What makes Estonia and Singapore so good?

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What makes Estonia and Singapore so good?

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ABSTRACT
Considering high performance in PISA, a case study of Estonia and Singapore is required. Estonia’s economy is not up to par with Singapore. On the other hand, Estonia is more democratic than Singapore. The national IQ levels are higher in Singapore (102) than in Estonia (99.4) but may explain a large portion of the attainment level in both countries. Singapore does also have more highly educated and better paid teachers, as well as a highly skilled foreign workforce. Annual educational quantity is very similar. Therefore, the high scores in Estonia relative to the OECD average and many wealthier western nations remain as somewhat of a minor mystery.

Introduction
In the educational research orbit, two-country comparisons with emphasis upon achievement have emerged as an important subfield (e.g., Rindermann, Hoang, and Baumeister 2013; Ning et al. 2015) and, indeed, constitute important complements to single-country studies and larger sets of country analysis typical of econometric research. Two strengths of two-country comparisons are that such initiatives tend to have almost the same depth as single-country studies but also the intriguing aspect of comparability. Comparisons can be made between nations at both low-performing, middling, or high achievement levels, sometimes cutting across these rather floating boundaries. Such analyses might be based on both empirical case studies where researchers collect new data, and/or national macro-social data retrieved from for instance the OECD reports and other sources.

The current article adds to the literature of high performers, specifically Estonia and Singapore, both in the light of the high performance in PISA 2015 (OECD 2018b) and recent research in the economics of education literature (Hanushek, Piopiunik, and Wiederhold 2019). Factors associated with high performance levels in cross-national assessments studies, such as national IQ, teacher salaries and cognitive skill levels, educational quantity, national culture, and respect for teachers (see Rindermann and Ceci 2009; Rindermann, Sailer, and Thompson 2009; Rindermann, Becker, and Coyle 2016; Hanushek, Piopiunik, and Wiederhold 2019) will be analysed from a comparative vantage point. Moreover, it seeks to examine how these two countries – which share some features, such as a small population and landmass, a compressed modernisation, and ethnic heterogeneity, while simultaneously being geographically and culturally different – have responded to globalisation, and what signifies its migration and integration policy in relation to educational attainment.

To address the issues raised above, the current article examines and critically discusses in a comparative context: national cultural characteristics and responses to globalisation; national IQ scores in relation to PISA scores; ethnic heterogeneity, migration and integration policies; political leadership and democracy; quality of education as indicated by average annual teacher salaries, cognitive
skill levels, and respect for teachers; quantity of education (annual number of instruction time measured by the number of school days and length of school days). It proceeds with a literature review, a theory section, followed by a method and data section, an overview of the two countries’ cultural characteristics and globalisation as related to educational attainment, results from the comparison of the main variables and related sub-variables, and ends with a conclusion and discussion.

**Related literature**

While Estonia and Singapore’s strong performance in PISA has not escaped the public or educational researchers, little research has in fact been conducted on Estonia, although the OECD country reports (OECD 2018b, 2019) provide some clues in relation to which extent educational achievement facilitates economic growth in Estonia.

Deng and Gopinathan (2016) emphasise a ‘hybrid pedagogy’ present in Singapore, which implies a blend of traditional and constructivist elements, which they believe to be particularly appropriate for performance in assessments such as PIRLS and PISA. Soh (2014) examined school management in Finland and Singapore and found that Finnish school leaders use a more detached managerial style, while their Singaporean counterparts prefer a more professional hands-on approach, likely a consequence of the specific cultural milieus that principals operate within. Cheung (2017; see also OECD 2011) has underscored that Singapore and other East Asian high performers in PISA have higher mathematical resilience relative to the West. Some researchers have linked the high performance in Singapore to high IQ and competent leadership (Rindermann, Sailer, and Thompson 2009). Lynn and Becker (2019) have presented a new composite national IQ score for Singapore.

Non-cognitive skills, such as perseverance and reliability, are some of the major factors associated with educational achievement (Heckman and Kautz 2014). Similar traits like grit and conscientiousness may have a larger explanatory magnitude than IQ scores according to some researchers (e.g., Duckworth and Seligman 2005; Borghans et al. 2008), although such traits are hard to measure in a cross-national context due to reference bias (Rindermann and Ceci 2009; Heckman and Kautz 2014). Among the big five personality traits, conscientiousness correlates the most with academic performance (Conard 2006; MacCann, Duckworth, and Roberts 2009). Some researchers stress the combination of IQ and conscientiousness (Lynn 1996; Rindermann 2018).

The large effect size of teachers in relation to educational achievement has been reported in a seminal work of Hattie (2012). One specific facet of instruction competence, and partly also cultural characteristics, is the attentiveness of students (Rindermann and Ceci 2009). OECD (2014, 65) measures disciplinary climate in PISA 2000 and 2009. The table, which compares PISA 2000 and PISA 2009, does not include Estonia while Singapore has performed slightly higher than the OECD average in this regard. Hanushek, Piopiunik, and Wiederhold (2019) have underlined the significance of teachers’ competence level, ‘In a follow-on report, Auguste, Kihn, and Miller (2010) note that the school systems in Singapore, Finland, and Korea ‘recruit 100% of their teacher corps from the top third of the academic cohort,’ which stands in stark contrast to the U.S. where ‘23% of new teachers come from the top third.’ (5) Further, they conclude, ‘All empirical strategies consistently indicate a robust positive relationship between teacher cognitive skills and student performance. In the OLS estimation with the full set of controls, we find that a one standard deviation (SD) increase in teacher cognitive skills is associated with 0.10–0.15 SD higher student performance.’ They also found that Finland’s pool of teachers has the highest cognitive skill level in OECD.

Overall, several studies report negative social and economic effects of increased immigration and ethnic heterogeneity (Alesina, Baqir, and Easterly 1999; Alesina et al. 2003; Salter 2004; Vanhanen 2004; Putnam 2007). Part of the reason is that ethnic heterogeneity is related to increased heterogeneity in social preferences (Alesina, Baqir, and Easterly 1999) and ethnic fractionalisation (Alesina et al. 2003). However, ethnic fractionalisation or polarisation is mainly a severe problem in some Sub-Saharan African and Caribbean countries (Alesina et al. 2003). While Salter (2004) stresses
that increased ethnic diversity negatively affects economic growth, Masters and McMillan (2004) suggest that wealthy countries are better equipped to deal with high immigration rates and increased ethnic heterogeneity. Thus, ethnic conflicts do seldom emerge in rich nations.

The political leadership in Singapore has been discussed by a plethora of scholars (e.g., Chua 1997; Tan 2008; Rindermann, Sailer, and Thompson 2009; Tan 2012; Morgenbesser 2017). Rindermann, Sailer, and Thompson (2009), who examined the nexus between cognitive ability, innovation, democracy and political leadership, stress:

One remark on Singapore: Its long-term Prime Minister Lee Kuan Yew has in our data set only as highest degree “university degree”, no doctorate or an additional scientific degree. But he has studied at London School of Economics and in Cambridge and finished his studies with exceptional “Double Starred First Class Honours”. Our assessment procedure seems to underestimate his cognitive ability level. Furthermore, Singapore has reached the highest rank in the smart fraction ability (IQ 127) in our list and the second highest rank in average ability (IQ 105), but “only” the 14th rank in the lower non-smart fraction ability ranking (IQ 79). In patents (1991-2007) Singapore has the first place. And, that is especially remarkable, Singapore has reached the first place in government effectiveness. Singapore seems to have the best government in the world. Lee Kuan Yew’s ability – indicated by his success – seems to be underestimated again by the solely use of formal education. Of course, Singapore was and still is no standard-bearer of liberty and democracy and Lee Kuan Yew has attracted criticism because of this. But, he stands apart from other leaders in terms of his exceptional success for Singapore in growth, modernization, technology and since several years also in science (up to now only STEM including biotechnology).

However, as Tan (2012) notes, the pragmatist-technocratic regime of Singapore tends to dismiss qualitative information. In that respect, it would certainly cherish studies like this but may find it harder to refute substantial evidence from the Economist Intelligence Unit’s Annual Reports, which consistently have showed that Singapore is indeed a ‘flawed democracy’ or ‘hybrid regime’ (i.e., constituting both authoritarian and democratic features). Moreover, Easterly (2014) is skeptical about that individual leaders such as Lee Kuan Yew have had much of an impact upon economic development in the country. The Economist’s Intelligence Unit reports (2010, 2014, 2018) show that Estonia is categorised as a flawed democracy, although currently near the 8.0 score which is required to be categorised as a ‘full democracy’.

Ultimately, there is a growing body of research on Singapore’s education system and high performance in international assessments, as well as on cultural, economic and political characteristics but more precise analytical discussion on significant factors related to educational attainment is required. A comparison with an ever more underreported high-performing country, Estonia, seems appropriate in that regard.

Theoretical framework

Many of the explanatory variables are similar to the input/output model in the economics of education literature (e.g., Hanushek 2003; Perelman and Santin 2011; see also Ning et al. 2015) but with national IQ (e.g., Lynn and Vanhanen 2012; Rindermann 2018) as an addition. Moreover, the analysis in this article is more qualitative or mixed. Educational attainment, i.e., the PISA scores in 2015, is understood as the dependent variable whereas other factors are understood as independent or associated (democracy, GDP per capita) variables. For example, raising teachers’ and students’ cognitive skills, non-cognitive abilities (i.e., effort), and educational quality may be regarded as input factors which lead to either positive, null or, less likely, detrimental output. In this comparative study, each variable is compared with another country’s corresponding level and may regarded as relative advantages/disadvantages. For example, a higher average teacher cognitive skill level is considered an advantage. IQ as an independent variable is associated with the high educational attainment in PISA (Rindermann 2018; Lynn and Vanhanen 2012). Due to very high inter-correlations these two variables may also be understood as representations of a similar underlying cognitive construct (Rindermann 2007; Lynn and Vanhanen 2012; Rindermann 2018; Lynn and Becker 2019).
However, regarding culture, modernisation and globalisation, I use a more interpretive approach. One may regard the educational system as an extension of the current national culture in each country. However, this does only provide an indirect understanding of any given culture. Therefore, in line with (Ratner 2012; 2017), I understand culture as complex systems that must consider both distinctive macro cultural concepts and broader macro variables such as political preferences and economic development. For instance, in China the concept Guanxi explains why Chinese students act egocentrically and expect future returns from seemingly altruistic behaviour despite being trained by moral educators in school to act altruistically (Ratner 2017; see also Xu 2014). In this regard, culture as a hegemonic practice facilitated by a political-economic framework (Laclau and Mouffe 2001; Tan 2012) is especially emphasised but particular concepts will be highlighted as well. This section primarily functions as a macro-contextual backdrop for the consecutive analysis on educational attainment.

**Method and data**

This is a comparative study which aims to present and discuss the most reliable and relevant data on ethnic heterogeneity, migration and integration policies; political leadership and democracy; GDP per capita and growth trends, the relationship between national IQ and PISA scores; quantity of education (annual number of instruction time measured by the number of school days and duration of school days); quality of education (teacher salaries, teacher cognitive skill levels, and respect for teachers). Some relevant sub-variables linked to educational quality, such as class size, students’ well-being and suicide rates, and attentiveness are omitted because as a non-OECD country the OECD reports do not include Singapore (e.g., OECD 2018b).

A substantial part of the data is nevertheless collected from various OECD reports, while complementary data are retrieved from other nation-specific sources and previous research. All major variables and sub-variables that have been highlighted are critically discussed in relation to the literature review. The 2015 PISA scores (OECD 2018a) are largely used as indicators of educational achievement throughout the entire comparative analysis. For the same reason I have presented data on 15-year-olds whenever that has been possible, which leads to a higher degree of validity. The other variables serve as underlying factors associated with PISA scores rather than to imply causation.

National IQ scores are retrieved from Lynn and Becker (2019) in regard to Singapore, and Pullman, Allik, and Lynn (2004) in relation to Estonia. Correlations between national IQ and PISA scores are measured in larger country samples (e.g., Lynn and Vanhanen 2012). However, in case studies it is more appropriate to use a 100/500 scale by dividing the IQ score with the PISA score (see Rindermann 2007). An average PISA score of 500 is expected if the IQ is 100. This provides a form of intercorrelation which is used in the current study.

A way to measure conscientiousness in a cross-national context is to use proxy indicators like educational quantity and ‘respect for teachers’ or attentiveness (Heckman and Kautz 2014). This is because industriousness, a facet of conscientiousness (see MacCann, Duckworth, and Roberts 2009), is directly linked to effort and is cross-culturally comparable and measurable as for instance the annual number of hours spent on schoolwork (regular school hours, cram schools, and homework). Educational quantity data is retrieved from NCEE (2018).

Data on average teacher salaries have been collected from OECD (2018b) and Payscale Singapore, while data on students’ respect for teachers have been obtained from OECD (2016, 91). Hanushek, Piopiunik, and Wiederhold (2019) include teacher salary statistics for both countries in their econometric analysis but the above-mentioned data is more recent. The third sub-variable of educational quality, teachers’ cognitive skill levels, are retrieved from Hanushek, Piopiunik, and Wiederhold (2019). GDP per capita has been collected from IMF (2018). The Economist Intelligence Unit’s democracy index has been used to present each country’s level of democracy in 2018 but reports from 2010 and 2014 are also discussed.
Cultural characteristics and globalisation as related to educational attainment

Estonia is a post-communist state with approximately 1.3 million inhabitants. Historically, its Russian-speaking minority increased in shares and numbers throughout the twentieth century, from 8% in 1939 to 35% in 1989. Not surprisingly, a complex bilingual and politico-linguistic situation has emerged after the fall of the Soviet Union, although Estonian has become the country’s official language. However, the broader ideal is that Estonia is multicultural although with Estonian culture and language as its official backbone. Proficiency in the Estonian language is required to be granted a citizenship, why many non-natives are citizens of Russia or other Russian-speaking countries (Siiner 2006).

Overall, three major tendencies can be identified in regard to Estonia’s cultural characteristics. First, a gradual loss of Marxist-Leninism after the dissolution of the Soviet Union in parallel with the implementation of free enterprise economic policies. The only significant Soviet residue is the earlier socialist imperium’s willingness to cherish each country’s national-cultural identity and to some degree Estonia’s current such builds upon Soviet socialist conceptions. Secondly, a strong but not hostile form of ethno-lingual national identity largely centred on the Estonian language, which throughout earlier phases of history had a low status compared to ‘cultural languages’ such as German and French. The third major feature is a willingness to be a part of the West (Raising 2004; Siiner 2006).

Moreover, Estonia’s national culture and identity has been associated with terms such as order, quiet, stubbornness, and individualism (Raising 2004, 35). Furthermore, the quiet stubbornness is similar to Finnish sisu (Brueggeman 2008; Sahlgren 2015; Duckworth 2017). Despite similarities one should be hesitant to impose foreign cultural concepts, since Finland and the Finnish people do not occupy much space in Raising’s (2004) in-depth ethnographic study of the Estonian culture and identity. Nevertheless, the predominantly positive elements ascribed to Estonians’ self-identity may have been transmitted to millennials who performed well in PISA.

Singapore has experienced three phases of educational development: the survival stage (1959–1978), the efficiency stage (1979–1996), and 1997 onwards the ‘Thinking Schools Learning Nations’ vision (Tan 2008; Ab Kadir 2019). The first phase was characterised by deep social issues like full-scale or latent ethnic conflicts, linguistic diversity, and the residues of the British colonial rule. While occasionally lacking an element of critical self-reflection, Singapore’s long-lasting national leader Lee Kuan Yew (1923–2015) has addressed many of these issues in an extensive monograph (2000). He underscores that many of the obstacles were gradually turned into national strengths, such as the co-existence of English as a common work language with other languages (majorly Mandarin, Malay and Hindi), British law, and heavy educational and technological investment (Lee 2000). This process is associated with the ideological pragmatism of the hegemonic PAP (People’s Action Party) (Tan 2012). Currently, the Thinking Schools Learning Nations Vision promotes increased diversity of educational choice and innovation, linked with the goal to create more passionate and active students. The implementation of this direction has been characterised by more local autonomy but simultaneously it is connected to centralised control mechanisms which are solidified to ensure quality (Tan 2008).

Broadly speaking, Singapore’s response to globalisation has been signified by neoliberal strategies through which the interplay between state control and global flows of capital plays a key role in relation to economic growth (Tan 2012). However, such economics-centered analyses tend to ignore the cultural peculiarities. Neoliberal ideology is associated with westernisation and Americanisation (Harvey 2007), but Singapore is characterised by a cultural hybridity of both significant British, American, Sino-Confucian, Malay and Hindu elements (Kawasaki 2004; Chua 2012). While the British system, in conjunction with multiculturalism, globalism and ideological pragmatism, has served as a backdrop for the modern development it has comprised a plethora of other components. For instance, the fortification of the Chinese demographic hegemony has been assisted by a reinvigoration of Mandarin (Lee 2000; Tan 2012). Moreover, some western ideals such as individualism and equality have been discarded, while Asian diligence has been cherished and Confucian anti-merchant sentiments deemed antithetical to instrumental economic goals (Tan 2012, 80).
Results

Ethnic heterogeneity, migration and integration policy

The degree of ethnic heterogeneity in Estonia is 31.3% based on data from 2011. Estonians make up 68.7% of the population, while Russians constitute 24.8% of the minority fraction (World Factbook Estonia). Estonians with Swedish ancestry have drastically declined since the independence in 1992 (Rausing 2004). Auers and Kasekamp (2013) have identified a recent rise of radical right-wing populism in Estonia and the country’s immigration policy is, indeed, not as liberal as that of neither neighbouring Sweden nor Singapore. Moreover, such parties are highly critical of the bureaucracy and liberal immigration policies in many EU countries, which in turn has led to a call for more closed borders. However, there is no clear evidence to suggest that this has had an impact upon high-skilled immigration influx, in part because some degree of aversion is mostly directed towards Russians (Auers and Kasekamp 2013; Rausing 2004). Median and average salary levels are better proxy indicators for the relative attractiveness (i.e., a pull factor) of to migrate to a particular country.

Based on data form 2018, Singapore’s degree of ethnic heterogeneity is 25.7%, with Chinese as the majority group (74.3%), and Malays (13%) and Indians (9%) as the two largest minority groups (World Factbook Singapore). However, this ethnic map is an oversimplification since each major ethnic group consists of sub-ethnicities, often related to a particular vernacular language. For instance, within the largest Chinese group, Huaren, the most common languages are or at least used to be Hokkien, Teochew, and Cantonese, while amongst Indians, Tamil, Hindi and Bengali are the most common languages (Chua 2012, 67). Moreover, many Singaporean citizens and permanent residents do not consider newly arrived people from Mainland China to be Singaporean (Yeoh and Lam 2016).

Yeoh and Lam (2016) and Yang, Yang, and Zhang (2017) provide overviews of the migration and integration policies and demographic composition of Singapore, currently with roughly 60% citizens of 5.61 million inhabitants. The shares of foreign people who inhabit the city–state tend to broadly correspond with the demographic makeup of the citizens, although there are more Malays (46%) than Chinese (18%) and the opposite pattern is the case with regard to citizenship. They also stress that between 1990 and 2015, Singapore’s total population increased with 82%; the share of citizens declined from 86% in 1990 to 60% in 2015. Despite the growing influx of foreigners, migration flows into Singapore are regulated by the Work Pass System which allows un-skilled, semi-skilled and high-skilled workers from around the world to enter the country. In addition, there is a so-called Entrepass for entrepreneurs who aim to start a business or firm in the country. High earners are allowed more liberties, such as to bring in one family member (Yang, Yang, and Zhang 2017). Moreover, the Personalised Employment Pass is another recent subcategory within the larger migration-integration framework in Singapore that serves foreign high earners who reside in the country (Yeoh and Lam 2016).

These elitist notions partly reflect Lee Kuan Yew and perhaps his son and successor Lee Hsien Loong’s penchant for cognitive ability studies which demonstrate correlational relationships between socioeconomic status, fertility and IQ (Lee 2000, 135–144; Rindermann, Sailer, and Thompson 2009). Moreover, it echoes a flexible immigration strategy which lightens the fiscal burden, infrastructure pressure, and potentially adverse impact upon Singaporean workers during recessions, when foreign labour consequently must leave the country (Yang, Yang, and Zhang 2017). Despite measures to tackle low fertility rates, a downward trend has been identified between 1990–2015. This provides incentives for the government to promote further immigration from Mainland China and elsewhere. Such measures are also used to sustain the demographic status quo in regard to the ethnic makeup (Yang, Yang, and Zhang 2017), which Lee and his successors believe is important to secure interethnic harmony. Local resentment against a large influx of immigrants has been tackled by a policy of increased regulation of foreign migrants and an official discourse which promotes a set of Singaporean core values (Yang, Yang, and Zhang 2017).

Despite the concerns raised by Singaporean citizens and its semi-authoritarian government, and recent instances of anti-Chinese sentiments (Yeoh and Lam 2016), it is unhesitatingly the case that
the country is much higher ranked on the Global Competitiveness scale (2018), second only after the US, while Estonia is placed on a middling level as number 32. The attractiveness of the country is indicated by the highly skilled foreign workforce.

**Political leadership and democracy**

Singapore is signified by a partly contradictory relationship, because it is not a beacon of democracy, yet its political leadership has been ranked as the world’s highest by some measures (Rindermann, Sailer, and Thompson 2009). The Economist Intelligence Unit data of 2018 indicates that democracy has been on a slow but steady rise throughout the last years. If democracy is understood as an intrinsic if not extrinsic goal, this trend captures some positive features such as an increase of freedom and liberties. As of 2018, Estonia is just slightly below the full democracy benchmark (7.97, 8.0 is the threshold value) while Singapore has reached the value 6.38, significantly lower in the flawed democracy category. While functioning of government (7.86) and civil liberties (7.35) in Singapore are rather high, ‘electoral process and pluralism’ is conspicuously low (4.33). This is a sharp contrast in relation to Estonia where ‘electoral process and pluralism’ is highly ranked (9.58). If one regards politics as a mere adaptive instrument to facilitate economic growth and consolidate a particular party’s hegemony (for a critical discussion, see Barr 2006; Tan 2012), then Singapore is working quite well despite its obvious democratic flaws relative to western and Northeast Asian democracies. However, if one considers democracy as an intrinsic goal which partly transcends economic development, then Estonia is indeed a better manifestation of modernity. Table 1.

Barr (2015) argues that the Lee Hsien Loong administration has gradually lost some of its grip as the hegemonic force in national politics. One indicator of this is the loss of electoral representation in the 2011 elections where it only reached 60.1%, which is the lowest share of support from voters since the foundation in 1963. According to Barr (2015), the Singaporean elite is no longer ‘controlling the narrative’. Further, despite rampant elitist aspirations and discourse they have made a series of mistakes and miscalculations regarding infrastructure (housing and transportation in particular) around 2011–2013. However, Barr’s critique may partly be read as a request for a better and more efficient elitist technocracy, not a different form of governance. Moreover, his article does not consider hard data on PISA, GDP per capita growth rates, and democracy index. For instance, Singapore scored 5.89, indicative of a hybrid regime in 2010, but was categorised as a ‘flawed democracy’ already in 2014 with the value 6.03 (The Economist 2010, 2014).

Indeed, there is always a lag in the data and academic publication; it might be the case that even PISA performance and GDP per capita will deteriorate in the coming reports. However, while housing and transportation issues affect the ordinary lives of the inhabitants in any country, they may merely have a minor effect on educational attainment, at least as they mark only a slight decline in infrastructural standards.

**GDP per Capita in relation to educational achievement**

Table 2 shows that the GDP per capita is substantially higher in Singapore (65 630 USD) relative to Estonia (23 510 USD). There are a set of historical reasons for this. While Singapore’s historical growth rate was relatively compressed, majorly from the 1970s to the early 2000s (Easterly 2014), Estonia has started from a low base as Soviet socialism collapsed in the early 1990s. However, since the independence in 1992 the economy has grew tenfold, albeit with massive fluctuations

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**Table 1. PISA 2015 scores.**

<table>
<thead>
<tr>
<th></th>
<th>PISA science</th>
<th>PISA reading</th>
<th>PISA math</th>
<th>Reference: OECD (2018a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>534</td>
<td>519</td>
<td>520</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>556</td>
<td>535</td>
<td>564</td>
<td></td>
</tr>
</tbody>
</table>
during the economic crisis around 2008/2009 and period of recovery in 2010. Between 2012–2015 the average annual growth rate has been approximately 3.5%. However, the growth rate is expected to slow down in the coming years due to a relaxation of internal and external demand (Estonia country study, 105–106; World Factbook Estonia). The growth forecast for 2019 is 3%. The corresponding figure for Singapore is 2.3% (IMF 2018). This may demonstrate that good PISA results may be somewhat trumped by growth forecasts. However, they may constitute proxy indicators for the make-up of the future workforce. Despite the impressive assessment aptitude, Estonia faces a partial mismatch of its current workforce (OECD 2019). As noted, Singapore is somewhat dependent upon high-skilled foreign workers, whereas fewer such individuals will be attracted to the middling salary levels which signify Estonia at this point. In that regard, Singapore faces a better situation.

The nexus between national IQ and PISA scores

As emphasised above, national IQ is largely predictive for PISA performance. According to Pullman, Allik, and Lynn (2004), Estonia has a national IQ of 99.4. This correlates well with the average PISA scores of pupils and students tested at age 7–19 (n = 4,874) on the WISC-R IQ test. With a PISA average score of 524.333 the intercorrelation is .88. Table 3.

When excluding the PISA scores in the composed value, Singapore’s national IQ is 102 (Lynn and Becker 2019, 139–140). With an average PISA score of 551.66 (OECD 2018a) it performs somewhat higher than expected on their national IQ score (.88). Thus, since the IQ/PISA intercorrelation is not ‘perfect’ there might some other variables which explain the ‘residual’.

Quantity of education

The NCEE report (2018) shows that the school year in Singapore is 18 days longer, roughly translating into 42.5 annual school weeks compared to 39 in Estonia. The average school day in elementary school lasts six hours in Estonia and five-and-a-half hours in Singapore. This implicates that the annual hours of instruction time are 1050 in Estonia and 1060 in Singapore, which shows a statistically insignificant difference. The annual number of hours spent on homework is unknown and therefore not included.

A large study of Danish students conducted by Andersen, Humlum, and Nandrup (2016; see also Parinduri 2014) indicates that added instruction time leads to small but statistically significant increases of scholastic aptitude of SD 0.15, although the findings may be sensitive to context-dependent national and local differences. Given that Estonia’s compulsory school year is slightly shorter and Singapore’s slightly longer than Denmark’s school year, which was close to the OECD average at that time (Andersen, Humlum, and Nandrup 2016; see also OECD 2018a), it seems to indicate that Singapore has found a balance and may even benefit from a somewhat shorter school day and that Estonia can increase its instruction time to the level of Denmark and gain some additional returns from a fairly cheap economic investment. Table 4.

<table>
<thead>
<tr>
<th>Table 2. GDP per capita.</th>
</tr>
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<tbody>
<tr>
<td>Estonia: 23,510 USD</td>
</tr>
<tr>
<td>Singapore: 65,630 USD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3. Educational quantity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual number of school days</td>
</tr>
<tr>
<td>Estonia: 175</td>
</tr>
<tr>
<td>Singapore: 193</td>
</tr>
</tbody>
</table>
Quality of education

The average annual salary in Estonia for teachers between 25–64 years of age is 23,847 USD (OECD 2018b, 375), whereas the largely corresponding figure for Singapore is 60,000 USD. It is significantly higher at the top of the scale for experienced teachers in Singapore, around 87,000 USD (Payscale Singapore). This provides incentives for Singaporeans to become teachers and to attract high-skilled individuals; however, it must be seen in the light of the average wages in the entire country which are roughly 5-10% higher (Payscale Singapore). Therefore, the average teacher cognitive skill level constitutes a better indicator in this comparative context.

The average teacher cognitive skill in the OECD, based on PIAACC scores are 259 points in numeracy and 268 points in literacy. PIAACC measures each skill according to a 500-point scale. The result for Estonia’s teacher pool is 285 for numeracy and 294 for literacy, whereas their Singaporean counterparts have 303 in numeracy and 300 in literacy (Hanushek, Piopiunik, and Wiederhold 2019), see also Table 5. This does in fact place Estonia at a moderately high level in the OECD while Singapore is one of the top performers after Finland. However, the data is from 2011/2012 and thus older relative to salaries in OECD (2018b). Hanushek, Piopiunik, and Wiederhold (2019) conclude that if other countries would raise their teachers’ average cognitive skills to the same level as Finland, the PISA scores would significantly increase. They stress:

In the OLS estimation with the full set of controls, we find that a one standard deviation (SD) increase in teacher cognitive skills is associated with 0.10-0.15 SD higher student performance. To put these estimates into perspective, they imply that roughly one quarter of gaps in mean student performance across our 31 countries would be closed if each of these countries were to raise the median cognitive skills of teachers to the level of Finnish teachers (the most skilled teachers by the PIAAC measures).

Given that Estonia and Singapore outperform Finland in PISA 2015 (OECD 2018a), these results are less pertinent for them but should not be overlooked. There is still a Singaporean advantage of 44 points in PISA mathematics relative to Estonia (see also Toh, Kaur, and Tay 2019).

OECD (2016) reports that only 6% of Singaporean students lack respect for their teacher whereas the OECD average is 20% and Estonia has 17% in that regard. Whether this reflects a strong educational culture in Singapore, or the general national culture is hard to discern. Nevertheless, it provides another advantage for Singapore relative to Estonia and many other countries.

Conclusion and discussion

The interpretive analysis of national cultural characteristics and political leadership provides significant cues related to Estonia and Singapore’s high educational performance. Estonia’s political leaders, inclusive of the national leader and filmmaker Lennart Meri who served as the country’s second president from 1992–2001, have been much less salient and conspicuous than those of Singapore (Lee Kuan Yew in particular), partly because Estonia is more democratic, while Singapore has based its leadership on a pragmatist-elitist technocracy the 1960s onwards. In Estonia’s case the national culture is associated with quiet and thrift traits, at least until recently, combined with

### Table 4. Teacher salaries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Average annual teacher salary</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>Estonia</td>
<td>23,847 USD</td>
<td>OECD (2018a)</td>
</tr>
<tr>
<td>Singapore</td>
<td>60,000 USD</td>
<td>Payscale (2019)</td>
</tr>
</tbody>
</table>

### Table 5. Teacher cognitive skill levels.

<table>
<thead>
<tr>
<th>Country</th>
<th>Teachers average cognitive skill levels</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>numeracy: 285; literacy: 294</td>
<td>Hanushek, Piopiunik, and Wiederhold 2019</td>
</tr>
<tr>
<td>Singapore</td>
<td>numeracy: 303; literacy: 300</td>
<td></td>
</tr>
</tbody>
</table>
free enterprise and westernised modernity not very different from that of neighbouring Sweden. In Singapore, a blend of British, American, and Sino-Confucian features is salient, in concert with a strong emphasis upon educational attainment and economic growth. Estonia’s economic growth started much later, after the independence in 1992, and the country is not up to par with Singapore, one of wealthiest countries in the world with regard to GDP per capita and salary rates. However, Singapore is only slightly better in PISA (2015), although the differences in mathematics are substantial in favour of Singapore. The results seem to be, in part, associated with higher salaries and teachers’ cognitive skill levels. This demonstrates a link between teacher competence and the facilitation of high quality of tertiary education.

The combination of Singapore’s relatively high national IQ (102), high-skilled foreign labour, and an economy which facilitates the pull of such ‘talent’ has proven to be successful over time, although with some recent challenges. In the case of Estonia its high PISA scores may also improve the country’s image as an indicator of national branding, why it might be relatively crucial to sustain or improve the educational performance in order to create a positive feedback relationship. However, such potential bi-directional causal relationships are rather speculative and might have small effect sizes in the light of macro processes at the national, regional and global level. How much can Estonia really affect its current situation, whether in regard to economic growth and/or educational achievement?

Nonetheless, Estonia can be proud of its high performance despite its relatively peripheral position within the OECD and the EU. Apart from the national IQ (99.4), which however is close to the British mean of 100 (Lynn and Vanhanen 2012), Estonia’s high performance relative to the OECD average (493.66 in PISA 2015) and wealthier Western countries, remains somewhat of a minor mystery. The reason is certainly not high educational quantity or respect for teachers; perhaps not high teacher salaries or cognitive skills, either. Sub-variables related to educational quality may thus be further researched. For instance, the teacher cognitive skill levels might not (always) properly reflect instructional competencies. For instance, Sweden’s teacher pool consists of highly skilled teachers based on their average academic credibility (Hanushek, Piopiunik, and Wiederhold 2019) but are often selected within a virtually non-competitive national environment (SVT 2018). Moreover, the resilience among Estonian students might be higher than the OECD average (OECD 2011).

The educational research community has to a large part transcended PISA policy suggestions as a binary situation in which policy makers either accept such recommendations or reject the entire system as an extension of a ‘neoliberal agenda’ of imposed accountability (for a critical discussion, see for example Hursh 2007; Rezai-Rashiti, Segeren, and Martino 2017) or nudging. Some studies suggest that it has not even affected national educational policy discourses to a substantial degree (Rautalin, Alasuutari, and Vento 2019). However, with large student samples and big data made available it has indeed made comparisons more comprehensive and valid (Hanushek, Piopiunik, and Wiederhold 2019). Be that as it may, this study indicates that at least up until 2015 Estonia and Singapore are two high performers that serve as decent role models for at least smaller nations within the OECD and its partner countries.

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**References**


