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**RESOURCE DEPENDENCE ANALYSIS OF PUBLIC HIGHER  
EDUCATION INSTITUTIONS IN UZBEKISTAN**

**BY**

**SHUKHRAT KHOLMUMINOV, SHAYZAK KHOLMUMINOV AND  
ROBERT E WRIGHT**

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UNIVERSITY OF STRATHCLYDE  
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# Resource Dependence Analysis of Public Higher Education Institutions in Uzbekistan

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Shukhrat Kholmuminov\*, Shayzak Kholmuminov\*\*, and Robert E. Wright\*\*\*

## Abstract

Since the early years of independence in 1991, a central topic of higher education in Uzbekistan has been how to fill the gap left by the reduced government funding at public higher education institutions (HEIs). The majority of the Uzbek universities, as in many other countries, have responded to the decline in public allocations through charging significantly increased tuition fees. Therefore, the revenue structure of public HEIs has changed from full government funding to mostly tuition funding over the last decade. Utilising resource dependence theory (RDT), this study empirically investigates whether or not increased institutional reliance on tuition fees as a main source of revenue has augmented the share of institutional expenditures dedicated to educational activities at public HEIs in Uzbekistan over the period 2000-2013. Drawing on a 14-year panel of university-level data and employing an instrumental variable approach that acknowledges the potential endogeneity of institutional tuition revenue, the analysis suggests that institutional expenditures for educational expenses are considerably increased as institutions became more dependent on tuition revenue for their financially sustainable operation. This finding is consistent with the predictions of RDT. Robustness of the empirical findings is also checked utilising several diagnostic models, and the results revealed that the IVs applied during the TSLS estimations are valid and they simultaneously uncorrelated with the error term.

**Keywords:** resource dependence theory; higher education finance; Uzbekistan.

**JEL classification:** I21, P20

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\* Banking and Finance Academy of the Republic of Uzbekistan, Tashkent, Uzbekistan

\*\* Tashkent State University of Economics, Tashkent, Uzbekistan

\*\*\* University of Strathclyde, Glasgow, Scotland

# **Research Dependence Analysis of Public Higher Education Institutions in Uzbekistan**

## **1. Introduction**

In the aftermath of the recent financial crisis, many countries had to considerably reduce their spending on public service sectors, such as health, transportation, education and tourism, in order to balance their budgets (Johnstone and Marcucci, 2010). Education was often among the sectors that lost out as a result of such public cuts (Albrecht and Ziderman, 1995; Sanyal and Johnstone, 2011). Higher education institutions have been struggling to find sufficient financial resources for conducting basic teaching and research activities due to the decline in government allocations (Barr, 2009; Sam, 2011). In some countries, the process of reforming the HEIs, to make them less dependent on government funding, had already been ongoing by giving more financial autonomy to their public HEIs for obtaining funds from external/private sources (Johnstone, 2004; Salmi and Hauptman, 2006; Sanyal and Johnstone, 2011). Many public HEIs used this newly 'granted' financial autonomy to introduce or dramatically increase tuition and other user charges (Barr, 2010; Muscio et al., 2013). Most of the previous studies on consequences of increased tuition and other user charges have largely focused on their impact on behaviours of students (Canning et al., 2007; Johnstone and Marcucci, 2010; Paulsen and Smart, 2001; Psacharopoulos and Partinos, 2004; Sam, 2011; Tilak, 2004). Over the recent years, however, understanding the behaviours of state HEIs has been a subject of research by many scholars of economics, education and public administration. Compared to other bureaucracies, HEIs usually enjoy much greater autonomy and their incomes are a mixture of both private and public financing.

In the recent years, many public universities have also started to rely more on tuition income for their survival due to insufficient government funding (Chernoshtan and Griciva, 2013; Jaramillo and Melonio, 2011). This shift in income structures of public HEIs from

government to tuition financing, to some extent, made those institutions more dependent on students who are paying for their education (Fowles, 2013). Whereas, universities which obtain large proportion of their operational revenues from contracting out research or private donations become heavily beholden to these clients or donors which are providing ‘critical’ financial resources (Bozeman and Gaughan, 2007). This form of resource dependency relationships between institutions and external stakeholders have been investigated by many researchers using different organisational theories, such as contingency, resource dependence, network organisation and institutional isomorphism theories. Most of the researchers found that RDT to be the most suitable theory in explaining the behavioural consequences of organisations within such relationships (Austin and Jones, 2015; Pfeffer and Salancik, 2003). Previous empirical works utilised this theory mainly for three purposes: to test this theory itself; to expose the behaviour of a focal institution based on its dependencies; or to explain patterns of exchange and dependency linkages. However, Nienhuser (2008) argues that “it is not possible to test such a complex theory like RDT in its entirety because it consists of many hypotheses” (p.18).

The remainder of this paper is organised as follows. Section 2 critically reviews the relevant theoretical and empirical literature on resource dependence theory in the context of higher education. Section 3 is a description of the higher education system in Uzbekistan. The methodology and data, including descriptions of key variables and instrumental variables as well as summary statistics, is presented in Section 4. The estimates using OLS and TSLS regression are presented, discussed and interpreted in Section 5. Concluding comments follow in Section 6. The main conclusion is that the analysis of Uzbekistan data is consistent with the predictions of Resource Dependency Theory.

## **2. Previous Research**

Research Development Theory (RDT), was originally formulated by Jeffrey Pfeffer and Gerald Salancik in 1978. This theory emphasizes that control over resource allocation is an

important power source in organisations and the core of this theory is that "the behaviours of organisations will respond to demand made by external organisations upon whose resources they are heavily dependent" (Pfeffer and Salancik, 1978; p. 39). These scholars propose three factors which are 'critical' in describing the dependence of one institution on a second institution: (1) "the importance of resource and the extent to which the institution requires it for continued operation and survival; (2) the extent of discretion over the allocation and use of a resource possessed by the other institution; (3) the extent to which there are few alternatives or concentration of resource control" (p. 45). Within this frame, the power of an organisation is interpreted as a measure of the extent to which it can govern responses and decrease its dependencies on external resources.

Since many years, this theory has been a principal and influential theory for explaining environment and organisation interactions, in that RDT can well exposes the impact of the external environment on organisational behaviours (Austin and Jones, 2015). These researchers remark that the environmental relation is based on concept that organisations cannot always sufficiently-support their-self and need engage in interchanges with their external environment for being alive. RDT is becoming a very popular among many researchers to explain the behaviour of organisations and to examine organisations dependency on other organisations' resources. One of the first studies that analysis the resource dependence of one organisation on another was conducted by Proven, Beyer and Kruytbosch in 1980. The scholars investigated the relationship between non-profit organisations and their 'umbrella' organisations funding. In agreement with the assumptions of RDT, they concluded that "power over an individual organisation is larger the more resources it controls" (p. 18). Empirical findings by Saidel (1991) are also consistent with the assumption of RDT. Through conducting a survey of 80 non-profit and 73 public organisations, the researcher finds a relationship between the importance of governed resources and the impact of the organisation governing those resources.

Over the last three decades the most of the conceptual and empirical studies on the RDT, which examine the relationships between organisations and external environments, have been extensively conducted by many researchers (Boyd, 2006; Casciaro and Piskorski, 2005; Davis and Cobb, 2010; Freel, 2000; Frooman, 1999; Hillman, Shropshire and Cannella, 2007; Ozcan and Eisenhardt, 2009). Since the main objective of our paper is to review the relevant empirical contributions on the development of RDT in the context of higher education, the empirical studies which utilise this theory to examine resource dependence of HEIs will be discussed from now on.

The resource dependency relationship between HEIs and the external resource providers are comprehensively discussed by a very few scholars. These studies emphasise that institutions of higher education function within a multi stakeholder environment and they respond to the demands of institutions, students, parents, governments and legislation. Due to the declines in government funding, majority of the public HEIs began to generate the main fraction of their income from students by providing teaching services and from enterprises by providing research and consulting services. Therefore, students and other purchasers of academic services become clients who make a significant influence on revenue streams of HEIs. In the context of higher education, the first substantial and influential work on evaluating the RDT and its assumptions belongs to Tolbert (1985). The scholar applies RDT to explore the administrative structures of HEIs and study samples contained 167 public and 114 private American HEIs which were randomly selected. Pamela Tolbert measures institutional resource dependence using the share of four main sources of funding to the total revenues of HEIs. The scholar assumes that the “magnitude of dependence would predict the number of administrative offices and positions associated with the management of the funds” (p. 3). Findings show that dependence on private sources of funding is a robust predictor of administrative differentiation.

The first empirical contribution on testing RDT in terms of a comparison of the changing behaviour of HEIs and senior academic managements when seeking external-incomes to survive

is presented by Slaughter and Leslie (1997). The authors employed the data of universities in Australia, Canada, the UK and the US. Furthermore, Pilbeam (2012) implements this theory to explain the role of pro-vice chancellors (PVCs) in the interactions between 16 UK universities and resource environment. A web link for the questionnaire and a covering letter showing the aims of the study was sent to the 16 PVCs responsible for teaching and 16 PVCs responsible for research at the UK universities. The main findings show that PVCs responsible for research have had a cohesive relationship between each other, while those PVCs responsible for teaching have had no significant relationship. Empirical study of Chen (2001) is also contributed to the development of RDT through evaluating the performance of the University Fund system in Taiwan. The scholar found that the Taiwanese universities are paying more attention on professional management training, operation management, and perception adjustment, but less attention on administrative management. Regarding the operation management; operation concentrates less on managing existing resources but more on acquiring financial resources, and cares more about internal and external interactions. Based on his findings the scholar suggested that the Taiwanese universities should redesign their organisational managements and structures by taking into account the needs of stakeholders.

One of the recent empirical studies which utilises RDT in the context of higher education belongs to Fowles (2013). The scholar examines the relationship between institutional dependence on net tuition funds as a main source of income and institutional expenditures for instruction and related activities at 419 four-year public HEIs in the US. Using 11-year panel of university-level data, the instrumental variables model is implemented by admitting the potential endogeneity of institutional revenue pattern. A main independent variable was the share of total operating revenues derived from net tuition and the dependent variable in this estimation was the share of total institutional expenditures for education and related expenses. Results of the estimations reveal that institutional expenditures are highly sensitive to changes in revenue patterns at the American HEIs. However, one of the main drawbacks of Fowles's (2013) study is

that the obvious and critical question of – whether or not the increased institutional expenditures for education and related expenses increased graduation rates or educational outcomes – left unanswered. However another recently published study that is delivered by Coupet (2013), to some extent, fills the gap left by Fowles (2013). Jason Coupet examines the impact of total operational expenditures on graduation rates in Black and other universities using a 6-year panel of four-year American institutions. A Chow test is used in order to find structural differences in production functions of 152 Black and 3086 other institutions. The analysis finds noteworthy structural differences, e.g., at Black institutions - the administrative expenditures have a significantly negative influence on graduation rates. For this reason, Coupet (2013) suggests to reduce the administrative costs or to alleviate the negative impact of these costs on student outcomes through mitigating resource dependence.

### **3. An Overview of the Uzbek Higher Education System**

The higher education system of Uzbekistan is mainly funded from the state budget at three levels: local, regional and central (ADB Evaluation Study, 2011). Institutions of higher education, teacher training institutions and affiliated academic lyceums in the Republic are financed mainly from the central budget. The budget expenditure is calculated based on the student quotas, the costs of government grants for students, fixed assets, equipment and buildings. To evaluate the salary of higher education staff a 9/1 students and a teacher ratio has been used since 1996, but in practice it differs depending on the field of study (EC Tempus, 2010). According to the Decree of the Cabinet of Ministers of Uzbekistan (CMUZB) (1997), before starting of every academic year – all public HEIs make budget bids based on the basis of the last year's allocations to the institutions, which are submitted to and then evaluated by the ministries and agencies. These ministries and agencies aggregate the total budget and thereafter submit to the MFUZB, where a judgement about the total is made and return to those ministries and agencies which then redistribute the final figures between the HEIs (Mirkurbanov,

Anoshkina and Danilova, 2009). Furthermore, extra-budgetary funds make up more than half of overall expenditures on the higher education system of Uzbekistan in these days. Main reasons of this situation can be seen the continually raising the number of contract-paid students and the prices of their education (EC Tempus, 2010). The extra-budget funds of Uzbek HEIs are usually generated from the following sources: tuition and other fees, renting the properties and provision of short-term training programs by academic staff of institutions (MFUZZ, 2013).

According to the Resolution of the CMUZZ (2001), extra-budget funds which obtained from tuition charges and other private activities do not reduce the amount of funding from the public budget. These extra revenues can be spent for operational expenditures of HEIs, but all financial activities have to be reported to their ministries. For example, the Tashkent Medicine Academy reports about the allocations of its extra-budget funds to the Ministry of Health. Particularly, the extra-budget funds can be spent for further developments of the facilities and infrastructure of universities (NHDR, 2011). According to Figure 1, the amount of extra/off-budget funding has considerably increased relative to the state-budget funding at Uzbek HEIs during the period 2007-2013.

If we rely on the data exposed by the figure above, the off-budget funding rose by over 27 per cent in 2013 compared to 2000. In 2013, the off-budget funds were twice higher than the state-budget funds due to extensively increased tuition fees. It is important to remark that a share of institutional revenue derived from tuition payments has consisted more than 90 per cent of total off-budget revenue at public HEIs – since 2007, but shares of institutional revenue from research activities and public services were lower than 10 per cent during that period (MFUZZ, 2013). Moreover, Table 1 illustrates that the total expenditure per student has insignificantly changed between the period 2000 and 2013. A slight trend towards an increase in public expenditure per student is witnessed during the annual adjustment for inflation of teachers' wages and students' scholarships. A decline in the off-budgetary expenditure per student may be a result of the fact that in 2003, the adjustment for inflation of the tuition fee contracts amount was not

made (EC Tempus, 2010). In 2013, with respect to the state-budget funding per student and payment per student on a fee-based contract, the amount of the state expenditure reduced from 50 to 25 per cent depending on the academic performance of a student. This residual amount per student does not meet even the minimal needs of the Uzbek HEIs.

The data obtained from the MFUZZB (2013) suggest that expenditures by the Uzbek government on higher education have increased by 10 per cent from 2007 to 2013. Accordingly, the amount of funds which need to be allocated to the several institutional expenditures, such as wages, stipends, social and other funds, capital costs and other expenses, have also increased year by year. Huge portions of the governmental funds were dedicated to paying stipends of students and salaries of academic staff over the period of 2007 to 2013. Whereas, relatively less amount of funds have been allocated to capital costs and other expenses. However, this increased expenditure to higher education was sufficient neither to expand the number of academic staff nor to improve financially sustainable operation of HEIs.

Since the mid-2000s, there has been a reform that was aimed to introduce a high degree of autonomy to the HEIs. Since then, to all public HEIs have been allocated a total budget by MFUZZB and those institutions have had autonomy to determine how this budget should be spent. Public HEIs are free to set their own tuition charges, but within a maximum cap which is determined by CMUZZB. The administrators of HEIs can freely decide about the use of tuition revenues, but their ministries should be reported about the management of the private funds in addition to the public funds. Sources of finance at the Uzbek HEIs are now much more heterogeneous compared to the previous decade, with more than 60 per cent of total revenue coming from private sources in 2013 (MFUZZB, 2013). Thus, this enhanced autonomy has encouraged institutions to pay heed to the financial performance and cost efficiency of their operations. Despite of the increased autonomy, the public HEIs in Uzbekistan remain very similar in their status and mission.

Figure 3 illustrates the evaluation of institutional revenue patterns for all public HEIs in Uzbekistan, figured against the considerably increasing tuition prices over the 14 years. The figure below also exposes that the reduced allocations from government after 2002 have been offset by an increased reliance on tuition revenue. This increased revenue has been derived mostly in part through raises in tuition charges, although most of the public HEIs considerably increased the number of contract-based student enrolments over the sample period.

According to the figure above, Uzbek HEIs have considerably increased their share of tuition revenue in order to fill the gap left by the reduced government funding over the last two decades. As these public HEIs become more dependent on tuition payments as income sources, the RDT proposes that it is reasonable to expect these institutions to produce outputs which are more consistent with the demands of the students who are paying these tuition fees. By applying this notion to the current context, we construct following research hypothesis which is subject to empirical test: a resource dependence perspective suggests that increased institutional revenues generated mostly from tuition payments lead to an increased share of institutional expenditures dedicated to education and other student related activities at public HEIs in Uzbekistan.

## 4. Methodology

### 4.1 Empirical model

Based on the theoretical discussions above, the following empirical model is estimated to investigate the relationship between institutional expenditure and revenue patterns:

$$SHEE_{it} = \beta SHTR_{it} + \delta TVC_{it} + \gamma time + \mu_i + \varepsilon_{it} \quad (1)$$

where,  $i$  and  $t$  are the institutions and time respectively.

$SHEE_{it}$  – captures the share of total institutional expenditures dedicated to education expenses for  $i$  institutions and  $t$  years;

$SHTR_{it}$  – captures the share of institutional revenues derived from tuition payments for  $i$  institutions and  $t$  years;

$TVC_{it}$  – is a vector of time-varying institutional-level controls;

$time$  – is a linear time trend which is included to capture the effect of common changes impacting all HEIs over time.

$\mu_i$  – denotes the institution-specific fixed effects; and  $\varepsilon$  – denotes the idiosyncratic error term.

One of the main challenges in this empirical study is the potential endogeneity of the tuition share of total institutional revenues ( $SHTR_{it}$ ). Therefore, it is reasonable to suspect that  $SHTR_{it}$  may be simultaneously determined with the share of total institutional expenditures for educational expenses ( $SHEE_{it}$ ). In other words, it is often the case that the universities would strategically define both their tuition revenue and expenditure patterns simultaneously. This endogeneity cannot be ignored in the empirical analysis of the Eq. (1). Otherwise, this equation would result in biased estimates of the statistical coefficients between the dependent variable and the independent variables. One of the potential methods to solve the problem of an endogenous independent variable is to use the instrumental variable (IV) approach. In order to use the IV(s) with the endogenous variable ( $SHTR_{it}$ ), at least one observable variable ( $Z_{it}$ ) will be required which is not already captured by Eq. (1). Also,  $Z_{it}$  must satisfy two following conditions as stated by Wooldridge, 2002:

First condition is that  $Z_{it}$  must not be correlated with the error term:

Instrument exogeneity:  $Cov(Z_{it}, \varepsilon_{it}) = 0$

In fact, it is not usually easy to test this condition because of unavailability of unbiased estimator for ( $\varepsilon_{it}$ ). Second condition requires the partial or strong relationship between ( $Z_{it}$ ) and the

endogenous variable ( $SHTR_{it}$ ). In other words,  $Z_{it}$  must have no direct influence on  $SHEE_{it}$  but must have direct influence on  $SHTR_{it}$ :

Instrument relevance:  $Cov(Z_{it}, SHTR_{it}) \neq 0$

With the aim to satisfy these two conditions, particularly the latter one, as well as to account for this potential endogeneity of  $SHTR_{it}$ , two instrumental variables are used in this study. We expect these IVs are at least partially correlated with the endogenous variable ( $SHTR_{it}$ ) while uncorrelated with the dependent variable ( $SHEE_{it}$ ) and the error term ( $\varepsilon_{it}$ ).

In this empirical strategy, the first IV ( $\theta_1 Z_{it}$ ) is the inflation-adjusted "*Development Fund*" for each of the academic years given in the analysis. According to the Decree introduced by the CMUZB in 1997, each HEI must devote their five per cent of overall income to this fund's budget at the beginning of every academic year (see, CMUZB, 1997). However, if any of the Uzbek institutions seek extra funding to finance its institutional expenses, then the CMUZB returns the HEI an amount of money which is negotiated between the CMUZB and the institution. It is important to note that all public HEIs, to some extent, rely on "*Development Fund*" returns to finance institutional activities. Therefore, it is plausible to suspect that exogenous changes in the returns generated by "*Development Fund*" should have a direct impact on relative institutional revenue patterns ( $SHTR_{it}$ ), but should not have a direct impact on ( $SHEE_{it}$ ).

The second IV ( $\theta_2 Z_{it}$ ) is the dummy variable, *additional admission allowance*, which captures the number of additional students enrolled as a tuition-fee basis at the public universities in each academic year. The Uzbek institutions may receive this allowance during the first month of academic semester (in September) if demands to study at these institutions from matriculants are too high. This is a responsibility of the CMUZB to decide either to allocate or not to allocate extra admission quotas to HEIs. As such, I set to one if the HEIs received this

allowance, zero otherwise. If a university receives this allowance, then this HEI generates extra revenue, since every additionally enrolled student has to pay a full instruction fee. According to the report of CMUZB, the funds from additional admission allowance have to be allocated for improving infrastructure of the HEIs, such as constructing new campuses as well as purchasing new technologies and furniture (NHDR, 2011).

## 4.2 Key Variables

The dependent variable in this analysis is the share of total institutional expenditures for educational activities which captures the amount of institutional spending on instruction, student services, as well as the spending on maintaining of the library and classroom facilities. Thus,  $SHEE_{it}$  measure includes both current expenditures and capital expenditures in the form of depreciation. However, the main part of  $SHEE_{it}$  goes to the salaries paid to academic and administrative staff to maintain the provision of education as well as financial support to students for assisting them with monthly stipends. At Uzbek public HEIs, all students receive institutional stipends based on their previous semester's grades (Index Mundi, 2013).

In other words, this variable captures the share of institutional expenditures occurring in the regions most possibly to have tangible and direct benefit to students or those regions of spending most reconcilable with the demands of students. The share of educational expenditures is calculated by simply dividing the education and other student related expenses by the total institutional expenditure.

The key explanatory variable in this equation strategy captures the extent to which a HEI depend on tuition as a source of revenue ( $SHTR_{it}$ ). This variable is calculated as the tuition share of total operating incomes, and the total operating incomes consist of tuition revenue; government allocations and grants; private gifts and contracts; and revenue generated from services and sales of educational products.

Several time-varying control variables are also included into the model in order to control for their potential impacts on the dependent variable in the interest. Since the control variables in addition to the ( $SHTR_{it}$ ) may also have effects on the ( $SHEE_{it}$ ), they need to be held constant to test the pure effect of the main independent variable on the dependent variable.

The first time-varying institutional-level control variable in the model is *institutional size* (SIZE) which is measured as total institutional full-time equivalent student enrolment. This variable is included into the model to account for potential economies of scale in the provision of instruction. For example, institutions which care only about quantity but not quality may have incentive to decrease their educational expenses by increasing number of FTE student enrolments while keeping number of academic staff constant. The second control variable is the *price of tuition and mandatory fees* (TP) which is included due to expectations of very different expenditure patterns depending on tuition charges. For example, if tuition price functions as a market signal of institutional quality, then institutions with higher tuition prices may provide a better quality education and experience to their students which may yield greater educational expenditures. Moreover, in order to account for potential nonlinearities in the relationships between TP and SIZE and expenditures that the quadrates of these variables are included to the model.

Undergraduate programs are relatively cheaper than postgraduate education at the all institution of higher education in Uzbekistan (Index Mundi, 2013). Therefore, the next controlled variable is the *duration of postgraduate programs* (measured as *study weeks*) which is include to control for the fact that all else equal. However, some scholars frequently argue that this greater cost in the provision of postgraduate education can be partially offset by economies of scope in postgraduate and undergraduate education (Albrecht and Ziderman, 1995; Koshal and Koshal, 1999; and Barr, 2009). The *number of staff* is also included to the model as an independent variable which comprises the total number of academic and administrative staff at public HEIs. The reason of including this variable can be explained that a huge share of institutional

expenditure allocates to staff salaries at the all HEI in Uzbekistan (MFUZB, 2013). Therefore, if these institutions decide to increase the number of staff in order to reduce a ratio of student and staff with the aim to increase quality of education, then those institutions with greater number of personnel are more likely to have greater educational expenditures. Although institutions with smaller number of, but with better qualified and experienced, academic staff may still have an objective to deliver high quality educational services yielding higher instructional expenditures. Lastly, a simple linear *time trend* is also included to the model in order to capture the impact of common changes affecting all HEIs over time.

#### **4.3 Data Set**

This study utilises various institutional-level data which were collected mainly from one single source through working closely with several administrative personnel of the MFUZB. The financial data used for this study are mainly derived from Annual Financial Report of the each public HEI in Uzbekistan which is originally conducted by the Main Department for Financing Social Sphere and Science under the MFUZB. Using these Annual Financial Reports of public HEIs, the author constructed a panel dataset which is used in this study. This dataset contains variables on institutional main revenue sources such as tuition revenues, government allocations, income from private activities and incomes from "Development Fund", as well as on various forms of institutional expenditures including expenditures to education for the universe of the public HEIs in Uzbekistan covering the years from 2000 to 2013.

The dataset also contains several variables on institutional characteristics, such as number of FTE student enrolments, admissions, graduation rate, staffing and tuition prices for each institutions of higher education for the period of 2000 to 2013. These forms of data are retrieved from authorized documents which are prepared by the Main Department for Financing Social Sphere and Science under the MFUZB. Finally, the data for the duration of postgraduate programs are collected from the official web-site of the MHSSE for the years between 2000 and 2013. This variable is measured as the share of study weeks offered at the postgraduate level. All

financial data are used as real UZB Soms during the analysis and estimation processes. For this purpose, the entire financial data were transformed from nominal Uzbek Soms to real Uzbek Soms using the Consumer Price Index (CPI) of Uzbekistan for the each of academic years. The CPI is a measure of the inflation rate of a basket of goods and services purchased by households, and the data are available from IMF World Economic Outlook Database. Although the outcomes considerably unchanged by adjusting by the GDP-deflator of Uzbekistan.

The analytic sample utilised in this empirical study captures almost entire public HEIs in Uzbekistan from the years 2000 to 2013 for which complete data were available. The final sample comprises 857 institution-year observations demonstrating 62 public institutions of higher education, each of which is observed for an average of 13.8 years. Descriptive statistics for the share of total institutional expenditures dedicated to education expenses, the share of institutional revenue derived from tuition, institutional FTE enrolment and the tuition prices are provided for the HEIs included in the sample over the period 2000-2013 appear in Table 2. This table also captures the annual CPI scalar that was used to transform nominal Uzbek Soms to real Uzbek Soms.

The table above illustrates that the per cent of institutional tuition revenue has been increased consistently over the sample period, while the per cent of total institutional expenditures dedicated to education expenses has been considerably increased too. This signifies that the growth in the share of tuition revenue yield to the increased share of educational expenditures at public HEIs in Uzbekistan. Table 2 also represents that on average, the number of full time enrolled students and the amount of tuition prices have remarkably increased by year. The peak of FTE enrolment took place in 2009, while the public HEIs charged the highest tuition fees in the last year of the sample. Furthermore, Table 3 represents the mean, the standard deviation, the minimum and the maximum data values of the share of total institutional expenditures dedicated to educational expenses, the share of institutional revenues derived from tuition, FTE student enrolment, tuition price (in 2013 UZB Soms), duration of postgraduate

programs, number of academic and administrative staff, as well as two instrumental variables "Development Fund" (in 2013 UZB Soms) and dummy additional admission allowances.

## **5. Results**

### **5.1 OLS and TSLS Estimates**

This sub-section is dedicated to the interpretation of OLS estimation results. The standard regression findings are reported in Table 4 with four different specifications. The outcome of this table shows mixed results for the beta coefficients of the regressions. Some variables have positive coefficients while others have negative coefficients. The four specifications differentiate in the following way. Specification 1 shows only findings of simple OLS estimation (neither institutional effect is controlled nor time trend is included). Specification 2 captures the time trend in order to account for unexpected events or variation which may have influence on the dependent variable, while this specification does not include institutional fixed effect. Specification 3 includes institutional fixed effect only that captures the influence of time-invariant characteristics of HEIs such as location, status and mission. The impact of these individual characteristics, however, cannot be uniquely identified. The main insight here is that any changes in the educational expenditures must be due to effects other than those institutional fixed effects (Stock and Watson, 2007). Therefore, the coefficients revealed are not artefact of the confounding influence of those time-invariant variables in the last two specifications. Finally, Specification 4 includes the both institutional fixed effect and time trend. Moreover, all the specification results include cluster-robust standard errors in order to account for arbitrary forms of intra-group correlation and heteroscedasticity.

The table above reveals that many of the explanatory variables can have significant, either positive or negative, influence on the dependent variable in the interest. Since both the dependent and main independent variables are measured as percentages, the coefficient on the tuition share factor can be understood as an elasticity of a Cobb-Douglas function that measures

the responsiveness of institutional expenditures to changes in institutional revenues. The first specification of Table 4 shows that a one percentage point increase in the main explanatory variable that is the tuition share yields a 0.08 percentage point increase in the share of institutional expenditures allocated to educational expenses, holding all other regressors constant. However, the percentage of ( $SHEE_{it}$ ) is increased and the coefficient becomes statistically significant when the time trend is included to the model in Specification 2. Additionally, the accounting for institutional fixed effects led to decreased and insignificant coefficient of the main independent variable ( $SHTR_{it}$ ) in Specification 3. In the fourth specification, ( $SHTR_{it}$ )'s coefficient of 0.12 suggests that HEIs are quite inelastic. In other words, large changes in tuition revenue leads proportionally smaller changes in institutional expenditures dedicated to education expenses.

If one makes a decision by relying on the OLS estimation outcomes, then the endogeneity of  $SHTR_{it}$  would be ignored in the Eq. (1). This would result in biased estimates of the relationship between the explanatory variables and the dependent variable in the interest. In this study, the two instrumental variables are utilised to solve this potential endogeneity of the main independent variable by applying the TSLS estimator that is originally developed by Theil (1953). According to Wooldridge (2002), the TSLS technique is one of the efficient ways to combine multiple instruments. Table 5 exposes the TSLS results with four different specifications. Specification 1 reveals that TSLS outcomes which were estimated without accounting for institutional fixed effects and linear time trend. Specification 2 includes time trend only, but Specification 3 drops linear time trend while includes institutional fixed effects. Both of the institutional fixed effects and time trend are captured in Specification 4 in order to expose the net effect of the predictors on ( $SHEE_{it}$ ). All of the TSLS estimations utilise the robust standard errors clustered on institutions.

Findings of the first and second specifications reveal that all of the variables have statistically significant coefficients when the institutional fixed effect is not included into the

models. The TSLS estimations show that the magnitudes of several exogenous variables (TP and TPSQ) become statistically insignificant when institutional fixed effects are accounted for in the last two specifications. Moreover, the variable of tuition revenue share shows negative but highly significant coefficients in the first two specifications. However, Table 5 shows that the values of  $SHTR_{it}$  become a positive and remarkably high when potential effects of institutional time-invariant characteristics are accounted for. The coefficients of this main explanatory variable are statistically significant at 1% level in the all specification phases. The last specification of TSLS results reveal that, on average, a one percentage point increase in the share of institutional revenue generated from tuition yields a 0.83 percentage point growth in the share of institutional expenditures dedicated to education expenses, holding all other variables constant. In general, these findings are more consistent with findings of Fowles (2013) and Titus (2006a, b) regarding the relationships between institutional revenue patterns and student outcomes. These scholars conclude that if the American HEIs change their revenue structures from government funding to student tuition dollars, then these institutions are more like to shift their expenditure patterns to more greatly emphasized activities which most consistent with the preferences of this particular customer cohort.

When the both institutional fixed effects and linear time trend are captured, the fourth specification of the OLS results exposes that estimated coefficient of ( $SHTR_{it}$ ) is over seven times smaller than one that estimated utilising TSLS model which is not simply a point of econometric significance. The estimated coefficients can be interpreted as an elasticity that measures the responsiveness of the institutional expenditures to changes in institutional revenue. The OLS coefficient of 0.12 percentage suggests that Uzbek HEIs are fairly inelastic, which means the large changes in the share of tuition revenue cause proportionally smaller changes in the share of expenditures allocated to education expenses. Conversely, the TSLS results reveal a much stronger institutional response to changing revenue structure by confirming that Uzbek institutions are quite elastic in this respect.

Regarding institutional characteristics, when both the institutional time-invariant variables and linear time trend are included, some remarkable differences emerge in institutional expenditures. A straightforward effect is observed for FTE student enrolments; institutional size is negatively correlated to the share of institutional expenditures dedicated to education activities across all institutions. Thus, all else equal, the educational expenditures ( $SHEE_{it}$ ) decrease by -0.003 percentage if institutional FTE enrolments increase by a one student. This finding can be explained by the economies of scale in the provision of education at the public HEIs in Uzbekistan. Perhaps, the Uzbek universities were trying to decrease the total institutional costs by increasing students/teacher ratio over the sample period. The coefficient on the duration of postgraduate program shows that institutions with longer postgraduate course provision spend more on educational activities. This outcome is not surprising given the increased institutional expenditure associated with postgraduate instructions. This finding is in line with the recent study of Fowles (2013), who found that the American public HEIs with a greater graduate share of total instructional hours spend more on education and related expenses. Specifications 4 also exposes, all else equal, the dependent variable increases by 0.01 percentage point as number of personnel increases by a one employee at 1% significance level. This finding suggests that institutions with greater number of academic and administrative staff spend more on educational expenses.

One possible explanation for this finding can be wages of staff; a huge share of institutional expenditures goes for paying staff salary at the all public HEIs. Therefore, it is reasonable to expect that increased number of academic or administrative personnel is more likely to lead the increased share of institutional expenditures dedicated to educational activities. For example, institutions that care more about a quality of education may decide to decrease a student/staff ratio by increasing a quantity of academic staff or by hiring "better" qualified and experienced senior academics those normally demand relatively higher salaries than less

experienced and lower qualified teachers. Both of these methods may yield to the increased institutional costs.

The coefficient of linear time trend reveals positive and insignificant magnitude in the second specification, but it shows statistically significant coefficient in the last specification. While plausible explanation for this outcome can be driven by the recent increased attention that improving quality of curricula and opening new faculties which specialised to information technologies have received from the CMUZB. Perhaps, public universities are responding to that pressure through dedicating the increased institutional expenditures to activities intended to promote these objectives.

## **5.2 Diagnostic Tests**

Once the instrumental variable techniques are utilised, as suggested by Wooldridge (2002), it is a very important to conduct tests for exogeneity and for the validity of the over-identifying restrictions. Therefore, findings of the conducted tests for exogeneity and validity of the external instruments will be discussed in this part of the paper.

### **5.2.1 Testing for Exogeneity**

One of the main reasons for implementing the TSLS estimator was the suspicion that the key independent variable ( $SHTR_{it}$ ) is endogenous. If this endogeneity is in fact not a problem, the TSLS estimator will be consistent (provided that the instruments are relevant and valid) but inefficient due to higher variance than for OLS estimator. In other words, if ( $SHTR_{it}$ ) is in fact exogenous, then OLS and 2SLS estimators should differentiate only with sampling error but they should not reveal considerably different outcomes (Wooldridge, 2002). Accordingly, it is beneficial and a very important to examine the null hypothesis that  $SHTR_{it}$  is exogenous (that  $E[SHTR_{it}\epsilon_{it}] = 0; p = 0$ ) by testing for a statistically significant difference between the OLS and TSLS estimators of  $\beta$ . For this purpose, the Durbin-Wu-Hausman test is used in this diagnostic test and findings are presented in Table 6 (Hausman, 1978). The finding of the

endogeneity test reveals that the Durbin-Wu-Hausman test strongly rejects the null of exogeneity of the suspected endogenous variable, suggesting the treatment of the main exogenous variable as endogenously determined.

### **5.2.2 TSLS First-stage Estimates**

TSLS estimates are reported in Table 6 presents results of under-identification and weak-identification tests. The Angrist and Pischke chi-square test of under-identification suggests rejecting the null hypothesis that the endogenous variable is unidentified. The Kleibergen-Paap rk LM statistic is also applied in order to conduct the test of under-identification that also suggests rejecting the null. Critical values for the Angrist-Pischke F-statistics are not available. Therefore, the Stock et al. (2002) critical values should be applied, or the Staiger and Stock (1997) rule-of-thumb that the F-statistic should be equal or greater than 10 can be used here. The Angrist-Pischke F-statistic is higher than the basic threshold ( $11.6 > 10$ ) which suggests rejecting the null hypothesis that the utilised instruments are weak. Since the cluster-robust standard errors are used, the Klibergen-Paap Wald rk F-statistic is also appropriate test for weak-identification analysis. Using critical value of Stock et al. (2002), F-statistic of 15.9 indicates that IV estimates retain 10% of OLS bias, suggesting to reject the null hypothesis of weak-identification.

### **5.2.3. Validity of Instruments**

The decision to instrument the share of institutional revenue derived from tuition with the "Development Fund" and dummy "additional admission allowance" variables require careful consideration to instruments validity. As such, it is important to test for validity of over-identifying restrictions when the number of instruments exceed from the number of endogenous variable. As it was remarked earlier that this study utilises the two IVs and only one the endogenous variable. In this diagnostic part, the Hansen J-statistic is employed since the cluster-robust standard errors are applied in the TSLS estimation procedures. The over-identification test

suggests that IVs are not correlated with the error term of the second stage across all models. Therefore, I test the null hypothesis that the instrument sets are valid and the model is correctly specified (Hayashi, 2000). A rejection arise doubt on the validity of the instruments. However, Table 6 exposes that Hansen J-statistic fails to reject the null hypothesis. This means, the IVs those were employed during the TSLS estimations are valid and simultaneously uncorrelated with the error term of Eq. (1), thus the instruments are correctly excluded from the estimated equation.

## **6. Concluding Comments**

The results of TSLS estimations suggest that the Uzbek universities have significantly changed their behaviours through paying more attention to finance educational and other student related activities when these institutions' income structure shifted from full public funding to mostly tuition funding. These findings are in the line with the RDT, thus we do not reject the research hypothesis: a resource dependence perspective suggests that increased institutional revenues generated mostly from tuition payments lead to an increased share of institutional expenditures dedicated to education and other student related activities at public HEIs in Uzbekistan. This empirical finding is in the line with findings of Fowles (2013), Slaughter and Leslie (1997) and Tolbert (1985). These scholars find that the American public HEIs relied more on incomes from tuition and other user fees for financing their educational and other related expenses due to the reduced state appropriations.

The findings of this paper are expected to offer considerable policy suggestions to administrative bodies of public HEIs and the governmental institutions in Uzbekistan. Since the early 2000s, CMUZB has demanded from all public HEIs to derive a main fraction of their income by charging tuition and other user fees. Therefore, tuition revenue has been seen as the main replacement source to the reducing public subsidies at the Uzbek HEIs. However, "the strings attached to new funding steers faculty and administrators in new directions that are

potentially at odds with institutional missions, at least as these core missions have been defined historically" (Fowles, 2013; p. 283). That is, if CMUZB has implicit bargain with the HEIs which aims to direct government allocations to the provision of free education to the state grant-based students or which requires the government allocations to be spent mainly for public services and research endeavours that may bring considerable benefits to the public, then the increased dependence on tuition revenue will likely be accompanied by a reduction in the production of these activities.

Throughout the last decade, the Uzbek government and public HEIs have accepted this trade-off through directing a huge share of institutional expenditures for educational activities. A very insignificant share of institutional funds is allocated to carrying out research activities at public institutions, and this issue is repeatedly and admittedly emphasised in the annual reports of MHSSE. In addition, to the best of my knowledge, none of the Uzbek HEI has dedicated any fraction of its financial resources for improving and supporting public services yet. Fowles (2013) proposed a plausible suggestion in the case that if this trade-off is permissible to policymakers, "if so, it seems that prudent public policy would suggest making this bargain explicitly and accompanying it with a fundamental renegotiation of the relationship between public institutions and the state in which they reside, rather than introducing these changes as an accidental consequence of evolving state expenditure patterns" (p. 284).

The Uzbek government bodies should consider introducing policy decisions which could give more financial flexibility to public HEIs in managing their fiscal resources. Once the policies are in place, CMUZB should demand from the all institutions to increase their financial supports to not student related expenses only but to the other institutional activities as well (e.g., to improve scientific research). Although allocations of the greatest share of tuition income to the education related activities at Uzbek HEIs seem totally fair from the RDT perspective. However, the policy decisions must be powerful enough to 'force' administrative bodies of public universities to allocate a significant fraction of their institutional income for improving quality of

research activities and public services. Moreover, the Uzbek HEIs need to improve their cooperation with foreign organisations those are operating in Uzbekistan, such as EBRD, The World Bank, Asian Development Bank, UNESCO and many others, in order to obtain more research funding and grants. Another way of generating considerable research incomes could be by creating entrepreneurial centres at the Uzbek HEIs for developing businesses and innovative projects initiated by academic staff. This type of entrepreneurial centres are already implemented at the most of public HEIs in the US and the UK, and projects which are conducted in these centres bring a considerable amount of private funds for these universities.

The empirical finding conducted in this paper, however, is not able to answer the critical and obvious question of whether or not this increased educational expenditure at public HEIs is actually associated with increased quality of institutional outputs (i.e. students) and increased institutional efficiency. A few but growing empirical evidences reveal that the increased educational expenditures do not always lead to successful long-term student outcomes (Coupet, 2013; Pike et al., 2006). Furthermore, the RDT integrated with other organisational theoretical models might provide strong theoretical frame for future research. For facilitating the development of a better understanding of the role of environment in understanding institutional behaviours, researchers should seek to apply and examine the different theoretical frameworks developed in the organisational behaviour and related literatures. A next step to this research could be to study the roles of institutional isomorphism, network organisation and population ecology theories in explaining how Uzbek HEIs shape and are shaped by the environment in which they operate. According to Fowles (2013) studies that “only through such endeavours can scholars begin to develop a more comprehensive conceptual model which integrates the complex interrelationships between stakeholders, resources, institutions, and ultimately, organisational outcomes” (p. 285).

Since the RDT is organisational based, it is generalizable to other educational situations. As in many other countries, all the departments and faculties compete for scarce funding within

the public HEIs in Uzbekistan. Therefore, we advise to conduct further empirical studies through broadening this research into other contexts within institutional departments or faculties using more enriched and extended departmental- or faculty-level data.

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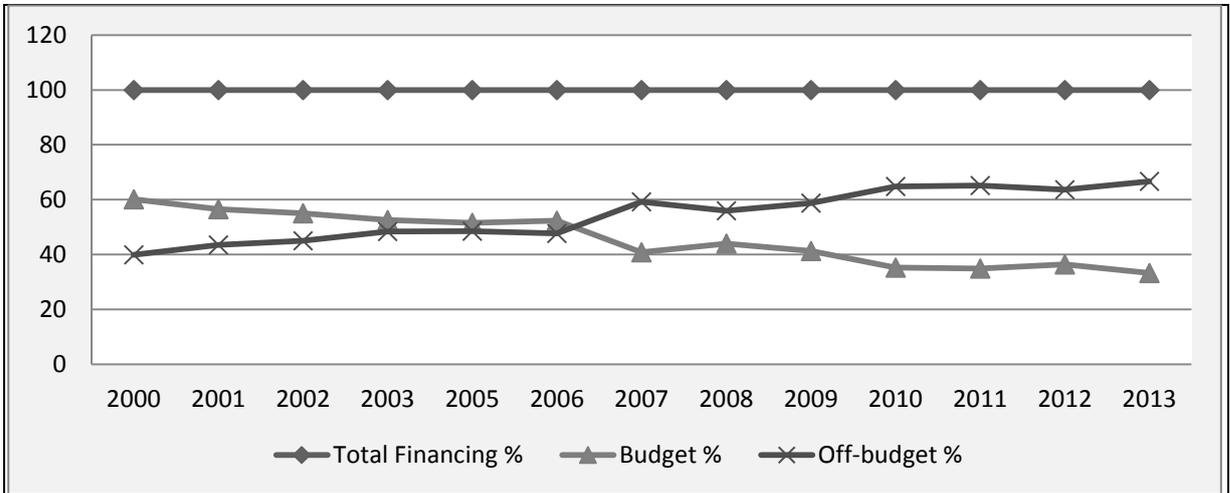
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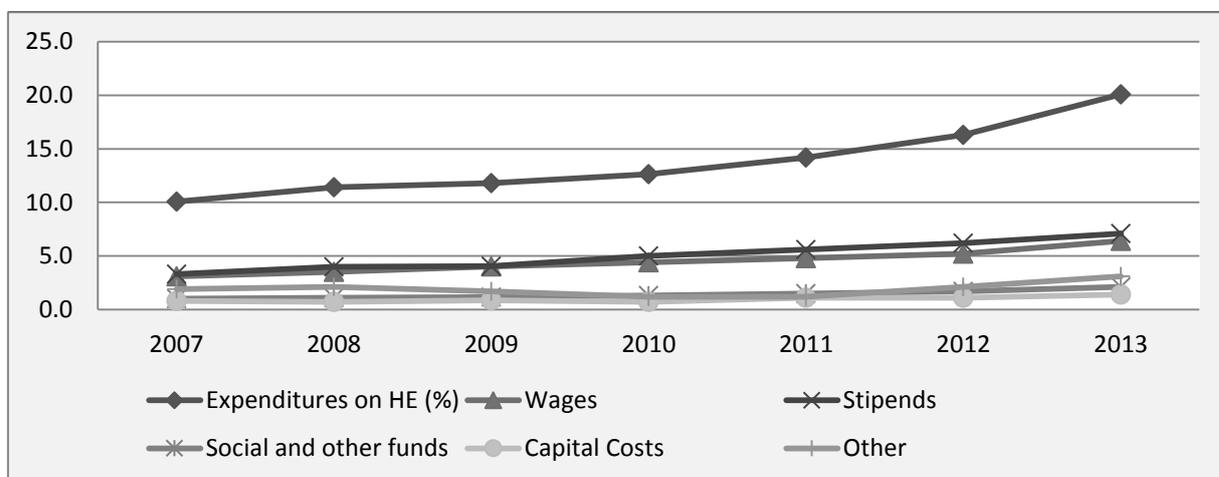
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**Figure 1: The State-budget and Off-budget Funding of HEIs in 2000-2013**



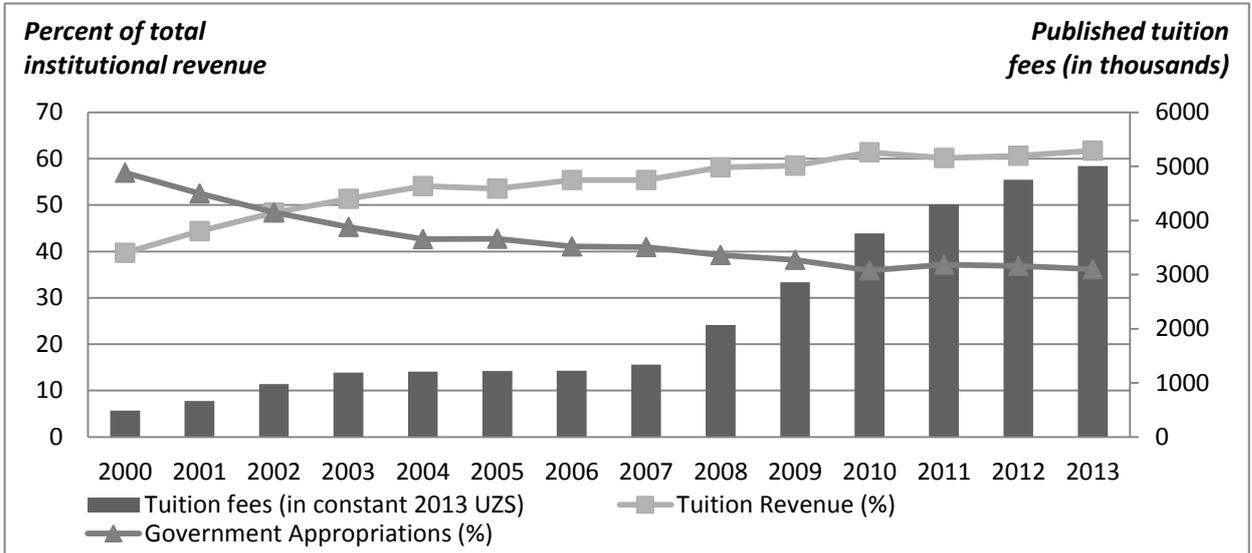
Source: MFUZB (2013)

**Figure 2: Expenditures on Higher Education in Percentage (between 2007 and 2013)**



Source: MFUZZ (2013)

**Figure 3: Revenue patterns at the public HEIs in Uzbekistan from 2000 to 2013**



Source: MFUZB (2013), author's calculations

**Table 1: Trends in Expenditure Per Student**

<b>Indicators</b>	<b>Monetary unit</b>	<b>2000/2001</b>	<b>2003/2004</b>	<b>2007/2008</b>	<b>2011/2012</b>	<b>2012/2013</b>
<i>Total expenditure per student</i>	<i>UZS('000)</i>	<i>125.8</i>	<i>126.3</i>	<i>109.1</i>	<i>109.1</i>	<i>112.3</i>
	<i>US dollars</i>	<i>531.7</i>	<i>533.8</i>	<i>461.1</i>	<i>461.1</i>	<i>474.6</i>
State-budget expenditure per student on scholarship	UZS('000)	153.5	171.4	172.1	184.8	197.8
	US dollars	661.5	724.4	727.4	781.1	836
Extra-budget expenditure per student on a fee-based contract	UZS('000)	92.3	96.7	73.7	70.7	72.3
	US dollars	390.1	408.7	311.5	298.8	305.6

Source: MFUZB (2013)

**Table 2: Selected Institutional Characteristics**

<b>Year</b>	<b>Per cent of total institutional expenditures dedicated to education (%)</b>	<b>Per cent of institutional revenue derived from tuition (%)</b>	<b>Full-time equivalent enrolment</b>	<b>Tuition price (in constant 2013 UZS)</b>	<b>Consumer Price Index scalar</b>
2000	72.79	39.70	1,559	487,763	0.1860
2001	73.70	44.38	1,864	666,843	0.2366
2002	72.77	48.35	2,037	978,795	0.3012
2003	71.80	51.33	2,167	1,188,452	0.3361
2004	79.08	54.09	2,497	1,209,043	0.3582
2005	80.57	53.54	2,741	1,221,981	0.3942
2006	79.25	55.39	3,387	1,223,445	0.4503
2007	82.92	55.39	3,799	1,338,272	0.5056
2008	82.79	58.14	4,256	2,071,708	0.5700
2009	85.57	58.46	4,648	2,859,238	0.6503
2010	85.93	61.36	3,935	3,765,462	0.7113
2011	75.63	60.13	3,671	4,299,449	0.8025
2012	83.07	60.66	3,763	4,753,797	0.8992
2013	86.61	61.71	3,683	5,010,595	1.0000

Source: MFUZB (2013), CB of Uzbekistan and IMF World Economic (2015), authors' calculations

**Table 3: Summary Statistics: Regression Variables**

<b>Variable</b>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<i>SHEE</i>	857	0.80	0.094	0.16	0.98
<i>SHTR</i>	857	0.541	0.161	0.06	0.95
<i>SIZE</i>	857	3231	2424	60	12648
<i>TP (000)</i>	857	2265	1589	393	6050
<i>DurPP</i>	857	63	26	0	102
<i>NumStaff</i>	857	783	507	34	2950
<i>DevFund (million)</i>	857	1995	2420	0	13209
<i>DumAdAdm</i>	857	0.891	0.311	0	1

**Table 4: OLS Estimates**

Variables	Spec.1	Spec.2	Spec.3	Spec.4
<i>SHTR</i>	0.083 (0.064)	0.098* (0.066)	0.095 (0.077)	0.115* (0.084)
<i>TP</i>	2.96e-08* (1.54e-08)	5.03e-08*** (1.56e-08)	3.61e-08* (1.96e-08)	5.19e-08*** (1.66e-08)
<i>TPSQ</i>	-1.86e-15 (2.06e-15)	-3.64e-15* (1.91e-15)	-2.77e-15 (2.57e-15)	-3.90e-15* (2.23e-15)
<i>SIZE</i>	-1.67e-05*** (6.45e-06)	-1.48e-05** (6.67e-06)	-2.48e-05*** (7.06e-06)	-2.17e-05*** (7.70e-06)
<i>SIZESQ</i>	1.26e-09*** (3.89e-10)	1.14e-09*** (4.04e-10)	1.70e-09*** (4.17e-10)	1.44e-09*** (4.72e-10)
<i>DURPP</i>	0.0002 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)
<i>NUMSTAFF</i>	2.34e-05 (2.39e-05)	2.81e-05 (2.44e-05)	2.70e-05 (3.12e-05)	4.11e-05 (3.38e-05)
<i>YEAR</i>	--	-0.005* (0.002)	--	-0.005 (0.003)
Institutional fixed effects?	<i>NO</i>	<i>NO</i>	<i>YES</i>	<i>YES</i>
Observations	857	857	857	857
Number of HEIs	62	62	62	62

Notes: Cluster-robust standard errors in parentheses

\* Significant at 10% level, \*\* Significant at 5% level and \*\*\* Significant at 1% level

**Table 5: OLS Estimates**

Variables	Spec.1	Spec.2	Spec.3	Spec.4
<i>SHTR</i>	-0.740*** (0.265)	-0.779*** (0.263)	0.525** (0.249)	0.829*** (0.342)
<i>TP</i>	1.12e-07*** (3.56e-08)	1.04e-07*** (2.96e-08)	-2.68e-08 (3.87e-08)	5.70e-09 (2.56e-08)
<i>TPSQ</i>	-1.05e-14** (4.34e-15)	-9.76e-15*** (3.72e-15)	4.29e-15 (4.58e-15)	3.32e-15 (3.97e-15)
<i>SIZE</i>	0.00005*** (0.00002)	0.00005*** (0.00002)	-0.00004*** (8.31e-06)	-0.00003*** (7.41e-06)
<i>SIZESQ</i>	-2.32e-09** (1.06e-09)	-2.44e-09** (1.05e-09)	2.61e-09*** (6.03e-10)	2.01e-09*** (5.07e-10)
<i>DURPP</i>	0.0012*** (0.0004)	0.0013*** (0.0004)	-0.00002 (0.0002)	0.0001* (0.0002)
<i>NUMSTAFF</i>	-0.00006*** (0.00002)	-0.00006*** (0.00002)	0.00003* (0.00002)	0.0001*** (0.00003)
<i>YEAR</i>	--	0.003 (0.005)	--	0.020** (0.008)
Institutional fixed effects?	<i>NO</i>	<i>NO</i>	<i>YES</i>	<i>YES</i>
Observations	857	857	857	857
Number of HEIs	62	62	62	62

Notes: Cluster-robust standard errors in parentheses

\* Significant at 10% level, \*\* Significant at 5% level and \*\*\* Significant at 1% level

**Table 6: Diagnostic Tests**

<b>(1)Endogeneity</b>			
Durbin-Wu-Hausman Chi <sup>2</sup> statistic	8.35	<i>P=0.004</i>	Reject Ho
Durbin-Wu-Hausman F-statistic	7.73	<i>P=0.006</i>	Reject Ho
<b>(2) Under-identification</b>			
Angrist-Pischke first stage chi-squared statistic	13.25	<i>p=0.000</i>	Reject Ho
Kleibergen-Paaprk LM chi-squared statistic	11.71	<i>p=0.003</i>	Reject Ho
<b>(3)Weak-identification</b>			
Angrist-Pischke first stage F-statistic	11.61	<i>p=0.000</i>	Reject Ho
Kleibergen-Paap Wald rk F-statistic	15.88	<i>P=0.000</i>	Reject Ho
<b>(4) Over-identification</b>			
Hansen J-statistic	1.39	<i>P=0.24</i>	Do not reject Ho
<p>Note: Institutional fixed effects and linear time trend are included and cluster-robust standard errors are reported. Test statistics: Number of clusters-62; Observations-857; Endogenous regressor-1; Excluded instruments-2.</p>			