Chapter 2
Study on Non-personnel Expenditure Standards for Rural Compulsory Education

Non-personnel expenditures for primary and junior secondary school are expenditures that ensure regular operation, teaching activities, and logistic services. These expenditures are important for guaranteeing that the school can accomplish schooling and teaching tasks, improve education quality, and maintain regular operation. In the past, schools could not offer all of the required curricula because of insufficient expenditures and operations being at a very low level. After implementation of the new mechanisms, non-personnel expenditures for schools have been guaranteed and improved remarkably. However, these expenditures are still not adequate, as primary and junior secondary schools cannot supply high-quality nine-year compulsory education for every student. Therefore, to perfect the new mechanism, it is necessary to establish a scientific and reasonable per-student non-personnel expenditure standard for rural compulsory education, including the improvement of fund guarantee level for rural compulsory education. A study on the approaches to per-student non-personnel expenditure standards for compulsory education will also be conducive to improving budget management, which will make the allocation of educational resources more reasonable and more efficient.

According to the Notice about Further Reforming the Fund Guarantee Mechanism for Rural Compulsory Education and Compulsory Education Law, the central government and local governments should determine non-personnel expenditure standards for primary and junior secondary schools in rural areas. This study tries to provide reasonable and scientific approaches for governments to determine non-personnel expenditure standards for primary and junior secondary schools.

To date, there have been five approaches to determine non-personnel expenditure standards around the world, each of which has advantages and disadvantages. However, no consensus has been reached on how to determine non-personnel expenditure standards in China. This study introduces these five approaches and analyzes the advantages and disadvantages of each approach. Then, some approaches that are suitable for China will be used to calculate non-personnel expenditure standards for rural compulsory education.

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2.1 Non-personnel Expenditure Standards for Rural Compulsory Education: Concept, Status Quo, and the Approaches

Some issues should be considered before we calculate non-personnel expenditure standards for primary and junior secondary schools: concept, scope, principles, and approaches. The concept tells us what non-personnel expenditures are; the scope provides the coverage of non-personnel expenditures; and the principles and approaches allow us to understand the basis of procedures to calculate non-personnel expenditure standards.

2.1.1 The Definition of Non-personnel Expenditures for Primary and Junior Secondary School

Educational expenditures include regular expenditures and construction expenditures. Regular expenditures are composed of personnel expenditures and non-personnel expenditures. Personnel expenditures refer to expenses on teacher and staff salaries, welfare, and allowances, among others. Non-personnel expenditures refer to expenses related to school operation, teaching, and equipment, among others. Construction expenditure refers to expenses for constructing school buildings. Non-personnel expenditures for equipment valued higher than 500 Yuan and construction expenditures are *capital expenditures*. Non-personnel expenditures for other items and personnel expenditures are *recurrent expenditures*. Therefore, one part of non-personnel expenditures is capital expenditures, whereas the other part is recurrent expenditures. Different systems and regulations have different descriptions of non-personnel expenditures for primary and junior secondary schools. Also, there is no uniform standard to classify the items of non-personnel expenditures. Therefore, it is necessary to clarify the concept of non-personnel expenditures before we study the approaches to non-personnel expenditure standards.

Recent policies and regulations have provided the definition and scope of non-personnel expenditures. In 1997, the Ministry of Finance promulgated the Financial System for Primary and Junior Secondary School, which defined that non-personnel expenditures, according to functions and accounting purposes, refer to expenses for teaching activities, line of duty, equipment, repair and maintenance, and others, which are necessaries for a school's regular operation. In 1998, the Accounting System for Primary and Junior Secondary School clarified the items of non-personnel expenditures from an accounting perspective, stating that non-personnel expenditures cover expenses for line of duty, teaching activities, equipment, repair and maintenance, and others. In 2006, the Provisional Regulations for Management of Non-personnel Expenditure for Rural Primary and Junior Secondary School defined, based on their function and scope, non-personnel

expenditures for rural primary and junior secondary schools as expenses for guaranteeing the regular operation, teaching activities, and logistic services, including management, teacher training, experiment and practice, afterschool student activities, water and electricity, heating, transportation, travel, post and telecommunication, equipment, books, magazines and newspapers, and repair and maintenance. Non-personnel expenditures cannot be used for personnel, construction, or payments for debts.

The Guidance on Preparing Budget for Primary and Junior Secondary School, edited by the Ministry of Education in 2006, provided the following description for non-personnel expenditures: non-personnel expenditures reflect the necessary expenses for an entire year for maintaining the regular operation of a school and meeting the basic demands for teaching, including current non-personnel expenditures and special non-personnel expenditures. The current non-personnel expenditures mainly reflect the expenses needed for regular school operation, printing, water and electricity, post and telecommunication, heating, transportation, travel, meeting, training, welfare, temporary staff, renting, repair and maintenance, special materials, and other items throughout the year. Special non-personnel expenditures include expenses for basic facilities, such as office equipment, instructional equipment, transportation tools, books, magazines and newspapers, and other items in the budgetary year.

Although the different definitions of non-personnel expenditures seem to be consistent in nature, they are not consistent in terms of the scope of non-personnel expenditures in implementation in different regions. For example, disagreements still exist on whether the following expenses should be in the scope of non-personnel expenditures, such as expenses for temporary staff (substitute teachers), school cafeterias, heating, water, and electricity for residences or dormitories of both teachers and students. We hold that, according to regulations issued by the central government and local governments, all of these expenses should be borne by primary and junior secondary schools. Therefore, they should be included in the scope of non-personnel expenditures.

Based on these understandings, we hold that non-personnel expenditures for primary and junior secondary schools are expenses related to the regular operation of the school, teaching activities, and logistic services in order to ensure that the school can accomplish teaching tasks and improve education quality. Non-personnel expenditures mainly cover teaching activities and school management, teacher training, experiments and practice, afterschool student activities, water and electricity, heating, transportation, travel, post and telecommunication, equipment and facilities, books, magazines and newspapers, and current repair and maintenance for buildings and equipment. For accounting purposes, non-personnel expenditures should cover expenses in the line of duty, teaching activities, equipment and books, repair and maintenance, and others. Line-of-duty expenses should include office supplies, teachers' books, temporary staff, electricity and water, post and telecommunication, heating, transportation, travel, meetings, property management, and rent payments. Teaching activity expenses should include special materials and printing. Equipment and book expenses covers office equipment,

special equipment, transportation tools, books, magazines, and newspapers. Repair and maintenance expenses consist of expenses for the repair of buildings and equipment. Other expenses includes training, hospitality, and miscellaneous items.

2.1.2 Status Quo of Non-personnel Expenditures for Primary and Junior Secondary Schools in China

Since the 1980s, the Chinese government has carried out many programs to explore non-personnel expenditure standards for primary and junior secondary schools. In 1989, focusing on uneven development in different regions, the National Education Commission[1] proposed the establishment of a material consumption ration system for non-personnel expenditures for primary and junior secondary schools so as to meet the demands of social and economic development and educational development. Also, the National Education Commission issued the Material Consumption Ration for Non-personnel Expenditure for Primary and Junior Secondary Schools in 1992 (also referred to as 92's Ration). At the beginning of this century, the Ministry of Finance and Ministry of Education put forward further requirements on how to determine non-personnel expenditure standards, requiring all provinces and autonomous regions to seriously measure and reasonably determine non-personnel expenditure standards. Meanwhile, it also required that developed regions could refer to 92's Ration to determine the non-personnel expenditure standards, considering the cost of information technology education and rural basic education development. Underdeveloped regions could determine non-personnel expenditure standards to keep schools operating smoothly.

Since 2001, to improve non-personnel expenditure guarantee levels gradually, the central government has issued related policies successively. On the one hand, they require that all local authorities determine reasonable non-personnel expenditure standards for primary and junior secondary schools in rural areas, while on the other hand requiring governments at various levels to share the financial responsibility. In 2001, the Decision of the State Council on Reform and Development of Basic Education clarified that the provincial government should be responsible for determining non-personnel expenditure standards for rural primary and junior secondary schools according to actual spending and demand for non-personnel expenditures in order to reasonably input the funds needed for regular operation of rural primary and junior secondary schools. Mainly, non-personnel expenditures are derived from miscellaneous fees collected by schools. If miscellaneous fees cannot meet the demands for non-personnel expenditures, the gap should be financed by county and township governments.

[1]The National Educational Commission of the PRC was a governmental organ of the State Council in charge of education. It was renamed the Ministry of Education in 1998.

On December 24, 2005, the State Council promulgated the Notice on Further Reforming Fund Guarantee Mechanism for Rural Compulsory Education, requiring governments at different levels to improve non-personnel expenditure guarantee levels for primary and junior secondary schools in rural areas jointly. In this notice, the State Council also requires local governments to implement per-student appropriation standards of budgetary non-personnel expenditures for rural primary and junior secondary schools determined by each provincial (autonomous region or municipality) government. By 2008, per-student non-personnel expenditure for rural junior secondary and primary students in all regions should reach the per-student standard of non-personnel expenditures determined by each provincial (autonomous region or municipality) government before the autumn semester of 2005. In 2009, central government issued the national standard of non-personnel expenditures for primary and junior secondary school in rural areas. In this year, 50 % of the gap, which is caused by non-personnel expenditure standards determined by each province (autonomous region or municipality) being lower than the national standard, will be jointly supplied by the central government and local governments according to the share-mechanism for miscellaneous fee exemptions.

Article 43 of the revised Law of Compulsory Education enacted on September 1, 2006 clearly states that per-student non-personnel expenditure standards are to be jointly determined by the Ministry of Finance and Ministry of Education of the State Council and will be adjusted according to economic and social development. Per-student non-personnel expenditure standards and their adjustment should meet the basic demands of schooling and teaching. The Law of Compulsory Education incorporates non-personnel expenditure standards of compulsory education into the state law system. Provincial governments shall determine local per-student non-personnel expenditure standards, which must be higher than the national standard.

As a result of a series of policies, remarkable changes have happened in the amount and structure of non-personnel expenditures for Chinese compulsory education. Before further discussing non-personnel expenditure standards for primary and junior secondary schools in China, we first analyze the status quo of non-personnel expenditures for primary and junior secondary schools in China and sample provinces.

2.1.2.1 Status Quo of Non-personnel Expenditures for Primary and Junior Secondary Schools in China

1. **Remarkable Growth of Non-personnel Expenditures**
   The central government has issued series of policies to provide rural compulsory education with an important strategic position in social development. To input more funds into compulsory education, the central government requires that most annual increases of educational funds be directed to rural education. Governments at different levels must establish and implement a fund guarantee mechanism for rural compulsory education. As a result, non-personnel

Table 2.1 Changes in non-personnel expenditures per student at primary and junior secondary schools in China (2003–2006) (Yuan)

	Primary schools	Rural primary schools	Junior secondary schools	Rural junior secondary schools
2003	280	200	477	307
2004	342	259	548	380
2005	423	332	668	496
2006	499	401	783	601
Growth of 2006 compared with 2003 (%)[a]	66.0	86.8	52.9	82.4

Data source Statistic Yearbook of Chinese Education Expenditure 2003–2006 (excluding data of Hong Kong, Macau, and Taiwan)

[a]The growth rate here is calculated based on comparable prices

expenditures for rural primary and junior secondary schools have increased remarkably (refer to Table 2.1). In 2006, the national non-personnel expenditure per rural primary school student was 401 Yuan, up by 86.8 % compared with that of 2003, based on the comparable prices. Per-student non-personnel expenditures for western rural primary schools increased 1.39-fold. The non-personnel expenditure per rural junior secondary school student was 601 Yuan, up by 82.4 % and per-student non-personnel expenditures for western rural junior secondary schools increased 1.12-fold.

The per-student current non-personnel expenditures for Chinese primary and junior secondary schools have increased remarkably (see Table 2.2). In 2006, the per-student non-personnel expenditure for rural primary schools was 315 Yuan, up by 86.9 % from 2003, based on the comparable prices. For primary schools in western rural areas, the per-student non-personnel expenditure increased 1.4-fold (and 1.5-fold in Inner Mongolia, Chongqing, Shannxi, and Xinjiang). In rural junior secondary schools, the per-student non-personnel expenditure was 478 Yuan, up by 81 %. The per-student non-personnel expenditure for rural junior secondary schoosl in western China increased by at least 1.26-fold. In Chongqing, Sichuan, and Xinjiang, it increased 1.5-fold compared with 2003.

Table 2.2 Changes in current non-personnel expenditures per student at primary and junior secondary schools in China (2003–2006) (Yuan)

	Primary schools	Rural primary schools	Junior secondary schools	Rural junior secondary schools
2003	230	157	394	246
2004	279	199	450	299
2005	340	252	541	382
2006	407	315	643	478
Growth of 2006 compared with 2003 (%)	64.8	86.9	52.0	81.0

2. **The Rise of the Proportion of Non-personnel Expenditures in Regular Expenditures**
   The regular expenditures for primary and junior secondary schools are composed of personnel expenditures and non-personnel expenditures. The proportion of non-personnel expenditures in regular expenditures for rural primary schools increased to 22 % in 2006 from 19 % in 2003. The proportion for rural junior secondary schools increased from 26 % in 2003 to 28 % in 2006. The increase in the proportion of non-personnel expenditures in regular expenditures demonstrates that the series of policies to improve the fund guarantee mechanism for rural compulsory education has made great progress (see Table 2.3).

3. **Certain Differences of Per-Student Non-personnel Expenditures for Rural Compulsory Education**
   The growth in the amount and proportion of non-personnel expenditures of regular expenditures for rural primary and junior secondary school shows that physical facilities of rural primary and junior secondary schools are being improved. However, due to the different financial abilities of local governments, there is still a difference in non-personnel expenditure standards for rural compulsory education among provinces (see Fig. 2.1). In 2006, the national per-student non-personnel expenditure for rural primary schools was 315 Yuan. The per-student non-personnel expenditure for rural primary schools in Beijing was highest at 2227 Yuan—15 times higher than that of the lowest in Guizhou, which is 149 Yuan. Additionally, six provinces were higher than 500 Yuan and 14 provinces were lower than 300 Yuan.

In 2006, the national per-student non-personnel expenditure at rural junior secondary schools was 478 Yuan (see Fig. 2.2). It reached 3689 Yuan in Beijing, while it was just 252 Yuan in Guizhou—the former is 15 times higher than the latter. The per-student non-personnel expenditure for rural junior secondary schools was greater than 500 Yuan in 13 provinces; in Anhui and Guizhou, it is less than 300 Yuan.

Table 2.3 The proportion of non-personnel expenditures in regular expenditures for primary and junior secondary schools (2003–2006) (Yuan)

	Rural primary schools		Rural junior secondary schools	
	Personnel expenditures	Non-personnel expenditures	Personnel expenditures	Non-personnel expenditures
2003	81	19	74	26
2004	80	20	73	27
2005	78	22	72	28
2006	78	22	72	28

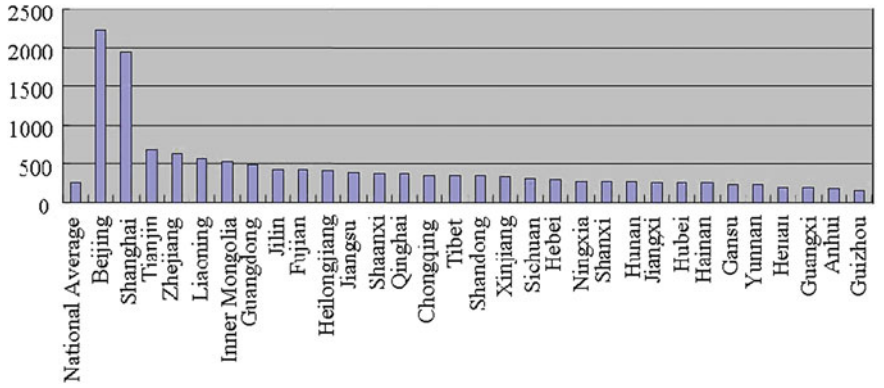


Fig. 2.1 Average per-student non-personnel expenditures for rural primary schools in 2006

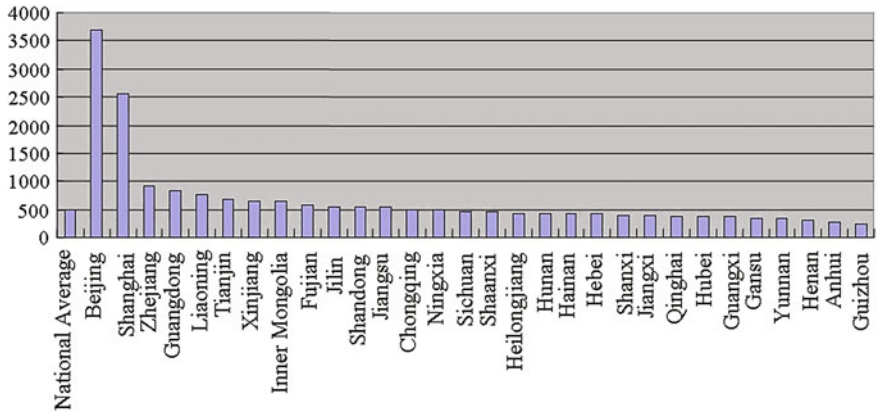


Fig. 2.2 Average per-student non-personnel expenditure for rural junior secondary schools in 2006. *Note* Excluding data of Hong Kong, Macau and Taiwan. *Note* Data are lacking for the Tibetan Autonomous Region

2.1.2.2 Non-personnel Expenditure Standards for Primary and Junior Secondary Schools in Four Sample Provinces

Based on the implementation of non-personnel expenditures in 12 sample counties of 4 sample provinces, data both at the macro and micro levels indicate that the implementation of the fund guarantee mechanism for rural compulsory education has improved the guarantee level for non-personnel expenditures. Most of the sample counties consider the scale of schools as an important factor to determine non-personnel expenditure standards and allocate non-personnel expenditures to primary and junior secondary schools. A higher standard for non-personnel expenditures is determined for small schools, which could promote the balanced

development of schools within the same region. However, there are still some problems with non-personnel expenditure standards in sample provinces and counties.

1. **Differences of Non-personnel Expenditure Standards**
   According to policies issued by the central government, the provincial government determines the minimum non-personnel expenditure standard. The county government determines the local standard, but the local standard must be higher than the minimum non-personnel expenditure standard. Most of the county governments took the minimum non-personnel expenditure standard as the local standard. For this reason, a trivial difference or even no difference exists between counties in the same province, such as sample counties of Guangxi and Heilongjiang. However, local non-personnel expenditure standards are different in the sample counties of Hubei and Zhejiang. For example, in Zhejiang, the highest non-personnel expenditure standard for primary schools was 365 Yuan and the lowest was 242 Yuan; for junior secondary schools, the highest was 445 Yuan, which is 115 Yuan higher than the lowest. Meanwhile, at the provincial level, there still exist differences among minimum non-personnel expenditure standards (see Table 2.4). For example, the highest standard for township junior secondary schools is 470 Yuan per student in Heilongjiang and the lowest is 225 Yuan in Guangxi. In rural junior secondary schools, the highest is 330 Yuan per student in Zhejiang and the lowest is 195 Yuan in Guangxi.

Based on our analyses, we found that differences still exist in the non-personnel expenditure standards for primary and junior secondary schools among regions. In order to promote educational equity, it is urgent for the central government to determine a reasonable minimum national standard.]

2. **Differences in Non-personnel Expenditure Standards between Township Schools and Rural Schools**
   The differences in non-personnel expenditures not only exist among provinces, but also between township schools and rural schools (see Table 2.4). In Hubei and Guangxi, the minimum non-personnel expenditure standard for township

Table 2.4 The minimum non-personnel expenditure standard for primary and junior secondary schools determined by four provincial governments in 2007 (Yuan)

Province/autonomous region	Junior secondary schools		Primary schools	
	Rural	Township	Rural	Township
Heilongjiang	355	470	305	390
Zhejiang	330	330	230	230
Hubei	300	330	200	230
Guangxi Zhuang	195	225	140	170

Data source survey data

schools is 30 Yuan, higher than that for rural schools. In Heilongjiang, the minimum non-personnel expenditure standard for township primary schools is 85 Yuan, higher than that for rural primary school, and the difference for junior secondary schools between township and rural areas is 115 Yuan. However, Zhejiang supplies the same minimum standard for township schools and rural schools. To improve balanced development of education, the government should determine a higher non-personnel expenditure standard for rural schools.

3. **The Non-personnel Expenditure Shortage**
   Currently, the resources for non-personnel expenditures consist of both appropriation of miscellaneous fee exemptions and appropriation of budgetary non-personnel expenditures. Because these two types of appropriations are at very low levels, schools cannot get adequate non-personnel expenditures for their actual needs related to school operations. In addition, the government did not pay enough attention to special needs of boarding schools, such as additional water, electricity, and temporary staff. If the government ignores the changes and special needs of schools when determining non-personnel expenditure standards, school operations will be difficult because of the shortage of non-personnel expenditures.
4. **Lack of Methodology Support for the Determination of Non-personnel Expenditure Standards**
   In the survey, we found that the determination of non-personnel expenditure standards lacked methodology support. Most governments determined the standard according to their superior government and local financial ability, while few governments determined the standard according to the actual needs of primary and junior secondary school operations.
5. **Lack of Growth Mechanisms for Non-personnel Expenditure Standards**
   All of the sample provinces and counties have had education since 2002. With the reform and development of curriculum and teaching, the need for non-personnel expenditures for primary and junior secondary schools has been on the rise. In 2006, the central government issued the Notice on Resolutely Restraining Excessive Tuition and Fees Collection by Schools in Reform of Fund Guarantee Mechanism for Rural Compulsory Education, requiring primary and junior secondary schools to remove agency and service fees and incorporate these reasonable expenditures into the scope of non-personnel expenditures. This requires non-personnel expenditure standards to be adjusted with the continuous development and reform of education. However, in our survey, we found that only sample counties in Zhejiang had increased non-personnel expenditure standards. If the government does not increase the standards with all changes faced by compulsory education, schools will not improve the quality of education. To implement educational reforms successfully, a reasonable growth mechanism should be designed for non-personnel expenditure standards.

2.1.3 Principles to Determine Non-personnel Expenditure Standards for Primary and Junior Secondary Schools

2.1.3.1 The Non-personnel Expenditure Standard Should Match Educational Development

The development of educational objectives, content, teaching methods, and teaching techniques will bring new need for non-personnel expenditures. Meanwhile, the shift of compulsory educational strategies from popularization to quality requires more funds, especially for non-personnel expenditures. Therefore, the non-personnel expenditure standard should be adjusted in time to match educational development.

2.1.3.2 The Non-personnel Expenditure Standard Should Be Determined Based on Convergences and Variations of Schools

The mission of primary and junior secondary school is to ensure that quality education is available to every child, so most activities in schools are similar. However, the characteristics of schools are usually different, such as scale and facilities. In addition, the characteristics of the school districts differ by location, such as geography, climate, and local price. For example, schools in northern China, where it is much colder in winter, have to spend more of their non-personnel expenditures on heating. Because of the different characteristics of schools and school districts, schools will have different needs for non-personnel expenditures. Therefore, non-personnel expenditure standards should be determined according to the convergences and variation of different schools.

2.1.3.3 The Non-personnel Expenditure Standard Should Keep Stable and Be Increased Over Time

The precondition for non-personnel expenditures is that they should be adequate to meet a school's reasonable demands. If the government does not change the objectives, contents, and outcomes of compulsory education, the resources consumed by schools will be stable. Therefore, non-personnel expenditure standards should keep stable. However, they should be adjusted in a timely manner when the prices of those resources change. Otherwise, some educational activities will not be carried out.

2.1.4 The Approaches to Non-personnel Expenditure Standards for Primary and Junior Secondary Schools

At present, there is little domestic research on approaches to non-personnel expenditure standards for primary and junior secondary schools. The most frequently mentioned is the material consumption ration approach designed by the National Education Commission in (1992). Since 2000, the Ministry of Education has been requiring local governments to use this approach to determine non-personnel expenditure standards for compulsory education. Internationally, the determination of expenditure standards for primary and junior secondary schools is based on four approaches to adequate finance: the successful school/district approach, cost function approach, professional judgment approach, and evidence-based approach to provide adequate funds for schools to achieve high minimum outcomes. Fiscal adequacy encompasses not only fiscal inputs but also their linkage to education programs, student achievement, and school efficiency. The material consumption ration approach and the other four international approaches could provide methodology support for the determination of non-personnel expenditure standards.

2.1.4.1 Material Consumption Ration Approach

The steps of the material consumption ration approach are as follows:

1. Assume school scale, class scale, and physical facilities.
2. Design the necessary resources and quantity of these resources for assumed schools.
3. Multiply the quantity by price, respectively, to calculate the cost for each resource.
4. Sum up the total cost of these resources.
5. Divide the total cost by enrollments to calculate the per-student non-personnel expenditure.

A disadvantage of this approach is that it is hard to determine a uniform benchmark for school operations due to the great differences in local prices, school scales, and physical facilities. Moreover, even if the uniform benchmark is determined, it is still complicated and difficult to detail resources in practice. Therefore, this approach has not yet been applied universally. However, the approach focuses on the detailed needs of schools, so it has been taken as the basis to determine non-personnel expenditures in many areas.

2.1.4.2 Successful District/School Approach (Best Practice District/School Approach)

The successful district approach, which has been used in Illinois, Maryland, Mississippi, and Ohio, is to identify districts that have been successful in teaching its students proficiency standards and to set the adequacy level at the weighted average of the expenditures per pupil of those districts (Odden 2003). The successful districts do not include large city school districts, small rural school districts, and school districts at both extremes of the per pupil property wealth distribution in the state (Conley and Picus 2003). The key to using the successful school district approach is being able to determine the differences in how successful and unsuccessful schools spend their money (Picus 2004).

This approach is easy to explain to the public and makes intrinsic sense as a way to specify an adequate level of resources (Picus 2004). However, it is difficult to identify successful districts. When this approach was used in Ohio, only 8 of the state's 612 districts met the established criteria of successful schools, which analyzed both inputs and outcomes to determine successful schools. However, when only the criteria for outcomes were applied, 100 districts met the criteria (Augenblick et al. 2002). The spending of those successful districts is lower than the state average. The other disadvantage of this approach is that the adequate expenditure level typically identified is difficult to relate to the fiscal adequacy needs of big city and small rural districts, even with adjustments for pupil needs and geographic price differentials (Odden 2003).

2.1.4.3 Cost Function Approach

The economic cost function approach employs regression analysis with expenditure per pupil as the dependent variable; student and district characteristics, as well as performance levels desired, are the independent variables (Odden 2003). The equations in a cost function approach accommodate differences in pupil characteristics, district conditions, and educational prices across all districts in a state. Student characteristics include providing additional funds for children with disabilities, children from low-income families, or children who are English-language learners. District conditions taken into account include district size, population density, and number of schools and other factors outside of the control of a school district. Finally, the equations accommodate educational price differences—differences in the cost of the products and services needed to operate a school (Conley and Picus 2003).

Although this approach has a great deal of appeal among economists (Picus 2004), the complex statistical analyses required to make these cost function estimates can be difficult for policy makers and the general public to understand, which makes policy makers less inclined to accept the expenditure estimates that such models generate (Conley and Picus 2003).

2.1.4.4 Professional Judgment Approach

This professional judgment approach has been used most recently in Kansas, Maryland, Oregon, and Wyoming. This approach creates a group of educational experts who identify effective educational strategies for elementary, middle, and high schools, as well as for special needs students, then specify the educational resources required for each to ensure that most of the students in the school will be able to meet the state-established performance goals, attach a price to each ingredient, and finally sum everything up to obtain a total expenditure per pupil (Odden 2003).

A disadvantage is that, other than expert educational judgments, the strategies and ingredients have no clear link to actual performance levels (Odden 2003). The second disadvantage is that it depends on the judgments of educational professionals to identify strategies rather than building directly from research that demonstrates an actual linkage between educational strategy or program and student performance (Conley and Picus 2003). Other disadvantages stem from the potential subjectiveness of the process. For example, it is impossible to ensure that each team member has no conflict of interest that would lead him or her to make judgments that might influence their own circumstances (National Research Council 1999; Picus 2004). Furthermore, it provides little differentiation between strategies for the average school and strategies for schools with higher concentrations of at-risk students, second language learners, or other specialized populations (Conley and Picus 2003).

The advantages to the professional judgment approach are that it is easily explained to the public and the resulting estimates are based on the judgments of professional educators with experience in educating students (Picus 2004). The approach also makes it easy to adjust for local characteristics and issues, such as special student needs and geographic price variations (Odden 2003).

2.1.4.5 Evidence-Based Approach

The evidence-based approach depends on current educational research to identify the resources needed for a prototypical school to meet a state's student performance benchmarks, as developed by Allen Odden. This approach designs a set of elements that are required to deliver a high-quality, comprehensive, schoolwide instructional program, and it determines an adequate expenditure level by placing a price on each ingredient and aggregating to a total expenditure (e.g., Odden 2003). This approach may be used to identify adequate site, district, and state expenditure levels (Odden 2003).

This approach is more directly based on educational strategies that improve student performance and produce desired results, so it also helps schools to use funds most effectively (Odden 2003). However, research-based education strategies may not work in absolutely every situation (Picus 2004). Also, this approach did not include adequate funds to cover planning and preparation time for teachers and

did not standardize costs across various designs, so it probably underestimated total costs somewhat (Conley and Picus 2003).

Based on the above analysis, five approaches are used comprehensively in this study. We use an item-specific integration approach and cost function approach to calculate the non-personnel expenditure standard. In the item-special integration approach, we mix the professional judgment approach, best practice school approach, evidence-based approach, and material consumption ration into one approach to calculate the non-personnel expenditure per student.

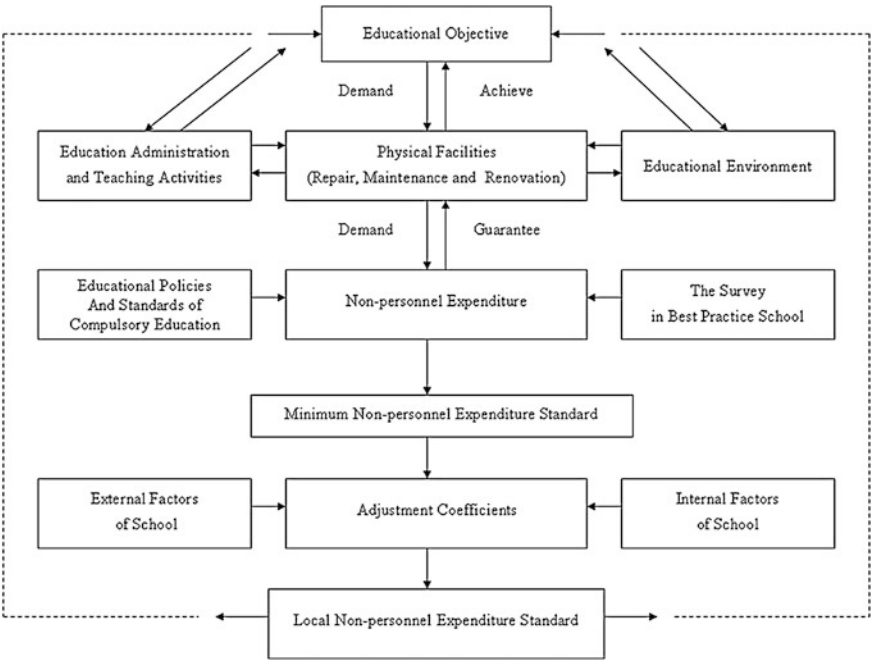
2.2 The Item-Specific Integration Approach to Non-personnel Expenditure Standards for Rural Compulsory Education

2.2.1 Introduction to the Approach

As shown in Picture 2.1, the education objective is the origin of the non-personnel expenditure demand. Since 2000, the central government has set up new objectives for compulsory education that primary and junior secondary schools should provide high-quality education for every student, which requires schools to improve management, reform teaching activities, and create a better educational environment. To achieve the educational objective, primary and junior secondary schools must be supplied with adequate non-personnel expenditures to get adequate physical resources. This study aims to determine reasonable non-personnel standards for primary and junior schools.

To ensure that every school achieves the required standards of school operation determined by the government, the government should provide adequate non-personnel expenditures for school. However, the government seems to be unclear on how to judge the adequacy of non-personnel expenditures. An approach is needed to clarify the real demand of non-personnel expenditure based on government requirements. A substantial method and procedure will be developed to calculate the non-personnel expenditure benchmarks, such as expenses for equipment, special materials, and books, which is the first step of the item-specific integration approach to calculate the minimum non-personnel standard without considering the differences of schools.

The item-specific integration approach calculates the standard for each item of non-personnel expenditure, based on the standards of school operation issued by government. The non-personnel expenditure for equipment, special materials, and books will be calculated according to the standards of school operation issued by the Ministry of Education; the non-personnel expenditure for training, labor union, and welfare will be calculated according to the required proportion of non-personnel expenditure ruled by policies; the non-personnel expenditure for the stable materials consumed by schools will be calculated according to 92's Ration;



Picture 2.1 Flow chart of item-specific integration approach

and other non-personnel expenditures will be calculated by the professional judgment approach and best practice school approach. Finally, we sum the non-personnel expenditures for each item to get the total minimum non-personnel expenditure standard per student.

After getting the benchmark of non-personnel expenditures, we need to tackle the differences on the regional level, district level, and school level. Accordingly, the final step of the item-special integration approach is to calculate adjustment coefficients for differences, then multiply the minimum non-personnel expenditure with adjustment coefficients to acquire the adjusted standard suitable for the characteristics of schools and regions. The differences of schools include internal and external differences. Internal differences consist of school scale, class scale, boarding school or not, etc. External differences are comprised of geography, climate, local price, etc.

The main standards of school operation and policies issued by the government are as follows:

– Provisional Regulations on Non-personnel Expenditure for Rural Primary and Junior Secondary School issued by the Ministry of Education in 2006:

  The expenses for teachers' training will account for 5 % of the total non-personnel expenditure of the school, covering expenses for transportation, training materials, meals, and accommodation.

Table 2.5 Per-student floor area of school buildings for primary and junior secondary schools (unit: m^2)

School category	School scale	Recent index	Planned index
Primary schools[a]	4 classes	3.69	4.78
Primary schools	6 classes	4.84	7.02
	12 classes	4.34	5.98
	18 classes	4.02	5.47
Junior secondary schools	12 classes	6.01	10.25
	18 classes	5.78	9.72
	24 classes	5.63	9.41

[a]These primary schools only provide grade 1 to grade 3 primary educations to students

The allocation of non-personnel expenditures for rural primary and junior secondary schools will mainly be based on the enrollment of schools; full consideration will also be given to the actual operational situation of schools with different scales. The government should supply a higher per-student appropriation of non-personnel expenditures for poverty schools, small schools, and teaching points.

– School Buildings Standards for Rural Primary and Junior Secondary School issued by the Ministry of Education in 1996:

  Section Four of Chap. 4 states the per-student standard for floor areas of the school building, shown in Table 2.5.

– The Notice on the Regulations of Libraries at Primary and Junior Secondary School issued by the Ministry of Education in 2003 states that the books per student are as follows:

  40 books per student at junior secondary school I,[2] 25 books per student at junior secondary school II, 30 books per student at primary school I, and 15 books per student at primary school I. For newspapers, 80 kinds and 60 kinds are defined for junior secondary schools I and II, respectively; with 60 kinds and 40 kinds for primary school I and II, respectively. The annual increase for books should not be less than 1 % of the total books.

– Working Plan for Distance Education Projects Pilot for Rural Primary and Junior Secondary School:

  An average of about 16,000 Yuan will be invested in each satellite teaching station for rural primary schools. About 150,000 Yuan will be input into each rural junior secondary school to build a computer classroom.

– Material Consumption Ration of Non-personnel Expenditure for Primary and Junior Secondary School (1992):

[2]A primary/junior school I has at least 19 classes; a primary/junior school II has 18 or less classes.

92's Ration mainly covers resources consumed in teaching activities, administration and management, and student activities of primary and junior secondary schools. These resources should be paid by expenses for the line of duty and activities (refer to Appendix 2).

Moreover, the standards and policies also include Standards for Inspecting Nine-year Compulsory Education Popularization, Mathematics and Science Instruments and Equipment Benchmarks for Primary Schools, Mathematics and Science Instruments and Equipment Benchmarks for Junior Secondary School, Personnel Standard for Primary and Junior Secondary School, and other related regulations on expenses for training, labor unions, and welfare.

2.2.2 Calculation Process and Conclusions

2.2.2.1 Calculation Process

Based on the actual situation of rural compulsory education, benchmarks for school operation, best practice school data, and macro statistical data, we used this approach to calculate the average non-personnel expenditure per student in order to ensure that schools have adequate non-personnel expenditures to achieve the benchmarks of school operation issued by the government and to supply high-quality education to students.

1. **Assumed School Scale**
   In 2007, there were 8 classes in each rural primary school on average and 36 students in each class. Therefore, there were 291 students in each rural primary school. In each rural junior secondary school, there were 16 classes, 907 students in each school, and 57 students in each class on average (refer to Table 2.6). Compared with 92's Ration, which assumed the average school scale was 12 classes and 540 students, the scale of rural primary schools is obviously lower and that of rural junior secondary schools is much higher.

Table 2.6 School and class scale of rural primary and junior secondary schools in 2007

	Number of schools	Total enrollment	Number of classes	Average school size	Average number of classes in each school	Average class size
Rural primary schools	302,526	88,029,214	2,502,861	291	8	36
Rural junior secondary schools	51,515	46,733,133	832,741	907	16	57

Considering that the rural primary school scale in China is small, in this approach we assume the primary school scale is 8 classes and 300 students. Junior secondary schools still refer to the normative school scale assumed in 92's Ration—12 classes and 540 students.

2.2.2.2 Calculation of Major Items

Non-personnel expenditures include five parts: expense for line of duty, expense for activities, equipment, repair and maintenance and other. Major items in each part were calculated using suitable approaches. The processes and results of the calculations refer to Appendix 1 in detail. The following are the calculation processes of major items.

(a) **Expenses for Line of Duty**

- We used the material consumption ration approach to calculate office supplies. That is to say, expenses for office supplies determined in 92's Ration were multiplied by price indexes to get non-personnel expenditure standards. To get a precise standard, we multiplied the per student expenses for stationeries, hardware, and electric apparatus determined in 92's Ration with the accumulated price index for 1993 to 2006, respectively:

  Office supplies per primary student = [4.88 Yuan (stationeries) × 1.1 (price index)] + [2.49 Yuan (hardware and electric apparatus) × 1.18 (price index)] = 8.3 Yuan
  Office supplies per junior secondary student = [5.42 Yuan (stationeries) × 1.1 (price index)] + [2.49 Yuan (hardware and electric apparatus) × 1.18 (price index)] = 10.3 Yuan

- We used the best practice school approach to calculate non-personnel expenditure standards for water and electricity. According to the survey, a primary school student consumes an average of 10 tons of water and 30° of electricity, and 12 tons of water and 40° of electricity for a junior secondary school student. The water costs 1.3 Yuan per ton and electricity costs 0.6 Yuan per degree. The results of the calculation were as follows:

  Expenses for water and electricity per primary school student = [10 × 1.3] + [30 × 0.6] = 31 Yuan
  Expenses for water and electricity per junior secondary school student = [12 × 1.3] + [40 × 0.6] = 39.6 Yuan

(b) **Expenses for Teaching Activities**

- The non-personnel expenditure standard for special materials was calculated using the evidence-based approach. According to Mathematics and Science Instruments and Equipment Benchmarks for Primary and Junior

Secondary Schools, schools should be equipped with instruments that are valued less than 500 Yuan. If the lifespan of these instruments and equipment is 8 years, the depreciation rate will be 1/8 per year on average.

Expenses for special materials per primary school student are 14 Yuan.
Expenses for special materials per junior secondary student are 20 Yuan.

– We also used the evidence-based approach to calculate the non-personnel expenditure standard for newspapers. The books benchmark for primary and junior secondary schools II determined in the Notice on the Regulations of Libraries at Primary and Junior Secondary School stipulates that each primary school should buy 40 kinds of newspapers a year and spend 60 Yuan on each kind of newspaper on average. It also requires junior secondary schools to buy 60 kinds of newspapers in one year, each of which may cost 90 Yuan.

Expenses for newspapers per primary school student = [60 × 40]/300 = 8 Yuan
Expenses for newspaper per junior secondary school student = [90 × 60]/540 = 10 Yuan

(c) **Expenses for Equipment**

– We used the evidence-based approach to determine the non-personnel expenditure standard for equipment valued higher than 500 Yuan—instructional equipment that is necessary for primary and junior secondary schools to supply quality education to students. This equipment is also an important part of a school's fixed assets, which feature large-value, one-time investments and long-term usage. To share the cost to remedy investments, expenses for equipment could be calculated according to the state equipment benchmarks and life expectancy of the equipment.
The calculation of special equipment expenses should be based on mathematics, science, music, sports, and art equipment benchmarks for primary schools and junior secondary schools, as determined by the Ministry of Education in 2006. We assume that 50 % of this equipment has a 5-year lifespan and the other 50 % has an 8-year lifespan.

Expenses for special equipment per primary school student are 21.0 Yuan.
Expenses for special equipment per junior secondary school student are 44.0 Yuan.

– Based on both the best practice school approach and professional judgment approach, we calculated the non-personnel expenditure standard for desks and chairs. According to the survey in best practice primary schools, one set of a double desk-and-chair costs 100 Yuan, or 50 Yuan per student. If we assume that there are 8 classes, 1 electrification classroom, 1 musical classroom, and 1 science experiment classroom in each primary school totaling 11 classes, the adjustment coefficient would be 11/8 = 1.375.

According to the survey in best practice junior secondary schools, one set of a double desk-and-chair costs 120 Yuan, or 60 Yuan per student. If we assume that there are 12 classes, 1 electrification classroom, 1 musical classroom, 1 physics experiment classroom, 1 chemistry experiment classroom, and 1 biology experiment classroom in each junior secondary school totaling 17 classes, the adjustment coefficient would be 17/12 = 1.42. The depreciation is based on 8 years:

Expenses for desks and chairs per primary school student = [50/8] × 1.375 = 8.59 Yuan
Expenses for desks and chairs per junior secondary school student = [60/8] × 1.42 = 10.65 Yuan

(d) **Expenses for Repair and Maintenance**

– *Expenses for equipment repair and maintenance*: In 2007, national average value of instruments and equipment per rural primary school student was 238 Yuan and that of rural junior secondary school student was 375 Yuan. The expenses for repair and maintenance will account for 8 % of the original value:

Expenses for equipment repair and maintenance per primary school student = 238 × 8 % = 19 Yuan
Expenses for equipment repair and maintenance per junior secondary school student = 375 × 8 % = 30 Yuan

– *Expenses for building repair and maintenance*: In 2007, the national average school building floor area per primary school student was 5.6 m^2 and per junior secondary school student was 6.9 m^2, which are higher than the recent indicators but lower than the planned indicators of School Buildings Standards for rural primary and junior secondary school. The cost of building repair and maintenance is about 7 Yuan per m^2:

Expenses for building repair and maintenance per primary school student = 5.6 × 7 = 39.2 Yuan
Expenses for building repair and maintenance per junior secondary school student = 6.9 × 7 = 48.3 Yuan

– *Expenses for playground repair and maintenance*: According to the Standards for Inspecting Compulsory Education Popularization, each rural primary school will have a playground of 2000 m^2 with a 200-meter-long track and each rural junior secondary school will have a playground of 3000 m^2 with a 250-m-long track. The playground repair and maintenance costs 1 Yuan per m^2:

Expenses for playground repair and maintenance per primary school student = 2000 × 1/300 = 6.7 Yuan
Expenses for playground repair and maintenance per junior secondary school student = 3000 × 1/540 = 5.6 Yuan

(e) **Other Expenses**

– *Expenses for training*: According to Provisional Regulations on Non-personnel Expenditure Management for Rural Primary and Junior Secondary School, 5 % of the total annual non-personnel expenditure of schools will be spend on teacher training, including transportation, meals, training materials, and accommodation.

The cost of teacher and staff training at rural primary and junior secondary schools is comparatively high. If 3 % of total salaries is used for staff training in enterprises and we assume that the proportion of personnel expenditures in regular expenditure accounts for 70 %, the proportion of training expenses in total non-personnel expenditures will be increased to 7 %. Calculated by this proportion, training expenses per teacher at primary school and junior secondary schools are only 467.5 Yuan and 584.5 Yuan, respectively. In 2007, the ratio of students to teachers at primary schools and junior secondary schools were 18.7:1 and 16.7:1, respectively, in 2007. Accordingly, per student training expenses are 25 Yuan at primary schools and 35 Yuan at junior secondary schools.

According to the non-personnel expenditure standards for rural primary and junior secondary schools (refer to Appendix 1) calculated by above approaches, the total non-personnel expenditure per student at a primary school is 345 Yuan, which is 9.8 % higher than the national average of 2006; the total non-personnel expenditure per student at a junior secondary school is 495 Yuan, 3.5 % higher than the national average of 2006 (refer to Table 2.7). Meanwhile, the structure of non-personnel expenditures is becoming reasonable because the proportions of expenses for activities, equipment and books, and repair and maintenance in non-personnel expenditures have increased appropriately. The growth of the non-personnel expenditures for activities, equipment and books, and repair and maintenance will help schools to improve physical facilities and enhance education quality. The growth of training expenses shows that the quality of teachers and staff, which is a factor for schools to improve education quality, will be improved.

2.2.2.3 Adjustment Coefficients

The above per-student non-personnel expenditure standards of primary and junior secondary schools are 345 Yuan and 495 Yuan, respectively. These standards do not account for the differences between schools. Therefore, we will use adjustment coefficients to adjust the standards in order to calculate local standards. In an item-specific integration approach, we will focus our attention on the differences in school scale, class scale, boarding students, and others.

(a) **Adjustment Coefficients for School Scale and Class Scale**
92's Ration designed a normative prototype school with 12 classes, 540 total students, and 45 students in each class. According to the material consumption ration for different scale schools, the per-student non-personnel expenditure

Table 2.7 Our calculated non-personnel expenditure standards versus the national average of non-personnel expenditures per student in 2006

	Sum (Yuan)		Composition (%)	
	Rural primary school	Rural junior secondary school	Rural primary school	Rural junior secondary school
Calculation standard				
Total	345	495	100	100
Line of duty	104	139	30	28
Teaching activities	65	105	19	21
Equipment	56	88	16	18
Repair and maintenance	65	84	19	17
Others	56	80	16	16
Actual value of non-personnel expenditure per student in 2006				
Total	315	478	100	100
Line of duty	125	182	40	38
Teaching activities	47	71	15	15
Equipment	41	70	13	15
Repair and maintenance	56	88	18	18
Others	45	68	14	14

for schools with 12 classes is 1.14 times higher than that for the schools with 18 classes, among which expenses for the line of duty are 1.14 times, expenses for teaching activities are 10.9 times, expenses for equipment are 1.15 times, expenses for repair and maintenance are 1.15 times, and other expenses are 1.13 times.

92's Ration only considered differences of school scale, not differences of class scale. In the survey, we found that the smaller the class scale is, the higher the per-student non-personnel expenditure is. Also, 80 % of non-personnel expenditures will still keep stable as the number of classes decreases. Therefore, when we determine and calculate non-personnel expenditure standards, school scale and class scale should be taken into account. Adjustment coefficients should be set for small schools and schools with small class sizes to ensure that adequate non-personnel expenditure are supplied to these schools and that school operation and teaching activities are smooth. Therefore, we could use the adjustment coefficients shown in Table 2.8 to calculate non-personnel expenditure standards for primary schools with less than 300 students and junior secondary schools with less than 500 students.

(b) **Adjustment Coefficient for Boarding Students**

According to the survey, the non-personnel expenditure per boarding student is 150 Yuan higher than that per non-boarding student. The 150 Yuan mainly

Table 2.8 Adjustment coefficients for school scale and class scale

	Total	Line of duty	Activities	Equipment	Repair and maintenance	Others
18 classes						
A1. Composition of junior secondary schools in 2006	1	0.38	0.15	0.15	0.18	0.14
A2. Composition of primary schools in 2006	1	0.40	0.15	0.13	0.18	0.14
Less than 18 classes						
B1. The coefficient of junior secondary schools with 12 classes		1.14	1.09	1.15	1.15	1.13
B2. The coefficient of primary schools with 8 classes		1.14	1.09	1.15	1.15	1.13
Adjustment coefficient: $c = a \times b$						
C1 for junior secondary schools with 12 classes	1.135	0.433	0.164	0.173	0.207	0.158
C2 for primary schools with 8 classes	1.078	0.456	0.164	0.150	0.150	0.158
Small class scale						
D1. The coefficient of 12 classes in junior secondary schools	1.10		Calculation: $(45/40 - 1) \times 0.8 + 1 = 1.10$			
D2. The coefficient of 8 classes in primary schools	1.23		Calculation: $(45/35 - 1) \times 0.8 + 1 = 1.23$			
Adjustment coefficient: $\mathbf{e = c \times d}$						
E1 for junior secondary schools	1.25		25 % of non-personnel expenditure standard per student will be added when a student less than the ration.			
E2 for primary schools	1.29		29 % of non-personnel expenditure standard per student will be added when a student less than the ration.			

includes 40 Yuan for expenses for water and electricity, 20 Yuan for daily life expenses, 50 Yuan for a subsidy of teachers due to morning and evening self-study of students, 30–40 Yuan for expenses for repair of beds and other miscellaneous expenses. Deducting 40 Yuan that is collected to cover the accommodation of boarding students, 100 Yuan needs to be subsidized for each student.

2.2.3 Conclusion

According to the requirements for standards of compulsory education, an item-specific integration approach gives full consideration to internal and external factors influencing non-personnel expenditure demands. If the government sets up standards for compulsory education, then the government should provide adequate funds to ensure that schools achieve those standards. We used an evidence-based approach, material consumption ration approach, professional judgment approach, and best practice school approach to calculate non-personnel expenditure standards for rural primary and junior secondary schools. Based on our results, the per-student minimum non-personnel expenditure standard for rural primary schools should be 345 Yuan per year, which is 9.8 % higher than the 2006 national average; the standard for rural junior secondary schools should be 495 Yuan per student per year, which is 3.5 % higher than the 2006 national average. We adjusted the minimum standards according to differences between schools, such as climate and geological condition, school scale, class scale, boarding school or not, and so on.

Due to limitations of time and data, the non-personnel expenditure standards for rural primary and junior secondary schools calculated in this study do not cover all items, such as expenses for property management, renting, and transportation tools. However, these expenses are indispensable for schools. Although this means that the minimum standards calculated in this study are lower than actual needs, we still hope that item-specific integration provides methodology support for the government to determine reasonable non-personnel expenditure standards.

2.3 Cost Function Approach to Non-personnel Expenditure for Primary and Junior Secondary Schools

2.3.1 Research Methods and Data

2.3.1.1 Cost Function

The cost function approach refers to the fact that demands of educational funds are not only influenced by the features of students and schools but also by expected

educational output level. Generally speaking, the higher the expected educational output is, the higher the demands for funds are. Therefore, educational outputs (student achievements) are determined by inputs (fund). Under the condition of considering the features of students and schools, the funds per student necessary for achieving certain achievements can be calculated, which could be used as non-personnel expenditure standards.

The basic form of the educational cost function is as follows:

$$E_{it} = h(S_{it}, F_{it}, P_{it}, Z_{it}, e_{it}, u_{it})$$

E_{it} represents the average educational expenses per student of a school in the t year; S_{it} is output; Z_{it} represents the features of students and schools; F_{it} represents the features of a student's family; P_{it} is the price vector of educational fund input factors; e_{it} represents the vectors that could not be observed; and u_{it} represents random errors.

The concrete form of cost function is a multiple regression equation. The dependent variable is educational expenses per student of the school and the independent variables measure output, features of students and schools, features of student families, and prices of educational fund input factors. The process to estimate educational fund demands is as follows:

1. Form the educational cost function E_{it} and multiple regression Eq.
2. Set down high minimum student achievement S^*_{it}.
3. Put the high minimum student achievement, the features of both students and schools, and prices into the regression model to estimate the fund input E^*_{it}. This fund input is necessary for schools to reach high minimum achievement.

We use the above model to estimate the funds needed by primary school and junior secondary schools, respectively.

2.3.1.2 Description of Variables

1. **The Actual Expenses of Non-personnel Expenditures Per Student of a School**
   In this study, the actual expenses of non-personnel expenditures per student are used as a dependent variable, which is calculated as follows: total annual expenses of non-personnel expenditure of the school/total annual enrollment of the school. Among samples used in this study (refer to introduction of samples), Guangxi has the lowest actual non-personnel expenses per student in the year (165.85 Yuan), while Zhejiang has the highest (519.48 Yuan), with the difference rate being 3.15. In junior secondary schools, Guangxi still has the lowest actual non-personnel expenses per student (218.59 Yuan) and Zhejiang has the highest one (722.49 Yuan), with the difference rate being 3.3. Comparing the current non-personnel expenditure standards, the actual non-personnel

expenditures of all provinces have reached the standards required in Notice on Provisional Regulations on Management of Non-personnel Expenditure for Rural Primary and Junior Secondary School. But considering the actual situation, the current level of non-personnel expenditure can only guarantee that schools operate at a relatively low level but is far from meeting the demands of school development.

2. **Student Achievement**

In this study, the indicators measuring the school achievements of students (educational output) refer to the standard cores of Chinese and mathematics. Because there are no standard examinations for Chinese and mathematics in practice, we converted the original scores of Chinese and mathematics to standard scores according to different provinces. The standard scores are independent of the difficulty of examinations and could show the rank of this school among schools of the same category in the province in terms of average scores. In this way, we could avoid the disadvantage of weak comparability due to the varying difficulties of examinations in different provinces. The conversion formula for standard scores is as follows:

$$\text{stand_exam}_{ijk} = 10 \times \frac{\text{orig_exam}_{ijk} - \text{mean}_{ik}}{\text{s}_{ik}} + 50$$

Here, i refers to the code of province, with $i = 1, 2, 3, 4$; j refers to the code of the school, with $j = 1, 2\ldots$; n_i; k refers to the code of the subject, with $k = 1, 2$; stand_exam_{ijk} refers to the standard score of subject k of school j in province i; orig_exam_{ijk} refers to the original score of subject k of school j in province i; mean_{ik} refers to the average score of subject k of province i; and s_{ik} refers to the standard difference of subject k of province i.

3. **Teacher Salary Index**

The teacher salary index refers to price variables in factors of educational fund inputs. In practice, we introduce the teacher salary index into the model because teachers play an irreplaceable role in school and exert great impact on school outcomes. In addition, the proportion of non-personnel expenditures in rural compulsory education expenditures decreased from 28.3 % in 1993 to 25.4 % in 2004, partly reflecting that the proportion of personnel expenditure is on the rise. It also indicates that although total educational expenditures have been increased in rural areas, the expenditures may guarantee teachers' salaries at first and only guarantee that schools operate at a low level. The adequacy of non-personnel expenditures could not be guaranteed at all (3).

Currently, the labor market is experiencing increased liquidity and schools need to increase personnel expenditures to attract more high-quality teachers with advanced educational degrees, professional titles, and long-term teaching experiences. This will bring more pressure on the payment of non-personnel expenditures. Therefore, teachers' salaries exert important indirect impacts on the non-personnel expenditures per student.

This study tries to find a balanced relationship between adequate expense levels of non-personnel expenditures and student outputs. Other variables are all regarded as control variables, which should be the least influenced by the controllable factors of schools. To achieve this objective, this study does not consider the controllable factors of local education departments, such as educational degrees, professional titles, and years of teaching experience. The salary index of teachers designed by Taylor (2004) is used to replace the salaries of teachers.

The calculation principles are as follows: First, use OLS regression with the average salary of full-time teachers being the dependent variable and features of schools and local features being independent variables:

$$\text{salary} = \alpha_0 + \alpha_1 \times x_1 + \alpha_2 \times x_2 + \alpha_3 \times x_3 + \alpha_4 \times x_4 + \varepsilon.$$

Here, salary refers to average salary of teachers, x_1 refers to the proportion of teachers holding educational degrees above junior colleagues, x_2 refers to the proportion of senior teachers, x_3 refers to the proportion of teachers having more than 10 years of teaching experience, and x_4 refers to the average training times of teachers each year.

Secondly, calculate the salary index of teachers: $\text{salary_index} = \text{salary} - \overline{\text{salary}}$. $\overline{\text{salary}}$ refers to the estimation after regression of the first step; thus, the teacher salary index could also be regarded as the residual value of the first step, including uncontrollable factors of schools and educational departments.

4. **School Scale**
   Schools with different scales have different demands for non-personnel expenditures. By adding the variables of student number and its quadratic term, on one hand we could control the impacts of student scales; on the other hand, we could estimate expense levels for schools of different scales.
5. **Features of Schools**
   School features in the model include the school building area per student, number of books per student, school type, ratio of students and teachers, proportion of boarding students, use of well water or not, and heating or not.

School building area per student Non-personnel expenditure includes expenses for property management and repair and maintenance. The larger the school building area per student is, the higher the expenses for property management and repair and maintenance and non-personnel expenditure per student are. This study introduces school building area per student to control the impacts of school building area on the expenses of non-personnel expenditures per student.

Books per student Expenses for books, magazines, and newspapers are an important component of non-personnel expenditures. The books possessed will exert an impact on the expenses of school funds. Therefore, this study introduces an indicator of books per student to control the difference of book availability at schools.

Variable of school types This variable is only used in the cost function model for primary schools. The sample primary schools include teaching points, village

regular schools, and central primary schools. Table 2.3 shows that the proportion of village regular primary schools is the highest (over 50 %) and the proportion of teaching points is the lowest (less than 10 %). Under the county-centered educational administration system, the county government has taken the responsibility of governance and financing, and central primary schools play an administrative role. Therefore, central primary schools need more non-personnel expenditures. Additionally, central primary schools have higher-quality education and teaching points have lower quality. Therefore, this study introduces the variable of school type to control the impacts of school types.

Ratio of students and teachers In order to investigate the minimum guaranteed non-personnel expenditure necessary for achieving high minimum outcomes, the ratio of students and teachers will exert important impacts on teaching quality. For research purposes, this study introduces the variable of the ratio of students and teachers to control differences in student achievements due to different ratios of students and teachers.

Proportion of boarding students Undoubtedly, the longer boarding students stay at schools, the more water, electricity, and other resources are consumed. With the proportion of boarding students increasing, expenses for water, electricity, and equipment maintenance will also be increased. The adjustment of school distributions in recent years made it common for schools to abolish teaching points for centralized education; as a result, the number of boarding students is sharply increasing. Among the sample primary schools, Zhejiang has the highest proportion of boarding students at 20.37 %; in junior secondary schools, Guangxi has the highest proportion of boarding students at 72.68 %. Therefore, when the non-personnel expenditure standard is determined, full consideration should be given to the proportion of boarding students. This study introduces the proportion of boarding students to control its impacts on the non-personnel expenditures of schools.

Resources of water There are two major sources of water: well water and tap water. If schools use well water, expenses for electricity (for pumping) and personnel funds are only needed to acquire water instead of higher payments for the expense of tap water. The use of well water could decrease the expenses of non-personnel expenditures. Particularly for schools in southern China such as Guangxi, using well water will dramatically decrease the water expenses of schools. Therefore, this study introduces well water as a controllable variable to investigate relationships between non-personnel expenditures per student and school achievements of students under the preconditions of controlling water resources.

Heating or not This indicator is targeted for Heilongjiang, which is located in the frigid zone. Expenses for heating equipment, resources, and maintenance are needed, accounting for 30 % of non-personnel expenditures for primary schools in Heilongjiang. This study introduces the variable of heating (1 represents yes and 0 represents no heating) to control the impacts of heating expenses on non-personnel expenditures.

6. **School Courses**
   Under the precondition of other courses, the proportion of experiment courses will directly exert an impact on the demands for non-personnel expenditures. Therefore, the time of experiment courses is introduced into the model to measure this relationship. In the model for primary schools, it refers to the class time of natural experiment courses per week per class. In the model for junior secondary schools, it refers to the class time of physics, chemistry, and biology experiment courses per week.

2.3.1.3 Sample Introduction

In total, there are 411 schools in this study. After selection based on each index, only 365 schools were entered into the cost function model, among which 300 are primary schools and 65 are junior secondary schools. The regional distribution is shown in Table 2.9.

2.3.2 Estimated Results

Tables 2.10 and 2.11 provide estimated results of models for primary schools and junior secondary schools. The equation results for the cost function of primary schools and junior secondary schools also show similar results. The effectiveness of

Table 2.9 Sample distribution

	Guangxi				Hubei			
County	Guiping	Yongfu	Rong'an	Sum	Xiaochang	Wuexue	Chibi	Sum
Town number	4	4	3	11	4	7	4	15
Primary school number	63	22	37	122	39	36	23	98
Junior secondary school number	4	3	5	12	10	5	9	24
	Zhejiang				Heilongjiang			
County	Jiangshan	An'ji	Lin'an	Sum	Mishan	Tangyuan	Keshan	Sum
Town number	5	5	4	14	4	4	3	11
Primary school number	10	8	16	34	4	12	30	46
Junior secondary school number	5	3	6	14	4	6	5	15

Table 2.10 Regression of the education cost function for primary schools

	Coefficient	t-statistics
Constant term	−303.325*	−1.75
Performance of student		
Standard average score for mathematics	0.373*	1.13
Standard average score for Chinese course	4.606*	1.82
School scale		
Student number	−14.606*	−1.13
Square of student number	0.023*	1.82
Features of teachers		
Teacher's salary index	0.115**	6.4
School equipment		
School building area per student	−0.169	−0.16
Books of books per student	0.881**	4.1
Features of schools		
Kind of schools	36.873*	1.91
Ratio of students to teachers	−128.060	−0.65
Percentage of boarding students	0.952	1.38
Use of well water	−19.670	−0.97
Heating or not	30.332**	5.97
Courses		
Time of natural experiment classes	0.019	0.02

Note
*refers to being obvious at the level of 10 %
**refers to being obvious at the level of 5 %

model for junior secondary schools is not so obvious, which is probably the result of small sample numbers. Therefore, we focus our explanation on the results for the primary school model.

In Table 2.10, student achievements for Chinese and mathematics are in direct proportion with non-personnel expenditures per student. Under the same conditions, a 1-point increase in the Chinese score will lead to an increase of 4.6 Yuan for the per-student non-personnel expenditure. A1-point increase in the mathematics scores will result in an increase of 0.373 Yuan in the per-student non-personnel expenditure. This shows that a stable increase in non-personnel expenditures will increase student achievements. Educators in various areas acknowledge that a lack of per-student non-personnel expenditures and insufficient non-personnel expenditures will limit teaching activities. The non-personnel expenditure should be increased in order to ensure that schools achieve school outcomes benchmarks.

The variable coefficient of enrollment is negative, while its square is positive, showing that the relationship between school scale and per-student non-personnel expenditures are represented in the features of a U-curve with a critical value. When the number of students is less than the critical value, the per-student non-personnel

Table 2.11 Regression of the education cost function for junior secondary schools

	Coefficient	t-statistics
Constant terms	163.681**	3.24
Performance of student		
Standard average score of mathematics	2.253	0.71
Standard average score of Chinese course	1.515	−1.48
School scale		
Number of students	−0.267	−1.46
Square of student number	0.000	0.81
Features of teachers		
Teacher's salary index	0.047**	2.11
School facilities		
School building area per student	0.689	0.19
Books of books per student	−0.078	−0.04
Features of schools		
Ratio of students and teachers	78.597	2.14
Percentage of boarding students	−0.480	−0.36
Use of well water	−15.614	−0.45
Heating or not	4.002	0.03
Courses		
Time of physical experiments	2.527	1
Time of chemical experiments	1.771	0.18
Time of biological experiments	6.155	1.25

Note
*refers to being obvious at the level of 10 %
**refers to being obvious at the level of 5 %

expenditure will decrease with the increase of enrollments; when the number of students is more than the critical value, the per-student non-personnel expenditure will increase with the increase of enrollment. According to the result of the regression, the critical value is 1270. However, most sample primary schools in this study are on a small scale and the highest average enrollment of primary schools is 784.31 students of Zhejiang, far from this critical value. On one hand, it shows that the smaller the scale of a school is, the higher the per-student expenditure will be; on the other hand, the main reason for small average school scale is the existence of teaching points. Therefore, the adjustment of school distributions should be made so as to achieve a scaled economy by appropriately expanding school scales.

Under the control of other conditions, if schools use well water, the per-student non-personnel expenditure will decrease by 19 Yuan. If schools have heating equipment, the per-student non-personnel expenditure will dramatically increase by 30 Yuan. If schools are central primary schools, the per-student non-personnel

expenditure will be 36 Yuan higher than village primary schools. Therefore, when the non-personnel expenditure standard is calculated, educational departments should give full consideration to extra cost needs related to the special conditions of schools; at the same time, schools should be encouraged to take full advantage of energy-saving resources to decrease the expenses of non-personnel expenditure. For example, primary and junior secondary schools in Heilongjiang must spend more non-personnel expenditures on heating because Heilongjiang is located in frigid-temperate zone. Guangxi is located in a subtropical zone and water consumption is higher than other regions, which will undoubtedly increase water expenses in non-personnel expenditures. If schools are located in regions with underground water resources, schools should be encouraged to reasonably use well water to achieve the goal of saving non-personnel expenditures. If schools are central primary schools, in order to ensure teaching quality and cover expenses for extra administration, governments should also increase the appropriation of non-personnel expenditures correspondingly.

The number of books per student also exerts an impact on per-student non-personnel expenditures. If other variables are unchanged, for a per-student increase of one book, the per-student non-personnel expenditure will be increased by 1 Yuan. The teacher salary index also affects non-personnel expenditures, indicating that staff expenditures should be considered in this approach.

Class hours per week of experiments also have a direct relationship with per-student non-personnel expenditures. The increase of natural experiments in primary schools does not increase the demands for non-personnel expenditures by much. The results show that an increase of one class hour of natural experiments will lead to less than 0.1 Yuan increase in per-student non-personnel expenditures. In junior secondary schools, this will have a great impact. If other indicators remain unchanged, an increase of one class hour of physics experiments per week will result in an increase of about 2 Yuan in per-student non-personnel expenditures; an increase of one class hour of chemical experiment a week will result in an increase of about 1.7 Yuan in per-student non-personnel expenditures; and an increase of one class hour of biological experiments per week will lead to an increase of about 6 Yuan in per-student non-personnel expenditures.

2.3.3 Use Cost Function to Calculate Non-personnel Expenditures

According to the results of above model, we acquire per-student non-personnel expenditures after inputting various variables into the model. In the process of calculation, the score standards should be determined first. Because there are not unified and authoritative score standards for students in compulsory education, we

Table 2.12 Estimation for adequate non-personnel expenditures for primary schools in four provinces (unit: Yuan)

			Guangxi	Hubei	Zhejiang	Heilongjiang
85 Points	Use of well water	Central primary schools	299	302	510	350
		Village primary schools	294	297	505	345
		Junior secondary schools	723	808	903	818
	Do not use well water	Central primary schools	338	341	549	389
		Village primary schools	303	306	514	354
		Junior secondary schools	738	823	918	834
90 Points	Use of well water	Central primary schools	357	361	569	409
		Village primary schools	323	326	534	374
		Junior secondary schools	742	826	922	837
	Do not use well water	Central primary schools	366	369	577	417
		Village primary schools	331	334	542	382
		Junior secondary schools	757	843	937	853

analyzed averaged scores of students from four sample provinces, which are around 80 points. For the purpose of improving educational output quality, this study set the output standards as 85 and 90 points of original scores, which will be put into a standard score conversion formula to calculate the standard scores. Other variables include the average value of the province. In this way, based on the two standards of scores, we calculated the per-student non-personnel expenditures for the primary and junior secondary schools in four provinces, as shown in Table 2.12.

From Table 2.12, we could find that if students achieve 85 points in Chinese and mathematics scores, under the condition of using well water, the per-student non-personnel expenditures for central primary schools and village primary schools in Guangxi are 299 Yuan and 294 Yuan; the per-student non-personnel expenditures for central primary schools and village primary schools in Hubei are 302 Yuan and 297 Yuan; the per-student non-personnel expenditures for central primary schools and village primary schools in Zhejiang are 510 Yuan and 505 Yuan; and

the per-student non-personnel expenditures for central primary schools and village primary schools in Heilongjiang are 350 Yuan and 345 Yuan.

If students achieve 90 points in Chinese and mathematics scores, under the condition of using well water, the per-student non-personnel expenditures for central primary schools and village primary schools in Guangxi are 357 Yuan and 323 Yuan; the per-student non-personnel expenditures for central primary schools and village primary schools in Hubei are 361 Yuan and 326 Yuan; the per-student non-personnel expenditures for central primary schools and village primary schools in Zhejiang are 569 Yuan and 534 Yuan; and the per-student non-personnel expenditures for central primary schools and village primary schools in Heilongjiang are 409 Yuan and 374 Yuan.

2.3.4 Conclusion

In this session, we used the cost function approach to determine non-personnel expenditure standards. After setting certain educational output standards (student achievements) and considering the features of schools and students, we may use the cost function approach to calculate non-personnel expenditure standards for the outputs of different levels. The relationships between the various factors of the educational cost function model and the non-personnel expenditure standards are basically identical to actual conditions, indicating that this approach could provide methodology support for the determination of non-personnel expenditure standards.

When comparing actual expenses of non-personnel expenditures and the standard of non-personnel expenditures calculated in this study, we can see that there are still great gaps. The non-personnel expenditure standards calculated in this study are higher than the non-personnel expenditure standards implemented by sample provinces and the actual expenses of four provinces. Additionally, attention should be paid to the fact that actual non-personnel expenditure expenses of schools were used as dependent variables, which do not meet the demands of school development. Therefore, the non-personnel expenditure standards calculated in this study are relatively low and need to be improved and perfected with the support of more accurate data.

Appendix 1: Calculation of Non-personnel Expenditure Standards for Rural Compulsory Education

	Primary schools	Junior secondary schools	Approaches	Calculation
Total (Yuan)	344.6	494.3		Calculated on the basis of a primary school with 300 students and junior secondary school with 540 students
Non-personnel expenditure for Line of duty	103.7	138.5		
Office expenses1: office suppliers	8.3	10.3	Material consumption ration approach (office expenses of 92's Ration × price index)	Per primary student = 4.88 (stationeries) × 1.1 + 2.49 (hardware) × 1.18 = 8.3 Yuan
				Per junior secondary student = 5.42 (stationeries) × 1.1 + 2.49 (hardware) × 1.18 = 10.3 Yuan
Office expenses 2: teachers' books	4.0	8.0	Professional judgment approach, assuming 45 students per class	3 sets per class of primary school, four books each set, one book costs 15 Yuan and a set costs 60 Yuan
				Per student = 60 × 3/45 = 4 Yuan
				5 sets per class of primary school, four books in one set, one book costs 18 Yuan and a set costs 72 Yuan
				Per student = 72 × 5/45 = 8 Yuan
Temporary workers	16.0	17.8	Professional judgment approach	One worker per primary school and two per junior secondary school
				Average price of rural labor force is 400 Yuan per person per month
				Personnel expenditure for temporary workers per primary student = 400 Yuan × 12 months × 1 person/300 students = 16 Yuan
				Personnel expenditure for temporary workers per junior secondary student = 400 × 12 × 2/540 = 17.8 Yuan

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	Primary schools	Junior secondary schools	Approaches	Calculation
Water and electricity	31.0	39.6	Best practice school approach and Professional judgment approach	11.15 tons of water and 31° of electricity per primary student consumed in best practice school; assuming that 10 tons of water and 31° of electricity consumed by each student, average water costs 1.3 Yuan per ton and electricity costs 0.6 Yuan per degree
				Per student expenses for water and electricity = 10 × 1.3 + 30 × 0.6 = 31 Yuan
				11.5 tons of water and 41° of electricity per junior secondary school student consumed in best practice school; assuming that12 tons of water and 40° of electricity consumed by each student, 1° of electricity costs 0.6 Yuan and 1 ton of water costs 1.3 Yuan
				Per student expenses for water and electricity = 12 × 1.3 + 40 × 0.6 = 39.6 Yuan
Post and telecommunication	8.8	9.2	Professional judgment approach	
# Expenses for communication by telephone	6.7	6.7		2 telephones per primary school and each telephone spends 100 Yuan per month and calculated by 10
				Per student expenses for telephone = 100 × 2 × 10/300 = 6.7 Yuan
				3 telephones per junior secondary school and each telephone spends 120 Yuan per month and calculated by 10
				Per student expenses for telephone = 120 × 3 × 10/540 = 6.7 Yua

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	Primary schools	Junior secondary schools	Approaches	Calculation
Heating or cooling	117.6	144.9	The coldest region: best practice school approach and Professional judgment approach	Average 6 heating months and 0.06 tons of coal per m^2 consumed. The coal price is 350 Yuan per ton
				Rural primary school: in 2007, national average per-student floor area of school building was 5.6 m^2. Heating expenses per student = 0.06 × 5.6 × 350 = 117.6 Yuan
				Rural junior secondary school: in 2007, national average per student floor areas of school building was 6.9 m^2. Heating expenses per student = 0.06 × 6.9 × 350 = 144.9 Yuan
	41.2	50.7	Professional judgment approach	In northern China, heating period per year lasts 4 months and the energy consumed is half of the coldest region
				Per primary student = 117.6 × 0.5 × 0.7 = 41.2 Yuan
				Per junior secondary student = 144.9 × 0.5 × 0.7 = 50.7 Yuan
	10.6	13.0	Survey data and professional judgment approach	Other regions: one month for the coldest and one month of hottest and energy consumption is 0.3 times of the coldest region
				Per primary student = 117.6 Yuan × 0.3 × 0.3 = 10.6 Yuan
				Per junior secondary student = 144.9 × 0.3 × 0.3 = 13.0 Yuan
Property management				
Transportation	4.2	10.9	Best practice school approach	Average of best practice schools
Travel	12.0	16.0	Best practice schools approach	Average of best practice schools
Renting				

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	Primary schools	Junior secondary schools	Approaches	Calculation
Meeting	3.0	5.0	Best practice schools approach	Average of best practice schools
Environmental sanitation	5.8	8.7	Material consumption ration approach (office expenses of 92's Ration × price index)	Based on 92's Ration, per student 2.8 Yuan for primary school and 4.2 Yuan for junior secondary school; price index is 1.6, and the standard is increased by 30 %
				Per primary school student = 2.8 × 1.6 × 1.3 = 5.8 Yuan
				Per junior secondary school student = 4.2 × 1.6 × 1.3 = 8.7 Yuan
Teaching activities	64.8	105.1		
Printing	3.2	8.4	Best practice schools approach	Average of best practice schools
Special materials expenses 1: Expenses for consumptive materials	4.0	12.0	Best practice schools approach	Average of best practice schools
Special materials expenses 2: teaching facilities (less than 500 Yuan)	14.0	20.0	Evidence-based approach	Evidence: "Mathematics and Science Instruments and Equipment Benchmarks" for primary and junior secondary schools; assuming 8-year depreciation for these facilities
Expenses for newspapers and materials	8.0	10.0	Evidence-based approach	Evidence: The Notice on the Regulations of Libraries at Primary and Junior Secondary School stating that primary school should buy 40 kinds of newspapers and each kind costs 60 Yuan averagely; junior secondary school should buy 60 kinds of newspapers and each kind costs 90 Yuan averagely
				Per primary school student = 60 × 40/300 = 8 Yuan
				Per junior secondary school student = 90 × 60/540 = 10 Yuan

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	Primary schools	Junior secondary schools	Approaches	Calculation
Music, sports, and art activities	13.0	15.0	Evidence-based approach	Evidence: standards of musical, sports, and art equipment for primary school and junior secondary school determined by Ministry of Education
				Consumptive materials and equipment valued under 500 Yuan will be calculated by 8-year depreciation
Student activities	8.0	10.0	Professional judgment approach	For primary schools, four activities include National Day, Children's Day, school year, and community activities
				For junior secondary schools, above four activities and a sports game. Each activity cost 2 Yuan per Student
Teaching research	2.7	4.2	Professional judgment approach	Assuming that per primary school teacher expenses for teaching research is 50 Yuan a year and the national ratio of students to teachers at rural primary school is 18.7:1: per student = 50/18.7 = 2.7 Yuan
				Assuming that per primary school teacher expenses for teaching research is 70 Yuan a year and the national ratio of students and teachers at rural primary school is 16.7:1: per student = 70/16.7 = 4.2 Yuan
Other activities	5.2	10.5	Professional judgment approach	For primary school, the expenses for other activities account for 8 % of non-personnel expenditure for teaching activities;
				For junior secondary school, these expenses account for 1 %
Information technology	6.7	15.0	Evidence-based approach	Evidence: Working Plan for Distance education Projects Pilot for Rural Primary and Junior Secondary School. An average of about 16,000 Yuan will be invested in each

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	Primary schools	Junior secondary schools	Approaches	Calculation
				satellite teaching station for rural primary schools. About 150,000 Yuan will be input into each rural junior secondary school to build computer classroom.
				Per primary school student = 16,000/300/8 = 6.7 Yuan
				Per junior secondary school student = 60,000/540/8 = 15 Yuan
Equipment	56.1	87.7		
Office equipment	19.0	21.0	Best practice school approach	Average of best practice schools
Special equipment	21.0	44.0	Evidence-based approach	Evidence: "Mathematics and Science Instruments and Equipment Benchmarks" for primary and junior secondary school, and standards of musical, sports and art equipment for primary school and junior secondary school determined by Ministry of Education
				This special equipment costs more than 500 Yuan. 50 % will be depreciated by 5 years and 50 % by 8 years.
Desks and chairs	8.59	10.65	Best practice school approach and Professional judgment approach	One set of double desk-and-chair for primary school costs 100 Yuan, or 50 Yuan per student. On the basis of average of 8 classes per school plus one electrification classroom, one musical classroom and one natural experiment classroom, totaling 11 classes. The adjustment coefficient is 11/8 = 1.375. Desks and chairs are depreciated by 8 years.
				Per student = 50/8 × 1.375 = 8.59 Yuan
				One set of double desk-and-chair for junior secondary school costs 120 Yuan, or 60 Yuan per student. On the basis of average of 12 classes per school plus one

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	Primary schools	Junior secondary schools	Approaches	Calculation
				electrification classroom, one musical classroom and one physics experiment classroom, one chemical experiment classroom and one biological experiment classroom totaling 17 classes. The adjustment coefficient is 17/12 = 1.42. Desks and chairs are depreciated by 8 years.
				Per student = 60/8 × 1.42 = 10.65 Yuan
Transportation tools				
Books and others	7.5	12.0	Evidence-based approach	Evidence: The Notice on the Regulations of Libraries at Primary and Junior Secondary School issued by Ministry of Education, requiring updating per primary school student is 0.5 books and 0.8 books for junior secondary student. If 15 Yuan per book, the expenses per primary student = 15 × 0.5 = 7.5 Yuan and per junior secondary school student = 15 × 0.8 = 12 Yuan
Repair and maintenance	64.9	83.9		
Equipment repair and maintenance	19	30	Professional judgment approach	In 2007, the national average value of instruments and equipment of rural primary school student is 238 Yuan. If repair and maintenance expenses account for 8 % of the original value, per student expenses = 238 × 8 % = 19.04 Yuan
				In 2007, the national average value of instruments and equipment of rural junior secondary school student is 375 Yuan. If repair and maintenance expenses account for 8 % of the original value, per student expenses = 375 × 8 % = 30 Yuan

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	Primary schools	Junior secondary schools	Approaches	Calculation
School building repair and maintenance	39.2	48.3	Professional judgment approach	In 2007, the national average floor areas of school building per rural primary school student is 5.6 m^2. Assuming 7 Yuan per m^2 for maintenance, the per student maintenance expenses = 5.6 × 7 = 39.2 Yuan
				In 2007, the national average school building per rural junior secondary school student is 6.9 m^2. Assuming 7 Yuan per m^2 for maintenance, the per student maintenance expenses = 6.9 × 7 = 48.3 Yuan
Playground repair and maintenance	6.7	5.6	Evidence-based approach	Evidence: Standards for Checking Nine-Year Compulsory Education Universal.
				Each primary school must have 200 meter-long tracks and 2000 m^2. Each junior secondary school must have 250 meter-long tracks and 3000 m^2
				We assume that the cost of repair and maintenance per m^2 is 1 Yuan.
				Per primary school student = 2000 × 1/300 = 6.7 Yuan
				Per junior secondary school student = 3000 × 1/540 = 5.6 Yuan
Other expenses	57	80		
Reception	7	10	Best practice school approach	Average of best practice schools, 2 % of total non-personnel expenditure
Training	25	35	Evidence-based approach	Evidence: Provisional Regulations on Non-personnel Expenditure Management for Rural Primary and Junior Secondary School. This regulation requires 5 % of total annual non-personnel expenditures of schools to be spent

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	Primary schools	Junior secondary schools	Approaches	Calculation
				on teacher training, such as transportation, meals, training materials, and accommodation.
				In this study, spending on training accounts for 7 % of total non-personnel expenditures. So, training expenses per teacher at primary schools and junior secondary schools are only 467.5 Yuan and 584.5 Yuan, respectively. In 2007, the ratio of students to teachers at primary schools and junior secondary schools were 18.7:1 and 16.7:1, respectively. According to this, per student training expenses at primary school is 25 Yuan, and it is 35 Yuan at junior secondary school.
Labor union and welfare	18	25	Evidence-based approach	Evidence: related educational policies.
				2 % of total salaries should be spent on labor union and welfare.
				The proportion of expenses for labor union and welfare in total non-personnel expenditures. = 2 % × (7/3) = 5 %
Other expenses	7	10	Professional judgment approach	Other expenses about account for 2 % of total non-personnel expenditures.

Appendix 2: Material Consumption Ration Per Student Issued by National Education Commission in 1993

Category	Items	Primary school		Junior secondary school	
		Sum	Composition	Sum	Composition
	Sum (Yuan)	124.94	100	168.79	100
	Consumptive material	47.14	37.73	77.28	45.78
Line of duty	Subtotal	22.64	18.12	26.69	15.813
	Office suppliers	4.88	3.906	5.42	3.209
	Water, electricity, and fuel	9.42	7.537	11.32	6.707
	Fuel for vehicles	3.85	3.084	3.85	2.283
	Hardware	2.49	1.989	3.67	2.174
	Environmental sanitation	2.00	1.604	2.43	1.441
Activities	Subtotal	22.25	17.81	46.91	27.793
	Teaching facilities	8.71	6.973	10.84	6.425
	Electronic audio-visual teaching	2.32	1.859	3.15	1.869
	Natural experiment	0.71	0.569	–	–
	Physics experiment	–	–	0.68	0.402
	Chemistry experiment	–	–	11.74	6.953
	Biology experiment	–	–	2.86	1.697
	Sports facilities	7.94	6.359	7.61	4.509
	Health care	0.82	0.657	1.76	1.042
	Music and art	0.91	0.732	0.83	0.492
	Labor technical education	0.83	0.662	7.43	4.404
Contingency expenses		2.24	1.796	3.68	2.180
Others	Subtotal	77.80	62.27	91.51	54.214
	Building repair	22.22	17.786	22.22	13.166
	Equipment and instruments repair	45.78	36.638	45.78	27.121
	Equipment purchase	7.11	5.694	18.35	10.874
	Travel, post and telecommunication, and training	2.69	2.156	5.15	3.052
The background of school assumed		12 classes, 540 students, original value of equipment is 294,000 Yuan		12 classes, 540 students, original value of equipment is 294,000 Yuan	

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