Nuns and the Effects of Catholic Schools Evidence from Vatican II

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Abstract

This paper examines the causal effects of Catholic schooling on educational attainment. Using a novel instrumental-variable approach that exploits an exogenous shock to the Catholic school system, we show that the positive correlation between Catholic schooling and student outcomes is explained by selection bias. Spearheaded by the universal call to holiness, the reforms that occurred at the Second Vatican Council produced a dramatic exogenous change in the cost/benefit ratio of religious life in the Catholic Church. Using the abrupt decline in the number of Catholic sisters as an instrument for Catholic schooling, we find no evidence of positive effects on student outcomes.

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1 Introduction

Several empirical studies attempted to assess whether private schools provide better education than public schools. This question is crucial in the debate on public versus private schools and, more generally, on the effectiveness of school choice. Advocates of school competition and vouchers often rely on research evidence suggesting positive effects of private schooling on educational outcomes. Most researchers have focused their attention on the role of Catholic schools, which account for the largest share of private schools, analyzing their performance and effectiveness. There is a substantial consensus on the positive correlations between Catholic school attendance and educational outcomes. However, a causal interpretation of these findings has been severely limited by the spurious correlation between Catholic school attendance and other unobserved characteristics that may affect educational outcomes.

Most of the previous studies attempted to estimate the effects of Catholic schooling on student outcomes using different instrumental variable (IV) strategies (e.g., religious affiliation, distance from the Catholic schools, density of Catholic population), and found evidence of positive effects of Catholic schooling on high school graduation and college attendance rates (Coleman et al., 1982; Neal, 1997; Evans and Schwab, 1995). More recently, Altonji et al. (2005b) cast doubt on the holding of the exclusion restrictions for the proposed instruments suggesting to use selection on the observed characteristics to estimate the potential selection on the unobservables. Following this approach, Altonji et al. (2005b) found positive effects of Catholic schooling on high school graduation and college attendance, but their results suggest smaller effects than previous studies and no evidence of significant effects on test scores. Adopting similar techniques, Elder and Jepsen (2014) find evidence of negative effects of Catholic primary schooling on math scores, while Gibbons and Silva (2011) show that the advantage of pupils in Faith primary schools in the UK is explained by sorting into Faith schools according to pre-existing characteristics. Cohen-Zada and Elder (2009) proposed an alternative instrument based on the historical Catholic concentration in a county.
They argued that historical Catholic shares are much more likely to be exogenous to student outcomes than previous instruments used in the literature. Their results are similar to those of Altonji et al. (2005b).

We contribute to the literature using a new strategy. With the universal call to holiness and the opening to lay leadership, the Second Vatican Council (Vatican II) in the early 1960s inadvertently produced a dramatic change in the cost/benefit ratio of religious life and drained Catholic schools of critical human capital. Between 1966 and 1980, the number of Catholic sisters (nuns) was reduced by more than 30%. This unexpected collapse was followed by a parallel decline in the number of Catholic schools in operation. Following the decline in the number of Catholic sisters, the share of religious teachers in Catholic schools fell by more than 50%. Because religious teachers were paid, on average, one-third the amount that lay teachers were paid, the sudden and rapid shift in personnel imposed severe financial constraints on Catholic schools and forced many schools to close. The closure of Catholic schools was mostly caused by supply effects and was not driven by changes in the demand for Catholic schooling (Caruso, 2012). The decline in the supply of Catholic sisters was also more marked in dioceses that were more exposed to the reforms that occurred at the Second Vatican Council (Stark and Finke, 2000).\footnote{Stark and Finke (2000) suggest that the heterogeneous decline in the number of Catholic sisters is partially explained by the unpredictable reactions of local bishops to the “religious earthquake” occurring in Rome.} We use the sudden shock to the supply of Catholic sisters and its heterogeneous impact across US dioceses as an exogenous instrument for Catholic schooling. This approach allows us to control for both local area fixed effects, which account for time-invariant characteristics, and cohort fixed effects, which capture any systematic difference in school outcomes across cohorts. At the same time, we control for a set of local-area time-varying characteristics. In addition, the focus of extant literature has been on the effectiveness of Catholic high schools. However, little is known about the effectiveness of Catholic primary schools. This paper focuses on the effects of Catholic schooling on grade repetition of students aged 7-15 years of age, and contributes
to a recent set of studies on the effectiveness of Catholic primary schools (Elder and Jepsen, 2014; Gibbons and Silva, 2011; Reardon et al., 2009; Lubienski et al., 2009; Carbonaro, 2006).

To conduct this analysis, we assembled a unique dataset based on the diocesan records of Catholic sisters, priests, and schools from 1960 to 1980, which was drawn from the Official Catholic Directory (OCD). We use these data to document the trends in the human assets of the Catholic Church and Catholic schools before and after the Second Vatican Council. We then merge the diocesan data with US Census information for different cohorts of students who were in school between 1960 and 1980. The US Census data contain individual information on parochial school attendance for individuals enrolled in school at the time of the census. While these data do not contain information on test scores, we can use the information on educational attainment to analyze the effects of Catholic schooling on grade repetition. Our results show that the rapid decline in the number of Catholic sisters was associated with a significant decline in Catholic schooling despite an increase in the Catholic population resulting from new immigrant inflows. In particular, a one standard deviation decrease in the number of Catholic sisters in a metropolitan statistical area (MSA) is associated with a 14% reduction in a student’s likelihood of attending a Catholic school. We provide evidence that our instrument is less correlated with observable determinants of student outcomes than alternative instrumental variable strategies previously used in the literature.

Turning to the analysis of the effects of Catholic schooling on educational performance, ordinary least squares (OLS) estimates confirm a positive relationship between attending a Catholic school and school outcomes. However, using the number of Catholic sisters in a given cohort-MSA as an instrument for Catholic schooling, we do not find evidence of significant effects on grade repetition and reject the OLS estimates.

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2The U.S. Census does not identify the religious denomination of the school, only whether the school was a "parochial" or "church-related" school. However, the vast majority of private schools over the period considered in the paper were Catholic schools (Kim, 2011). Of course, this is even more pronounced when restricting the analysis to parochial schools. Therefore, we will use parochial and Catholic schools interchangeably.
There may be some concern about how to interpret grade retention: although a great deal of research has identified the negative effects of grade retention on students’ academic achievement and educational attainment, some studies found mixed results. Furthermore, our main results may be confounded by the fact that private and public schools may have different standards for grade promotion, and age at school entry do not apply to private schools. Therefore, we consider an alternative outcome—the likelihood of dropping out of school at compulsory age. Because US census data contains information only on current type of school attended for those who are enrolled at the time of the survey, we utilize the two sample two-stage least square (TS2SLS) technique. Similarly to our results for grade retention, we find no evidence of significant effects of Catholic schooling on the likelihood of leaving the school at compulsory age.

The findings suggest that the OLS estimates are entirely driven by a positive selection bias. We provide compelling evidence supporting the validity of our instrumental variable. However, one may still be concerned that the decline in the number of Catholic sisters may have affected outcomes through other potential channels by affecting directly the quality of Catholic schools with spillovers on the public sector because of the decline in competition. We discuss the potential bias associated with changes in average quality of the teachers and the decline in competition induced by the changes in staff composition and the closure of Catholic schools. Finally, to verify the plausibility of our 2SLS estimates, we assess the bias resulting from potential selection into Catholic schools on the basis of unobservables, following the procedure developed by Altonji et al. (2005b). Consistent with the implication of the 2SLS analysis, the results indicate that even a modest degree of selection on unobservables compared to the selection on observables is sufficient to eliminate and reverse the sign of the estimated effect of Catholic schooling.

The paper is organized as follows. Section 2 provides a brief description of the Second Vatican Council and its causes and consequences. In Section 3, we describe the identification strategy and the data. The results are presented and discussed in Section 4. Section 5
concludes.

2 The Second Vatican Council and the Decline of Catholic Sisters

Less than three months after his election, Pope John XXIII announced his decision to convene a new Council in Rome to “open the windows of the Church and let some fresh air in”. Given that the Conclave elected Angelo Roncalli, nearly eighty years old, in the context of a transitional pontificate, no one expected this to happen. The surprising decision of calling a new Vatican Council was undertaken by the pope alone, exercising his papal primacy. Alberigo (2006), one of the most qualified historians to comment on Vatican II, starts his brief history of the Second Vatican Council by remarking how the pope’s announcement “was unexpected and surprising for most sectors of the Church, which were dominated by the climate of the Cold War and satisfied with a Catholicism unyielding its certainties”. The purpose of the Council was to “recognize the signs of times” and to discuss and update the major features of Catholic doctrine and practice. For the purposes of this paper, it is important to note that most scholars emphasize the exogeneity of the pope’s announcement. Not only was the Curia caught by surprise, but even liberal scholars and Council reformers did not expect the pope to convene all of the Bishops in Rome to renew and update the Church’s beliefs, liturgies and practices (Stark and Finke, 2000; Berman et al., 2012).

These changes had important practical and theological consequences on the life of the entire Catholic Church, starting with the life of religious men and women. Stark and Finke (2000) explain in depth how three Vatican II documents (Lumen Gentium, Gaudium et Spes and the Perfectae Caritatis) involved important changes to religious life. In particular, by

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3As reported in Alberigo (2006), the pope himself later acknowledged in the Journal of Soul that the Vatican Council was entirely the pope’s initiative.
establishing the universal call to holiness, the Lumen Gentium helped overcome the notion of the superior holiness of the religious state and gave new importance to the role of lay people in the Church. Overall, the Second Vatican Council emphasized the need of the Church to recognize “what changes with the passing of time” and to open itself to the modern world. Stark and Finke (2000) and Berman et al. (2012) note how these changes unintentionally affected the marginal benefits of a religious life by eliminating the superiority of religious status without substantially reducing the costs of a religious life, such as the vows of celibacy and poverty. The changes in the cost-benefit ratio of a religious life were marginally higher for women. Indeed, the Vatican II did not bring any progress to the ordination of women in the Church and de facto equiparated Catholic sisters to lay women in their path to “holiness”. The loss of this special status contributed to the large decline in the late 1960s and early 1970s in the number of religious women.

Scholars agree that these shocks in the life of the Catholic Church were the primary causes of the unexpected decline in vocations and the rise in defections. However, the debate on the mechanism underlying these patterns persists, with liberals arguing that priests and nuns left the Church because they had been hoping for more extensive reforms and conservatives blaming the Church’s excessive modernization and the universal call to holiness for the decline in the number of religious women (Ebaugh, 1993; Stark and Finke, 2000). Like Berman et al. (2012), who use the natural experiment provided by the Second Vatican Council and the decline in the number of Catholic sisters to explain fertility patterns in Europe, we do not focus directly on the causes of the decline. We are simply interested in establishing the exogeneity of the shock to the supply of Catholic sisters and its validity as an instrument for studying the effects of Catholic schooling. In particular, it is important to establish that this shock was exogenous and not related to individual unobservable characteristics that may affect both Catholic schooling and student outcomes.

4The researchers use a panel on church attendance and clergy employment for the years 1960-2000 and show evidence that the interaction of the service provision and religiosity largely explains the declining fertility observed in Southern Europe. In particular, they show that their results are consistent with a model in which social service provided by the Church affects fertility by lowering the cost of raising children.
The obvious concern when using a historical event as a natural experiment is that there may have been several other factors affecting Vatican II that may explain the trends in the number of Catholic sisters and be endogenous to the outcome of interest. One could think that the appeal of a religious life decreased because of the expanded opportunities for women. Stark and Finke (2000) argue that the timing of the collapse in the number of Catholic sisters suggests that other factors, such as trends in income and female labor force participation, played only minor roles in explaining the abrupt reduction in the number of Catholic sisters. After World War II, female labor force participation and income grew slowly and steadily. On the contrary, as shown in Figure 1, there was a steady growth in the number of nuns until the mid 1960s, followed by a rapid decline thereafter. We further discuss the validity of our identification strategy in the next section.

3 Data and Empirical Specification

We use data from three main sources: the US diocesan records contained in the Official Catholic Directory; the records of votes expressed at the Second Vatican Council, collected by Wilde (2007); and individual data drawn from the US Census (1970 and 1980) containing information on parochial school attendance and educational attainment. The Official Catholic Directory (OCD) was first published in 1817 by P.J. Kennedy & Sons and contains detailed annual statistics on American dioceses, including the number of priests and nuns serving the dioceses, and the number of seminarians, Catholic schools, and religious and lay teachers. We collected data for the years 1960 to 1980 for each US diocese.5 To be able to conduct a consistent analysis over time and across US dioceses, we constructed a balanced panel of dioceses for which we have information available for every year since 1960. In cases where new dioceses were created, we aggregated the information to reconstruct the original set of dioceses. In the few cases in which a new diocese was created by merging the territories of two or more dioceses, we attributed the numbers of the new diocese to the major

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5Figure 5 shows an extract of the Diocesan data in the Official Catholic Directory for 1965.
contributing diocese.\textsuperscript{6} After performing these adjustments, we were left with a panel of 122 dioceses for which we had consistent information for the period between 1960-1980.\textsuperscript{7}

### 3.1 Catholic Sisters and Parochial Schools Before and After the Second Vatican Council

Figure 1 shows the pattern in the number of Catholic sisters and changes in the staff composition in Catholic schools over time. As previously noted, in the years preceding the Second Vatican Council, there was substantial and steady growth in the number of nuns and more moderate growth in the number of Catholic priests. The increase in the number of nuns was accompanied by an expansion of the Catholic school system in the US, which was reflected in the growth of sisters and lay teachers. However, in the years immediately following the Second Vatican Council, we observe a sharp decline in the number of nuns. This decline is only partially compensated for by the increase in the number of lay teachers in Catholic schools. The number of Catholic sisters reached a peak of approximately 180,000 in 1966 and then fell dramatically to approximately 125,000 in 1980 (-30\%).\textsuperscript{8} During the same period, the number of lay teachers increased significantly (+56\%). However, this increase could not compensate for the decline in the number of sisters who were teachers.\textsuperscript{9} Catholic sisters accounted for 60\% of the total number of teachers in 1960 but for less than 25\% in 1980. Because religious teachers were, on average, paid one third the amount that lay

\textsuperscript{6}When using alternative criteria such as excluding these dioceses from our analysis, our results were not substantially changed.

\textsuperscript{7}We excluded from the analysis the Vicariate Apostolic of Alaska, the Belmont Abbey, the Byzantine Rite and the Pittsburgh (Greek Rite) diocese.

\textsuperscript{8}Ebaugh (1993) remarks how the sharp decline in the number of Catholic sisters between 1966 and 1986 was due to both a decrease in the rate of entry and an increase in defections. The shortage of new vocations and the fact that the majority of those defecting were under the age of 40 dramatically affected the age structure within the religious orders. Within a few years, the percentage of sisters over 65 years of age doubled from 17\% in 1966 to 38\% in 1982 (Neal, 1984).

\textsuperscript{9}Interestingly, the absolute number of priests remained relatively stable over the evaluated period of time. However, after normalizing by the size of the Catholic population, the decline followed a similar, although less marked, pattern. This is consistent with the idea suggested by Stark and Finke (2000) that the changes occurring at the Second Vatican Council were particularly devastating for women who, "unlike males, had never been granted ordination, and now their holiness was reduced to that of all other lay Catholics".
teachers were paid, the dramatic collapse in the number of Catholic sisters had an immediate impact on tuitions and the ability of parishes to keep their schools open by replacing former religious teachers with lay teachers.\textsuperscript{10}

Figure 2 illustrates how the trends in Catholic schools across US dioceses closely resemble the trends in the number of Catholic sisters. Between 1965 and 1980, the number of parochial high schools declined by approximately 40% and parochial elementary schools by 35%. The correlation between the number of Catholic sisters and the number of parochial schools is 0.88. It is worth noting that the decline in the number of Catholic schools occurred in a context of the “voracious demand of families for Catholic schools”, as noted by Caruso (2012). The closure of Catholic schools was largely the result of supply effects. Without nuns to staff schools, Catholic schools were forced to hire lay teachers and pay competitive salaries to meet demand. The increase in the share of lay teachers became financially unbearable, forcing schools to increase their tuition fees or to close (Caruso, 2012; Dolan, 1992; Bryk et al., 1993).

### 3.2 Heterogeneity Across US Dioceses

The decline in the number of Catholic sisters was heterogeneous across the different dioceses. Scholars speculated that the variation in the decline across US dioceses can be partially explained by variation in the receptiveness of the dioceses to Vatican II reforms. With the help of a group of experts, Stark and Finke (2000) classified dioceses to identify

\textsuperscript{10}Differences in the extent of the vow of poverty and the congregational needs reflected different salaries across congregations and schools. Unfortunately, we did not find more precise data regarding religious women’s salaries. However, Finke and Stark (2005) emphasize that religious women’s salaries were not only lower than those of public school teachers but also lower than those of religious brothers who were teachers. We found more information regarding the salaries paid to lay teachers (see Hesburgh et al. (1966), which were also lower than those paid to public school teacher, but still approximately three times higher, on average, than salaries paid to Catholic sisters. Koob and Shaw (1970) report that in the late 1960s, lay teachers’ salaries in many dioceses were set at 90-95\% of public school salaries. The increased need for lay teachers forced Catholic schools to provide more competitive salaries to attract trained teachers. The gap between religious and lay teacher salaries shrunk over the most recent years, likely due to the increasing financial difficulties facing religious congregations (Fialka, 2003). In 2009, however, a religious teacher was paid, on average (30,806\$), approximately 4,000\$ less than a lay teacher (34,656\$) in a Catholic school. Additionally, less than 30\% of the schools applied the same rate to the two categories of teachers.
those that were most traditional and progressive. They showed that liberal dioceses faced a sharper decline in the number of Catholic sisters in the aftermath of Vatican II. We take a different approach and use the voting records of Bishops at Vatican II to classify progressive and conservative bishops.\textsuperscript{11} Wilde (2007) obtained Council votes from the Vatican Secret Archive (Archivio Segreto Vaticano) and entered them into an electronic database that is now publicly available on the ARDA website. The voting data contain information on individual bishops, their dioceses and their votes on ten of the most contentious Council reforms. As suggested by Wilde (2007), we use the vote on the document “On the Sources of Revelation” as a measure of the Bishop’s openness to change. “On the Sources of Revelation” is a particularly conservative document refuting the historical and anthropological contextualization of the Bible and emphasizing the importance of Church “tradition” with respect to the scripture-centered protestant culture. Because most of the bishops who expressed liberal views in the other votes opposed this document, we define a bishop as liberal if he voted against it. In cases where two or more bishops participating at the Council resided in the same diocese, we averaged the votes and considered the dioceses where the votes where tied to be conservative.\textsuperscript{12}

Figure 3 and Table 1 provide evidence that the change in the number of sisters per Catholic school was more pronounced in liberal dioceses. In Figure 3, we show how the number of Catholic sisters, sister teachers, parochial elementary schools and high schools follow a similar pattern. However, the decline following Vatican II occurred at a faster rate in liberal dioceses (solid line in the graphs). Table 1 shows that, accounting for persistent differences in the dioceses and time fixed effects, the fall in the number of Catholic sisters per Catholic was 11% lower in conservative dioceses than in liberal dioceses (see column 1). Column 2 reports a similar pattern when we look at the number of sister teachers. The difference in the rate of decline is more evident when we focus on the most conservative

\textsuperscript{11}In Table 1, we compare the results obtained using the classification adopted by Stark and Finke (2000)\textsuperscript{12} Alternatively, we considered only the vote of the residential bishop and found no significant differences in the main results.
dioceses as classified by Stark and Finke (2000) (see columns 3 and 4).\textsuperscript{13} For these dioceses, the decline was approximately 65% lower than what we observed for the more liberal dioceses. The evidence presented suggests that the heterogeneous decline in the number of Catholic sisters was partially explained by the reactions of bishops to the “religious earthquake” occurring in Rome. Moreover, the votes of bishops at the Second Vatican Council and, more generally, their attitudes toward the unexpected reforms were largely unpredictable at the beginning of the Council (Alberigo, 2006; Wilde, 2007). Taken together, this analysis strengthens our belief that the variation in the decline in the number of Catholic sisters was exogenous to unobservable time-varying diocesan characteristics that may have been correlated with both the drop in the number of nuns and student outcomes. Under this identifying assumption, we exploit the sudden shock to the supply of Catholic sisters and its heterogeneous impact across US dioceses as an exogenous instrument for parochial schooling.

\subsection*{3.3 Identification Strategy}

Figure 4 illustrates the heterogeneity in the decline in the number of Catholic sisters and parochial schools across US states in the aftermath of Vatican II. Our identification follows a difference-in-difference approach, exploiting the variation in the availability of Catholic sisters across US Census Metropolitan Statistical Areas (MSAs) between 1960 and 1980, covering the years preceding and following the Second Vatican Council. We merged the panel of US dioceses with the 1\% US Census Sample of 1970 and the 5\% US Census Sample of 1980.\textsuperscript{14} Following previous literature (Lankford and Lee, 1995), we assigned to each MSA the diocesan characteristics of the dioceses contained in the MSA.\textsuperscript{15} Averages across dioceses were used whenever an MSA included counties from more than one diocese. For a robustness

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\textsuperscript{13}When comparing the most conservative and most liberal dioceses, we adopted the same categorization used by Stark and Finke (2000), who asked a group of experts to identify the ten most traditional and the ten most liberal dioceses. We consider the following dioceses to be traditional: Lincoln, Arlington, Bridgeport, Scranton, St. Louis, and Camden. We consider the following dioceses to be the most liberal: Saginaw, New Ulm, Albany, Milwaukee, Joliet, San Francisco, Rochester, and Richmond.

\textsuperscript{14}The results are identical using the 1\% sample for both years.

\textsuperscript{15}To match dioceses and MSAs, we relied on the county composition of the diocese.
exercise, we collected county- rather than diocese-level data on the number Catholic sisters for the four largest dioceses (Chicago, Detroit, Los Angeles, and New York) and merged it with US census data at county- rather than MSA-level.

The US Census does not contain information on Catholic schooling but it does contain information on parochial and private schooling attendance. We eliminated from the sample secular private schools.\textsuperscript{16} We focus on the population of children between 7 and 15 years of age, who were the most likely to live with their parents and therefore who were more likely to be represented in the sample. Focusing on this group allows us to use the information on current enrollment in a parochial or public school in the census year. US Census data contain only limited information on children’s outcomes. However, grade retention can be computed using information on educational attainment and age. Grade retention has been shown to be significantly correlated with other measures of educational performance (Oreopoulos et al., 2006; Shepard and Smith, 1989). As in Oreopoulos et al. (2006), we define the likelihood of repeating a grade with a dummy variable of a value of one if a student is one grade behind the median grade by state, sex, quarter of birth and age. This measure of grade retention includes students who delayed entry into the school system and therefore it is, more accurately, a measure of grade-for-age.\textsuperscript{17} We compare cohorts of students who were 7-15 years old at the time of the 1970 US Census and entered school between 1961 and 1969 to the outcomes of students who were 7-15 years old at the time of the 1980 US Census and entered school between 1971 and 1979. This allows us to compare different cohorts of students living in the same areas and to control for both local area fixed effects, which account for time invariant characteristics, and cohort fixed effects, which capture systematic differences in school outcomes within a given cohort. Furthermore, we control for a set of time-varying characteristics of the MSA (e.g., current density of Catholic population, female

\textsuperscript{16}According to the National Center for Education Statistics, approximately 80\% of the total number of private schools in existence in the 1950s were Catholic (see also Kim (2011)).

\textsuperscript{17}Alternatively, we measure grade retention by treating all children who turned 6 before October 1 as if they had entered first grade in the autumn of that year and children who turned 6 after October 1 as though they had entered school the following year. Our main results are substantially unchanged.
labor force participation, population density, and teacher’s education) that may be correlated with both the number of Catholic sisters and grade repetition. We restrict the sample to children living in identifiable MSAs, with no missing information on parental education and family income. After setting these restrictions, the sample included 841,958 children. We estimate the following linear probability model:

\[ P_{imt} = \beta_0 + \theta N_{mt} + \beta_1 X_{imt} + \beta_2 D_{mt} + \tau_t + \lambda_m + u_{imt} \]  

where \( P_{imt} \) is a dummy variable indicating whether individual \( i \) of birth cohort \( t \) goes to a parochial school in MSA \( m \). \( N_{mt} \) denotes a measure of average exposure to Catholic sisters who are teachers throughout the schooling years of an individual \( i \) in MSA \( m \). Henceforth, we will use Catholic sisters to refer to Catholic sisters teaching in Catholic schools. This measure varies by birth cohort (we computed the starting school year based on quarter of birth and age) and MSA. For example, if a 10-year-old student is observed in the 1970 Census in MSA \( m \), he will be assigned the average number of Catholic sisters in MSA \( m \) between 1967 and 1970. \( D_{mt} \) are MSA time-varying characteristics. \( X_i \) are standard socio-demographic controls. \( \tau_t \) and \( \lambda_m \) are cohort and MSA fixed effects. To analyze the effects on school outcomes, we estimate the following model:

\[ Y_{imt} = \alpha_0 + \alpha_1 P_{imt} + \gamma_1 X_{imt} + \gamma_2 D_{mt} + \tau_t + \lambda_m + \epsilon_{imt} \]  

where \( Y_{imt} \) is an indicator of grade retention. In practice, we exploit within-MSA differences in the availability of Catholic sisters that created exogenous shifts in the likelihood of at-

\[ 18 \] As a robustness check, we estimate probit models for our main estimates. The results are substantially unchanged and available upon request.

\[ 19 \] As mentioned earlier, MSA-level data for Catholic sisters, teachers and the Catholic population were computed using diocesan data. Therefore, the term diocese and MSA will be used interchangeably in this paper.

\[ 20 \] We alternatively use the total number of sisters (including those who were not teachers) in the diocese. The results flow in the same direction, as the two metrics are strongly correlated.

\[ 21 \] We followed the same method to compute analogue measures of exposure to lay teachers and total teachers in Catholic schools, Catholic schools, and Catholic population in the MSA.
tending a parochial school to analyze the effects of Catholic schooling on grade repetition. We believe that conditioning on MSA time-varying characteristics and controlling for MSAs and cohort fixed effects shows that the sudden and sharp decline in the number of Catholic sisters that induced Catholic school closures across the country is an exogenous shock to Catholic schooling. Yet, for our instrument to be valid we need to assume that the shock to the number of Catholic sisters affected student outcomes only by reducing the likelihood of attending Catholic schools. In particular, one may think that the decline in the number of Catholic sisters affected school quality and school competition. In Sections 4.3–4.4, we discuss these alternative channels and we verify the plausibility of our main results adopting the techniques developed by (Altonji et al., 2005a).

One could be concerned that age at school entry laws do not apply to private schools, so that differences in grade for age between public and private schools might simply reflect differences in age at school entry. However, we checked the age of first-graders enrolled in parochial and public schools and found non-meaningful differences. In 1970, first-grade students in Catholic schools were on average about two weeks younger than those attending public schools. In 1980, the difference increased but remained marginal (about 20 days). Furthermore, grade retention policies may be correlated with the changes in the supply of religious teachers. It is worth noting that while the number of Catholic sisters teaching in schools declined dramatically, the school administration and direction remained largely in the hands of religious staff (Caruso, 2012). If grading standards were defined at the administration level, we may be less concerned that grade retention policies were affected by the decline in the number of Catholic sisters.

Ample research has identified predominantly negative effects of grade repetition on student’s achievements and educational attainment. However, there is still research finding positive academic effects. In view of that, one might question the informative value of grade retention. In Section 4.5 we adopt a two-sample two-stage least squares (TS2SLS) approach and analyze an alternative outcome: the likelihood of leaving school at compulsory age.
3.4 Evidence for the Exogeneity of the Instrument

In an attempt to assess the validity of our instrumental strategy, in Table 2, we analyze the correlation between our instrument and individual observable characteristics (column 3). We then compare the coefficients reported in column 3 to the ones observed when considering the most recent instrument used in the literature (Cohen-Zada and Elder (2009), column 4) and the simple parochial schooling indicator (column 5). Columns 1 and 2 report the summary statistics of the main individual observables. In column 3, we present the standardized coefficients of separate regressions of the variables listed in the first column on the number of Catholic sisters, controlling for MSA and cohort fixed effects. In column 4, we repeat the same exercise for the instrumental variable proposed by Cohen-Zada and Elder (2009) and look at the relationship between observables and the historical share of Catholic population.22 We restrict the sample to 1980 and condition each regression for state fixed effects and current Catholic population to mimic the empirical strategy used by Cohen-Zada and Elder (2009). Finally, in column 5, we analyze the relationship between parochial schooling and the other observable characteristics. Column 5 confirms the significant selection on observable characteristics with parochial schooling associated with higher parental education, higher income and lower likelihood of minority status. The average number of Catholic sisters (column 3) is positively correlated with family income and parental education, suggesting some selection bias.23 Family income and parental education are included as controls in all of our regressions. However, the absolute value of the coefficients is always lower with respect to the correlation between observables and both Catholic schooling (column 5) and the historical share of Catholics in the county (column 4). Furthermore, the coefficients on the other observables are non-significant. While this does not rule out that our estimates may still suffer from spurious correlation between unobservables and our instrument, Table

22 Data on the share of Catholic population in 1980 are drawn from the Religious Congregation and Membership in the United States, while data for 1890 were taken from the American Religion Data Archive and originally collected by the US Census of Religious Bodies.
23 MacGregor (2012) shows that schools that served the urban poor were more likely to close than schools in richer areas.
suggests that our instrumental variable may be less likely to suffer from selection on unobservables than those previously used in the literature.

4 Main Results

4.1 Catholic School Supply and Catholic Schooling

Table 3 illustrates the estimates for equations 1 (column 1) and 2 (columns 2-4). Each regression controls for a set of a child’s characteristics, gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age dummies, maternal and paternal education (4 groups), family income, MSA and cohort fixed effects, and a set of MSA time-varying characteristics, female labor force participation, teachers’ education and Catholic population. We include a quadratic trend in all of our estimates. Standard errors are clustered at the MSA level. Column 1 reports the estimate of our first-stage regression. There is a positive and significant association between attending a parochial school and the number of sisters available in the different dioceses. The coefficient implies that a one standard deviation increase in the number of Catholic sisters (789.12) is associated with a 14% increase in the likelihood of attending a parochial school. The F-statistic of the first-stage is 14.84. We now move to the examination of the relationship between Catholic schooling and grade repetition. Column 2 reports the OLS estimate. Attending a parochial school is associated with an 11% reduction in the likelihood of repeating a grade. This finding is in line with previous evidence of a positive correlation between Catholic schooling and school outcomes. However, instrumenting parochial schooling with the cohort-MSA measure of exposure to Catholic sisters does not lead to evidence of significant effects on

24 Adding to this specification, teacher experience and the logarithm of teacher wages do not change the point estimate, but they do reduce the precision of our estimate. Female labor force participation and teacher education vary by census year. The female labor force participation rate in each MSA is calculated by dividing the number of employed women aged 15-64 by the total female population of the same age group. Teachers in each MSA were identified by industry (professional and related services - elementary and secondary schools) and occupation (elementary and secondary school teachers). The Catholic population is drawn from the Official Catholic Directory.
grade repetition. Column 3 reports the reduced-form showing no significant relationship between the availability of nuns and the likelihood of repeating a grade.\textsuperscript{25} The 2SLS estimate (column 4) is also non-significant and, if anything, suggests a negative (positive) effect of Catholic schooling on school outcomes (grade repetition). Although the standard errors are large, we reject the OLS estimate. The Hausman test rejects the equality of the coefficients at the 10\% level on the overall sample and at the 5\% level when we restrict the sample to whites.\textsuperscript{26}

Previous studies found larger positive effects of Catholic schooling on minority students. In Table 6, we report the 2SLS estimates by race, ethnicity and poverty level. Column 1 replicates the estimate of column 4 in Table 3. In column 2, we restrict the sample to whites. The 2SLS coefficient is still not significantly different from zero, but the estimate is more precisely estimated. Focusing on non-Hispanic whites, the coefficient becomes significant and suggests that parochial schooling increases the likelihood of repeating a grade by 20\%. The sign of the coefficient becomes negative when we look at minorities. While the large variance does not allow for making strong inferences, the direction of the effect appears to be consistent with previous studies on Catholic schooling and minorities. The coefficient is positive and significant when we analyze children hailing from families above the median poverty level (i.e., of higher socio-economic status), and the effect is less precisely estimated for children of families with lower socio-economic status.

The 2SLS estimates, though imprecise, seem implausibly large. This may suggest that our instrument may suffer of weak instrument problems. The first stage coefficient may

\textsuperscript{25}We also find no evidence of a significant effect when analyzing the reduced-form relationship on public school students.

\textsuperscript{26}We examined the sensitivity of our main estimate to the inclusion of additional time-varying controls (e.g., the number of Catholic schools and the number of students in the metropolitan area, regional time trends, and region-year fixed effects. Including time-varying MSA information on teachers’ wages and experience does not significantly affect the point-estimate with respect to the baseline result reported in column 1. However, the precision of the estimate is clearly affected because these variables are correlated with teachers’ education. Including region-specific cohort trends, the point-estimate does not change substantially, but the confidence interval increases. Results are similar when using as an alternative instrument the shock in the number of Catholic schools or the collapse in the number of Catholic schools predicted by the shock to the number of Catholic sisters. These results are available upon request.
be attenuated by measurement error in parochial school attendance and the fact that we only observe parochial school at one point in time, lacking information on cumulative years of exposure, which would be the ideal measure of Catholic schooling in our setting. To address this concern and gain identification power in the next section we present results obtained using county-level data (rather than diocesan data) on the number of Catholic sisters. Using these more micro-level data, the coefficient becomes smaller and more precisely estimated. Another relevant concern is that the shock in the number of Catholic sisters may affect student outcomes through channels other than Catholic schooling violating the exclusion restriction. In Section 4.3, we verify the plausibility of our main estimates using the techniques proposed by Altonji et al. (2005a). Then, in Section 4.4 we analyze two alternative channels through which student outcomes may be affected by the decline in the number of Catholic sisters: school quality and competition.

4.2 Using County-Level Variation in Large Dioceses

In an attempt to obtain more precise estimates, we collected county-level information on the number of Catholic sisters. While this information is available in the Official Catholic Directory, it requires an intensive data collection process as the within-diocese information is only available at the school level. For this reason, we only collected data at the school-level for the four largest dioceses in the US (Chicago, Detroit, New York, and Los Angeles) which account for 14% of our original sample of students. We then aggregated the school-level information at the county-level in order to merge it with the information available in the US Census.

Table 4 replicates the analysis presented in Table 3 using county-level variation in the number of Catholic sisters on this restricted sample of dioceses. In practice, we estimate equation 2 replacing MSA fixed effects and time-varying characteristics with county fixed effects and time-varying controls. Standard errors are clustered at the MSA level.\footnote{Note that in a previous version of the paper standard errors were clustered at the county level. However,} Column
1 shows that one standard deviation in the number of Catholic sisters increases Catholic schooling by 40%. The OLS and the reduced-form coefficients (columns 2 and 3) on grade retention are substantially identical to the ones observed in Table 3. Using county-level variation in the number of Catholic sisters we obtain a more precise estimate of the effect that the one presented in Table 3. The 2SLS estimate in column 4 implies that Catholic schooling increases the likelihood of repeating the grade by 10 percentage points. Though the coefficient is still not significant, it becomes marginally significant when we exclude individuals who resided in a different state 5 years before the Census (Panel (b)). Overall, the estimates presented in Table 4 confirm that the OLS relationship is entirely explained by selection and that, if anything, Catholic schooling increases grade retention.

4.3 Is the Selection Implied by Our Results Plausible?

The above findings suggest that the OLS estimates are driven by positive selection bias. Despite our instrument being less correlated with observables than those previously used in the literature, one may still be concerned that the decline in the number of Catholic sisters may have affected outcomes through other potential channels by affecting directly the quality of Catholic schools with spillovers on the public sector because of the decline in competition. It is reassuring that the reduced-form relationship between our instrument and the outcomes is non-significant also when the sample is restricted to public school students (coef. 0.003, s.e. 0.004). To further verify the plausibility of our results, we use the techniques of Altonji et al. (2005b) and exploit the information about selection on the observables to gauge the role of selection bias and verify whether our IV estimates are consistent with it. In particular, in Table 5, we jointly estimate the following system of equations:

\[ P = 1(X'\beta + u > 0), \]

the significance of the results is not affected.
\[ Y = 1(X'\gamma + \alpha P + \epsilon > 0) \]

We impose different values for \( \rho \), the correlation between the error terms of the above equations. Column 1 (\( \rho=0 \)) presents the single-equation estimates. The marginal effect is substantially identical to the OLS estimate presented in Table 3, column 2. In columns 2-7 we illustrate how a modest amount of positive selection (small negative correlation between \( \epsilon \) and \( u \)) is sufficient to explain away the positive effect of Catholic schooling and even reverse the sign. Column 8 reports the estimate obtained assuming that selection on the observables equals selection on unobservables. In other words, we assume that the projection of \( P \) on \( \epsilon \) equals its projection on the index of other determinants of \( Y \):

\[
\frac{\text{Cov}(P,\epsilon)}{\text{Var}(\epsilon)} = \frac{\text{Cov}(P,X'\gamma)}{\text{Var}(X'\gamma)}. 
\]

Altonji et al. (2005b) justify the equal selection assumption by arguing that for large datasets used for different purposes, the available information can be thought of as a random subset of the determinants of a particular outcome under study.\(^{28}\) Following this approach, we identify a lower bound for the effects of Catholic schooling. In practice, we estimate a bivariate probit model and maximize the likelihood imposing \( \rho = \frac{\text{Cov}(X'\beta, X'\gamma)}{\text{Var}(X'\gamma)} \). The estimate of \( \alpha \) implies a large and negative effect of parochial schooling on grade repetition. Under the assumption of equality of selection on observables and unobservables, the strong and positive (negative) correlation between observable determinants of student outcomes (grade repetition) and Catholic schooling results in a strong and positive correlation with the unobservables, implying a large positive bias in the OLS estimate. In other words, correcting for the bias using Altonji et al. (2005b) method predicts an even more negative effect of Catholic schooling on grade repetition than the effect found using our IV.

Using a more informal approach, we estimate that if selection on unobservables was less than half as strong (approximately 40\%) as that found on a limited set of observables, the

\(^{28}\)Note that this is an extreme assumption because datasets are designed to answer particular questions and researchers do not choose their controls randomly. Therefore, selection on unobservables is likely to be less than selection on observables. However, for large datasets, such as the US Census, the actual selection on unobservables may be closer to the selection implied by the equal selection assumption than to the one that uses smaller longitudinal surveys containing a rich set of individual characteristics (e.g., NLSY79, NELS:88 etc.).
effect of Catholic schooling would be explained away.\textsuperscript{29}

Overall, this sensitivity analysis suggests that the OLS estimates are driven by selection bias as with a moderate degree of selection on unobservables, the positive effect of Catholic schooling on student outcomes (negative on grade repetition) vanishes and the coefficient becomes negative (positive on grade repetition). These results are consistent with the finding of no effect of Catholic schooling obtained using our instrumental variable approach.

4.4 Alternative channels: teachers’ quality and school competition

A potential threat to the validity of our instrument is the fact that the shock to the supply of Catholic sisters may have had an impact not only on the supply of Catholic schools and tuition costs but also on the average quality of surviving Catholic schools. This may happen because of a change in the composition of the staff and of the teacher-pupil ratio in Catholic schools or because of a reduction in the competition which may affect the surviving Catholic schools and have spillovers on public schools which would face less pressure. No consensus has been reached on the effect of private school competition on student outcomes. In particular, while Hoxby (1994) finds evidence that greater private school competitiveness significantly increases the quality of public schools, Sander (1999) and Cohen-Zada (2009) found no evidence of causal effects on student achievement. As mentioned above, we find

\textsuperscript{29}Altonji et al. (2005b) show that if the bias in a probit is close to the bias in OLS, then

\[
\text{plim } \hat{\alpha} = \alpha + \frac{Cov(\hat{P}, \epsilon)}{\text{Var}(\hat{P})} = \alpha + \frac{\text{Var}(P)}{\text{Var}(\hat{P}|E(\epsilon|P = 1) - E(\epsilon|P = 0)}
\]

where \(\hat{P}\) is the residual from a regression of \(P\) on the set of observable controls \(X\). Under the assumption that observable and unobservable determinants of student outcomes have the same relationship with Catholic schooling, \(E(\epsilon|P = 1) - E(\epsilon|P = 0) = \frac{E(X'\gamma|P = 1) - E(X'\gamma|P = 0)}{\text{Var}(X'\gamma)}\). Therefore,

\[
\text{plim } \hat{\alpha} = \alpha + \frac{Cov(\hat{P}, \epsilon)}{\text{Var}(\hat{P})} = \alpha + \frac{E(X'\gamma|P = 1) - E(X'\gamma|P = 0)}{\text{Var}(X'\gamma)}
\]

The ratio between the unconstrained estimate of \(\alpha\) and the estimated selection bias can then be used to measure how strong the selection on unobserved characteristics should be relative to the selection on observables for explaining all of the effects of parochial schooling.
no significant reduced-form relationship between the number of Catholic sisters and grade retention for both public and private school students. However, we claim that if the number of Catholic sisters is positively correlated with differential private school quality (Cohen-Zada, 2009), our estimate would tend to overstate the effects of Catholic schooling.

Neal (1997) suggested the higher dedication and vocational motivation of Catholic school teachers as a potential explanation for the positive effects of Catholic schooling on urban minorities. Kim (2011) shows that religious personnel were, on average, more educated and more experienced and provides evidence that teacher’s quality explains a substantial part of the Catholic school effect on academic achievement and labor market outcomes. The Notre Dame Survey on American Catholic Schools of 1966 provides aggregate descriptives that confirm the relative higher experience, education and work satisfaction of religious teachers compared to lay teachers in Catholic schools. In particular, we know that 49% of Catholic sisters had a Master degree compared to only 19% of lay teachers. Furthermore, sisters were often required to attend educational and training programs. Koedel (2008) shows that teacher quality and education have significant effects on graduation outcomes.

While we do not have direct information on teacher’s quality, in Table 7 we document evidence of a negative association between the share of religious teachers and the likelihood of grade repetition in Catholic schools. Our results show that the ratio of religious teachers to lay teachers in Catholic schools (or the share of Catholic sisters among Catholic school teachers) is negatively associated with the likelihood of grade repetition among students attending Catholic schools (see column 1). In particular, we find that a one standard deviation in the sister-lay teacher ratio is associated with a 3 percentage points decline in grade repetition. This is equivalent to a 21% effect with respect to the average grade repetition rate among parochial school students (14.7%). The coefficient becomes non-significant when focusing on non-Hispanic whites (column 3) and is large and significant for minorities (column 4). The point-estimate implies that a one standard deviation increase in the sister-lay teacher ratio is associated with a 57% decrease in the likelihood of repeating a
grade for minority students attending parochial schools. Similarly, the coefficient is non-significant when looking at students whose families are above the median poverty level (i.e., of higher socio-economic status, column 5) but negative and significant for students of lower socio-economic status (-23%, column 6). These results are in line with the idea that more qualified and motivated teachers may be more productive for disadvantaged students (Kim, Koedel, 2008). Exploring the effects of the decline in the number of Catholic sisters on the quality of teachers in Catholic schools goes well beyond the main purpose of this paper and would require additional micro-level data on teachers and school characteristics (Kim, 2011). However, if Catholic sisters were better teachers than lay teachers, then our 2SLS estimates would be biased toward finding a positive effect of Catholic schooling on student outcomes, as the higher number of Catholic sisters would be associated with higher teachers’ quality and higher competition.  

4.5 Alternative outcome: Leaving school at compulsory age

As mentioned above, grade retention is a controversial outcome as it may be the result of higher standards for grade progression, whereas social promotion achieved by eliminating grade retention may be considered as a failure. Though the use of historical Census data severely limits the availability of educational achievements, we now turn to an alternative outcome: the likelihood of leaving school at compulsory age.

Here, the first stage and reduced-form regressions come from different samples, as it is not possible to do conventional 2SLS to estimate the effect of Catholic schooling on the likelihood of being a high-school dropout for those aged 16. Instead we use Two Sample Two Stage Least Squares (Angrist and Krueger, 1992; Inoue and Solon, 2010). This is implemented by

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30 We acknowledge that Catholic sisters were involved in a wider variety of social services, and the drop in the number of Catholic sisters may be correlated with shocks to childcare, preschool and charity care which may indirectly affect outcomes. However, again the higher number of Catholic sisters would be associated with higher levels of church service provision which would likely bias our estimates towards finding a positive effect of Catholic schooling.

31 Furthermore, Cascio (2005) shows that grade for age is a mis-measured proxy for grade retention, thus raising concerns of non-classical measurement error which may bias both OLS and 2SLS estimates.
forming the predicted value of the likelihood of attending a catholic school using the first stage coefficients estimated in the 1970 and 1980 censuses on those aged 15.\textsuperscript{32} We then regress the likelihood of dropping out at compulsory age on the predicted value of catholic schooling and the usual explanatory variables. We focus on the 4 largest dioceses and use county-level variation in the number of Catholic sisters to get more precise estimates.\textsuperscript{33}

Note that because we have one instrument and our specification is just identified, the Two Sample Two Stage Least Squares (TS2SLS) estimator is simply the reduced-form effect of nuns-exposure divided by the first stage effect.\textsuperscript{34} Table 8 reports the first stage, the reduced-form, and the TS2SLS estimates. As suggested by the reduced-form, we find no significant effect of Catholic schooling on dropout at compulsory age. Though not precisely estimated, the point estimate is positive, consistent with the results shown for grade retention. Results are substantially unchanged when we exclude individuals who were living in a different state 5 years before the Census. Considering other outcomes for older cohorts in our sample (e.g. high-school graduation, college attendance) increases the selectivity in the sample and compromises the ability of controlling for parental background. However, consistent with what found for grade retention and dropout at compulsory age, the reduced-form relationships between our instrument and alternative outcomes such as college attendance and high school graduation are non significant.\textsuperscript{35}

5 Conclusion

A large literature has investigated the relationship between Catholic schooling and student outcomes. Most of the previous studies have found positive effects, but the causality

\textsuperscript{32} We focus on the closest age cohort in compulsory schooling to estimate the first-stage assuming that they were practically exposed to the same shock.

\textsuperscript{33} As for grade retention, when using the entire sample and MSA-level variation in the number of Catholic sisters, the point-estimate is positive but larger and less precisely estimated.

\textsuperscript{34} In calculating the TS2SLS standard errors, we use the delta method to allow for the fact that the predicted value of catholic schooling contains sampling error.

\textsuperscript{35} We compute the average number of nuns available to each individual living in a different diocese during his schooling years. We restrict the sample to individuals between 16 and 24 years of age who resided in the same MSA for the 5 years preceding the survey. Results are available upon request.
has long been questioned. This paper proposes a new identification strategy for assessing
the effects of Catholic schooling on student outcomes. We exploit an exogenous shock to the
number of Catholic sisters and show that the positive correlation between Catholic schooling
and student outcomes is explained entirely by selection bias.

We show that the unexpected shock to the supply of Catholic sisters, induced by the
changes sparked by the Second Vatican Council, affected the number of Catholic schools and,
in turn, the likelihood of children attending Catholic schools. Additionally, we present
evidence that compared to previous instruments used in the literature, our instrumental
strategy is less correlated with observable determinants of educational achievement. We
confirm the previous findings of a positive correlation between Catholic schooling and edu-
cational outcomes. However, using our instrument to identify the causal effects of Catholic
schooling on grade repetition, we find no evidence of positive effects and reject the OLS
estimates. If anything, our estimates imply that Catholic schooling increases the likelihood
of repeating a grade. Furthermore, we find no evidence of positive effects when analyzing
the likelihood of leaving school at compulsory age using a two sample two-stage least square
estimation (TS2SLS). The results are similar to those found by Elder and Jepsen (2014) and
Gibbons and Silva (2011) using more recent data on primary schools in the US and faith
schools in the UK. To verify the plausibility of our results, we use the techniques of Altonji et
al. (2005b) and show that even a modest degree of selection on unobservable characteristics
is sufficient to eliminate and reverse the sign of Catholic schooling. Though we are unable to
estimate a precise causal effect of Catholic schooling on student outcomes, we conclude that
the results obtained using our instrumental variable and the Altonji et al. (2005b) techniques
suggest that Catholic school attendance does not reduce the likelihood of repeating a grade
nor the likelihood of dropping out of school at compulsory age.
References


Elder, Todd, and Christopher Jepsen (2014) ‘Are Catholic primary schools more effective than public primary schools?’ *Journal of Urban Economics* 80, 28–38


Hoxby, Caroline Minter (1994) ‘Do private schools provide competition for public schools?’ *National Bureau of Economic Research No. 4978*


Lubienski, Christopher, Corinna Crane, and Sarah Thule Lubienski (2009) ‘What do we know about school effectiveness? Academic gains in public and private schools.’ *Phi Delta Kappan* 89(9), 689–685

MacGregor, Carol Ann (2012) ‘Affecting the catholic school effect: Racial and ethnic differences in catholic school closure.’ *Mimeo*


Figure 1: Human Assets in the American Catholic Church, 1950-1985


Notes - Number of Sisters, Priests, Teachers in Catholic Schools, Sister Teachers, Lay Teachers.
Figure 2: The Decline of Catholic Sisters and Catholic Schools Across US

Figure 3: The Decline of Catholic Sisters and Catholic Schools Across Liberal and Conservative Dioceses

Figure 4: The Decline of Catholic Sisters Across US States (1966-1980)

Notes - States are classified in 5 categories. The darker the blue the higher the decline in the number of Catholic sisters and parochial schools between 1966 and 1980.
Table 1: Heterogeneity in the Vatican II Shock across US dioceses

<table>
<thead>
<tr>
<th></th>
<th>(1) Sisters per 1,000 Catholics</th>
<th>(2) Sisters Teachers per 1,000 Catholics</th>
<th>(3) Sisters per 1,000 Catholics</th>
<th>(4) Sisters Teachers per 1,000 Catholics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vatican II</td>
<td>-1.832*** (0.066)</td>
<td>-1.474*** (0.042)</td>
<td>-1.858*** (0.066)</td>
<td>-1.489*** (0.042)</td>
</tr>
<tr>
<td>Vatican II * conservative diocese</td>
<td>0.218* (0.114)</td>
<td>0.163** (0.073)</td>
<td>0.192* (0.114)</td>
<td>0.147** (0.073)</td>
</tr>
<tr>
<td>Vatican II * most conservative diocese</td>
<td></td>
<td></td>
<td>0.913*** (0.281)</td>
<td>0.540*** (0.179)</td>
</tr>
</tbody>
</table>

Diocese fixed effect: YES YES YES YES
R-squared: 0.328 0.439 0.332 0.441

Source - Official Catholic Directory (1960-1980) and voting records of Bishops at Vatican II collected by Wilde (2007) from the Vatican Secret Archive (Archivio Segreto Vaticano). The sample is restricted to the 105 dioceses for which we have information on Bishop’s vote at the Second Vatican Council.

Notes - The sample is restricted to the 105 dioceses for which we have information on Bishop’s vote at the Second Vatican Council.
Table 2: IVs and Individual Observable Characteristics (standardized coefficients)

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade repetition</td>
<td>0.18</td>
<td>0.38</td>
<td>-0.002</td>
<td>0.017*</td>
<td>-0.043***</td>
</tr>
<tr>
<td>Enrolled in a parochial school</td>
<td>0.14</td>
<td>0.35</td>
<td><strong>0.063</strong>*</td>
<td><strong>0.0101</strong>*</td>
<td>1.000***</td>
</tr>
<tr>
<td>Male</td>
<td>0.51</td>
<td>0.50</td>
<td>0.002</td>
<td>0.003</td>
<td>-0.014***</td>
</tr>
<tr>
<td>Black</td>
<td>0.11</td>
<td>0.31</td>
<td>-0.001</td>
<td><strong>0.118</strong></td>
<td>-0.060***</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.10</td>
<td>0.29</td>
<td>-0.021</td>
<td><strong>0.102</strong></td>
<td>-0.013***</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>2.18</td>
<td>0.94</td>
<td><strong>0.023</strong>*</td>
<td>-0.053*</td>
<td>0.180***</td>
</tr>
<tr>
<td>Father’s education</td>
<td>2.38</td>
<td>1.11</td>
<td><strong>0.029</strong>*</td>
<td>-0.068**</td>
<td>0.220***</td>
</tr>
<tr>
<td>Log (family income)</td>
<td>9.40</td>
<td>0.64</td>
<td><strong>0.068</strong>*</td>
<td>-0.078**</td>
<td>0.137***</td>
</tr>
</tbody>
</table>

Notes - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old. Column 3 includes MSA and cohort fixed effects. Column 4 includes state fixed effects. Standard errors were clustered at the MSA level in column 3 and at the county level in column 4.
Table 3: Sisters, Catholic Schooling and Grade Retention

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>(1) First Stage</th>
<th>(2) OLS</th>
<th>(3) Reduced-Form</th>
<th>(4) IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enrolled in a Parochial School</td>
<td>Grade Repetition</td>
<td>Grade Repetition</td>
<td>Grade Repetition</td>
</tr>
<tr>
<td>Sisters (in thousand)</td>
<td>0.023*** (0.006)</td>
<td>0.005 (0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enrolled in a parochial school</td>
<td>-0.020*** (0.003)</td>
<td>0.255 (0.167)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>841,958</td>
<td>841,958</td>
<td>841,958</td>
<td>841,958</td>
</tr>
<tr>
<td>First-stage F (1, 121)</td>
<td>14.84</td>
<td>14.84</td>
<td>14.84</td>
<td>14.84</td>
</tr>
<tr>
<td>Mean of dependent variable</td>
<td>0.139</td>
<td>0.176</td>
<td>0.176</td>
<td>0.176</td>
</tr>
<tr>
<td>s.d.</td>
<td>0.346</td>
<td>0.381</td>
<td>0.381</td>
<td>0.381</td>
</tr>
</tbody>
</table>

Notes - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old. All estimates include controls for a set of child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income), MSA and cohort fixed effects, and a set of MSA time varying characteristics (female labor force participation, and teachers’ education). Standard errors are clustered at the MSA level.
Table 4: Sisters, Catholic Schooling and Grade Retention, 4 Largest Dioceses, County-Level Variation

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Stage</td>
<td>OLS</td>
<td>Reduced-Form</td>
<td>IV</td>
</tr>
<tr>
<td>Enrolled in a Parochial School</td>
<td>OLS</td>
<td>Reduced-Form</td>
<td>Grade Repetition</td>
<td>Grade Repetition</td>
</tr>
<tr>
<td>Sisters (in thousand)- county level</td>
<td>0.070** (0.021)</td>
<td>0.007 (0.007)</td>
<td>0.023** (0.008)</td>
<td>0.099 (0.077)</td>
</tr>
<tr>
<td>Enrolled in a parochial school</td>
<td>-0.020** (0.008)</td>
<td>0.110* (0.063)</td>
<td>0.173</td>
<td>0.173</td>
</tr>
<tr>
<td>Observations</td>
<td>117,376</td>
<td>117,376</td>
<td>117,376</td>
<td>117,376</td>
</tr>
<tr>
<td>First-stage F (1, 7)</td>
<td>11.33</td>
<td>11.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of dependent variable</td>
<td>0.209</td>
<td>0.173</td>
<td>0.173</td>
<td>0.173</td>
</tr>
<tr>
<td>s.d.</td>
<td>0.406</td>
<td>0.378</td>
<td>0.378</td>
<td>0.378</td>
</tr>
</tbody>
</table>

Panel (a) - All individuals

Panel (b) - Non-movers

Notes - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old living in counties belonging to the 4 largest U.S. dioceses: Chicago, Detroit, New York, and Los Angeles. All estimates include controls for a set of child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income), county and cohort fixed effects, and a set of county time varying characteristics (female labor force participation, teachers’ education and Catholic population). Standard errors are clustered at the MSA level.
Table 5: Effects of Catholic Schooling on Grade Retention Accounting for Selection on Observables

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constrained Selection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\rho$</td>
<td>0</td>
<td>-0.05</td>
<td>-0.1</td>
<td>-0.2</td>
<td>-0.3</td>
<td>-0.4</td>
<td>-0.5</td>
<td>-0.727</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>Enrolled in parochial school</td>
<td>-0.023</td>
<td>0.006</td>
<td>0.022</td>
<td>0.070</td>
<td>0.119</td>
<td>0.171</td>
<td>0.224</td>
<td>0.358</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>

Notes - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old. These are estimates from a bivariate probit models imposing the various restrictions. All estimates include child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income). The outcome variable is grade repetition.
### Table 6: Catholic Schooling and Grade Retention, by Socio-Demographic Groups

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enrolled in a parochial school</strong></td>
<td>0.253</td>
<td>0.170</td>
<td>0.213**</td>
<td>-0.0509</td>
<td>0.304**</td>
<td>0.255</td>
</tr>
<tr>
<td></td>
<td>(0.167)</td>
<td>(0.108)</td>
<td>(0.093)</td>
<td>(0.321)</td>
<td>(0.143)</td>
<td>(0.316)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>841,958</td>
<td>751,302</td>
<td>671,872</td>
<td>170,086</td>
<td>414,058</td>
<td>427,900</td>
</tr>
<tr>
<td><strong>Mean of dependent Variable</strong></td>
<td>0.176</td>
<td>0.173</td>
<td>0.163</td>
<td>0.227</td>
<td>0.138</td>
<td>0.213</td>
</tr>
<tr>
<td></td>
<td>0.381</td>
<td>0.378</td>
<td>0.369</td>
<td>0.419</td>
<td>0.345</td>
<td>0.409</td>
</tr>
</tbody>
</table>

**Notes** - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old. All estimates include controls for a set of child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income), MSA and cohort fixed effects, and a set of MSA time varying characteristics (female labor force participation, and teachers’ education). Standard errors are clustered at the MSA level.
Table 7: Sisters-Lay Teachers Ratio and Grade Retention in Catholic Schools

<table>
<thead>
<tr>
<th></th>
<th>(1) All Whites</th>
<th>(2) Non-Hispanic Whites</th>
<th>(3) Minorities</th>
<th>(4) Below median poverty level</th>
<th>(5) Above median poverty level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sisters-Lay Teachers Ratio</td>
<td>-0.030**</td>
<td>-0.027*</td>
<td>-0.022</td>
<td>-0.111***</td>
<td>-0.020</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.027)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Observations</td>
<td>117,148</td>
<td>110,578</td>
<td>100,803</td>
<td>16,345</td>
<td>64,217</td>
</tr>
<tr>
<td>Mean of dependent variable</td>
<td>0.147</td>
<td>0.144</td>
<td>0.137</td>
<td>0.192</td>
<td>0.125</td>
</tr>
<tr>
<td>s.d.</td>
<td>0.345</td>
<td>0.344</td>
<td>0.338</td>
<td>0.384</td>
<td>0.328</td>
</tr>
</tbody>
</table>

Notes: Data are drawn from the 1970 and 1980 US Census. The sample is restricted to children 7-15 years old enrolled in parochial schools. All estimates include controls for a set of child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income), MSA and cohort fixed effects, and a set of MSA time varying characteristics (female labor force participation, teachers’ education, and Catholic population). Minorities include blacks and Hispanics. Standard errors are clustered at the MSA level.
Table 8: Effects of Catholic Schooling on Dropout at Compulsory Age, TS2SLS

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>First Stage Enrolled in a Parochial School</th>
<th>Reduced-Form Drop-out at Compulsory Age</th>
<th>TS2SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sisters (in thousands)</td>
<td>0.084** (0.017)</td>
<td>0.001 (0.003)</td>
<td>0.013 (0.037)</td>
</tr>
<tr>
<td>Observations</td>
<td>13,313</td>
<td>16,927</td>
<td>16,927</td>
</tr>
<tr>
<td>First Stage F</td>
<td>24.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of dependent Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s.d.</td>
<td>0.171</td>
<td>0.047</td>
<td>0.047</td>
</tr>
<tr>
<td>s.d.</td>
<td>0.377</td>
<td>0.212</td>
<td>0.212</td>
</tr>
</tbody>
</table>

Notes - Data are drawn from the 1970 and 1980 US Census. The sample is restricted to students at compulsory age living in counties belonging to the 4 largest U.S. dioceses: Chicago, Detroit, New York, and Los Angeles. All estimates include controls for a set of child’s characteristics (gender, race, Hispanic ethnicity, birth quarter, age dummies), family background (maternal and paternal age (quadratic), maternal and paternal education (4-groups), family income), county and cohort fixed effects, and a set of county time varying characteristics (female labor force participation, teachers' education and Catholic population). Standard errors are clustered at the MSA level.
Appendix

Figure 5: Extract from the Official Catholic Directory, 1965