly, those cities with a higher proportion of foreign born citizens received significantly lower ratings. The coefficient estimate is 4.28 which is also significant at the .01 level of

significance. This implies that in 1980, both immigrants and non-whites represented a net drain on municipal resources.

The results described above provide evidence that increases in the immigrant population have a statistically significant negative effect on the bond ratings of municipalities. However, it is not clear that these effects are of practical importance. To determine the practical significance of increases in the immigrant population, the marginal effect of such increases was estimated. For the typical city³ in 1980, the estimated numerical rating is 2.4641, yielding a prediction of an A rating, which is the mode category in the sample. The mean value for the percentage of the population that is foreign born is .0680 with a standard deviation of .0672, while the parameter estimate for this variable is 4.2823. If the immigrant population is increased by two standard deviations, the estimated numerical rating increases to 3.0396, which does not change the predicted bond rating for a city that has average characteristics. This result would seem to indicate that the practical significance of increases in the immigrant population are not as severe as the statistical results imply. However, it should also be noted that while the predicted rating itself doesn't change, the numerical estimate moves from a value that is close to the upper limit of the A rating category to one that is near the bottom limit of this classification.

In order to assess how potential changes in cohort quality have influenced municipal bond ratings, the model was re-estimated for 1990. In this case, those municipalities with higher immigrant populations no longer receive bond ratings that are significantly different than those with a smaller proportion of foreign born residents. Given the results for 1980, there are two potential explanations for this change. As described above, a smaller proportion of cities received bond ratings from Moody's in

³The typical city is defined as by the mean value of a characteristic for continuous explanatory variables and the mode for categorical variables.

1990 than 1980. This decrease in the sample size would be expected to increase the estimated standard errors of the parameter estimates, and therefore make it less likely to obtain results that are statistically significant. However, the estimated standard error for the foreign born coefficient is similar for both years. This indicates that the change in the statistical significance of the estimate of the impact of an increase in the immigrant population is not entirely due to the smaller sample size of the 1990 sample.

As described above, another potential explanation for the change in the significance of the foreign born is that demographic factors in general might be less influential in 1990 than 1980. While the significance level for the percentage of the population that is non-white falls to .065 for 1990, this is due in large part to a larger estimated standard error of the estimated coefficient.

The estimated coefficient for the foreign born population changes from 4.28 to -1.27 over this period, while that for the percentage non-white falls from 1.26 to .97. This indicates that the large change in the estimated coefficient of the foreign born population is not entirely due to the reduced influence of demographic factors in determining the bond rating of a municipality.

A final consideration is the possibility that immigrants might have been more inclined during the 1980's to move to cities where employment opportunities were greatest. To the extent that these cities may have been expected to have higher municipal bond ratings, such movements might explain the change in the estimated coefficient for the foreign born between 1980 and 1990.

To test this hypothesis, a first-differenced model was considered for cities that received bond ratings both in 1980 and 1990. If immigrants moved to cities that initially had better employment opportunities and higher bond ratings, those cities that witnessed an increase in the immigrant population could expect to see their ratings decrease. This decrease might serve to equalize the ratings across cities, and therefore explain the lack of relationship between the number of immigrants and the bond rating in 1990. In this

case, a first-differenced model would predict a negative relationship between the change in the percentage of the foreign born population and the change in bond ratings between 1980 and 1990.

Results for the first-differenced model are reported in Table 5. Of the cities included in the study, 340 received ratings in 1990 as well as 1980, which indicates that issue of sample selection discussed by Moon and Stotsky might be present in the first-differenced results. Each of the explanatory variables is the change in the value of the characteristic from 1980 to 1990 while the dependent variable is defined as -1 if the bond rating decreased, 0 if there was no change and +1 if the bond rating increased. The reason for limiting the dependent variable in this manner is that there are a large number of possible changes that could occur, which would be difficult to either estimate or analyze. A negative coefficient indicates that an increase in the explanatory variable from 1980 to 1990 causes a decrease the bond rating.⁴ The estimated coefficient for changes in the percentage of the population that is foreign born is negative. However, it has a large estimated standard error and is not statistically significant. These results indicate that changes in the pattern of the immigrant flow do not explain fully the differences in the estimated coefficients for this variable from 1980 to 1990.

6. Conclusion

Municipal bond ratings provide a summary of the overall financial condition of a city. As such, they furnish information about the net impact of various characteristics. Previous studies have shown that both financial as well as demographic variables can

⁴ Financial variables for 1990 were normalized by using the Consumer Price Index for 1980 and 1990.

influence the bond rating of a municipality. The results described above indicate that in 1980, cities with a higher percentage of foreign born citizens were likely to receive lower municipal bond ratings than similar cities with smaller numbers of immigrants. However, by 1990, this difference disappears. The relative improvement in the bond rating for cities with larger foreign born populations does not appear to be due to an overall decrease in the importance of demographic characteristics. Likewise, it does not appear that either internal or foreign migration to cities with higher bond ratings can explain this difference. Together, these results are at variance with those from studies that indicate that the influx of immigrants during the 1980's placed an increased strain on the financial resources of municipalities.

Appendix

The dependent variable is the municipal bond rating assigned by Moody's for 1980 and 1990. The categories are Aaa (highest), AA1, Aa, A1, A, Baa1 and Baa (lowest). The category Baa includes all cities that received a rating of Baa or lower.

- LNMEDHS - logarithm of median housing value, in nominal dollars
- OLDHS - proportion of housing units built before 1940
- NEWHS - proportion of housing units built after 1970
- OWNER - proportion of housing units that are owner occupied
- LNINC/POP - logarithm of per capita income in nominal dollars
- CHPOP - percentage change in population over the past ten years, expressed as a yearly average
- NWHITE - proportion of the population that is non-white
- LNPOPDEN - logarithm of population density
- LNDEBT - logarithm of total debt, in nominal dollars
- LNDEBT/POP - logarithm of per capita debt, in nominal dollars
- DEBT/INC - ratio of debt to income
- SUREV - ratio of surplus revenues to general revenues
- INTGREV - ratio of intergovernmental revenues to general revenues
- MANGR - dummy for the council-manager form of government

COMMIS - dummy for the commission form of government
 LARGECIT - cities with 100,000 to 500,000 people
 HUGECIT - cities with more than 500,000 people
 FORBORN - proportion of the population that is foreign born

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