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Comparing funding and performance within the Dutch educational system

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Abstract

In this paper, the relationship between governmental funding and student performance within the Dutch educational system is analyzed. The differences in the funding systems and the effects of funding on student achievement between the secondary level of education and the tertiary level of education is determined. Through this approach, the effectiveness of a funding system based on performance variables can be contemplated. The measurements are done by regressing performance variables, such as grades and graduation rates, on government funding variables. Results show that within the 2nd level of education, funding has a jointly significant positive effect on average grades and on average graduation rates. This means that additional government funding, increases student performance. In particular, funding from one year prior has a positive impact on performance, showing that Dutch secondary schools are not only using their funds for current costs, but also for investing. Within tertiary education, a similar, but weaker effect is found. These findings are in line with previous literature where in general a positive relationship has been established between funding and performance. The literature also shows that educational institutions where a performance funding system is in place, this relationship is far weaker or does not exist at all. Also recognizing the potential side effects of such a system, the Dutch government has been criticized by external researchers for making higher educational institution's funding too dependent on performance variables. This thesis supports these claims and forms a base for further research on the topic.

JEL: D78, H52, C33
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Introduction

In the Netherlands, an ongoing debate surrounds the allocation of educational funds, a topic underlined by the annual announcements of national budgets for various ministries by the Dutch government. Funds earmarked for education are subject to yearly fluctuations, with varying distribution mechanisms across different educational levels. These systems typically comprise a fixed subsidy component alongside a variable part, influenced by factors such as school size, type of education, and in some cases, performance indicators. Notably, the tertiary level of education in the Netherlands incorporates performance-based funding, a practice that has faced criticism for potentially fostering negative outcomes such as a decline in educational quality (Marée & Been, 2021).

Recognizing the importance of this discussion, the Dutch government has initiated research to explore the optimal balance between fixed and variable funding within the higher education funding system. In this context, this proposed thesis research aims to contribute to the ongoing debate by offering more insight into the effects of existing educational funding mechanisms on student performance. Specifically, it aims to compare the relationship between funding allocations and performance outcomes across secondary and tertiary education levels.

The current literature finds that in general, there is a positive correlation between educational funding and student performance. Money matters in all different levels of education and can vary per subject and per type of student (Baker, 2016). We see that in the Netherlands, government funding also provides school choice and competition between schools (Patrinos, 2013). As funding is associated with performance, some countries, especially the United States, have adapted a funding system based on performance indicators, where money is assigned based on student achievements. Such systems however, have not been empirically proven to affect performance in a positive way and often come with negative side effects (Dougherty, et al., 2014) (Umbricht, Fernandez, & Ortagus, 2017).

The Netherlands presents an interesting case study, with distinct funding systems operationalized at the secondary and tertiary education levels. This context offers an opportunity to compare and contrast the effects of different funding mechanisms within a similar educational environment. The aim of this paper is to add to the debate between conflicting findings in previous research and to add to ongoing research by the Dutch government and external parties to find a balance between fixed funding and performance based funding.

The remainder of this paper is structured as follows: First off, a literature review containing an analysis of previous research on the topic. After this, the hypothesis, research design and methodology are described. Following up, are the results and interpretations, discussion and conclusion and recommendations.

1. Literature review

1.1 Educational funding in the Netherlands

In the Netherlands, the relationship between educational institutions and the government is characterized by a high degree of institutional autonomy and freedom. In general, the Dutch government provides educational institutions in the Netherlands with funding. Under article 23 of the Constitution, all educational institutions, both public and private, are funded on an equal basis. Schools and other educational institutions in the Netherlands receive one annual budget for costs of personnel and materials; the lumpsum.

Schools are free to decide how this budget will be spent within the organization. This form of financing supports the objectives of the Ministry of Education, Culture and Science to impose fewer rules on schools. Educational institutions have a lot of freedom in making policy. This enables schools to improve the quality of their offered education by adapting their policy to contextual characteristics of their own school and region (European Commission, 2023).

The lumpsum that the government provides is based on different systems for the different levels of education. This paper focusses on secondary and tertiary education.

Secondary education
For the secondary level of education in the Netherlands, the government divides the budget each year between educational institutions. If a board consists of multiple schools, then the board can freely decide on the distribution of the budget (European Commission, 2023). The lumpsum that the schools receive is based on an amount per student-type and a fixed amount for the head-establishment and a fixed amount for other establishments.

Amount per student
Schools receive an amount for different types of student:
- An amount for all lower-level students and for all upper-level students in pre-university education ('VWO'), senior general secondary education ('HAVO') and the mixed learning path in pre-vocational secondary education ('VMBO').
- An amount for all practical education and upper-level students in pre-vocational secondary education ('Basis, Kader').

Fixed amount
Schools additionally receive:
- A fixed amount for the head office of a school
- A fixed amount for the permanent branch(es) of a school

The received lumpsum is intended for personnel costs and exploitation costs (Rijksoverheid, 2024).

Tertiary education
For the tertiary level of education, institutions also receive an annual lumpsum. Similarly to the secondary level, institutions providing tertiary education are free to determine by themselves how this sum is spend. The Education Inspectorate supervises the financial policy of educational institutions (European Commission, 2023). The lumpsum for tertiary education consists of a fixed amount and a variable amount.

Fixed amount
Educational institutions receive a fixed amount of government funding for providing higher professional education (HBO) and for scientific education (WO).

Variable amount
In addition, a variable amount is provided, based on performance based criteria. The variable amount depends on:

- The number of enrollments in recognized bachelor's and master's programs within the nominal study duration. The nominal duration is the time it takes students to complete their studies when no delay is incurred.
- The number of bachelors and masters completed for which a diploma has been awarded.

Educational institutions can also receive additional funding for research, design and development and collaborations with academic hospitals. Funding for research can also be provided by companies or non-profit institutions. Lastly, educational institutions receive tuition fees from students (Rijksoverheid, 2024).

1.2. Relationship between funding and school performance

Previous research has been done, where the relationship between funding and school performance has been analyzed, as well as other related variables. Varying results are shown, depending on the target country and corresponding funding systems.

Public funding effects on choice and competition
As mentioned before, one of the key features of the Dutch educational system is freedom of education. Schools are free to distribute and use their funding according to their own insight. Most schools in the Netherlands are administered by private boards, and all schools are funded equally by the government, allowing for school choice. Patrinos (2013) shows that this funding systems promotes academic performance, as private school attendance is associated with higher test scores.

Similarly public funding of schools, public and private, can be seen as way to increase competition among schools. A paper by Cretan and Gherghina (2015) suggests that, based on funding patterns in the European union, national funding has impact on the competition and competitiveness of higher education institutions and argue for the necessity of integrating performance indicators as a criterion for allocating public recourses.

Increasing competition between schools, or between public and private schools, is sometimes found to have positive effects on results and performance. A U.S. study (Hoxby, 1994) finds that greater private school competitiveness significantly raises quality of public schools. This is measured through educational attainment, wages and graduation rates of public school students. Contradictory, a study by Ahlin (2003) has been published, where the effect of general school choice and school competition is tested in a Swedish institutional setting. This study shows that increased school competition has significant positive effects on student performance in mathematics, but no significant effects on performance in English and Swedish. A Danish study (Andersen & Serritzlew, 2007) shows even less support for a

relationship between competition and performance, as they found that competition between schools and public expenditure per student are related, but do not improve achievement of public school students. Based on these different results increased choice and competition might or might not be an indirect result of public funding on performance.

Funding effects on performance

In general a positive relationship between school funding and performance is found, at the secondary level as well as the tertiary level of education. Different studies from different continents have been performed, with many showing similar results.

A study from 2010 (Gherghina, Nicolae, & Mocanu, 2010) examines the relationship between the amount of public funds used for financing, the financing mechanisms and the performance obtained by these for higher education. This is observed in different EU member states. At the level of each of the member states, a relationship between public funds and performance is observed. Each state is also observed to be using its own indicators evaluation system for establishing the amount of funding to be used. A more recent similar European study (Sharipova, Weisburst, & Iqbal, 2023) indicates that there is a positive relationship between school funding levels and student achievement. Higher levels of funding are associated with improved academic outcomes, including higher test scores and higher graduation rates.

An article showing opposite results (Belot, 2016) has been disproved in a journal article (Cobbold, 2017) where scientists address the Australian senate to look into funding policies, based on their research which shows an indeed relationship between funding and performance.

Tow (2006) shows results from a study in the U.S., where a small, yet significant effect of school funding on student's academic achievements is found. However, not all funding sources yield the same results. It is found that money earmarked, or restricted, by the federal government for categorical aid, is the most effective in increasing student achievement. A more recent U.S. study by Baker (2016) finds that on average, aggregate measures of per pupil spending are positively associated with improved student outcomes. In some cases, additional funding appears to matter more to some students than for others. The fact that different types of students are differently influenced by funding is also shown by Ahlin (2003), in a study that shows that immigrant students and students in need of special education tend to gain more from increased competition between schools than others.

Funding can also be seen as a method of helping low performing students who are falling behind. EOCD published a report (2016) with evidence suggesting that all countries and economies can reduce their share of low performing students and that a reduction can be accomplished in a relatively short amount of time. Policy makers are advised to prioritize tackling low performance in their education policy agendas, and translate this priority into additional recourses.

Performance funding

Because of the established relationship between funding and performance, some governments have established a performance based funding system, which involves using a formula to tie funding to institutional performance on specified indicators. This is mainly found in the U.S., where performance funding has become quite widespread with formidable political support (Dougherty, et al., 2014). However, it has also experienced some considerable implementation vicissitudes, with many programs being discontinued and the programs that survived having encountered substantial obstacles and unintended effects. Dougherty, et al, (2014) also suggests that even though performance funding does stimulate colleges and universities to substantially change their practices and policies, it is not yet clear if performance funding does improve student achievements.

This conclusion is supported by others. A literature review and policy recommendation by Dougherty and Reddy (2011) suggest that tying funding to outputs has immediate impacts on colleges in the form of changes in funding, higher awareness by institutions of state priorities and of their own institutional performance, and also increased status competition among institutions. However, claims that performance funding increases outcomes in the form of improved rates of retention, completion of developmental education or graduation, are not validated by data.

Other unintended consequences of a performance based funding system can be declining admission rates and increased selectivity (Umbricht, Fernandez, & Ortagus, 2017). This study also does not find an increase in the number of graduates. A different side effect is found by Hillman, Tandberg and Fryar (2015) where it is found that policy change had little immediate effect on retention rates or associate's degree productivity. However, it is also found that community colleges produced more short-term certificates after the implementation of the performance funding system. These certificates yield less value in the labor market than associate's degrees, but are easier for colleges to produce. Rutherford and Rabovsky (2014) even state that current performance funding policies may in fact even contribute to lower performance over a longer period of time. More recent policies linked to institutional base funding however, may produce some likelihood of longer term improvements and require additional research.

Also in The Netherlands, where higher education funding is partly based on performance, negative side effects can be seen and are criticized. The variable part of the funding system causes competition to grow. Universities do everything they can to grow and the amount of international students has more than doubled in the last ten years. Diploma returns were through the roof and some universities are even labeling particular studies as 'cash cow studies'. The total government budget however, did not increase as much, resulting in a decreasing amount of funding per student (Marée & Been, 2021). The Van Rijn Commission published a report (2019) stating that because of higher financial dependence on the amount of students, in combination with government budgets lagging behind, the quality of education is threatened. Also, the government is launching its own studies, where the optimal ratio between fixed and variable education funding is explored. This has been the reason for the simplified current system, implemented in 2022 (Berenschot, 2021).

1.3 Research gap

In the previous part of this literature review, two things can be concluded. 1: money matters in education, and performance of secondary and tertiary education can be linked to government funding. 2: A performance related funding system might not have the intended effects and does not always increase student performance or quality of education.

The Netherlands is an interesting case, as both 2nd and 3rd levels of education are publicly funded, but with different systems. This gives an opportunity to compare different systems on different types of education, but in the same environment (the Netherlands). Therefore, this thesis will add to the research on European union countries by analyzing the relationship between funding and performance in the Netherlands as this has not been done with specific school data. It is also interesting to see whether there are differences between the relationship in funding and performance when we look at secondary and tertiary education. As many of the performance funding studies have taken place in the U.S., carrying out a similar study in the Netherlands will contribute to the understanding of such systems and its effects.

2. Hypothesis

This paper focusses on the main topic of the relationship between government funding and student performance between the secondary and tertiary level of education in the Netherlands and the differences between the two. The aim is to add to the debate between conflicting findings in previous research and to add to ongoing research by the Dutch government to find a balance between fixed funding and performance based funding.

To find the effects that are linked to the relationship between funding and performance, the following two hypothesis will be tested:

H1: There is a positive relationship between government funding and student performance within educational institutions at the secondary level of education in the Netherlands.

H2: There is a positive relationship between government funding and student performance within educational institutions at the tertiary level of education in the Netherlands.

These hypotheses are based on previous findings by Gherghina, Nicolae, & Mocanu (2010) where a positive relationship is found between educational funding and performance, as well as more recent papers by Sharipova, Weisburst, & Iqbal (2023), Cobbold (2017) and Baker (2016). These hypotheses measure the precise effect in the Netherlands based on the most recent years. If true, these hypothesis contribute to the policy recommendations where educational funding is discussed.

To test whether there are differences in the effects of funding on performance between the 2nd and 3rd level of education, the following hypothesis will be tested:

H3: The effect of funding on student performance is bigger (positive) within secondary education compared to tertiary education in the Netherlands.

This hypothesis is based on previous work, such as by the Van Rijn Commission (2019), Dougherty, et al, (2014) and Marée & Been (2021), where performance based funding systems have been criticized to have no or even negative influence on student achievement. As the Dutch system for tertiary educational funding only partly depends on variable performance based funding, this effect might be offset by the positive effect found in the second hypothesis.

Hypothesis three will also contribute to policy recommendations for the funding of higher education in the Netherlands, showing either support or opposition for a performance based funding system.

3. Methodology and Empirical Strategy

3.1 Data

In order to test the hypotheses, data is collected from the Dutch Education Implementation Service (DUO). This institution provides public data on Dutch educational institutions, containing grades, graduation rates, funding figures and more. For the research concerned for this thesis, data on the following variables are collected: Government contributions, Other subsidies, School size, Grades, Graduation rates, Registrations, Type of education, Location and School personnel.

The data is collected for educational institutions in the Netherlands which provide secondary and tertiary education and are officially recognized by the government. A total of 53 school boards in tertiary education are analyzed over a timeline of 5 years; 2018 - 2022. A total of 216 school boards in secondary education are analyzed over a timeline of 5 years; 2018 - 2022. The dataset contains panel data, which is analyzed using OLS in the STATA software.

3.2 Methodology

To test the different hypotheses, different regression models are run. For H1, the model is as follows:

$$StudentPerformance_{it} = \beta 0 + \beta 1 GovFunding_{it} + \beta 2 GovFunding_{it-1} + \beta 3 GovFunding_{it-2} + \beta 4 LogSize_{it} + \beta 5 Personnel_{it} + a_i + u_{it}$$

Equation 1: Regression model for H1

StudentPerformance	= Student performance, measured through average grades; total and per subject.
GovFunding	= Government Funding, measured by the total of government contributions, consisting of the contributions from the Ministry of Education, Culture and Science, with the contribution for the workshop function (e.g. universities with a university medical center) subtracted and the total of other subsidies from OCW and EZ added.
Size	= School size, measured by amount of students
Personnel	= Personnel, measured by the student-teacher ratio

The hypothesis is tested as follows;

H0: β1 = β2 = β3 = 0
HA: H0 is not true

In table 3.1, the expected signs for the different variables are shown.

Variable	*Expected sign*
GovFunding	+
Size	-
Personnel	+

Table 3.1: Expected Coefficient signs

For H2, the model is as follows:

$$StudentPerformance_{it} = \beta 0 + \beta 1 GovFunding_{it} + \beta 2 GovFunding_{it-1} + \beta 3 GovFunding_{it-2} + \beta 4 LogSize_{it} + a_i + u_{it}$$

Equation 2: Regression model for H2

StudentPerformance	= Student performance, measured through graduation rates; total and per bachelor and master.
GovFunding	= Government Funding, measured by the total of government contributions, consisting of the contributions from the Ministry of Education, Culture and Science, with the contribution for the workshop function (e.g. universities with a university medical center) subtracted and the total of other subsidies from OCW and EZ added.
Size	= School size, measured by amount of students

The hypothesis is tested as follows;

H0: β1 = β2 = β3 = 0
HA: H0 is not true

In table 3.2, the expected signs for the different variables are shown.

Variable	*Expected sign*
GovFunding	+
Size	-

Table 3.2: Expected Coefficient signs

Measuring performance will differ between secondary and tertiary education, due to limitations in data availability. For secondary education, the grades from the national final exams are used, as these are based on national guidelines and are the same for every school. This also controls for teacher subjectivity influence. For the tertiary education, no data on grades or results is available, which is why the measure for performance will be the graduation rate. For comparison, graduation rates can also be measured for secondary education.

For H3, the regression results from the first two hypotheses can be used. Coefficients can be compared from the two models, which will show differences in effects of government funding.

4. Results and Interpretations

Before looking at the results, an overview of the data statistics is given.

4.1 Descriptive statistics

The research has been carried out with two separate data files. One for the secondary level and one for the tertiary level of education. More statistic tables can be found in the appendix.

Year	Frequency	Percent	Cumulative
2018	216	19.98	19.98
2019	211	19.52	39.50
2020	216	19.98	59.48
2021	219	20.26	79.74
2022	219	20.26	100.00
Total	**1,081**	**100.00**	

Table 4.1.1: Tabulation for the Years in the data set for 2nd level education (Author, STATA).

Year	Frequency	Percent	Cumulative
2018	53	20.00	20.00
2019	53	20.00	40.00
2020	53	20.00	60.00
2021	53	20.00	80.00
2022	53	20.00	100.00
Total	**265**	**100.00**	

Table 4.1.2: Tabulation for the Years in the data set for 3rd level education (Author, STATA).

The dataset for secondary level education has a strong balance, where all years have around a 20% proportion. The dataset for tertiary level is in perfect balance. In the regressions this means that the secondary level estimations will be based on 211 data groups, as not all groups have enough data for a regression containing the lagged variables as described in the methodology.

	Gov. Funding	Graduation Rate	Grades	Size	Student-Teacher ratio
Gov. Funding	1.0000				
Graduation Rate	-0.0044	1.0000			
Grades	-0.1104	0.4936	1.0000		
Size	0.9638	-0.0111	-0.0931	1.0000	
Student-Teacher Ratio	-0.1121	-0.1494	-0.0322	-0.0714	1.0000

Table 4.1.3: Correlation table for model 1 (2nd level educ.) variables (Author, STATA).

The correlation levels between the variables of model 1 are shown in table 4.1.3. We see the highest correlation between size and government funding, which is unsurprising, as the amount of funding for the secondary level of education is largely based on the amount of students (size). The correlation between graduation rate and grades is also strong. It can be argued that when average grades within a school are high, it is logical for the graduation rate to be higher as well.

	Gov. Funding	Graduation Rate	Size
Gov. Funding	1.0000		
Graduation Rate	0.2418	1.0000	
Size	0.8647	-0.0753	1.0000

Table 4.1.4: Correlation table for model 2 (3rd level educ.) variables (Author, STATA).

The correlation values for tertiary education also show a strong correlation between size and government funding, which is consistent with the values in model 1. A stronger correlation between graduation rates and government funding, relative to model 1 is also shown. This is in tune with the difference in funding systems, where the system for tertiary also contains a performance based factor, based on graduation rates.

4.2 Model 1 results

To differ between using first difference estimations and fixed effect estimations, the Breusch Godfrey test has been used, which indicated that estimation through fixed effects gives the most trustworthy estimates. Regressions have been run with clustered estimates when necessary. The full tables, including the test regressions can be found in the appendix.

The next table shows the results of regressing model 1. For the model, five different variables have been used to measure student performance.

Table 4.2.1
Model 1; Secondary Education

	Overall		Specified level		
Variables	**Grades**	**Graduation Rate**	**Graduation Rate VMBO**	**Graduation Rate HAVO**	**Graduation Rate VWO**
Government Funding	1.58e-09	1.81e-07***	7.74e-08*	4.67e-07***	3.24e-07***
Government Funding t-1	3.06e-09**	3.32e-07***	1.25e-07***	7.13e-07***	5.06e-07***
Government Funding t-2	-1.16e-09	3.18e-07	2.72e-09	9.55e-08	3.65e-07
Size (logSize)	-.0502645	1.972831	1.364019	5.947892	5.958166
Personnel (Student-Teacher Ratio)	.0012	.0728743	.1023187	-.0366867	-.1656017
Constant (_cons)	-.0705347	-3.337121	-1.432031	-6.658519	-5.566299
N	422	422	422	422	422
n-clusters	211	211	211	211	211

The table shows the coefficients as a result from regressing model 1.
Five different dependent variables have been tested with the same set of independent variables. All dependent variables are based on an average (average grades or average graduation rates).
, and *** represent significance levels of 10%, 5% and 1% respectively.*

Table 4.2.1: Output and results Model 1 (Author, STATA).

To interpret these results, it is necessary to keep in mind that the minimum amount of government funding in this data set is close to one million euros. The maximum amounts of funding are around 600 million and the mean is around 30 million (see appendix for data characteristics). Therefore the coefficients may seem small, but can be multiplied by a million to obtain a more intelligible effect.

Overall
For model 1, we find that government funding with a one year lag has a significant impact on average grades. Looking at the coefficient, this effect can be interpreted as follows;
An extra million euros of government funding, results in the average grade being 0.00306 higher for the following year, keeping all other variables constant. An extra 10 million euros of funding would result in the average grade being 0.0306 higher in the next year, keeping all other variables constant. The F-test (see appendix) proves that government funding, government funding t-1 and government funding t-2 are jointly significant for grades.

The effects of funding on the average graduation rate are more significant, where the funding coefficients in the current period and the funding in the previous period are both significant at a level of 1%. It is found that a million euros of funding in the current year can increase the graduation rate of that year by 0.181 percentage points, keeping all else equal. A million euros of funding in the previous year can increase the graduation rate by 0.332 percentage points, ceteris paribus. For the overall graduation rate, the three funding variables are also jointly significant.

Specified level
When zooming in to the specified levels, we see that the biggest funding effects are found on the intermediate level (HAVO). The lower level (VMBO) has the smallest effects, as well as being less significant. On all three levels, the funding variables are jointly significant.

General
Overall, we find that funding in the previous period (GovFunding t-1) has a significant effect on performance. Funding in the current period (GovFunding) has a significant impact on graduation rates, but not on the average grades.

We find that the size of the school, measured in amount of students, does not have a significant effect on the performance variables. The student-teacher ratio also does not have a significant effect on performance in our model.

4.3 Model 2 results

The next table shows the results of regressing model 2. For the model, three different variables have been used to measure student performance.

Table 4.3.1
Model 2: Tertiary Education

	Overall	Specified level	
Variables	**Graduation Rate**	**Graduation Rate HBO**	**Graduation Rate WO**
Government Funding	-2.52e-08	-2.24e-08	-5.52e-09
Government Funding t-1	4.91e-08**	4.94e-08**	7.10e-08*
Government Funding t-2	-1.77e-08	-1.44e-08	-7.44e-08
Size (logSize)	-10.71955**	3.87333	-28.45953***
Constant (_cons)	115.0076	-15.52573	283.9779
N	156	105	51
n-clusters	52	35	17

*The table shows the coefficients as a result from regressing model 2. Three different dependent variables have been tested with the same set of independent variables. All dependent variables are based on an average. *,** and *** represent significance levels of 10%, 5% and 1% respectively.*

Table 4.3.1: Output and results Model 2 (Author, STATA).

When looking at the regression results for the overall graduation rate, we see that only government funding in t-1 is individually significant. Here, an extra million euros of funding in the previous year, will improve graduation rates by 0.0491 percentage points. The funding variable only have a jointly significant effect on overall graduation rate at a 10% significance level.

We see similar results for the specified levels of HBO and WO where a one period lagged funding has a significant positive effect on performance. In model 2, the effects of funding on performance (graduation) is smaller compared to the effects found in model 1.

Contrary to model 1, the size of an educational institution does seem to have significant effects on performance at the tertiary level of education. For the overall graduation rate and the WO graduation rate, size has a significantly negative impact.

5. Discussion of Results

In this chapter, the results from 4.2 and 4.3 will be analyzed and discussed, while looking at the formulated hypothesis and literature.

5.1 First hypothesis

Looking at the regression results of the first model, a jointly significant effect of government funding on average grades is found. A jointly significant effect of government funding is also found on average graduation rates. This means that there is evidence in support of the first hypothesis:

There is a positive relationship between government funding and student performance within educational institutions at the secondary level of education in the Netherlands.

The null hypothesis can be rejected, which means that it can be concluded that a positive relationship between government funding and student performance exists within the secondary level of education in the Netherlands.

We find that the biggest effect is found for the one year lagged government funding. It can be argued that the funding that is received throughout the year will be spend on that years standard and fixed costs, but also on investments for next year. These investments might cause the improvement in student performance which is seen in the data model.

The findings in model 1 are largely in line with the literature, such as the study by Sharipova et al. (2023) where a positive relationship between funding levels and student achievement is indicated in Europe, where higher funding is associated with higher test scores and graduation rates. We see this reflected in our model as well. Our research is also in line with the published reports by the EOCD (2016), which suggest low performance can be reduced by funding policies. Our research aligns with studies outside Europe as well. Tow (2006) shows results from a U.S. study where a small, yet significant effect of funding on academic achievement is found.

Contradictory to the literature, we find the biggest effects of funding on the intermediate level (HAVO) within secondary education. The lowest effects of funding are found on the lowest level (VMBO), while studies by Baker (2016) and Ahlin (2003) find that students that need more or special attention tend to gain more form additional funding.

5.2 Second hypothesis

Looking at the regression results of model 2, we find an individually significant effect of pervious year government funding on performance. A weak jointly significant effect is found for all funding variables on performance. This means that there is partial evidence in support of the second hypothesis:

There is a positive relationship between government funding and student performance within educational institutions at the tertiary level of education in the Netherlands.

For both the overall level and the specified level results we find that government funding with a one year lag has a positive effect on achievements. However, the lack of a jointly significant effect means that the hypothesis can only partly be accepted.

The same logic for model 1 can be utilized for model 2. A lagged effect of funding can be due to investments by the school board, which mostly reap benefits the next year.

The findings for model 2 support the results from a study by Gerghina et al. (2010) where the relationship between funding and performance in higher education is measured in different EU member states. In that study, a relationship between the two factors is observed. We find in our study that this relationship exists in higher education in the Netherlands, but it is more selective to time periods.

When looking at the literature on performance funding, we find that our research adds to the indecisiveness on the topic. Our study finds partial individual significant effects of funding, but no joint significant effects. The positive effects can also be due to the side effect of schools producing more short-term certificates (Hillman et al., 2015) or due to so called 'cash cow' studies (Marée & Been, 2021).

5.3 Third hypothesis

The third and last hypothesis to evaluate is:

The effect of funding on student performance is bigger (positive) within secondary education compared to tertiary education in the Netherlands.

By looking at model 1 and 2, we can compare the coefficients of the funding variables. It is clear that within model 1 (2nd level education), governmental funding has a bigger, and a more significant effect compared to model 2 (3rd level education). From this, it can be concluded that our third hypothesis is true.

Our study shows that in the Netherlands, there is a bigger positive relationship between funding and performance within the secondary level of education than in the tertiary level of education. This is in line with the literature, where this phenomenon is attributed to performance based funding systems. As the Dutch tertiary education funding is partly based on a system with performances variables, this is in line with the results found in previous research.

Dougherty et al. (2011) claim that even though funding has impact on policy and awareness, there are no data validated claims of funding enhancing performance and achievement in any form. The data model used in our study still finds a positive partial effect on funding, yet this is not as big and significant as the effects we find within secondary education, where no performance funding system is in place.

This study adds to the paper by Marée and Been (2021), where concerns about the future of the Dutch higher education funding are pointed out. It is claimed that the funding through performance indicators is threatening the quality of university education. Our results show a positive effect of funding on performance, but only with a weak significance level. It could be argued, based on our accepted hypothesis, the Dutch government is limiting the effects of funding on performance by making use of performance based funding factors within tertiary education.

6. Conclusion and Recommendations

The aim of this thesis was to look further into the relationship between government funding and student performance within the secondary level education and the third level education in the Netherlands. New knowledge can add to ongoing research and the debate on finding a balance between fixed funding and performance based funding in the Netherlands.

Based on the analytical testing of several hypothesis, this study has three main findings:

- *There is a positive relationship between government funding and student performance within educational institutions at the secondary level of education in the Netherlands.*
- *There is a partial (positive) relationship between government funding and student performance within educational institutions at tertiary level of education in the Netherlands.*
- *The effect of funding on student performance is bigger (positive) within secondary education compared to tertiary education in the Netherlands*

These findings can be used to add to the European and global research on this topic. In the Netherlands, the government has been criticized for using performance related variables within the funding system of higher education. This paper adds to the findings of previous research where it is shown that with increasing competition, growing student numbers and governmental budgets lagging behind, the quality of higher education is threatened. This thesis shows that the positive relationship between funding and performance exits in the Netherlands as well, but it also shows that this correlation is lower and less significant within the higher education. It can be advised to the government to take this into account when setting up the balance between fixed and variable (performance) factors within the financing systems, as this thesis supports the call to lower the financial dependence on performance factors.

This thesis forms a base for more research on this topic. First of all, it would be interesting to improve upon this study by implementing various points. This research has been limited by the availability of open data by DUO. To improve on the validity of this research, more years should be taken into account, reaching back further than 2018. This would also provide the opportunity to use more lagged funding variables in the model. Further improving the current research would be to distinguish between compulsory courses and electives.

As seen in the literature, performance funding systems are often criticized because of the unintended side effects that might occur. This thesis does not take any side effects that are potentially caused by performance funding into account. Further research should focus on factors that might be affected by these possible side effects, such as admission rates, selectivity and short term or ‘cash cow’ degrees.

Furthermore, this research measured student performance through grades and graduation rates. These can be recognized as the basis for quantitively measuring achievements. However, they do not reveal the full picture, like quality of education. Therefore, it would be interesting to also include other variables which measure quality and performance, such as the ratings by the Dutch ‘Keuzegids’ or data from the Dutch Education Inspectorate.

References

Ahlin, A. (2003). Does School Competition Matter? Effects of a Large-Scale School Choice Reform on Student Performance. *Department of Economics, Uppsala University*.

Andersen, S. C., & Serritzlew, S. (2007, April). The Unintended Effects Of Private School Competition. *Journal of Public Administration Research and Theory, 17*(2), 335-356. doi:https://doi.org/10.1093/jopart/mul019

Baker, B. D. (2016). *Does Money Matter in Education?* Albert Shanker Institute.

Belot, H. (2016, December 7). *Education Minister responds to damning report, says he's open to importing specialist teachers*. Retrieved from ABC News: http://www.abc.net.au/news/2016-12-07/education-minister-simon-birminghamresponds-to-damning-schools/8098842

Berenschot. (2021). *Verkenning naar de optimale verhouding tussen vaste en variabele onderwijsbekostiging in het hoger onderwijs.* Berenschot.

Cobbold, T. (2017). School funding policies and their impact on student achievement. *Professional Voice*, 48-57.

Cretan, G. C., & Gherghina, R. (2015). Funding Higher Education in a few EU Countries: Implications for Competition and Competitetivenes in Higher Education. *Journal of Knowledge Management Economics and information Techonology*.

Dougherty, K. J., & Reddy, V. T. (2011). *The Impacts of State Performance Funding Systems on Higher Education Institutions: Research Literature Review and Policy Recommendations.* Community College Research Center, Teachers College, Columbia University.

Dougherty, K. J., Jones, S. M., Lahr, H., Natow, R. S., P. L., & Reddy, V. (2014). Performance Funding for Higher Education: Forms, Origins, Impacts, and Futures. *The ANNALS of the American Academy of Political and Social Science*, 163-184.

EOCD. (2016). *Low-performing Students: Why They Fall Behind and How To Help Them Succeed.* Paris: OECD Publishing.

European Commission. (2023, December 14). *Bekostiging van het primair onderwijs, het voortgezet onderwijs en het speciaal onderwijs*. Retrieved from Eurydice: https://eurydice.eacea.ec.europa.eu/nl/national-education-systems/netherlands/bekostiging-van-het-pre-primair-onderwijs-het-voortgezet

European Commission. (2023, December 14). *Eurydice*. Retrieved from National Education Systems - Netherlands: https://eurydice.eacea.ec.europa.eu/nl/national-education-systems/netherlands/bekostiging

European Commission. (2023, November 27). *Higher education funding*. Retrieved from Eurydice: https://eurydice.eacea.ec.europa.eu/national-education-systems/netherlands/higher-education-funding

Gherghina, R., Nicolae, F., & Mocanu, M. (2010). Comparative research on the correlation of the quantum to public funding for the public institutions of higher education and the institution's performance within the European Union member states. *Management & Marketing Challenges for Knowledge Society, 5*(3), 103-118.

Hillman, N. W., Tandberg, D. A., & Fryar, A. H. (2015). Evaluating the Impacts of “New” Performance Funding in Higher Education. *Educational Evaluation and Policy Analysis*, 501-519. doi:https://doi.org/10.3102/0162373714560224

Hoxby, C. M. (1994). Do Private Schools Provide Competition for Public Schools? *National Bureau of Economic Research (working papers)*.

Marée, K., & Been, J. (2021, March 23). *Red de universiteit, verlaag de financiering per student*. Retrieved from De Correspondent: https://decorrespondent.nl/12224/red-de-universiteit-verlaag-de-financiering-per-student/57ebe60e-d5c3-047e-309b-2c7ad240597f

Patrinos, H. A. (2013). Private Education Provision And Public Finance: The Netherlands. *Education Economics, 21*(4), 392-414.

Rijksoverheid. (2024). *Financiering hoger onderwijs*. Retrieved from Rijksoverheid.nl: https://www.rijksoverheid.nl/onderwerpen/financiering-onderwijs/financiering-hoger-onderwijs

Rijksoverheid. (2024). *Financiering voortgezet onderwijs*. Retrieved from Rijksoverheid.nl: https://www.rijksoverheid.nl/onderwerpen/financiering-onderwijs/financiering-voortgezet-onderwijs

Rutherford, A., & Rabovsky, T. (2014). Evaluating Impacts of Performance Funding Policies on Student Outcomes in Higher Education. *The ANNALS of the American Academy of Political and Social Science*, 185-208. doi:https://doi.org/10.1177/0002716214541048

Sharipova, A. F., Weisburst, M. C., & Iqbal, C. S. (2023). SCHOOL FUNDING AND STUDENT ACHIEVEMENT IN PUBLIC SCHOOLS IN MILAN, ITALY. *African Journal of Emerging Issues*, 14-24.

Tow, C. (2006). *The Effects of School Funding on Student Academic Achievement.* Berkeley: University of California, Berkeley.

Umbricht, M. R., Fernandez, F., & Ortagus, J. C. (2017). An Examination of the (Un)Intended Consequences of Performance Funding in Higher Education. *Educational Policy*, 643-673.

Van Rijn Commissie. (2019). *Wissels Om.* Commissie-Van Rijn.

Appendix

1. Results and STATA output Model 1 (2nd level education)

Panel Data Summary Model 1 (2nd level education):

Variable		Mean	Std. Dev.	Min	Max	Observations
Board	Overall	.	.	.	.	N = 1081
	Between		.	.	.	n = 219
	Within		.	.	.	
Government Funding	Overall	3.81e+0.7	5.82e+07	1081811	6.40e+08	N = 1081
	Between		5.76e+07	2001235	5.74e+08	n = 219
	Within		7948882	-2.24e+07	1.24e+08	T-bar = 4.936
Average Graduation rate	Overall	94.60192	3.979235	76.6715	100	N = 1079
	Between		2.130781	84.66389	100	n = 219
	Within		3.365662	79.4302	109.4299	T-bar = 4.927
Average Grades	Overall	6.632214	.1249969	5.916229	7.266667	N = 1079
	Between		.1050731	6.088174	7.111407	n = 219
	Within		.073338	6.303951	6.960593	T-bar = 4.927
Size	Overall	3722.49	5571.733	33	63215	N = 1081
	Between		5544.243	36	61223.6	n = 219
	Within		433.1336	405.4903	8638.69	T-bar = 4.936
Student-Teacher ratio	Overall	14.83189	2.91217	0	21.72881	N = 1079
	Between		2.267847	3.223038	20.29342	n = 218
	Within		1.857476	.6300606	22.74962	T-bar = 4.950

Tabulation Years dataset model 1

Year	Frequency	Percent	Cumulative
2018	216	19.98	19.98
2019	211	19.52	39.50
2020	216	19.98	59.48
2021	219	20.26	79.74
2022	219	20.26	100.00
Total	**1,081**	**100.00**	

Correlation table model 1

	Gov. Funding	Graduation Rate	Grades	Size	Student-Teacher ratio
Gov. Funding	1.0000				
Graduation Rate	-0.0044	1.0000			
Grades	-0.1104	0.4936	1.0000		
Size	0.9638	-0.0111	-0.0931	1.0000	
Student-Teacher Ratio	-0.1121	-0.1494	-0.0322	-0.0714	1.0000

Regression through first differences Model 1 (grades)

Number of obs = 422
F(5,416) = 1.60
Prob > F =0.1593
R-Squared = 0.0188

D. Average Grades	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
D1.	3.03e-10	6.42e-10	0.47	0.638	-9.60e-10	1.57e-09
LD.	1.15e-09	6.27e-10	1.84	0.067	-8.02e-11	2.39e-09
L2D.	-3.33e-09	1.82e-09	-1.84	0.067	-6.90e-09	2.37e-10
logSize						
D1.	-.0516418	.0394764	-1.31	0.192	-.12924	.0259563
Personnel						
D1.	.0008538	.00157	0.54	0.587	-.0022323	.0039399
_cons	-.0579518	.0053593	-10.81	0.000	-.0684864	-.0474172

Autocorrelation test Model 1

Number of obs = 211
F(6, 204) = 12.68
Prob > F =0.000
R-Squared = 0.2717

VHat	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Vhat						
L1	-.4092029	.0500178	-8.18	0.000	-.5078211	-.3105847
Gov Funding						
D1.	8.70e-11	1.10e-10	0.79	0.431	-1.30e-10	3.04e-10
LD.	-1.76e-10	8.25e-11	-2.13	0.034	-3.39e-10	-1.32e-11
L2D.	3.14e-10	3.37e-10	0.93	0.352	-3.50e-10	9.79e-10
logSize						
D1.	.0011456	.0076811	0.15	0.882	-.013999	.0162902
Personnel						
D1.	.0000591	0.0002003	0.30	0.768	-.0003358	.000454
_cons	.0027726	.0008993	3.08	0.002	.0009995	.0045457

Fixed effects estimations Model 1 (grades)

Group variable: School Board **Number of obs = 422**
R-Sq: **Number of groups = 211**
Within = 0.0309 **F(5,210) = 3.93**
Between = 0.0000 **Prob > F =0.0020**
Overall = 0.0064 (Std. Err. Adjusted for 211 clusters)

Average Grade	Coef.	Std. Err.	T	P>|t|	[95% Conf.	Interval]
Gov Funding						
--	1.58e-09	1.39e-09	1.14	0.256	-1.15e-09	4.31e-09
L1.	3.06e-09	1.37e-09	2.23	0.027	3.51e-10	5.76e-09
L2.	-1.16e-09	3.43e-09	-0.34	0.736	-7.93e-09	5.61e-09
logSize	-.0502645	.0566982	-0.89	0.376	-.0162035	.0615061
Personnel	.0012	.0016239	0.74	0.461	-.0020011	.0044012
_cons	-.0705347	.0117144	-6.02	0.000	-.0936276	-.0474418
Sigma_u	.05118171					
Sigma_e	.11562783					
rho	.016383192					

F-test fixed effects estimations Model 1 (grades)

```
. test GovFunding l.GovFunding l2.GovFunding

(1) GovFunding = 0
(2) l.GovFunding = 0
(3) l2.GovFunding = 0

       F(  3,   210) =    5.79
            Prob > F =    0.0008
```

Fixed effects estimations Model 1 (graduation rate)

Group variable: School Board **Number of obs = 422**
R-Sq: **Number of groups = 211**
Within = 0.1124 **F(5,210) = 6.97**
Between = 0.0000 **Prob > F =0.0000**
Overall = 0.0132 (Std. Err. Adjusted for 211 clusters)

Average Graduation rate	Coef.	Std. Err.	T	P>|t|	[95% Conf.	Interval]
Gov Funding						
--	1.81e-07	5.40e-08	3.34	0.001	7.42e-08	2.87e-07
L1.	3.32e-07	7.72e-08	4.29	0.000	1.79e-07	4.84e-07
L2.	3.18e-09	1.78e-07	0.02	0.986	-3.47e-07	3.54e-07
logSize	1.972831	2.036493	0.97	0.334	-2.041758	5.98742
Personnel	.0728743	.0831464	0.88	0.382	-.0910341	.2367828
_cons	-3.337121	.5548684	-6.01	0.000	-4.430947	-2.243295
Sigma_u	3.3243535					
Sigma_e	4.7778148					
rho	.32620143					

F-test fixed effects estimations Model 1 (graduation rate)

```
. test GovFunding l.GovFunding l2.GovFunding

(1) GovFunding = 0
(2) l.GovFunding = 0
(3) l2.GovFunding = 0

       F( 3,   210)  =  10.66
            Prob > F =   0.0000
```

Fixed effects estimations Model 1 (graduation rate VMBO)

Group variable: School Board — **Number of obs = 422**
R-Sq: — **Number of groups = 211**
Within = 0.0371 — **F(5,210) = 5.12**
Between = 0.0012 — **Prob > F =0.0002**
Overall = 0.0022 — (Std. Err. Adjusted for 211 clusters)

Average Graduation rate VMBO	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	7.74e-08	4.24e-08	1.83	0.069	-6.16e-09	1.61e-07
L1.	1.25e-07	4.04e-08	3.09	0.002	4.52e-08	2.05e-07
L2.	2.72e-09	9.42e-08	0.03	0.977	-1.83e-07	1.88e-07
logSize	1.364019	1.499368	0.91	0.364	-1.591723	4.31976
Personnel	.1023187	.0640974	1.60	0.112	-.0240382	.2286755
_cons	-1.432031	.3530017	-4.06	0.000	-2.127912	-.73615
Sigma_u	1.6776528					
Sigma_e	3.304264					
rho	.20495045					

Fixed effects estimations Model 1 (graduation rate HAVO)

Group variable: School Board — **Number of obs = 422**
R-Sq: — **Number of groups = 211**
Within = 0.1254 — **F(5,210) = 7.07**
Between = 0.0002 — **Prob > F =0.0000**
Overall = 0.0119 — (Std. Err. Adjusted for 211 clusters)

Average Graduation rate HAVO	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	4.67e-07	1.08e-07	4.31	0.000	2.53e-07	6.81e-07
L1.	7.13e-07	1.56e-07	4.57	0.000	4.05e-07	1.02e-06
L2.	9.55e-08	3.12e-07	0.31	0.760	-5.20e-07	7.11e-07
logSize	5.947892	4.042343	1.47	0.143	-2.020879	13.91666
Personnel	-.0366867	.1858129	-0.20	0.844	-.4029844	.3296109
_cons	-6.658519	1.097666	-6.07	0.000	-8.822374	-4.494663
Sigma_u	7.4883667					
Sigma_e	8.902176					
rho	.41437942					

Fixed effects estimations Model 1 (graduation rate VWO)

Group variable: School Board — **Number of obs = 422**
R-Sq: — **Number of groups = 211**
Within = 0.1035 — **F(5,210) = 6.10**
Between = 0.0019 — **Prob > F =0.0000**
Overall = 0.0030 — (Std. Err. Adjusted for 211 clusters)

Average Graduation rate VWO	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	3.24-e07	8.94e-08	3.63	0.000	1.48e-07	5.00e-07
L1.	5.06e-07	1.13e-07	4.48	0.000	2.83e-07	7.28e-07
L2.	3.65e-07	2.57e-07	1.42	0.157	-1.42e-07	8.71e-07
logSize	5.958166	4.035861	1.48	0.141	-1.997827	13.91416
Personnel	-.1656017	.1393788	-1.19	0.236	-.4403626	.1091592
_cons	-5.566299	.8941127	-6.23	0.000	-7.328886	-3.803712
Sigma_u	6.0990817					
Sigma_e	6.0975841					
rho	.50012279					

2. Results and STATA output Model 2 (3rd level education)

Panel Data Summary Model 2

Variable		Mean	Std. Dev.	Min	Max	Observations
Board	Overall	.	.	.	.	N = 265
	Between		.	.	.	n = 53
	Within		.	.	.	
Government Funding	Overall	1.60e+08	1.61e+08	1224332	6.43e+08	N = 265
	Between		1.60e+08	1391483	5.60e+08	n = 53
	Within		2.81e+07	8.30e+07	2.56e+08	T = 5
Average Graduation rate	Overall	22.05098	5779343	13.23792	42.62295	N = 260
	Between		5.587946	14.07229	34.35167	n = 52
	Within		1.630309	15.39162	30.32226	T = 5
Size	Overall	15258.12	14579.03	78	48115	N = 260
	Between		14655.73	92.4	46533.2	n = 52
	Within		1036.706	10749.12	18970.72	T = 5

Tabulation Years dataset model 2

Year	Frequency	Percent	Cumulative
2018	53	20.00	20.00
2019	53	20.00	40.00
2020	53	20.00	60.00
2021	53	20.00	80.00
2022	53	20.00	100.00
Total	**265**	**100.00**	

Correlation table model 2

	Gov. Funding	Graduation Rate	Size
Gov. Funding	1.0000		
Graduation Rate	0.2418	1.0000	
Size	0.8647	-0.0753	1.0000

Regression through first differences Model 2

Number of obs = 104
F(4, 99) = 5.07
Prob > F =0.0009
R-Squared = 0.1701

D. Graduation Rate	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
D1.	-4.11e-08	1.57e-08	-2.62	0.010	-7.23e-08	-9.94e-09
LD.	5.09e-08	1.47e-08	3.47	0.001	2.18e-08	8.01e-08
L2D.	-2.79e-08	3.85e-08	-0.72	0.471	-1.04e-07	4.85e-08
logSize						
D1.	-2.922969	4.276582	-0.68	0.496	-11.40864	5.562696
_cons	.6915342	.2939694	2.35	0.021	.1082351	1.274833

Autocorrelation test Model 2

Number of obs = 52
F(5, 46) = 1.45
Prob > F =0.2244
R-Squared = 0.1362

Vhat	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Vhat						
L1.	-.0299251	.0947049	-0.32	0.753	-.2205562	.1607059
Gov Funding						
D1.	6.15e-08	4.15e-08	1.48	0.145	-2.20e-08	1.45e-07
LD.	-6.60e-08	2.98e-08	-2.21	0.032	-1.26e-07	-5.93e-09
L2D.	5.86e-08	5.33e-08	1.10	0.277	-4.87e-08	1.66e-07
logSize						
D1.	-.0003452	.0005647	-0.61	0.544	-.0014819	.0007914
_cons	.175589	.319458	0.55	0.585	-.4674467	.8186247

Fixed effects estimations Model 2 (graduation rate)

Group variable: School Board — **Number of obs = 156**
R-Sq: — **Number of groups = 52**
Within = 0.1403 — **F(4,100) = 4.08**
Between = 0.0316 — **Prob > F =0.0042**
Overall = 0.0306

Average Graduation rate	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	-2.52e-08	1.55e-08	-1.62	0.108	-5.59e-08	5.58e-09
L1.	4.91e-08	1.91e-08	2.57	0.012	1.12e-08	8.71e-08
L2.	-1.77e-08	3.44e-08	-0.52	0.607	-8.60e-08	5.05e-08
logSize	-10.71955	4.257723	-2.52	0.013	-19.16675	-2.272346
_cons	115.0076	36.83357	3.12	0.002	41.93089	188.0844
Sigma_u	17.686309					
Sigma_e	1.6581232					
rho	.99128718					

F-test fixed effects estimations model 2 (Graduation rate)

```
. test GovFunding l.GovFunding l2.GovFunding

(1) GovFunding = 0
(2) l.GovFunding = 0
(3) l2.GovFunding = 0

       F(  3,    100) =    2.45
            Prob > F =    0.0676
```

Fixed effects estimations Model 2 (graduation rate HBO)

Group variable: School Board — **Number of obs = 105**
R-Sq: — **Number of groups = 35**
Within = 0.0938 — **F(4,66) = 1.71**
Between = 0.4291 — **Prob > F =0.1588**
Overall = 0.3733

Average Graduation rate	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	-2.24e-08	1.85e-08	-1.21	0.230	-5.94e-08	1.45e-08
L1.	4.94e-08	2.04e-08	2.42	0.018	8.66e-09	9.01e-08
L2.	-1.44e-08	8.21e-08	-0.18	0.862	-1.78e-07	1.49e-07
logSize	3.87333	5.30159	0.73	0.468	-6.711636	14.4583
_cons	-15.52573	46.91567	-0.33	0.742	-109.1959	78.14443
Sigma_u	9.4945006					
Sigma_e	1.454815					
rho	.97706005					

F-test fixed effects estimations model 2 (graduation rate HBO)

```
. test GovFunding l.GovFunding l2.GovFunding

(1) GovFunding = 0
(2) l.GovFunding = 0
(3) l2.GovFunding = 0

       F( 3,    66)    =    2.28
            Prob > F  =    0.0878
```

Fixed effects estimations Model 2 (graduation rate WO)

Group variable: School Board — **Number of obs = 51**
R-Sq: — **Number of groups = 17**
Within = 0.4252 — **F(4,30) = 5.55**
Between = 0.0050 — **Prob > F =0.0018**
Overall = 0.0032

Average Graduation rate	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Gov Funding						
--	-5.52e-09	3.96e-08	-0.14	0.890	-8.63e-08	7.53e-08
L1.	7.10e-08	3.78e-08	1.88	0.070	-6.22e-09	1.48e-07
L2.	-7.44e-08	7.86e-08	-0.95	0.352	-2.35e-07	8.61e-08
logSize	-28.45953	6.915197	-4.12	0.000	-42.58225	-14.33681
_cons	283.9779	62.58222	4.54	0.000	156.1679	411.7878
Sigma_u	62.689863					
Sigma_e	1.7817475					
rho	.99919286					

F-test fixed effects estimations Model 2 (graduation rate WO)

```
. test GovFunding l.GovFunding l2.GovFunding

(1) GovFunding = 0
(2) l.GovFunding = 0
(3) l2.GovFunding = 0

       F( 3,    30)    =    1.97
            Prob > F  =    0.1404
```