The Relative Importance of School Discipline and Education Investment on Competitiveness – the Mediating Role of Educational Performance

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Submitted to Faculty of Business and Economics at Macquarie University for the partial fulfilment of the requirements for the degree of
Master of Research

October 2015

Statement of Candidate

I certify that the work in the thesis entitled "The relative importance of school discipline and education investment on competitiveness – the mediating role of educational performance" has not been previously submitted for a degree nor has it been submitted as a part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been properly acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

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8 October 2015

Acknowledgements

I would like to express my deepest gratitude and thanks to my supervisor Associate Professor Chris Baumann for his endless support, encouragement and advice during the course of my Master of Research studies. Without him, I would not be where I am today.

During my candidature, I have faced a rather sudden and unexpected job loss with a subsequent major career change that affected both my family and my academic pursuits. I am enormously grateful for my family's support during the times of hardship. Without the support of my husband Craig, who has selflessly encouraged my love of learning for over 17 years now, and without the understanding and smiles from my little five year old daughter Lily, who plays alongside my study station every weekend, this thesis would not be here either. I am very fortunate to be surrounded by family and friends that have forgiven me for cutting short a many special event and that continue to encourage me to pursue my dreams.

And finally, I would like to thank Jamie Moore for pointing me in the right direction with my statistical analysis and Viviane Morrigan for her professional editing and her 'above and beyond' endnote referencing advice.

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8 October 2015

Abstract

The purpose of this study is to combine seemingly unrelated factors to partly explain global competitiveness. The study argues that school discipline and education investment affect competitiveness with the association being mediated by educational performance. Partial Least Square (PLS) modelling is used to analyse the OECD's Programme for International Student Assessment (PISA) data and the World Bank Government Expenditure on Education data to explain World Economic Forum (WEF) data on competitiveness. Five dimensions of school discipline (students listening well, noise levels, teacher waiting time, students working well, class start time) are hypothesised to affect academic performance in reading, math and science, and to ultimately impact competitiveness. Findings confirm the relative importance of school discipline (88%) in comparison to education investment (12%) on educational performance, with both variables also being found to be significantly associated with competitiveness indirectly. This study demonstrates further the time effects of discipline, more specifically that discipline dimensions (students listen well in 2003 and students work well in 2009) are associated with competitiveness in 2012. Implications for school policy and further research are also discussed.

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1. Introduction

Educational performance, school discipline and competitiveness are all issues discussed regularly in the popular press (Banchero, 2013; Donnelly, 2013; Mullich, 2013). This study proposes to combine these seemingly unrelated "real world" issues to gain better understanding of how educational policy could be reformed and how changes could be made to the way schools are run in order to achieve the best possible academic performance. Will increasing discipline lead to increased educational outcomes as well as helping nations to become more competitive?

The purpose of this study is to examine the links between everyday school operations that result in various levels of school discipline, national financial investment in education, academic performance measured every three years globally by the OECD's Programme for International Student Assessment (PISA) assessment, and national competitiveness levels. The study is structured to reveal how the various dimensions of school discipline - namely students listening well, noise levels, teacher waiting time, students working well, and class start time - and PISA academic performance in reading, math and science all impact competitiveness. If a nation would change its school operations in such a manner as to increase one of the five school discipline dimensions, would educational performance improve and, in turn, would the country's competitiveness increase? Could it be that educational performance should be viewed as a mediating factor for global competitiveness levels?

It has long been believed that education creates human capital and leads to economic growth (Barro, 2001; Hanushek & Kimko, 2000). Researchers have therefore been investigating the drivers behind educational performance for decades. Apart from examining enrolment ratios (Barro & Lee, 1993), years of schooling (Barro & Lee, 1996) and school funding (Jensen et al., 2011) further studies have also looked at how competitiveness and performance in education

are linked. Does educational performance explain competitiveness (Baumann & Winzar, 2014) or does competitiveness play a role in explaining academic performance (Baumann & Hamin, 2011)? Understanding how the mechanics work and how various dimensions are linked is very important for the future. It is the responsibility of every nation to ensure that young generations are work ready, and that nations remain competitive. However, past investigations usually focused only on one angle of this complicated research area, with studies focusing on one or two variables conducted independently and no study as yet has combined all four variables into one model.

2. Research Questions

Researchers have looked quite extensively at the combined topic of education and education expenditure (Annabi et al., 2011; Jensen et al., 2011; Keller, 2006a) as well as at the topic of education combined with competitiveness (Jessop, 2008; Sahlberg, 2006; Mayhew & Keep, 1999). It appears that no research has yet focused on combining all the above factors, namely school discipline, education investment, educational performance and a country's competitiveness, into one model. That is precisely what this study investigates. If academic performance is increased, will there also be an increase in a country's competitiveness? Should more funding be allocated to education? Should classrooms become more disciplined and be run more strictly?

The importance of this study is three-fold. First, it attempts to confirm that, for schools to improve academic performance, it is necessary to reconsider the most appropriate approach to education, with perhaps stricter discipline being adopted in classrooms. Second, it attempts to contribute to the ever-growing discussion in the academic as well as popular press about what policy changes might be necessary to improve scores in internationally comparable assessments of educational performance. Finally, it further attempts to refocus research away from how

much funding is allocated to education to the arguably more important issue of how the funds are spent and how classrooms are run.

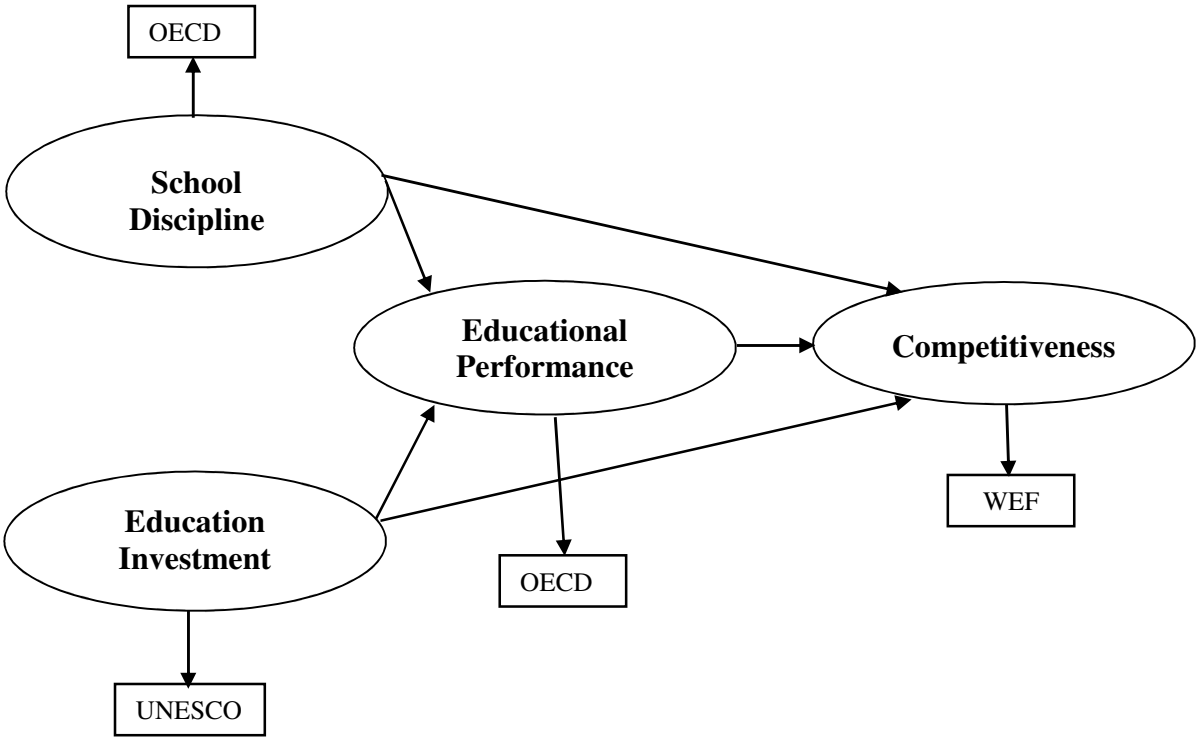
This study is designed to answer a number of very specific questions.

1. Does school discipline affect competitiveness via educational performance?
2. Does education investment affect competitiveness via educational performance?

The initial review of literature has identified a gap in that there was no model available to combine all four above-mentioned variables. The research objectives of this proposed study therefore are as follows:

1. To develop the conceptual framework, as presented in Figure 1 (with data sources indicated in rectangular boxes).
2. To test the model's assumptions, specifically the assumed mediating effect of educational performance.
3. To examine data obtained from various sources to assist with answering research questions.

Figure 1: Conceptual Framework



3. Literature Review

The previous section provided background to the research problem to be investigated. The purpose of this section is to review the relevant literature on constructs used in this study, in order to identify gaps in previous research. This review of the literature is organised in the following order: first, various studies into 'discipline' are summarised and a definition of discipline provided before moving onto discussion of the relatively new area that links school discipline and educational performance; second, education investment is discussed; and, third, background on educational performance measurement through PISA assessment is provided. The literature review concludes with a section on competitiveness.

3.1. School Discipline

There is a rich body of literature relating to school discipline in many fields, namely in child development and behaviour (Dodge et al., 1994; Loeber, 1982; Patterson & Stouthamer-Loeber, 1984), adolescent behaviour (Ary et al., 1999; Conger et al., 1992; Dodge & Pettit, 2003), punishment (Gershoff, 2002; Maag, 2001; Straus, 1991), school uniforms and school violence (McCarthy, 2001; Starr, 2000; Wilson, 1999) and physical discipline (Deater-Deckard et al., 1996; Lansford et al., 2005; Straus, 1991). Slightly more recent research deals with how discipline in classroom is perceived by various parties involved with school discipline such as students, parents and teachers and how it is used to manage the classroom. Discipline in schools is defined by Romi & Freund (1999, p. 54) as 'a system of sanctions that addresses the breakdown when the code of conduct is broken' and, according to Bechuke & Debeila (2012, p. 242), 'school discipline can be described as all activities that are implemented to control learner behaviour, to enforce compliance and maintain order'. Cameron (2006, p. 219) adds further that school discipline relates to 'teachers' methods of managing students' actions in class'.

One area of research that appears to be largely overlooked in the literature, though, is how discipline contributes to academic achievements, especially how schools are run in everyday operation. This study is designed to fill this important gap in the literature. Is it possible that if a school implements a specific level of school discipline such a decision could lead to a direct improvement in academic performance? It has already been established (Baumann & Hamin, 2011; Baumann et al., 2012) that countries around the world appear to have differing attitudes to the level of school discipline necessary for achieving outstanding academic results. For example, East Asian countries such as South Korea, Japan or Singapore lean towards enforcing high levels of discipline in their classrooms while other regions, such as North America or

Europe, appear to prefer a much more permissive approach in their classrooms. Is it therefore possible that results achieved in international academic performance assessments and the level of a nation's competitiveness could possibly be primarily due to the level of discipline each country enforces in their schools?

Research has confirmed the association between parenting styles and academic achievement (Chen, 2015; Dornbusch et al., 1987; Huang & Gove, 2015; Leung et al., 1998; Shumow et al., 1998; Spera, 2005), with Aunola et al. (2000, p. 205) finding authoritative parenting - ie. being both demanding and responsive but not controlling - is 'associated with children's and adolescents' school adjustment' [and] 'high performance'. Linking various school discipline types with parenting discipline preferences was further developed by Pellerin (2005a), who found that 'schools in which students remain engaged combine high standards for academics and behaviour' [with responsiveness to] 'demonstrate the appropriateness of applying parenting theory to school'. Pellerin based her classification of various school disciplines on an influential parenting typology developed in the1960s known as *Baumrind's Parenting Typology* (Baumrind, 1966), which originally classified parenting styles as authoritative, authoritarian and permissive. Pellerin focused on establishing what kind of school climate and what level of discipline achieves the best outcomes. Her work supports the notion authoritative socialisation - ie. adults being both demanding and responsive - achieves the best results both at school and at home. That line of reasoning supports the hypothesis in this study about an association between school discipline and academic performance, and this study argues that a school's approach to discipline, either being very focused on discipline or providing a less disciplined climate, leads to different academic outcomes.

On the one hand, East Asian countries are celebrating their academic successes. *The Four Tigers,* namely Singapore, Hong Kong, South Korea, and Taiwan/China have consistently appeared at the top of PISA scores. In his work based on an interview with former Singaporean

Prime Minister Lee Kuan Yew, Zakaria & Yew (1994p. 116) reported 'strict discipline, respect for teacher, no talking back to the teacher and rote learning' as values common among East Asian schools. According to Chua (2011, p. 5) in her somewhat controversial book *Battle Hymn of the Tiger Mother*, the Chinese view is that 'academic achievement reflects successful parenting'. Both these authors support the findings by Baumann et al. (2012) that the perceived stricter East Asian discipline delivers better PISA results.

On the other hand, the topics of school discipline (or the lack thereof) and the perceived low academic performance of Western countries have also been discussed in the popular press on numerous occasions (Donnelly, 2013; Lipman, 2013). It is possible that, to deliver better PISA results, Western schooling might have to become less permissive and indulgent. It is also possible that the focus among Western schools and Western parents on making "learning fun", and by not teaching younger generations that academic non-performance has consequences for life, might actually be harming overall performance of countries. This study argues that discipline in classrooms should be increased to give students the opportunity to perform better and to achieve higher academic results. Times of viewing discipline as a punitive measure (Skiba & Peterson, 2000) are truly in the past and schools need to move towards teaching students to embrace discipline and see it as beneficial to their development. Pellerin (2005a; 2005b) has already established that students who are expected, by parents or schools, to live to high standards and high expectations appear to behave better and also appear to aim to achieve better academic results. This study argues that the higher the level of discipline in a school, the higher the academic performance of the schools' students, and that schools can certainly influence how disciplined their classrooms can get.

The review of literature reveals a further gap in the current research. Somewhat surprisingly, PISA discipline data are yet to be used in empirical research. PISA related studies appear not to have touched on school discipline at all, instead concentrating for example on comparing

learning strategies, study time and motivation of Western and Asian students (Helmke & Tuyet, 1999), the links between PISA results and spending on education (Agasisti, 2014; Siddiqi et al., 2012), the misalignment between education expenditure and academic performance, for example in Australia (Jensen et al., 2011), looking at higher average achievement of egalitarian countries in PISA assessment in comparison to some less egalitarian counterparts (Condron, 2011), or what role school socioeconomic composition plays in educational equity and effectiveness (McConney & Perry, 2010). There is no single study into PISA compiled students' views of discipline, even though students' observations are arguably the most objective as to what happens in today's classrooms. This study fills in this gap by combining discipline dimensions of PISA with other PISA variables and by using students' views about discipline instead of the popular views of school principals.

3.2. Education Investment

According to the World Bank (1993, p. 45), 'a common, though imperfect measure of educational quality is expenditures per pupil' and researchers have been investigating the association between investment in education and academic performance for decades. For example Keller (2006b, p. 18) recommended 'raising enrolment rates and prioritizing public expenditure toward lower education stages', which leads to much discussion about whether investment in human capital should be increased (Annabi et al., 2011). Keller (2006a, p. 38) also found statistically significant results that 'the faster-growing countries in Asia have spent more public resources on primary education, notably also per student in primary school'. On the one hand, there certainly is evidence that some best performing PISA countries increased their funding per student at primary level by significant amounts. For example, funding in South Korea increased from 1970 to 1989 by 355 percent (World Bank, 1993) but, on the other hand, there is evidence that investing more in education does not always lead to effective increases in educational attainment. Leigh & Ryan (2011) found that while there has been a statistically

significant drop in numeracy between 1964 and 2003 in Australia, school expenditure per child increased, which would indicate a decline in school productivity. Siddiqi et al (2012) confirmed a surprising fact that increased educational spending failed to increase adolescent reading literacy in their study of over one hundred thousand students from OECD countries.

When investigating the cost of education, the focus in the past has also been on teacher ratios, as employee related expenses are the main costs of education (Keller, 2006b). While it is widely believed that quality of education can be improved by decreasing the pupil-teacher ratio (Keller, 2006a), some question the impact a reduction in class sizes might have on academic achievement. In fact Hoxby (2000, p. 1280) established 'that class size reductions have little or no effect on achievement'. This was further supported by Hanushek (2003, p. 92) who questioned government policy of 'funding or mandating smaller class sizes', which while popular is also proving to be 'an expensive and generally unproductive policy'. The mismatch between academic performance and education expenditure was further highlighted by Jensen et al (2011) in their analysis of increasing school expenditures at the same time as performance appears to decline. The authors discussed that while 'reduced class sizes and student-teacher ratios have a substantial impact on expenditure', they are 'not associated with improved student performance' (2011, p. 326).

Another measure of effectiveness of education is the impact on student learning. Jensen et al. (2011) raise an interesting point about what actually drives the increased investment if better results are not being achieved. In effect, how cost effective are investments in education? How aware are nations of where funding disappears? Is funding perhaps being used inefficiently, especially on higher education? The latter question has been raised already by prior research (Keller, 2006a). The author also raised a point that the highest test scores across the world achieved by East Asia's students might indicate that 'East Asian nations have generally spent [an] efficient amount per student' (2006a, p. 24). Is it possible that Western countries are

spending too much on teachers? It is a known fact that the longer a teacher has been teaching, the more experienced they are perceived to be and the more "expensive" they become, even though teacher skills rather than teacher salaries have been found to be associated with student performance (Piopiunik et al., 2014) and there is evidence that to raise student achievement it might be more cost effective to employ staff who are more verbally capable than those with more experience (Levin, 2001). So, should more spending be dedicated to increasing the quality of teachers' education rather than simply pay for years of service? Should more performance-related pay schemes be adopted (Woessmann, 2011)? However, there might be little point in getting teachers to obtain further degrees, as it has been documented that a Master's degree has "little effect" on the quality of teaching (Rivkin et al., 2005; Hanushek, 2011).

When discussing the topic of allocation of funding to education, it is also important to discuss the trade-off between the various levels of education, as the level of education to which a country allocates its scarce resources has significant implications for that country's future. There is empirical evidence that investment in various levels of education leads to different future outcomes (Arcalean & Schiopu, 2010). So, should the focus be on primary, secondary or higher education? According to the World Bank (1993), the distribution of funding between high and basic education is a factor behind the extraordinary performance and quantity of East Asian basic education. Does a county wish to generate more general skills by spending more on primary and also secondary education or is the goal increased innovation through investment in higher education? Any future policy change needs to incorporate not only the size of the education investment but also the composition or the allocation of funding between the various levels of education (Arcalean & Schiopu, 2010).

Another issue impacting student performance is the level of private investment. After-school tutoring paid for by parents influences both a school's success rate and the ranking students achieve in international comparisons. For example, the amount spent on private education in

South Korea, as a percentage of GDP in primary and secondary education, is the highest among OECD member and partner countries (Oh, 2010). Could the importance families place on education and expectations to perform at least partially explain how "successful" a student becomes at aspiring and achieving top marks?

There certainly are many factors that appear to influence academic performance, such as socio economic or family background, class sizes, hours of schooling, or gender, as discussed for example in Carter & Chu-May Yeo (2014). However, this study argues that the question might not be about how much is spent on education but about how the funds are used. The difference lies in how schools are run and not how much funding the schools have. This study argues that how well students perform might be about the climate in the schools and the expectations placed on the students (McInerney et al., 2006).

3.3. Educational Performance

Since 2000, every three years the OECD conducts Programme of International Student Assessment (PISA) testing that has been designed to 'offer policy makers a lens through which to monitor students outcomes over time and to assess the strengths and weaknesses of their own systems in the light of other countries' performance' (OECD, 2003, p. 3). These surveys are now not only administered in the OECD countries but also in partner countries, in order to compare the performance of 15-year olds in reading, math, science and problem solving. The aim is to measure how well secondary schools prepare students to meet the challenges of today's societies. Over 500,000 students participated in the 2012 PISA, with the number of participating students in each country varying between 293 in Liechtenstein to 38,142 in Italy; the average number of participants was almost 8,000 (OECD, 2013).

As discussed in the previous sections, the importance of education for countries is well researched and discussed in the literature. Some factors found to influence academic performance include the role of homework in improving academic achievement (Cooper et al., 2006), the difficulty schools have in attracting and retaining teachers (Hanushek et al., 2004), the lack of impact of a master's degree on improving teachers skills (Rivkin et al., 2005), the role of teacher effectiveness (Hanushek, 2011), the relationship of emotional intelligence with academic success (Yeo & Carter, 2011), funding issues (Jensen et al., 2011), the role played by students' perceptions of the quality of educational institutions in their choice of international university (Carter & Yeo, 2009), and the impact of classroom size on academic achievement (Finn et al., 2005; Hoxby, 2000; Jepsen & Rivkin, 2009). There is also a vast body of literature on the topic of the OECD's PISA. Previous research into PISA focused for example on how various countries such as the United States and Germany (Martens & Niemann, 2013), the United States and Switzerland (Bieber & Martens, 2011), Finland, the United Kingdom and Germany (Grek, 2009) responded to PISA results. Other issues investigated include how PISA results may impact educational policy in the future (Carnoy et al., 2015; Rautalin & Alasuutari, 2007), how decisions about education policies are justified (Rautalin & Alasuutari, 2009) or how OECD might influence national educational policy development in Europe (Grek, 2010; Grek, 2013; Simola et al., 2009; Grek et al., 2009).

Interestingly, previous studies into PISA data have predominately used a case study approach, with a number of studies focusing in detail on one or two particular countries. Examples are the investigation of classroom practices in Israel and Finland as relatively low and high performing countries respectively (Cohen et al., 2009), Italy as the focus of investigation of effective educational policies design (Vergolini & Zanini, 2013), determination of the status of Turkey among OECD member and candidate countries (Acar, 2012), comparison of Canada with the United States in a study about how a reading skills deficit in the US can be traced to early childhood, even before formal schooling could make any impact (Merry, 2013) or a study into

performance and inequality across the UK nations (Machin et al., 2013). It is, however, surprising that only a few studies attempted to include a larger number of the countries that participate in the OECD PISA. For example, Marks (2006) used thirty countries participating in the 2000 PISA assessment in his study into between- and within-school differences in student performance, Chiu & Chow (2011) investigated forty one countries for impact of school, economic and cultural differences on classroom discipline, and Baumann & Winzar, (2014) included a majority of the PISA countries in a study about how a country's competitiveness could be predicted by a change in educational achievement. This study picks up on such work, and on a recommendation by Cohen et al. (2009) that more of the PISA participating countries should be examined and, in particular, the authors' suggestion to look at countries with high scores such as Korea and Japan. Cohen et al. (2009) focused specifically on two PISA countries only, namely Finland and Israel, in his research into classroom practices. Following the authors' suggestion, this study investigates the maximum number of PISA countries that offer data on performance and discipline, two focus areas of this research.

Following the three-yearly rounds of PISA assessment, many educational reforms have been implemented around the World. For example Germany, England and Eastern Europe have introduced reforms in order to increase their academic performance. Many a reform has also been justified in the past by a country's desire to increase competitiveness (Sahlberg, 2006) but what some of the reforms expect to implement is questionable. On the one hand, teaching for results to improve scores in PISA might in fact be detrimental to competitiveness as it hampers innovation, creativity and the ability to share ideas. On the other hand, even though the Finnish dislike "ranking" they adopted a "management by results" or national comparisons approach in the early 1990's, as a result of the deep economic recession of 1991 – 1993 (Simola et al., 2009). Subsequently, Finland ranked rather highly in the first PISA assessments.

It has been argued that 'the notion of uniform academic standards raises serious concerns about social equity, cultural diversity and appropriate local educational autonomy' (Dowson et al., 2007, p. 5). These concerns are supported by arguments about how problematic it is to try to compare school performance across countries, as PISA assessments do not take into account local context and culture (Simola, 2005). Sahlberg (2006, p. 263) adds further that there is 'no reliable recent comparative analysis of how education reforms in different countries have been designed and implemented'. Sahlberg (2006) argued that there is no correlation between the quality of education and economic competitiveness due to mismatch between results in PISA and in competitiveness rankings for countries such as the United States, Norway, Korea, Canada or Netherlands. The author admitted, however, that some countries were able to achieve high scores in both assessments. He focused on the example of Finland and its enviable results in early PISA assessments while their schools were almost totally 'test-free'. Is it therefore wise to suggest that countries should attempt to imitate what worked well in other countries? Or should the focus be on implementing best practice in teaching and learning, such as putting a learner at the "centre" of education as well as devising sufficiently challenging tasks (Liem & McInerney, 2008)?

Educational systems must be modified not only to improve international rankings by simply "teaching for results" but also to ensure that any policy changes are well embedded in the respective cultures and local context. Students must be guided to 'learn in their schools and universities to love learning' (Sahlberg, 2006, p. 284) so that new generations are equipped with the ability to learn from one another, produce synergies and advances that lead to innovation, which in turn helps countries to stay competitive. It is recognized that differences among world nations, in terms of maturity of public institutions and advancement levels of countries' technology, might be problematic for producing standardised education policy (Sahlberg, 2006). However, this study argues that one simple and universal factor that can be changed to subsequently increase academic performance is school discipline. After all, it might

have been factors such as the authoritarian flavours, more visible in Japan and Korea and still retained in Finish culture, as well as democracy (Simola, 2005) that played a role in Finland becoming the "Finish miracle" in one of the first PISA assessments. The high respect and regard given to teachers in Finland, in fact, led to teaching actually overtaking the ever so popular career choices of being lawyer, engineer or physician.

3.4. Competitiveness

Historically, the source of competitiveness has been discussed from many different perspectives. Back in the 18th century, the role of talents and abilities contributing to countries' capital had been discussed by Adam Smith in his famous *Wealth of Nations* from 1776. Fast forward to the 20th century and the 1960s, when Schultz proposed in his *Capital Formation by Education Theory* (1960; 1971) that nations should treat education as an investment that contributes to economic growth. He warned that if a country's human capital does not increase together with its physical capital, human capital can limit economic growth. In his *Human Capital Theory,* Schultz (1961) explains why investment in people leads to some nations becoming more wealthy than others.

For a country to succeed, and the extent to which that may occur, depends on how talented its people are and what education they choose to pursue. Porter (1990), who is known for linking competitive advantage to innovation, also noted that when governments seek to redesign their educational policies to increase a nation's competitiveness, the process of creating a competitive advantage in an industry might take longer than a decade, and the consequences of any changes will not become visible for many years to come. Research on using education to increase competitiveness has been continued by a group of influential Harvard scholars (e.g. Barro, 1991; Barro, 1996; Barro & McCleary, 2003) who focused on how countries that are poorly developed economically use education to 'succeed' or 'catch up' with more

economically advanced and developed countries especially, and, more specifically, how important human capital is to economic growth.

A nation's prosperity and productivity measures are also an aid in investigating competitiveness. Prosperity indicates how high a country's standards of living are, and productivity is linked to innovative activity. In a review of competitiveness in the UK in 2002, Porter & Ketels (2003, p. 1) indicated that 'the UK now needs an approach focused on improving skills, stimulating innovation and fostering enterprise'. Even the more developed and prosperous countries have begun to realize that innovation is something that countries must focus on, should they wish to increase their competitive advantage. To increase the levels of competitiveness, a country must invest in increasing the levels of innovation because 'high and increasing levels of productivity and innovation are [a] manifestation of competitiveness' (Porter & Ketels, 2003, p. 18).

Further studies into economic growth have investigated how educational attainment is linked to economic performance (Barro & Lee, 1993), or how various levels of education affect per capita growth (Keller, 2006b). Keller (2006a, p. 23) outlined that 'a country needs a highly skilled and creative population to learn and use new information'. While each educational stage, be it primary, secondary or tertiary education, leads to increases in productivity (Keller, 2006b), each nation needs to decide what their focus should be. Does a country wish to increase the pool of workers able to use computer technology (through increases in secondary education) or is a country looking to innovation and invention of new technologies and, in turn, to increase competitiveness (through tertiary education)? Hanushek & Woessmann (2007) continued to probe the role of education quality in economic growth, and they subsequently (2010) investigated the OECD PISA data with respect to the long-term economic impact of improving PISA outcomes. They confirmed the economic costs of low educational achievement, and a

correlation between education and economic indicators; in other words, education is essential for a country to succeed.

Another definition of competitiveness has been provided by Sala-I-Martin et al (2009, p. 4), who defined competitiveness as 'the set of institutions, policies and factors that determine the level of productivity of a country', with Sahlberg (2006, p. 259) adding that 'economic competitiveness is commonly seen as a valid index for judging a country's level of economic prosperity'. This is in line with the view of the IMD World Competitiveness Centre (2014, p. 493) that 'competitiveness analyses how nations and enterprises manage the totality of their competencies to achieve prosperity or profit'.

More studies into the links between education and competitiveness have followed, with a focus on explaining academic performance by competitiveness, economic performance and culture (Baumann & Hamin, 2011) as well as the role education plays in explaining competitiveness (Baumann & Winzar, 2014). Not surprisingly, political agendas of countries around the globe are now also focusing on competitiveness, with 'the need for greater economic competitiveness' being 'used to justify educational reforms' (Sabadie & Johansen, 2010, p. 237), 'as human capital is an essential component of national economic competitiveness' (2010, p. 253). Interestingly, though, very limited attention so far has been paid to explaining how various levels of classroom practices lead to differing results in PISA assessment (Cohen et al., 2009), and which, in turn, leads to increased competitiveness.

If a country would let its competitiveness levels "slide", it would be a struggle to regain its competitive advantage. As many countries have learnt from their experiences with the manufacturing industry, especially car manufacturing, once the competitive advantage is lost, it is a daunting task (if not impossible) to get back on top of "the game"; both the nation's prosperity and welfare are impacted. This study therefore argues that countries should work on

increasing their competitiveness, through increasing discipline and subsequent educational performance, which in turn leads to increased innovation.

4. Theory Development and Hypotheses Formulation

Knowledge and skills are a form of capital (Schultz, 1961), with education being an aspect of human capital and a known determinant of economic growth (Barro, 2013; Schultz, 1961). It has long been argued that societies need to start regarding education as an investment in the nation and, therefore, treat it as a form of capital (Schultz, 1960). Education can help to improve the capabilities of a nation's citizens and, therefore, lead to their increased future earnings at both macro and micro level (Schultz, 1971). The 1992 Nobel Prize Winner in Economics, Gary Becker, discussed as early as in 1975 the benefits of investment in human capital and the potential rates of return (Becker, 2009). Further research followed into links between education and economic growth (Hanushek & Woessmann, 2010), indicating that even the smallest improvements in a nation's workforce skills can translate to a large impact on national growth in the future. In the case of less developed countries, the more human capital a country has, the faster it can catch up to leading countries and absorb more innovation (Barro, 1991).

Over recent decades, various mechanisms have been used to find links between education and economic growth, and to model economic growth theoretically. Solow (1956) proposed in his first *Growth Model* that output of economy is a direct function of the labour and capital in an economy. Subsequently, *Neoclassical Theories of Growth* expanded the analysis by adding education into the equation (Mankiw et al., 1990). The opposing view on the role of education comes from *The Endogenous Growth Theories*, with researchers focusing on the role of education and of creating new ideas and technologies in order to increase innovation in an economy (Lucas, 1988). The final theoretical perspective on the role of education in the production function is found in *The Technological Diffusion Theories*, which deals with growth

through adoption of new technologies (Nelson & Phelps, 1966). What all these approaches have in common is that they believe in education having a positive effect on economic growth.

The impact of education on economic growth and competitiveness can be investigated in a number of ways. There is a difference in investigating education through the lens of quantity of education, or years of school attainment, and through the lens of quality of education, as measured by international education performance assessments such as OECD's *PISA* (Barro, 2001) or International Mathematics Science Study (TIMSS) (Hanushek & Luque, 2003). Some researchers believe that quality of schooling measured by international assessments is more important than quantity, or years of school attainment, when it comes to influencing economic growth (Hanushek & Kimko, 2000). Barro (2001) confirmed that the effects of school quality, measured by test scores in internationally comparable assessments, were larger than the effects of quantity of schooling, even though the average years of schooling of male students at both secondary and higher levels were also related to economic growth. This study argues that quality of education, measured by PISA assessment, indeed impacts economic growth and, in particular, global competitiveness levels, but that there are also other factors at play, particularly school discipline.

The level of discipline instilled in classrooms will have an impact on future workforces' work ethic (Baumann et al., forthcoming, forthcoming). In a study into school failure and school success, Glasser (1997) in his work on *Choice Theory* advocated that societies should focus on nurturing the warm, supportive relations that can help students to succeed at school and to work hard. He argued that individuals can control their own behaviour and, therefore, young generations can become more self-disciplined and subsequently learn more. Parents, schools and a society as a whole have the responsibility to ensure that young generations are well prepared to enter the workforce. A little more than two hundred and fifty years ago Jacques Rousseau (1762), in his work on the social contract, advocated the idea that children are born

good and need to learn the values necessary to guide them successfully through life. This idea is still applicable today. Societies are responsible for younger generations, for instilling the right attitudes and beliefs in them for years to come, making them job ready. If a society can help students to be more disciplined, ready to learn more and aim to achieve more, nations might become more competitive as a result.

There is a myriad of academic literature on the topic of academic achievement. For example, in the United States, in the mid-1980s, great concerns were expressed about educational performance levels. *The Shame of American Education* questioned what might have been seen as a mediocrity of American schools, especially in terms of motivational levels, learning and academic achievement (Skinner, 1984), and concerns about the possible erosion of the work ethic were discussed in the 1985 study *Achievement American Style* (Spence, 1985). Interestingly, Asian Americans already were being discussed as 'extraordinary achievers' at that time (Sue & Okazaki, 1990), identifying one of their differences from other Americans as the value placed on education. Is it therefore possible that to achieve better academic results, societies might need to reconsider the expectations placed on the younger generation?

This study argues that a key factor for investigation is the way in which schools are run, as there appears to be a "natural" ceiling for the effect of increased funding; just spending money might lead, for example, to establishing unproductive programs. Furthermore, it has been suggested that more resources might actually 'harm achievement' (Hanushek, 1997, p. 301), and investigation of 'how well schools are using their resources' in order to find out 'what works' was recommended (p. 303), as different schools have been found to have different effects on achievement of students. It might not all be about how much money is spent in order to decrease class sizes and increase quality of education. According to Barro (1991, p. 421), 'a higher student-teacher ratio signals lower quality education and hence, a lower initial stock of human capital', making an increase in spending on education a very much hotly discussed topic in the

popular press in many countries, especially in times of pre-election debates. There is a temptation for politicians to simply assign more money to "fix the declining standards of education". However, there is emerging evidence that East Asia, for example, spends less on education but achieves better academic performance. Interestingly, it has been previously noted that class sizes are much bigger, for example, in Hong Kong or China than in Western countries. Classes in Hong Kong have typically more than 40 students in secondary schools (Harfitt, 2012) and Chinese "large classes" have well over 45 students with some even having between 56 and 66 students (Zhou et al., 2014). Yet, despite the large student numbers in class, students in Hong Kong and China are achieving high scores in educational performance assessments.

Accumulation of human capital is influenced by government public policies (Barro, 2013), and it has long been acknowledged that making changes to educational policies is difficult but doing better is certainly possible. Countries like Poland or Germany in Europe or Japan in East Asia all improved their mean PISA results over the nine years between 2003 and 2012 (Poland by 25 points, Germany by 16 points and Japan by 13 points); proof that making things better for the younger generation is possible. Therefore, choosing not to introduce changes aimed at improving educational outcomes would mean that nations "choose" to forego future economic growth gains (Hanushek & Woessmann, 2010). The question is what kind of changes should be implemented?

Cohen et al. (2009, p. 29) put forward their *Preliminary Theory* stating that 'teachers and schools systems that are simultaneously demanding and supportive of all students achieve the best and most equal results', in contrast to 'teachers and schools'… [that are]… not demanding much academically and have poor results with a wide gap between the strong and weak students'. This study builds on his foundation and argues that it is more relevant to focus on what happens in the classrooms, on the discipline climate at school rather than on how much is spent on education. If discipline in classrooms is increased to enable students to concentrate

more and subsequently learn more, better academic results will also be achieved, which in turn will increase the nation's competitiveness levels. Furthermore, this study argues that the impact of school discipline is greater than the impact of how much is spent on the education.

Based on the review of the literature, it is hypothesised:

Overarching hypotheses:

HM1: Discipline has a significant impact on competitiveness mediated by educational performance.

HM2: Education investment as government expenditure on education, as a percentage of GDP, has a significant impact on competitiveness mediated by educational performance.

Diachronic perspective:

School discipline

HD1: School discipline in 2003 had significant impact on competitiveness in 2012.

HD2: School discipline in 2009 had significant impact on competitiveness in 2012.

Education investment

HI1: Education investment as government expenditure on education, as a percentage of GDP, in 2003 had significant impact on competitiveness in 2012.

HI2: Education investment as government expenditure on education, as a percentage of GDP, in 2009 had significant impact on competitiveness in 2012.

Educational performance

HP1: How well students performed in 2003 PISA Math assessment had significant impact on competitiveness in 2012.

HP2: How well students performed in 2003 PISA Science assessment had significant impact on competitiveness in 2012.

HP3: How well students performed in 2003 PISA Reading assessment had significant impact on competitiveness in 2012.

HP4: How well students performed in 2009 PISA Math assessment had significant impact on competitiveness in 2012.

HP5: How well students performed in 2009 PISA Science assessment had significant impact on competitiveness in 2012.

HP6: How well students performed in 2009 PISA Reading assessment had significant impact on competitiveness in 2012.

5. Methodology

5.1. Overview

This study focuses on combining four variables, namely school discipline, education investment, educational performance and competitiveness, into one model as a result of identifying a gap in the literature that called for developing a combined conceptual framework. The study draws on publicly available data in PISA discipline dimensions, PISA scores for math, science and reading, as well as educational expenditure and countries' competitiveness levels. The data used for this research are cross-sectional secondary data and, for the purposes of this study, the strategy was to use a quantitative technique to analyse the data. This section provides details about the methodology chosen to test the hypotheses, the justification as to why the chosen methodology was deemed appropriate for this research, and the details of techniques undertaken to analyse data in this study.

5.2. Justification for the Methodology

The data gathered for this research are secondary (as opposed to primary data collected through surveys or questionnaires), defined by Lowe et al. (2014, p. 23) as 'data previously collected and assembled for some other project other than the one at hand'. Lowe et al. (2014, p. 24) add further that 'secondary sources often prove to be very valuable; investigating such sources has saved many a researcher from "reinventing the wheel" in primary data collection'; a view that this study builds upon.

Partial Least Squares Structural Equation Modelling (PLS-SEM) was deemed to be the appropriate technique for the analysis of the gathered data for a number of reasons. Firstly, according to Hair et al. (2011, p. 139), 'PLS-SEM is a causal modelling approach aimed at maximising the explained variance of the dependent latent constructs'. It meets the requirements of this testing, as the purpose of this study is to examine multiple relationships between dependent and independent variables, and the possible mediating effect. Secondly, as 'the research objective is prediction rather than confirmation of structural relationships, then variance-based PLS-SEM is the preferred method' (Hair et al., 2011, p. 139). The key advantage of using the PLS tool stems from its ability to analyse relationships between latent variables, especially the more complex ones, and for studies with small samples (Henseler & Sarstedt, 2013). The PLS approach was also selected as 'PLS-SEM has been increasingly applied in business disciplines' (Hair et al., 2011, p. 139).

To complement the testing of the overall model, aimed to confirm that the overarching model works "all up", correlation analysis, factor analysis and regression analysis were also selected to analyse the longitudinal effect of the numerous variables in this study. Correlation analysis was used to establish if any association exist between the relevant variables, factor analysis was

utilized to address issues of *multicollinearity* of discipline variables and regression analysis was used to investigate the effects of school discipline and education investment over time.

The following sections summarise how each variable was measured, the source of the data, and what procedures were undertaken in order to investigate the research questions and later to test the hypotheses.

5.3. Data Sources

School Discipline

The first area of investigation of this study focuses on 'School Discipline'. The secondary data used in the analysis were collected during the OECD' PISA academic performance assessments for years 2003, 2009 and 2012. No data about discipline were collected in 2006. The disappearance of the disciplinary variable from 2006 data set raised some questions within the general population as well as among researchers and is discussed, for example, in Salinas & Santín (2011, p. 176). Subsequently, the five dimensions of school discipline were reintroduced back into PISA survey in 2009. Apart from academic achievement data, various reports compiled by the OECD include student information about 'themselves, their homes and their school and their learning experience' (OECD, 2013, p. 3). The OECD's report '*What makes schools successful*?' provides a summary about what students perceive as 'conducive' to learning in classrooms, with disciplinary climate being found 'consistently related to higher average performance at the school level … even after accounting for the socio-economic status and demographic background of students' (OECD, 2013, p. 64).

The publicly available data set used in this study, as a proxy measure for classroom discipline, breaks down school discipline into five areas with the marks for all five constructs ranging

between 1 and 100 (with most starting around 50). The constructs were measured as a percentage of students who reported that the investigated phenomena occur:

- 'in every or most lessons" for 2003
- 'never or hardly ever' or 'in some lessons' for 2009 and 2012

School discipline is an example of an abstract concept. Such a latent or unobservable variable is hard to measure This study, therefore, builds on a suggestion raised by Hair et al. (2013, p. 6) that 'when concepts are difficult to measure, one approach is to measure them indirectly with a set of indicators that serve as proxy variables'. In the case of PISA assessment, the focus is on measuring school climate by assessing the quality of relationships and also of 'the general orderly atmosphere' in the classrooms (OECD, 2013, p. 166). Table 1 provides an overview of the PISA discipline dimensions publicly available in OECD documentation, with the proxy variable assigned to each, and Appendix A provides a summary of the source documents accessed for the purposes of this study.

Table 1: PISA discipline dimensions

Queries raised during PISA testing	**Variable label used in this study**
Students don't listen to what the teachers says	D1 - Students listen well
There is noise and disorder	D2 - Noise level
Teacher has to wait a long time for students to quiet down	D3 - Teacher wait time
Students cannot work well	D4 - Students work well
Students don't start working for a long time after the lesson begins	D5 - Class start time

Education Investment

The second area of investigation of this study examines 'Education Investment'. The secondary data used in this study uses data publicly available on the website of World Bank, as data on

education inputs and outputs, efficiency of education and also on participation rates are compiled there. The data is based on responses to surveys from official education authorities in each country, and compiled by the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics. Two distinct databases of education expenditure data can be found on the World Bank website: The EdStat Query – Education Expenditures - for which the UNESCO Institute for Statistics is the data source, and World Bank Education Expenditure Database, which is sourced from World Bank Public Expenditure Review Documents.

The World Bank Education Expenditure Database is compiled by using World Bank Public Expenditure Review documents and this data set was considered for PLS modelling initially. However, the data set sample size of countries with available data for 2012 was only 38, which was below the minimum sample size required, being 'ten times the maximum number of arrowheads pointing at any latent variable anywhere in the PLS path model' (Hair et al., 2013, p. 20). Therefore a decision was made to use data from the EdStats Query section on the World Bank website, which is maintained by UNESCO Institute for Statistics, and provides information about education investment as a percentage of Gross Domestic Product (GDP). Using education spent information as a percentage addresses the issue of comparability, or purchasing power parity, making the analysis much more robust.

Educational performance

The third area of investigation of this study focuses on 'Educational Performance'. The secondary data used in this study was obtained by accessing the Organization for Economic Co-operation and Development (OECD)'s PISA publicly available results. The underlying question of the triennial survey is 'What is important for citizens to know and be able to do?' (OECD, 2013, p. 21), with the focus of the survey being on assessing the level of knowledge and skills students have gained in the areas of reading, mathematics, science and problem

solving. Over half a million students completed the 2012 assessment, representing approximately 28 million students. Each student completed a two hour paper based test and an additional 40 minute computer based assessment of problem solving, reading and mathematics (OECD, 2013).

Because each and every country has its own national testing instrument, such instruments do not produce comparable data sets. However, the standardised PISA data set allows us to compare results for all OECD countries as well as for OECD partners, and the programme 'offers insights for education policy and practice' (OECD, 2013, p. 21) such as baseline indictors of knowledge and skills or student performance trends. Table 2 provides a summary of the varying results achieved in each PISA category in the four PISA assessments discussed in this study. Appendix A provides a summary of the source documents accessed for the purpose of this study.

Table 2: Summary of PISA triennial highest and lowest results

PISA Category	N	Min	Max
PISA 2003			
PISA Math	40	356	550
PISA Science		385	548
PISA Reading		375	543
PISA 2006			
PISA Math	55	318	549
PISA Science	55	349	563
PISA Reading	54	312	556
PISA 2009			
PISA Math	61	365	600
PISA Science		369	575
PISA Reading		370	556
PISA 2012			
PISA Math	65	368	613
PISA Science		373	580
PISA Reading		384	570

Competitiveness

The dependant variable in this study is "Competitiveness" and it is the final area of this investigation. The secondary data used in this analysis were obtained by accessing *The Global Competitiveness Reports* produced annually by World Economic Forum (WEF), which provide a comprehensive assessment of the productive potential of countries worldwide (Schwab,

2010). The Global Competitiveness Index (GCI) has been at the centre of the annual competitiveness analysis conducted by WEF as the index is viewed as 'a comprehensive tool that measures the microeconomic and macroeconomic foundations of national competitiveness' (Schwab & Sala-i-Martín, 2013, p. 4).

In their reports, the WEF attempts to identify key factors behind economic growth in order to enhance understanding about why some countries are more successful than others. The WEF has been a player in this field for over 30 years and, understandably, their annual reports have evolved and expanded over this time. The WEF started to report on three subgroups only, as in 2003, and gradually increased the details provided, from nine pillars in 2006 to twelve pillars and three subgroups in 2009 and 2012. This study used the total Global Competitiveness Index figure per country in the multiple regression analyses, and the three subgroups for the analysis of 2012 global competitiveness through PLS-PM analysis. Table 3 below provides a summary of information available in the reports relevant to this study and Appendix A provides a summary of the source documents accessed for the purposes of this study.

Table 3: Summary of information available in WEF's Global Competitiveness Reports

	High level	Details
2003	Total GCI figure per country	***3 subgroups*** 1 Public Institutions Index 2 Macroeconomic Environment Index 3 Technology Index
2006	Total GCI figure per country	***9 Pillars*** 1 Institutions, 2 Infrastructure, 3 Macroeconomy, 4 Health and Primary Education, 5 Higher Education and Training, 6 Market Efficiency, 7 Technological Readiness, 8 Business Sophistication, 9 Innovation
2009	Total GCI figure per country	***3 subindices*** 1 Basic Requirements 2 Efficiency Enhancers 3 Innovation & Sophistication Factors ***12 Pillars*** 1 Institutions, 2 Infrastructure, 3 Macroeconomic Stability, 4 Health and Primary Education, 5 Higher Education and Training, 6 Goods Market Efficiency, 7 Labour Market Efficiency, 8 Financial Market Sophistication, 9 Technological Readiness, 10 Market Size, 11 Business Sophistication, 12 Innovation
2012	Total GCI figure per country	***3 subindices*** 1 Basic Requirements 2 Efficiency Enhancers 3 Innovation & Sophistication Factors ***12 Pillars*** 1 Institutions, 2 Infrastructure, 3 Macroeconomic Stability, 4 Health and Primary Education, 5 Higher Education and Training, 6 Goods Market Efficiency, 7 Labour Market Efficiency, 8 Financial Market Sophistication, 9 Technological Readiness, 10 Market Size, 11 Business Sophistication, 12 Innovation

5.4. Data Harmonization

Great care was taken in this study to ensure that the data from various sources, namely World Bank, OECD and World Economic Forum, would match. The data harmonization process was crucial for this study due to the fact that there were three different data sources, and the data set had to be validated for completeness, accuracy and consistency of data entry to ensure that the most complete data set was obtained in order to later conduct correlation and regression analyses and PLS analysis.

In order to prepare the data set for statistical analysis, it was necessary to conduct data entry into an Excel spreadsheet, to tabulate and organize the required data. The file was to include PISA scores for reading, science, math and the mean per each country for the four years selected to be used in this study. The file was based on the final 2012 list of 65 PISA study participants, and therefore some data for the previous three years of testing might have been missing, as smaller number of countries participated in each round. Next, five school discipline scores per country were included, resulting in 15 new columns in the data file (discipline data were not collected in 2006 testing round). Additional columns were later added for competitiveness data but, as the Global Competitiveness Report evolved over time, only 2009 and 2012 years have comparable detailed data, namely three subindices – Basic Requirements, Efficiency Enhancers and Innovation and Sophistication Factors, which are averages of the 12 detailed pillars reporting for those two years. A conscious decision was therefore made to use the three subindices for the PLS analysis of 2012 data, with the focus of the additional analyses being only on the total GCI figures per country. Finally, columns were added for OECD annual expenditure per student data and UNESCO Government expenditure on education as % of GDP for each of the years examined in this study.

Once all the available data were entered into Excel, the data had to be cleaned and double checked to ensure the accuracy of the data entry process. A data harmonization process had to be undertaken also with the objective of aligning data from all the numerous data sources in order to produce an easily comparable data set. The data harmonization process attempted to deal with a common issue frequently faced by researchers, relating to the inconsistent measurement of variables (especially in developing countries) (Barro, 2013), which can be overcome by using recognised international assessment data, as is the case in this study.

The data were next transferred onto an SPSS data file and a last data quality control check was performed. The available data were checked for any missing values, such as to evaluate for inclusion in the upcoming testing. As some information was not available in the relevant data sources, some of the fields were blank. For the purposes of PLS analysis of the 2012 data, a conscious decision was made not to replace values in the model, as using 'mean or mode' or 'nearest neighbour' would lead to incorrect data for some of the countries. Therefore, all cases with missing values were excluded from the analysis, as discussed in Hair et al. (2013).

It is also important to note that the focus of both PISA 2003 and 2012 was on mathematics (OECD, 2013) making those two years comparable, while mathematics was only a minor domain of the PISA assessment in 2009, with the focus then being on reading (OECD, 2010). It is therefore not possible to compare 2009 discipline data with 2003 or 2012 PISA discipline data. In other words, discipline 2009 results are not comparable with results from 2003 or 2012, as students in math classes behave very differently from students in reading classes. To uncover trends, only 2003 and 2012 disciplinary climate data were compared in this study. To ensure that both years were directly comparable, reversed scores had to be calculated for 2003 discipline, as each of the five constructs in 2003 were measured as a percentage of students who reported that the investigated phenomena occurred 'in every or most lessons' as opposed to 'never or hardly ever' or 'in some lessons' in 2012.

Lastly, to utilize an adequate sample size for the analyses, a decision was made to use data from 2011 for both constructs of education investment, as 2012 UNESCO expenditure on education data was only available for 25 countries and the OECD data for 2012 annual expenditure per student will only become available in late 2015.

Table 4 provides an overview of details of each variable available for each year investigated in this study.

Table 4: Summary of available data per year

Source	Number of countries participating			
	2003	**2006**	**2009**	**2012**
PISA results – Discipline	40	Not Available	41	64
UNESCO Government Expenditure on Education	53	48	49	49*
PISA results – Education	40	55	61	65
Global Competitiveness Index	55	62	63	62
OECD – Annual expenditure per student	34	35	36	38**

Note:

**As at the end of September 2015, 2012 UNESCO Government Expenditure on Education data was available only for 25 countries. To increase the sample size for the analysis, 2011 data were used instead, as the data was available for 49 countries.*

***2012 OECD Annual Expenditure per student will only become available in late 2015. Again, to increase the sample size for the analysis, 2011 data were used in this study instead.*

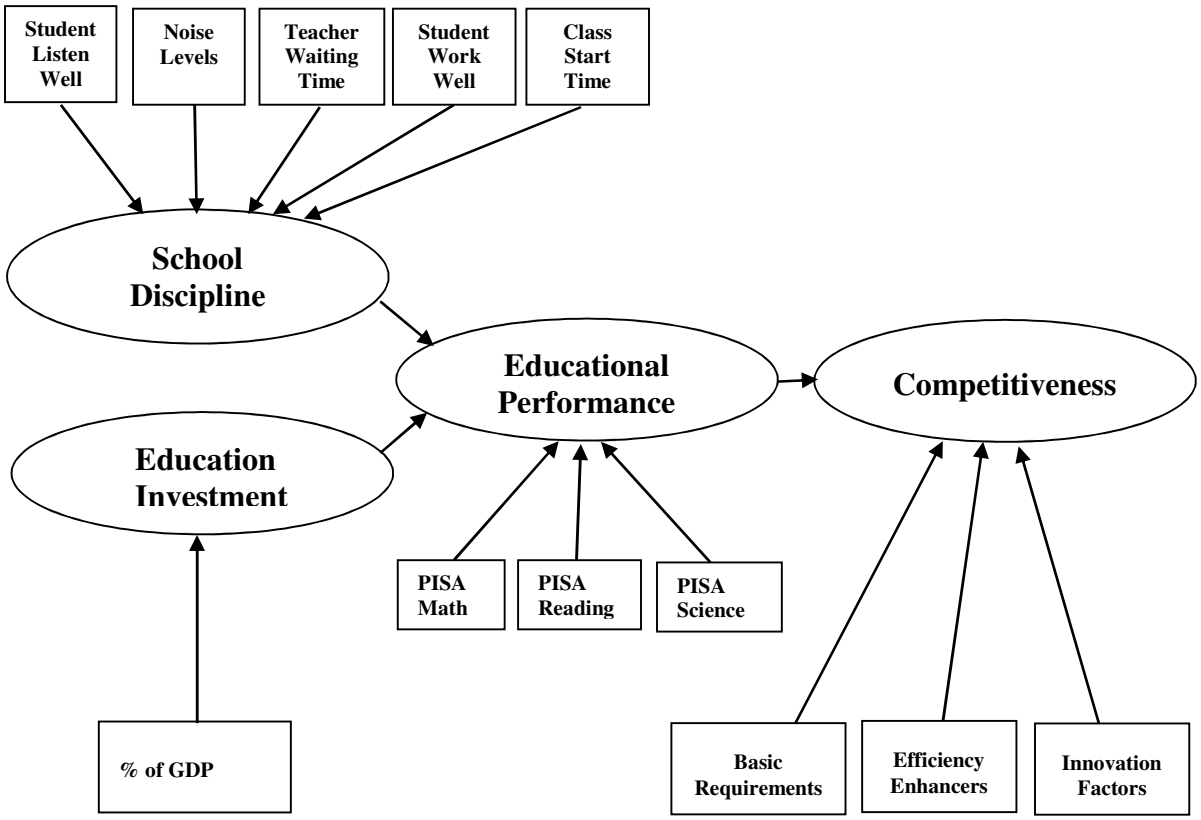
5.5. Method of Data Analysis

The data in this study were analysed by PLS-PM in XLSTAT, an add-on in Microsoft Excel software. The purpose was to analyse and confirm the association between school discipline, education investment, educational performance and global competitiveness as hypothesised in the conceptual model. The analysis involved model development, including specifying the path model, path model estimation, and assessing as well as interpreting and reporting results, as described in Hair et al. (2013). Model development included combining hypotheses into a model, which is graphically summarised in Figure 2.

While developing constructs, both reflective and formative measurement models were considered. The formative model approach was adopted as this study assumes that a change in the indicators causes a change in the latent construct value (Hair et al., 2011); the reasoning is backward oriented (Wilcox et al., 2008); the indicators define the characteristics of the construct (Jarvis et al., 2003) and a process of inductive reasoning needed to be employed (Baumann et al., 2011).

Constructs that are not directly measured are represented in PLS path models either as ovals or circles while indicators or manifest variables - ie. proxy variables directly measured - are depicted as rectangles (Hair et al., 2013). The SPSS analytical package was also used in this study to conduct further analysis, namely correlation analysis, factor analysis and regression analyses to investigate the longitudinal effects of the various variables on competitiveness in 2012.

Figure 2: Model and construct specification



Initial Screening of Data

The first step in data analysis of the 2012 data was aimed at reviewing the data graphically, to identify general trends in the data set. A review of frequency tables confirmed that no variables were omitted or entered in error as too high. When reviewing the *descriptives* tables, *skewness* and *kurtosis* were both assessed. *Skewness* indicates 'a way to describe the shape of the distribution in relation to the normal curve' where 'a negative skew means that the majority of the values tend to be at the high end of the x-axis, which results in the median being greater than the mean' (Cunningham & Aldrich, 2011, p. 91). *Kurtosis* indicates the shape of the distribution (Cunningham & Aldrich, 2011), and provides information about how data is spread, with a high number indicting that data is grouped together, and a negative number indicating that the dataset is spread widely. For the sample size used in this study, both *skewness* and *kurtosis* were deemed acceptable. A test for normality, or more specifically the *Shapiro-*

Wilk test, was also conducted. As the results were non-significant (p >0.05) (Field, 2013), it was confirmed that further PLS-PM analysis of the data for 2012 could be performed.

Partial Least Squares (PLS) Analysis

Prior to progressing the data analysis onto the PLS modelling, consideration had to be given to creating a new variable, namely Discipline 2012. For the purpose of this study, the latent construct of discipline was considered to be multidimensional. In terms of PLS modelling, the five individual sub-dimensions of discipline were used to create a new composite Discipline 2012, which is in line with other studies using such a multidimensional approach (Baumann & Hamin, 2011).

To test the assumptions of the overall model and to confirm that the model "works" overall, PLS analysis was conducted. This study focuses on testing of the relative importance of school discipline and education investment and the mediating effect of educational performance on competitiveness. PLS technique was used to investigate these relationships, as PLS is 'a statistical approach for modelling complex multivariable relationships among observed and latent variables' (Vinzi et al., 2010, p. 2), with Chin (2010, p. 84) adding further that 'PLS path modelling is a component based methodology that provides determinate construct scores for predictive purposes'. In other words, PLS is used to look for patterns in data when there is only little known about how the variables might be related (Hair et al., 2013) and, in this study, the focus is also on establishing which independent variable will be better at predicting the dependent variable.

While Hair et al. (2013, p. 4) indicated that Partial Least Squares or PLS is 'primarily used to develop theories in exploratory research', 'PLS is also typically recommended in situations in which the sample size is small' (Haenlein & Kaplan, 2004, p. 295), as is the case of this study. According to Hair et al. (2013, p. 20), 'the minimum sample size should be 10 times the

maximum number of arrowheads pointing at a latent variable anywhere in the PLS path model'. The complete sample size of countries participating in 2012 PISA assessment is sixty five. However, data on the amount the OECD spent on education per student initially considered to be used in the PLS analysis was not available for a sufficient number of countries to meet the minimum sample size requirement. Another dataset of education investment data was therefore compiled using UNESCO government expenditure on education as percentage of GDP data.

The baseline model for the 2012 data was assessed for appropriateness of the model fit. According to Hair et al. (2011, p. 141), 'a structural equation model with latent constructs has two components'. The first, the inner model (also called the structural model), deals with relationships between the model constructs (also called latent variables), or concepts that are abstract and cannot be directly observed, while the second component, the outer model (also called measurement model), deals with relationships between indicators (also called manifest variables) and latent variables (Hair et al., 2013).When evaluating the model, the fit indices were examined to determine how well the inner and outer models are suited for making predictions. Using goodness-of-fit indices has increasingly become popular in judging t/he overall model fit (Henseler & Sarstedt, 2013), as the indices (summarised in Table 5) indicate how well the model fits the data in a study. As there was no indication of lack of fit in both instances, and the fit indices are on par with similar modelling approaches such as in Baumann & Hamin (2011, p. 191), who reported goodness-of-fit indices as 'absolute = 0.381, relative = 0.812, outer model = 0.901 and inner model = 0.902', the overall model was deemed robust and valid. This conclusion was supported by high *Cronbach's Alpha* figures achieved in the PLS model, namely 0.931 for school discipline, 0.990 for educational performance and 0.980 for competitiveness.

Table 5: Goodness of fit indices

Goodness of fit			
Absolute	0.447	Outer model	0.975
Relative	0.688	Inner model	0.706

Factor Analysis – Discipline

To enable the analysis of effects over time, the extraction method of principal factor analysis was used to create 2003, 2009 and 2012 discipline constructs, which were subsequently used in the correlation and regression analyses. For years 2003 and 2009, a decision was made to exclude the discipline construct 'Students work well', because it had the lowest values. A deliberate decision was made to include all the five discipline dimensions for 2012, in order to keep the 2012 Discipline construct comparable with the construct utilized in PLS analysis, which was also created by using all five discipline dimensions for 2012. To ensure that required reliability has been achieved in the model, *Cronbach's Alpha* reliability score was also computed as it is viewed as 'the most common measure of scale reliability', with a value of .7 being acceptable (Field, 2013, p. 708). The constructed discipline variables for 2003, 2009 and 2012, as constructed during the factor analysis, and later utilised in the correlation analysis, together with *Cronbach's Alpha* reliability scores for 2003 (0.845), 2009 (0.958) and 2012 (0.942) are summarised in Appendix C.

Regression Analysis

The principal objective of this study is to shed light on the relative importance of discipline and education investment on a country's competitiveness and, in order to test for possible longitudinal effects, multiple regression analyses were performed. 'Multiple regression analysis is a common statistical technique to assess the relationships among two or more independent variables and their correlation with the dependent variable' (Nardi, 2006, p. 93). In this particular analysis, the focus was however also on the various time dimensions available to

study. In other words, the study analysed the possible impact that discipline and education investment from 2003 and 2009 could have had on competitiveness in 2012. A decision was made to focus on full data sets of 2003, 2009 and 2012, again excluding the incomplete 2006 dataset from this analysis.

Correlation Analysis

The focus of the correlation analysis was on establishing if there are any associations between the relevant variables. According to Lowe et al. (2007, p. 68), 'association means that two variables share some sort of relationship. That is, as one changes, another variable is also likely to change'. The test used to check for associations is called 'correlation analysis' and the outcome of such analysis is 'a correlation coefficient between -1 and +1', where +1 indicates positive linear relation and -1 indicates negative relation (Lowe et al., 2007). The correlation analysis in SPSS is based on several assumptions such as data being interval or ratio scaled, a linear relationship existing, and the data being normally distributed,

Correlation analysis was utilised in this study as it is in line with the approach used by other studies investigating academic performance (Cheng, 1994; Fenollar et al., 2007).The correlation of the three dimensions of PISA assessment, five dimensions of discipline and the new composite discipline construct for both 2003 and 2012, as calculated during the previously described factor analysis, are summarised in Appendix D. No discipline data were collected in 2006 and, therefore, the year 2006 has been excluded from any analysis in this study.

When reviewing the results of both the correlation and the subsequent regression analyses, the issue of *multicollinearity* was considered. Field (2013, p. 324) explains *multicollinearity* as a situation where 'there is a strong correlation between two or more predictors.' The author urges researchers to 'look through the correlation matrix for variables that correlate very highly (r >.8) and consider eliminating one of the variables (or more) before proceeding' (2013, p. 868).

The elimination of variables, while considered, proved not required in this study, as only the one dimension of discipline in 2003 and another dimension in 2009 were found significant.

6. Results

The purpose of this study is to examine the relative importance of the effects of school discipline in comparison to education investment on global competitiveness, as mediated by educational performance. The study used PLS-PM to analyse the conceptual framework, discussed in the model development part of the methodology section. The results section of this study is organised into the following sections. First, results of the baseline model for the 2012 data are discussed to confirm if the assumptions in this study work overall; second, results of the longitudinal analyses are provided. The first set of analyses, the PLS model, demonstrates the relative importance of school discipline and education investment in the formation of educational performance and global competitiveness. The longitudinal analyses demonstrate the impact of levels of school discipline, education investment and educational performance in the past, namely in 2003 and 2009, on competitiveness in 2012. The section concludes with a summary of both the supported and unsupported hypotheses.

6.1. Baseline Model

This section provides the results obtained by running the baseline model for 2012 data. The model was examined using the PLS approach and the model fit was determined to be acceptable (see Table 5), as supported by high *Cronbach's Alpha* figures achieved in the model, namely 0.931 for school discipline, 0.990 for educational performance and 0.980 for competitiveness. Thus the results of explanatory power of individual constructs are presented next. The explanatory power of the two predictors of a country's educational performance is summarised in Table 6. The results indicate that school discipline and education investment are significantly

associated with educational performance. School discipline, in fact, explains over 88% of educational performance while education investment explains approximately 11.80%. The strongest impact on educational performance was found in discipline (coefficient = 0.389), followed by education investment (coefficient = 0.142). Further, Figure 5 provides details of β coefficients for discipline and education investment indicating that the strength of the association with educational performance is three times stronger for discipline (β = 0.328) than it is for education investment (β = 0.115).

Table 6: The explanatory power of two predictors in explaining educational performance

	Discipline	**Education Investment**
Correlation	0.351	0.128
Path coefficient	0.389	0.142
Correlation * path coefficient	0.137	0.018
Contribution to R^2 (%)	88.199	11.801
Cumulative R^2 (%)	88.199	100.000

Next, the explanatory power of the three predictors of a country's competitiveness is summarised in Table 7. The variable with the greatest predictive power of competitiveness is education investment. Measured as R^2, it explains over 87% of competitiveness. Educational performance and discipline follow at a lower predictive power, educational performance explaining over 12% and discipline explaining just under 1% of competitiveness. In other words, the results of this study confirm that competitiveness is significantly associated with education investment and school discipline. The strongest impact on competitiveness was found in education investment (coefficient = 0.501), followed by education performance (coefficient = 0.189), and discipline (coefficient = 0.010).

Table 7: The explanatory power of three predictors in explaining competitiveness.

	Education Investment	**Educational Performance**	**Discipline**
Correlation	0.543	0.205	0.011
Path coefficient	0.501	0.189	0.010
Correlation * path coefficient	0.272	0.039	0.000
Contribution to R^2 (%)	87.458	12.509	0.033
Cumulative R^2 (%)	87.458	99.967	100.00

Table 8 summarises the model assessment of R^2, showing to what extent the developed model explains competiveness. The model explains 31% (R^2 = 0.311, adjusted R^2 = 0.280) of competitiveness. The study also uncovered that educational performance is explained by over 15% (R^2 = 0.155, adjusted R^2 = 0.137). Overall, the model's explanatory power is more than 23% (R^2 = 0.233).

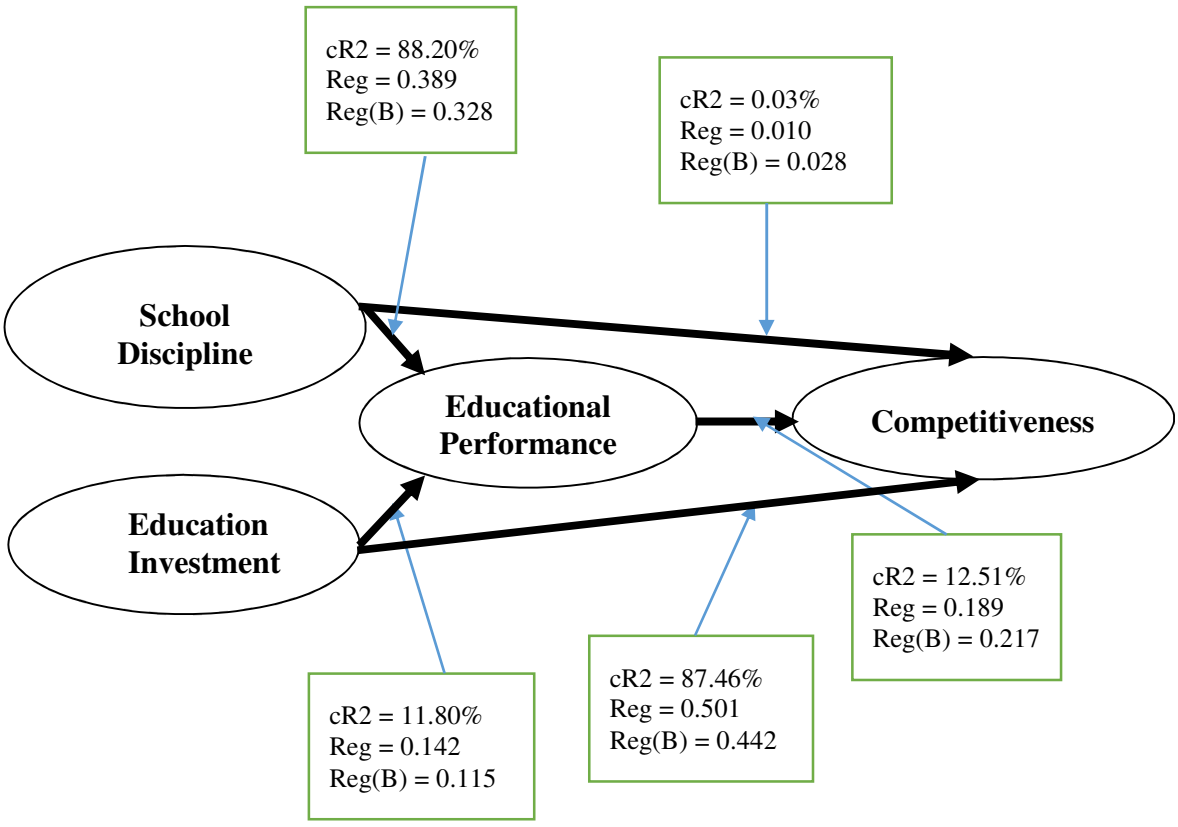
This study investigated three constructs only, namely school discipline, educational performance and education investment and yet, the model's explanatory power is over 23%. Given that global competitiveness of nations is influenced by many factors, such as infrastructure, innovation or government effectiveness, approximately 77% of global competitiveness remains unexplained, which points towards a robust model with 23% explanatory power being deemed realistic.

Table 8: Model assessment of R^2.

Latent Variable	**Type**	**R^2**	**Adjusted R^2**
Educational Performance	Endogenous	0.155	0.137
Competitiveness	Endogenous	0.311	0.280
Mean		0.233	

Lastly, Figure 3 provides a graphical summary of the strength of relationships within the tested model with associations between all constructs being found significant at $p \leq 0.05$. This model highlights the relative importance of discipline in comparison to education investment on competitiveness mediated by educational performance, and also how discipline has a direct effect on educational performance and an indirect effect on competitiveness. As all associations have been found statistically significant, the findings support the overall hypotheses about mediating and direct effects as well as the proposition of the model being realistic and robust.

Figure 3: The relative importance of discipline and education investment on competitiveness



Note:

All associations significant at $p \leq 0.05$

N=48

6.2. Diachronic Perspective

The previous section provides results of testing of the baseline model for the 2012 data, while this section discusses the results of testing for time dimension effects with the focus of the longitudinal examination being on the three yearly intervals of the PISA cycle between 2003 and 2012. Results of multiple regression analyses, which examined the time effects of school discipline, education investment and educational performance on competitiveness in 2012, will be provided. The aim of this analysis was to create the most "parsimonious" model that would provide the desired level of explanation with the fewer predictor variables possible.

Similar to other studies into academic performance, multiple regressions were run for various scenarios (Lang et al., 2015; Ricketts & Rudd, 2005). A process of elimination was used to remove any potentially explanatory variables that did not have a statistically significant association with the dependent variable. Predictor variables were removed based on their *p* value until, at the conclusion of this process, the remaining variables were significant at least at $p \leq 0.1$. In other words, only significant and meaningful predictors of competitiveness were identified to explain competitiveness in 2012. The results of the multiple regressions are summarised in Table 9.

The first testing focused on the impact of school discipline and the findings confirm that the variables students listen well in 2003 and students work well in 2009 are both significantly associated with global competitiveness in 2012. Students listen well in the 2003 dimension explains 4.3% of competitiveness in 2012 and students work well in 2009 dimension explains almost 14% of competitiveness in 2012. While the β coefficient of students listen well in 2003 is 0.385 and only a trend was found (0.084), the β coefficient of students work well in 2009 is very strong at 0.705, with the association being found significant at $p \leq 0.05$ level.

In regards to educational performance, 2003 PISA Reading and PISA Math dimensions both in 2006 and 2009 were all found significantly associated with competitiveness in 2012 at $p \leq 0.001$ level. The β coefficient of 2003 PISA Reading variable was 0.684, with the variable being found to explain over 45% of competitiveness in 2012. 2006 PISA Math variable (β = 0.571) and 2009 PISA Math variable (β = 0.621) were found to explain over 31% and over 37% of competitiveness in 2012 respectively.

Lastly, the testing focused on education investment and OECD annual expenditure per student in the years investigated in this study, namely 2003, 2006 and 2009, were also found statistically significant (at $p \leq 0.001$ level) in relation to competitiveness in 2012. 2003 OECD annual expenditure per student was found to explain over 41% of competitiveness in 2012 with the β coefficient being 0.657. 2006 OECD annual expenditure per student (β = 0.667) and 2009 OECD annual expenditure per student (β = 0.693) were found to explain almost 43% and over 46% of competitiveness in 2012 respectively.

Table 9: Diachronic effects of education on competitiveness (2012)

Predictor	Unstandardised Coefficients	Standard error	Standardised coefficients (beta)	*T*	*P*
Discipline dimension					
Discipline 2003					
2003 - D1 - Students listen well	.040	.022	.385	1.788	.084*
R^2= .176, Adjusted R^2= .043					
Discipline 2009					
2009 - D4 - Students work well	.062	.023	.705	2.689	.011**
R^2= .247, Adjusted R^2= .136					
Educational Performance					
Educational Performance 2003					
2003 PISA Reading	.009	.002	.684	5.547	.000***
R^2= .468, Adjusted R^2= .453					
Educational Performance 2006					
2006 PISA Math	.006	.001	.571	4.872	.000***
R^2= .326, Adjusted R^2= .313					
Educational Performance 2009					
2009 PISA Math	.006	.001	.621	5.922	.000***
R^2= .385, Adjusted R^2= .374					
Education Investment					
2003 OECD – Annual expenditure per student	.000	.000	.657	4.933	.000***
R^2 = .432, Adjusted R^2= .414					
2006 OECD – Annual expenditure per student	.000	.000	.667	5.147	.000***
R^2= .445, Adjusted R^2= .428					
2009 OECD – Annual expenditure per student	.000	.000	.693	5.611	.000***
R^2= .481, Adjusted R^2= .465					

Note:

*** *Significant at $p \leq 0.001$*

** *Significant at $p \leq 0.05$*

* *Significant at $p \leq 0.1$*

6.3. Correlation Analyses

The correlation analyses of the three PISA dimensions, PISA mean, the five discipline dimensions and the constructed overall PISA Discipline variable for both 2003 and 2012 are summarised in Appendix D. The results of the 2003 correlation analysis indicate that there is a significant relationship between the total discipline variable and PISA Science in 2003 (at $p \leq 0.05$ level) and a trend was found between the total discipline variable and PISA Math ($p \leq 0.1$). Further analysis confirmed relationships in 2003 between all three PISA dimensions and two discipline dimensions, namely students work well and class start time (at least at $p \leq 0.05$ level). A trend (at $p \leq 0.1$ level) towards a significant association was also found between the teacher wait time dimension and PISA Math, and a significant relationship (at $p \leq 0.05$ level) between the teacher wait time dimension and PISA Science in 2003.

For 2012, the overall 2012 Discipline variable is, in fact, significantly related to all three PISA dimensions (PISA Reading and PISA Science at $p \leq 0.05$ and PISA Math at $p \leq 0.001$). There is also a significant relationship between three discipline dimensions (teacher wait time, students work well and class start time) and all three PISA dimensions (at minimum of $p \leq 0.05$). Further, two more discipline dimensions (noise levels and students listen well) are also significantly related to PISA Math (both at $p \leq 0.05$).

Both in 2003 and 2009, PISA dimensions are significantly associated both with individual dimensions of discipline as well as with the overall discipline variable constructed during the factor analysis. As no discipline data were collected in 2006 and 2009, discipline data collection

methodology was not comparable with years 2003 and 2012, and interpretation of results for years 2006 and 2009 have been omitted from this section.

Twelve hypotheses in total were developed for this study and Table 10, which follows, provides a summary of the 8 hypotheses that are supported by the research findings. The results in this study support the overarching hypothesis about discipline climate in classrooms having an impact on both educational performance of countries as well as on country competitiveness.

Table 10: Summary overview of hypotheses

Panel A: Baseline model	
HM1: Discipline has significant impact on competitiveness mediated by educational performance.	*Supported*
HM2: Education investment as a percentage of GDP has significant impact on competitiveness mediated by educational performance.	*Supported*
Panel B: Diachronic perspective	
School Discipline	
HD1: School discipline in 2003 had significant impact on 2012 competitiveness.	*Supported*
HD2: School discipline in 2009 had significant impact on 2012 competitiveness.	*Supported*
Education Investment	
HI1: Education investment as government expenditure on education as a percentage of GDP in 2003 had significant impact on competitiveness in 2012.	*Supported*
HI2: Education investment as government expenditure on education as a percentage of GDP in 2009 had significant impact on competitiveness in 2012	*Supported*
Educational Performance	
HP1: How well students performed in 2003 PISA Math assessment had significant impact on competitiveness in 2012.	*Not supported*
HP2: How well students performed in 2003 PISA Science assessment had significant impact on competitiveness in 2012.	*Not supported*
HP3: How well students performed in 2003 PISA Reading assessment had significant impact on competitiveness in 2012.	*Supported*
HP4: How well students performed in 2009 PISA Math assessment had significant impact on competitiveness in 2012.	*Supported*
HP5: How well students performed in 2009 PISA Science assessment had significant impact on competitiveness in 2012.	*Not supported*
HP6: How well students performed in 2009 PISA Reading assessment had significant impact on competitiveness in 2012.	*Not supported*

Note:

HM denotes hypotheses regarding mediating effects.

HD denotes hypotheses regarding discipline.

HI denotes hypotheses regarding education investment.

HP denotes hypotheses regarding educational performance.

7. Discussion

The purpose of this study was to examine the relative importance of the effects of school discipline in comparison to education investment on global competitiveness. Educational performance was modelled as the mediator between school discipline, education investment and competitiveness. Importantly, the study was also designed to test for effects of education dimensions on competitiveness over time. The previous section presented the results of the data analyses and this section presents a discussion of the results. The discussion section of this study is organized in the following order. First, a discussion of the relevant importance of school discipline in comparison to education investment on educational performance will be provided, followed by a discussion of the mediating effect of educational performance. Thirdly, the time dimension results will be discussed. Further, future research directions will be outlined and the section will be concluded by a summary of limitations of this research.

7.1. Relative Importance of School Discipline

One of the key focus areas of the study was to explore the impact of school discipline, in comparison to education investment. In terms of explanatory power, school discipline was the much stronger factor to explain performance. Eighty eight per cent of educational performance is explained by discipline, which contrasts with only twelve per cent explained by education investment. The literature had some indication that discipline would be an important factor to explain education performance, but such strong explanatory power is remarkable. In other words, discipline has a greater impact on educational performance than education investment. Discussion, by both politicians and the media, on education policy often centres on funding, but this study now provides evidence that suggests that a much more effective 'tool' to improve education performance and ultimately competitiveness of a nation, is indeed to focus on school

discipline. Better disciplined students learn more and perform and ultimately contribute to a more competitive workforce and economy. Indeed, the results of this study are in line with recent research on the role of discipline in the formation of a work ethic (Baumann et al 2016) that established how strict discipline and a focus on academic performance significantly contribute to a work ethic. This study also indicates that academic performance is more closely linked with how schools are run and with how well expectations and goals are set for students (McInerney, 2005) than with how much money is spent on schools (Jensen et al., 2011).

In a recent article in the *Wall Street Journal* Lipman (2013) argued that 'a little pain is good for you' and that 'strict is better than nice'. Lipman reflected on her old school teacher who applied strict discipline, and the author attributed her own and her classmates' success largely to that strict teacher's pedagogical approach. Respect for tough teachers gets good results since such teachers challenge their students to peak perform. Education systems instil work ethic through strict discipline and focus on academic performance' (Baumann et al., forthcoming, p. 201) and this study offers support for refocusing the attention of teaching staff onto good discipline in the classroom. If teachers can ensure that there is a disciplined climate in the classroom, more can be achieved, more can be learnt.

Ultimately, this study is aligned with previous studies confirming that, for example, 'students and schools tend to perform better in a climate characterised by discipline and high levels of student morale and commitment' (Schleicher, 2007, p. 355). East Asian like South Korea and Japan, for example, have strict discipline in schools and also peak perform in international student competitions, whereas Wester countries generally have lower levels of discipline, but also lower academic performance (Baumann et al., forthcoming; Baumann & Winzar, 2014). For countries that cannot afford additional education investment, the findings of this study provide a practical and cost effective solution, as changing school policy is, more or less, cost–

neutral, but good (or better) discipline appears most effective in driving academic performance. Crucially, good school discipline ultimately also links to competitiveness.

7.2. Mediating Effect of Educational Performance

In this study, one of the focus areas has been on investigating the relative importance of discipline and education investment on competitiveness mediated by educational performance. One of the objectives of the PLS method is to predict, meaning the higher the R^2 of endogenous constructs, the higher the prediction in the PLS path model (Hair et al., 2013). This study has demonstrated mediating effect of educational performance on competitiveness, linking school discipline and education investment. The overall model explains 23 per cent of competitiveness based on three explanators, meaning that educational dimensions together explain roughly a quarter of competitiveness. The variable with stronger explanatory power is education investment. Naturally, many other variables come into play when forming competitiveness, but both discipline and education investment significantly link to competitiveness, mediated by educational performance.

The way competitiveness and education relate to one another has been researched with prior studies probing two angles - how competitiveness explains academic performance (Baumann & Hamin, 2011) and also, reversely, how education explains competitiveness (Baumann & Winzar, 2014). This study builds on the previous research of education impacting on economy by adding a new perspective of the contributing factors to global competitiveness. This study demonstrates that school discipline has the potential to influence a country's competitiveness as well as educational performance. While investment in education clearly has an effect might educational performance and on competitiveness, this study suggests that the stronger leverage is school discipline. This study has shown that discipline is a key factor in both increasing educational performance and also increasing a nation's competitiveness levels.

7.3. Linking Discipline, Performance and Investment Dimensions to Competitiveness

To gain further understanding of competitiveness, diachronic testing was applied to ascertain how school discipline and education investment link to competitiveness over time. One of the key findings of this study is that discipline dimensions, namely students listen well in 2003 (adjusted $R^2 = 0.043$) and students work well in 2009 (adjusted $R^2 = 0.136$) were significantly associated with competitiveness in 2012, and the time effect becomes stronger the closer the tested year was to the year 2012. In other words, if students pay attention and listen during classes, such behaviour in classes will influence competitiveness in the longer term, meaning that discipline has an effect over time. This study also found that education investments made in both 2003 and 2009 impacted significantly on 2012 competitiveness.

This study has demonstrated temporal effects of the discipline dimension, educational performance dimension and education investment on competitiveness in 2012. As pointed out by Porter (1990), there is always a time lag effect. It might take longer than a decade for any educational policy change to impact competitiveness and, while competitiveness could be increased by simply ensuring that students listen well, the impact might not directly be visible instantly.

More disciplined students achieve better educational results (Cohen & Romi, 2010; Pellerin, 2005b) with the issue at play in undisciplined classrooms relating to distraction combined with a lack of respect for teachers and education. If it takes time for teachers to get students' attention, time is wasted rather than spent on learning. Education is among the most important services provided by governments, and the findings in this study support the argument that how schools and classrooms are run need to be reconsidered, and perhaps the expectations a society places on students need to be increased. It might not be about how much the schools receive in

funding, or how many students are in a class but, rather, how well students listen and how well students work in the classrooms.

Teachers need to be empowered to achieve greater discipline in classrooms. For countries with already a high level of discipline with equally high educational performance (for example in East Asia), the recommended strategy is to maintain good levels of discipline in the classroom in order to keep up strong academic performance. In contrast, countries with low levels of discipline and low performance may consider changing school policy to a stricter regime in order to lift academic performance and competitiveness without increasing education investment. It is necessary for schools to put in place strategies for managing school misbehaviour or 'any behaviour that threatens the flow of academic performance' (Türnüklü & Galton, 2001, p. 291), in order to create a discipline climate conducive to high achievement with the aim of influencing global competitiveness in years to come.

7.4. Future Research Directions

This study has put forward a new conceptual framework combining school discipline, education investment, educational performance and competitiveness into one model for the first time, and the subsequent testing of the overall model has provided empirical support for the proposition that school discipline has indirect impact on competitiveness. What remains to be investigated are likely differences in levels of discipline between geographic regions, as different geographic regions were found in prior research to have differing attitudes towards school discipline (Baumann et al., 2012) and educational achievement (Baumann & Winzar, 2014).

A recent experiment reported in a BBC Two documentary (*Are Our Kids Tough Enough: Chinese School*, 2015) reiterates the interesting and important observation about differences in attitude to education between various geographic regions and cultures. This particular

experiment added to the ever growing discussion about the very different approaches Eastern and Western education systems have towards discipline and expectations placed on students. Fifty students aged thirteen and fourteen in, by English standards, quite a successful school located in Hampshire participated in this four week long experiment, in which Chinese teachers subjected English teenagers to the Chinese way of teaching, including twelve-hour days, "gruelling" physical education classes, teaching for content and from the front of the class only, and having class "monitors" to assist with classroom discipline.

While the five Chinese teachers initially struggled to regain control of their classes, apparently not used to dealing with classroom management because respect for teachers is a 'given' in China and does not need to be 'demanded', some of the students actually expressed a preference for their style of teaching. The teachers were constantly challenged by the teenage English students who, seemingly unlike their Chinese counterparts, like to challenge the authority of teachers, speak back as well as like being 'just themselves' Nevertheless, the teachers' strong belief in hard work, competition and a regime of discipline led to students achieving higher academic results when compared to those of the regular Hampshire school students. To the Head Teacher's surprise, at the end of the experiment, the Chinese school's results in all three examinations of math, mandarin language and science, all specifically prepared by an independent body to compare the two very different English and Chinese educational approaches, came up higher than results of their English counterparts. These findings are in line with previous studies (Baumann et al., 2012; Baumann & Winzar, 2014), which confirmed that there are differences in academic achievements between different world geographic regions. PISA data provides only data about outcomes ie. students listen well or work well, but it does not provide details about how discipline is achieved. The BBC documentary provides inspiration to sample students in East Asia to investigate how they could possibly be perceived to be better disciplined. It is therefore recommended that future research should investigate the

extent to which various geographic regions differ in terms of school discipline and its impact on educational performance and competitiveness.

Other suggestions for future research include expanding on the findings from this study, which drew on publically available secondary data, by using a survey instrument to focus on examining the links between school discipline and academic achievement at a more granular level. The OECD's PISA dataset provides access to information about school discipline at the aggregated national level, and surveys could be used to investigate the various discipline approaches used at individual schools, as information about the PISA assessment participating schools could possibly be obtained from the administrators of PISA surveys in individual countries. And, lastly, future studies could also investigate further the diachronic perspective of this research. This study has made an attempt to explain competitiveness in absolute terms but future studies should focus on investigating changes in competitiveness.

7.5. Limitations

No study is without limitations and this study is no exception. In the latest PISA assessment, for example, 790 schools and 17,800 students participated in Australia, 200 schools and 6,100 students in the US, 550 schools and 12,600 students in the UK and 150 schools and 5,000 students participating in South Korea (OECD 2013). Due to the sheer number of PISA participants and the variance in the number of schools, students in participating countries, limitations of the PISA assessment, such as socioeconomic inequality, will be inherent in findings of this study; and, thus, cross-country differences in the quality of educational systems and other influences such as family background cannot be neglected (Hanushek & Woessmann, 2010).

One area of concern in this study was to confirm the mediating effect of educational performance. According to Chin et al. (2003, p. 192), 'a mediating relationship is an intervening construct that sits between two other constructs and passes/mediates the influence of the one variable through to the other'. In contrast, a moderator effect 'occurs when the moderator (an independent variable or construct) changes the strength or even the direction of a relationship between two constructs in the model' (Hair et al., 2013, p. 37). There might be many moderating variables at play when dealing with the four constructs of discipline, investment, educational performance and competitiveness, such as religion, culture or geographic regions. However, due to the time restrictions associated with this Master of Research study, the focus was primarily on mediating effects only.

Finally, this study has always been intended as a pilot for a more in-depth PhD study so the research conducted in this study has only been of more exploratory nature based on a smaller sample size. The sample size has been sufficiently large to demonstrate the hypothesised effects and to also provide a platform for a further PhD study. While the study started with the full list of 65 countries participating in the PISA assessment, during the harmonization stage, the number of countries included in the final PLS analysis were only 40. It is therefore recommended that future studies are based on a large sample size.

8. Conclusion

This study makes unique contributions in three distinct ways. Firstly, the study demonstrates the substantially higher explanatory power (roughly 88%) of school discipline in explaining educational performance in comparison to education investment with only 12%. Secondly, this study demonstrates the mediating effect of educational performance on competitiveness, linking school discipline and education investment. The overall model explains 23% of competitiveness based on three explanators. Thirdly, diachronic testing was applied to better

comprehend how school discipline and education investment link to competitiveness. It was demonstrated that school discipline indeed is associated with competitiveness over time, specifically a nine year effect for the students listen well dimension, and a three year effect for students working well, explaining a remarkable 4-14% of competitiveness in 2012. Time effects were also found for educational performance ranging from 31-45%, with reading demonstrating a nine year effect and math a six as well as a three effect. The results of this study support the previously established temporal effects shown by Baumann & Winzar (2014), i.e. education really boosts competitiveness.

For education policy, the study points towards the importance of school discipline with the now demonstrated effects on educational performance and competitiveness, both cross-sectional and also over time. This study suggests that education investment alone is not sufficient to boost educational performance as well as global competitiveness. The findings in this study indicate that possibly the more cost effective approach might be to focus on school policy where improving school discipline is cost neutral, but it appears very effective on desirable outcomes such as performance and competitiveness. Teachers need effective tools to discipline students in order to create an atmosphere where students listen well, noise levels are low, teacher waiting time is also low, students work well, and class starts on time.

For academics, this study provides useful input to better model competitiveness and its drivers, namely by incorporating educational dimensions such as school discipline, education investment and educational performance. Future research should aspire to explain geographic differences in diverging approaches to school discipline with equally diverging academic performance.

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Appendices:

Appendix A – Summary of Data Sources Accessed

A.1 Discipline

Year	Source	Date accessed
2003	http://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/34002216.pdf	8/3/2015
2006	Data not collected in 2006	21/3/2015
2009	http://www.oecd.org/pisa/pisaproducts/48852742.pdf	21/3/2015
2012	http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-IV.pdf	19/5/2014

A.2 Education Investment - OECD

Year	Source	Date accessed
2003	Skills beyond school 2006 http://www.oecd.org/edu/skills-beyond-school/37344658.xls	14/3/2015
2006	Education at a Glance 2009: OECD Indicators http://www.oecd.org/education/skills-beyond-school/43636332.pdf	14/03/2015
2009	Education at a Glance 2012: OECD Indicators http://www.oecd.org/edu/EAG%202012_e-book_EN_200912.pdf	9/8/2015
2011	Education at a Glance 2014: OECD Indicators http://www.oecd.org/edu/EAG2014-Indicator%20B1%20(eng).pdf	9/8/2015

A.3 UNESCO – Expenditure on education as % of GDP (from government sources)

Year	Source	Date accessed
2003 2006 2009 2011	http://data.uis.unesco.org/Index.aspx?queryid=184	26/8/2015

A.4 Educational Performance

Year	Source	Date accessed
2003	www.oecd.org/newsroom/34011082.xls	7/3/2015
2006	http://www.oecd.org/pisa/pisaproducts/39725224.pdf	15/3/2015
2009	http://www.oecd.org/pisa/pisaproducts/46619703.pdf	1/3/2015
2012	http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf	1/3/2015

A.5 Competitiveness

Year	Source	Date accessed
2003	http://www.weforum.org/pdf/Gcr/GCR_2003_2004/GCI_Chapter.pdf	1/3/2015
2006	http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2006-07.pdf	1/3/2015
2009	http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2009-10.pdf	4/8/2015
2012	http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf	1/3/2015

Appendix B – PLS Descriptive Statistics (2012)

Variable	N	Min	Max	Mean	Standard Deviation
Panel A – Discipline					
D1 - Students listen well	64	51.00	93.00	68.64	9.13
D2 - Noise level		49.00	90.00	69.78	9.20
D3 - Teacher wait time		55.00	93.00	73.19	8.18
D4 - Students work well		59.00	90.00	77.39	6.62
D5 - Class start time		50.00	90.00	73.72	9.10
Panel B – Education Investment					
OECD Expenses per student	38	522.00	16,182.00	8,282.90	3,944.00
UNESCO Government Expenditure on Education	49	2.56	8.55	5.00	1.27
Panel C – Educational Performance					
PISA Math	65	368.00	613.00	473.35	55.50
PISA Science		373.00	580.00	478.57	50.68
PISA Reading		384.00	570.00	473.97	47.09

Variable	N	Min	Max	Mean	Standard Deviation
Panel D – Competitiveness					
C1 – institutions	62	2.85	6.07	4.50	0.88
C2 – infrastructure		3.22	6.72	4.93	0.94
C3 - macroeconomic stability		2.42	6.66	5.04	0.90
C4 - health and primary education		5.37	6.82	6.09	0.37
C5 - higher education and training		3.69	6.18	4.96	0.60
C6 - goods market efficiency		3.18	5.60	4.60	0.51
C7 - labour market efficiency		3.29	5.90	4.56	0.56
C8 - financial market sophistication		3.13	5.89	4.44	0.70
C9 - technological readiness		3.33	6.29	4.92	0.86
C10 - market size		2.08	6.93	4.50	1.02
C11 - business sophistication		3.11	5.80	4.53	0.71
C12 – innovation		2.63	5.78	4.05	0.94

Appendix C – Factor Score Analysis – Discipline

2003

Variable Name	Factor Loadings Initial CFA	Factor Loadings Optimised CFA	Min	Max	Mean	Standard Deviation
D1 - Students listen well	0.720	0.771	61	82	70.54	5.139
D2 - Noise level	0.871	0.910	52	100	67.12	10.303
D3 - Teacher wait time	0.927	0.916	57	86	69.04	6.703
D4 - Students work well	0.613	Excluded	61	82	76.35	4.624
D5 - Class start time	0.799	0.775	37	85	70.40	9.045

Note:
Optimised Cronbach's alpha = 0.845; N= 40

2009

Variable Name	Factor Loadings Initial CFA	Factor Loadings Optimised CFA	Min	Max	Mean	Standard Deviation
D1 - Students listen well	0.931	0.923	55	92	74.06	9.125
D2 - Noise level	0.909	0.944	52	90	70.83	10.109
D3 - Teacher wait time	0.973	0.979	62	93	74.25	8.381
D4 - Students work well	0.810	Excluded	56	91	81.82	6.116
D5 - Class start time	0.932	0.934	56	91	76.63	8.535

Note:
Optimised Cronbach's alpha = 0.958; N= 41

2012

Variable Name	Factor Loadings Optimised CFA	Min	Max	Mean	Standard Deviation
D1 - Students listen well	0.860	51	93	68.64	9.129
D2 - Noise level	0.911	49	90	69.78	9.202
D3 - Teacher wait time	0.958	55	93	73.19	8.190
D4 - Students work well	0.883	59	90	77.39	6.620
D5 - Class start time	0.920	50	90	73.72	9.102

Note:
Optimised Cronbach's alpha = 0.942; N= 64

Appendix D – Correlation Analysis

D.1 - Correlation table of 2003 PISA and Discipline

	PISA Reading	PISA Math	PISA Science	PISA Mean	D1 - Students listen well	D2 - Noise level	D3 - Teacher wait time	D4 - Students work well	D5 - Class start time	2012 Discipline
PISA Reading	1									
PISA Math	.943*** .000	1								
PISA Science	.934*** .000	.967*** .000	1							
PISA Mean	.974*** .000	.989*** .000	.984*** .000	1						
D1 - Students listen well	-.111 .497	.004 .982	.014 .930	-.028 .862	1					
D2 – Noise level	-.020 .904	.077 .636	.133 .412	.066 .685	.677*** .000	1				
D3 – Teacher wait time	.180 .287	.272* .090	.320** .044	.263 .101	.580*** .000	.801*** .000	1			
D4 - Students work well	.427** .008	.401** .010	.427** .006	.424** .006	.201 .215	.308* .053	.542*** .000	1		
D5 – Class start time	.403** .010	.508*** .001	.536*** .000	.494*** .001	.383** .015	.575*** .000	.682*** .000	.502*** .001	1	
Discipline 2003	.152 .349	.271* .090	.316** .047	.253 .115	.732*** .000	.915*** .000	.907*** .000	.465** .003	.808*** .000	1

Note:

**** Significant at $p \leq 0.001$*

*** Significant at $p \leq 0.05$*

** Significant at $p \leq 0.1$*

N=40

D.2 - Correlation table of 2012 PISA and Discipline

	PISA Reading	PISA Math	PISA Science	PISA Mean	D1 - Students listen well	D2 - Noise level	D3 - Teacher wait time	D4 - Students work well	D5 - Class start time	Discipline 2012
PISA Reading	1									
PISA Math	.960*** .000	1								
PISA Science	.978*** .000	.972*** .000	1							
PISA Mean	.988*** .000	.988*** .000	.993*** .000	1						
D1 - Students listen well	.215* .087	.268** .034	.215* .068	.236* .061	1					
D2 - Noise level	.177 .163	.283** .035	.206 .102	.220* .081	.730*** .000	1				
D3 - Teacher wait time	.346** .005	.404*** .001	.353** .004	.373** .002	.775*** .000	.908*** .000	1			
D4 - Students work well	.433*** .000	.482*** .000	.461*** .000	.464*** .000	.739*** .000	.685*** .000	.791*** .000	1		
D5 - Class start time	.363** .003	.420*** .001	.392*** .001	.397*** .001	.670*** .000	.818*** .000	.859*** .000	.816*** .000	1	
Discipline 2012	.329** .008	.396*** .001	.349** .005	.363** .003	.866*** .000	.917*** .000	.957*** .000	.871*** .000	.918*** .000	1

Note:

**** Significant at $p \leq 0.001$*

*** Significant at $p \leq 0.05$*

** Significant at $p \leq 0.1$*

N=64