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# An Exploration of Resilience During the COVID-19 Crisis

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# Labour Market Dynamics and Resilience in Singapore: An Exploration of Resilience During the COVID-19 Crisis*

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September 2020

**Abstract**

Within the context of an economic downturn triggered by the COVID-19 pandemic, this paper explores the concept of resilience as applied to Employment. It analyses the latest available data as the crisis unfolds and applies an Error Correction Model to model the long run and transitory dynamics of Employment and Real GDP, giving a prediction of changes in Employment based on the official worst case scenario of Real GDP contraction for 2020. Through this, it is found that: (1) There is early evidence of ongoing structural changes in the Singapore economy; (2) Employment in Singapore is inelastic to changes in Real GDP in the short term and to a lesser extent in the long term and (3) Further and more detailed research will be necessary as the situation develops and more data becomes available to examine the impact of the structural changes in the economy on the resilience of the economy.

## Introduction

The concept of "resilience" has been thrust into prominence within the public conversation around economics and policy as a result of COVID-19. This marks a distinct departure from the established philosophy in the years prior to the crisis. Economics and business practices revolve around the concepts of competition, competitiveness and efficiency. This entails a high degree of responsiveness and optimization in the pursuit of maximizing net benefits or profits. This process of maximization leaves the economy at an equilibrium that is potentially highly sensitive to shocks that bring extensive damage to the economy.

The abrupt, exogenous nature of the COVID-19 crisis makes for a "black swan event" which provides a convenient if unfortunate point in time with which to consider the resiliency of the Singapore economy. The data and fallout of from the crisis will throw into sharp relief various vulnerabilities in the Singapore economy as well as the ability of the country to absorb, respond and adapt to unforeseen disruptors. This study aims to analyze the latest economic data available at the time of the study to motivate further research into the topic of resilience.

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* This paper is a preliminary study, the author welcomes comments and suggestions for improvement.

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**Analysis of Early 2020 Data**

Table 1 presents the seasonally adjusted Y-o-Y growth rates of GDP in chained 2015 dollars by industry. We see that economic output in general has contracted on a Y-o-Y basis for the first 2 quarters of 2020. With the exception of Finance & Insurance, all sectors shrank in Q2. The next least impacted sectors being Information & Communications and Manufacturing. The hardest hit sectors are Construction, Accommodation & Food Services and Transport & Storage. The Construction sector was severely impacted by the imposition of the "circuit breaker" imposing a cessation of almost all activity in the sector. The other sectors are those directly impacted by the near total stoppage of international travel.

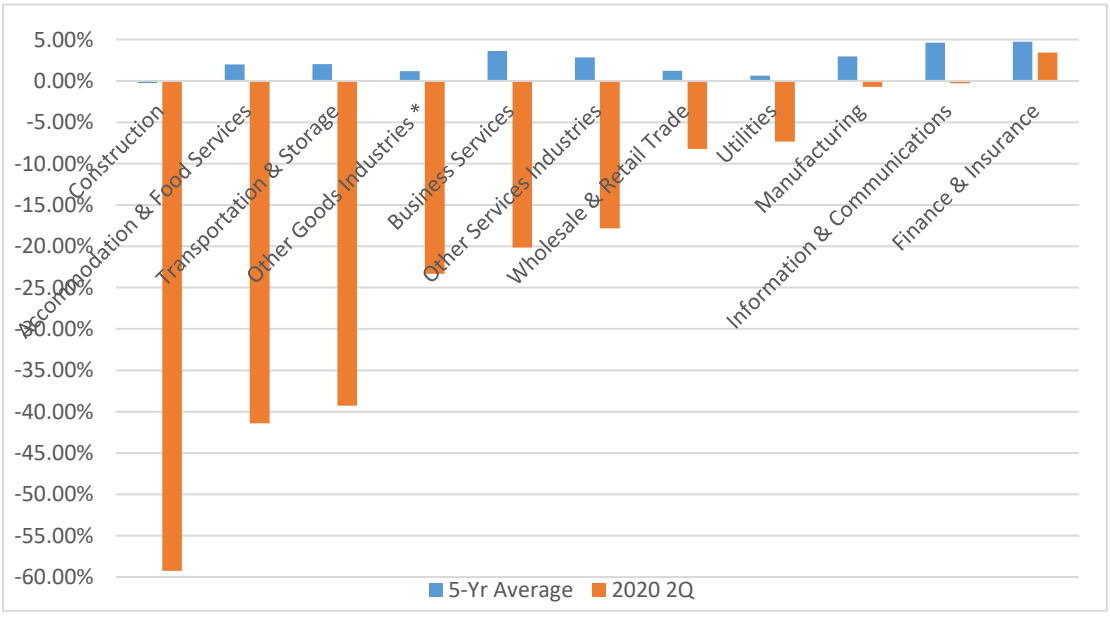
Table 1. Y-o-Y Real Growth Rates (Seasonally Adjusted)

| | 2020 1Q | 2020 2Q |
|---|---|---|
| GDP In Chained (2015) Dollars | -0.28% | -13.14% |
| Construction | -1.20% | -59.26% |
| Accommodation & Food Services | -23.76% | -41.41% |
| Transportation & Storage | -7.65% | -39.28% |
| Other Goods Industries * | 1.71% | -23.33% |
| Business Services | -3.56% | -20.14% |
| Other Services Industries | -3.74% | -17.82% |
| Wholesale & Retail Trade | -5.60% | -8.24% |
| Utilities | 0.23% | -7.35% |
| Manufacturing | 8.06% | -0.73% |
| Information & Communications | 2.80% | -0.28% |
| Finance & Insurance | 8.28% | 3.42% |

*Other Goods Industries Comprise Agriculture, Fishing and Quarrying

Figure 1 below compares the Y-o-Y growths rates in 2020 2Q to the average of the preceding 5 years from the period 2015 1Q – 2019 4Q. It is observed that the least impacted sectors of the economy are largely similar to the best performing sectors in the years up to 2020.

Figure 1 Growth Rates 2020 2Q vs 5 Year Average



In terms of employment, it is observed in Table 2 that overall employment has shrunk for the first two quarters of 2020. Employment in all sectors shrank in Q2. Notably, the worst hit sectors are those directly impacted by the "circuit breaker" and stoppages of international travel. Of wider concern is that employment in Financial and Insurance Services contracted in Q2 despite positive growth. Additionally, Manufacturing employment continues trend of contraction that has persisted since 2014.

Table 2. Changes in Employment

| | **2020 1Q** | **2020 2Q** |
|---|---|---|
| Total Changes In Employment | -25,200 | -113,200 |
| Goods Producing Industries * | -8,900 | -22,900 |
| Manufacturing | -3,200 | -8,900 |
| Construction | -5,900 | -13,600 |
| Others | 100 | -500 |
| Services Producing Industries | -16,300 | -90,300 |
| Wholesale & Retail Trade | -8,500 | -15,900 |
| Transportation & Storage | 500 | -4,300 |
| Accommodation & Food Services | -10,900 | -27,400 |
| Information & Communications | 700 | -700 |
| Financial & Insurance Services | 2,600 | -700 |
| Business Services * | -800 | -14,000 |
| Real Estate Services | -1,500 | -2,700 |
| Other Services Industries | 100 | -27,300 |
| Public Administration & Education | 2,400 | -4,500 |
| Health & Social Services | 800 | -1,400 |

**Methodology**

Based on the previously observed trends, where the best performing growth sectors in the first half of 2020 remain largely the same as the 5 prior years. The general structure and trends in terms of output in Singapore appears not to have significantly changed in light of COVID-19. The apparent trends in employment in the first half of 2020 does not in itself provide clear indication of wider structural change.

An econometric model of employment and output is thus an arguably helpful basis to form a rough baseline estimate of the effect of the COVID-19 downturn on employment. This estimate can then be compared to data from the first half of 2020 and full year data when available to determine how resilient the labour demand of Singapore is to external shocks. We form the labour demand function on the following premises:

1. Labour demand is driven by the output of the economy and prevailing wage rates.
2. Labour market rigidities exist and thus employment in previous periods affect labour demand in the current period.
3. Under condition of rigidities, a forward looking economy would demand labour based on expectations of future demand.

The following labour demand function is then specified:

$$L_t^D = f(Y_t, E(L_{t+1}^D), w_t, N_{t-j})$$

Under adaptive rationality assumptions:

$$E(L_{t+1}^D) = f(L_t^D, \varepsilon)$$

The demand function is simplified to:

$$L_t^D = f(Y_t, w_t, N_{t-j}, \varepsilon)$$

The key variables of interest in this model are primarily Real GDP ($Y$) and Employment ($N$) as a proxy for labour demand. The chronology of COVID-19 fits neatly into 2020. This thus makes it arguably valid to use the annual time series data from 1994-2019 to model the function. Using Augmented Dickey Fuller (ADF) and Johansen trace tests, we find that both variables are non-stationary and co-integrated. Furthermore, ln($Y$) is found to have a unidirectional Granger causal relation to ln($N$). Additionally, it was found during preliminary estimates that the wage effect ln(w) is insignificant and results in a non-stationary model. The relevant ADF test statistics and other diagnostic tests are reported in the appendix, Johansen test statistics and Granger test statistics are available upon request.

As such, a bivariate Error Correction Model (ECM) of Employment and Real GDP using the Engle & Granger 2-Step approach has been adopted. The ECM as specified below is relatively easy to implement as OLS estimation produces highly consistent results and allows for the relationship to be separated into long run and transitory effects (Davidson and MacKinnon 2004).

1st Stage Regression – Long Run effect:

$$lnN_t = \alpha + \beta_1 lnY_t + \beta_2 X_t + \mu_t \quad (1)$$

$$X_t = recession\ dummy$$

2nd Stage Regression – Transitory effect:

$$ect_t = \mu_t$$

$$\Delta lnN_t = a + b_1 \Delta lnN_{t-1} + b_2 \Delta lnY_t + b_3 X_t + \gamma ect_{t-1} + \varepsilon_t \quad (2)$$

**Results**

| Long Run - (1) | | Transitory - (2) | |
|---|---|---|---|
| Constant | -0.27959 | Constant | -0.010579 |
| $lnY_t$ | 0.65248*** | $\Delta lnN_{t-1}$ | 0.790856*** |
| $X_t$ | 0.04546** | $\Delta lnY_t$ | 0.389979*** |
| | | $X_t$ | -0.020994** |
| | | $ect_{t-1}$ | -0.22048* |

***, ** & * denote 0.01, 0.5 and 0.1 levels of significance respectively

The coefficients of this model can be interpreted as the approximate percentage change in employment resulting from a 1% change in the independent variable. The specification of the model simplifies the process of estimating the potential impact of COVID-19 by allowing for various forecasts of annual real GDP growth ($\Delta lnY_{2020}$) in 2020 to be readily plugged into the equation, assuming residuals are 0, while all other variables are obtained within the estimation sample.

The Ministry of Trade and Industry Q2 forecasts $\Delta lnY_{2020}$ of between -7% to -5%. Using the worst case scenario of -7%, the projected loss of employment solely due to $\Delta lnY_{2020}$ is calculated as:

$$0.389979 \times (-7\%) \approx 2.73\%$$

When accounting for the full transitory model, the projected loss of employment is approximately -2.74% or 104 thousand persons. In the long run model, the projected loss of employment is approximately -4.8% or 158 thousand persons. In comparison with the latest available employment data from Q2 2020 where the total loss of employment in the first half of 2020 is already 138,400 persons, it is plausible that even this worst case prediction is an underestimation.

**Conclusion**

Several interesting insights can be drawn from this result. To start, this model carries the implicit assumption that the underlying structure and relationships encapsulated within the model does not change with time. This thus makes the results above an estimate of the underlying natural rate of unemployment and the cyclical unemployment from the economic downturn. In the event that the model is underestimating the full year change in employment, it is good indication that there are likely structural shifts occurring in the economy driving further employment loss.

Within the framework of resilience, it gives insight to the sensitivity of labour demand in Singapore towards external shocks as the coefficients can be interpreted as the elasticity of labour demand. The transitory model indicates that labour demand is largely inelastic in the short run to changes in real GDP. In the long run, the labour demand remains inelastic though far less so. In isolation, this coefficient is insufficient in determining the resilience of labour demand comparative to other economies but it can be concluded that shocks to output have a dampened effect on labour demand in Singapore. Though small, the positive coefficient of the long run recession dummy is also a point of note as it indicates the Singapore economy generates increased labour demand in the long run from recession.

While it is at present unclear what the full extent and implications of the COVID-19 pandemic are, the results of this study highlight the need for further research into the resilience of the labour market in Singapore in light of the ongoing structural changes in the economy. As more data emerges, further refinement exploration into the topic will refine and sharpen the discussion.

**References**

Davidson, R. and MacKinnon, J., 2004. *Econometric Theory And Methods*. New York: Oxford University Press, pp.629-630.

## Appendix

ADF Tests: $H_0 = Non - Stationary$

| Variable | p-value |
|---|---|
| ln(Real GDP) | 0.9073 |
| ln(Employment) | 0.4927 |
| $\mu_t$ | 0.4835 |
| $\varepsilon_t$ | 0.01901** |

***, ** & * denote 0.01, 0.5 and 0.1 levels of significance respectively

Diagnostic Tests

| Test | p-value |
|---|---|
| Durbin Watson | 0.3648 |
| RESET | 0.8384 |

***, ** & * denote 0.01, 0.5 and 0.1 levels of significance respectively

Figure 3. Q-Q plot