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Community, Inequality, and Local Public Goods: Evidence from School Financing in South Africa

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Abstract

To examine how local income distribution affects both a community's ability to pay for schooling and the quality of that schooling, this research merges household and school census data from South Africa. Empirical results are twofold. First, while the median income and the average household income increase school fees, inequality in household income (standard deviation) decreases school fees, which indicates that the lower tail of income distribution pulls down school fees. Second, an increase in school fees significantly improves school quality, decreasing the learner-educator ratio and increasing the number of nonsubsidized educators. The result is consistent with (1) strategic behavior of the low-income group and (2) optimal school fee determination with incomplete interhousehold income transfers. Empirical results and simulations demonstrate the possibility that income and asset inequality may reduce the quality of public goods, decreasing human capital and income growth for the next generation.

Key words: local public goods, school finance, willingness to pay, human capital, South Africa

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Acknowledgments

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1. Introduction

Aggregation of diverse opinions in public decisionmaking is crucial to the provision of public goods. For example, the public provision of education influences the welfare of the majority since publicly financed school education equally benefits different income groups. The way school is financed, however, is a particularly large concern for poor families whose human capital is an important determinant of their earnings.

In this paper we examine the impact of unequal income distribution on the community's capability to finance local schools in the empirical context of South Africa. In general, poor households, who face an imperfect credit market, find it difficult to finance their children's schooling. Where borrowing constraints exist, income and asset levels affect the ability to pay for child schooling. As poor households can afford to pay less than rich households, this creates divergence in the ability to pay. Thus, the inequality in income and asset distributions within a community can ultimately influence the quality of public goods. How to compromise the conflicts between groups is a problem for local governance.[1]

Until recently, in South Africa, government subsidies have been limited, so financing of schools relies heavily on the collection of school fees—a user charge—from parents.[2] School governing bodies (SGBs), which consist of the principal, teachers, community leaders, parents, and in some secondary schools, learners, decide school fees.

[1] A related problem arises from indivisibility in public good resource allocation. If asset distribution is unequal, community members demand public investments that are complementary to the assets that they own. For example, where land redistribution is difficult to implement, the landless may desire investment in child schooling, since public investment in land has no direct impact on their incomes. Foster and Rosenzweig (2001) study this problem of public goods allocation between road and irrigation construction in the context of rural India.

[2] For accounts of the general situation in South African education, see Bot, Wilson, and Dove (2000), Crouch (1996), and Kriege et al. (1994).

Therefore, the school fee represents the community's ability to pay for education.[3] SGBs played a greater role in the period before a recently revised funding reform was implemented, whereby provincial governments allocate school subsidies progressively, according to local poverty measures.

This example from South Africa has interesting features. First, community members change the quality of local school education by changing the school fee. The quality of education, and therefore that of human capital is endogenous under community governance.[4]

Recent literature examines the resource allocation problem in local public goods in developing countries. Foster and Rosenzweig (2001) study the effects of village-level choices on public investment in roads or irrigation in India. In their empirical context, there are two different groups in a rural economy: the landless and the landed. The landless prefer road investment, which opens access to employment (thus increasing returns to labor), while the landed favor irrigation investment, which increases returns to land. Strengthening democracy shifts local public resources from irrigation to road construction, as the landless (majority) become more vocal. Recent literature also includes Ghatak and Ghatak (2002) and Chattopadhyay and Duflo (2004), which study the impact of women's participation in policy decisionmaking in India. While these examples highlight the resource allocation problem in the context of local public decisionmaking, user cost and the quality of public goods are not examined.

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[3] Not only education but some local public management in agriculture requires collective decisions at the community level. For example, public investment in and maintenance costs of irrigation are shared in the community, which affects agricultural productivity in the future. We imagine that forest management has similar features. However, the latter faces the asymmetric information problem and therefore a free rider problem.

[4] Strengthening local democracy may create greater inequality in education quality across communities without effective government subsidy. The government may raise the quality of education by allocating (conditional) credit to poor households. Whether the targeting should be at the household level (within the community) or at the community level depends on the sensitivity of the school fee to changes in the average income and in inequality within the community. This question is answered quantitatively in Section 6, based on our parameter estimates.

Second, the quality of education has a long-term implication. It determines human capital for the next generation and therefore their income opportunities in the future. Income growth ultimately affects consumption growth, which improves nutritional intake.[5] Therefore, an improvement in educational quality, particularly through mother's education, provides a supply-side foundation for consumption and nutrition growth. It can also change political participation, particularly for women in the country.

In the above context, we are interested in the relationship between local inequality and the quality of human capital investment and therefore growth. Since Lewis (1954) and Kaldor (1956), economists have tried to determine whether and how inequality affects growth at the national level. More recently, Alesina and Rodrik (1994), Person and Tabellini (1994), and Perotti (1993) have proposed mechanisms that in an unequal society result in distributional conflicts in policies that hinder the incentive to invest, therefore leading to lower growth.[6][7] Galor and Zeira (1993) assess the negative effects of inequality on growth in the presence of an imperfect credit market and indivisible human capital.

Although our paper is not concerned with aggregate growth, we share some elements with them. First, political process is important in resolving the variations in ability to pay for education among community members. Second, heterogeneity arises in the presence of an imperfect credit market and thus a liquidity constraint among the poor in the community. As these political economy models predict, this implies that inequality

[5] In the long run, income growth improves nutritional and health outcomes over generations, by securing sufficient consumption growth and further reinforcing schooling investments and outcomes. Yamauchi (2005a) attempts to identify the effects of early childhood nutrition and health status on schooling investments and outcomes in South Africa.

[6] Easterly (2002) analyzes growth effects of inequality with focus on changes in institutional quality, redistributive policies, and schooling.

[7] As Glomm (2004) shows, if redistribution from the rich to the poor takes the form of public investment in education benefiting the poor, the initial inequality that increases the political pressure on redistribution through public education can increase the aggregate growth.

results in lower growth due to the inherent difficulty in reaching a growth-promoting decision.[8]

The second section of this paper lays out a simple model, characterizing implications of the linkage of income distribution and school fees, while Appendix 1 presents an equally explanatory model. Section 3 discusses our empirical strategy, with a focus on possible endogenous sorting in school choice and household mobility in the light of the recent reform in the education funding allocation in South Africa.

Section 4 describes the data that we use in the empirical analysis, which are merged from several sources. The first data set consists of the Census 2001 Community Profile database and School Census 2002, which together provide the information on school fee and community characteristics in 2001. The second set is constructed from a clustered household survey: KwaZulu Natal Income Dynamics Study 1998 and School Census 1999, which jointly identify school fee and community factors in the province of KwaZulu Natal in 1998. In addition, the School Census 1999 can provide the details of school financing conditions and school governing body activities. We also assess the impacts of school finance on school quality with panel data from 1996 and 2000.

Section 5 summarizes our empirical results. Our analysis of school fee determination shows that (1) the school fee increases as the median (or average) household income increases, but (2) it decreases as income distribution becomes more unequal (measured by the standard deviation). Thus, the richer a community is, the more likely they can afford to support higher school quality. However, low-income people in a community pull down the quality of school education. The analysis of school quality determination shows that both school fees and a government subsidy per learner can improve school quality, decreasing the learner-educator ratio. In particular, the size of school fee revenue has a significant effect on the number of nonsubsidized educators.

[8] These authors also provide evidence from country level data. For an example of cross-village studies, see Benjamin, Brandt, and Giles (2004), which shows that higher inequality at the village level impeded growth in China.

In Section 6, simulations are conducted to quantify the impact of changes in intra-community income distribution on school fees and thus the community's ability to invest in schooling, which demonstrates that a reduction in inequality leads to a substantial change in school fees. Therefore, we may increase the quality of education by redistributing income within a community, while maintaining the mean in each community, thus maintaining the aggregate income constant in the country. Implications of these findings are discussed in the final section.

2. A Basic Model

Environment

Here we set up a simple model that captures key empirical observations from South Africa to prove that income inequality is associated with a lower school fee and thus lower quality of education. Suppose there are N households in the community. In period 1, parents finance investments in children's schooling according to their exogenous income. Let y_i denote the exogenous income and p the school fee. In period 2, children work and contribute to household income. Let $q(p)$ denote the quality of education that determines their future earnings. Assume that $q' > 0$ and $q'' < 0$. Parents maximize the discounted sum of utilities from the current and future consumptions: $u(y_i - p) + \beta v[q(p)]$, where u and v are utilities in the current and future periods, respectively, both strictly increasing and concave, and $\beta \in (0,1)$ is the discount factor.

Without a credit market, the first order condition is

$$\frac{\partial q}{\partial p}[p^*(y_i)] = MRS_{1,2}(y_i, p), \tag{1}$$

where

$$c_i^1 = y_i - p$$

and

$$c_i^2 = q(p).$$

There exists a unique optimal school fee p_i^*, given y_i.

If we allow strategic interactions in setting the school fee such that the quality is determined as $q(p_i,p_{-i})$, the response function of p_i to p_{-i} is negatively sloped if $\frac{\partial^2 q}{\partial p_i \partial p_{-i}} < 0$.[9] This condition holds, for example, if $q(p)$, where $p = \frac{1}{N}\sum_i p_i$. A free rider incentive exists. However, in this paper, we do not examine this type of game. With the condition (1), each household has its optimal school fee, p_i^*. The nondegenerate initial income distribution leads to the distribution of the optimal willingness to pay: $p^* = [p^*(y_i)]_{i=1}^N$. The distribution of p^* represents conflict among community members. In this situation, the median voting theorem predicts p^{**}, which satisfies

$$\sum_j I\left(p_j^* > p^{**}\right) = \sum_j I\left(p_j^* < p^{**}\right). \tag{2}$$

Since the rank order of p_i^* follows that of income in our setting, the voting equilibrium p^{**} is only sensitive to the median of income in the community. Therefore, income inequality does not matter as long as the median is constant.[10]

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[9] $$\frac{dp_i}{dp_{-i}} = \frac{-\beta\left[\frac{\partial^2 q}{\partial p_i \partial p_{-i}} v' + \frac{\partial q}{\partial p_i}\frac{\partial q}{\partial p_{-i}} v''\right]}{\beta\left[\frac{\partial^2 q}{\partial p_i^2} v' + \left(\frac{\partial q}{\partial p_i}\right)^2 v''\right] + u''} < 0.$$

[10] The political economy growth model asserts that the dependence of the redistribution policy (for example, capital income tax for transfer to the poor) on median income and/or wealth implies the negative growth effect of inequality. Only under the condition that an increase in inequality decreases the median does this proposition hold. In empirical analysis below, we control the median or mean income to investigate the effect of the standard deviation (a proxy for inequality) on endogenous school fees.

If the credit market is perfect, the intertemporal marginal rate of substitution is uniquely equalized to the market interest rate, $1 + r$, so the optimal p becomes unique no matter what the initial income is. Namely,

$$\frac{\partial q}{\partial p}\left(p^{*}\right)=1+r.$$

In this case, therefore, there would be no potential conflict in setting the school fee in a community.[11] Income inequality does not matter.

Proposition 1

(1) In majority voting without a perfect credit market, the school fee is equal to the median of individual-specific optimal school fees of the community members.

(2) With a perfect credit market, community decisionmaking disappears and the unique school fee is determined by individual decisionmaking.

Strategic Behavior in a Community

We consider the possibility that a school fee may not be paid by poor households. This model interprets the empirical regularities found in South Africa. Suppose that the school governing body that sets the school fee consists of community members from the high-income group. This represents a so-called elite capture (see, for example, Bardhan and Mookherjee 2000), but we also incorporate strategic responses from the poor. That is, the low-income group, observing the announced school fee, can choose whether or not to pay it. For simplicity, assume that there are two income groups, y_H (high) and y_L (low), where $y_H > y_L$.

[11] If there are strategic interactions through $q(p_i,p_{-i})$, the response function is characterized by $\frac{dp_i}{dp_{-i}}=-\frac{q_{12}}{q_{11}}<0\left(q_{12}<0\right)$. Since the first order condition does not contain the initial condition, the Nash equilibrium is symmetric.

Actions are sequential. In the first stage, the high-income group (leader) sets p. In the second stage, the low-income group decides the actual payment p - τ, affecting the quality of education for both groups. In reality, those who cannot pay the school fee can apply for formal exemptions, and even if the exemptions are not granted, they can usually substitute by providing some services to schools, such as cleaning playgrounds and facilities. Thus, the corresponding payoff functions are

$$\begin{aligned} &u\left(y_H - p\right) + \beta v[q(p,\tau)] \\ &u\left(y_L - p + \tau\right) + \beta v[q(p,\tau)] \end{aligned} \quad \text{and}$$

for high and low income groups respectively, where the quality of education is $q(p,\tau)$, with $q_1 < 0$ and $q_2 < 0$. We assume that τ is continuous, and for simplicity, that there is only one school within a community.

Payment postponement, expressed by τ here, causes the quality of education to deteriorate, which affects children's future income for both groups. This could be a credible threat to the high-income group, since they have already committed to payment (or have paid), and the action taken by the low-income group also affects the payoff for the high-income group.[12] This is possible because the marginal cost of the school fee payment is higher for the low-income group as their income level is lower (that is, marginal utility is higher).

The problem is solved in backward induction. If $\tau \in [0,p]$ is continuous, the first-order condition with respect to τ for the low-income group is

$$u_L' + \beta q_2 v_L' \equiv F\left(p,\tau\right) = 0\,,$$

under the assumption that $|\, q_2 \,|$ is large enough to guarantee an interior solution. This condition holds, for example, when the number of low-income community members is

[12] In reality, those who cannot afford to pay school fees or need to substantially delay the payment can be exempted in full or part by providing some labor services to schools such as cleaning school facilities.

large. The first-order condition defines the response function $\tau(p)$. An increase in p increases τ^*, that is,

$$\frac{\partial \tau_i^*}{\partial p} = \frac{u_L'' - \beta q_{12} v_L''}{\Delta} > 0,$$

where

$$\Delta = u_L'' + \beta q_{22} v_L'' < 0,\ q_{12} < 0, \text{ and } q_{22} > 0.$$

Therefore, if the high-income group sets a high school fee, the low-income group is likely to pay less. Taking this condition into account, the maximization problem on p for the high-income group provides

$$-u_H' + \beta\left[1 + q_2 \frac{\partial \tau_i^*}{\partial p} + \mathbf{q}_2' \frac{\partial \tau_{-i}^*}{\partial p}\right] v_H' = 0,$$

where $\mathbf{q}_2$ is a column vector of $\dfrac{\partial q}{\partial \tau_j}$ where $j \neq i$ (dim $= N_L - 1$). With symmetry at equilibrium $\tau_i^*(p) = \tau_{-i}^*(p)$,

$$-u_H' + \beta\left[q_i + N_L q_2 \frac{\partial \tau^*}{\partial p}\right] v_H' = 0,$$

where $N_L q_2 \dfrac{\partial \tau^*}{\partial p} < 0$. Assume that the second order condition holds.[13] In this Subgame Perfect Nash Equilibrium, therefore, the equilibrium p^{**} is smaller than that without τ.[14] We also obtain a similar result from this noncooperative game setting.

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[13] In other words, $u_H'' + \beta\Gamma^2 v_H'' + \beta v_H' \left(\dfrac{\partial \Gamma}{\partial p}\right) < 0$.

[14] To learn about Nash and Subgame Perfect Nash equilibriums, see Fudenberg and Tirole (1993), for example, which is one of the basic textbooks on game theory.

Proposition 2

As the income level for the low-income group decreases, p^{**} also decreases if $u_L^{'''} > 0$ (that is, precautionary motive).

***Proof*:** In this simple model, the effect of an increase in income level among the low-income group on the equilibrium price is positive, that is,

$$\frac{dp^{**}}{dy_L} = \frac{-\beta N_L q_2 \dfrac{\partial^2 \tau^*}{\partial p \partial y_L} v_H^{'}}{u_H^{''} + \beta \Gamma^2 v_H^{''} + \beta v_H^{'} \left(\dfrac{\partial \Gamma}{\partial p} \right)} > 0,$$

where

$$\Gamma = \frac{\partial q\left(p, \tau^*(p)\right)}{\partial p} = q_1 + N_L q_2 \frac{\partial \tau^*}{\partial p}.$$

Knowing that the denominator is negative, with $\dfrac{\partial^2 q\left[p, \tau^*(p)\right]}{\partial p^2} < 0$ (the second-order condition for p), we obtain the result that if $u_L^{'''} > 0,$ then

$$\frac{\partial^2 \tau^*}{\partial p \partial y_L} = \frac{\beta u_L^{'''} v_L^{''} \left(q_{22} + q_{12}\right)}{\Delta^2} < 0.$$

Note that this result incorporates the strategic nonpayment threat from the low-income group, which is demonstrated.

We summarize the theoretical predictions on the effect of income distribution within a community on the equilibrium school fees in different models that we have examined as follows. The characteristics of income distribution that we focus on are the median, average, and standard deviation of household income in a community.

First, voting theory predicts a positive effect of the median community income on the school fee. This implication also survives in a noncooperative game. Second, a noncooperative dynamic game with a credible nonpayment threat by the low-income group predicts that income variations decrease the school fee. Simply, the low-income households put pressure on the school fee by implying the possibility of nonpayment.

As discussed in Appendix 1, this is not the only explanation for the negative correlation between income inequality and the school fee. The social planner's programming with complete income redistribution (that is, exemption policies) predicts that the average community income increases the school fee. With incomplete interhousehold transfers, income inequality also implies a decrease in the optimal school fee.

3. Empirical Strategy

In this section, we discuss the empirical framework to test the key implications of community effects on school fee determination. To capture the effect of community-level income distribution on the school fee, we focus on the mean or median and the standard deviation to represent the average income level and the variations respectively.[15] Specifically, we estimate

$$\ln p_{jt} = \alpha + \beta_1 m\left(y_k\right) + \beta_2 sd\left(y_k\right) + z_{jk}\delta + \mu^p_{k\in d} + \varepsilon^p_{jt}, \tag{3}$$

where p_{jt} is the school fee charged in school j located in community k at year t, $m(y_k)$ is the median or mean of household income y_k in the community, $sd(y_k)$ is the standard deviation, z_{jk} is a vector of community and school characteristics, $\mu^p_{k\in d}$ is the area fixed effect that captures community or area-specific fixed unobservables, and ε_{jt} is an error term. Since the distribution of p_{jt} is highly skewed, it is log transformed.

In equation (3), we predict that $\beta_1 > 0$ and $\beta_2 < 0$ in both the case of the social planner's problem with incomplete income transfers and in the case of a noncooperative dynamic game with a credible threat by the low-income group. It is important to control the average level of community income (that is, the poverty level), as we have to examine the impacts of a mean-preserving spread of income distribution within the community.

[15] In the future, it will be necessary to check the robustness of our findings on the income inequality effects, with Gini coefficients, 90/10, and 75/25 ratios. It is known that standard deviation is sensitive to extremely large values (outliers).

An identification problem arises if unobserved heterogeneity in the school fee is correlated with income distribution in the community. First, it is important to remember that schools do not change locations in general. Unless the government rebuilds or integrates schools, they stay in the same place. Therefore, in contrast to individual earning equations, we assume that school relocation will lead to correlations between unobserved components and the community income distribution.

Second, however, it is quite plausible that households may move from one place to another looking for better educational opportunities or choose to send their children to school in other communities. In these cases, the nature of endogenous income distribution depends on who moves.

In the case of household movement, it is natural to conjecture that parents who desire to increase their access to better schools may move into well-off communities or neighborhoods. Where relatively poor households move to new schools, a greater unexplained component in school fee variations correlates with lower incomes. This type of household mobility lowers the average income and increases income inequality within a community. A good example is household movement from rural to urban areas, which is prevalent in South Africa today. However, this endogeneity leads to an upward bias in the effect of income inequality on the school fee, and therefore the negative effect of income inequality is robust to this type of endogenous household mobility. Similarly, the direction of bias in the effect on average income would be downward since the inflow of households decreases the mean income in the community. A positive effect of the average income would be a lower bound.

In South Africa, high-quality schools that charge relatively high school fees are located in well-off communities as a result of the apartheid segregation policy before 1994 (see Yamauchi 2004 for some evidence on geographical clustering).[16] This

[16] Casual observation also tells us that rich households, for example, whites, stay in their well-off residential areas, while relatively poor households move into the communities or neighborhoods from rural areas or historically disadvantaged residential areas (townships). Some exceptions are centers of large cities such as Johannesburg where the center has relocated to the new suburbs.

historical initial condition limits the possibility that rich households move to well-off communities to access high-quality schools.

The possibility of commuting to schools outside the community creates a different type of endogeneity problem. In contrast to household movements, this does not change income distribution. Therefore, as long as we restrict our focus in the estimation of equation (3), we do not face bias in parameter estimates. However, a problem arises in our interpretation of the parameter estimates of interest.

For example, relatively rich households in the community can send their children to private schools outside the community, while children from the relatively poorer households in the community attend local public schools.[17] In this case, since we control the average income level, it is easy to obtain the negative effect of income inequality on the school fee. In our setting, we have no means to control this effect, as it is impossible to identify the households who send their children outside the community or to determine where the children are sent.

From the viewpoint of the hosting community, this means that children from relatively poor households outside the community attend local schools, which implies that the school fee is likely to be decreased as a result of this pressure. In this case, changes in the school fee attributed to such pressure can be treated as shocks in our empirical framework. However, this shock component is negatively correlated with the average income, since higher community income levels coupled with high-quality schools attract children from relatively poor households outside the community. A positive effect of the average income, as we hypothesized, is robust to this bias.

We do not know the magnitude of the potential bias, which depends on how likely it is that short-run school fee shocks or unobservable fixed factors will induce household mobility and child commuting. In the analysis that covers the whole country of South Africa, we control for subplace characteristics such as the unemployment rate, population density, proportions of black and white populations, and settlement type distributions, in

[17] This situation is possible in the post-apartheid regime, as those who gain economic opportunities among the historically disadvantaged group can send their children to schools formerly restricted to whites.

addition to mean and standard deviations of the subplace income distribution. Since household mobility is important in urban areas, these factors can mitigate the effects of endogenous sorting. In the analysis of KwaZulu Natal, however, since the sample clusters are mostly from rural areas, this problem is less serious. The endogeneity of income distribution is not a serious problem.[18]

To check robustness of the key prediction, we use as a dependent variable not only school fees but also total revenue per learner, donations per learner, and funds raised per learner with the same specifications used in the school fee equation, using a provincial data set that covers 67 clusters. While school fees are collected from households, the other revenue measures do not necessarily accrue to households but reflect other revenue opportunities for schools. Evidence from these indicators will supplement the main analysis of school fee determination.

In the analysis of KwaZulu Natal, we assess school quality function, by estimating the following school production functions:

$$\Delta y_{jk} = \gamma_0 + \gamma_1 \ln p_{jkt} + \gamma_2 \ln g_{jkt} + z_{jk}\zeta' + \Delta\xi_j, \tag{4a}$$

and

$$\begin{aligned} \Delta Y_{jk} = \gamma_0 + \gamma_1 \ln p_{jkt} + \gamma_2 \ln g_{jkt} + \gamma_3 \Delta L_{jk} \\ + \gamma_4 \ln p_{jkt}\Delta L_{jk} + \gamma_5 \ln g_{jkt}\Delta L_{jk} + z_{jk}\zeta' + \Delta\xi_j, \end{aligned} \tag{4b}$$

where Δ is the difference operator, Y_{jk} is the number of educators , L_{jk} is the number of learners, y_{ik} is the learner-educator ratio, and g_{jkt} is the per-learner subsidy from the government.

As discussed below, the learner-educator ratio is a measure of school quality. However, we also admit that this measure can only partially capture overall school quality, which is supplemented by other measures such as teaching facilities (classroom conditions, such as the availability of desks and blackboard), quality of school

[18] The government changed the boundary definition for subplace, a geographical unit that we use in the analysis, between the Census of 1996 and the Census of 2001. Therefore, panel analysis is infeasible.

administration, and so forth. We constructed the learner-educator ratio from two school censuses in 1996 and 2000, which focus on school facilities.[19] Since the government subsidy allocation in principle did not change before 2000, we assume that the subsidy reported for 2000 basically applies to the period before 2000. Here z_{jk} includes former department indicators.

We also test whether a change in the number of learners induces change in the number of educators who are privately employed in the community. To supplement the limited number of subsidized educators, community members can collect school fees and employ educators privately.

In equation (4), if the government subsidizes disadvantaged schools more (that is, the schools that have fewer educators relative to the number of learners), potential bias in γ_2 would be upward since differences ξ_{jt} are positively correlated with the per-learner subsidy g_{jkt}. On the other hand, if the government subsidy allocation increases inequality in the number of educators, we would expect a downward bias in the estimate. However, since fixed unobservables are already differenced out, the systematic component of endogenous subsidy allocation has no impact on our estimates.

Finally, how the subsidy per learner is determined is also of interest to us in the empirical analysis. Though one possible way to eliminate the bias mentioned above is to use instruments for g_{jkt}, we lack identifying instruments in the available data. Therefore, we simply examine the effects of the school fee, the initial learner-educator ratio, former departments, and the fixed effects of school type and location.

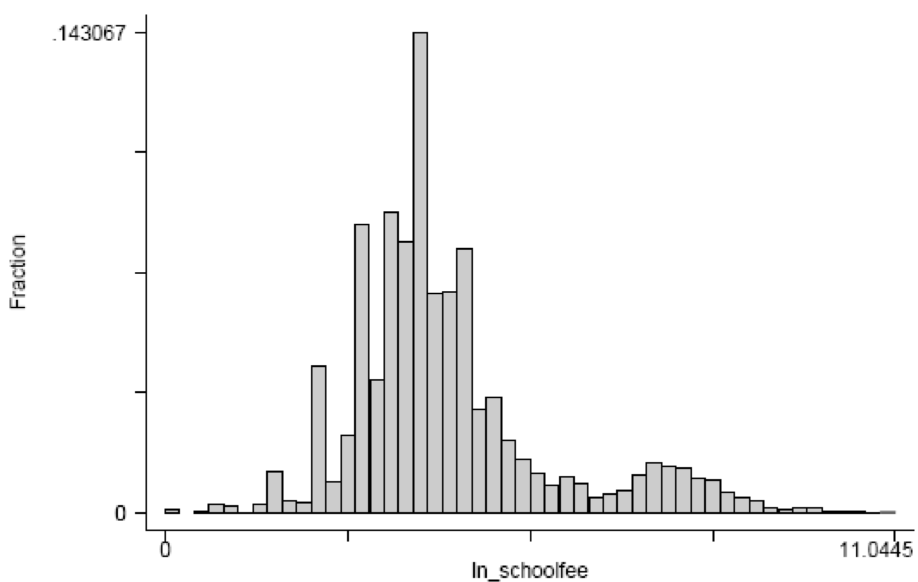
4. Data

The data for this research come from several sources in South Africa. In the first set of analyses, which covers South Africa as a whole, the Census 2001 community

[19] Since measurement errors are reported in the number of learners in Annual School Surveys, we decided to use the 1996 and 2000 School Registers of Needs. The latter has a simplified questionnaire structure focusing on school facility information. Therefore, they are likely to have fewer measurement errors.

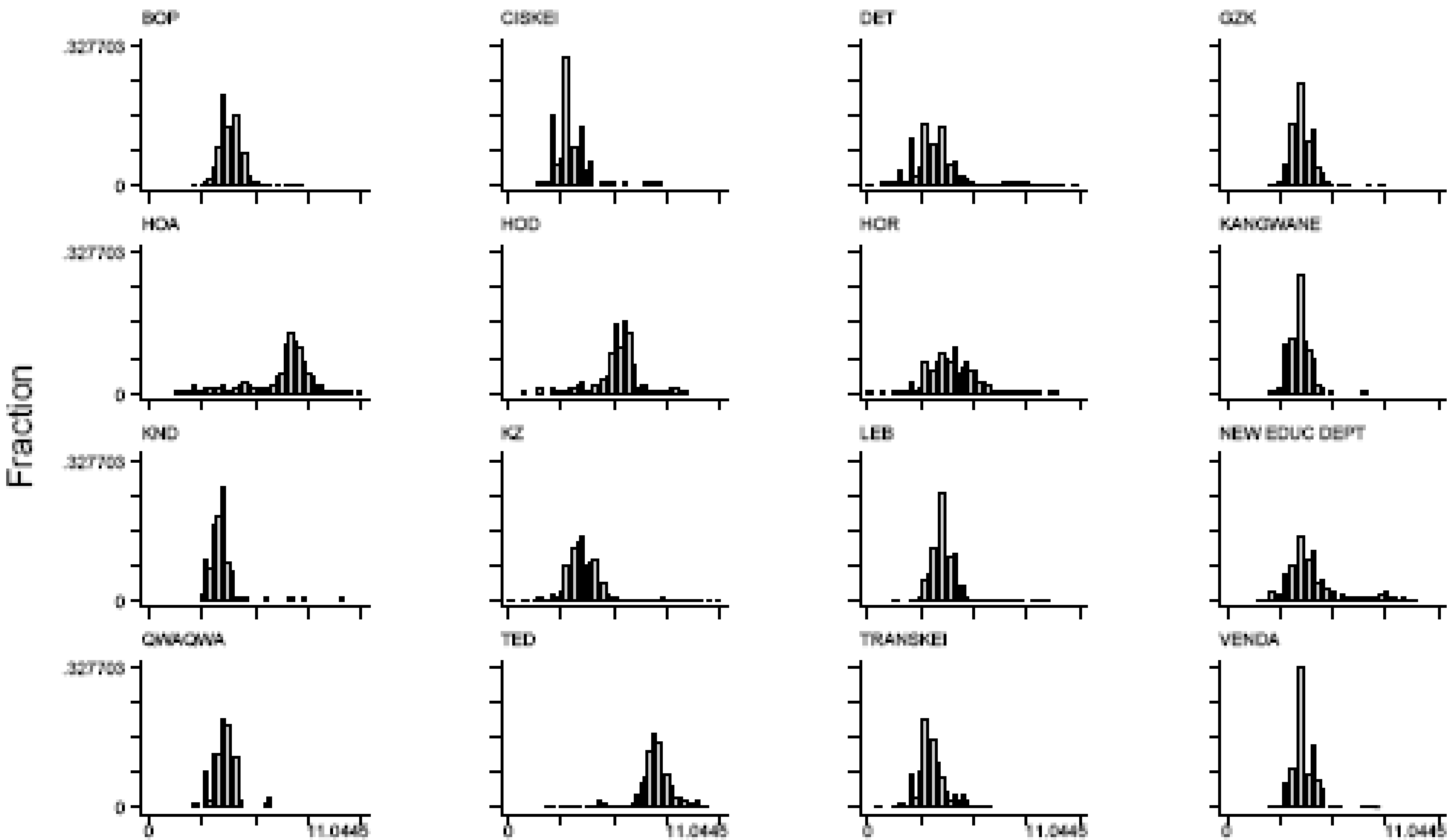
profile database from Statistics South Africa (Stats SA) provides the distribution of socioeconomic characteristics such as household income and population group compositions. The Annual School Survey 2002 from the National Department of Education (DOE) provides the data on school fees charged in 2001. By merging these data, therefore, we can determine the school fee in 2001 for the country as a whole.[20] Figure 1 shows the distribution of public school fees. It is interesting to note that the distribution is bimodal. Figure 2 shows the distribution by the former apartheid-government departments. Formerly non-African schools, including Whites, Coloured, and Indian, have higher school fees than formerly African schools, suggesting that we have to control for the effects of former departments. This also implies that, given the current residential clustering, community characteristics are correlated with school fees.

Figure 1—Distribution of the log of annual school fees, South Africa



[20] School Census 2002 does not provide the details of school financial conditions used in this analysis, however.

Figure 2—Log of annual school fees, by former apartheid-government departments



Notes: BOP: African—Bophuthatswana Education Department; CISKEI: African—Ciskei Education Department; DET: African—Department of Education and Training; GZK: African—Gazankulu Department of Education; HOA: White—Department of Education and Culture: House of Assembly; HOD: Indian—Department of Education and Culture: House of Delegates; HOR: Coloured—Department of Education and Culture: House of Representatives; KaNGWANE: African—KaNgwane Department of Education; KND: African—KwaNdebele Department of Education; KZ: African—KwaZulu Department of Education and Culture; LEB: African—Lebowa Department of Education; NEW EDUC DEPT: all races—Schools established after 1994, New Education Department; QWAQWA: African—QwaQwa Department of Education; TED: White—Transvaal Education Department; TRANSKEI: African—Transkei Education Department; VENDA: African—Venda Education Department.

In this analysis, subplace in the South African Census 2001 is used as the geographical unit. GIS information enables us to identify schools in each subplace (Stats SA, GIS). We restrict the analysis to subplaces with a population density of more than 10 persons per square kilometer and area smaller than 500 square kilometers to exclude nonresidential and farm areas.

In the second set of analyses, we use school and community information from the province of KwaZulu Natal. School information comes from the Annual School Survey 1999 (DOE) and the KwaZulu Natal Department of Education's Norms and Standards database (KZN DOE), while community information comes from the 1998 KwaZulu Natal Income Dynamics Study [KIDS-2, by the International Food Policy Research Institute (IFPRI)], which covers a random sample of households in 67 clusters in the province of KwaZulu Natal.[21] One advantage of this particular combination is that we have details of school financial conditions from the Annual School Survey 1999. However, since nation-wide household surveys that can be matched with school information by GIS were not conducted in 1998, we cannot cover the country as a whole. The 1999 school survey also collects information on the functioning of the schools' governing bodies, including frequency of meetings, composition, and agenda discussed in 1998. We identify schools within and near the clusters based on school lists provided in the KIDS-2 community survey. These schools do not necessarily pertain to schools inside the communities; nearby schools to which children could possibly commute are included.

To supplement the second set of analyses, information on school fees in 1999 to 2000 was also obtained from the KZN DOE. In the province of KwaZulu Natal,

[21] These household data pertain only to the province of KwaZulu Natal. The KwaZulu Natal Income Dynamics Study 1998 (KIDS-2) is based on the SALDRU 1993 data set, which probabilistically covered the whole of South Africa in 1993. The follow-up survey, which was conducted in 1998, covered only KwaZulu Natal. We use data from the 1998 survey to construct community characteristics. The 1993 survey was population weighted representative of the province, based on the 1991 census. In the 1998 follow-up survey, some clusters were dropped either because the rejection rate from the white population was quite high, or because interviews were unsafe in some locations. The 1998 household survey provides detailed information on household activities.

therefore, we can track dynamic changes in the school fee to check robustness of the main findings.

To assess school quality, we use different data sets. The School Register of Needs 1996 and 2000 obtained from the KZN DOE focus on school facility information, so that they are suitable to compute changes in learner-educator ratios and the number of educators from 1996 to 2000. In this analysis, we use information on school fees and government funding as key explanatory factors. Since the latter data are only available for the province of KwaZulu Natal, we restrict our analysis to that province.

Data on government subsidies are also received from the KZN DOE Norms and Standards database. Currently a funding reform is under way in the South African public education system, which attempts to allocate more funding to poor schools and communities on the basis of a poverty ranking of schools and areas in each province. We use the information on actual funding during the period of January to March 2000—before the implementation of the funding reform—so that we can assume that it represents the status quo in the period before 2000.

5. Empirical Results

School Fee and Community Income Distribution

This section summarizes estimation results. We first present the results for the whole country of South Africa, based on the information on school fees and subplace-level characteristics in 2001. Table 1 reports the effects of the subplace-level income distribution on the log of the annual school fee. Column 1 includes mean and standard deviations of household income in addition to school type and district fixed effects. The Census 2001 community profile database only produces the number of households (or individuals) in each income range, so a median estimate from the data would have excessively small variations across subplaces. For this reason, we use mean income in Table 1. The sample used in the estimation consists of subplaces that have population densities larger than 10 persons per squared kilometer and areas of smaller than 500 square kilometers. In this benchmark specification, the mean and standard deviations have positive and negative effects, respectively, on the school fee, consistent with the predictions in Section 2.

Table 1—Effects of income distribution on school fees, South Africa 2001

Dependent: Log of annual school fee	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Mean household income	0.00002	0.00001	7.55E-06	5.02E-06	4.95E-06	4.88E-06
	(21.29)	(12.60)	(9.19)	(6.32)	(5.88)	(6.06)
Standard household income	-2.63E-06	-1.24E-06	-7.84E-07	-4.32E-07	-4.66E-07	-4.01E-07
	(11.03)	(6.82)	(4.47)	(2.57)	(2.55)	(2.34)
Unemployment rate			-0.4263	-0.2939	-0.3990	-0.3223
			(9.50)	(7.54)	(8.57)	(8.21)
Population density			-0.00002	-5.18E-06	-7.25E-06	-5.67E-06
			(3.06)	(1.08)	(1.40)	(1.15)
Proportion African				-0.5023	-0.6102	-0.5540
				(5.88)	(6.31)	(6.16)
Proportion Whites				0.4936	0.5703	0.5344
				(4.24)	(4.44)	(4.47)
Settlement type %			Yes	Yes	Yes	Yes
Former department fixed effects		Yes	Yes	Yes	Yes	Yes
School type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Persons per square kilometer	>10	>10	>10	>10	>100	>10
Area (square kilometer)	<500	<500	<500	<500	<500	<50
R-squared	0.6153	0.7138	0.7249	0.7300	0.7472	0.7392
Number of observations	14,204	14,204	14,174	14,174	12,059	13,464

Notes: Numbers in parentheses are absolute t values, using robust standard errors with subplace clusters. Settlement type percentages include those of urban, informal, industrial, institutional, and hostel, leaving others as omitted.

In Column 2, the indicators of former education departments are included to control the historically persistent tendency in school fee gaps across different population groups. The main results of the income distribution effects remain robust to these controls.

Columns 3 and 4 include other socioeconomic factors specific to subplace. In Column 3, the unemployment rate, population density, and the percentages of different settlement types (urban, informal, industrial, institutional, and hostel) are included. While an increase in either the unemployment rate or population density or both decreases the school fee, the parameter estimates of our interest remain significant and consistent with our predictions. In addition, Column 4 includes the proportion of the African and white populations that control the effects of population compositions. An increase in the white population increases the school fee, while an increase in the African population decreases the fee. Again, the key results are significant in all specifications.

As mentioned, we restrict our sample to the subplaces with population density larger than 10 persons per square kilometer and areas smaller than 500 square kilometers. In preliminary analyses, different criteria were also tested to investigate the robustness of the main results. In Columns 5 and 6, which use alternative criteria, we also obtain quite similar parameter estimates, which implies that our results are not derived spuriously from the inclusion of too sparsely populated nonresidential areas.

Table 2 reports results on school fee determination, based on the merged community and school sample from the province of KwaZulu Natal. Factors of interest are community income distribution characteristics: median and standard deviation.[22] In order to check robustness, the logs of annual school fees are taken from 1998 to 2000. To control unobserved heterogeneity specific to locations, we use educational circuit fixed effects. A circuit is a smaller administrative unit than a magisterial district at the provincial department level. School types (primary, secondary, and combined) and location fixed effects are included to control school-type specific unobserved factors that differ across circuits. In the estimation, observations with extremely large values of school fees and community-income standard deviations are excluded from the sample.[23]

[22] In preliminary analysis, we also confirmed that basic results remain robust with mean income, rather than median income. However, median income provides slightly higher t-values and better overall fit than mean income does.

[23] The sample also pertains only to schools under KwaZulu Natal government ownership. In some exceptional cases, this includes private schools.

Table 2—School fees and revenue, KwaZulu Natal Province

	Log annual school fee			Total revenue per learner	Proportion school fee in total revenue	Fund-raising per learner	Donations per learner	SGB meeting more than a month
	1998	1999	2000					
Dependent variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Monthly household income 1998								
Median	0.00017	0.00017	0.00015	0.0131	-3.26E-06	0.0036	-0.0002	0.0002
	(4.84)	(6.53)	(8.20)	(3.78)	(0.19)	(5.06)	(1.15)	(1.34)
Standard deviation	-0.00006	-0.00008	-0.00008	-0.0069	0.00001	-0.0016	-0.0003	-0.00007
	(3.37)	(18.25)	(12.00)	(8.08)	(5.74)	(20.51)	(7.80)	(2.93)
School type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Circuit fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.7745	0.8081	0.8787	0.6823	0.3666	0.5243	0.2106	0.1187
Number of observations	309	319	323	309	294	310	310	213

Notes: The numbers in parentheses are absolute t-values, based on Huber robust standard errors with KIDS-2 clusters. SGB is school governing body.

In Columns 1 to 3, median monthly household income in 1998 has a significant and positive effect on the log annual school fees in all years, which is consistent with voting and social planner hypotheses. More interestingly, standard deviation, which measures income inequality within a community, has a significant negative effect on school fees. Therefore, the determination of the school fee is sensitive to the low end of community income distribution. This result either supports a noncooperative game in which the poor gain bargaining power against the rich to push down the school fee or altruistic behavior among community members favors the poor.

In Columns 4 to 7, we expand definitions of revenue to income categories other than school fee. Column 4 shows the total per-learner revenues, including various fund-raising, donations, and other income-generating activities, in addition to school fees collected from parents. The previous results continue to be robust here. The total per-learner revenue increases as median income increases, while it decreases as standard deviation increases. In Column 5, which shows the proportion of the school fee in the total revenue, we find that income inequality increases the dependence of school financing on school fees. Columns 6 and 7 show the determinants of per-learner fund-raising and donations. Although school fees are charged to families who send children to school, fund-raising and donations are open to outsiders. Fund-raising and donations seem to originate mainly from inside communities, that is, festivals and charity affairs are organized in the community, and local businesses are asked for donations, and so forth. Consistently, an increase in median income raises revenue, while an increase in the standard deviation decreases revenue. In unequal communities, those where income inequality is pronounced, it appears that income generation becomes difficult at the community level either because collaboration among community members is difficult or because donors are limited to a small number of relatively rich people in the community.

Column 8 shows the probit result on whether or not the school governing body holds meetings more than once a month. Interestingly, income inequality within a community reduces the frequency of meetings. This result suggests that in unequal communities, it is difficult for members to cooperate to make collective decisions.

In Appendix 2, Table 4, we report the determinants of the proportion of fees unpaid with and without a log of school fee on the right-hand side. Nonpayment could be due to official exemption or simply postponement of the fee payment. In Column 1, neither median nor standard deviation of community income has a significant effect on the exemption rate. In Column 2, the log of school fee has a significant positive effect on the nonpayment proportion. To further control local heterogeneity, Column 3 includes the interaction terms of school type and circuit indicators. First, it is found that standard deviation of community income significantly increases the unpaid proportion. Since the median income is controlled (insignificant), the result implies that those who cannot pay are in the lower tail of the income distribution. Second, an increase in the school fee increases the proportion of those who cannot afford to pay. As discussed, the estimated effect on the school fee is likely to be biased downward, so the positive sign indicates that the true effect is even larger.

School Quality and Financial Conditions

Table 3 summarizes estimation results on school quality determination. School quality is measured by the learner-educator ratio (LER) and the sensitivity of the number of educators to changes in the number of learners, which we construct from the School Register of Needs (SRN) 1996 and 2000. An increase in LER means a decrease in school quality. As Case and Yogo (1999) show, LER had significant effects on the rate of returns to schooling in South Africa during the apartheid regime. Qualified empirical analyses found some significant causal effects on the educational achievement such as test scores (for example, Angrist and Lavy 1999; Card and Krueger 1996; Case and Deaton 1999; Dustman, Rajah, and Soest 2003; Hoxby 2000; Krueger 1999), though the literature in general reaches mixed conclusions (Hanushek 1998).[24] Yamauchi (2005b) shows that changes in the number of educators in response to changes in the number of learners are larger in formerly non-black (non-African) schools than in formerly black schools in post-apartheid South Africa, which indicates that many formerly black schools are liquidity constrained.

In the education function that we estimate, inputs are (log transformed) school fees and per-learner funding from the government. As discussed in previous sections, the school fee in 1998 is taken from the Annual School Survey 1999. School funding information comes from the KwaZulu Natal Department of Education.

Columns 1 to 3 use school fees in different years. The dependent variables are changes in LER from 1996 to 2000. Former population group, school type, and circuit indicators are controlled. Parameters of interest are those on school fee and per-learner funding. In these columns, the effects of these revenue conditions are significant and negative. Thus, the better the school financial situation, the better the school's quality. In a preliminary analysis, log school fee in 2000 was included, but its effect on the dynamic change in LER from 1996 to 2000 was insignificant. Column 3 uses per-learner

[24] The difficulty in identifying the causality arises from potential endogeneity in the number of learners and unobserved fixed components specific to school and community, which are likely correlated with school inputs. For example, Lazear (2001) argues that the effect of LER on student achievement could be empirically ambiguous because of (often unobserved) heterogeneity in students' quality, that is discipline. In his model, the optimal size of class (that is, LER) increases if students' discipline improves, since the probability of disruption in a classroom decreases. To avoid such a correlation between LER and unobservables, recent studies use exogenous variations (changes) in LER and class size to identify the effect on student achievement.

total revenue (excluding government funding), which also has a significant and negative effect on the LER.

Table 3—Learner-educator ratio and government subsidy

Dependent variable	Change in learner educator ratio 1996 to 2000 (1)	(2)	(3)	Change in nonsubsidized educators 1996 to 2000 (4)	(5)	Log per-learner government funding January to March 2000 (6)
Log school fee 1998	-0.4204			0.6870	0.7249	-0.1061
	(1.76)			(8.25)	(8.48)	(11.73)
Log school fee 1999		-0.6994				
		(2.31)				
Log per-learner total revenue 1998			-0.5481			
			(1.91)			
Log per-learner government funding (January 01, 2000 – March 31, 2000)	-8.2887	-8.2919	-7.8244	-0.3378	-0.3341	
	(10.22)	(10.35)	(9.52)	(3.92)	(3.68)	
Change in learner size				0.00035	-0.0034	
				(2.19)	(1.00)	
Change in learner size * log fee 1998					0.0013	
					(2.75)	
Change in learner size * log funding 2000					-0.00048	
					(0.92)	
Learner-educator ratio 1996						0.0021
						(2.92)
School type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Former department fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Circuit fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.1622	0.1315	0.1588	0.4432	0.4569	0.6085
Number of observations	3,933	3,947	3,951	4,011	4,011	3,933

Notes: The numbers in parentheses are absolute t-values based on Huber standard errors with circuit clusters. The sample has schools with positive numbers of educators and learners in both 1996 and 2000, classrooms in 1996 recorded in the School Register of Needs and funded or aided from the government.

In Columns 4 and 5, we test how school financing can change the number of privately employed educators (nonsubsidized educators), controlling changes in learner size. First, an increase in learner size increases the number of those educators. Second, the log of school fee 1998 increases the number of nonsubsidized educators, while the government funding decreases the change. Third, most interestingly, the interaction term of the log school fee and the change in the number of learners both show a significant positive effect, which implies that with a higher school fee (ability to pay for schooling in the community), an increase in the number of learners can be accommodated by an increase in privately paid educators. These results are consistent with the prediction that communities that are capable of paying for schooling investments will increase the quality of education for the next generation with their own resources.

In the last column, per-learner funding is regressed on the 1998 school fee and 1996 LER with fixed effects of former population groups, school types, and circuits. The estimate shows that in 2000, the initially less-endowed schools (and also areas) were likely to receive more funding from the government.

6. Simulations: Inequality Is Harmful to Human Capital Investment

In this section, we attempt to assess the effects of income inequality on the quality of education, measured by the school fee, as a proxy for the community's ability to pay for schooling investments. For this purpose, the following experiment is conducted, given the estimated parameters in the school fee determination equations, derived from the Census 2001 information. Since our purpose is to see the impact of a reduction of income inequality, the mean of household income in the community is kept constant. Maintaining the mean in each community means that aggregate income is kept constant, so that changes arising from the experiments conducted below are redistributional within each community.

Let us summarize the distribution of within-subplace mean (Figure 3) and standard deviations of household income (Figure 4). Both are skewed, with the mean being larger than the median. Figure 5 demonstrates the relationship between the mean and standard deviation. It shows that, on average in the country, the level and inequality of household income are positively correlated, so that as average income increases, inequality is also likely to increase but with the variations across subplaces increasing as well. Given a certain level of community mean income, we observe quite large heterogeneity in the within-community income inequality. We compare equally endowed communities with similar average incomes but with intracommunity distributions being different, in order to see the change in school fee in response to moving from the very unequal (located in the top of the band in Figure 5) to equal distributions (located in the bottom of the band).

Figure 3—Distribution of mean household income, by subplace

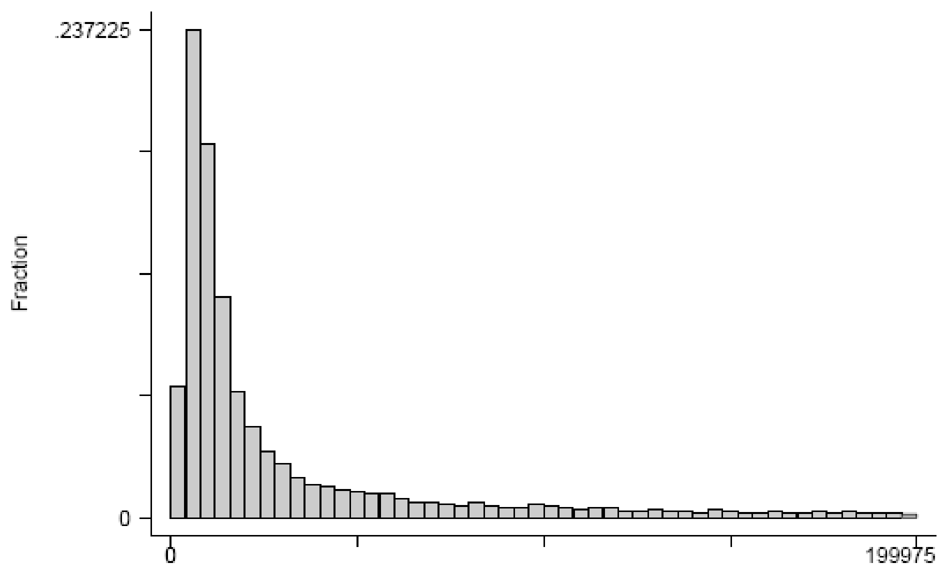


Figure 4—Distribution of standard deviations of household income, by subplace

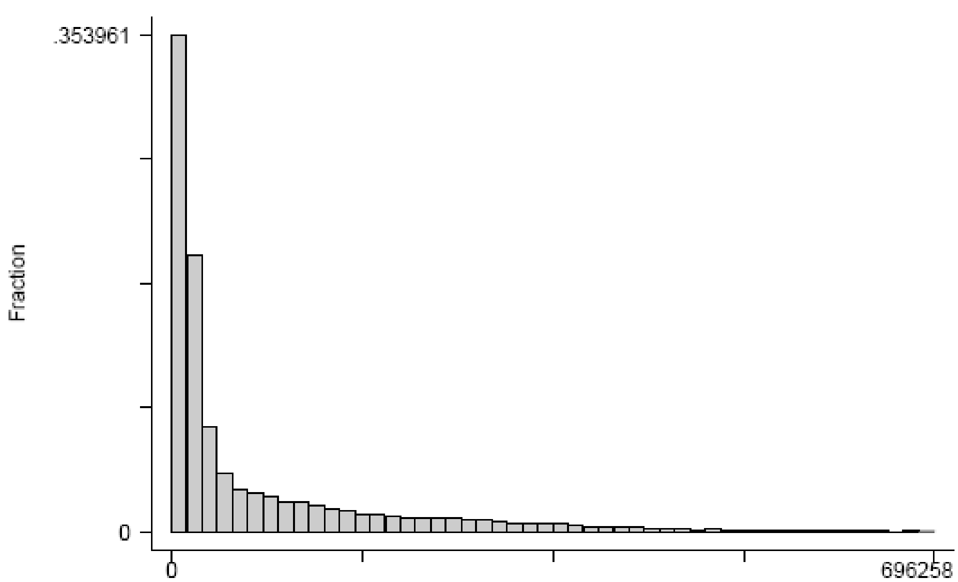
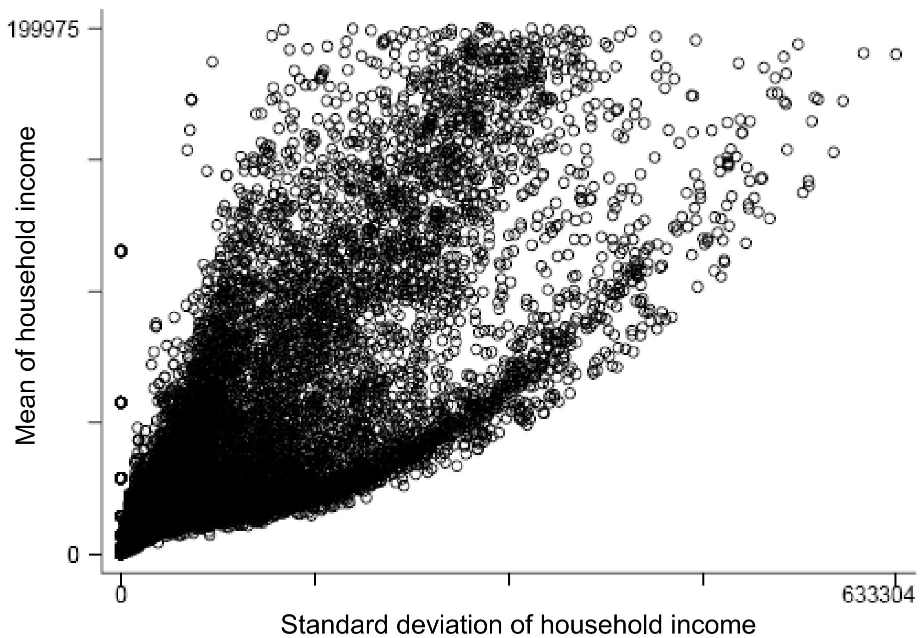


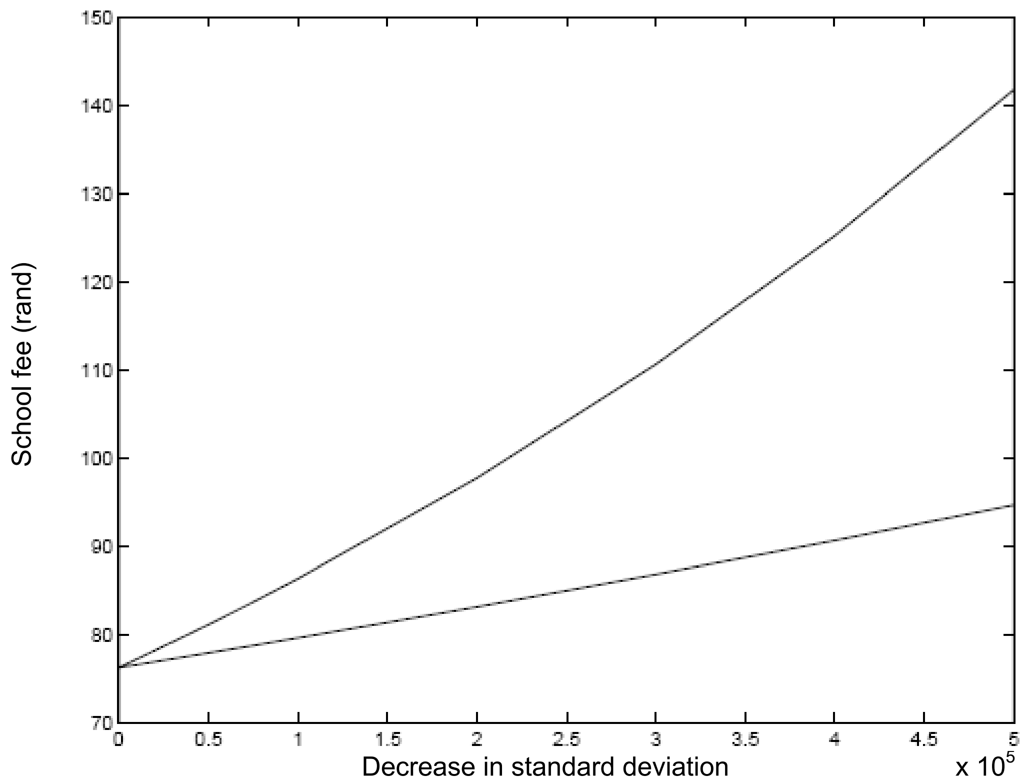
Figure 5—Mean versus standard deviations of household income, by subplace



We use two different parameter values from Table 1 to quantify the effects of a decrease in income standard deviations on school fee. A set of parameters is taken from the column-2 specification with former department, school type, and district fixed effects being controlled but not including settlement type distributions. Another parameter set is taken from the column 4 specification, which controls settlement type distributions and the proportions of white and black residents, in addition to former department, school type, and district fixed effects. The former provides an aggressive estimate, while the latter provides a conservative estimate of the distributional effect on log school fee.

Figure 6 shows the simulation results. The sample average of log school fee is used as the initial point when intracommunity distribution is perfectly equal. The standard deviations range from zero to $5*10^5$ so that it roughly corresponds to the horizontal width of the band at the mean income $2*10^5$. The result is converted to the school fee in rand. Although results differ between the two specifications, we may conclude that a substantial change in school fee happens when income inequality is decreased to zero (keeping the mean). For instance, the reduction of $4*10^5$ rand, corresponding to the mean of nearly 10^5 rand in Figure 3, will bring about a change in the school fee from 76 to 109 rand (using the average of the two parameter estimates). Remember again that in this experiment, we do not have to change the aggregate income level in the country and involve intercommunity income redistributions, but we must keep the mean income in each community. An interesting and very strong implication is that we may increase the quality of education by adjusting the intracommunity income distribution.

Figure 6—Gain from within-community inequality reduction: Mean-preserving experience



7. Conclusions

In this paper, we examine how local income distribution affects a community's capability of improving school quality by increasing the school fee, using evidence from

South Africa. The empirical results show two important paths. First, both school fees and government subsidies determine the learner-educator ratio. The capability of a community to afford a higher school fee thus enhances human capital and income opportunities for the next generation.

Second, we also find that while, at the community level, a higher average household income increases the school fee, income inequality decreases the school fee. In the context of South Africa, the school governing body, which consists of community leaders, educators, and parents, tends to lower the school fee if income distribution is unequal. That is, they listen to the low-income households, who are more likely to face liquidity constraints than high-income households. This empirical regularity is consistent with the strategic behavior of low-income groups who do not pay school fees in full and the Pareto optimal school fee determination in which some income is transferred to low-income groups (as discussed in Appendix 1).

Whether community leaders coordinate interests or community members behave strategically, the negative effect of income inequality on school fees has the same long-term implications for income dynamics. The lower tail of income distribution pulls down school fees, and it also affects the average quality of education for the next generation. Therefore, the local income distribution of the parents' generation (aside from parents' own resources) indirectly influences the income opportunities of the next generation. Policy interventions are needed to stop this vicious cycle. For instance, government subsidies must be increased to those schools and communities trapped in situations where they cannot collect sufficient school fees, a policy that South Africa has recently implemented. It is also desirable to have reliable macroeconomic and dynamic projections on what consequences this subsidy allocation reform will bring to a society that historically has suffered enormous inequality and inequity. To answer these questions, however, is beyond the scope of this paper.

Appendix 1

First, we examine Pareto optimal allocation with interhousehold income transfers τ_i in a simple framework.[25] Assume that a community leader decides the school fee p to maximize the sum of utilities subject to two community-level constraints and one household-level constraint: (1) resource feasibility constraint $Np \leq \sum_i y_i$, ; (2) income transfer constraint $\sum_i \tau_i \leq 0$, where τ_i is a net transfer that household i receives; and (3) $\tau_i \leq \theta p$, where $\theta \leq 1$, that is, income transfer (payment postponement or exemption) is smaller than a certain proportion of the school fee. The Pareto programming with corresponding Lagrange multipliers is

$$\max_{p,\{\tau_i\}_{i=1}^N} L = \sum_i \left\{ u\left(y_i - p + \tau_i\right) + \beta v\left[q(p)\right] \right\}$$
$$+ \lambda\left[\sum_i y_i - Np\right]$$
$$+ \eta\left[-\sum_i \tau_i\right] + \sum_i \mu_i\left[\theta p - \tau_i\right].$$

From the first order conditions,

$$\sum_i \left\{ -u'\left(c_i^1\right) + \beta q'\left(p\right) v'\left(c_i^2\right) + \theta \mu_i \right\} = \lambda N$$
$$u'\left(c_i^1\right) - \eta - \mu_i = 0 \text{ for all } i$$
$$\mu_i = 0 \text{ if } \tau_i < \theta p$$
$$\mu_i > 0 \text{ if } \tau_i = \theta p,$$

and knowing $\lambda = 0$ at the optimum, we obtain

[25] Nontechnical readers can refer to any microeconomics textbooks on Pareto optimality.

$$q^{'}\left(p^{**}\right)=\frac{\eta+(1-\theta)\frac{1}{N}\sum_{i}\mu_{i}}{\beta v^{'}\left(q\left(p^{**}\right)\right)}.$$

Note that when $\theta = 1$, the first period consumption will be equalized with complete transfers, $p^{**}-\tau_i^{*}\left(y_i\right)$. When $\theta < 1$, p^{**} decreases with more binding cases in $\tau_i = \theta p$ (that is, $\mu_I > 0$). Here, the lower tail of income distribution is likely to pull down the optimal school fee. Lagrange multipliers $(\lambda,\eta,\{\mu_i\}$ affect p^{**}. We summarize key results in the following proposition.

Proposition A1:

(1) As the average community income increases, p^{**} increases (as λ decreases).

(2) If $\theta < 1$, a mean preserving spread of community incomes decreases p^{**} (as more μ_i take strictly positive numbers).

Data Sources

Census 2001 Community Profile Database (Statistics South Africa)
Annual School Survey 1999 (National Department of Education)
Annual School Survey 2002 (National Department of Education)
School Register of Needs 1996 (National Department of Education)
School Register of Needs 2000 (National Department of Education)
KwaZulu Natal Income Dynamics Study 1998 (International Food Policy Research Institute)
Norms and Standard Database, KwaZulu Natal Department of Education 1999, 2000 (KwaZulu Natal Department of Education)

Appendix 2 Table

Table 4—Nonpayment of school fees

	Proportion of unpaid fee		
Dependent variable 1998	**(1)**	**(2)**	**(3)**
Monthly household income 1998			
Median	0.00001	0.00003	4.87E
	(0.57)	(1.23)	(0.02)
Standard deviation	-2.59E-06	3.77E-06	0.00001
	(0.64)	(0.49)	(1.99)
Log school fee 1998		0.0984	0.1069
		(2.10)	(1.99)
School type fixed effects	Yes	Yes	yes
Circuit fixed effects	Yes	Yes	Yes
School type * circuit			Yes
R-squared	0.2525	0.2779	0.4787
Number of observations	309	309	309

Note: The numbers in parentheses are absolute t-values based on Huber robust standard errors with KIDS-2 clusters.

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