

Box A: Drivers of Labour Force Participation in Singapore

Introduction

Singapore's current resident labour force participation rate (LFPR) of 68.6% in 2023 is relatively high, comparable to those of global leaders, such as Switzerland and New Zealand, and 7.7% points above the OECD (2022) average of 60.9%. However, further increases in overall LFPR may be limited, due to a combination of continued population ageing, and the slowing growth of LFPR for females and older residents. Slowing LFPR growth could constrain further resident workforce expansion, which may consequently contribute less to the economy's potential growth.

This Box analyses the historical structural drivers of labour force participation of different age-gender groups in Singapore, using a panel regression approach. Structural drivers identified include changing life expectancy, educational attainment, and patterns in family formation. A better understanding of the contribution of structural factors to LFPR movements could help shed light on effective policy levers for boosting labour force participation.

The analysis finds that the two biggest contributors to the rise in Singapore's overall trend LFPR from 2003 to 2023 were longer life expectancies and higher educational attainment. These likely boosted the participation rate of women in particular. Looking ahead, trend LFPR is likely to plateau as the ageing population profile will increasingly outweigh the boost from rising life expectancy and educational attainment, with further improvements in these two areas likely to be limited.

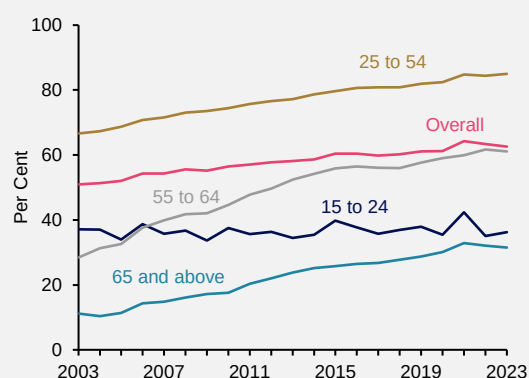
Overview of Recent LFPR Trends

The overall LFPR for the resident population has risen steadily over the past two decades, from 63.2% in 2003 to 68.6% in 2023. The two groups that have contributed most to the overall LFPR increase have been i) females, as well as ii) older workers. Two further observations are notable.

- LFPR has risen significantly for females while remaining broadly stable for males (**Charts A1 and A2**). The rise in LFPR for females was observed across all age groups, except the youngest age cohort, i.e., aged 15–24, as a larger proportion of them pursue further education.
- Over the years, LFPR has risen sharply for both males and females aged 55 and above. While the LFPR increase for males aged 55–64 eased in the 2010s, LFPR for females in this age group continued to rise strongly.

Chart A1 LFPR of females has risen significantly across almost all age groups

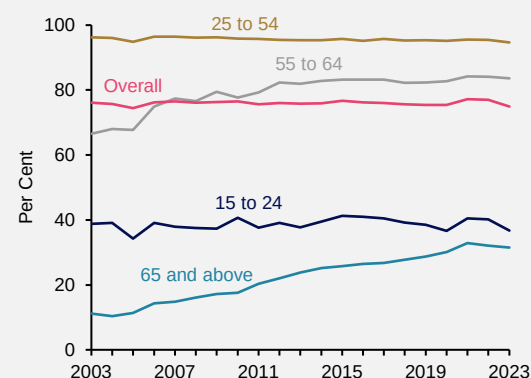
LFPR for females by age group



Source: MOM

Chart A2 LFPR of males has been relatively stable

LFPR for males by age group

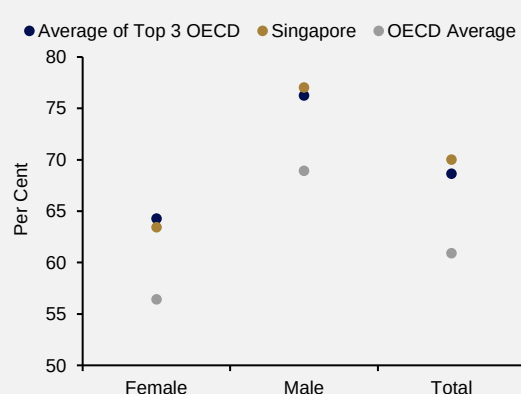


Source: MOM

The resident LFPR in Singapore exceeds the OECD average and is now close to the “global frontier” for both males and females. The male LFPR in Singapore has historically been consistently close to the frontier countries (**Chart A3**) and has hovered between 75% and 80% since the 1990s. Meanwhile, Singapore’s female LFPR has risen substantially over time (by about 12% points since 2003) and is now close to that of global leaders.¹

Chart A3 Singapore’s LFPR for males and females are close to frontier countries...

LFPR of OECD countries and Singapore in 2022

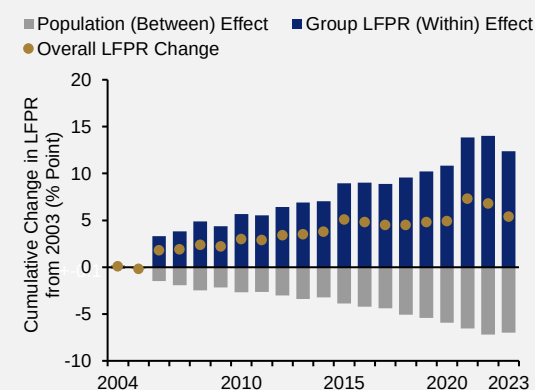


Source: MOM, OECD and EPG, MAS estimates

Note: The top 3 OECD countries by each category are: New Zealand, Netherlands, Australia for females; Colombia, Mexico, New Zealand for males; and New Zealand, Netherlands, Switzerland for overall.

Chart A4 ...with within-group increases driving the overall rise in LFPR

Shift-share decomposition of cumulative LFPR change compared to 2003



Source: MOM and EPG, MAS estimates

However, Singapore’s ageing population has been a drag on overall LFPR. Using a shift-share decomposition framework, the effects of population ageing are captured by the

¹ In 2022, female LFPR averaged 64.3% among the top three OECD countries (New Zealand, Netherlands and Australia), and was 63.4% in Singapore.

“between-group” component. Over the 2003–23 period, this component contributed –7% points to overall LFPR growth (**Chart A4**), as older age groups with lower LFPR account for a growing share of the working-age population. Meanwhile, the “within-group” component of LFPR contributed 12.4% points to the overall 5.4% points rise in LFPR.

Estimating Drivers of LFPR

To explain the change in LFPR trends within age-gender groups, a panel regression approach, adapted from a Brookings study by Aaronson *et al.* (2014), is used to estimate the contributions of cyclical and structural drivers. This step estimates how trend participation rates within age-gender groups have changed over time due to structural factors, while remaining agnostic to the changes in the population’s age structure over time.

The panel regression model takes the specification in Equation (1) below. The subscripts a , g and t refer to age groups, gender groups and time respectively:

$$\log\left(\frac{LFPR_{a,g,t}}{1 - LFPR_{a,g,t}}\right) = C + A_{a,g} + T_{a,g,t} + Z_t\lambda + X_{a,g,t}\beta + \varepsilon_{a,g,t} \quad (1)$$

The dependent variable is the log-likelihood of LFPR within age-gender groups for year t .² The independent variables include a constant term C , age-gender fixed effects $A_{a,g}$, and time trends for several age-gender groups $T_{a,g,t}$. Cyclical factors, denoted Z_t , are used to control for the effects of the business cycle on participation and consist of the output gap and EPG’s labour market pressure indicator (LMPI).³ Of primary interest are the effects of structural factors, denoted by $X_{a,g,t}$, on labour force participation. Drawing from the international empirical literature on the long-term determinants of LFPR, the following structural factors were included in the empirical model, each of which varies by age-gender group across years.⁴

1. Educational attainment (as measured by the proportion of population in each age-gender group with tertiary education of diploma & above): Higher educational attainment has been found to be associated with greater labour force participation, as more educated individuals have greater earnings potential (OECD, 2023). However, research has also found that some more highly educated individuals may exit the labour force at a younger age, due to larger accumulated retirement savings in their prime working age (Geppert *et al.*, 2019).
2. Life expectancy (defined as the average remaining life expectancy for each age-gender group): Life expectancy has been found to be positively correlated with labour force participation, as more working years will be required to accumulate sufficient savings

² The dependent variable is the log odds ratio of LFPR, a functional form that ensures that implied estimated participation rates are restricted to between 0 and 100%. Annual mid-year LFPR data from MOM for each age-gender group is used.

³ Please see Box B on “Labour Market Pressures and Inflation: A Principal Components Approach” in the October 2014 *Review* for more details on EPG’s LMPI.

⁴ As the majority of the population aged 15–24 years are still full-time students, this model does not estimate LFPR for the 15–24 years age group.

for retirement. A European Central Bank study (Balleer *et al.*, 2009) of five Euro area countries estimated that increases in life expectancy had a positive effect on labour force participation, particularly for older age groups.

3. Marriage rate (defined as the proportion of the population in each age-gender group that is married) and average number of children per female (refers to the average number of children born to each female age group): The literature has generally found that prime working-age women are less likely to work when they are married with young children than single mothers (e.g., Azcona *et al.*, 2020), suggesting that childbearing and childcare responsibilities have a stronger negative association with labour force participation for married women. This is likely because married women take on more homemaking tasks and cede income-seeking responsibilities to men. A marriage rate-female dummy interaction term in the specification accounts for the effects of marriage, while another interaction term, consisting of average number of children per thousand women and a childbearing female dummy, is included to account for the effects of childbearing on labour force participation among women.
4. Gender wage ratio (defined as male earnings/female earnings⁵): A large gender wage ratio (i.e., a larger gap between male and female wages) reduces the opportunity cost of home production, such as housework and childcare, for females, *vis-à-vis* males, and incentivises women to engage in home production rather than join the labour force. An IMF study by Kinoshita and Guo (2015) found that a large gender wage ratio (i.e., higher relative male wages) is associated with lower female employment in formal work and higher female employment in the informal sector. A gender wage ratio-female dummy interaction term is included in the specification.
5. Time trend: In the Singapore context, some of the increase in trend LFPR for older individuals likely reflects a combination of policy moves to encourage senior workers to remain in the labour force, including shifts in retirement and re-employment age policies⁶, as well as possibly greater embedded preferences for work among newer cohorts of older workers. Due to the econometric challenges of accounting for each of these effects separately, a time trend is introduced for certain age-gender groups to flexibly control for the combined effects of policy and preference shifts.⁷

Overall, the empirical strategy utilises variation in structural factors among age-gender cohorts across time to estimate drivers of the aggregate resident LFPR. As the validity of this strategy relies on the assumption that the structural drivers are exogenously determined, only variables that can be reasonably expected to be independent are included as potential drivers in the model. For example, educational attainment and life expectancies have likely increased across time largely due to the development of Singapore's schooling and medical infrastructure, and are likely to be exogenous.

⁵ Earnings refer to Median Gross Monthly Income from Work (Including Employer CPF) of Full-Time Employed Residents by age-gender groups.

⁶ The retirement age was increased from 60 to 62 in 1999, then to 63 in 2022, with a further increase to 65 expected by 2030. The re-employment age was increased from 65 to 67 in 2017, then to 68 in 2022, with a planned further increase to 70 by 2030.

⁷ Time trends were included for age-gender groups for which the estimated error term was non-stationary, after controlling for the structural drivers in Equation (1). Age-gender groups for which time trends were included under this criterion largely comprised older age groups and females.

Estimation Results

The estimation results suggest that cyclical factors (as measured by the LMPI), life expectancy, educational attainment, marriage, average number of children (per thousand females), as well as the gender wage ratio were significant drivers of labour force participation in Singapore, largely in line with the literature. The estimated coefficients of the selected model are presented under “Specification (1)” in **Table A1**.⁸

Table A1 Selected results of panel regression estimation

Independent Variable	Specification (1)	Specification (2)
LMPI	0.049**	–
Output Gap	–	–0.0021
Educational Attainment	0.61***	0.89***
Life Expectancy	0.11***	0.093
Marriage Rate	7.1***	6.5***
Marriage Rate × Female Dummy	–3.4**	–2.2
Average Number of Children × Childbearing Groups Dummy	–0.0099*	–0.010
Gender Wage Ratio × Female Dummy	–1.3***	–1.4***
R^2	0.64	0.63
Regression Standard Error	0.21	0.21

Source: EPG, MAS estimates using data from DOS and MOM

Note: Figures shown refer to the mean coefficient estimates under the panel fixed effects logistic regression model shown in Equation (1). The dependent variable is the log odds ratio of LFPR, which varies by age-gender group and by year. A positive estimated coefficient implies that the independent variable raises the odds ratio of labour force participation, and vice versa. *** Statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level.

Some of the key results and insights from this estimation exercise are as follows:

1. Consistent with empirical literature, higher educational attainment and life expectancies are associated with higher LFPR in Singapore. The effect of educational attainment and life expectancy on LFPR is significant. Raising the expected remaining life expectancy for an individual by one year increases his/her likelihood of participating in the labour force by 11.6% on average⁹, while a 1% point increase in the average share of population

⁸ Specification (1) was chosen as the baseline specification since the output gap was not a statistically significant cyclical driver of labour force participation.

⁹ Higher conditional life expectancy is likely to have a heterogeneous impact across age groups, with the labour force participation of older individuals likely to be more responsive to an increase in life expectancy, as they have a shorter runway to accumulate savings required for an additional year of life.

with a diploma qualification and above is associated with a 0.6% increase in the average likelihood of labour force participation.¹⁰

2. Increasing the average number of children (per thousand females) by one is associated with a 1% decline in the likelihood of a woman of childbearing age participating in the labour force, suggesting that childbearing discourages labour force participation by women in Singapore.
3. Marriage is found to be positively associated with participating in the labour force (as indicated by the positive coefficient on the marriage variable), suggesting that the larger financial commitments associated with marriage prompt stronger labour force attachment. However, marriage improves labour force participation for females to a smaller extent, relative to males (as indicated by the negative coefficient on the interaction term between marriage and a female dummy). An increase in marriage rate by 1% point only raises the likelihood of labour force participation of females by 4%, around half of its impact on the male labour force participation.
4. A 1% point decline in the gender wage ratio is associated with a 1.3% increase in the likelihood of labour force participation for females. This suggests that reducing gender wage inequality could help to encourage labour force participation among women and boost overall LFPR.
5. The positive coefficient on the LMPI implies that LFPR is generally procyclical in Singapore, similar to countries like the US (Krusell *et al.*, 2017). That is, there is typically a net inflow of workers into the resident labour force during periods of cyclical labour market tightness when labour demand and wage growth tend to be strong, while more workers exit the labour force when there is significant labour market slack.

Decomposition of Historical Change in LFPR

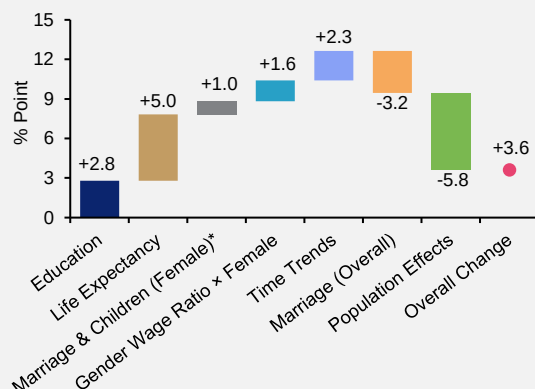
As shown by the decomposition in **Chart A5**, the largest positive contributors to increases in trend LFPR from 2003 to 2023 were higher life expectancies and rising education levels. The share of the population aged 25 and above with a diploma qualification and above more than doubled from 25.8% in 2003 to 53.1% in 2022 (**Chart A6**), while the average life expectancy rose from 79.1 to 83 years over the same period.¹¹ In comparison, the fall in marriage rates contributed to some decline in trend LFPR. However, for females, the negative effect of declining marriage rates on LFPR was partly counteracted by a falling fertility rate, which encouraged more women to participate in the workforce. Finally, the decline in gender wage ratio, as well as the time trend terms representing policy and preference shifts among older individuals have also boosted overall LFPR.

¹⁰ To be precise, the results refer to the marginal impact of increasing the value of an independent variable by 1 on the *odds ratio* of labour force participation, $e^{\hat{\beta}}$, where $\hat{\beta}$ is the estimated coefficient in Equation (1). The odds ratio impact should be interpreted as the percentage change in the probability of participating in the labour force, relative to non-participation. Mathematically, the odds ratio impact cannot be converted to an equivalent change in the probability of labour force participation in a logistic regression framework, as the marginal effect varies depending on the individual's characteristics.

¹¹ Preliminary 2022 life expectancy data.

Chart A5 Life expectancies and educational attainment were the largest drivers of increase in LFPR...

Estimated contributions of structural drivers to the cumulative change in trend LFPR (2003–23)

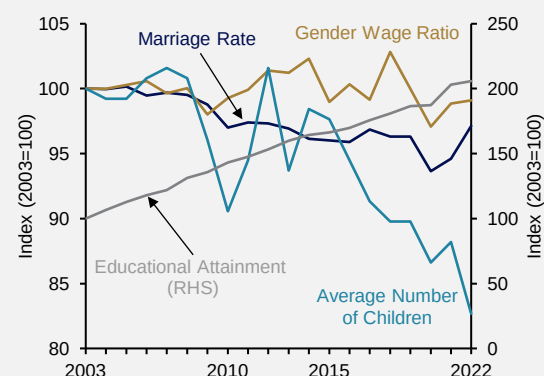


Source: EPG, MAS estimates using data from DOS and MOM

Note: * Includes the additional effect of marriage on LFPR for only females. A linear approximation is taken to obtain the decomposition chart above. As the model only estimates LFPR for age 25 and above, average LFPR (over 2003–22) for ages 15 to 24 were included to compute overall trend LFPR. 2023 trend LFPR is estimated based on the projected values of structural variables.

Chart A6 ...as both structural variables rose over the past two decades

Indices of structural variables (2003–22)



Source: EPG, MAS estimates using data from DOS and MOM

Note: Population measures of structural variables are shown in the chart above. As conditional life expectancy could not be aggregated up to population level index, this structural variable is not included in the chart.

Overall, trend LFPR rose by 3.6% points from 64% in 2003 to 67.6% in 2023. The structural forces pushing up LFPR within age-gender groups over the last 20 years raised trend LFPR by 12.6% points, which more than offset the drag from an ageing population and declining marriage rates (–5.8% points and –3.2% points respectively).

Conclusion

Looking forward, the drag on LFPR caused by the underlying ageing population profile is expected to increasingly outweigh the boost from structural factors, primarily as rising life expectancies and educational attainment, which were the largest drivers of historical increases in trend LFPR, are already plateauing. If current trends continue, trend LFPR may fall gradually in the future.

To facilitate some continued growth in “within-group” LFPRs, the estimation results affirm the focus of current policy efforts on two areas. First, engendering greater labour force attachment among seniors will be important to facilitate a continued increase in overall LFPR. Given that newer cohorts of seniors have higher average educational attainment and incomes relative to their predecessors, their participation rates could be higher than implied by the projections based on panel regression results. Efforts to improve productivity and skills, strengthen employment facilitation support, enhance employers’ abilities to create age-friendly jobs and workplaces, and shift mindsets of workers and employers would help encourage seniors to extend their time in the workforce and employers to hire seniors.

Second, the estimates suggest that having children and getting married are still correlated with lower labour force participation for women, relative to men. This implies that

policy efforts to alleviate the burden of childcare for women (e.g., reductions in preschool fees and other forms of support for young families introduced in Budget 2024, as well as moves to support flexible work arrangements such as the upcoming implementation of Tripartite Guidelines on Flexible Work Arrangement Requests) could help to raise participation rates for women. With local workforce growth slowing as a result of an ageing population and falling birth rates, employers will need to widen their access to talent by embracing the skills and experience of senior workers and women.

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