Renewal Capital Matters: Comparison Between Lithuania and Taiwan

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Abstract: In a hyper-competition era with the shadows by COVID-19 pandemic, nations as well as companies are competing for talents, high-technologies and innovations to sustain the economic performance and competitiveness. This study compares the NIC of two small economies, Lithuania and Taiwan, that both perform better than most countries during the pandemic, aiming to understand their next steps to sustain the successfulness after the pandemic. The study utilized the ELSS (Edvinsson, Lin, Stahle and Stahle) model (Stahle et al., 2015) with 48 indicators collected from the World Competitiveness Yearbook to measure the degree of NIC. Based on 20 years (2001-2020) national intellectual capital (NIC) panel data, the descriptive analysis reveals that Lithuania lags behind Taiwan renewal capital. However, Lithuania's market capital and process capital have great improvement over the past 20 years and are catching up with those of Taiwan. The renewal capital mainly consists of R&D spending/GDP, business R&D spending, cooperation between corporations and universities, venture capital, entrepreneurship, development and application of technology and 6 other renewal relevant indicators. From the perspective of NIC, the gap of GDP per capita between Lithuania and Taiwan corresponds to the difference of renewal capital between these two countries. The results show the significance of renewal capital. Those who are unable to attract, retain talents and slow in technology renewal will not be competitive and sustainable. We suggest that Lithuania utilize its short-term NIC to boost up economic development, then invest more in talent development and technology advancement to ensure its sustainability.

Keywords: National intellectual capital, Renewal capital, Technology advancement, Competitiveness, Panel data

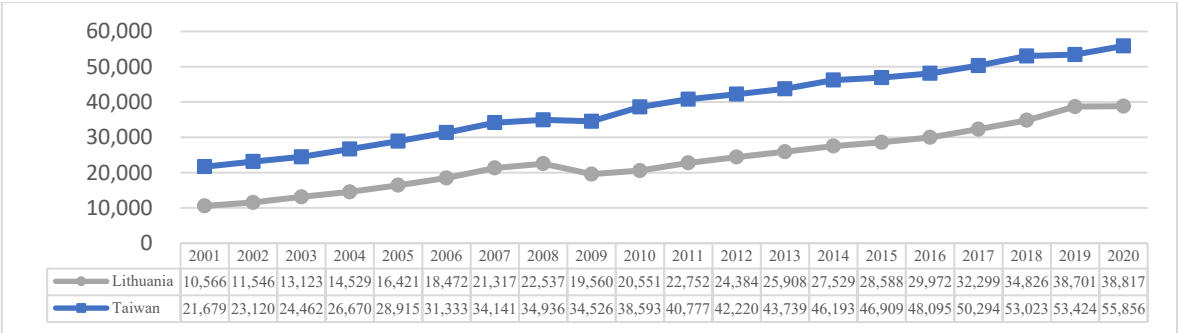
1. Introduction

The COVID-19 pandemic has impacted the global economy and led to a global economic downturn, with many countries experiencing recessions or significant slowdowns in economic growth. However, some countries performed better than others during the pandemic, such as Taiwan and Lithuania (Lee, Hu, & Kung, 2022; Martinho, 2021). This study compares and analyzes Lithuania and Taiwan's national intellectual capital performance to find out the next steps to sustain their economic performance after the pandemic.

Taiwan's economic performance during the COVID-19 pandemic has been relatively robust compared to many other countries. The government's effective response to the pandemic, strong healthcare system, resilient export-oriented economy, strong manufacturing sector, and digital transformation efforts played significant roles in mitigating the economic impact and contributed to its relatively strong economic performance during the COVID-19 pandemic.

Lithuania experienced significant economic challenges during the COVID-19 pandemic. The pandemic profoundly impacted various sectors of the economy, but Lithuania managed to navigate through the crisis relatively well compared to some other European countries. While Lithuania experienced an economic contraction during the pandemic, the country's resilient export sector, government support measures, and the gradual recovery of economic activities have helped mitigate the impact (Nakrošis & Bortkevičiūtė, 2022). Lithuania remains focused on promoting economic growth, attracting investments, and enhancing its competitiveness as it emerges from the pandemic

Figure 1 shows the progression of GDP per capita. Taiwan's GDP per capita remains higher than that of Lithuania and the gap keeps growing slowly from 2001 to 2018. Both Taiwan and Lithuania show continuous improvements in GDP per capita despite the drop from the financial crisis in 2009. Taiwan's GDP per capita remains almost unchanged in 2009, followed by a great increase in 2010 and then shows steady progression until 2020. Lithuania's GDP per capita dropped severely in 2009 and kept a slow growth until 2019.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Lithuania	10,566	11,546	13,123	14,529	16,421	18,472	21,317	22,537	19,560	20,551	22,752	24,384	25,908	27,529	28,588	29,972	32,299	34,826	38,701	38,817
Taiwan	21,679	23,120	24,462	26,670	28,915	31,333	34,141	34,936	34,526	38,593	40,777	42,220	43,739	46,193	46,909	48,095	50,294	53,023	53,424	55,856

Figure 1: GDP per Capital from 2001 to 2020

2. Intellectual Capital

Initially considered as the difference between a firm's market value and the book value, intellectual capital is defined as "intellectual material-knowledge, information, intellectual property, experience- that can be put to use to create wealth" (Stewart, 1997). It gives a country a competitive advantage and is widely recognized as a critical force driving economic growth (Lin, 2018). The NIC mainly consists of four subcategories: human capital (HC), market capital (MC), process capital (PC) and renewal capital (RC) (Bontis, 2004; Lee, Lin & Lin, 2017; Lin, 2018), described hereunder.

Human capital represents individuals' knowledge, expertise, competencies, skills, intuition, wisdom, and ability to achieve national tasks and goals (Bontis, 2004; Lin and Edvinsson, 2011). Typically considered as the most essential link in the value creation process, human capital is a source of innovation, strategic renewal, and a resource for developing and cultivating other intellectual assets (Curado, Henriques & Bontis, 2011).

Market capital refers to the assets in a nation's relationship with international markets (Lin and Edvinsson, 2011) and its capability to provide a desirable, competitive solution to its international clients' needs (Bontis, 2004). As a type of social intelligence in national intra-interrelationships, the focal area entails legal relationships, market mechanisms, social networks, customer or national loyalty, flexibility and adaptability, resilience of the economy (Lee *et al*., 2017; Lin, 2018).

As the non-human reservoir of knowledge embedded in a nation's technological, information, and communication systems (Bontis, 2004), process capital is the cooperation and flow of knowledge requiring structural intellectual assets (Lin and Edvinsson, 2011). The assets in the focal point include information systems, laboratories, national infrastructure, quality scientific research institutions, and a legal environment for entrepreneurship (Lin, 2018).

Renewal capital is a nation's capability and investments in increasing its competitive advantage for future growth and intellectual wealth. As a country's ability to create, sustain and develop competitive strength, renewal capital includes investments in novel, innovative entrepreneurship activities (Lee *et al*., 2017); some assets include investments in research and developments, patents, the number of scientific publications, total expenditure on R&D and capacity for innovation (Lin, 2018).

3. NIC of the two Countries

This section introduces the data collected and methods, the NIC profile of Lithuania and Taiwan, and the correlation of each dimension of NIC with GDP per capita (PPP).

3.1 Data and Methods

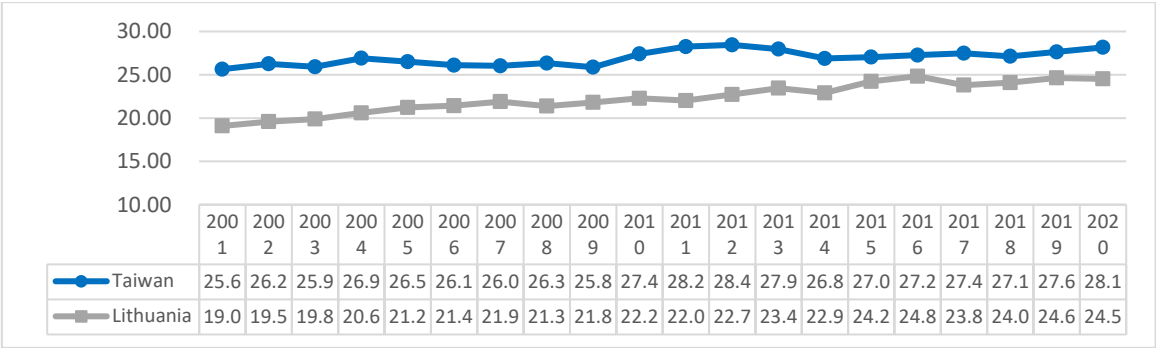
This study utilized the ELSS model which contains 48 indicators (Stahle, Stahle and Lin, 2015) to measure NIC. Table 2 shows the indicators in the model. Based on the model, we collected the data from World Competitiveness Yearbook from 2001 to 2020.

Two types of data are provided in the database: absolute value data, such as "patents per capita" and qualitative rating data based on a scale of 1 to 10, such as "image of country". To integrate the absolute data and qualitative rating, each absolute data is transformed to the number into a 1-10 score by dividing to the highest value of each variable and multiplied by 10. We repeat the data transformation procedures for all absolute value indicators of all four component capitals. We average the 12 indicators to form the score of each component capital and sum up the four component capitals to measure the overall NIC.

This study uses descriptive analysis from the data ranging from 2001 to 2020 to compare each dimension of NIC of Lithuania and Taiwan and the correlations among the dimensions and GDP per capital (ppp).

3.2 NIC Profile of the two Countries

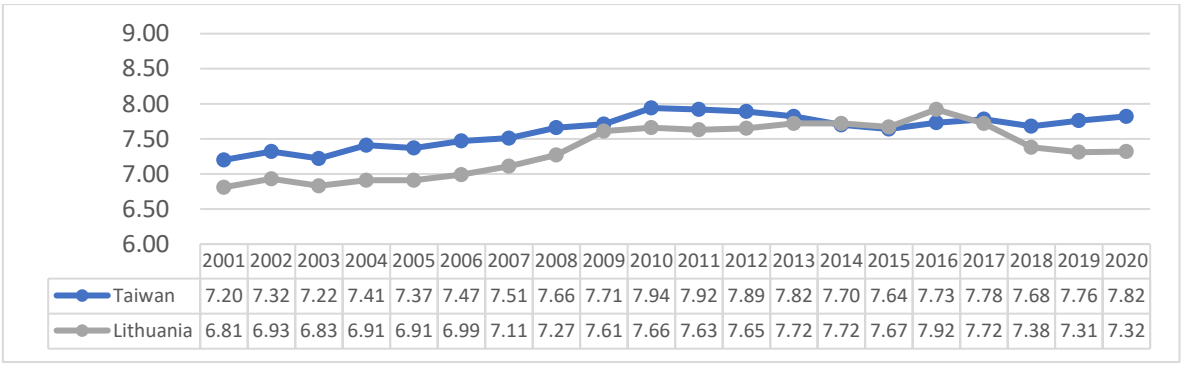
Figures 2-6 show Lithuania and Taiwan's overall NIC, HC, MC, PC and RC trends. Figure 2 shows that Lithuania remains lower in NIC level but the gap continues to narrow. Lithuania has greatly improved during the 20 years from NIC degree of 19.09 to 24.52. On the contrary, despite the higher degree of NIC, Taiwan only shows limited progress.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	25.6	26.2	25.9	26.9	26.5	26.1	26.0	26.3	25.8	27.4	28.2	28.4	27.9	26.8	27.0	27.2	27.4	27.1	27.6	28.1
Lithuania	19.0	19.5	19.8	20.6	21.2	21.4	21.9	21.3	21.8	22.2	22.0	22.7	23.4	22.9	24.2	24.8	23.8	24.0	24.6	24.5

Figure 2: Overall NIC from 2001 to 2020

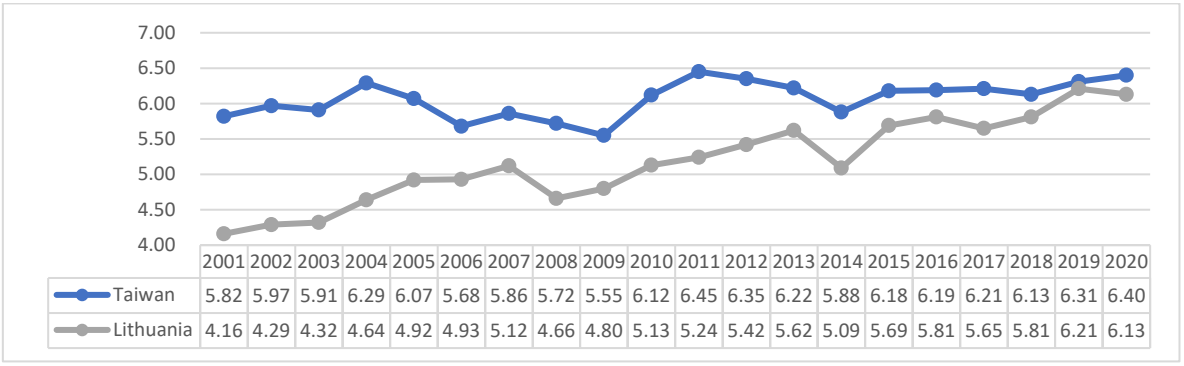
Figure 3 shows that Taiwan and Lithuania experienced HC improvements over this period. Taiwan generally had a higher HC than Lithuania throughout these years. From 2014 to 2016, Lithuania caught up with Taiwan, even higher than Taiwan. However, after 2017, Lithuania's HC lagged behind Taiwan and regressed to the same level in 2008.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	7.20	7.32	7.22	7.41	7.37	7.47	7.51	7.66	7.71	7.94	7.92	7.89	7.82	7.70	7.64	7.73	7.78	7.68	7.76	7.82
Lithuania	6.81	6.93	6.83	6.91	6.91	6.99	7.11	7.27	7.61	7.66	7.63	7.65	7.72	7.72	7.67	7.92	7.72	7.38	7.31	7.32

Figure 3: HC from 2001 to 2020

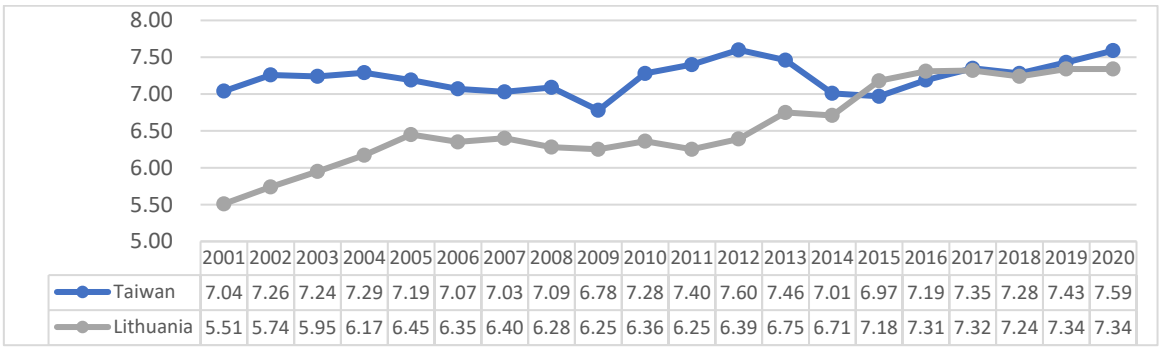
Figure 4 shows that although Lithuania's MC lagged largely behind Taiwan in 2001, it continued to catch up afterward. Taiwan and Lithuania have had similar fluctuations within the 20 years, but Lithuania has made much progress and finally reached a similar level with Taiwan.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	5.82	5.97	5.91	6.29	6.07	5.68	5.86	5.72	5.55	6.12	6.45	6.35	6.22	5.88	6.18	6.19	6.21	6.13	6.31	6.40
Lithuania	4.16	4.29	4.32	4.64	4.92	4.93	5.12	4.66	4.80	5.13	5.24	5.42	5.62	5.09	5.69	5.81	5.65	5.81	6.21	6.13

Figure 4: MC from 2001 to 2020

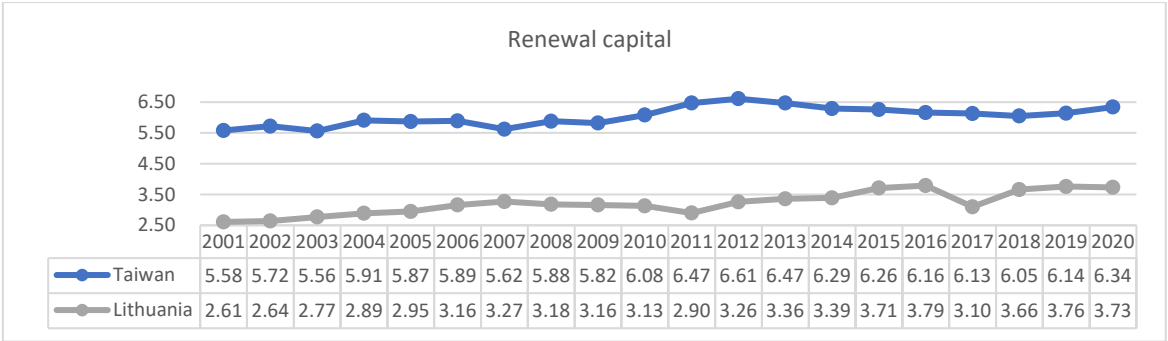
Figure 5 shows a similar pattern with MC. Lithuania lagged largely behind Taiwan in 2001 but showed steady progress afterward and reached almost the same level as Taiwan. On the contrary, Taiwan exhibits fluctuations and shows only a tiny improvement during these 20 years.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	7.04	7.26	7.24	7.29	7.19	7.07	7.03	7.09	6.78	7.28	7.40	7.60	7.46	7.01	6.97	7.19	7.35	7.28	7.43	7.59
Lithuania	5.51	5.74	5.95	6.17	6.45	6.35	6.40	6.28	6.25	6.36	6.25	6.39	6.75	6.71	7.18	7.31	7.32	7.24	7.34	7.34

Figure 5: PC from 2001 to 2020

Figure 6 shows a considerable gap between Taiwan and Lithuania regarding RC. Both Taiwan and Lithuania have shown slow improvement during these 20 years. Although Lithuania exhibits a greater increase in RC than Taiwan, it still largely falls behind Taiwan.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	5.58	5.72	5.56	5.91	5.87	5.89	5.62	5.88	5.82	6.08	6.47	6.61	6.47	6.29	6.26	6.16	6.13	6.05	6.14	6.34
Lithuania	2.61	2.64	2.77	2.89	2.95	3.16	3.27	3.18	3.16	3.13	2.90	3.26	3.36	3.39	3.71	3.79	3.10	3.66	3.76	3.73

Figure 6: RC from 2001 to 2020

4. Conclusion

From the comparison of overall NIC and each dimension of NIC, Lithuania shows generally steady improvement for most of the NIC dimensions, and its HC, MC, and PC even once had similar levels with Taiwan or higher than Taiwan. The only significant gap appears in its RC. The apparent difference in RC results in the remaining gap of NIC between Lithuania and Taiwan.

The comparison of the NIC's four components and GDP per capita indicates that the disparity between GDP per capita of Lithuania and Taiwan may result from the gap in RC. In other words, the difference in RC explains the difference in GDP per capita between the two countries. Innovation, the ratio of business enterprises' R&D expenditures to GDP and the share of R&D investment in the high-tech sector are all testified to directly increase GDP (Acheampong, Dzator, Dzator, & Salim, 2022; Falk, 2007). Moreover, this study finds that the impact of renewal capital on GDP per capita may be so critical. Even Lithuania's HC, MC and PC reach the same levels with Taiwan's, its GDP per capita still lags behind Taiwan because of the gap of RC.

Therefore, for Lithuania to increase its GDP per capita, it can increase its RC and HC in the long term and try to maintain the MC and PC in the short term. Lithuania's MC and PC become lower than Taiwan's after 2018 and indicates a warning for Lithuania to maintain the investment in MC and PC to support the long-term improvement of HC and RC. With the investment in MC and PC to build a competitive, sound and welcoming environment, HC and RC could thus be developed and accumulated based on the environments. It might take continuous and enormous investment to improve HC and RC in Lithuania. Nevertheless, due to the significant impacts of RC on GDP per capita, it is crucial for Lithuania to invest in RC in pursuing national economic development.

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