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Social Security Scheme as an Economic Tool to Stabilize Employment

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Abstract: The Singapore Central Provident Fund (CPF) is a compulsory national saving scheme that is designed to force its citizens to save out of the monthly wages for housing, healthcare, education for their children and post-retirement expenses. During the last few economic crises, we observe that the Singapore government could keep its competitiveness by cutting labour costs via reducing employers' CPF contribution rates. Based on regression analyses, we find that there is a strong, negative and significant correlation between national unemployment rates and changes in employers' CPF contribution rates, suggesting that the CPF scheme has been used to minimize unemployment in Singapore. We also find that the reduction of employers' CPF contribution rates have a positive impact on annual surplus ratios in the manufacturing sector. The main conclusion is that a reduction in employers' CPF contribution rates should remain as an interim measure as an economic tool as changing CPF contribution rates to stabilize employment can compromise social security goals.

Key words: CPF, unemployment; labor costs; manufacturing; annual surplus ratio; wage systems and wage determination in Singapore

JEL codes: A1, J3

1. Introduction

The Singapore Central Provident Fund (CPF) is a compulsory national saving scheme that is designed to force its citizens to save out of the monthly wages for housing, healthcare, education for their children and post-retirement expenses (Chew, 2012). For instance, for a worker earning $1,000 a month, he has to save 20% of $1,000 into his personal CPF account and his employer has to pay 17% of $1,000 into the same account for this worker. Hence, mandatory employers' contributions of an extra 17% of workers monthly salary to the provident fund represent an additional labour costs in doing business in Singapore. Each year, the Singapore government will review whether to alter employee and employer CPF rates. The general principle is that when the economy is doing well, both employee and employer rates would increase. For instance, during the 70s when Singapore was doing well, both the employee and the employer CPF rates have been increased steadily but not excessively. In 1978, Singapore government decided to increase labour costs to force firms to restructure so that we could avoid competing with China in export labour intensive products, both employee and employer rates were raised substantially. Both rates reached 25% by 1984. However, the recession in 1985 forced the government to reduce employer CPF rate from 25% to 10%. Hence, with lower cost, employers in Singapore could lower the price of

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their products and exports quickly recovered and the unemployment rate back to the normal level at around 2%. The employee CPF rate was raised back to 20% but not 25%. Similarly in 1997 crisis and 2003 SARS crisis, employer CPF rate again was reduced. During the 2007 economic crisis which started from the US sub-prime crisis, while Singapore workers continued to receive 14.5% in 2010 from their employers, the Singapore government used past reserves to help employers pay 9% in the employer CPF rate[1]. Later in our regression analyses, we will use effective employer CPF rate instead of nominal employer CPF rate.

We are interested to study the correlation between employer CPF contribution rate and the unemployment rate. We will also be studying the impact of employer CPF rate on manufacturing sector firms' annual surplus ratio.

Section 2 gives the literature review of existing studies on the economic variables leading to a reduction of employer CPF as well as the impact of such rates cuts. This is followed by the data description in Section 3 and the models and research methodology in Section 4. The regression and analysis of the results are laid out in Section 5. Finally, Section 6 provides the discussions and conclusions.

2. Literature Review

In the first part of the paper, we explore the issue of whether specific macroeconomic factors are associated to the changes in employers' CPF contribution rates. As discussed, there were adjustments of employers' CPF contribution rates during the periods of various economic factors or shocks. It is true that amidst the uncertain outlook due to terrorism threats, superpowers international politics, and global competition, employers' CPF contribution rates and thus total labour cost must remain competitive. Tan (2001) argued that the cost-cutting and budgetary measures including employer CPF contribution rates cuts that aimed to reduce labour and business costs by 15% in November 2000 should have pre-emptive and not reactive. The government view was that drastic wage cost-cutting policies and thus hardships on workers should not be implemented unless there is firm evidence of recession. Among government economists, there is also a prevalent view of underestimating the seriousness of any crisis at the beginning. Furthermore, the government wants people to save money and have an incentive to keep or raise employers' CPF contribution rates. Indeed, drastic cost-cutting measures were implemented on both occasions in 1985 recession and 1997/8 Asian Financial Crisis only *after* the economy had bottomed out. Interestingly, to the best of our knowledge, there is no empirical estimation developed to identify economic indicators that may have a direct association to the changes in employers' CPF contribution rates. Even then-PM Goh Chok Tong mentioned, "*It is not practical to try to identify a single number as a long-term rate. No one can be sure how the competitive situation will evolve. We must also expect our economy to run into rough weather from time to time. We should thus make our system flexible, so that we can put more into the CPF in good years and cut the rate in bad years. This will give us room to respond quickly to the changing economic environment.*" This raises the question of how wage policy, specifically with employers' CPF contribution rates cut being a blunt macroeconomic instrument, should incorporate an economic stability element. One way for policy makers is to monitor more closely and track an array of economic factors. There is thus an unmet need of identifying economic factors that can predict quantitatively how employers' CPF contributions rates should be adjusted. There are a variety of indicators assessing the state of an economy but this study will be limited to main macroeconomic indicators: GDP rate of growth, national unemployment rates, and foreign direct investment (FDI). Since GDP is a

[1] http://www.straitstimes.com/multimedia/graphics/changing-cpf-rates-over-the-years.

direct indicator of economic health, our initial hypothesis (H1) is that data of annualized change in real GDP over preceding years would be associated with the fluctuations of employers' CPF contribution rates. Our second hypothesis (H2) is that higher national unemployment rates during an economic crisis would be more likely be associated to a change in the employers' CPF contribution rates. FDI is to enhance productivity, encourage employment, stimulate innovation and technology transfer, as well as to enhance sustained economic growth, and thus our third hypothesis (H3) is that the volume of FDI inflows as a percentage of GDP might be associated with employers' CPF contribution rates. The fourth hypothesis (H4) is that the number of retrenched workers, a more specific indicator of conditions of employment, would likely be associated with changes in employers' CPF contribution rates. Finally, during economic downturn, there are more firms being deregistered and our fifth hypothesis (H5) is that the net gap between the formation and cessation of firms may have an association in employers' CPF contribution rates. With our empirical estimation model, we hope to address the pre-emptive nature of cost-cutting measures and cut in employers' CPF contribution rates. We also hope to address the issue of how can the employers' CPF contribution rates be restored and by how much can it be restored as the economy recovers.

In the second part of the paper, we aim to draw inferences on the impact and effectiveness of the use of employers' CPF as a macroeconomic crisis management tool. Specifically, we want to study the role of employers' CPF contribution rates cut in an environment of rising wages. There were attempts by Hoon (1987) and Asher (1998) to model theoretically the effects of an employers' CPF contribution rates cuts, but both authors understood the difficulty in quantifying impact of an employers' CPF contribution rates cut and had their discussions limited to mainly qualitative and descriptive analysis. They showed that employers' CPF contribution rates cut leads to a lowering of the rate of consumption and speculate that there may be a stimulation of net exports through relative-price effects since employers' CPF contribution rates cut effectively reduces the labour costs. Interestingly, both authors did not look at the impact of employers' CPF contribution rates cut on lowering the operating costs of local firms and the effectiveness in protecting local employment. Annual surplus is equal to total revenue (TR) minus total business cost (excluding fixed costs). As most firms are price takers and few firms would dare to increase the price as most products are price-elastic, TR is stable. On the other hand, operating costs of business especially labour costs have been rising non-stop. When labour costs increases, annual surplus is smaller and therefore the annual surplus to labour costs ratio (ASR) will be smaller. A firm that has a higher ASR is able to withstand the rising wages more than a firm with lower ASR. For example, the ASR in food industry is 133%, implying that, any increase in labour costs can be tolerated as the surplus margin is big enough to absorb the rising cost. However, for textile and furniture, the ASR is less than 20%, and any increase in labour costs will cause some firms in these industries to cease production. Specifically, as employers' CPF contribution rates are cut, labour costs for businesses are reduced and we expect firms' ASR to increase. Therefore, our sixth hypothesis (H6) is that a cut in employers' CPF contribution rates will have a bigger impact on firms with lower ASR and is ineffective in firms with higher ASR. For this analysis, we will look at data in manufacturing and manufacturing-related industries and services as this sector remains a key pillar of the Singapore economy, contributing almost 20% to nominal GDP in 2015. Furthermore, the manufacturing sector also provides good jobs for Singaporeans, and contributes significantly to overall productivity growth, e.g., nominal median monthly income of full-time employed residents in the sector rose by 5.4 per cent, from S$4,210 in 2014 to S$4,437 and over the period of 2009 to 2015, real value-added (VA) per worker in the manufacturing sector grew by 5.9 percent CAGR, higher than the 2.2 percent for the overall economy.

3. Data Description

In our regression models, we are interested to study the role of CPF as an additional labour costs and have a better understanding of the rationale for adjusting the CPF contribution rates to bring about economic restructuring during times of recession. Consequently, we are interested in the total labour cost to employers. However, for 1.5 years in 2010, the Singapore government helped employers to pay for 9% of employers' CPF contribution rate (Budget, 2009).

From 1980 to 2015, we obtain data on the annualized change in real GDP growth rates over preceding years (X_1 = GDP), annual average unemployment rates (X_2 = UN), foreign direct investment as a percentage of GDP (X_3 = FDI), annual number of retrenched workers (X_4 = RWK), and the annual net gap between the formation minus the cessation of firms (X_5 = NetFormT).

The manufacturing sector comprised some 9,100 establishments across 21 industries and employed about 416,400 workers in 2014. Annual surplus ratio (ASR) is determined by net operating surplus/total labour costs, value-added per worker (VAW) is the total valued-added/number of workers, and export propensity (EXP) is defined as total direct exports to manufacturing output as a percentage.

4. Regression Models

The first part of this paper aims at identifying economic indicators that are quantitatively associated with employers' CPF contributions rates. In order to do this, we utilize the ordinary least squares (OLS) static time series model to investigate the relationship between employers' CPF contribution rates and economic state of Singapore during the period of 1980 to 2015. Naturally, we can have several explanatory independent variables (various indicators of state of economy) for the dependent variable (effective employers' CPF contribution rates). Consequently, utilizing a multiple time-series regression model would be more ideal as using such a model, we can hope to estimate, for example, the ceteris paribus effect of an increase in unemployment rates on employers' CPF contribution rates. For such time series regression models, the first thing we check is if all the variables are all stationary with the Phillips-Perron test for unit root; MacKinnon approximate p-value for Z(t) [ECPF, GDP, UN, FDI, RWK, NetFormT] = 0.0479, 0.0000, 0.0895, 0.0088, 0.0040, 0.9954, respectively, where $p < 0.1$ (small sample size of n = 30) indicating stationary data. NetFormT is not stationary and we processed it into change of the variable, i.e., delta_NetFormT = $\text{NetFormT}_t - \text{NetFormT}_{t-1}$; MacKinnon approximate p-value for Z(t) [delta_NetFormT] = 0.0001; thus, the variable change of NetFormT is now stationary data. However, it is also noteworthy to mention that as CPF policy changes is a reaction to the economy outlook, there may be a timing lag in policy implementation, and for simplicity, we assume that the dependent variable (effective employers' CPF contribution rates) is based on only the lagged past period of 1 year values of the explanatory independent variables. In other words, employers' CPF contribution rates in 1981 will depend on 1980 data of the explanatory independent variables. The following Model 1 can be constructed so as to identify the relationship between effective employers' CPF contribution rates and the 5 explanatory independent variables as described.

Model 1: $Y_t = \alpha + \beta_1 * X_{1(t-1)} + \beta_2 * X_{2(t-1)} + \beta_3 * X_{3(t-1)} + \beta_4 * X_{4(t-1)} + \beta_5 * X_{5A(t-1)} + \varepsilon$

Where:

Y is the annual effective employers' CPF contribution rates (ECPF)

X_1 is the annualized change in real GDP growth rates over preceding years (GDP)

X_2 is the annual average unemployment rates (UN)

X_3 is the foreign direct investment as a percentage of GDP (FDI)

X_4 is the annual number of retrenched workers (RWK)

X_{5A} is the change in annual total net gap between the formation minus the cessation of firms (delta_NetFormT)

α is intercept and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the parameters of the independent variables

ε is the error term

The second part of this paper aims at understanding the impact of cutting employers' CPF contribution rates on economic recovery, and as described earlier we proxy that to annual surplus ratio (ASR) that is equal to total revenue (TR) minus total business cost including labour costs but excluding fixed costs (TBC). In a similar fashion, we utilize the ordinary least squares (OLS) time series static model to investigate the relationship. Besides having effective employers' CPF contribution rates as the independent variable, we have to incorporate other explanatory independent variables. We start from the production function: Q = f (K, L), where Q is the aggregate output and changes with variations in an economy's capital K and labour costs L. First, as output increases there will be economies of scale leading to an increase in productivity, where TR would increase or TBC would decrease or both, and consequently ASR would be impacted. We proxy productivity to a quantifiable term as value-added per worker (VAW). Second, as the market size increases, there will be a demand in increase output which would impact productivity and ASR. We proxy market size to a quantifiable term as export propensity (EXP). For the purpose of this paper, as we want to investigate solely the impact of employers' CPF contribution rates on annual surplus ratio, and thus it is necessary for us to include both value-added per worker (productivity) and export propensity (market size) as these variables may impact the net operating surplus of a firm. Effective employers' CPF contribution rates (ECPF) variable was already established to be stationary, and for simplicity, we use the change of ASR, i.e., delta_ASR = $ASR_t - ASR_{t-1}$, the change of VAW, i.e., delta_VAW = $VAW_t - VAW_{t-1}$, and change of EXP, i.e., delta_EXP = $EXP_t - EXP_{t-1}$ such that all variables are now stationary as tested with the Phillips-Perron test for unit root; MacKinnon approximate p-value for Z(t) for all variables = 0.0000. The following Model 2 can be constructed so as to identify the relationship between firms' ASR and the 3 explanatory independent variables as described.

Model 2: $\text{delta\_ASR}_{n(t)} = \alpha + \beta_1 * \text{delta\_ECPF}_{(t)} + \beta_2 * \text{delta\_VAW}_{n(t)} + \beta_3 * \text{delta\_EXP}_{n(t)} + \varepsilon$

Where:

delta_ASR_n is the change of Annual Surplus Ratio of firms in a specific industry

N refers to one of the 21 following industries including Total Manufacturing (1): Food, Beverage & Tobacco (2), Textiles (3), Wearing Apparel (4), Leather, Leather Products & Footwear (5), Wood & Wood Products (6), Paper & Paper Products (7), Printing & Reproduction Of Recorded Media (8), Refined Petroleum Products (9), Chemicals & Chemical Products (10), Pharmaceutical & Biological Products (11), Rubber & Plastic Products (12), Non-Metallic Mineral Products (13), Basic Metal (14), Fabricated Metal Products (15), Computer, Electronic & Optical Products (16), Electrical Equipment (17), Machinery & Equipment (18), Motor Vehicles, Trailers & Semi-trailers (19), Other Transport Equipment (20), Furniture (21), Other Manufacturing Industries (22).

ECPF is the annual effective employers' CPF rates

delta_VAW_n is the change in annual value-added per worker in a specific industry

delta_EXP_n is the change in annual export propensity in a specific industry

α is intercept and $\beta_1, \beta_2, \beta_3$ are the parameters of the independent variables
ε is the error term

5. Regression Results and Analysis

We conduct two steps to examine hypothesis H1 to H5. First, we incorporated a time trend to Model 1: $Y_t = \alpha + \beta_1 * X_{1(t-1)} + \beta_2 * X_{2(t-1)} + \beta_3 * X_{3(t-1)} + \beta_4 * X_{4(t-1)} + \beta_{5A} * X_{5(t-1)} + \boldsymbol{\beta_6 * t} + \varepsilon$. In the regression output of data as shown in Table 4 of appendix, the time variable is statistically insignificant (small sample size of n = 30, 10% significance level was chosen) and that time trend can be ignored as it did not impact the regression Model 1. The Durbin-Watson test statistic is DW = 1.40; there are k = 5 regressors and n = 30, so at 2-sided 10% significance, dL = 1.07 and dU = 1.83; since dL< DW < dU, and the test is inconclusive if the residuals are serially uncorrelated. However, using the Durbin's alternative test for autocorrelation, F = 2.384 and Prob > F = 0.1363, at 10% significance there is no serial correlation. Similarly, using Breusch-Godfrey LM test for autocorrelation, F = 2.817 and Prob > F = 0.1068, at 10% significance there is no serial correlation[2].

Table 1 shows the regression results of Model 1 and we can have 5 important conclusions from the analysis: 1) about 54% of the data can be reflected in Model 1 and that the result of testing goodness of fit proves the model's applicability in this study, 2) there are not any common linearity among the variables with the reason that all the computed VIFs are less than 2 meeting the requirement of conservative threshold of 10, 3) unemployment rates have a significant correlation with effective employers' CPF contribution rates ($p < 0.001$) with the coefficient suggesting that a 1% increase in unemployment is associated with a 2% decrease in effective employers' CPF contribution rates, 4) variables GDP, FDI, and RWK all showed empirically relevant coefficients but were not statistically significant, and 5) the intercept differs significantly from zero.

Table 1 The Regression of Model 1

Model Y = ECPF	Coefficient	Std. Error	T	Sig.	Collinearity Statistics VIF
X_1 GDP	0.2036201	0.1994133	1.02	0.317	1.82
X_2 UN	-2.01119	0.5540893	-3.63	0.001	1.04
X_3 FDI	0.0162546	0.1038912	0.16	0.877	1.20
X_4 RWK	-0.000069	0.000131	-0.53	0.603	1.71
X_5 Delta_NetFormT	-0.0002514	0.0004119	-0.61	0.547	1.36
(Constant)	19.74913	3.08771	6.4	0.000	-

R-squared = 0.5453, Dependent variable: Effective employers' CPF contribution rates.
GDP: annualized change in real GDP growth rates over preceding years, Un: Annual average unemployment rates, FDI: Foreign direct investment as percentage of GDP, RWK: Annual number of retrenched workers, NetFormT: Total net formation minus cessation of firms

For Model 2 which investigates the relations between firms' annual surplus ratio and the effective employer CPF rate, we incorporated a time trend to $ASR_{n(t)} = \alpha + \beta_1 * delta\_eCPF_{(t)} + \beta_2 * delta\_VAW_{n(t)} + \beta_3 * delta\_EXP_{n(t)} + \boldsymbol{\beta_4 * t} + \varepsilon$ but our regressions show that the time variable is statistically insignificant and that time trend can be ignored. The regression results for the whole manufacturing sector and the respective industries are presented in Table 2[3]. Both Durbin's alternative test for autocorrelation (F = 0.439 and Prob > F = 0.5128) and

[2] Correlation regression analysis was also done for the 5 independent variables to check for multi-collinearity.
[3] Total Manufacturing (1), Food, Beverage & Tobacco (2), Textiles (3), Wearing Apparel (4), Leather, Leather Products & Footwear

Breusch-Godfrey LM test for autocorrelation (F = 0.507 and Prob > F = 0.4821) indicates that the residuals are serially uncorrelated and thus the t-statistic values from Model 2 is reliable.

For the Manufacturing sector as a whole (1), the regression coefficient of ECPF shows that a 1% decrease in effective employers' CPF contribution rates is associated with 0.013 increase in the change of firms' annual surplus ratio with a statistically significant t-value of -2.51 and p-value = 0.018). The coefficient of annual value added per worker has a statistically significant positive correlation with change of firms' annual surplus ratio while the coefficient of annual export propensity is not statistically significant in the regression for the manufacturing sector. Our regression results imply that the government of Singapore can reduce employer CPF rate to help firms in the short run but the survival of firms depends of value added per worker.

Using the same methodology, we then went on to do a regression analyze for the 21 industries of the manufacturing sector. The results shown in Table 2 show that effective employers contributions rates cut is associated with the change of firms' ASR in 11 industries out of 22 industries[4]. These 11 industries also rank low in terms of ASR; in majority of these 11 industries, their median ASR are < 0.5 and manufactured products that are of lower value, e.g., wood products, food & beverages, rubber & plastic products, fabricated metal products, and leather footwear products. Hence, firms with low ASR benefit more from a cut in employers' CPF contribution rates.

Table 2 The Regression of Model 2

Regressor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ECPF	-0.01286**	-0.01277**	-0.01094	-0.00166	-0.01332**	-0.01036*	-0.00887	-0.00626	-0.09090***	-0.04630*	0.014373
VAW	0.000026***	0.000032***	0.000033***	0.000032***	0.000017***	0.000035***	0.000042***	0.000023***	8.96e-06***	0.000014***	0.000013***
EXP	0.024585*	-0.00472	-0.01632**	0.001171	0.00138	-0.00071	0.023027**	0.005426	-0.00778	0.041760	-0.01114
Const.	0.105423	0.146532	0.132922	-0.00393	0.176804	0.124105	0.029700	0.049778	1.21632	0.612852	-0.62986
Durbin's Alt Test	0.5128	0.6732	0.5567	0.9225	0.4934	0.5620	0.1922	0.1454	0.4797	0.9755	0.8648
R-Squared	0.8383	0.7108	0.5377	0.5266	0.4724	0.4677	0.7385	0.5974	0.8479	0.7411	0.9004
Regressor Y = ASR	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
ECPF	-0.00820**	-0.02031***	-0.01916**	-0.00975**	-0.00345	-0.00881*	-0.01566***	-0.00308	-0.01011	-0.00529	-0.00010
VAW	0.000035***	0.000027***	0.000024***	0.000036***	0.000022***	0.000022***	0.00001***	0.000024***	0.000031***	0.000029***	0.000023***
EXP	0.001468	-0.00270	-0.00174	-0.00514	-0.0264*	-0.00591	0.001496	0.001765	0.001792	-0.00570	0.01240*
Const.	0.069137	0.268379	0.23008	0.099614	-0.06736	0.078446	0.185292	-0.01224	0.103968	0.04824	-0.07059
Durbin's Alt Test	0.9015	0.7616	0.9872	0.4670	0.2947	0.6192	0.3045	0.9643	0.1641	0.8415	0.4977
R-Squared	0.5955	0.8136	0.8894	0.6101	0.8659	0.5153	0.6619	0.7417	0.5499	0.5470	0.6951

*p < 0.1, **P < 0.05, ***P < 0.01, Dependent variable: Firm's annual surplus ratio

This shows that a temporary reduction of employer CPF rate can help half of the industries in the manufacturing sector, implying that the CPF system can mitigate the impact of recession on employment in Singapore. Again, the coefficient of value added per worker is positive and significant in accounting for changes

(5), Wood & Wood Products (6), Paper & Paper Products (7), Printing & Reproduction Of Recorded Media (8), Refined Petroleum Products (9), Chemicals & Chemical Products (10), Pharmaceutical & Biological Products (11), Rubber & Plastic Products (12), Non-Metallic Mineral Products (13), Basic Metal (14), Fabricated Metal Products (15), Computer, Electronic & Optical Products (16), Electrical Equipment (17), Machinery & Equipment (18), Motor Vehicles, Trailers & Semi-trailers (19), Other Transport Equipment (20), Furniture (21), Other Manufacturing Industries (22).

[4] Durbin's alternative test for autocorrelation indicates that the residuals are serially uncorrelated and thus the t-statistic values from Model 2 are reliable.

in the surplus ratio in all the 21 industries. However, the coefficient of exports is positive and significant in the regression for the industries (1) (7) and (22), implying that export propensity has a positive impact on surplus ratio for the whole manufacturing sector, printing and other manufacturing. On the other hand, the coefficient of exports is negative and significant in the regression for the industries (3) and (16), implying that export propensity has a negative impact on surplus ratio for the wearing apparel and electrical equipment. Our regression analysis therefore shows that the only way to protect workers in Singapore is to move to higher value added industries.

6. Conclusions

In the literature, no studies have done to assess the impact of unemployment on changes in employer CPF rate in Singapore. Hence, our study was the first to quantify the correlation between unemployment rate and employer CPF rate in Singapore. It is shown that a 1% increase in unemployment is associated with a 2% decrease in effective employers' CPF rates. Of course, the reduction in CPF rate has to be an interim measure as Singaporeans rely on CPF balances to pay for housing mortgage, etc.

The second part of the study was designed to address impact and effectiveness of using employers' CPF contribution rates on firm's surplus ratio (ASR). Our results showed that a 1% decrease in effective employers' CPF contribution rates is associated with 0.013 increase in the change of firms' ASR in the manufacturing sector. At the industry level within the manufacturing sector, our regression analysis shows that there was significant association between effective employers' CPF contribution rates and firms' ASR in 11 out of the 21 different manufacturing industries. The reality is that value added per worker is the most consistent determinant of ASR in all 22 regressions.

This study was done against the backdrop of weak economic outlook where GDP growth in Singapore is not expected to growth more than 3% from 2013 to 2017. Unemployment rate in Singapore has been rising although the absolute level is still low compared to many developed countries. Given our regression results, we can conclude that should unemployment rates continue to rise to say 2.9% in first quarter of 2017 and higher in the later part of 2017, policy makers might reduce employers' CPF contribution rates in 2018. If the employer CPF rate were to be reduced from current 17% to 15%, we expect the annual surplus ratio can increase by 0.026.

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