

A Portfolio Approach to Economic Development: Evidence from a Regional Economy

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Views expressed in this presentation are solely of the authors and not necessarily of the City of the Gold Coast Council and Bond University.

Roadmap

Motivation

- No research available on the regional or local level economies
- Shock to tourism and hospitality industry as the leading sector among others and its revival—what is the great economic strategy?

Experience

- Shocks like GFC and COVID-19 have challenged the policy of a one-size-fits-all approach. Greatly relevant to the regional or local context.

Ground reality

- This is important to note regional city policymakers have often implemented policies to drive the few key larger sectors as the ‘backbone’ of the economy
- Implementing development programs are expensive for regional cities with relatively smaller budgets and hard to change once in place

Evidence

- Many researchers align with Kuznets’s philosophy that each problem needs a different solution and diversification in industrial policy remains critical in circumventing any adversity in the process of sustainable growth.
- Literature points to that greater volatility in GDP growth rate lowers the average long-run growth rate and has adverse impacts on the economy (Ramey and Ramey 1995, Prichett 2000)
- Diversification of economic base, rather than regional specialisation, leads to higher productivity and economic growth in the long run (Acemoglu 1997, Ramey and Ramey 1995, Mobarak 2005)

Aim

- Present evidence to understand key sectors which are risk-reducing and contribute to stability within the economy—Gold Coast economy.



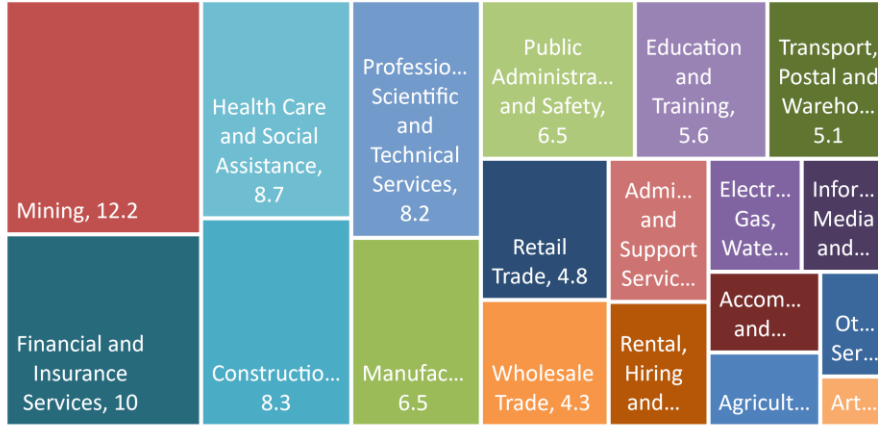
Case Study: Gold Coast, Australia's 6th Largest City

- Gold Coast, QLD: GRP [\\$39.24 Billion](#)
- [643,000 people](#)
- [302,000 jobs](#)
- Largest employer and GVA contributing sector: [Health Care and Social Assistance](#)
- Traditional Focus Sectors: Tourism, Construction
- V-shape recovery after COVID-shock, experienced faster recovery than Queensland and Australia

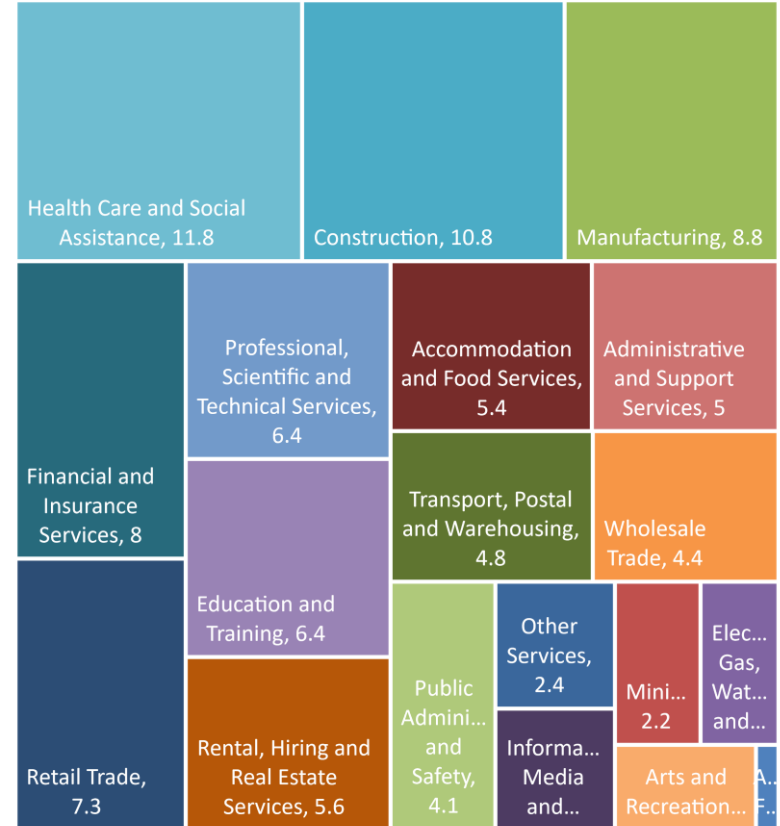
We define it as [a transitional regional economy](#), meaning, those economies that have traditionally focussed on [a few large sectors](#) but are moving towards a more mature economic base with a number of productive and contemporary sectors contributing to GRP (Gross Regional Product).

Composition-2020

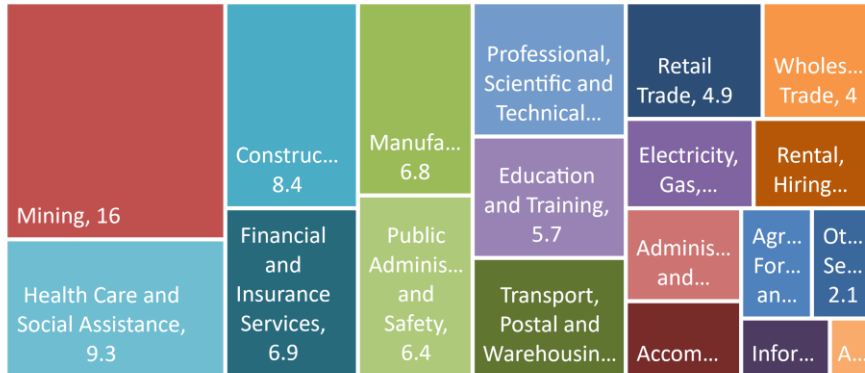
National level composition (%)



Gold Coast economy composition (%)

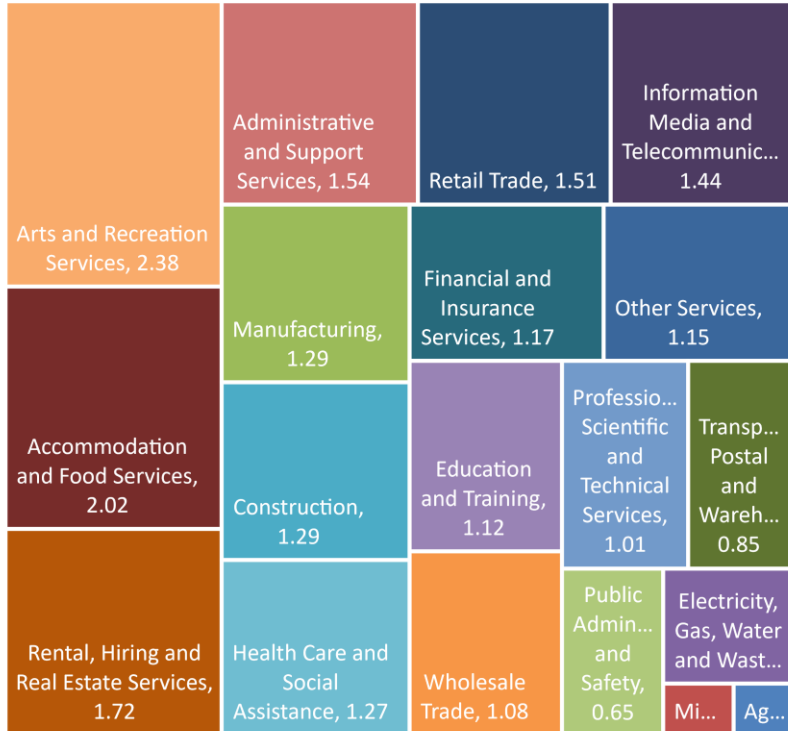


Queensland economy composition (%)

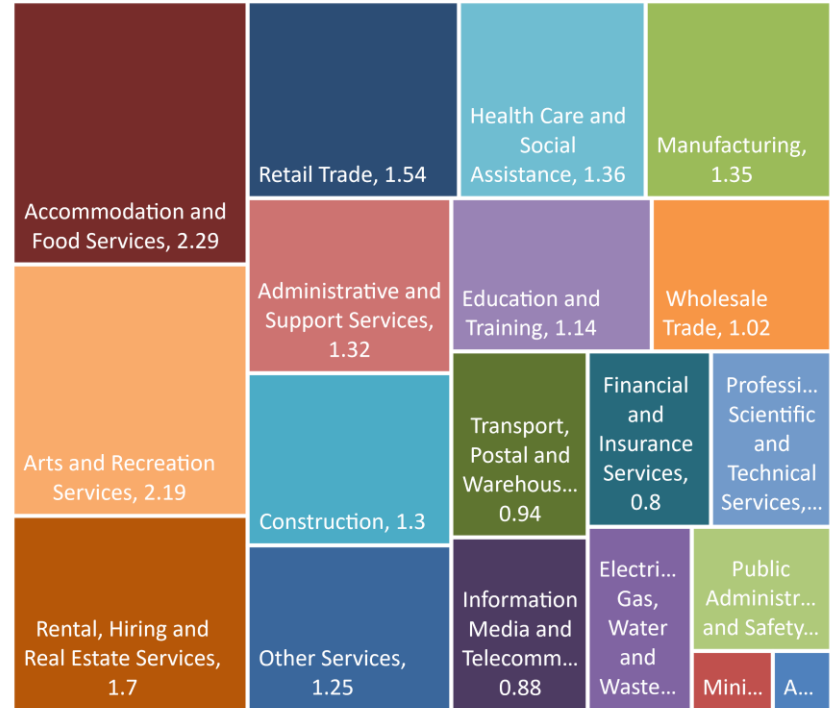


Specialisation w.r.t. Queensland and Australia

GC Location Quotient w.r.t., QLD (Specialisation)

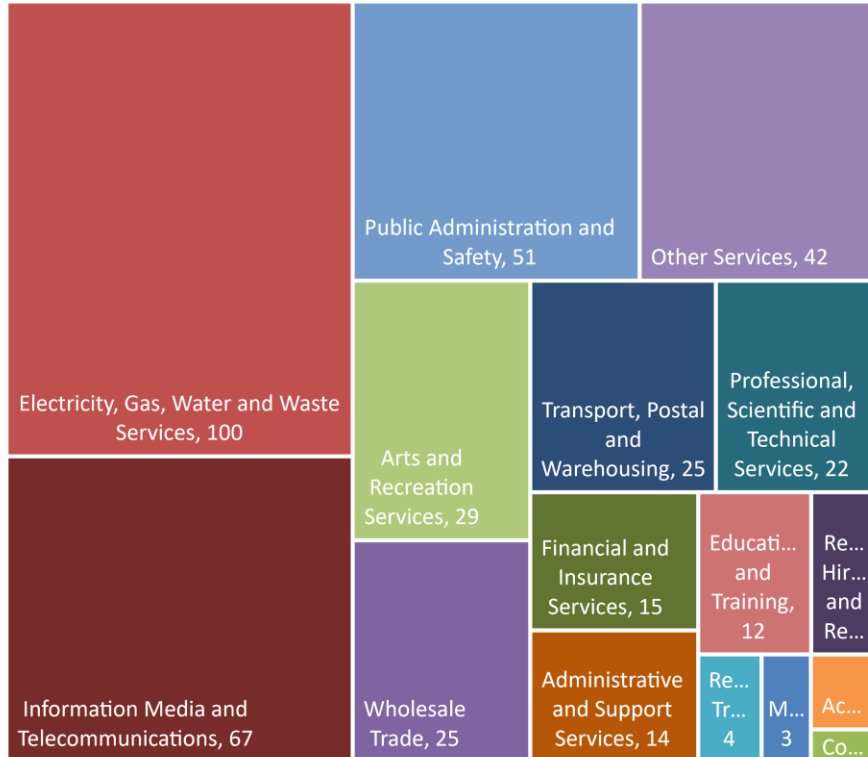


GC Location Quotient w.r.t., Australia (Specialisation)



The Hachman Index of Diversification

GC Hachman Index w.r.t. National Economy:
Normalised Score (0-100)

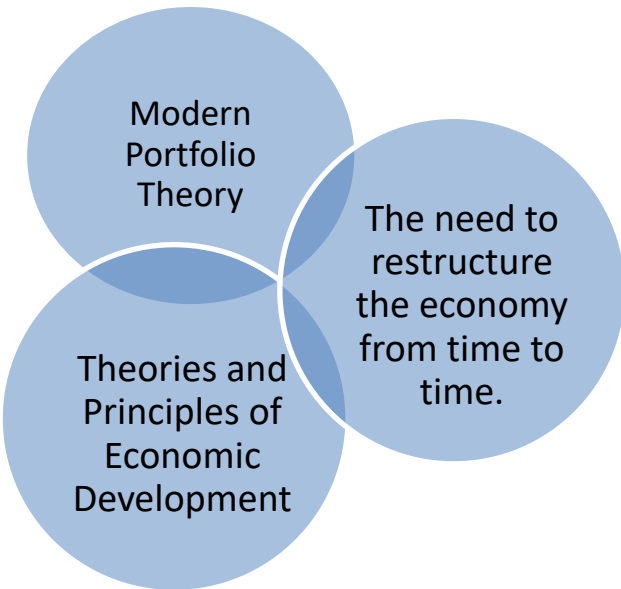


GC Hachman Index w.r.t. QLD Economy:
Normalised Score (0-100)



The Portfolio Approach to Economic Development

Markowitz (1952)>>Tobin (1958)>>Sharpe (1963, 1964)>>Levy and Markowitz (1979)>>Markowitz (1991)>>Merton (1973) and Rubinstein (1976)>>Lucas (1978) relates stochastic consumption and asset returns to output>>Lucas (1978), and Markowitz (1991) basis to develop a model for economies based on portfolio theory.



Simon Kuznets (1950), economic development ‘theory’> the first link between consumption and income that inspired Modigliani (1971) and Friedman (1957) to introduce their Life Cycle-Permanent Income>Hall (1978) extends this hypothesis Hypotheses>Mankiw (1982) adds the depreciation rate to develop a model for consumer durables expenditures>Lewis (1954) emphasized the importance of capital accumulation>The Harrod-Domar (1939, 1946) model requires increasing savings>The Harrod-Domar (1939, 1946) model requires increasing savings>In the meantime, Nurkse (1961) provides a theory of “balanced growth” that is further refined by Singer (1964)>The former such as Singer (1964) and Prebisch (1976) advocated government interventions>Bauer (1981) and Lal (1985), argue against government involvement as an obstructive force in the development process>Ramey and Ramey (1995) show that in the long run, a large variation in growth lowers the average rate of economic growth>Pritchett (2000) goes farther by examining developing and developed countries separately>Regarding industrial policy, Acemoglu (1997) develops a seminal model to show the importance of diversification>Hence, productivity and economic growth increase when the diversification opportunities improve>Mobarak (2005) extends the observations in Ramey and Ramey (1995) and Acemoglu (1997) by carrying out a thorough examination of the relationship between volatility and average growth. The debate about the World Bank and International Monetary Funds (IMF) should follow a one-size-fits-all approach>Krugman (2001) argues that this approach is not helpful, Stiglitz (2002) emphasizes that they are downright harmful.

The Portfolio Approach to Economic Development: A simple model

Based on Cass (1965) and Mankiw (1982) models, the social planner maximises:

$$\text{Max: } W_0 = W_0 \int_{t=0}^{\infty} e^{-\rho t} U_t[K_t(C_t)] dt$$

$$\text{subject to: } S_t = Aw_t - K_t - \delta K_t + rS_t$$

Society's lifetime welfare > social time preference > instant utility > Durable goods > flow durable good expenditure > social asset > wage income >

$$\text{and } K_t \equiv -\delta K_t + C_t$$

The first-order condition for the social welfare maximation—solution: Further differentiating both sides w.r.t σ —variance of the output.

$$\frac{dW_0[Y_t/Y_t]}{d\sigma} = \frac{1}{\lambda\theta} > 0, \text{ as } U' > 0 \text{ and } U'' < 0$$

There is a positive association between the output growth rate and variance—which implies that the policymaker faces the trade-off between low unemployment and volatility. In other words, a society that sacrifices high output growth in the present can enjoy a more stable pattern of growth in the future. This is also shown in Ramey and Ramey (1995) and Mobarak (2005).

Propositions!

Corollary 1: In a regional economy, a policymaker who wishes to maximise social welfare may be facing a trade-off between growth and volatility. Therefore, the policymaker/planner should be focusing on **smoothing growth** by **decreasing the output growth volatility**.

*In the context of transitional economies, Acemoglu (1997) demonstrates that diversification can sufficiently increase the average growth rate. Smoothing growth can be achieved by diversifying into a multi-sector economy, focusing on overall output growth rather than one **special sector**. Our model is a combination of development theory and portfolio theory, therefore we consider all major sectors as investments within the portfolio and output growth is the total rate of return of the portfolio.*

Corollary 2: In a regional economy, a policymaker or a planner who aims to diversify using a portfolio approach to development should attempt to minimise the variance of the overall portfolio return.

COMPUTATIONS!

The rate of return (R_i) is as follows:

$$R_i = \ln \left[\frac{R_t}{R_{t-1}} \right]$$

The resulting returns are then weighted by the proportion each sector has in the overall economy.

This can be shown as:

$$R_{p,j} = \sum_{i=1}^n w_i * R_i$$

Further, the historical average and standard deviation of returns on the portfolio can be calculated as:

$$E(R_p) = \sum_{t=1}^T R_{p,j}$$

$$S_p = \sqrt{\frac{(R_{p,j} - E(R_p))^2}{T-1}}$$

$$\text{Minimise: } S_p = \sqrt{\frac{(R_{p,j} - E(R_p))^2}{T-1}} \quad \text{subject to: } E(R_p) = \omega ; w_i \geq 0 \cap i \text{ and } \sum_{i=1}^n w_i = 1$$

The objective is to minimise the standard deviation for return by altering the different shares of sectors in the economy, the objective function and corresponding constraints can be written as:

The weighted standard deviation is computed as: $WStd = \sum_{i=1}^n w_i * S_i$

Finally, the risk elimination because of diversification can be computed as:

$$\text{Risk elimination} = 1 - \left(\frac{S_p}{WStd} \right)$$

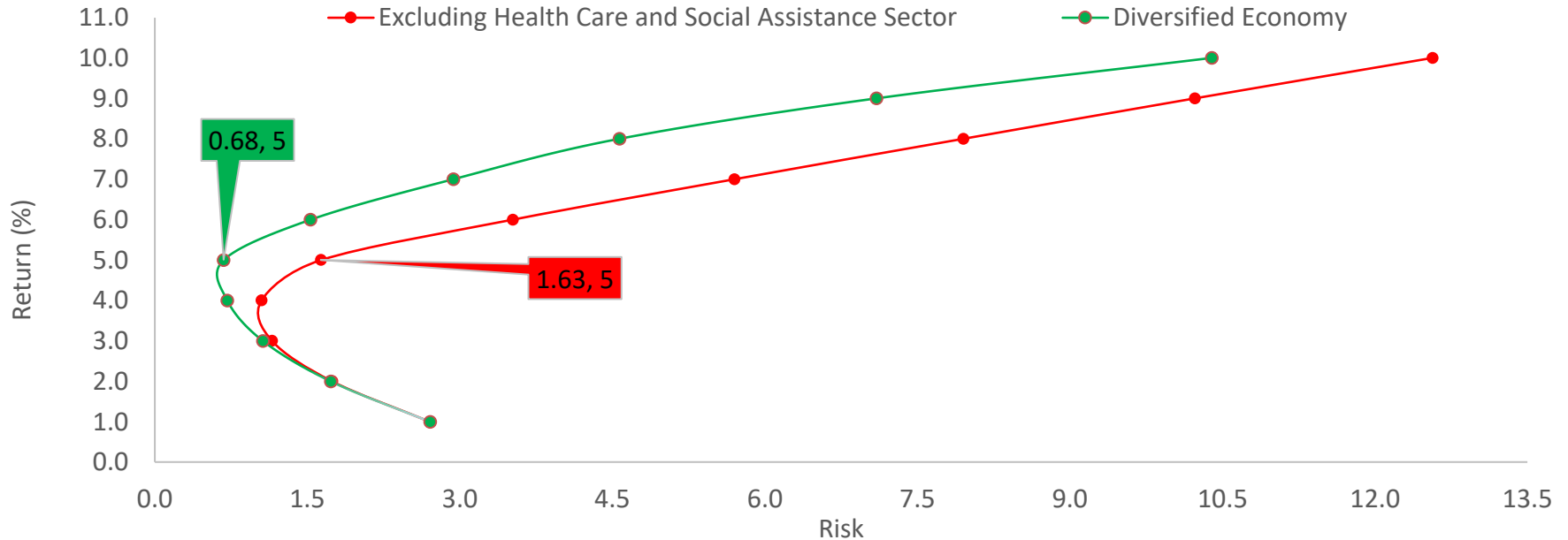
RESULTS: DESCRIPTIVES

Table 1: Summary statistics of sectoral return (2010-2020)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	<i>Average return</i>	<i>Std. Dev.</i>	<i>2020 Wt.</i>
Agriculture, Forestry and Fishing	-16.6	10.5	75.7	1.8	10.2	16.5	-0.6	-6.9	2.3	-21.2	-23.9	4.3	25.9	0.3
Mining	4.5	-18.1	15	59.4	12.2	8.1	29.7	-1.1	11.2	13.9	0.7	12.3	19.6	2.2
Manufacturing	-1.1	0.4	7.4	4.4	-6.1	3.4	6.2	0.7	8.3	4.3	0.6	2.6	4.2	8.8
Electricity, Gas, Water and Waste Services	10.6	12.6	-4.7	-5.8	-1	2.4	-1.3	-0.9	28	0.1	-11.1	2.6	10.8	2
Construction	-4.1	-9.4	-0.9	-2.5	19.2	2.2	7.9	8.4	4.9	-11.2	-11.8	0.2	9.5	10.8
Wholesale Trade	-3.1	-1.8	9.2	6.9	-1.4	-0.4	-1.4	4.5	-1.1	1.9	-4.3	0.8	4.3	4.4
Retail Trade	2.8	3.6	6	3.1	1.7	4.1	2	1.3	3.8	5.3	-1.8	2.9	2.1	7.3
Accommodation and Food Services	0.1	-0.6	7.4	2.9	-0.2	3.3	4.1	-3.1	7.9	9.8	-12	1.8	6.1	5.4
Transport, Postal and Warehousing	2.3	-1.6	8.6	6.5	2.6	0.6	5.7	9.5	13.8	13.7	-10.2	4.7	7	4.8
Information Media and Telecommunications	3.9	6.9	2	4.3	2.7	12.5	20.8	6.7	-7.8	-6.9	16.5	5.6	8.7	2.3
Financial and Insurance Services	-5.6	-3.1	16.7	3.8	-4.6	3.3	11.5	8.6	-3.7	3.7	7.6	3.5	7.3	8
Rental, Hiring and Real Estate Services	-11.1	-5.6	11.8	9.3	10.5	-0.8	5.8	-1.3	3	-2.7	-5.3	1.2	7.4	5.6
Professional, Scientific and Technical Services	10.6	3.8	9.2	4.8	2.8	8.3	3.8	9.3	-0.8	-3.4	2.3	4.6	4.4	6.4
Administrative and Support Services	-2.8	5.7	0.5	1	8.7	5.7	6.1	12.2	19.7	-7.8	-12.6	3.3	9.1	5
Public Administration and Safety	-5.1	16.5	0	-2.6	2.4	-1.9	9.3	1.9	2.4	5.5	11.2	3.6	6.5	4.1
Education and Training	3	1	4.3	1.6	17.9	5	6	-0.8	1.8	3.8	1.2	4.1	5	6.4
Health Care and Social Assistance	6.7	1.7	7.2	5.4	1.5	12.8	7.2	5.9	5	15.8	10.9	7.3	4.4	11.8
Arts and Recreation Services	-4.5	-0.3	5.3	-2.5	-1.1	0.3	2.3	-0.8	5.6	6.1	-10	0	4.8	1.9
Other Services	0	-6.3	9.7	-0.2	5.4	1.1	2.3	0.7	7.4	1.7	-9.7	1.1	5.5	2.4
Tourism	0.9	0.8	6.8	3	1	2.7	3.4	1.5	7.4	8.7	-7.8	2.6	4.4	19.5

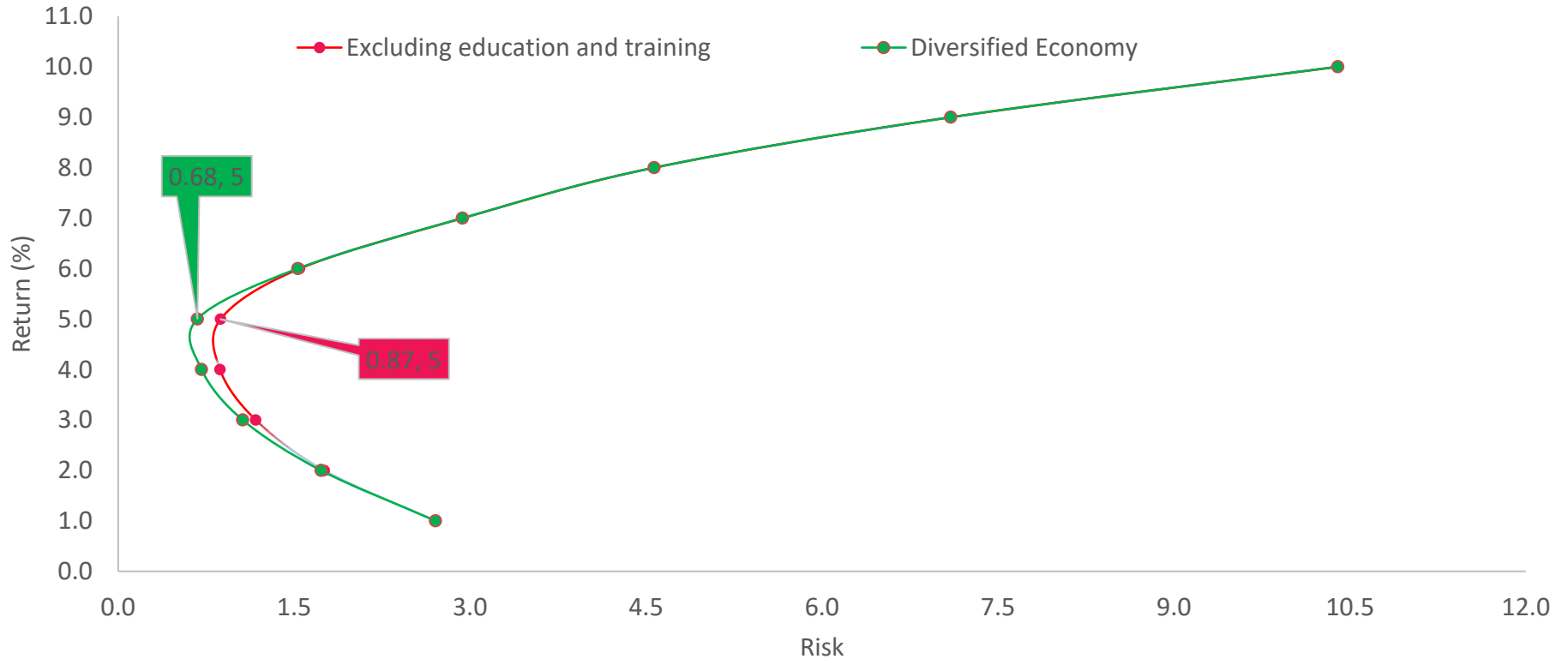
Notes: Sectoral returns are continuously compounded percentage changes in the level of economic activity in the sector. The average return is simply the arithmetic mean during the period, Std. Dev is the sample standard deviation and Wt. is the proportion of the sector in the economy in the last year of the sample period. The tourism sector is a composite of four sectors including Retail Trade, Accommodation and Food Services, Transport, Postal and Warehousing and Arts and Recreation Services.

Results: Excluding Health Care and Social Assistance Sector



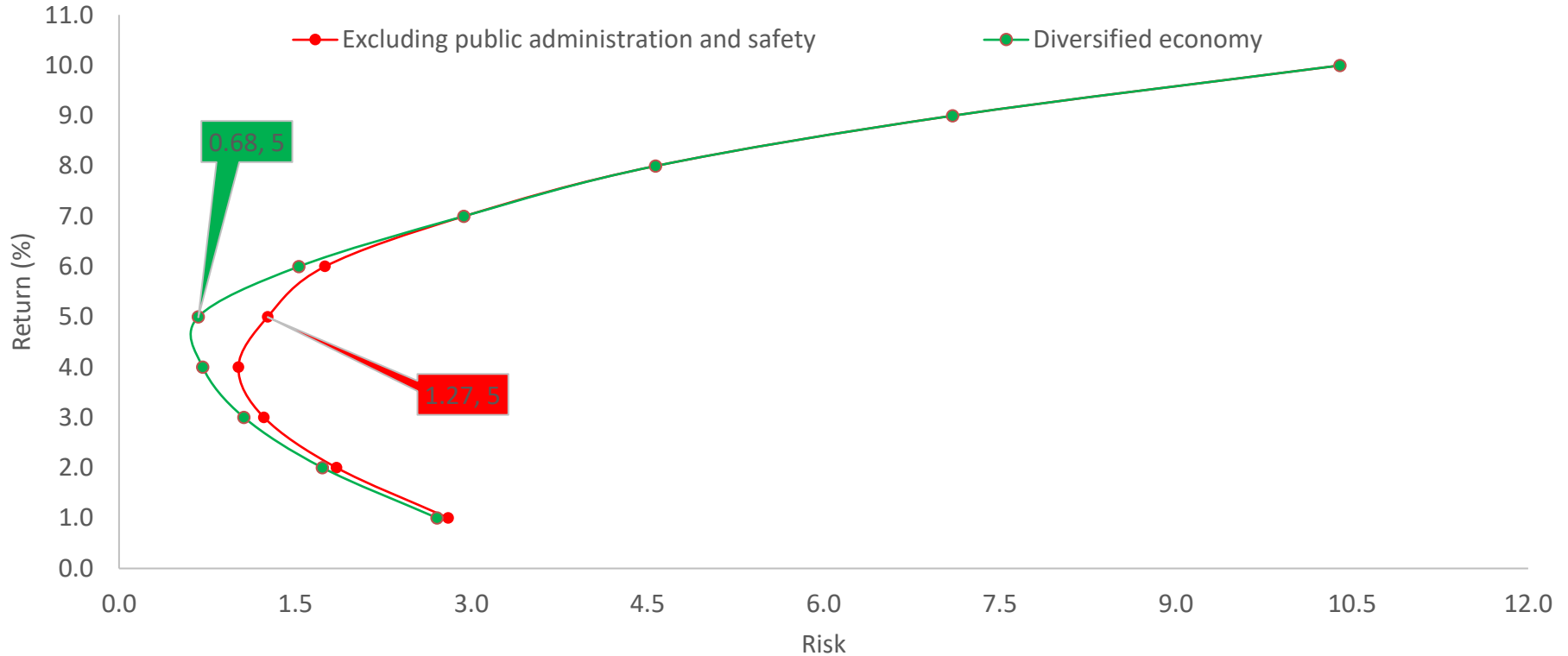
- At the optimum point the economy without Health care and social assistance are **141.9 %** more risk vulnerable relative to a fully diversified economy.
- Risk vulnerability exacerbates as we move away from the above risk-return optimum level.

Results: Education and Training



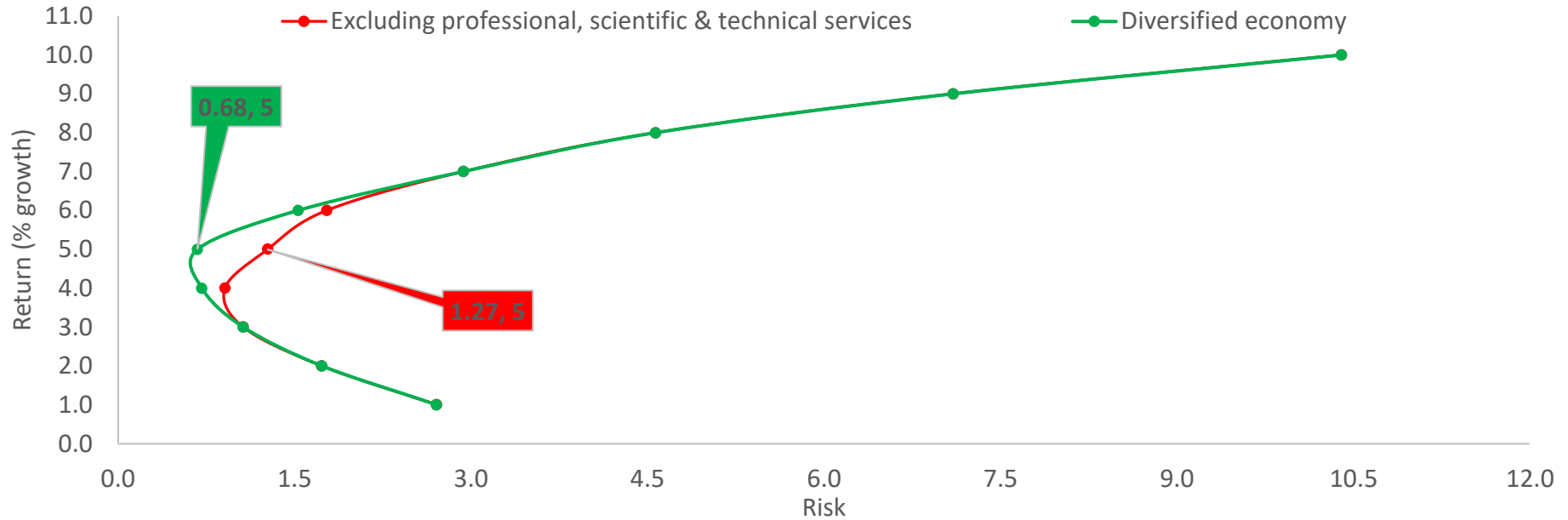
- At the optimum risk-return point Education & training less economy is **29.4 %** more risk vulnerable relative to the fully diversified economy.

Results: Public Administration and Safety



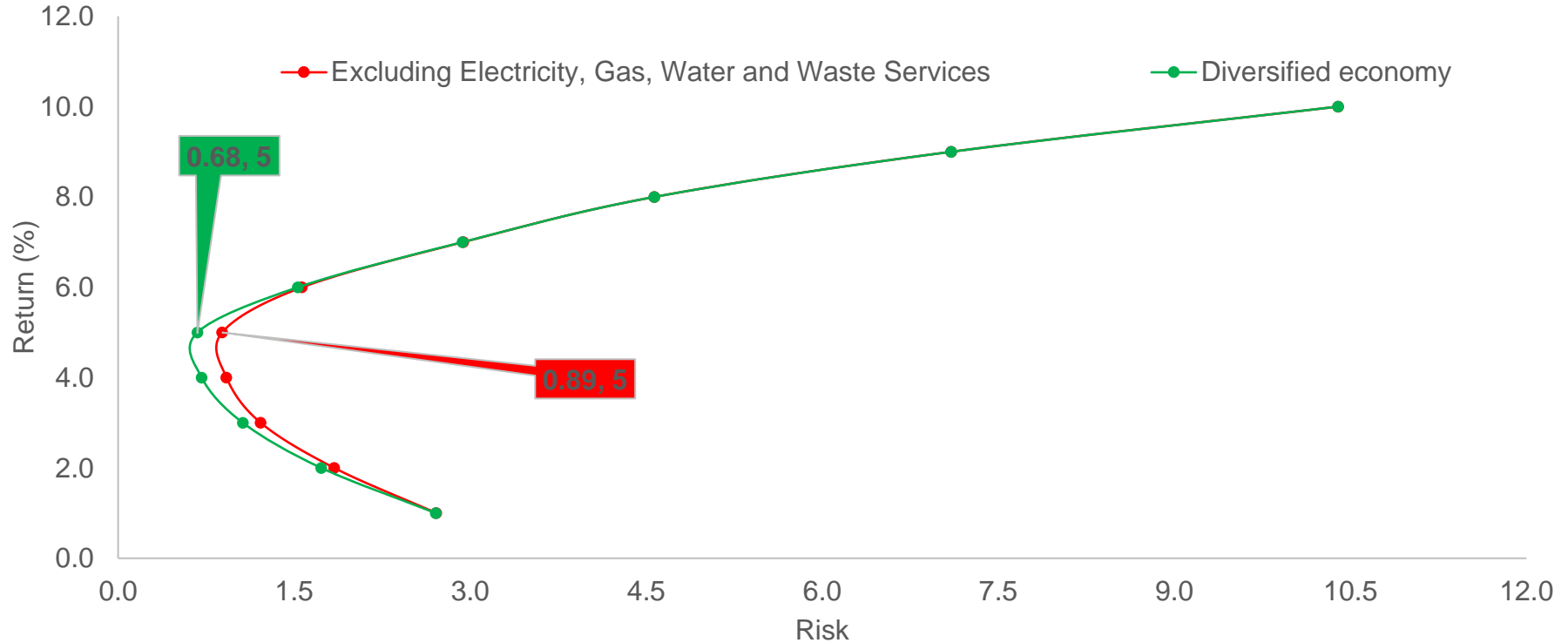
- At the optimum risk-return level, the economy excluding the public administration and safety appears to be 87.4 % more risk vulnerable.

Results: Professional, Scientific, and Technical Services



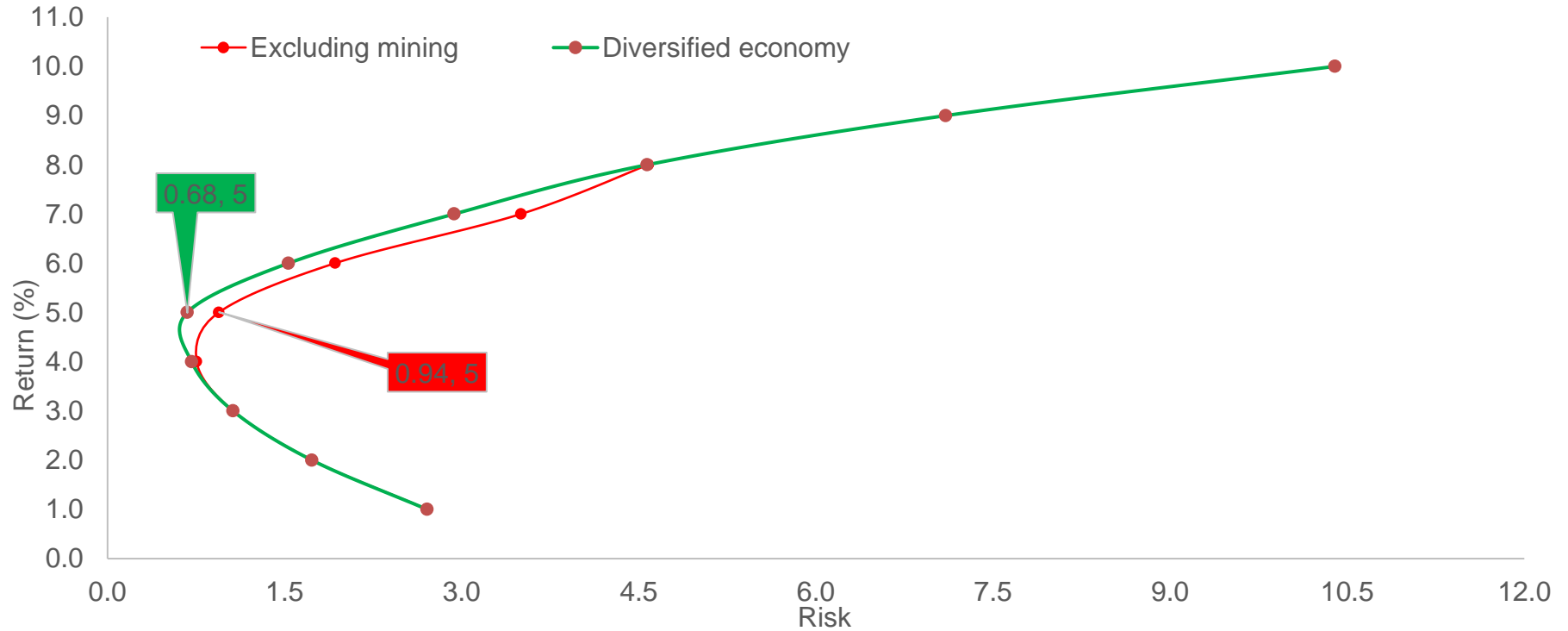
- At the optimal level, the less diversified economy (excluding prof. scientific and tech services) appears to be **71 %** risk vulnerable relative to the given fully diversified economy

Results: Electricity, Gas, Water and Waste Services



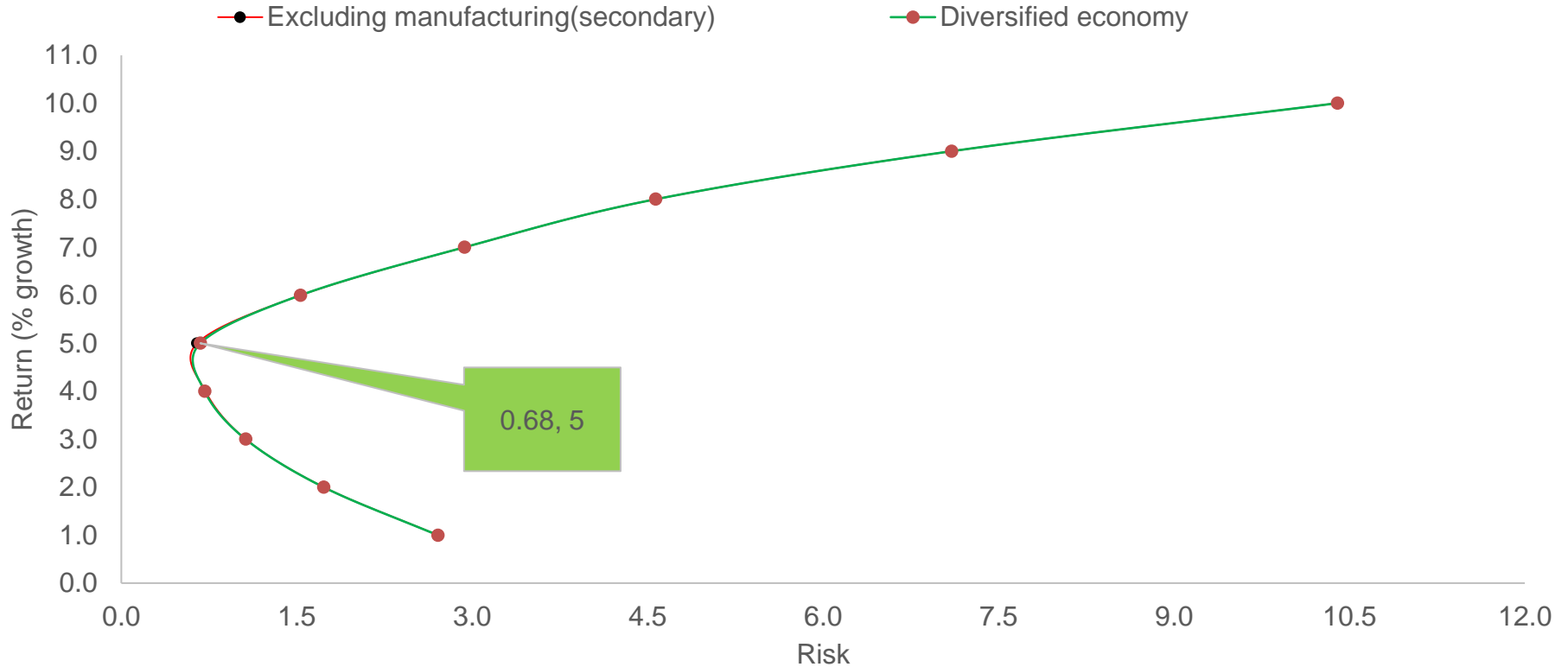
- At the optimal minimum risk point identified, the less diversified economy of electricity, gas, water and waste services is **54.88%** more risk vulnerable relative to a diversified economy.

Results: Mining



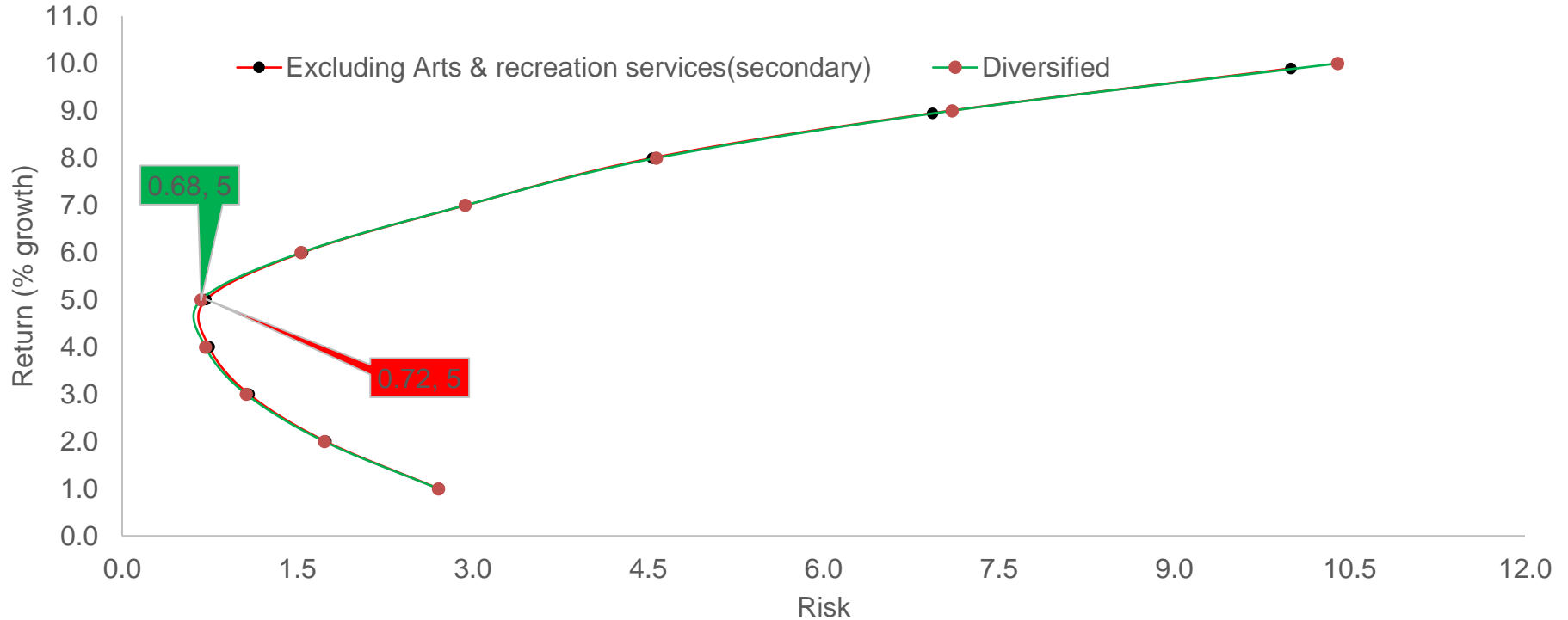
- At the optimal minimum risk point identified, the less diversified economy of mining is **39.5%** more risk vulnerable relative to a diversified economy.

Results: Manufacturing



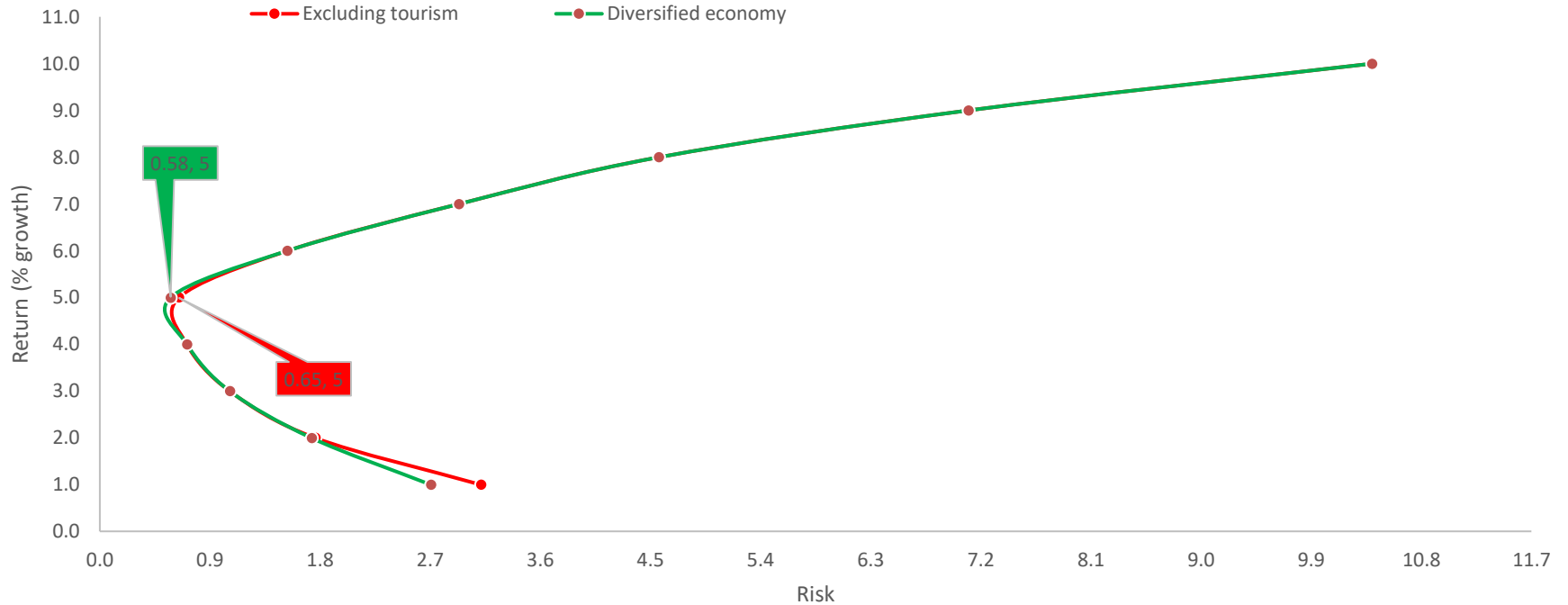
- At the optimal minimum risk point identified, the less diversified economy (excluding manufacturing) is **12 %** more risk vulnerable relative to a diversified economy.

Results: Arts and Recreation Services



- At the optimal minimum risk point identified, the less diversified economy (excluding Arts and recreation services) is **21 %** more risk vulnerable relative to a diversified economy.

Results: Tourism overall



- At the optimal minimum risk point identified, the less diversified economy (excluding tourism) is **11.9 %** more risk vulnerable relative to a diversified economy.

RESULTS

Table 2: Diversified and undiversified economy

Panel A: Unrestricted model with all industries/sectors			Output growth (return)									
	Industries	MVP	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
Weights	Agriculture, Forestry and Fishing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
	Mining	0.03	0.00	0.00	0.00	0.01	0.04	0.07	0.09	0.15	0.34	0.54
	Manufacturing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Electricity, Gas, Water and Waste Services	0.08	0.02	0.11	0.13	0.10	0.08	0.05	0.03	0.00	0.00	0.00
	Construction	0.00	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Wholesale Trade	0.06	0.40	0.46	0.40	0.20	0.02	0.00	0.00	0.00	0.00	0.00
	Retail Trade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Accommodation and Food Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Transport, Postal and Warehousing	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
	Information Media and Telecommunications	0.00	0.02	0.10	0.11	0.02	0.00	0.00	0.06	0.01	0.00	0.00
	Financial and Insurance Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rental, Hiring and Real Estate Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Professional, Scientific and Technical Services	0.23	0.00	0.00	0.01	0.18	0.28	0.21	0.02	0.00	0.00	0.00
	Administrative and Support Services	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.08	0.00	0.00	0.00
	Public Administration and Safety	0.17	0.14	0.13	0.11	0.17	0.20	0.14	0.02	0.00	0.00	0.00
	Education and Training	0.12	0.00	0.08	0.16	0.16	0.14	0.04	0.00	0.00	0.00	0.00
	Health Care and Social Assistance	0.20	0.00	0.00	0.09	0.17	0.22	0.44	0.68	0.83	0.66	0.46
	Arts and Recreation Services	0.00	0.33	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Other Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Standard deviation	Std.	0.58	2.71	1.73	1.06	0.58	0.68	1.53	2.94	4.57	7.10
Wt.		5.37	5.48	5.98	5.99	5.73	6.11	6.33	6.91	6.94	9.58	12.61
Risk reduction		0.89	0.51	0.71	0.82	0.89	0.88	0.76	0.58	0.34	0.26	0.18

Notes: Panel A shows the optimal weighting when all sectors are included. MVP--is the minimum variance portfolio. Std. is the standard deviation on the portfolio. Wt. is the theoretical standard deviation that would occur if each of the sectors were perfectly correlated. The expected return on the minimum variance portfolio in Panel A is 4.0. Risk reduction is the proportion of risk that was eliminated due to portfolio effects.

RESULTS

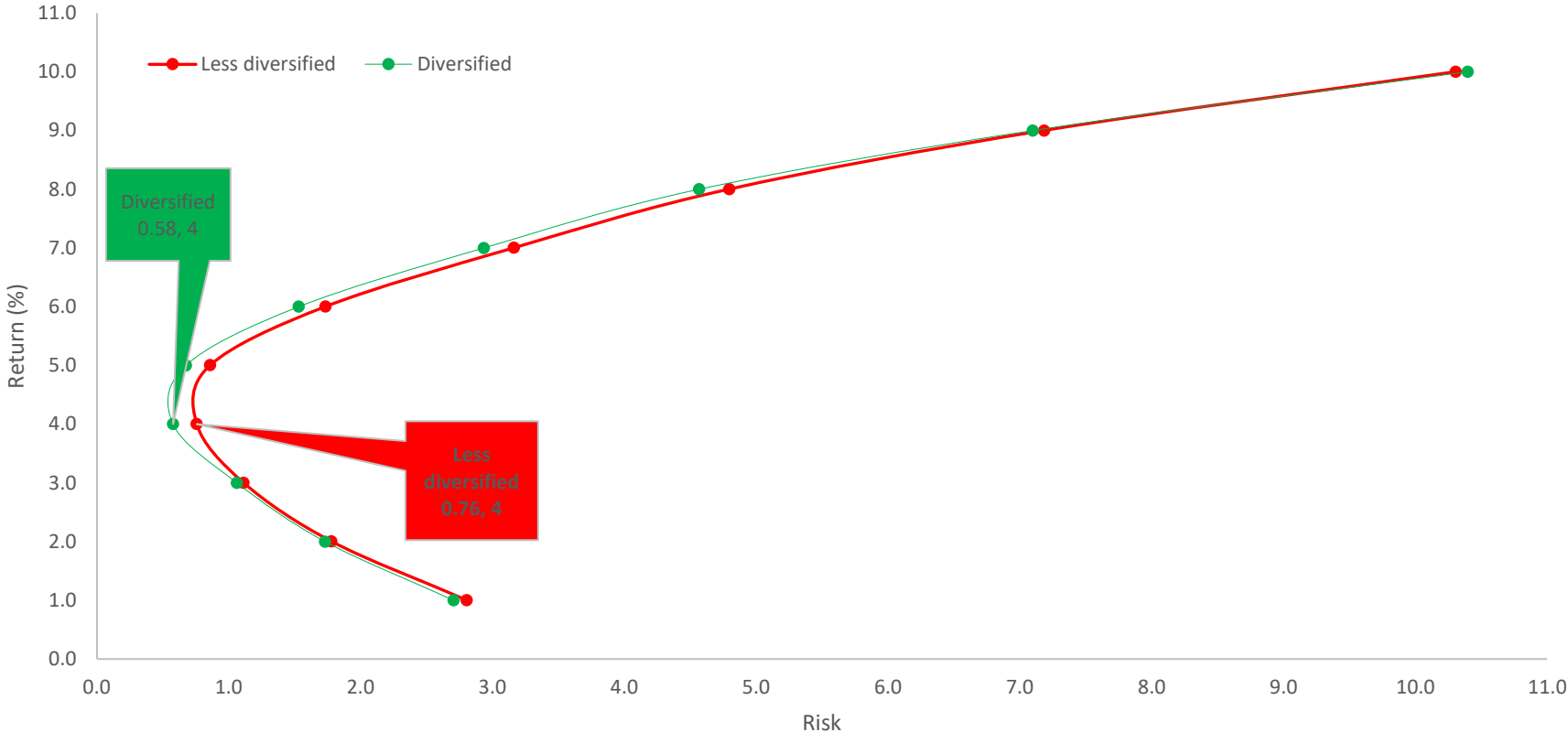
Table 2: Diversified and undiversified economy

Panel B: Unrestricted model overall average (excluding all sectors one by one at a time)													Output growth (return)			
	Industries	MVP	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%				
Weights	Agriculture, Forestry and Fishing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00				
	Mining	0.02	0.00	0.00	0.00	0.02	0.04	0.07	0.10	0.16	0.33	0.52				
	Manufacturing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	Electricity, Gas, Water and Waste Services	0.08	0.02	0.09	0.11	0.08	0.08	0.05	0.03	0.00	0.00	0.00				
	Construction	0.01	0.10	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00				
	Wholesale Trade	0.13	0.40	0.42	0.33	0.16	0.02	0.00	0.00	0.00	0.00	0.00				
	Retail Trade	0.05	0.00	0.05	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00				
	Accommodation and Food Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	Transport, Postal and Warehousing	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
	Information Media and Telecommunications	0.01	0.03	0.09	0.09	0.02	0.01	0.01	0.06	0.02	0.02	0.02				
	Financial and Insurance Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	Rental, Hiring and Real Estate Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	Professional, Scientific and Technical Services	0.20	0.00	0.01	0.03	0.18	0.26	0.20	0.03	0.01	0.00	0.00				
	Administrative and Support Services	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.08	0.00	0.00	0.00				
	Public Administration and Safety	0.17	0.12	0.13	0.12	0.16	0.19	0.13	0.03	0.00	0.00	0.00				
	Education and Training	0.14	0.00	0.07	0.13	0.14	0.13	0.05	0.00	0.00	0.00	0.00				
	Health Care and Social Assistance	0.19	0.00	0.00	0.08	0.16	0.23	0.43	0.66	0.80	0.65	0.47				
	Arts and Recreation Services	0.00	0.34	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	Other Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Standard deviation	Std.	0.76	2.81	1.78	1.11	0.76	0.86	1.73	3.16	4.80	7.19	10.31				
	Wt.	5.64	5.49	5.77	5.60	5.64	6.13	6.45	6.99	7.11	9.59	12.37				
	Risk reduction	0.87	0.49	0.69	0.80	0.87	0.86	0.73	0.55	0.33	0.25	0.17				

Notes: Panel B shows weights when one or the other sector is eliminated as a candidate sector. MVP--is the minimum variance portfolio. Std. is the standard deviation on the portfolio. Wt. is the theoretical standard deviation that would occur if each of the sectors were perfectly correlated. The expected return on the minimum variance portfolio in Panel B is 4.3 Risk reduction is the proportion of risk that was eliminated due to portfolio effects.

RESULTS: Overall economy

Gold Coast Economy (2010-2020)



Take away!

- Identification of industries that impact the overall economy's long-term sustainability most
- Identification of industries vulnerable to risk
- Vulnerable industries need more attention relative to industries that are less sensitive to overall output vulnerability
- Align development programs accordingly
- Carefully design the financial incentives as guided through a rigorous assessment process
- Suggest ways to diversify the existing economy/sectors

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