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Is Singapore's Beveridge Curve Suffering From Long Covid Shifts?

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13 January 2023

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Abstract

The Covid-19 pandemic has significantly impacted the way people think of work and the economic relationship between vacancies and unemployment. This paper analyses the Beveridge curve changes of Singapore since the pandemic's onset. We find evidence of an outward shift in the curve and a steepening of the curve's slope. The shift is mainly driven by lower matching efficiency and higher activity, and partially due to higher labour reallocation.

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1. Introduction

The Covid-19 pandemic has inflicted enormous devastation on the global economy over the last two years. From paralysing industries and stalling trade to halting human mobility and displacing populations, the pandemic has undoubtedly caused severe commercial and social disruptions. Organisations have had to adapt to the pandemic, with many implementing remote working, flexible work arrangements, virtual meetings and social distancing measures in an effort to slow the spread of the virus while continuing their operations and serving their customers and clients.

Now, experts are warning that the pandemic may have permanently changed the way that people think of work[2], and with that the economic relationship between vacancies and unemployment. Indeed since the onset of the pandemic, several countries have observed movements in their Beveridge curves. From Germany, Spain and UK (Ando et al., 2022) to Denmark (Darougheh, 2022) and Ireland (An Roinn Airgeadais, 2021), economists have reported outward shifts in their countries' Beveridge curves. In the US in particular, multiple researchers (Blanchard, Domash and Summers, 2022; Rodgers and Kassens[3], 2022; Bok et al., 2022; Figura and Waller, 2022) have identified a significant rightward Beveridgean shift since the pandemic hit. For central banks who are currently fighting surging prices, this is bad news. After all, their ability to engineer a soft landing in labour markets whilst taming inflation depends crucially on whether excess job vacancies can fall without spiking unemployment.

This paper aims to investigate whether the Beveridge curve of Singapore has shifted since the Covid pandemic hit. We find both graphical and empirical evidence of a rightward shift in the curve, as well as a steepening in the slope of the curve, since the second quarter of 2000. In addition, we also decompose the Beveridge curve shift to find that this Beveridgean shift was primarily driven by lower job matching efficiency and higher activity, and partially by higher labour reallocation intensity.

[2] https://www.pewresearch.org/social-trends/2022/02/16/covid-19-pandemic-continues-to-reshape-work-in-america/
[3] https://www.stlouisfed.org/on-the-economy/2022/jul/beveridge-curve-labor-market-recovery

The motivations for this paper are three-fold. First, the key objective is to understand and quantify the impact of the Covid pandemic on the relationship between vacancies and unemployment in Singapore. In particular, a deeper understanding of Singapore's Beveridge curve will aid in monetary policymaking as the Monetary Authority of Singapore continues to tighten monetary policy to combat inflation, which is currently at 14-year highs. In addition, our analysis of the drivers of the Beveridge curve shift also has important policy implications as our findings can be used to realign current policy directions to mitigate the structural changes in the labour market brought about by the pandemic. Thirdly, this paper focuses on Singapore because existing research on the vacancy-unemployment relationship is predominantly focused on Western economies such as the US and Europe with little work being done on Asian countries. Singapore's government is widely acknowledged as being highly efficient and successful in implementing policies promoting economic growth, its workforce is also known to be highly-skilled and multicultural. This makes the country, in our view, an interesting case study. To our knowledge, there has been no published research on Singapore's Beveridge curve since Teo et. al (2005) fifteen years ago.

This paper is structured as follows: Section 2 provides a brief literature review before presenting our graphical and empirical analyses of the Singapore Beveridge curve shift, as well as the decomposition of the curve move into its three shifters. Section 3 shows the conclusions of our paper.

2.   Singapore's Beveridge Curve and its Post-Covid Shift

2.1 Brief literature review

The Beveridge curve is a graphical representation of the relationship between the unemployment rate and the vacancy rate in the labour market. Named after the British economist William Beveridge who first described the relationship in the 1940s, it is a central regularity in labour economics that has been found to hold across countries, in different time periods, and at both aggregate and sectoral levels. Typically depicted as a

downwards-sloping convex curve (Diamond, 1982), it reflects the inverse relationship between the unemployment rate and the vacancy rate. The location on the curve is often regarded as an indication of the labour market health, with economies traversing along the curve as they transition from recession to expansion. Shifts in the entire Beveridge curve, on the other hand, are seen as indicators of structural changes in the efficiency of the job matching process. These changes include shifts in the labour force characteristics and composition (Bonthuis et. al, 2016), matching technology (Bleakley and Fuhrer, 1997; Shimer, 2012), labour market institutions and policies (Nickell and Layard, 1999), and unemployment hysteresis (Bova et al., 2018).

In this paper, we employ two methods order to investigate the impact of the Covid pandemic on Singapore's Beveridge curve, namely graphical examination and empirical analysis. All the data used in this paper is obtained from the Singapore Ministry of Manpower website[4].

2.2 Graphical examination

We first construct the Beveridge curve of Singapore using quarterly data from the Labour Market Report spanning Q1 1992 to Q2 2022. Figure 1 shows each data point as a combination of the job vacancy rate and unemployment rate, with separate curves fitted for the pre-Covid period (Q1 1992 to Q1 2020) and post-Covid period (Q2 2020 to Q2 2022). The pre-Covid period can be further divided into two phases: pre-Asian Financial Crisis and post-Asian Financial Crisis.

In this first phase of Q1 1992 to Q1 1998 before the Asian Financial Crisis (AFC) hit, the Singapore economy mostly resided at the top part of the fitted Beveridge curve, reflecting a time of high job vacancy rates and low unemployment levels. When the Asian Financial Crisis hit, the job vacancy rate started to decline while the unemployment rate started to pick up. At its worst in the fourth quarter of 1998, the job vacancy rate troughed at 1.3% and the unemployment rate peaked at 3.4%. Around this time, the economy also started traversing to the bottom half of the Beveridge curve where job vacancy rates largely stayed within the 1% to 3% range and
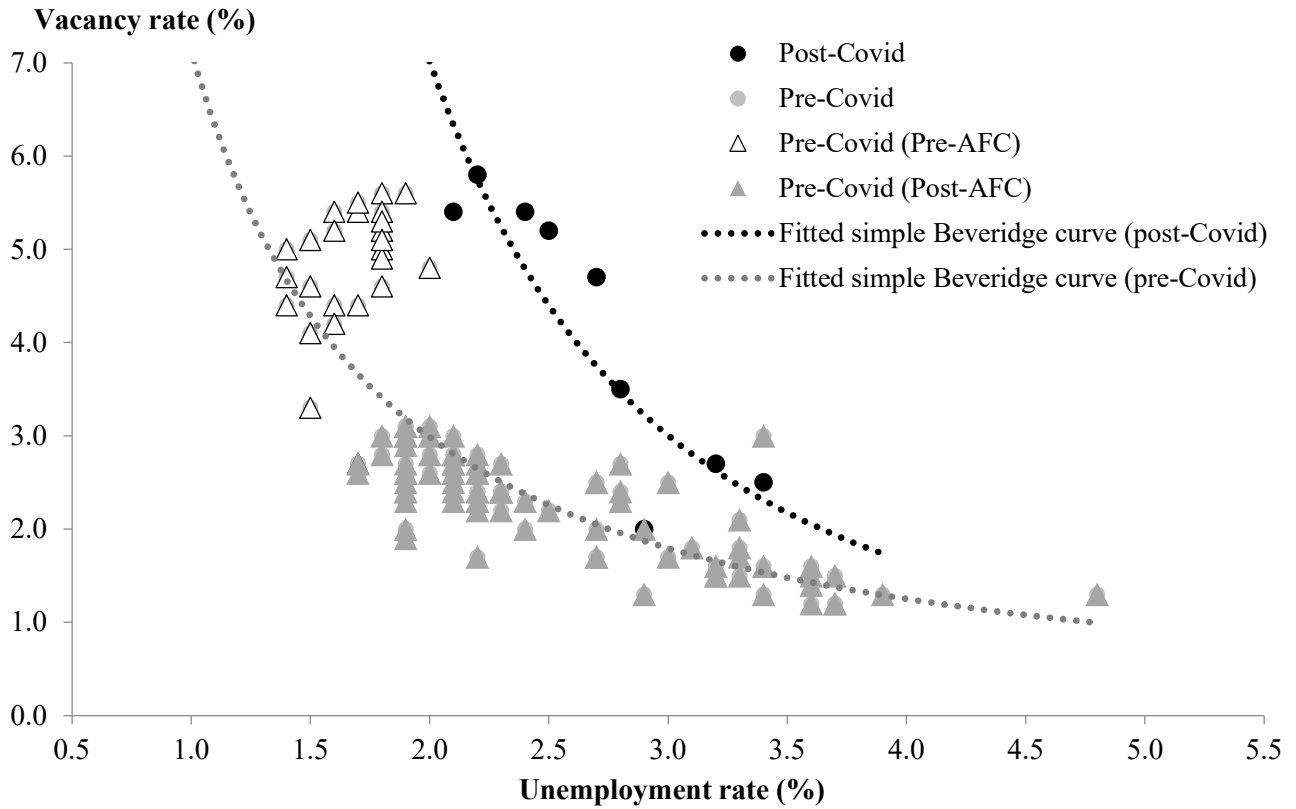
the unemployment rate occupied a wider range of 1.5% to 4%. The fact that the economy was mostly moving along the fitted Beverage curve reflects that job matching efficiency has stayed fairly constant over that time period.

After the Covid pandemic struck in the second quarter of 2020, we can observe a clear outward shift in the newly-fitted Beveridge curve as well as a steepening in the slope of the curve. This indicates that the matching efficiency of the labour market has worsened, and also implies that the unemployment rate now falls less for a given increase in vacancies. Our finding is perhaps not surprising. In a recent biannual survey by human resource consultant Randstad[5], it is revealed that the Singaporean workforce's sentiments and perceptions towards employment have indeed changed since the pandemic. According to the survey, "94% of [Singaporeans] maintained that post-pandemic work-life balance is [now] important to them. [However while] 77% of respondents in the study said that flexibility in working location is important [to them], only 52% reported that their employers provided them remote working options. Likewise, 4 in 5 of [the] survey respondents value flexible working hours, but only 60% of them reported being given this autonomy by their employers." The results of the survey clearly points to an increased mismatch between the demand and supply of labour in Singapore post the Covid pandemic.

Figure 1: Beveridge Curve for the Singapore Economy, Q1 1992 – Q2 2022

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[5] https://www.randstad.com.sg/hr-trends/workforce-trends/singapore-employees-rather-be-jobless-than-feel-unhappy-at-work/#:~:text=close-,41%25%20of%20singaporeans%20would%20rather%20be%20unemployed%20than%20feel%20unhappy,their%20jobs%3A%20randstad%20workmonitor%202022.&text=In%20addition%2C%2052%25%20of%20respondents,their%20life%20experiences%20over%20work.

Vacancy rate (%)

Legend:
- ● Post-Covid
- ● Pre-Covid
- △ Pre-Covid (Pre-AFC)
- ▲ Pre-Covid (Post-AFC)
- ••••• Fitted simple Beveridge curve (post-Covid)
- ••••• Fitted simple Beveridge curve (pre-Covid)

Unemployment rate (%)

2.3 Empirical analysis

We also perform a more rigorous empirical analysis to establish the statistical significance of our visual inspection of the Beveridge curve. To do this, we adopt a Beveridge specification used in Valetta (2005), the European Commission (2011) and Banthuis et al (2013) that regresses the unemployment rate U_t against the job vacancy rate V_t and some shift parameters:

$$U_t = \alpha + \beta_1 U_{t-1} + \beta_2 V_t + \beta_3 V^2_t + \beta_4 COVID_t + \beta 4 COVID_t * V_t + \varepsilon_t \qquad (1)$$

where U_{t-1} is the unemployment rate lagged by one period, V_t is the job vacancy rate and the subscript t represents the time. The quadratic term V^2_t is included to ensure the convexity of the Beveridge curve and therefore captures non-linearities in the Beveridge relationship. The dummy variable $COVID_t$ takes the value of 1 during the pandemic period of Q2 2020 - Q2 2022, and takes the value of 0 otherwise. In addition, the dummy variable $COVID_t * V_t$ represents an interaction term between the COVID dummy and the vacancy rate variable, and captures changes in the slope of the Beveridge curve.

Table 1 shows the results of our regressions. It can be seen that the coefficient for the lagged unemployment variable is large and significant, implying a high level of persistence in unemployment. The coefficients for the job vacancy rate and its quadratic term are both negative and positive respectively and highly statistically significant, confirming that the Beveridge curve for Singapore is downwards-sloping and convex. More importantly, we can see that the coefficient for the Covid dummy variable is positive and significant, suggesting that there has been a rightward shift in the Beveridge curve since the onset of the pandemic. Based on our regression, the unemployment rate is now 0.805% higher than pre-pandemic for any given level of vacancy rate. In addition, the positive coefficient of the interaction term shows that the slope of the curve has also steepened. This reflects an overall decline in the responsiveness of unemployment to vacancy developments, with a 1% change in the vacancy rate now yielding an unemployment rate response that is weaker by -0.116% compared to pre-Covid. Our empirical findings therefore confirm the findings from our graphical analysis.

Table 1: Singapore's Beveridge Curve Estimation

This table reports the results of the least squares regressions for the dependent variable, the unemployment rate $U_{i,t}$. Following Valetta (2005), the European Commission (2011) and Bonthuis, Jarvis and Vanhala (2013), the regression takes the form:

$$U_t = \alpha + \beta_1 U_{t-1} + \beta_2 V_t + \beta_3 V^2{}_t + \beta_4 COVID_t + \beta4 COVID_t * V_t + \varepsilon_t$$

where U_{t-1} is the unemployment rate lagged by one period, V_t is the vacancy rate and the subscript t represents time. The quadratic term $V^2{}_t$ is included to ensure the convexity of the Beveridge curve and therefore captures non-linearities in the Beveridge relationship. The dummy variable $COVID_t$ takes the value of 1 during the pandemic period of Q2 2020 - Q2 2022, and takes the value of 0 otherwise. The dummy variable $COVID_t * V_t$ represents an interaction term between the COVID dummy and the vacancy rate variable, and captures changes in the slope of the Beveridge curve. T-statistics for the regressions are shown in parentheses with the standard errors corrected for autocorrelation using Newey-West procedure. Significance levels: *** = 1%, ** = 5%, * = 10%.

	Explanatory variables					
	U_{t-1}	V_t	$V^2{}_t$	$COVID_t$	$COVID_t * V_{i,t}$	Constant
Dependent variable: U_t	0.528***	-1.048***	0.125***	0.805***	-0.116***	2.885***
	(10.012)	(-6.852)	(6.409)	(5.623)	-1.000	(8.086)
Adjusted R-squared:		0.846		Durbin-Watson statistic:		2.294
F-statistic:		133.300***		No. of observations:		121

2.4 Decomposing into three shifters

To delve further into the drivers of the outward shift in Singapore's Beveridge curve, we employ the framework used by Blanchard, Domash and Summers (2022) to decompose the Beveridge curve movements into ones that

are due to aggregate activity, matching efficiency and reallocation. We do this by first expressing the relations between gross hires, unemployment and vacancies as a Cobb-Douglas function with constant returns to scale

$$H = aU^{\alpha}V^{1-\alpha} \tag{2}$$

where H is the number of gross hires, V is the number of vacancies and U is the number of unemployed. In this equation, a therefore represents the matching efficiency.

Dividing both sides by the labour force N,

$$H/_N = a\left(U/_N\right)^{\alpha}\left(V/_N\right)^{1-\alpha} \tag{3}$$

Then

$$h = au^{\alpha}v^{1-\alpha} \tag{4}$$

where h is the hiring rate (or labour reallocation intensity), u is the unemployment rate and v is the job vacancy rate.

Equation 4 thus yields a downwards-sloping convex Beveridgean relationship between the unemployment rate u and the vacancy rate v, with the position of the curve dependent on the parameters α, a and h. An increase in h or a decline in a shifts the Beveridge curve up, while stronger activity rotatew the activity line to the left.

We next construct time series for each of the three shifters.

First, we plot the shifts in activity using movements in v/u as the proxy. We can see from Panel A in Figure 2 that at the onset of the pandemic, there was a brief dip in activity for one quarter before the economy staged a strong recovery that surpassed previous peaks to reach the current historical high level. This very high ratio of vacancies to unemployment does not merely reflect a very strong level of activity, but also a potential overheating of the labour market that can drive wages higher.

We next turn to the matching efficiency shifter. To calculate the labour market matching efficiency, we first estimate the value of α by regressing the log of hires on the log of unemployment and the log of vacancies (both lagged by one period). Our regression gives us an estimated value of 0.52 which is close to the range of estimates of 0.3 to 0.5 found in economic literature. The matching efficiency a is then calculated as

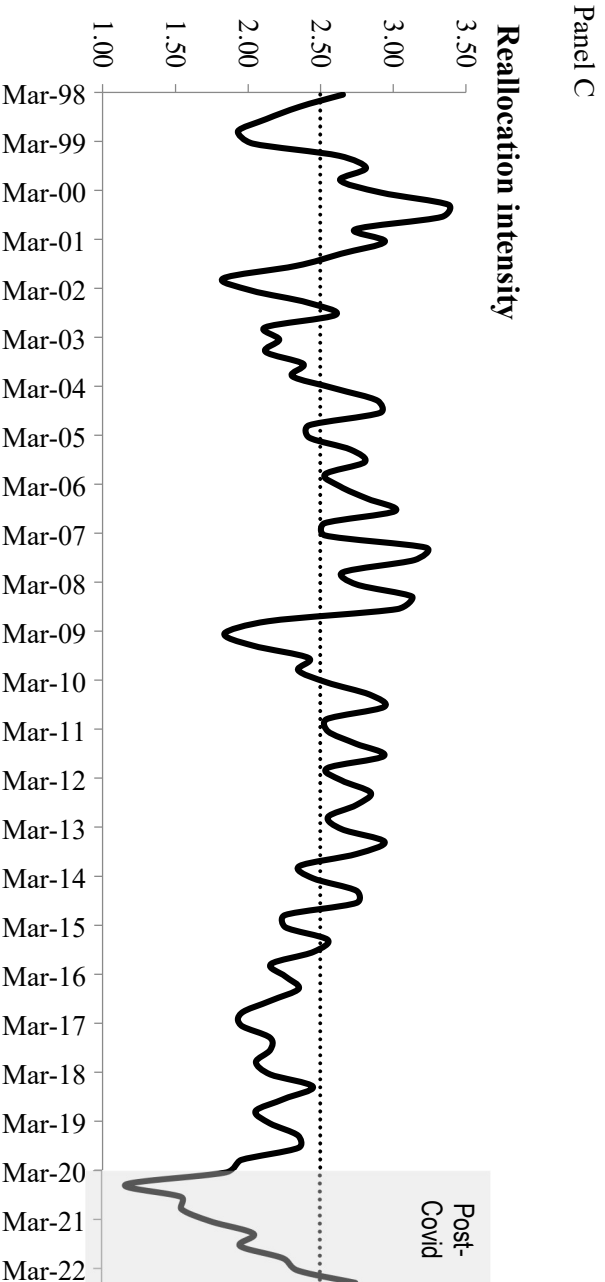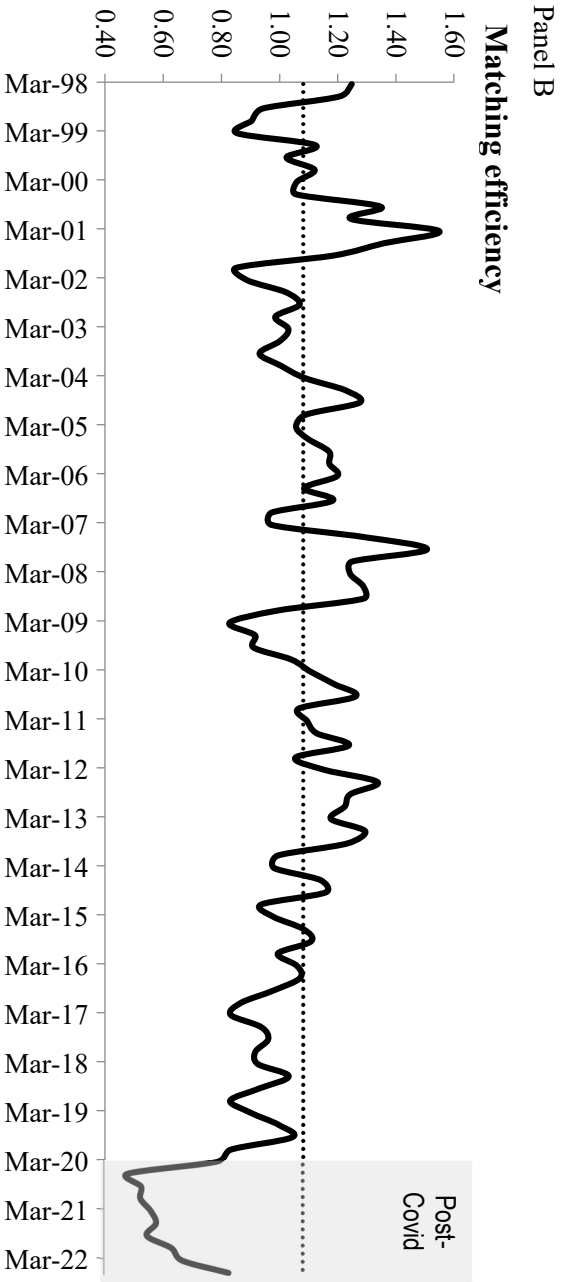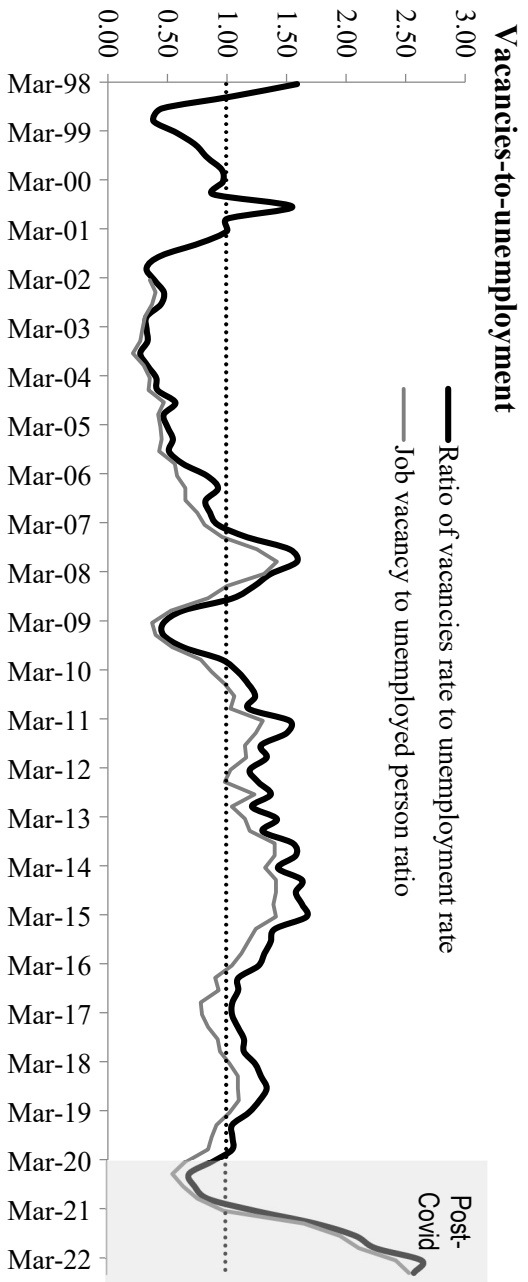$$a = h/(u^{\alpha}v^{1-\alpha}) \tag{5}$$

Figure 2 shows the time series plot of a. We can see that while there was a massive decline in matching efficiency when the pandemic hit, unlike the activity shifter, the recovery here was more prolonged. It took the labour market seven quarters before it got back to its pre-pandemic matching efficiency level which remains still some distance below the long-term average. Although we note that job matching efficiency has already been declining before Covid hit, the subsequent change in employee's preference for flexible working arrangements post-Covid and the inadequate employer accommodation for it will likely exacerbate the pre-existing trend and keep matching efficiency structurally lower versus the past.

Last, we graph the shifts in labour reallocation which are simply given by the movements in h. This is shown in Figure 4 where we observe the same initial collapse in labour reallocation intensity at the onset of the pandemic. The hiring rate however rebounded strongly after that to exceed both its pre-pandemic level as well as its long-term average.

Our study of the three drivers of unemployment-vacancy movements therefore show that the outward shift in Singapore's Beveridge curve is driven mostly by higher activity and lower matching efficiency and partially by higher labour reallocation intensity.

Figure 2: Evolution of the Beveridge Curve Shift Determinants

Panel A

Vacancies-to-unemployment

3.00
2.50
2.00
1.50
1.00
0.50
0.00

Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22

—— Ratio of vacancies rate to unemployment rate
—— Job vacancy to unemployed person ratio

Post-Covid

Panel B

Matching efficiency

1.60
1.40
1.20
1.00
0.80
0.60
0.40

Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22

Post-Covid

Panel C

Reallocation intensity

3.50
3.00
2.50
2.00
1.50
1.00

Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19
Mar-20
Mar-21
Mar-22

Post-Covid

Note: The dotted line in each panel is the pre-Covid long-term average for the relevant shifter.

3.   Conclusions

The Covid-19 pandemic over the last two years have had a massive economic and societal impact on the global economy. As companies adopted remote working and flexible working arrangements to meet the challenges of the pandemic, it inadvertently changed the way people think of work, and the Beveridgean relationship between vacancies and unemployment.

In this paper, we find graphical and empirical evidence of an outward shift in Singapore's Beveridge curve since the pandemic as well as a steepening of the curve's slope. This points to a deterioration in the job matching efficiency in the labour market, and warns of a decline in the responsiveness of unemployment to changes in vacancies versus the past. Our decomposition of the Beveridge curve shift into the three components show that much of the shift has been primarily driven by higher activity and lower matching efficiency, with higher labour reallocation being a partial contributor. This has important economic implications for Singapore, and developing the right policies can help mitigate some of the challenges. In particular, improving the job matching efficiency of the labour market will be critical. This can be achieved by developing job search tools, providing continuous education and training, implementing job matching programs, and encouraging firms to adapt to a new hybrid working environment. Improving Singapore's institutional quality, such as promoting economic diversification, enhancing public sector governance, and encouraging greater social cohesion, can also create a favourable investment climate that attracts investment and creates jobs. By implementing the right policies, Singapore's Beveridge curve will be better placed to recover from its long Covid shifts.

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