December 2012

A Report Card: How Are Secondary Vocational Schools in China Measuring Up to Government Benchmarks?

Hongmei Yi, Linxiu Zhang, Chengfang Liu, Ai Yue, Chu Yang, James Chu, Prashant Loyalka, May Maani, Jianguo Wei*

* Hongmei Yi, Assistant Professor, Center for Chinese Agricultural Policy, Institute for Geographical Sciences and Natural Resource Research, Chinese Academy of Sciences, Beijing. Email: yihm.ccap@igsnrr.ac.cn; Linxiu Zhang (corresponding author), Deputy Director, Center for Chinese Agricultural Policy, Institute for Geographical Sciences and Natural Resource Research, Chinese Academy of Sciences, Beijing. Email: lxzhang.ccap@igsnrr.ac.cn; Chengfang Liu, Associate Professor, Center for Chinese Agricultural Policy, Institute for Geographical Sciences and Natural Resource Research, Chinese Academy of Sciences, Beijing. Email: cfliu.ccap@igsnrr.ac.cn; Ai Yue, Research Associate, and Chu Yang, Research Associate, Northwest Socioeconomic Development Research Center, Northwest University of Xi'an, Xi'an, China. Email: yueai@163.com; James Chu, Project Manager, Rural Education Action Project, Freeman Spogli Institute for International Studies, Stanford University, Stanford, Email: jchu1225@stanford.edu; Prashant Loyalka, Center Research Fellow, Freeman Spogli Institute for International Studies, Stanford University, Stanford. Email: loyalka@stanford.edu; May Maani, Research Associate, China Institute for Educational Finance Research, Peking University, Beijing. Email: may.maani@gmail.com; Jianguo Wei, Assistant Professor, China Institute for Educational Finance Research, Peking University, Beijing. Email: jgwei@ciefr.pku.edu.cn.

*

A Report Card: How Are Secondary Vocational Schools in China Measuring Up to Government Benchmarks?

Abstract

As a result of increasing interest among policymakers, secondary vocational schooling has expanded steadily during the past two decades in China. This paper assesses whether China's secondary vocational schooling is measuring up to government benchmarks for quality, whether poor students have access to quality secondary vocational schooling, and whether poor students have financial aid assistance to attend. These government benchmarks include the following: teacher qualification and training, student opportunities for practical training, and adequate facilities. By these benchmarks, we find that secondary vocational schools are meeting government standards. We also show that poor students are accessing schools of similar quality as non-poor students. However, we find that 34% of poor students do not receive financial aid. Among students receiving aid, poor students receive roughly the same amount of aid as non-poor students.

We conclude that recent policies are successfully ensuring secondary vocational school quality (as measured by inputs alone) as well as equity of access to school quality between poor and non-poor students. However, financial aid policies should be carefully examined: at the very least the poorest students should be fully covered. Moreover, the government's use of input-based benchmarks to assess the quality of secondary vocational schools is limited. In the future, the government might consider holding schools accountable for outcomes and not just inputs.

Key Words: China; secondary vocational school; quality; access; financial aid

A Report Card: How Are Secondary Vocational Schools in China Measuring Up to Government Benchmarks?

Secondary vocational schooling has expanded steadily during the past two decades in China. In 1990, the amount of money invested in secondary vocational schooling was roughly 100 dollars per student (National Bureau of Statistics, 1991). In 2011, more than 650 dollars were invested per secondary vocational school student (National Bureau of Statistics, 2012). Between 1990 and 2011, enrollments in secondary vocational schooling increased by 14.2 million, far outpacing concurrent increases in secondary academic schooling (National Bureau of Statistics, 2012; National Bureau of Statistics, 1991).

Motivating this rapid expansion is a belief among policymakers that secondary vocational schooling can more quickly equip students with the skills needed for future employment than can secondary academic schooling. While secondary academic schooling primarily produces graduates who are seeking to attend college, secondary vocational schooling is largely meant to produce graduates who directly enter the labor market (Fang, Liu, and Fu, 2009; Dougherty, 1990; Wei et al., 1999). In 2002 and again in 2005, the State Council promulgated policy directives highlighting the importance of secondary vocational schooling in ensuring a skilled labor force to power China's future growth (Chinese State Council, 2002, 2005). In its National Education Reform and Development Outline (2010-2020), the State Council pledged to continue expanding secondary vocational schooling (Chinese State Council, 2010, Ch. 6). Indeed, this commitment continues to drive the policy initiatives that are creating and molding secondary vocational schooling: the central government's Twelfth Five Year Plan for 2011-2015 highlighted secondary vocational schooling as an important component for future economic development (Xinhua News, 2011). To be clear, in this paper we use "secondary vocational

schooling" to refer specifically to three-year programs enrolling junior high graduates and training students for employment after graduation (UNESCO, 2011).

However, policymakers recognize that secondary vocational schools can only produce skilled graduates if *quality* keeps pace with expansion (Xinhua News, 2011). As a basis for assessing the quality of secondary vocational schools, policymakers have focused on three specific benchmarks: a.) *teacher qualifications and training*; b.) the degree to which school curricula are linked to practical skills valued by the market (*practical training*); and c.) the presence of *adequate facilities* in schools (Chinese State Council, 2010). For brevity, from henceforth we call these benchmarks of secondary vocational school quality *government benchmarks.* We discuss each of these benchmarks in turn below.

First, according to the Teachers' Law of the People's Republic of China, all secondary vocational school teachers are supposed to be certified and have a bachelor's or vocational college degree (MoE, 1993, Ch. 3). Ideally, teachers should have "dual certification" (*shuangshixing 双师型*), defined as having professional certification in teaching *and* a second non-teaching professional skill (Xinhua News, 2011). Moreover, all teachers should ideally have working experience in industry before teaching (Chinese State Council, 2010). Aside from teacher qualifications, schools are supposed to offer teachers in-service training to continue developing their skills (MoE, 1999).

Second, school curricula are supposed to focus on building practical skills. To better orient the curricula towards practical skills and generate worthwhile internship opportunities, schools have been encouraged to form tight partnerships with local enterprises (Chinese State Council, 1996). Schools are supposed to provide opportunities for students to participate in

internships, both off-campus in companies and on-campus while in the school (Chinese State Council, 2010).

Finally, policymakers have mandated that secondary vocational schools have an adequate set of facilities. To be considered having adequate facilities, vocational schools are supposed to be equipped with laboratories, libraries, multimedia rooms, workshop centers, and dormitories (Chinese State Council, 1996).

Although these input-based measures may not capture quality fully, the international literature writing about developing countries often use input-based benchmarks to assess the quality of education systems (Guo and Lamb, 2010; Shi and Qi, 2010; Schnarr et al., 2008; Song, 2011). A complete evaluation of vocational school quality would of course require focusing on educational processes and outputs, such as student learning and employment outcomes. However, in practice many studies have to rely on the imperfect input-based measures. For example, teacher certifications are sometimes used as proxies for teacher quality and have been found to be associated with student learning, as measured by standardized test scores (Park and Hannum, 2001; Hanushek et al., 2005). Vocational school curricula that are insufficiently synced to market and industry needs have been associated with adverse employment outcomes, such as decreased wages or increased time elapsed before finding employment (Chen, 2009; Ding and Li, 2007). Finally, school facilities, including libraries and classrooms, generally have been shown to have positive impacts on student learning (Glewwe et al., 2011). In short, both government officials and scholars generally concur that teacher qualifications and training, practical training and adequate facilities are important, albeit incomplete, signals of vocational school quality (Guo and Lamb, 2010; Shi and Qi, 2010; Schnarr et al., 2008; Song, 2011).

Beyond quality, policymakers are also interested in ensuring *access* to secondary vocational schools among poor students, who may not be able to attend for financial reasons. One study estimates that 80% of students in poor, rural areas enter the workforce without attending secondary school (Yi et al., 2012). One reason (among many) for this high rate of exit from the schooling system is that the direct and indirect (opportunity) costs of attending secondary school are high (Liu et al., 2009). Including the cost of living and tuition, the annual cost of attending secondary school was estimated to be around 5,000 yuan, or five times the per capita income of a rural family at the poverty line (Liu et al., 2009; China Youth Daily, 2009). When accounting for the opportunity cost of foregone wages, which students could be earning instead of attending school, the "full cost" is several times higher.

To address the problem of the high cost of secondary schooling, the government pledged nearly 4.5 billion yuan (750 million dollars) to subsidize secondary vocational schooling for poor students in 2010 (Chinese State Council, 2010). In theory, the subsidies are supposed to be allocated in the form of stipends (students should receive 1500 yuan or 240 dollars in each of the first two years) to poor secondary vocational school students (Kuczera and Field, 2012). Students falling under a poverty threshold are supposed to receive full tuition waivers (Fo and Xing, 2011; Ministry of Finance and Ministry of Education, 2006). These investments are the result of the interests of policymakers in ensuring that poor students also acquire the knowledge and skills needed to work in China's rapidly developing economy (Chinese State Council, 2002).

Surprisingly, there have been very few studies examining either vocational school quality or access in China. First, even using these government benchmarks as proxies for school quality, there have been few evaluations of China's secondary vocational school system. Kuczera and Field (2012) report that employers do not always collaborate with China's secondary vocational

schools to provide workplace training for students. Their findings, however, are based on a limited number of case studies and interviews in China as part of field visits rather than empirical evidence from systematically collected survey data. As another example, Guo and Lamb (2010) argue that insufficient investments have left schools with poorly trained teachers. This work, however, relies on administrative and survey data from a limited sample in Yunnan province.

Second, despite the policy interest in ensuring poor students can attend secondary vocational schooling, there has been almost no empirical evidence showing whether poor students attend schools of comparable quality to non-poor students. Even if, on average, secondary vocational schools perform well compared to benchmarks, poor students may be attending schools of lower caliber.

Third, a related question is whether government efforts to provide financial aid (which, as discussed above, are meant to ensure poor students are able to attend secondary vocational school in the same way as their non-poor peers) are reaching them. Although policies have set out to cover 90% of all secondary vocational school students (Fo and Xing, 2001; Wang, 2012) there is no evidence that aid is actually reaching poor students. How well is financial aid being distributed? To the best of our knowledge we know of no paper that has studied whether and to what extent poor secondary vocational school students receive financial aid.

Given these gaps in the literature, this study pursues three objectives. First, we attempt to understand how secondary vocational schooling measures up to the three sets of government-established benchmarks: a.) teacher qualifications and training; b.) practical training; and c.) adequate facilities. Second, we examine whether poor students are attending schools of comparable quality (according to government-established benchmarks) to the same degree as non-poor students. Third, we identify the extent to which government financial aid is targeted

toward poor students. Ultimately, we are interested if China's secondary vocational schooling is measuring up to government-established quality standards, if poor students have access to quality schooling, and if poor students have the financial aid assistance to attend.

Although we believe this study is among the most systematic assessments of China's secondary vocational schooling, there are limitations to our approach. For example, some of our data is derived from the responses of principals to survey questionnaires. The benchmarks we aim to measure may be well known, and the principals may respond as they believe they should. It is possible that reliance on data from principals will overestimate the quality of China's vocational schools. While this bias in the data is plausible, we were aware of this possibility during the data collection and took steps to build checks into the survey process that could help us assess the veracity of the answers of the principals. We will discuss these checks in greater detail in the methodology section below.

The remainder of the paper proceeds as follows. Section 2 is the methodology section. In four subparts, it describes the sample, the data collection process, the key variables that we use in the analysis and our analytical approach. Section 3 reports on the results of the study, assessing how secondary vocational schools are performing according to the three major government benchmarks: teacher qualifications and training; practical training; and adequate facilities. Section 4 presents results on our analysis of whether poor students and non-poor students attend schools of comparable quality. Section 5 identifies whether financial aid is reaching poor students. Section 6 concludes.

Methodology

2.1 Dataset

This paper draws on a dataset collected by the authors in October 2011. In executing the survey, we wanted to include both a poorer inland province and richer coastal province to increase the generalizability of our findings. Shaanxi province, the inland province in our study, has a Gross Domestic Product (GDP) per capita of 33,427 yuan (5,305 dollars). Shaanxi ranks 15th among all provinces and has been among the slowest growing provinces in China during the 2000s (National Bureau of Statistics, 2012). By contrast, Zhejiang is a rich coastal province with a GDP per capita almost twice that of Shaanxi: 59,157 yuan (9,390 dollars—National Bureau of Statistics, 2012). Zhejiang is also the fifth richest province in terms of per capita GDP (after Tianjin, Shanghai, Beijing and Jiangsu--National Bureau of Statistics, 2012). Because the two provinces also differ greatly in terms of economic development and geography, if our results are consistent across the two provinces, the findings should have greater external validity.

After selecting the two provinces, we chose the most populous prefectures based on official records (three in Shaanxi and four in Zhejiang provinces). There were more than 1,000 vocational schools—ranging across skilled worker schools, secondary vocational high schools and secondary specialized schools—in the seven prefectures included in the sample. Resource constraints prevented us from sampling all majors. As such, using administrative data, we identified the most popular major (i.e. the major with the largest enrollments) among secondary vocational schools in each province: computing. Using official records, we excluded schools that reported having no computer or computer-related majors.[2] We then called the remaining schools to ascertain the autumn 2011 enrollment of each school. Schools that had fewer than 50 students enrolled in the computer or computer-related major were also excluded. We ultimately enrolled 51 schools in Shaanxi and 54 schools in Zhejiang in our study.

[2] We defined computer or computer-related majors by whether the official name of the major contained the word "computer." The most common major included was titled "computer applications," followed by computer maintenance, computer design, and computer programming.

The next step was to choose the actual set of students that would be surveyed. In each school we randomly sampled two first-year computer major classes (one class if the school only had one computer major class). There were a total of 181 classes sampled and a total of 7309 first-year secondary vocational school students in these classes. According to the study's design, we can authoritatively state that the sample is representative of all secondary vocational schools with computer majors in the prefectures with the highest concentrations of vocational schools in Zhejiang and Shaanxi provinces.

In October 2011 (one month after the start of the autumn semester), our team of enumerators went to each school to administer a set of surveys. In the presence of an enumerator, the school principal filled out a school survey with assistance from his or her staff. From the school survey we gathered information on teacher qualifications and training, practical training for students, and the nature of the school's facilities (whether the facilities were adequate). More specifically, we collected information about the degrees of the teaching staff (how many teachers had bachelor degrees or vocational college degrees, teaching certifications, professional experience, and/or dual certification). We also collected information about whether the school offered training (whether any training was offered, how many training sessions were offered, and how long each training session lasted). In regards to practical training for students, the survey asked about the number of partnerships with companies and the nature of those partnerships. The survey also asked to what extent students participated in school and company internships. In terms of school facilities, we asked about whether the schools had school dorms, cafeterias, libraries, or laboratories. Because multimedia rooms, workshop centers, and computer clusters were required for the computer major, we also asked how many of each type of these facilities existed and whether the facilities were operational.

Enumerators were trained to conduct data quality checks to catch obvious misreporting from principals, including asking other administrators, gathering curriculum plans, cross checking principals' responses against school records, and referencing school promotional materials. A total of 105 vocational school surveys were completed (from henceforth, *school data*). These data form the core of our analysis to measure school quality in terms of teacher qualifications and training, practical training for students, and adequate facilities.

To further verify whether the data from the school survey was accurate, we also administered surveys to the homeroom teacher of the sampled computer major classes. Specifically, we were concerned that schools might provide inflated reports on government benchmarks. As such, we asked teachers to report on whether they had a vocational or bachelor's degree, a teaching certificate, or received in-service training. In terms of practical training, we asked teachers to report on whether the school had industry partnerships and the kinds of industry partnerships the school had. Finally, to measure if students had access to adequate facilities, we asked whether the school had laboratories, libraries, multimedia rooms, or computer clusters. A total of 181 teachers—representing 181 classes—responded to our surveys. Henceforth, we call the results from the homeroom teacher surveys *teacher data*.

To address our research questions regarding financial aid and access, we also conducted a four-block student survey. The first block asked each student to fill out a checklist of the durable assets owned by his or her household, including such items as washing machines, computers, cameras, tractors, and television sets. We used this checklist to identify students who were poor (we describe our specific methodology in the analytical approach section below). The second block of the survey asked students whether they received any financial aid and the amount of financial aid they received for that semester. Specifically, we asked them how much financial aid

they received as of October 2011. These data are used as our dependent variables when evaluating whether poor students are receiving financial aid. The third block of the survey involved a standardized mathematics and computer skills test developed by a psychometrician from Peking University. We administered the test ourselves (such that students had no time to prepare for the test beforehand). From this block we develop our measures of academic performance. The fourth block of the survey collected information on the basic characteristics of students, including their age (in years), ethnicity (an indicator variable equaling one if they were Han Chinese), and gender (an indicator variable equaling one if they were male). As part of the fourth block, we also asked students whether they planned to take the college entrance examination (required for entering both vocational and academic tertiary schooling).

2.2 Analytical Approach

To present data on government benchmarks of quality, we report the mean values of each variable (as well as the standard deviations, minimum, and maximum), using schools as the unit of analysis. We then compare these values with government benchmarks. We also draw inferences about regional differences by splitting the sample into two, based on whether the school is located in Zhejiang or Shaanxi province and comparing the differences in the means by a t-test.

To test whether poor students attended schools meeting government benchmarks or received financial aid (relative to non-poor students), we first generate a measure for whether a student was poor or not. We assigned a monetary value (based on the National Household Income and Expenditure Survey, which is organized and published by National Bureau of Statistics—2008) to each asset in the checklist of common durable household assets (described in subsection 2.1 above). We then summed the value of the assets owned by the household of

each student, thus creating a single metric of the value of the asset holdings of each student's household. To control for the effect of being in a rich coastal province (Zhejiang) versus a poor inland province (Shaanxi), we ranked students separately in each province. We then split the ranked students into four quartiles. The poorest 25% of students are labeled *Q4* for quartile 4, students ranking from 50% to 25% fall under quartile 3 or *Q3*, students ranking from 50% to 75% fall under quartile 2 or *Q2*, and the richest 25% of students falling under *Q1*, or quartile 1.

Following the procedure to identify poor students, we first split the student sample into two based on whether they were poor (in Q4) or non-poor (in Q1, Q2, or Q3). We then compared the means in the quality benchmarks of kinds of schools they were attending by a t-test. To control for the fact that these students were actually clustered in schools, we proceeded to set the dummy variable Q4 as the dependent variable in an ordinary least squares (OLS) model to examine whether poor students attend schools meeting government benchmarks. This equation is our *unadjusted model*:

$$Q4_{is} = \beta_1 \boldsymbol{X}_{ij} + \varepsilon_{is} \qquad (1)$$

where the dependent variable is a dummy variable for whether student *i* in school *s* is ranked among the poorest among all the students in our sample (quartile 4). The independent variable **X** is one quality benchmark that are requirements for schools to operate: whether teachers have bachelor's or vocational college degrees, certifications, or received trainings; whether the school has at least one industry partnership or sends its students on internships; and whether the school has a library, multimedia room, and computer room. We run this regression once for each individual independent variable, and thus do not hold constant the other variables. However, to be concise, we report all the values in one table. If the coefficient on a particular (i.e. a particular school quality benchmark) is significant, it means that poor students and non-poor students are

attending schools of different quality in terms of that particular benchmark. We calculate cluster-robust standard errors (to adjust for the clustering of students within schools).

To control for differences across Shaanxi and Zhejiang, we add a province dummy to a second equation (our *adjusted model*):

$$Q4_{is} = \beta_1 \boldsymbol{X}_{ij} + \text{province}_s + \varepsilon_{is} \qquad (2)$$

This adjusted model is identical to the unadjusted model, except that it controls for whether a school is located in Zhejiang.

We also use an OLS model (with cluster-robust standard errors) to relate getting any financial aid and how much financial aid received with whether a student is poor. The first empirical model to be estimated is called our *unadjusted model*:

$$y_{is} = \beta_1 \boldsymbol{Q4}_{ij} + \varepsilon_{is} \qquad (3)$$

Here, our dependent variable y is either a dummy variable for whether a student receives any financial aid (which equals 1 if student *i* in school *s* receives financial aid) or the amount of aid received (a continuous variable measured in yuan). The dummy variable Q4 equals 1 if student *i* in school *s* is ranked in the bottom 25% in terms of the value of household assets.

We also add a series of control variables to the unadjusted model to create our *adjusted model*:

$$y_{is} = \beta_1 \boldsymbol{Q4}_{is} + \beta_2 \boldsymbol{X}_{is} + \text{province}_s + \varepsilon_{is} \qquad (4)$$

The equation is identical with equation (3). However, we add a vector **X**, which incorporates the following control variables: age (in years), gender (a dummy variable where 1=male), ethnicity (a dummy variable where 1=Han), math test performance (standardized in our sample), computer test performance (standardized in our sample), and whether the student desires to take the college entrance examination (1=yes). We also include the dummy variable *province* to indicate whether

the student attends school in Zhejiang or Shaanxi (1=Zhejiang) to control for regional differences. In both equations, we are interested in β_1, the coefficient for whether a student is poor, which allows us to infer whether a poor student is more likely to receive any aid and how much more aid he or she will receive.

3. Results: Are Schools Meeting Benchmarks?

3.1 Teacher qualifications and training

In terms of the minimum degree requirements of teachers (all secondary school teachers are supposed to have at least a vocational college degree), schools are largely meeting government benchmarks. According to our school data, 80% of teachers had bachelor degrees and 22% had vocational college degrees (some teachers had more than one degree, see Table 1, rows 1-2). In fact, 95% of teachers had either a bachelor degree or vocational college degree (row 3). Indeed, these percentages were confirmed by teacher data: 97% of teachers reported that they either had a bachelor or vocational college degree (omitted in tables for brevity).

Not only do secondary vocational school teachers appear to fulfill minimum degree requirements, most are certified to teach in secondary vocational schools and report having considerable experience. Specifically, according to school data, 82% of teachers had teaching certificates—a credential required to teach in secondary vocational schools (Table 1, row 4). The teacher data are largely consistent with school data. According to the principals, 75% of teachers reported that they had teaching certificates (table omitted for the sake of brevity). Teachers in the computer major reported having an average of 9.7 years of teaching experience (row 5).

Although most teachers had formal degrees, fewer teachers had industry experience or qualifications. For example, according to school data only 33% of teachers had dual certification (*shuangshixing*—Table 1, row 6). Whether teachers had dual certification in both teaching and a

second (non-teaching) professional field is believed (by policymakers) to be an important measure of whether teachers are able to keep up with changes in industry and recent technological advances (Chinese State Council, 2010).

The same trend—few teachers have industry experience or qualifications—is true when examining teacher data. Only 32% of teachers had any kind of industry experience (outside of teaching), including any previous job in the labor force—outside of an educational institution (Table 1, row 7). In addition, of those with previous industry experience, the average length of work experience for teachers was only two years (row 8). Fewer than half of those with industry experience reported that their previous work was relevant to the subjects they were teaching (row 9).

According to China's national vocational training policy, a minimum requirement is that all schools offer in-service training for their teachers (MoE, 1999). Schools may offer in-service training to their teachers in two ways. They may either send their teachers to training sessions organized by the local bureau of education or organize the training sessions themselves. Our school data show that secondary vocational schools mostly meet the minimum requirement for offering teacher training. Almost all (94%) schools offered teacher training sessions during the 2010-2011 school year (Table 1, row 10). Schools with teacher trainings offered an average of 75 training sessions during the 2010-2011 school year (row 11). Assuming each teacher in a given school attended a single training session for the school year, each school (that reported offering trainings) provided an average of 0.79 training sessions per teacher (row 12). These training sessions averaged 11.4 days per session (row 13).

Although schools reported that they met national requirements in terms of *offering* training sessions, teachers did not always attend them (or principals were over reporting their

training efforts). Only 66% of first-year computer major homeroom teachers reported attending any training session offered by the school during the 2011-2012 school year (Table 1, row 14). In other words, although almost all schools reported that they offered training to teachers, roughly a third of homeroom teachers (who should be among the first staff members in schools to receive training—MoE, 2011) did not attend.

Taken together, the evidence suggests that, while vocational schools are largely meeting government benchmarks in terms of teacher qualifications and training, quality gaps appear to still remain. First, only a third of teachers have had any industry credentials or experience. Second, although schools are providing training sessions for their teachers, teachers do not seem to know about the training opportunities.

3.2 Practical Training

One of the chief aims of a vocational education is for students to be able to join the workforce. As such, policymakers encourage secondary vocational schools to closely link their curricula to the workplace (Chinese State Council, 1996). In this section we examine the degree of school-industry collaboration and internship participation among first year secondary vocational school students as measures for the provision of practical training for students.

According to the school data, schools and industries have formed a number of different types of partnerships. Most (91%) schools have at least one of several different types of industry partnerships (Table 2, row 1). The most common type of partnership is sending secondary vocational school graduates to enterprises as full-time employees (80%— row 2). On average, 54.5% of the students in our secondary vocational sample schools were able to find employment through these partnerships (row 3). The second most common type of partnership was inviting industry professionals to train teachers (43%--Table 2, row 4) or teach classes for students

(42%—row 5). The least common type of partnership was the formulation of a joint curriculum. Only 12% of schools reported having this kind of partnership (row 6). Based on these finding (which rely on our school data), we conclude that schools and enterprises are indeed collaborating with one another, primarily in terms of sending students to internships and placing students in full-time employment positions after graduation.

In the case of internship placement and firm-school interaction, the school data are fairly accurate. According to the teacher data, the degree of internship participation among students is high. Students generally attend internships as part of their class. There are two primary ways that students become involved in internships. Students may stay in their school and take courses while also participating in an internship inside the school itself (a *school internship*). Students may also leave the school with an internship supervisor to work at a company directly (an *industry internship*). Half of the teachers reported that their students attended school internships; 71% reported that their students attended industry internships (Table 2, rows 7-8). Importantly, 93% of teachers say that they communicate regularly with internship supervisors (row 9). It is in this way that our data suggest at the very least that the school does connect its internships with its curriculum/activities. Therefore, in summary, according to the teacher data, schools are doing well in maintaining industry relationships and ensuring student participation in internships—which is consistent with government educational targets (Chinese State Council, 2010).

3.3 Adequate facilities

Our school data also show that almost all schools have the facilities that are required by policymakers. For example, 98% of schools have laboratories; 99% have libraries (Table 3, rows 1-2). Almost all (95%) of the sample schools had multimedia rooms; all (100%) schools sampled had computer clusters (row 3 and 5). Clearly, secondary vocational schools (at least those with

computer majors) are largely meeting minimum requirements in terms of having adequate facilities.

Moreover, the school data show that the facilities are open for use (at least for formal instruction).The multimedia room is open for use 29 hours per week (Table 3, row 4). Access also appears to be sufficient for school computer clusters. Students also can use computer clusters 35 hours per week (row 6).

Finally, a large number of schools meet government benchmarks by having workshop centers. Workshop centers (*shiyanshixun jidi*) are supposed to be built in a way that allows students to practice skills using industry-caliber equipment and protocols. In theory, workshop centers are supposed to be set up under the supervision (and in collaboration with) industry professionals (MoE, 2012). Workshop centers are of particular interest because they require substantial investment, the procurement of expensive equipment and the hiring of specialized staff to run. According to the school data, 86% of schools have workshop centers. Of the schools with workshop centers, 92% are equipped with specialized staff to maintain and run them (Table 3, rows 7-8). During the 2011-2012 school year, schools with workshop centers reported spending roughly 670 yuan per student for workshop center equipment (row 9). To place this in context, schools spent a total of 2266 yuan per secondary vocational school student for construction and the upkeep of school facilities in the 2011-2012 school year (row 10).

Taken together, the evidence suggests that—while not perfect—secondary vocational schools are mostly meeting government benchmarks in terms of teacher qualifications and training, practical training for students, and facilities. There are some possible weak points, such as the fact that teachers may not attend training sessions apparently offered through the schools. . But, according to our surveys with principals and teachers, secondary vocational training schools

appear to have teachers that meet minimum criteria; the training they provide to students appears to be augmented somewhat by industry partnerships and internships; and basic facilities exist and by in large appear to be accessible to students.

3.4 Differences in Shaanxi and Zhejiang

The results above have pooled together schools in a rich coastal province (Zhejiang) and a poor inland province (Shaanxi). Regional differences may be such that while overall schools are meeting benchmarks, schools in a given province may not.

In fact, Zhejiang secondary vocational schools are of better quality in most dimensions. For example, in terms of teacher certifications, teachers in Zhejiang schools are 15 percentage points more likely than teachers in Shaanxi to have bachelor degrees (Table 4, row 1). Although Shaanxi teachers are 17 percentage points more likely to have vocational college degrees, vocational college degrees would be considered by most to be inferior to bachelor degrees (row 2). The two differences are significant at the 1% level.

Zhejiang schools also outperformed Shaanxi schools in terms of teacher training. All schools (100%) in Zhejiang offered teacher training, while only 87% in Shaanxi did (Table 4, row 10). Moreover, whereas Zhejiang schools offered an average of 111 training sessions for the 2011-2012 school year, Shaanxi schools only offered 27 training sessions for their teachers (roughly one fourth the amount of Zhejiang schools—row 11). Not only did Zhejiang schools offer more training sessions, significantly more teachers in Zhejiang knew about the trainings than in Shaanxi (76% in Zhejiang versus 59% in Shaanxi—row 14).

With regard to practical training, schools in Zhejiang had more types of industry partnerships. For example, Zhejiang schools were more likely to invite industry professionals to train teachers or teach classes for students than in Shaanxi. Whereas 57% of schools in Zhejiang

had industry partnerships where professionals would train teachers, only 26% of schools in Shaanxi reported having these partnerships (Table 5, row 4). Likewise, 51% of Zhejiang schools reported having industry partnerships where professionals would visit the school to train students, compared to only 29% of schools in Shaanxi (row 5).

There was one exception: Shaanxi outperformed Zhejiang in one area of practical training. Schools in Shaanxi were almost twice as likely to offer school internships (67%) compared to schools in Zhejiang (33%—Table 5, row 7). This difference is significant at the 1% level. The difference in favor of Shaanxi may reflect a provincial-level policy in Shaanxi that encourages secondary vocational training schools to increase the relevance of technical skills learned in school as early as possible (Shaanxi Department of Education, 2011).

In terms of facilities, schools in Zhejiang also seemed to be of higher quality. Although the presence of adequate facilities was almost the same in both provinces, students in secondary vocational schools in Zhejiang had better access to the multimedia rooms and computer clusters. The multimedia rooms in Zhejiang schools were open, on average, 33 hours per week—10 hours per week more than in Shaanxi—only 23 hours per week (Table 6, row 4). Zhejiang schools also kept their computer clusters open for longer hours and more available for use by students. In Zhejiang, students were able to use computer clusters for 42 hours per week. In Shaanxi, students were only able to use computer clusters for 25.6 hours per week. The difference (15 hours) is statistically significant (row 6).

In summary, the comparisons between Zhejiang and Shaanxi schools show that schools in Zhejiang are generally better in quality. Teachers in Zhejiang are more likely to have higher formal degrees. Zhejiang schools offer more training for its teachers and have more industry

partnerships to train teachers and students. The availability of computer clusters and multimedia rooms in Zhejiang also exceeds that of Shaanxi.

Despite the systematic differences, the main finding is that both sets of schools more or less appear to meet government benchmarks. That is, in spite of these differences, neither province is failing to meet government benchmarks. Teachers in both provinces mostly have received higher educational training; schools in both provinces have industry partnerships; and schools in both province mostly have required facilities are present in almost all schools.

4 School Quality for Poor versus Non-poor Students

In the discussion in the previous section, our data showed that, on average, secondary vocational schools are more or less meeting government benchmarks. However, since there are still a number of schools that do not meet the benchmarks, we are not able to conclude on this basis that poor students are attending schools that meet government benchmarks (relative to non-poor students). It is possible that there is a systematic bias, with non-poor students getting full access to secondary vocational schools that meet government benchmarks and poor students not fully having access.

However, despite concern about the failure to provide quality education to the poor (Wang, 2012), our descriptive results show that, with some exceptions, poor students appear to be attending schools of comparable quality to non-poor students. For example, in terms of teacher qualifications, 95% of poor students had teachers with a bachelor or vocational college degrees; 96.5% of their non-poor peers had teachers with these degrees (Table 7, row 1). Although this difference is significant at the 1% level, the magnitude (1.5 percentage points) is small. There were no statistically significant differences between poor and non-poor students in terms of whether their teachers had teaching credentials (row 2). Moreover, 96% of poor students

attended schools where training was offered (row 3), compared to 94% of non-poor students. While this difference (96% versus 94%) is statistically significant (at the 1% level), the difference is surely not large enough to be a policy concern.

In terms of practical training, poor students attended schools of comparable (perhaps even better) quality than their non-poor peers. For example, 92% of both poor and non-poor students attend schools with one or more industry partnerships (Table 7, row 4). Somewhat less than half (44%) of both poor and non-poor students attended schools offering school internships (row 5). In the case of industry internships, poor students even seemed to have a slight advantage over non-poor students. Whereas 71% of poor students attended school offering industry internships, only 67% of non-poor students did (row 6). This finding is significant at the 1% level.

In terms of facilities, poor students seem to be at only a slight disadvantage. For example, 97% of poor students attended schools with laboratories, compared to 98% of non-poor students (Table 7, row 7). Likewise, 98% of poor students attended schools with libraries, compared to 100% of non-poor students (row 8). In addition, 94% of poor students attended schools with multimedia rooms, compared to 96% of non-poor students. Although these findings are all significant, the magnitude of difference is no more than 2 percentage points.

Our regression results, which account for robust standard errors and clustering by school, are largely consistent with the above findings: with some exceptions, poor and non-poor students are attending schools of similar quality. In terms of teacher qualifications, poor students are 0.2 percentage points less likely than non-poor students to have teachers with either bachelor or vocational college degrees (Table 8, column 1, row 1). Our adjusted regression, which includes a dummy variable for whether the school is located in Zhejiang province, is identical: the point

estimate does not change (column 2, row 1). Although this finding is statistically significant at the 10% level, the magnitude (0.1 percentage points) is even smaller than the already small difference observed in the descriptive results (1.5 percentage points). Whether in the adjusted or unadjusted regressions, there were no differences in terms of whether teachers had teacher certifications (column 2, row 2).

There was one exception: poor students are more likely to attend schools where teacher trainings are offered. In the unadjusted model, poor students are 8.4 percentage points more likely to attend schools with teacher trainings (compared to their non-poor peers). This finding is significant at the 5% level. The adjusted model is consistent: poor students are 10.4 percentage points more likely than non-poor students to attend schools with teacher trainings (column 2, row 3), and this result increases in significance to the 1% level.

In terms of practical training, the unadjusted and adjusted regression results also echo the descriptive results: poor students attend schools of comparable quality than their non-poor peers. Although the point estimate of the coefficient suggests that poor students were up to 1.4 percentage points more likely to attend schools with any industry partnerships when compared to non-poor students (Table 8, column 2, row 4), this finding is not statistically significant. In the unadjusted and adjusted models, poor students were at most 0.5 percentage points more likely to attend schools with school internships (columns 1 and 2, row 5). In terms of industry internships, poor students are 3.6 percentage points more likely to be in schools where students participated in industry internships (column 2, row 6). However, none of these findings are statistically significant

In terms of facilities, multivariate results show that poor students are attending slightly lower quality schools. Poor students are 10 percentage points less likely than non-poor students

to attend schools without laboratories (Table 8, column 1, row 7). This finding is significant at the 1% level and remains significant even after controlling for province (column 2, row 7). Poor students are also 25 percentage points less likely to attend schools with libraries. This finding is significant at the 10% level (column 2, row 8). Although poor students are less likely to attend schools with laboratories and libraries, there is no indication of the same trends in terms of multimedia rooms and computer clusters.

We also conducted three robustness checks to check our results. First, one concern is that our variable for poverty is a dummy variable. As such, we use a logit model with the same specifications and examine the coefficients (that can be interpreted as marginal effects at the mean) to assess if the coefficients match those in ordinary least squares. Second, we shifted the cutoff to create the dummy variable for "poor" from 25% to 30% and 20%. Third, instead of ranking on assets weighted by household item values, we created student asset rankings using polychoric principal components analysis (polychoric PCA), as per the work of Kolenikov and Angeles (2009). Although the coefficients changed slightly in these robustness checks, the general nature and the statistical significance of the results reported above were the same. The results of the robustness checks are not included in tables for sake of brevity and are available upon request from the authors.

Taking the evidence together, we conclude that poor students, in fact, attend schools of similar quality when compared to their non-poor peers. Granted, there are some exceptions. In some cases, poor students are at a disadvantage: poor students tend to attend schools where teachers do not have a bachelor's or vocational college degree when compared to non-poor students. They are also more likely to attend schools without laboratories or multimedia rooms. In other cases, poor students attend schools of better quality than their non-poor peers. Poor

students attend schools where in-service training is offered to teachers more frequently than non-poor students (even when controlling for province). However, the differences (as per our descriptive results) are mostly small and not policy relevant. As such, as a whole, our data suggest that there are no major quality differences in schools attended by poor or non-poor students.

5 Are Financial Aid Policies Well Targeted?

Although we find that poor students attend schools of similar quality to their non-poor peers, an additional concern is whether they (and their families) are shouldering heavy financial costs to attend these schools. In fact, in our survey, the average cost of attendance per semester of secondary vocational schooling (including tuition and costs of living, and without any financial aid) was 4,100 yuan, roughly similar to the cost reported in the literature (5,500 yuan—Liu et al., 2009). By contrast, the average household asset value of poor students in our sample (that is, students ranked below quartile 4 as described in our methods) was 3,736 yuan, suggesting that the cost of schooling may be beyond their means (approximately 4 to 5 times per capita income for the three years of secondary vocational school). While government financial aid policies are targeted toward poor students and meant to lighten these financial burdens, there has not been any empirical data showing whether poor students receive the aid.

Our descriptive data (as shown in Figure 1) show that up to 34% of poor students did *not* receive any government aid. In Shaanxi, only 66% of the poorest students received government financial aid. Although the situation was less severe in Zhejiang, still only 80% of the poorest (Q4) students received government financial aid. That is, 34% of the poor students in Shaanxi and 20% of the poor students in Zhejiang received zero financial aid.

One reason for the shortage of funds for poor students is that a large amount of financial aid is going to the richest students in schools. In Shaanxi, 62% of rich students (that is, students in quartile 1 or Q1) received financial aid. In Zhejiang, 75% of the students receive financial aid (Figure 1). While it is true that rich students still receive less financial aid than poor students (a 4 percentage point difference in Shaanxi and 5 percentage point difference in Zhejiang), students in quartile one reported an average asset value of 26,300 yuan, over seven times the value of students in quartile four. In short, there is evidence that the distribution of financial aid is flawed: while a third of poor students are not covered, aid is going to rich students. If all of the aid were provided to the poor, our data suggest that there is enough financial aid to cover them all. However, the empirical findings of the study show that much of China's financial aid for secondary vocational schools is currently going to support the families of rich students who do not need it as much as the families of poor students.

This flawed distribution story is consistent with the analysis that examines the amount of financial aid actually received by each student. It could be that, while all students are receiving financial aid, the poor are receiving substantially more. This would minimize concerns of severe problems in financial aid distribution. However, we find evidence to the contrary. Poor students in Shaanxi had received, on average, 1879 yuan in financial aid (as of October 2011—Figure 2); during this same time period, the non-poor students (that is, students in quartiles 1 to 3) in the sample had received, on average, 1718 yuan in financial aid. In other words, poor students only received 161 yuan (or only 9%) more in financial aid than non-poor students. The same general pattern also appears in Zhejiang (Figure 2). In other words, in both Shaanxi and Zhejiang poor students are not receiving significantly more financial aid than rich students.

When we turn to our multivariate regression results, the analysis produces results consistent with the simple descriptive statistics. In the unadjusted model (which pools students from Zhejiang and Shaanxi together), the point estimate of the coefficient actually suggests that poor students are 1.4 percentage points *less* likely to receive financial aid compared to their non-poor peers (Table 9, column 1, row 1). This finding, however, is not statistically significant. In our adjusted model, which controls for whether a student is in Zhejiang or Shaanxi (as well as other student characteristics, such as age, gender, ethnicity or baseline test scores), we find that poor students are only 2.6 percentage points more likely to receive aid than non-poor students (column 2, row 1). This finding is significant at the 10% level. The evidence taken together, we find that poor students are only marginally more likely to receive any financial aid than their non-poor peers.

Of students receiving any financial aid, our data show that (on average) poor students receive less than 100 yuan more in financial aid than their non-poor peers. In our unadjusted model, poor students receive an average of 83.2 yuan more financial aid than their non-poor students (Table 10, column 1, row 1). This finding is significant at the 10% level. In our adjusted model, the difference increases to 98 yuan (column 2, row 1), a finding significant at the 5% level. To put this value in perspective, the average financial aid received among all students is 1924 yuan (column 2, row 9). Poor students are only receiving 5% more in financial aid than the average. In essence, poor and non-poor students can be considered to be receiving the same level of financial aid at the same rates.

5 Discussion and Conclusions

Drawing on a carefully sampled dataset in two provinces (one coastal, one inland), we have demonstrated that secondary vocational schools largely appear to meet government

benchmarks of teacher qualifications and training, practical training, and adequate facilities. Zhejiang schools outperform Shaanxi schools, but neither province can really be said to fail in terms of government benchmarks. We have also shown that (with some exceptions) poor students generally attend schools that are comparable in quality to the schools attended by non-poor students. That is, being poor does not seem to reduce the quality of school that students are able to attend. However, poor students may be shouldering heavy financial burdens to attend school. Indeed, we find that financial aid misses roughly 34% of poor students and also includes many rich students who may not need it.

In some respects, these findings suggest the success of recent policies. One reason that schools (especially in Zhejiang) perform adequately when we evaluate them based on inputs may be the recent wave of policy interest in secondary vocational education. The amount of attention paid to secondary vocational education on a policy level, whether in the Twelfth Five Year Plan (Xinhua News, 2011) or National Education Reform and Development Outline (Chinese State Council, 2002), has been matched with increases in investments per secondary vocational school student (by over 6 times—National Bureau of Statistics, 1991; 2012). Zhejiang, a rich province with abundant fiscal resources, has also been taking steps to promote secondary vocational education, as borne out by a recent initiative to increase vocational teacher training (Zhejiang Department of Education, 2011). These recent policies have likely helped schools to meet government benchmarks.

These pro-vocational education policies may have also helped ensure that poor students attend schools that are of comparable quality to the schools of their non-poor peers. As witnessed in its commitment to providing financial aid for poor students, the central government is keen on ensuring poor students benefit from the expansion of secondary vocational education (Chinese

State Council, 2002). While we cannot be certain, one possible reason for why poor and non-poor students were able to enroll in schools of comparable quality is that the recent investments in school inputs from the central government have been relatively equitable.

However, inputs are only a proxy for quality. In fact, there is reason to believe that inputs are not translating to outcomes, which are more persuasive measures of quality. For example, Min and Tsang (1990) find that vocational schools do not significantly increase student wages after graduation. Yang (1998) surveyed over 1400 employees and concluded that vocational training had no measurable positive benefit on job performance. More recently, Wang (2012) estimated that the dropout rate among secondary vocational school students was roughly 15% by using enrollment data from the Chinese statistical yearbook. While these studies are either dated or rely on secondary (administrative data), they do at least suggest gaps in secondary vocational school quality when measured in terms of outcomes. Such findings from the past should serve as a call for more research on the outcomes of secondary vocational schooling in the near future.

Moreover, even if poor and non-poor students receive the same inputs, the poor likely face challenges in achieving the same outcomes (measured in future income or graduation rates, for example). Even though government policies are in fact targeting poor students, the distribution of financial aid is flawed and misses several poor students. As such, poor students may be pressured to drop out earlier to enter the workforce and earn an income. Financial burdens might interfere with their ability to learn skills at school or participate in internships. Previous studies conducted in junior high schools, for example, have shown that poor students drop out more frequently than non-poor students (Yi et al., 2012). In addition, our study only focuses on students who had the financial ability to attend vocational schools: the lack of financial aid may have kept certain students from even attending.

As such, even though our findings suggest certain successes of recent policies, there is still more work to do. First of all, while schools are generally performing well, some quality gaps still exist. For example, while training sessions are offered, teachers do not seem to be attending. Secondary vocational school teachers lack the industry experience required by government benchmarks. Second, while financial aid policies are targeting poor students, policymakers should examine the distribution of aid to ensure that poor students (who may currently be shouldering heavy financial burdens) are in fact covered.

Third, and most importantly, schools should be held accountable for outcomes and not just inputs. Current oversight has been focused on inputs (Kuczera and Field, 2012), which could very well explain why schools appear to have been so successful in terms of inputs. However, if schools are failing to deliver on outcomes, the fact that they are providing sufficient inputs may in fact reveal serious flaws in administration, curricula, or other important areas. Further research is required to determine whether this is the case.

References

Chinese State Council, 1996, "Vocational education law of the People's Republic of China." URL http://www.gov.cn/banshi/2005-05/25/content_928.htm (chinese).

Chinese State Council, 2002, "Decision to rapidly expand vocational schooling reform and development." URL http://www.gov.cn/gongbao/content/2002/content_61755.htm (chinese).

Chinese State Council, 2005, "Decision to vigorously develop vocational education." URL http://www.gov.cn/gongbao/content/2005/content_93014.htm (chinese).

Chinese State Council, 2010, "National education reform and development outline (2010-2020)." URL http://www.gov.cn/jrzg/2010-07/29/content_1667143.htm (chinese).

China Youth Daily, 2009, "Gap between China's poverty line and international standard." China Youth Daily, April 9, 2009. (chinese).

Chen, Dandan, 2009, Vocational schooling, labor market outcomes, and college entry. Policy Research Working Paper 4814. Washington, DC: World Bank.

Chen, Song, 2011, "Comparative analysis on regional development of secondary vocational education." *Technical and Vocational Education*, Vol. 32, No. 16, pp. 5-10 (chinese).

Dougherty, C. R. S., 1990, "Unit costs and economies of scale in vocational and technical education: evidence from the people's republic of china." *Economics of Education Review*, Vol. 9, pp. 389–394.

Ding, Xiaohao and Ying Li, 2007, "An analysis on employment for secondary vocational education graduates in urban China." *Economics of Education Research* (Beida), Vol. 5, No. 4, pp. 1-15 (chinese).

Fang, Zhanhua, Hui Liu, Xueling Fu, and Xiaozhou Xu, 2009, *Knowledge and Skill: 60 Years of Chinese Vocational Education,* Hangzhou: Zhejiang University Press (chinese).

Fo, Zhaohui and Hui Xing, 2011, "Survey on implementation of the national stipend policy in secondary vocational schools." *The China Educational Development Yearbook*, Volume 3 (Yang, Dongping ed.), Chapter 10, BRILL.

Glewwe, Paul, Eric A. Hanushek, Sarah D. Humpage, and Renato Ravina, 2011, "School resources and educational outcomes in developing countries: A review of the literature from 1990 to 2010." URL http://faculty.apec.umn.edu/pglewwe/documents/Edinput3%5B1%5D.pdf.

Guo, Zhenyi and Stephen Lamb, 2010, *International comparisons of China's technical and vocational education and training system*. Dordrecht: Springer.

Hanushek, Eric A., John F. Kain, Daniel M. O'Brien and Steven. G. Rivkin, 2005, "The market for teacher quality." The National Bureau of Economic Research. URL http://www.nber.org/papers/w11154.

Kolenikov, Stanislav and Gustavo Angeles, 2009, "Socioeconomic status measurement with discrete proxy variables: Is principal component analysis a reliable answer?" *Review of Income and Wealth*, Vol. 55, No. 1, pp. 128–165.

Kuczera, Małgorzata and Simon Field, 2012, "Learning for jobs: OECD reviews of vocational education and training: Options for China." Organization for Economic Cooperation and Development.

Liu, Chengfang, Linxiu Zhang, Renfu Luo, Scott Rozelle, Brian Sharbono and Yaojiang Shi, 2009, "Development challenges, tuition barriers, and high school education in China." *Asia Pacific Journal of Education*, Vol. 29, No. 4, pp. 503–520.

Min, Weifang and Munchiu Tsang, 1990, "Vocational education and productivity: a case study of the Beijing general auto industry company." *Economics of Education Review*, Vol. 9, No. 4, pp. 351–364.

Ministry of Education, 1993, "Teachers law of the People's Republic of China." URL http://www.gov.cn/banshi/2005-05/25/content_937.htm (chinese).

Ministry of Education, 1999, "Rules of continuing education of teachers at primary and secondary schools." URL http://baike.baidu.com/view/2721832.htm (chinese).

Ministry of Education, 2011, "Regulations on improving vocational teacher training from the ministry of education." URL http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe_731/201112/128905.html (chinese).

Ministry of Education, 2012, "Regarding notice of financial support from central government to build workshops in vocational schools." URL http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe_700/201204/133821.html (chinese).

Ministry of Finance and Ministry of Education, 2006, "Comments regarding the expansion of secondary vocational school financial aid for poor families." URL http://www.edu.cn/zong_he_801/20060817/t20060817_192408.shtml (chinese).

National Bureau of Statistics, 1991, China Statistical Yearbook 1990, China Statistics Press, Beijing. (chinese).

National Bureau of Statistics, 2008, China Statistical Yearbook 2008, China Statistics Press, Beijing. (chinese).

National Bureau of Statistics, 2012, China Statistical Yearbook 2011, China Statistics Press, Beijing. (chinese).

Park, Albert, and Emily Hannum, 2001, "Do Teachers Affect Learning in Developing Countries?: Evidence from Matched Student-teacher Data from China." Paper presented

at the 2001 Rethinking Social Science Research on the Developing World in the 21st Century Conference.

Schnarr, Alexander, Sun Yang, and Kai Gleibner, 2008, "Vocational education and training and the labour market: A comparative analysis of China and Germany." Technical report, UNESCO Centre for Technical and Vocational Education and Training.

Shaanxi Department of Education, 2011, "Guidelines for the Reform of Shaanxi Secondary Vocational Schooling." URL http://www.snedu.gov.cn/news/weitingwenjian/201109/28/2998.html.

Shi, Xueyun and Zhanyong Qi, 2010, "Analysis on policy trends of vocational education reform and development of China." Vocational and Technical Education, 1. http://www.cctve.com.cn/images/stories/english/00002-201002/ zyjsjy-english-00002-201002-044-052.pdf.

Tsang, Mun C., 2000, "Education and national development in China since 1949: Oscillating policies and enduring dilemmas." *China Review*, pp. 579–618.

UNESCO, 2011, World data on education 7th edition: China. Geneva, UNESCO. http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/China.pdf.

Wang, Rong, 2012, "To phase in free vocational secondary education for all: not so fast." *Education and Economics*, Vol. 2, pp. 1-6 (chinese).

Wei, Xin, Mun Tsang, Wweibin Xu, and Liang-Kun Chen (1999), "Education and earnings in rural China." *Education Economics*, Vol. 7, No. 2, pp. 167–187.

Xinhua News, 2011, "Economics and social development: The twelfth five-year plan." URL http://www.gov.cn/2011lh/content_1825838.htm (chinese).

Yang, Jin, 1998, "General or vocational? The tough choice in the Chinese education policy." *International Journal of Educational Development*, Vol. 18, No. 4, pp. 289–304.

Yi, Hongmei, Linxiu Zhang, Renfu Luo, Yaojiang Shi, Di Mo, Xinxin Chen, Carl Brinton, and Scott Rozelle, 2012, "Dropping out: Why are students leaving in China's poor rural areas?" *International Journal of Educational Development*, Vol. 32, pp. 555–563.

Zhejiang Department of Education, 2011, "Zhejiang province mid-term to long-term education reform and development outline (2010-2020)." URL http://edu.zjol.com.cn/05edu/system/2011/05/31/017563051.shtml (chinese).

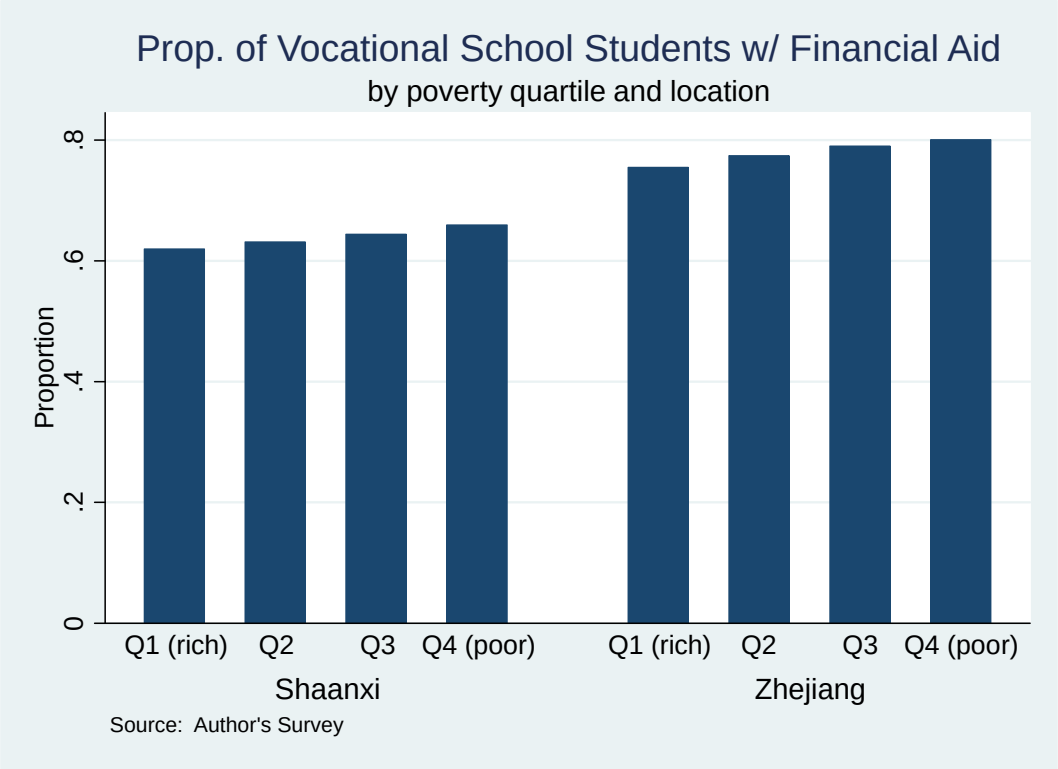

Figure 1: Proportion of Students Receiving Any Financial Aid

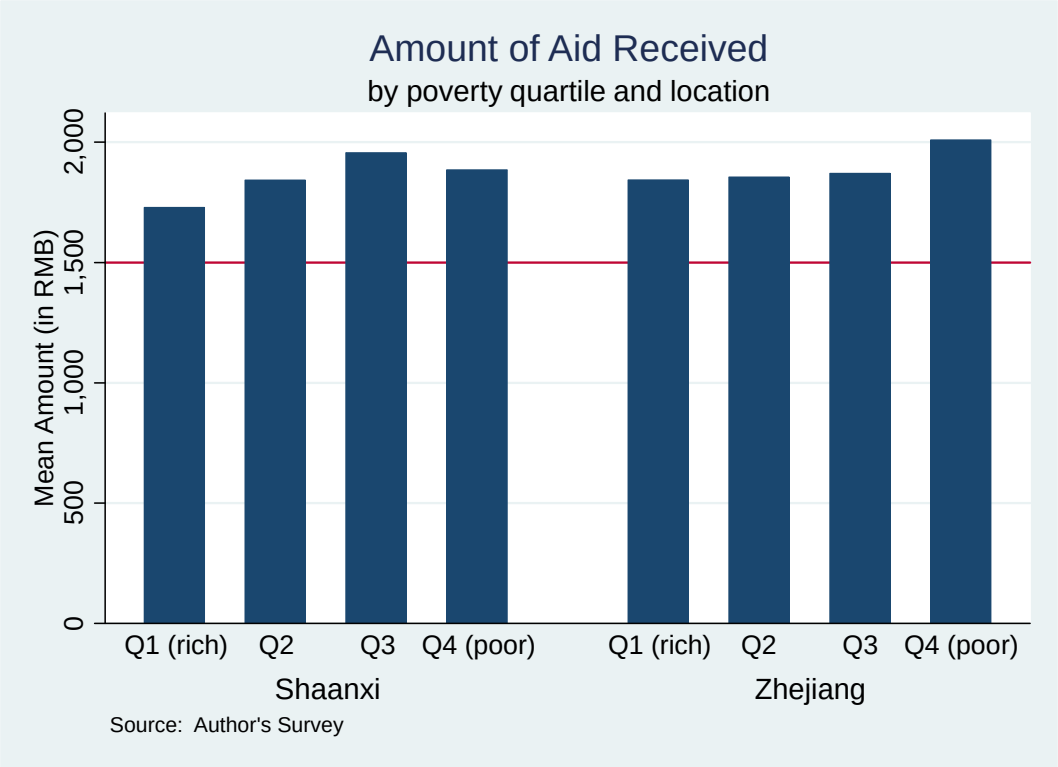

Figure 2: Conditional on Receiving Aid, How Much Aid Received

Table 1: School Quality in Terms of Teacher Qualifications and Training

	Mean	Std Dev	Min	Max
Percentage of Teachers with...				
1. bachelor's degree	79.7	23.9	8.33	100
2. vocational college degree	22.3	26.3	1.47	100
3. either bachelor or vocational college degree	94.7	14.6	12.7	100
4. teacher certifications	82.0	24.1	16.7	100
5. how many years has teacher taught?	9.77	13.8	0	114
Industry Experience				
6. proportion of teachers with dual certifications	0.33	0.18	0.036	0.86
7. any industry experience (1=yes)	0.32	0.46	0	1
8. years of industry experience	2.17	2.44	0.090	10
9. industry experience relevant to teaching (1=yes)	0.46	0.50	0	1
Trainings in 2010-2011 School Year				
10. any teacher training offered by school (1=yes)	0.94	0.24	0	1
11. sessions of trainings offered by school	75.6	110.5	2	489
12. average number of training sessions per teacher	0.79	1.02	0.032	4.11
13. average duration of each training session (in days)	11.4	10.7	0.50	50
14. did homeroom teachers attend any training (1=yes)	0.68	0.47	0	1
Observations	105			

Table 2: School Quality in Terms of Practical Training

	Mean	Std Dev	Min	Max
School-Industry Partnerships				
1. has at least one industry partnership (1=yes)	0.91	0.28	0	1
2. industry provides job offers to graduates (1=yes)	0.80	0.40	0	1
3. percentage of graduates with industry job offers	54.5	39.3	0	100
4. teacher trainings given by industry professionals (1=yes)	0.43	0.50	0	1
5. student trainings given by industry professionals (1=yes)	0.42	0.50	0	1
6. industry and school develop curriculum together (1=yes)	0.12	0.33	0	1
School Internships				
7. were school internships offered? (1=yes)	0.50	0.50	0	1
8. were industry internships offered? (1=yes)	0.71	0.46	0	1
9. does teacher communicate with internship supervisor? (1=yes)	0.93	0.26	0	1
Observations	105			

Table 3: School Quality in Terms of Proper Facilities

	Mean	Std Dev	Min	Max
Basic Facilities				
1. has laboratory (1=yes)	0.98	0.15	0	1
2. has library (1=yes)	0.99	0.11	0	1
Multimedia Rooms				
3. has multimedia room (1=yes)	0.95	0.22	0	1
4. multimedia room availability (hours open per week)	28.9	20.4	2	90
Computer Rooms				
5. has computer room (1=yes)	1	0	1	1
6. computer room availability (hours open per week)	35.2	26.3	0	144
Workshop Centers				
7. is the school equipped with an workshop? (1=yes)	0.86	0.35	0	1
8. is the workshop equipped with specialized staff? (1=yes)	0.92	0.28	0	1
9. money spent on workshop equipment per student (in yuan)	668.3	1198.2	0	6666.7
10. money spent on construction and upkeep per student (in yuan)	2266.6	2180.3	9.23	10571.0
Observations	98			

Table 4: Teacher Qualifications and Training (by Shaanxi and Zhejiang)

	Shaanxi	Zhejiang	p-value*
Percentage of Teachers with...			
1. bachelor's degree	70.9	86.0	0.00
2. vocational college degree	31.9	15.0	0.00
3. either bachelor or vocational college degree	92.5	96.3	0.22
4. teacher certifications	79.7	83.5	0.48
5. how many years has teacher taught?	10.6	8.90	0.55
Industry Experience			
6. proportion of teachers with dual certifications	0.30	0.35	0.19
7. any industry experience (1=yes)	0.36	0.28	0.39
8. years of industry experience	2.42	1.88	0.48
9. industry experience relevant to teaching (1=yes)	0.48	0.45	0.87
Trainings in 2010-2011 School Year			
10. any teacher training offered by school (1=yes)	0.87	1	0.01
11. sessions of trainings offered by school	27.6	111.4	0.00
12. average number of training sessions per teacher	0.37	1.09	0.00
13. average duration of each training session (in days)	16.0	8.87	0.01
14. did homeroom teachers attend any training (1=yes)	0.59	0.76	0.08
Observations	105		

**Note:* p-value based on t-test of difference of means between Shaanxi and Zhejiang

Table 5: Practical Training (by Shaanxi and Zhejiang)

	Shaanxi	Zhejiang	p-value*
School-Industry Partnerships			
1. has at least one industry partnership (1=yes)	0.94	0.89	0.34
2. industry provides job offers to graduates (1=yes)	0.80	0.80	0.96
3. percentage of graduates with industry job offers	61.5	48.9	0.13
4. teacher trainings given by industry professionals (1=yes)	0.26	0.57	0.01
5. student trainings given by industry professionals (1=yes)	0.29	0.51	0.05
6. industry and school develop curriculum together (1=yes)	0.11	0.14	0.76
School Internships			
7. were school internships offered? (1=yes)	0.67	0.33	0.00
8. were industry internships offered? (1=yes)	0.77	0.65	0.18
9. does teacher communicate with internship supervisor? (1=yes)	0.89	0.97	0.21
Observations	105		

**Note:* p-value based on t-test of difference of means between Shaanxi and Zhejiang

Table 6: Proper Facilities (by Shaanxi and Zhejiang)

	Shaanxi	Zhejiang	p-value*
Basic Facilities			
1. has laboratory (1=yes)	1	0.96	0.26
2. has library (1=yes)	0.97	1	0.22
Multimedia Rooms			
3. has multimedia room (1=yes)	0.93	0.96	0.54
4. multimedia room availability (hours open per week)	23	33.0	0.04
Computer Rooms			
5. has computer room (1=yes)	1	1	.
6. computer room availability (hours open per week)	26.5	41.7	0.01
Workshop Centers			
7. is the school equipped with an workshop? (1=yes)	0.87	0.85	0.78
8. is the workshop equipped with specialized staff? (1=yes)	0.93	0.91	0.75
9. money spent on workshop equipment per student (in yuan)	768.1	604.9	0.59
10. money spent on construction and upkeep per student (in yuan)	1765.9	2533.7	0.17
Observations	98		

**Note:* p-value based on t-test of difference of means between Shaanxi and Zhejiang

Table 7: Comparison of School Minimum Requirements by Poverty

	Nonpoor	Poor	p-value*
1. either bachelor or vocational college degree	96.5	95.0	0.000
2. teacher certifications	83.1	84.0	0.132
3. any teacher training offered by school (1=yes)	0.94	0.96	0.000
4. has at least one industry partnership (1=yes)	0.92	0.93	0.465
5. were school internships offered? (1=yes)	0.44	0.44	0.887
6. were industry internships offered? (1=yes)	0.67	0.71	0.003
7. has laboratory (1=yes)	0.99	0.98	0.014
8. has library (1=yes)	1.00	0.99	0.000
9. has multimedia room (1=yes)	0.96	0.94	0.011
10. has computer room (1=yes)	1	1	.
Observations	7292		

**Note:* p-value based on t-test of difference of means between poor and non poor schools

Table 8: OLS Regression for Association of Poverty to Government Benchmarks

	(1)	(2)
Minimum Requirements for Teachers		
1. either bachelor or vocational college degree	-0.002*	-0.002*
	(0.001)	(0.001)
2. teacher certifications	0.000	0.000
	(0.001)	(0.001)
3. any teacher training offered by school (1=yes)	0.084**	0.104***
	(0.025)	(0.028)
Minimum Requirements for Practical Training		
4. has at least one industry partnership (1=yes)	0.014	0.014
	(0.063)	(0.063)
5. were school internships offered? (1=yes)	0.002	0.005
	(0.027)	(0.029)
6. were industry internships offered? (1=yes)	0.036	0.036
	(0.027)	(0.027)
Minimum Requirements for Facilities		
7. has laboratory (1=yes)	0.099***	0.100***
	(0.018)	(0.025)
8. has library (1=yes)	0.252***	0.254***
	(0.015)	(0.017)
9. has multimedia room (1=yes)	-0.063	-0.061
	(0.054)	(0.056)
10. has computer room (1=yes)	0.000	0.000
	(.)	(.)
11. controls for whether school is in Zhejiang (1=yes)	NO	YES
Observations	6335	6335

* p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors clustered by in parentheses.

Table 9: OLS Regression for Determinants of Getting Any Financial Aid (1=yes)

	(1)	(2)
SES Characteristics		
2. Ranked in Lowest Asset Quartile (1=yes)	-0.014	0.026•
	(0.012)	(0.013)
1. Attend School in Zhejiang (1=yes)		0.140•••
		(0.014)
Student Characteristics		
3. Student's Age (Years)		-0.003
		(0.006)
4. Student's Gender (1=male)		-0.007
		(0.012)
5. Student's Ethnicity (1=Han)		-0.060
		(0.040)
Academic Characteristics		
6. Baseline Math Test Score (Std Dev)		-0.002
		(0.006)
7. Baseline Computer Test Score (Std Dev)		-0.011
		(0.006)
8. Prepared to Take Gaokao? (1=yes)		0.026•
		(0.012)
Constant	0.729•••	0.737•••
	(0.006)	(0.108)
Observations	7345	6877

* p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors clustered by in parentheses.

Table 10: OLS Regression for Determinants of Amount of Financial Aid (in yuan)

	(1)	(2)
SES Characteristics		
2. Ranked in Lowest Asset Quartile (1=yes)	83.19•	95.77••
	(33.47)	(37.03)
1. Attend School in Zhejiang (1=yes)		66.60
		(35.87)
Student Characteristics		
3. Student's Age (Years)		-1.334
		(15.97)
4. Student's Gender (1=male)		-76.15••
		(29.22)
5. Student's Ethnicity (1=Han)		-81.66
		(102.7)
Academic Characteristics		
6. Baseline Math Test Score (Std Dev)		44.59□□
		(13.63)
7. Baseline Computer Test Score (Std Dev)		-11.34
		(14.61)
8. Prepared to Take Gaokao? (1=yes)		-8.695
		(29.10)
Constant	1855.8□□□	1961.6□□□
	(14.28)	(282.1)
Observations	5008	4712

* p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors clustered by in parentheses.