Demand for Education in China

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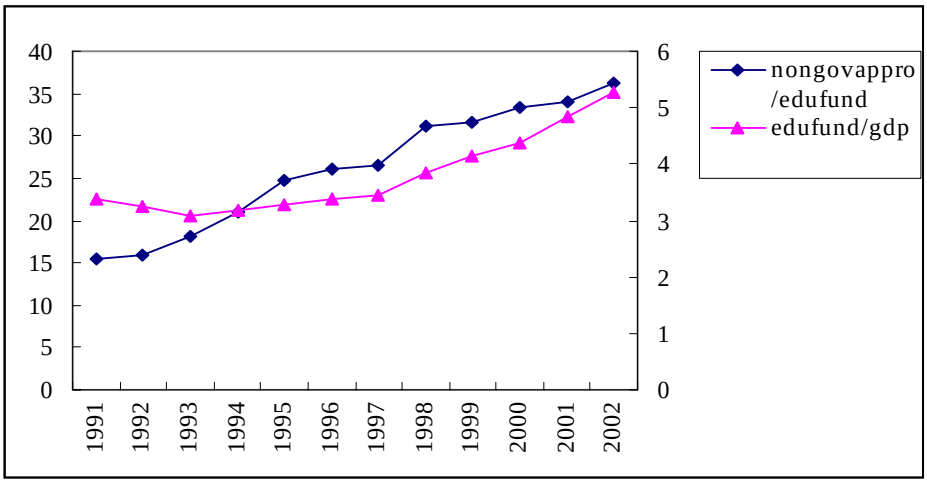
Abstract: After discussing the sources of funding of education in China this paper offers an explanation of the quantitative changes in education spending by the framework of demand analysis, including the changes in the ratio of educational funding to GDP in the period 1991-2002. Income effect is estimated mainly by using cross-provincial data, while time series data are used to estimate the price effect. Changes in government and non-government spending through time can be satisfactorily explained by the factors of demand. Demand for education services in the three levels of primary school, secondary school and higher education and aggregate demand for education services are investigated. Implications of our finding on inequality of education opportunities are briefly stated.

1. Introduction

A very striking fact in China's economic history in the turn of the 21st century is that the ratio of education funding to GDP increased from a mere 3.4 percent in 1997 to 5.2 percent in 2002. Almost as striking is the rapid increase in the share of education funds outside of government appropriation from 24.8 percent in 1995, 31.7 percent in 1999 to 36.3 percent in 2002. Are the increases in these ratios due to changes in government policy or to changes in conditions of demand for education? A main purpose of this paper is to demonstrate that factors affecting demand for education, namely real income and relative price, can explain the increases in these ratios.

Since 1978 China's economy has been transformed step by step from a planned economy to a market economy, as documented in the literature (see Chow, 2002). One aspect of this transformation is from the provision of educational services entirely by government institutions to one that is significantly financed by non-government sources. Figure 1 presents the ratios of educational funds to GDP and of non-government funding for education to total educational funds according to China Statistical Yearbook (SYB) 2004 (Tables 21-31 and 3-1). It shows that the ratio of educational funds to GDP was 3.38 percent in 1991, remained approximately constant until it was 3.40 percent in 1997 and increased steadily to 5.21 percent in 2002. In the mean time, non-government funding as a fraction of total funding for education (defined narrowly as total funding minus "government appropriation" for education, a broader definition being total funding minus "government budgetary" funding) increased steadily from 15.5 percent in 1991 and 24.8 percent in 1995 to 36.3 in 2002. See Figure 1 for these two ratios from 1999 to 2002.

Figure 1 The Ratios of educational funds to GDP
and non-government funding to total education funds



In section 2, we document the institutional transformation of the education system by describing the extent to which private funding of education has increased and exists today. It is often alleged that spending on education in China is the result of government

policy. This statement is subject to two major qualifications. First, to the extent that educational expenditures are a part of total government expenditures, their total amount is limited by economic factors that affect total government revenue. Second, substantial parts of educational expenditures in China are financed by non-government sources that are affected by economic factors. Hence economic factors affect both government and non-government spending on education in China and elsewhere. We take the viewpoint that by 1991 the entry of new private schools has reached an equilibrium (meaning the completion of the initial development stage while new entries still continued) and that we can use the framework of demand analysis to explain the expenditures on education, in the aggregate and by the three levels of education.

Taking the above viewpoint, we use in section 3 a demand function for educational services to explain the quantity of and total expenditure on education in each of the three levels of education. Market forces are found to be capable of explaining the amount of education provided to a large extent. We estimate income elasticity using observations across provinces in China and price elasticity by combining time-series and cross-section data. Both the quantity demanded as measured by school enrollment and total expenditure on education are explained. Government provision of education, though an important part of government policy, is treated as only one component in the demand for education, and its effect on the demand is evaluated. In section 4, the framework of section 3 will be applied to study the aggregate demand for all three levels of education combined, and its two components that are financed by government and non-government sources. In section 5, we comment briefly on the relation of income inequality and inequality in education opportunities in China. Section 6 concludes.

2. The Sources of Funding of Education in China

In 1978, educational services at all levels of schooling were provided by the government. Since economic reform started, non-government schools have sprung up rapidly at all levels (see Chow (2002, pp. 355-6)). This has happened because the government has allowed it, partly to solve its budgetary problem in providing the amount of education desired, and because there was an increase in demand for educational services as income increased. The entry of new schools was quite free. Non-government operated schools can be established and operated by social organizations or by a collection of individuals. Non-government or "people-operated" schools consist of two kinds, those established and operated by non-government institutions and those *public schools* turned over or leased to private operations. In the early 1980s it was easier for a social organization than for a private individual to establish and operate a school because it had land and buildings, financial capital, administrative personal and other forms of human capital, a legal status as well as social connections that were beneficial to the establishment and operation of a school. Defined broadly social organizations included all institutions other than government departments and government operated educational institutions. As the economy grew private citizens accumulated financial and other resources and began individually and collectively to establish schools at all levels. Often these non-government operated schools received help in the form of land and capital from local

governments that wished to improve the education of their own community.

The development of a free market of education accelerated with Deng Xiaoping's southern expedition in 1992 in which the paramount leader of China declared a policy of further opening of the Chinese economy to the outside world and urged the Chinese people to adopt market institutions to promote economic growth. This policy further encouraged the establishment of non-government financed educational institutions. Private funding for education also increased because government educational institutions began to collect more fees and tuitions. Thus "private funding" includes funding of the above two kinds of non-government operated schools and of government operated schools in the form of tuition and fees. The Chinese government encourages social organizations and private citizens to operate and finance schools at all levels, as stated in the 9th Five-year Plan for 1995-2000 (section 2 of Chapter 5) and in the 10th Five-year Plan for 2001-2005 (section 1 of Chapter 11 on the development of education). It has also increased the levy of tuition and fees in government-operated schools.

It is the policy of the central government to assign the responsibility of providing the compulsory primary school and three years of middle school education to the local governments since it has not been able to finance it. Local governments have to find various ways to supply it, including the collection of fees and tuitions and the assignment of the operation to private citizens in the "people-run" but "government owned" public schools. There are also private schools that are operated by citizens in the name of social organizations or in their own names. Lin (1999, p. 8) states that in 1996 about 4 percent of the schools in China were private and that there were about 70,000 private schools. There were more if we include public schools that were given to private operation and financing. Both types of schools are "run by social forces in China." The *Regulation on Education Run by Social Forces*, a State Council Degree No. 266 signed by Premier Li Peng on July 31, 1997, (see Lin, 1999, pp. 187-88), defines "social forces" as "any organization of enterprises or institutions, any social groups or other social organizations and any individual citizens that establish and run schools and other educational institutions … without using state educational funds (Article 2)," "The government encourages social forces to establish compulsory educational institutions to supplement the state-run compulsory education. (Article 5)."

At the primary school level local governments in many poor villages were not able to finance the six years of compulsory education mandated by the central government and had to resort to the collection of tuitions and fees. At the middle school level the change in central government policy in 1994 to extend compulsory education from 6 to 12 years had a similar effect. At the level of higher education, since the middle 1990s the central government's policy itself was changed to raising the amount of tuition charged to students year after year and encouraging the university staffs to obtain funding themselves by engaging in extra teaching, research and consulting activities as an extension of or outside the university. It also allows public universities to operate financially independent colleges or schools. For instance, a school of business administration of a university can establish a branch that offers a degree in business administration and that is financially independent, possibly charging a higher tuition than

the regular tuition of the university.

To recapitulate, the term "private funding" in China includes funds raised or spent by three types of schools: (1) public schools which are operated by government departments but charge tuition and fees, (2) public schools which are leased for private operation, or parts of which are operated and financed independently, and (3) private or non-government schools. The schools in category (2) include financially independent colleges or schools that are set up by public universities or their affiliated units.

The effect of privately operated schools on the educational system is to increase both the quantity of education services (number of students to be accepted) and the quality of education. The effect on quantity (number of students enrolled) is small in percentage terms, accounting for about 5 percent of total student enrollment. The effect on quality through competition can be substantial. For example a family in Shanghai can choose among several public and private schools for a child. Unlike the public school system in the US, a public school in a Chinese city has to compete with other public schools and private schools. These schools charge different tuitions. Public schools can choose not to accept students below different standards. Some public or private schools are known to be better and more difficult to enter. The market for the provision of educational services is free and competitive in the primary and secondary levels. Even at the university level competition exists because there are many privately operated universities.

Total private funding is substantial as the following statistics show. Data on "educational funds" are provided in *China Statistical Yearbook* 2004 (see Table 21-31). The total funds are divided into "government appropriation for education" (a part of which is "budgetary") and the remaining categories that include "funds of social organizations and citizens for running schools," "donations and fund-raising for running schools," "tuition and miscellaneous fees" and "other educational funds." Since a part of "government appropriation" is non-budgetary and excluded from government expenditures, we can choose to define "non-government" education funding as total funding minus government budgetary funding, as we will later in this paper. The ratio of "educational funds" to GDP was 731.50/21617.8 or 3.38 percent in 1991, decreased to 3.06 percent in 1993, increased only slowly back to 3.40 in 1997 and then increased steadily to 3.76 in 1998, 4.08 in 1999, 4.30 in 2000, 4.77 in 2001 and 5.21 in 2002. From 1998 to 2002, both "government appropriation" and the remainder increased substantially, the former from 2.59 to 3.33 percent and the latter from 1.17 to 1.89 percent of GDP, but the latter increased proportionally more, by 61.5 percent as compared with 28.6 percent for government appropriation. The education funds to GDP ratio of 5.21 percent in 2002 is close to the average percentage of expenditures on educational institutions in 1999 for countries participating in the World Education Index Program and the OECD countries as reported in *Financing Education – Investment and Returns* prepared by UNESCO and OECD, 2002, both being 5.5 percent (See Table 11, p. 183 of the report). In section 4 below we will attempt to explain the change in this percentage by estimating an aggregate demand function for education.

Let us examine more closely the share of non-government funding of education. In 1999,

according to the UNESCO report, Table 13, p. 185, private sources provided 44.7 percent of total "expenditure on education." By contrast, *China Statistical Yearbook 2003* Table 20-35, p. 747, gives (3349.04-2287.18)/3349.04 or 31.71 percent as funding exclusive of government appropriation. Note that the UNESCO report includes as non-government funding "sources of funds for educational institutions after transfer from public sources" in its private sources. "Government appropriation" in *China Statistical Yearbook* may well include such transfers. If we define non-government funding as total funding minus the "budgetary" component of "government appropriation" the ratio of non-government to total funding for education in 1999 would be (3349.04-1815.76)/3349.04 or 45.8 percent, which is close to the UNESCO figure of 44.7 percent. In the remainder of this section we wish to establish three propositions. (1) By official sources, the share of non-government funding in China's education system is substantial. (2) The share has been increasing steadily since 1991. (3) The share is underestimated by official sources.

Propositions (1) and (2) are established simply by the data provided in *SYB* 2004, Table 21-31, p. 804. In 1991, 1995, 1999 and 2002 respectively, total educational funds were 731.5, 1877.95, 3349.04 and 5480.02 while the shares of non-government-appropriation funding were 15.5, 24.8, 31.7 and 36.3 percent respectively, showing both a substantial share and a steady increase in the share. In 1991, 1999 and 2002 respectively, the fractions of non-budgetary to total educational funds in China were 37.2, 45.8 and 43.2. These fractions can be considered as measures of the extent of private funding.

The share of funding by the central government itself is much smaller. *China Statistical Yearbook 2004* Table 21-32 shows that for 2002, of the total educational funds of 54800278 (10000yuan) "budgetary" funds account for 56.8 percent. However, only 3042307/31142383=9.77 percent of total "budgetary" funds are accounted for by the central government (the remaining 90.23 percent by local governments). Funding for all private schools is recorded as a part of non-budgetary funding of the local governments. The percentage of "budgetary" funds from the central government was smaller in 2002 than in 2001. Although its own educational funding is small, the central government directs local governments to pay for education and regulates school fees charged by both local governments and by private schools. Thus the policy of the central government can affect education funding substantially even when its own share is less than 6 percent of the total.

On the proposition (3), official data on private funding of education underestimate its actual amount. These official data in SYB are stated as coming from the Department of Planning and Development of the Ministry of Education, but it is difficult for the Ministry to keep tract of the funding from all private sources. Even a college in a government university of which the first author serves on the Board of Trustees, namely Lingnan (University) College of Sun Yat-sen University in Guangzhou, does not report to the Ministry of Education its very substantial funding from private sources that was used to construct over ten new buildings, to establish an endowment to support research by its faculty and to pay for visiting professors from abroad. An important source of underestimation is contributions from overseas Chinese and Chinese living in Hong Kong. The first author knows of several other specific cases of such funding totaling tens

of millions of US dollars that were not reported, and not required to be reported, to the National Statistical Bureau through the Ministry of Education. As another outside source, organizations such as the Chinese Economists Society and the Overseas Young Chinese Forum both registered in the United States and having several hundred members obtain their own funding to send scholars to lecture in China regularly. All such funding is not reported in Statistical Yearbooks but we have not come up with an accurate estimate of the amount of this underestimation.

3. Demand Analysis of Three Levels of Educational Expenditure in China

For each education level of regular primary school, regular secondary school and regular higher education we assume that the demand function has constant income elasticity and price elasticity. We first estimate the income elasticity *a* by using cross section data for provinces. Time series data will be used to estimate price elasticity *b*. In section 4 we perform a similar analysis for total student enrollment in China. Before we proceed we wish to clarify the concept of demand in the present application of demand analysis. If all schools in China were private and all parents send their children to the private schools the concept of demand for education by Chinese families is clear and we can use real income and relative price as the two major explanatory variables. In the present application governments at all levels both demand and supply education services. On the side of demand we assume that real income and relative price are still the major determining factors as income affects government revenue and the ability to pay and relative price has the substitution effect. The fact that the government, or perhaps another part of it, happens to be the supplier of a part of total educational services does not invalidate the above conceptual framework of demand. As a supplier the government is subject to the constraint of a production function and the costs of the factors of production such as faculty time and services of school building and other education equipments. Once the conceptual framework of demand is clear we still face the problem of simultaneous equation bias if we use a single-equation approach to estimate price and income elasticities. This problem will be discussed later in this section.

Let Q_{ij} denote student enrollment in school level i (i= 1, 2, 3) in province or municipality j and q_{ij} be Q_{ij} divided by the population in province j. Let y_j be real GDP per capita in province j. Let f_{ij} be the funding for education level i in province j (that includes both government and private funding) deflated by the consumer price index of province j and by population in province j. Table 1 provides data for cross-section analysis to estimate income elasticities of demand for the three levels of education. Under the simplifying assumption that the relative price of education is the same for different provinces the income elasticity of demand can be estimated by regressing $\ln f_{ij}$ on $\ln y_j$ because $\ln f_{ij}$ is the sum of $\ln q_{ij}$ and $\ln p_i$ (p_i being the price or cost of education level i) which is a constant to be absorbed in the intercept of the regression. This simplifying assumption can be replaced by the weaker and more reasonable assumption that the relative prices of education may be different across provinces but are uncorrelated with provincial per capita income. Under this assumption the relative price variable would enter the regression of $\ln f_{ij}$ on $\ln y_j$ as an intercept plus a residual term that is added to the residual of the regression. Using data for 2001 for thirty provinces excluding Beijing

(where the central government spends a large amount for higher education), we have estimated the above regression for each education level i and obtained the income elasticities a_i at the three levels to be, with standard errors in parentheses, 1.2913 (0.1738) for "regular institutions" of higher education, 0.8095 (0.0595) for secondary schools and 0.4172 (0.0913) for primary schools. These estimates of income elasticity would be unbiased if the residuals are uncorrelated with provincial income, which seems to be a reasonable assumption. The result indicates that income inequality in different provinces is reflected in inequality in the provision of education and that at the lower levels of education the opportunities of schooling are more equalized among different groups since the income elasticities are lower than for higher levels.

Table 1 Cross Section Data for Estimating Income Elasticities of Demand at 3 Levels of Education

	Total population (10000p)	GDP (0.1billion)	CPI	Fund for high-education (0.1 billion)	Fund for secondary education (0.1 billion)	Fund for primary education (0.1 billion)
Beijing	1383	2845.65	103.1	173.7426	411.8193	279.4691
Tianjin	1004	1840.1	101.2	29.01817	196.5084	138.7214
Hebei	6699	5577.78	100.5	30.91984	568.5589	516.9546
Shanxi	3272	1779.97	99.8	15.42902	282.1993	275.2763
Mongolia	2377	1545.79	100.6	8.9449	198.2006	221.7992
Liaoning	4194	5033.08	100	50.16632	426.9275	357.9219
Jilin	2691	2032.48	101.3	30.00493	252.2105	266.5102
Helongjiang	3811	3561	100.8	43.92138	295.6441	305.5674
Shanghai	1614	4950.84	100	87.9929	573.8752	309.3251
Jiangsu	7355	9511.91	100.8	91.90611	991.0779	839.9106
Zhejiang	4613	6748.15	99.8	56.20513	863.0527	714.5375
Anhui	6328	3290.13	100.5	27.34042	403.2994	435.8699
Fujian	3440	4253.68	98.7	24.77333	429.4111	437.4424
Jiangxi	4186	2175.68	99.5	16.68792	306.6181	308.331
Shandong	9041	9438.31	101.8	49.58235	1002.519	710.7552
Henan	9555	5640.11	100.7	28.44927	644.8469	595.3073
Hubei	5975	4662.28	100.3	67.04464	538.0263	412.0719
Hunan	6596	3983	99.1	40.4015	556.169	490.5896
Guangdong	7783	10647.71	99.3	68.24383	1199.918	1373.49
Guangxi	4788	2231.19	100.6	14.44068	329.8354	406.7171
Hainan	796	545.96	98.5	4.13452	62.1809	76.735
Chongqing	3097	1749.77	101.7	25.03474	216.8854	230.2012
Sichuan	8640	4421.76	102.1	47.4993	566.3341	641.6841
Guizhou	3799	1084.9	101.8	8.64407	163.4009	270.6459

Yunnan	4287	2074.71	99.1	16.33944	293.642	451.5414
Tibet	263	138.73	100.1	1.10127	30.2557	50.2526
Shaanxi	3659	1844.27	101	53.23582	257.4927	291.5024
Gansu	2575	1072.51	104	14.30295	161.9951	213.0483
Qinghai	523	300.95	102.6	2.32423	42.3059	58.8424
Ningxia	563	298.38	101.6	3.28797	50.0358	60.3704

Data source: Total population, GDP, CPI: China Statistical Yearbook (2002), fund for high education, fund for secondary education, fund for primary education: China Educational Finance Yearbook (2002).

We will combine the above estimates of income elasticity from cross-section data with time series data to estimate price elasticities. As pointed out by Friedman (1957) income elasticity estimated from cross-section data may not be equal to the estimate from time series data because the transitory components of income in the two sets of data may have different variances relative to the variances of permanent income. In the context of demand for education services in China we expect the transitory component of log provincial income to have a smaller variance relative to the variance of log permanent provincial income than the case for log real GDP observed through time. The latter is subject to short-run cyclical fluctuations. Although the levels of the former log income are also subject to cyclical fluctuations, when measured across provinces at one point in time, the cyclical components for all provinces may be nearly the same in percentage terms and affect only the intercept in a cross-section regression of log quantity on log income. If the non-cyclical components of transitory incomes across provinces are small, the income elasticity estimated from a cross-section regression is close to the long-run elasticity with respect to permanent income. It will be larger than the income elasticity estimated by time-series data alone since the log income data in time-series have a transitory component with a larger variance relative to the permanent component.

We next discuss the problem of possible simultaneous-equation bias if the above estimated income elasticities are combined with time series data to estimate price elasticities. An income adjusted log quantity is defined as log quantity demanded minus the income elasticity times log income. If we regress log price on income adjusted log quantity, the regression coefficient will be an unbiased estimate of the inverse of price elasticity provided that the explanatory variable can be treated as exogenous. The assumption that the income adjusted log quantity is exogenous is based on the fact that the quantity of education services as measured by student enrollment is mostly given since the supply of such services depends on the capacity to produce it, namely the number of school teachers and the amount of physical facilities available, which cannot be changed materially within one year. The demand curve relating log price and log quantity has been shifted upward by the increase in income through the income effect. Together with a slowly changing supply this shift leads to increases in price as observed from the time-series data. Using log price as the dependent variable and income adjusted log quantity as the explanatory variable in a regression we can expect the residual to be uncorrelated with the explanatory variable since it is uncorrelated with log quantity as explained above and there is no reason for it to be correlated with log income which

causes log price to go up.

If both relative price of education and real income have a positive time trend, a lower income elasticity estimated from time series data alone as compared with the cross-section estimate will be accompanied by a lower (in absolute value) price elasticity as compared with the elasticity estimated by imposing the higher cross-section income elasticity in the time series estimation for the following reason. Given the observed slow increase in the quantity demanded as measured by student enrollment and a rapid increase in real income, a higher income elasticity will shift the demand curve upward more, and, given the observed increase in relative price, it will require a larger price elasticity to slow down the quantity demanded to the supply level available. This larger price elasticity and the associated larger income elasticity estimated from cross-section data can explain the time trend of education services observed. We can interpret the elasticities obtained by combining time-series and cross-section data as long-run elasticities and the elasticities estimated from time-series data alone as short-run elasticities to the extent that the macro income variable has a transitory component with a larger variance relative to the variance of the permanent component than the provincial income variable in the cross-section data.

For each level of education i we define the price p_{it} as the ratio of total government and non-government (meaning budgetary and non-budgetary) spending on education level i to its student enrollment in year t, further divided by the consumer price index to yield a relative price index per student at the corresponding level in year t. Define q_{it} as total enrollment divided by population of the corresponding age group in school level i in year t, and y_t as real GDP per capita in year t. Using annual time series data from 1991 to 2002, we have attempted to estimate the price elasticity of demand for education in level i by regressing $\ln p_{it}$ on $(\ln q_{it} - a_i \ln y_t)$. Using log price as the dependent variable is justified by our assumption that log quantity is predetermined to a large extent because school enrollment depends on the existing educational facilities which cannot be changed easily. As income increases in China the demand curve for education shifts upward but enrollment cannot be increased rapidly, leading to an increase in price as reflected in the data. We will provide a check for our estimates of price elasticity by using log quantity adjusted for income effect as the dependent variable and log price as the independent variable. This is our simple method to deal with the simultaneous equation bias in the estimation of price elasticity. The estimated regression coefficients are respectively 0.4196 (.1494) for higher education, -3.2481(1.8703) for secondary schools, and –3.6281 (0.9148) for primary schools. The corresponding price elasticities b_i are the inverses of the above coefficients, namely +2.38 for higher education, -0.3079 for secondary schools and -0.2756 for primary schools. (See regressions below.) The data for time series analysis are provided in Table 2.

Table 2 Time Series Data for Estimating the Price Coefficients

Year	Total population	popprim	popsec	pophigh	GDP per capita	CPI	Budgetary
1991	115823	14097.377	12580.904	10395.8371	1879	170.8	4597308

1992	117171	14516.556	12094.389	10243.9198	2287	181.7	5387382
1993	118517	15299.909	11631.708	9715.03049	2939	208.4	6443914
1994	119850	15838.968	11418.245	9299.71317	3923	258.6	8839795
1995	121121	16035.698	11669.298	8856.74391	4854	302.8	10283930
1996	122389	16644.139	11873.841	8275.40596	5576	327.9	12119134
1997	123626	16613.503	12013.549	7861.41756	6054	337.1	13577262
1998	124761	16438.214	12156.134	7632.06438	6038	334.4	15655917
1999	125786	15903.011	12628.819	7414.80886	6551	329.7	18157597
2000	126743	14914.294	13338.095	7527.316	7086	331	20856792
2001	127627	14142.819	13479.288	7947.61127	7651	333.3	25823762
2002	128453	13144.485	13980.097	8055.45447	8184	330.6	31142383

Year	enrollh	enrolls	enrollp	edufundh	edufunds	edufundp	edufund
1991	204.4	5226.8	12164.2	1507310.5	2021205.5	2306283.75	7315028
1992	218.4	5354.4	12201.3	1547467	2522117.6	3099381.9	8670491
1993	253.6	5383.7	12421.2	2214292.1	4070105.8	4830462.4	10599374
1994	279.9	5707.1	12822.6	2418589.3	4687452.25	5450420.3	14887813
1995	290.6	6191.5	13195.2	2622886.5	5304798.7	6070378.2	18779501
1996	302.1	6635.7	13615	3267929	6941063	7655924	22623394
1997	317.4	6995.2	13995.4	3904842	7676303	8349661	25317326
1998	340.9	7340.7	13953.8	5493394	8734432	9188468	29490592
1999	413.4	8002.7	13548	7087280	9818889	9939983.1	33490416
2000	556.1	8518.5	13013.3	9133504	11302022	10814443	38490806
2001	719.1	8901.4	12543.5	11665761.8	13863722.1	12740074.1	46376626
2002	903.4	9415.2	12156.7	14878590	16682290	14480218	54800278

Variable definition and data sources: popprim, popsec, pophigh: the sum of the population between 6-12 years old, 13-18 years old, 19 – 22 years old, respectively. Calculated based on *Census 2000*. Variables enrollh, enrolls, enrollp are the enrollments at the usual high education, at the usual secondary schools, and at the usual primary schools, respectively. These data together with GDP and CPI are from SYB 2003. Variables edufundh, edufunds, edufundp are the educational funds for the usual high education, for secondary schools, and for primary schools, respectively. Data before 1995 are collected (or calculated) from various years of China Educational Finance Yearbook, data for 1996 – 2002 are from China Statistical Yearbook, 1998 – 2004.

Table 3 Regressions for the Price Coefficients of High, Secondary and Primary Education

Dependent Variable	Explanatory variables	Estimated Coefficients	Standard Error
Log of edufundh/(enrollh*cpi)	log(enrollh/pophigh)-1.29*log(real gdp/totpop)	.4195583	.1493766

	Constant	.2500569	1.237502
Log of edufunds/(enrolls*cpi)	log(enrolls/popsec)-0.81*log(real gdp/totpop)	-3.248128	1.870364
	Constant	22.65541	12.33623
Log of edufundp/(enrollp*cpi)	log(enrollp/popprim)-0.42*log(real gdo/totpop)	−3. 628168	. 9147713
	Constant	13.58846	3.261037

The low price elasticities of demand for secondary and primary education are reasonable. Since primary school education is compulsory, price affects the choice of schools and not total enrollment substantially (except in very poor region where compulsory education cannot be provided). For both primary and secondary school education, the Chinese parents appear to be willing to pay high tuition to get their children to good schools. Hence price elasticity can be expected to be low also. Partial evidence for low price elasticity can be found in the very large tuition (relative to the parents' incomes) charged in private schools both in rich coastal areas and in poor rural areas.

However the estimate of price elasticity for higher education has the wrong positive sign. One possible explanation for this unreasonable result is that demand for higher education is composed of two components, government and non-government, with each component determined by its own income and price variables. To explore this hypothesis, we have divided "total educational funds" for higher education into "government" and "non-government" or the remainder, where "government" is defined as the "budgetary" part of "government appropriation." While the appropriate income variable for non-government demand is real GDP per capita y, the appropriate income variable for government demand is real government revenue per capita y_g. The latter part of this statement is demonstrated by the regressions exhibited in Table 4 below. The price variable for the government component is p_g which equals government spending on higher education divided by total enrollment in higher education Q_h; the price variable p_n for the non-government component equals non-government spending on higher education divided by Q_h. Under this hypothesis we regress demand for higher education on the income and price variables for government and non-government components as shown in the first regression of Table 4. The estimated coefficients indicate that income variables have positive and significance effects and price variables have negative effects on demand for high education.

This regression shows that the government revenue elasticity of demand for higher education is 1.264 (with a standard error of .063); the GDP elasticity is 0.199 (.027), the price elasticity with respect to p_g is -0.310 (.090) and the price elasticity with respect to p_n is -0.040 (.033). If we drop the price variable p_n, the result is the second regression presented in Table 4. This regression shows that the estimates of the remaining three coefficients are hardly changed. The high government revenue elasticity and the low GDP elasticity are reasonable since the government provides much of the higher education in China, in contrast with secondary and primary school education which

depend to a larger extent on non-government funding or local government funding both of which are a function of local GDP. The magnitude of the government revenue elasticity 1.264 is close to the cross-section estimate 1.292 of income elasticity insofar as provincial per capita income at one point in time is highly correlated with provincial government revenue per capita. The low price elasticity with respect to p_g shows that in providing higher education the government is not very sensitive to price and it is of the same order of magnitude as the price elasticities of demand for secondary and primary school education. The even lower and perhaps insignificant elasticity respect to p_n shows that the price which the non-government sector has to pay for higher education has little effect on demand for higher education.

Table 4 Demand functions for Higher Education

Variable	Real Gov. Rev. Per Capita	Price of Gov.	Real GDP per capita	Price of Non-Gov.	Constant	Adjusted R square
Coefficient	1.264499	-.3099243	.1987756	-.0401371	8.089801	0.9959
Standard Error	.0628039	.0896898	.0271588	.0332141	.793086	
Coefficient	1.216068	-.2946543	.1996815		7.526407	0.9956
Standard Error	.0497254	.0913141	.0279186		.6597799	

We next provide a check on the possible inconsistency of the estimates of price elasticities for secondary school and for primary school education previously obtained, as shown in Table 3, by regressing log price on income-adjusted log quantity by performing the regressions in the opposite direction as given below.

$$[\log(\text{enrolls/popsec})-0.81*\log(y/\text{totpop})] = 6.683 - 0.071 \ln p_{gs} \qquad \text{Adj } R^2 = 0.1549$$
$$(.052) \quad (.04)$$

$$[\log(\text{enrollp/popprim})-0.42*\log(y/\text{totpop})] = 3.675 - 0.1685 \ln p_{gp} \qquad \text{Adj } R^2 = 0.5725$$
$$(0.31) \quad (0.042)$$

The price elasticities of demand are –0.071 and –0.1685 respectively for secondary and primary school education, as compared with -0.3079 and -0.2756 reported previously in Table 3. The regressions of the log of income-adjusted quantity on log price have yielded smaller (in absolute value) price elasticities as expected from regression theory.

In summary we have found that for higher education, the government revenue elasticity of demand is about 1.3, and government revenue rather than GDP is the appropriate income variable since government is the main provider of higher education. The price elasticity with respect to government price is about -0.3. For secondary school education, we have estimated an income elasticity of 0.8095 and the associated price elasticity in the range of -.07 to -0.3079. For primary schools, the cross-section estimate of income

elasticity is 0.4172 and the associated price elasticity is in the range -.1685 to -0.2756.

4. Aggregate Demand for Education in China

We wish to explain the large increase in the ratio of educational funding to GDP from 3.4 percent in 1997 to 5.21 percent in 2002 by the factors affecting demand. In this section we use the framework of section 3 to explain total student enrollment in China.

In (1), (2) and (3) below we regress respectively ln(real non-government appropriation for education/per capita), ln(real government appropriation per capita) and ln(total educational funding per capita on ln(real provincial income/capita) using cross-section data for 2002 on 30 provinces and municipalities with Beijing excluded because much educational expenditures allocated for Beijing was for higher education of non-residents . Data on provincial GDP in 2001 is found on *China Statistical Yearbook 2002*. Using 30 provincial observations and after dividing both funding data and provincial GDP by provincial CPI indices we have estimated the following three equations.

(1) ln(real nongov app/pop) = -4.697 + 1.1263ln(real GDP/pop), Adj R=0.6897
(0.6115) (0.1369)
(2) ln(real gov app/pop) = -2.302 + 0.7599 ln(real GDP/pop), Adj R=0.5855
(0.5153) (0.1154)
(3) ln(total edu funding/pop) = -2.319 + 0.8552 ln(real GDP/pop), Adj R=0.7231
(0.4288) (0.096)

Observe that the income elasticity of demand for education spending from non-government appropriation estimated in regression (1) is slightly above unity and is higher than the elasticity of 0.7599 for government appropriation in (2) because government policy for education is intended to equalize funding in different regions by subsidizing the very poor regions. The estimated income elasticity of government demand in (2) is still substantial because the ability of local governments to fund education depends on their income levels. We will use the estimate 0.8552 for income elasticity from regression (3) for the purpose of estimating the price elasticity of aggregate demand for education using time series data.

Table 2 contains the time series data employed that begin in 1991 partly because statistics for total expenditure pq before 1991 are not available. Furthermore the demand function might not be valid before 1991 as the market for education services might not be in equilibrium when entry of many new schools continued to occur in the late 1980s. Here q is quantity demanded per capita, defined as total student enrollment in all three levels of schools divided by total population, and p is total educational fund divided by q and by CPI. As in the case of studying demand for the three levels of education separately we regress log price on the log of income-adjusted quantity to obtain

(4) lnp = -7.8996 - 2.184(lnQ-0.8552*ln(real GDP/pop), Adjusted R=0.9132
(0.8553) (0.2021)

The estimated price elasticity is 1/2.184 = 0.4579. Regression in the opposition direction

shown in equation (5) below gives a slightly smaller and very similar price elasticity of 0.4218.

(5) [lnQ-0.8552ln(real GDP/pop)] = -3.664-0.4218lnp, Adjusted R=0.9132
(0.0539) (0.039)

The low price elasticity is reasonable and is consistent with the low price elasticities of demand for primary and secondary school education estimated in section 3.
Our objective is to explain total educational spending pq and the ratio pq/GDP, where p denotes the relative price of education, q denotes enrollment per capita and GDP denotes real GDP per capita. An equation for ln(pq) can be obtained by a demand equation for lnq plus lnp. The log of the ratio pq/GDP can be obtained by the above equation for ln(pq) minus ln(GDP), as given by

[ln(pq) - ln(GDP)] = -(1-a)ln(GDP) + (1-b)ln(p)

This equation shows that if income elasticity *a* is above unity and price elasticity *b* is below unity, the ratio of education spending to GDP will increase as income increase since the first term on the right hand side will have a positive effect and the increase in price resulting from an increase in demand will also assert a positive effect through the second term. The equation can explain the increase in the ratio for developing countries even if the income elasticity is slightly below unity for the price effect of the second term may dominate, given a low price elasticity of demand for education. To put this point in simple terms, in the course of economic development as the income effect shifts the demand for education upward and as a slow increase in the supply of education causes the relative price of education services to go up, a price-inelastic demand for education will lead to an increase in the total expenditure on education. The above equation states that the price effect will also lead to an increase in the ratio of education spending to GDP unless the income elasticity is much below unity and the negative income effect dominates the positive price effect.

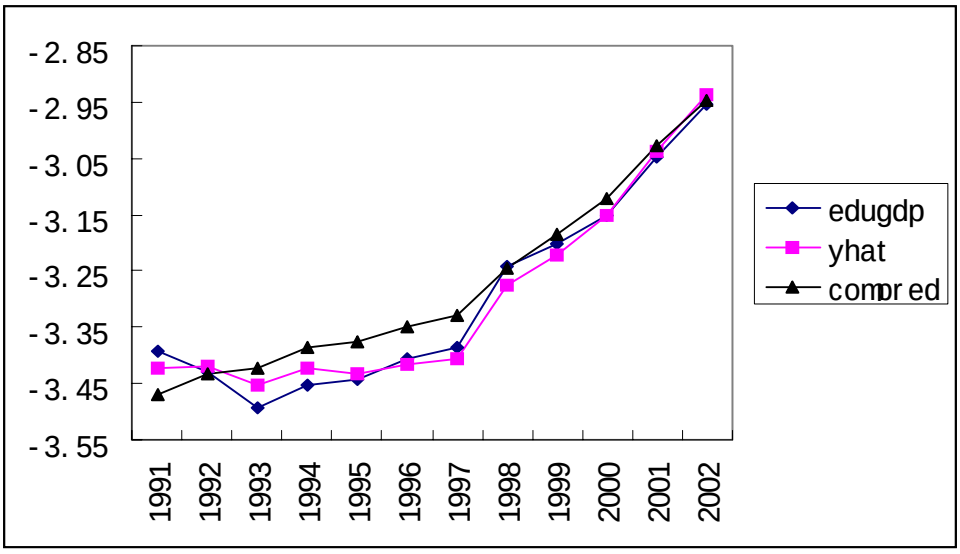
We estimate this equation using annual time series data alone from 1991 to 2002 to obtain

(6) [ln(pq)-ln(GDP)] = -2.64 -0.6688ln(GDP) + 0.925lnp, Adj. R= 0.9791
(0.218) (0.1105) (0.0764)

which implies a= 1-.6688 =0.3312 and b= 1-0.925 = 0.075. Both estimates are much smaller than the corresponding estimates 0.8552 and 0.4579 or 0.4218 obtained by combining cross-section and time-series data, for the reason given in section 3 before the beginning of the time-series analysis. Equation (6) has a high adjusted R sq =0.9791 and can explain the estimated ratio of education spending to GDP well as shown in Figure 2 below.

Figure 2

Observed and Predicted values of log(Education Expenditure/GDP)



In Figure 2, edugdp is the log of the observed ratio of education expenditure to GDP, yhat is the predicted value from equation (6), and compred is the predicted value by imposing the income elasticity 0.8522 and price elasticity -.42 that were estimated by combining cross-section and time series data, after adjusting for a constant term. The rising trend in the log of the ratio of education expenditure to GDP can be explained well even after we impose the income elasticity of 0.8522 but there is overestimation of the log ratio in the years 1993 to 1997.

Based on the equations

lnp =1/b(c+alnGDP-lnq), and therefore
ln(pq/GDP)=(1/b)c+(a/b-1)lnGDP+(1-1/b)lnq

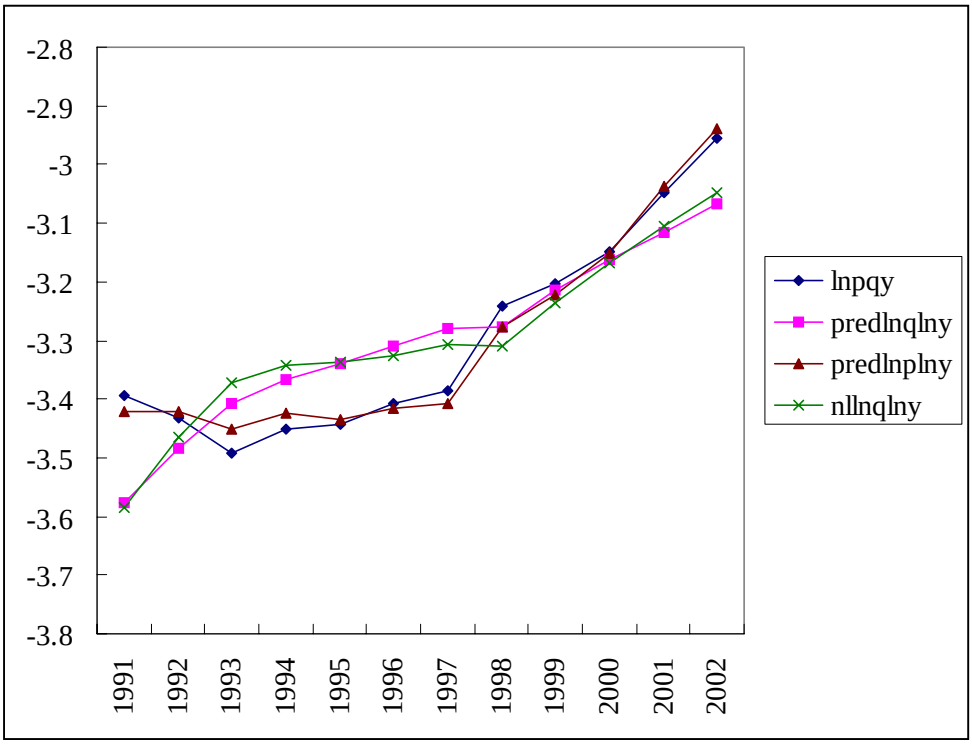
we can also regress ln(pq/GDP) on lnGDP and lnq (rather than lnp as done previously) to derive the price and income elasticities:

(7) [ln(pq)-ln(GDP)] = -5.75 +0.6789lnGDP –0.2899lnq, Adj. R= 0.9791
(3.236) (0.3265) (1.314)

Given 1-1/b=-0.2899, we find the price elasticity b=0.755; and given a/b-1=0.6789, we find the income elasticity a = 1.6789*0.755=1.3, both are higher than 0.4182 and 0.8552 estimated by combining cross-section and time-series estimates with the adjusted log quantity as the dependent variable, and much higher than 0.075 and 0.3312 estimated from time series data alone and using lnGDP and lnp as regressors. If we impose the income elasticity .8552 from cross section and allow the time series to determine only the price elasticity from the nonlinear regression of ln(pq/y) on (1/b)c+(0.8552/b-1)lnGDP+(1-1/b)lnq, we obtain an estimated coefficient of b equal to 0.4579 with a

standard error of 0.04. In Figure 3 we compare the actual log (education expenditure/GDP) ratio with the fitted values of (1) regressing ln(pq/y) on lnp and lnGDP as shown previously in Figure 2 and denoted by predlnplny, (2) regressing ln(pq/y) on lnq and lnGDP, denoted by predlnqlny and (3) the nonlinear regression of ln(pq/y) on lnGDP and lnq, imposing a =0.8552.

Figure 3 Comparisons of Fitted Values of log(Ed Exp/GDP)



The main conclusions from the regressions shown in Figures 2 and 3 are as follows. First the regression (6) of the log of income-adjusted quantity on log GDP and log price gives the best fit and can trace the observed ratio of education expenditure to GDP well but yield very low income and price elasticities which perhaps can be interpreted as short-run elasticities. Second, the regressions of log price on log GDP and log income-adjusted quantity give higher income and price elasticities but fit the data not as well, although the general increasing trend of the ratio is captured. Third, imposing the income elasticity of 0.8522 does not affect substantially the goodness of fit of the regression of log price on log GDP and log income-adjusted quantity but affect the goodness of fit of the regression of log quantity on log GDP and log price since the latter income elasticity is small as estimated by time series data alone. Since none of the above regressions give both reasonable elasticities and a very good fit of the data, we propose to decompose the aggregate demand for education into the two components of government and non-government demand following the idea in section 3 for higher education. However there is one difference. In section 3 we have explained expenditures on higher education by two sets of income and price variables, one set from government demand and the second set from non-government demand. In this section, we decompose the quantity demanded itself, or the expenditure on education, into two components that result from government

and non-government demand. The reason for doing so in this section is the need to explain the ratios of government and non-government spending to GDP which is a main purpose of this paper.

Let "total educational funds" be divided into "government" and "non-government" or the remainder, where "government" is defined as the "budgetary" part of "government appropriation." The above method of analysis for the aggregate will be applied to each of the two components separately, except that government revenue is the relevant income variable for the government component of demand Q_g and GDP is the appropriate income variable for the non-government component Q_n. Low case letters denote the corresponding per capita figures.

We first estimate the revenue elasticity of demand for the government component using 30 provincial observations for 2001 by regressing real provincial government spending per capita on real provincial government revenue per capita, and similarly for the non-government component except for the use of provincial GDP in place of provincial government revenue. For government spending per capita, the result is

$\ln(q_g*p) = -0.1232 + 0.6143 \ln (\text{real gov rev/pop})$ Adj R^2 =0.6823.
(0.1439) (0.0759)

For non-government spending per capita with provincial GDP per capita as the income variable we find

$\ln(q_n*p) = -4.4749 + 1.119 \ln(\text{real GDP/pop})$ Adj R^2 =0.6825.
(0.6175) (0.1382)

The higher income elasticity for the non-government component as compared with the government revenue elasticity for the government component is consistent with the income elasticities in equations (1) and (2) where government is defined as government appropriation rather than government budgetary expenditure.

Given a government revenue elasticity of 0.6143 for the government component of demand, and an income elasticity of 1.119 for the non-government, we estimate the price elasticities of these two components using time-series data. For the government component:

$[\ln(q_g*p) - 0.6143*\ln(\text{Gov rev})] = 3.5499 + 0.4315 \ln p$ and Adj R^2 = 0.9773.
(0.27) (0.432)

Using time-series data alone, we obtain

(8) $\ln(q_g*p/\text{Gov rev}) = 0.8475 - 0.6631 \text{ Gov rev} + 0.711 \ln p,$ Adj R^2 = 0.8493
(0.869) (0.089) (0.091)

which yields a government revenue elasticity of (1-0.6631) = 0.3369 and a price elasticity

of (1-0.711) = 0.299, both lower than the respective estimates 0.6143 and (1-0.4315)=0.5685 based on combining cross-section and time-series for the reason discussed in section 3.

For the non-government sector with GDP replacing government revenue, we have

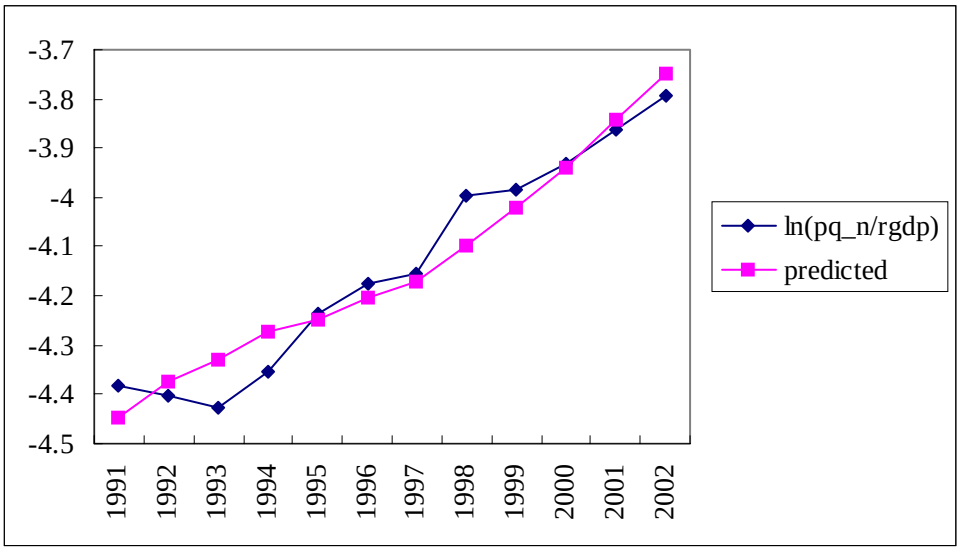
$[\ln(Q_n*p) - 1.119\ln(\text{real GDP/pop})] = -5.20 + 0.5377 \ln p$, Adj R^2=0.9036.
(0.073) (0.0527)

Given income elasticity of 1.119, price elasticity estimated by time series is (1- 0.5377) = 0.4623 for non-government spending. Using time-series data alone we obtain

$[\ln(Q_n*p) - \ln(\text{real GDP/pop})] = -5.367 + 0.2041 \ln rgdp + 0.4814 \ln p$, Adj R^2=0.9179
(0.5476) (0.2776) (0.1918)

which yields an income elasticity of (1-0.204)= 0.796 and price elasticity of (1-0.4814) = 0.5186, both of the same order of magnitude as the estimates obtained by combining cross-section and time series data.

Figure 4 The Ratio of Non-gov Spending on education Q_n*p to GDP and Their Predicted Values



If we want to explain the ratio of gov spending on education Q_g*p to GDP we have to convert (8) to

(9) $[\ln(Q_g*p/gdp) - a1*\ln(\text{Gov rev})] = \text{const} - \ln(\text{real GDP/pop}) + (1-b1)\ln P$

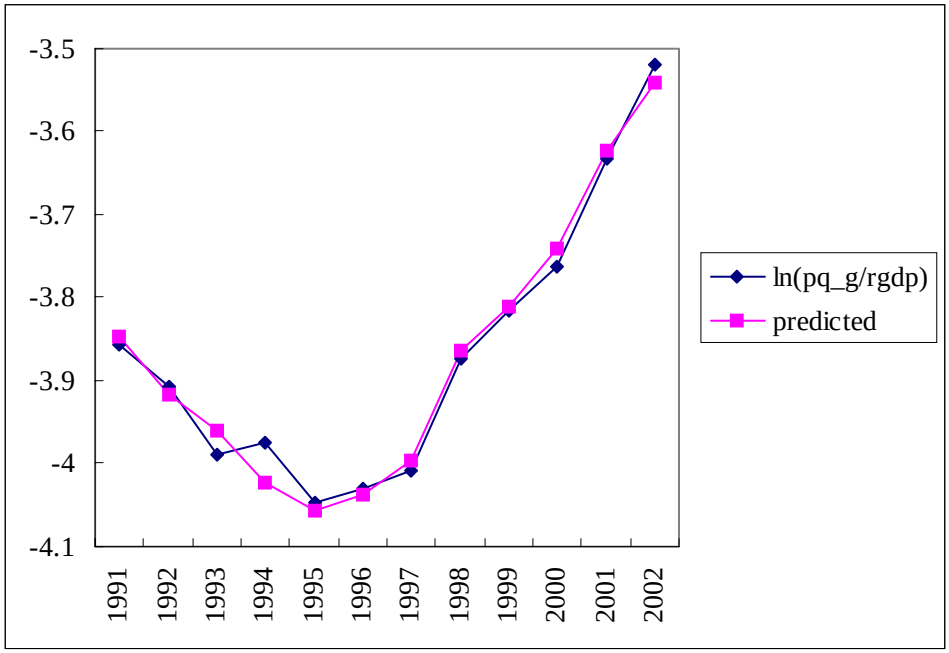
The estimated regression is

$[\ln(Q_g*p/gdp) - 0.6143*\ln(\text{Gov rev})] = 3.4136 - 0.9302 \ln(\text{real GDP/pop}) + 0.3854 \ln p$
(0.202) (0.1022) (0.0706)

, Adj. R-squared = 0.95.

The above equation predicts [ln(Q_g*p /gdp) well, as shown in Figure 5.

Figure 5 The Ratio of Gov Spending on Education Q_g*P to GDP and Their Predicted Values



Government policy can affect education funding not only by increasing its own appropriation for education but also by encouraging the local governments and private sector to spend more on education. This may have happened in 1998-2002 but the above demand analysis does not resort to a change in government policy and is able to explain the increase in the ratio of education funding to GDP through its two components. We have found that using government revenue as the income variable enables us to explain the ratio government spending to GDP well. The government revenue elasticity of the government component aggregate demand for education is lower than in the case of the government demand for higher education, as expected, but the explanatory power for the ratio of education spending to GDP is excellent as Figure 5 shows.

In summary we have succeeded in explaining the increase in total education spending as a fraction of GDP from 3.4 percent in 1997 to 5.23 percent in 2002 by the factors affecting demand. By considering the log of total spending on education as the dependent variable we have found an income elasticity of 0.86; 0.76 for government spending and 1.13 for non-government spending where government spending is defined by government appropriation and non-government as the remainder. Given the income elasticity of 0.86. we have estimated a price elasticity of -0.42 to -0.46. The framework explains very well total student enrollment and the ratio of total education spending to GDP. By dividing total educational spending into the government (budgetary) and non-government component, with the government component determined by government revenue rather

than GDP we can explain the ratio of each component to GDP very well. Our framework implies that total expenditure on education can increase rapidly with rising income because of the positive income effect (from government revenue and/or GDP) and of the price effect (with a low price elasticity of demand and an increase in price).

5. Implications for Income Inequality

We first compare the standard deviation of log education expenditure across provinces with the standard deviation of the log of real GDP across provinces. Since income elasticity is less than one, the former is expected to be smaller than the latter but not much smaller. Since income elasticity of demand for education is close to one (0.8522) income inequality has led to education inequality. Non-government spending has income elasticity larger than unity that makes inequality in education opportunities greater than inequality in income. Given an income elasticity of demand of 0.6 for government spending, the government fails to equalize education expenditure among the rich and the poor although it lessens the degree of inequality of education opportunities as compared with income inequality.

Concerning inequality in education spending on the three school levels, since income elasticity is higher for higher education than for secondary and primary schools, being 1.29 as compared with 0.81 and 0.42 respectively, inequality in income generates a lower degree of inequality in lower level education than in higher education. With an income elasticity of 0.42 for primary school, the poor receives primary school education to a larger extent than their income allows. In other words, there is a tendency to equalize primary school education among people of different income levels but not completely.

The use of provincial data to estimate income elasticity of demand for primary school education may obscure the fact that some very well to do families may be spending proportionally more on sending their children to very good primary schools. This would have an effect on increasing educational spending inequality even for primary schools. Even if this is the case, the situation may not be considered undesirable if one believes that the government's main responsibility is to provide a basic level of income for necessities to the poor who cannot afford them otherwise, and not to prevent the rich from spending money to benefit their family members. In brief, China has a substantial degree of income inequality and, given income elasticity of demand for primary school education to be 0.42 and for secondary schools education to be 0.81, the effects of income inequality on education inequality are substantial. Such effects will persist as long as the degree of income inequality continues to be large.

Regional income disparity, as measured by the standard deviation of log (provincial consumption per capita) for a cross-section of provinces, has increased from 0.47 in year 1990 to 0.5568 in year 2003. The measure of inequality would increase if we used rural income per capita rather than total income per capita among provinces since disparity in urban income per capita among provinces is less than in rural income per capita. With an income elasticity of demand for education of about 0.8552 an increase in income inequality leads to an increase in inequality in education opportunities also.

In discussing income inequality we recognize that increasing inequality is not necessarily bad, although poverty is. Inequality can be the result of having more talented people on top and/or more opportunities for the very talented while the economic wellbeing of the poor people improves more slowly. More income inequality can result when people with high income can afford better education for themselves and their children. The effects of private tuition on inequality across generations is discussed in Heckman (2004). Less income inequality may occur in the long run when the educated are able to increase income per capita and to help the poor. A poor country cannot devote enough resources to help the poor or to develop the Western region in the case of China. One indication of the rich having more opportunities is reflected in the income elasticity of non-government demand for education being larger than unity as reported.

In China, the income elasticity of demand for higher education is large (approximately 1.29) and the income elasticity of demand for primary school education is low (approximately 0.42). This is consistent with the finding of UNESCO (2002, p.48) that China spends much more on a student at college level relative to GNP per capita as compared with other countries and less per student in the primary education level. The higher income elasticity at the college level reflects the government's desire to make some Chinese universities world class (as explicitly stated in policy statements by top education officials like former Vice Premier Li Lanqing) and to develop science and technology by educating the elite. This policy helps to create more inequality but may help China catch up with the developed economies in its process of modernization.

6. Conclusions

The main conclusions of the paper can be summarized as follows.

First, although China's education system is under the direction of the government, it is guided by market forces to a large extent. The fraction of non-government education funding (defined as total spending minus government budgetary spending) has been increasing in recent years and has risen to about 50 percent in 2002.

Second, from an institutional point of view non-government funding can take a variety of forms. It can take place in public schools which collect fees, or which are operated by non-government organizations or individuals through some form of leasing arrangement. Some schools are privately owned and operated by non-government professional associations or by a collection of individuals. In all cases the driving force is market oriented because the operation of a school is guided by its financial considerations.

Third, the development of privately financed or privately operated educational institutions illustrate one important aspect of China's economic transformation into a market economy. While the government maintains an important role in many sectors in the economy, including the industrial, financial, transportation and communication, and education sectors, it has allowed and encouraged the development of non-government institutions in these sectors. It is often the latter that was the driving force of economic

growth and development in an environment of free entry and competition.

Fourth, as compared with the parents in the United States the Chinese parents have more choices of schools for their children. They are not subject to paying a real estate tax to finance the usually only local public school available to their children, as the Chinese schools are financed party by general tax revenue and partly by tuition. There are several public and private schools available to most urban families. The schools are not obliged to accept any student below the standard they set, and thus have different academic standards.

Fifth, the framework of demand analysis is applicable to explain the spending on education, with real income and relative price as the major explanatory variables.

Sixth, when primary school, secondary school and higher education are studied separately we find income elasticity to be 0.42 for primary school and 0.81 for secondary school and government revenue elasticity to be 1.264 for higher education. The price elasticities are respectively 0.2756, 0.3079 and 0.31 with the price paid by the government as the appropriate variable in the demand for higher education.

Seventh, when total enrollment of all three levels of schools combined is studied by decomposing total demand into the government (budgetary) and non-government components, we find a government revenue elasticity of 0.6143 and a price elasticity of 0.5685 for the government component and an income elasticity of 1.119 and a price elasticity of 0.4623 for the non-government component.

Eighth, our framework can explain the ratio of education expenditures to GDP very well. The increase in this ratio from 3.38 in 1991 to 5.21 in 2002 can be explained by the increase in real GDP which raised demand. Given an inelastic supply of education services, this resulted in a large increase in price. Since demand is price inelastic, total spending increased as price increased. This mechanism can explain the increase in the ratio of education spending to GDP in other developing countries as well. Hence one should be careful in criticizing the government for an observed low ratio of education spending to GDP without studying the influence of market forces on this ratio.

Ninth, on the relation between income inequality and education inequality, to the extent that the demand for education is affected by income, income inequality will be reflected in education inequality. Since the income elasticity of total education spending by the government is below unity, the government has helped to equalize educational opportunities among the rich and poor to some extent, as compared with the situation with all education spending being private (which has a higher income elasticity). For primary school education, the income elasticity is low. Hence education opportunities are more equalized in primary schools than in secondary schools and higher education. Yet inequality remains even for primary schools.

Tenth, the Chinese government places a strong emphasis on developing world class universities and has spent a large amount on higher education, as reflected in a large

government revenue elasticity of government demand for higher education. In the mean time it has a policy of compulsory education for nine years but many children aged fifteen or below do not receive the required education because the central government has given the responsibility for providing it to provincial and local governments which resort to collecting tuitions and fees from the students.

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References

China Statistical Yearbook 2003. Beijing: National Bureau of Statistics of China, China Statistics Press, 2003.

Chow, Gregory C. *China's Economic Transformation.* Oxford: Blackwell Publishers, 2002.

Friedman, Milton. *A Theory of the Consumption Function.* Princeton: Princeton University Press, 1957.

Friedman, Milton and Rose. *Free to Choose: A Personal Statement.* New York: Harcourt Brace Jovanovich, 1979.

Gordon, Roger H. and Wei Li, "Taxation and Economic Growth in China," Chapter 2 of Y. K. Kwan and Eden Yu, ed. *Critical Issues in China's Growth and Development.* Aldershort, Hamphere: Ashgate, 2005.

Heckman, James. "China's Human Capital Investment," mimeo, August 2004, to appear in *China Economic Review*

Lin, Jing. *Social Transformation and Private Education in China.* Westport, Connecticut: Praeger Publishers, 1999.

United Nations Educational, Scientific and Cultural Organization (UNESCO) and Organization for Economic Co-operation and Development (OECD), *Financing Education-Investment and Returns: Analysis of the World Education Indicators, 2002 Edition.*