Intergenerational Income Mobility In Singapore



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INTRODUCTION – HOW TO MEASURE INTERGENERATIONAL MOBILITY

1. The measurement of intergenerational income mobility, or the degree to which income status persists across generations within a family, has been a subject of great interest among social scientists and policymakers. High intergenerational mobility is desirable from the social perspective as it suggests that there is greater equality of opportunity – society offers similar chances of achieving economic success regardless of one's background. Conversely, low mobility implies that children from low income families are more likely to remain poor, and thus presents a case for more active government intervention to "level the playing field".

2. In this paper, we present measures of intergenerational income mobility in Singapore, derived using a simple methodology originating from Solon (1992). Specifically, we estimate the correlation between measures of fathers' incomes and that of their sons' incomes. The correlation coefficient, ρ, is typically a value between 0 and 1, where a higher value implies lower intergenerational mobility, meaning a son is more likely to be of an income status similar to his father's.[2] To illustrate, Table 1 shows, for various values of ρ, the associated (simulated) probability of a son reaching different parts of the income distribution if his father is in the lowest income quintile.[3] In a society where ρ is 0.2, the probability of the son reaching the 2nd and higher income quintiles is 72 percent. This probability decreases to 62 percent when ρ is 0.4, and further to 50 percent when ρ is 0.6. Similarly, the probability of the son reaching the top income quintile falls from 13 percent to 2 percent when ρ goes from 0.2 to 0.6.

Table 1: Intergenerational Income Status Transition Probabilities for Different Values of ρ (Given Father in the 1st Quintile)

Father: 1st quintile	Son: Probability of Reaching Various Quintiles		
	1st quintile	2nd-4th quintile	5th quintile
ρ = 0.2	0.28	0.59	0.13
ρ = 0.4	0.38	0.55	0.07
ρ = 0.6	0.50	0.48	0.02

3. For the United States (US), Solon (1992) found an estimate of ρ = 0.4 and concluded that intergeneration mobility was relatively low.[4] This value of ρ = 0.4 has since served as a benchmark for international comparison of intergenerational mobility.

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[2] A positive correlation indicates that higher parental income is associated with higher child incomes. Negative values, while possible, are rare.

[3] The simulation assumes that fathers' and sons' incomes are jointly log-normal with correlation coefficient ρ. Using this assumption, it is then straightforward to generate income transition probabilities.

[4] Solon's sample was taken from the Michigan Panel Study of Income Dynamics (PSID), which contained 348 father-son pairs from 5,000 households tracked longitudinally since 1968. Eldest sons' birth cohorts were between 1951 and 1959 and their annual incomes were measured in 1984. Their fathers' mean annual incomes were measured for the years 1967-1971 (inflated to 1984 dollars). This gave sons in the sample an age of between 25 and 33, and at least a 13 year gap between the measurement of fathers' and their sons' incomes.

EARLIER WORK ON INTERGENERATIONAL MOBILITY IN SINGAPORE

4. To our knowledge, the only other work measuring intergenerational income correlation in Singapore are two papers by Ng (2007) and Ng et. Al., (2009). Both papers used data from the 2002 Singapore National Youth Survey (NYS 2002), which surveyed youths aged 15-29 in 2002. In that survey were respondents' monthly incomes and their parents' monthly combined incomes (parent and child incomes were for the same year).

5. In both papers, the authors estimated intergenerational mobility using interval regression, with education and occupation of the parents as instrumental variables. Ng (2007) estimates intergenerational correlation to be about 0.23-0.28. However, after applying certain adjustments similar to Corak (2006) to obtain earnings (instead of income) correlation, she finds correlations ranging from 0.135 to 1.2, a very wide range suggesting extremely high and low mobility respectively.

6. Ng et. Al. (2009) subsequently focus on ensuring that treatment of the US data and the Singapore data were as similar as possible, and applied the same estimation method to both. This, in effect, artificially imposed the Singapore sample's data constraints on the US data in the estimation process. This yielded similar estimates of 0.26 and 0.27 for Singapore and the US respectively. Thereafter, using what is learned about the downward biases of such an approach in the US data, they adjust both the US and Singapore estimates upwards by similar magnitudes, thus concluding that Singapore has an intergenerational correlation coefficient as high as the US.

7. The two studies faced significant data constraints. First, the sample sizes, though similar to several influential studies using the Michigan Panel Study of Income Dynamics (PSID), were small, with only about 271 usable parent-child pairs. Second, only a single cross section of data was available, the income data was recorded not in dollar values but in intervals, and youths' reports on parental incomes could contain recall error, thus further introducing sources of measurement error. Third, ages below 30 are regarded as too early to draw conclusions on mobility. The lack of longitudinal and high-quality data necessitated the use of interval regression and instrumental variables to overcome measurement error bias. The use of parental characteristics as instruments is valid if these characteristics affect the child's income only through the parent's income, but not via another channel. As Ng (2007) notes, there is evidence suggesting that this may not be the case. Ng (2007) also notes that the use of scale factors to adjust for discrepancies between estimation methods and samples, requires that two income distributions for two countries be similar, which may be untrue. Therefore, while the strategy used to address the data issues was the correct one, it nonetheless required debatable assumptions and adjustment factors, making their results than less conclusive, and cannot be interpreted with confidence. In our view, the data issues they faced required a larger sample size and longitudinal data in order to be convincingly addressed.

8. In our study, we use data that is longitudinal, measured with high precision and of large sample sizes to overcome the challenges faced by the earlier body of work in Singapore. The estimates we obtained suggest that intergenerational correlation for the cohorts born between 1969 and 1978 was moderate to low. Furthermore, our results are relatively robust to alternative assumptions on parental job attachment and permanent income measurement, and are also relatively stable over different quantiles. Together they imply that intergenerational mobility in Singapore appears to be moderate or relatively high, at least for the cohorts under study.

9. In the subsequent sections, we describe the data used to measure intergenerational income mobility in Singapore, followed by the measurement issues faced. We then present the detailed findings and compare them with other studies on intergenerational mobility in Singapore before discussing the implications in the concluding section.

METHODOLOGY AND DATA

10. Our estimation methodology follows that used in Solon (1992) closely. For a father-son pair indexed by *i,* we estimate equation (1), which expresses a son's 2008 income, Y, as a function of his father's average income, $\bar{Y}$, over *T* years, controlling for the age of both father and son. The father's income is averaged over *T* years to proxy for his *permanent* or lifetime income.

$$Y_{\text{son},i,2008} = \alpha + \beta_0 \bar{Y}_{\text{father},i,T} + \beta_1 Age_{\text{son},i,2008} + \beta_2 Age^2_{\text{son},i,2008} + \beta_3 \overline{Age}_{\text{father},i,T} + \beta_4 \overline{Age^2}_{\text{father},i,T} + \varepsilon \quad (1)$$

11. Our main interest is the parameter β_0, which is the intergenerational correlation coefficient. It is common to adjust the intergenerational correlation coefficient by the ratio of standard deviation of the father's income to the son's income because income variance may differ over the generations. This leads to the following adjustment:

$$\rho = \beta_0 \left(\frac{\sigma_{\bar{Y}_{\text{father},i,T}}}{\sigma_{Y_{\text{son},i,2008}}} \right) \quad (2)$$

12. The data used in the study are from the Singapore Department of Statistics, and consist of income records, year of birth and parent-child linkage indicators. These data are from a combination of administrative, survey and census records. Data on incomes refers to individuals' wages and self-employment incomes for the period from 1996 to 2008. In particular, we focused on fathers and their eldest sons (including eldest sons who have elder sisters) who are Singapore Citizens or Permanent Residents. This decision to study the relationship between the income of fathers and their eldest sons, specifically, is in line with the literature and the reasons are twofold. First, the measurement of income mobility using daughters is complicated by life-cycle events such as marriage and childbirth, which can lead to variability in daughters' incomes from temporary or permanent exit from employment. Second, focusing on eldest sons avoids possible issues arising from any gender or birth-order biases in child investments.

13. Three other key technical issues affect the estimation of intergenerational income correlation. These include: (i) determining the appropriate points in the life cycle at which to measure the incomes of the father-son pair; (ii) obtaining good measures of *permanent* income; and (iii) dealing with possible biases arising from the choice of the father-son sample. Below, we discuss how these issues were addressed in our study.

Life-Cycle Considerations and Father-Son Age

14. In the initial years of the life cycle, income trajectories tend to be steeper and variation tends to be lower, as wages are initially paid according to observed educational attainment and eventually diverge as workers reveal differences in skills and ability. Conversely, incomes towards the end of working life can be complicated by retirement considerations. The middle of the life cycle (between ages 30 and 55) is a period of relative income stability and is thought to be the best period to measure parent-child correlation. However, the income data available to us was limited to the period 1996 to 2008. Thus, we selected only the son cohorts aged 30-39 in 2008 (i.e. those cohorts born between 1969 and 1978). The average

age of their fathers at the earliest window (1996 to 2000) would have just exceeded 50 (see Table 2), and the duration between the father's last measured income and his son's measured income is at least eight years. In our view, keeping ages above 30 and maximizing the duration between father-son incomes represents the best use of the data at hand. This data limitation may be resolved in future, when data of longer horizon is available.

15. Our main sample comprises 39,500 father-son pairs. We further split the sample into two five-year birth cohorts, from 1969 to 1973 and from 1974 to 1978, to investigate if the correlation coefficient varies by birth cohort. Table 2 below presents the summary statistics of the two sub-samples.

TABLE 2: SUMMARY STATISTICS

	1969-1973 Cohorts		1974-1978 Cohorts	
Variable	**Mean**	**Std Dev**	**Mean**	**Std Dev**
Son's age as at end-2008	37	1.4	32	1.4
Son's employment income in 2008	$78,200	$115,400	$58,400	$54,400
Son's monthly employment income in 2008	$6,900	$9,900	$5,200	$5,100
Father's age as at end-1998	56	4.8	51	4.6
Father's mean annual employment income 1996-2000	$53,500	$91,900	$56,700	$88,000
Father's mean monthly employment income 1996-2000	$4,800	$9,400	$5,000	$8,300
Number of father-son pairs	15,400		24,100	

*Income values in 2009 dollars.

Biases and Measurement of Permanent Income

16. Intergenerational correlation is a measurement of correlation between *long-run* or *permanent* incomes of fathers and their sons. Although a natural approach is to estimate equation (1) by Ordinary Least Squares (OLS) using the father's income in year X and his son's income in year Y, it has been well-established that this leads to biased estimates of the correlation. This is because in any given year, the father's income is made up of a permanent (skills-related) component and a transitory fluctuation. The presence of transitory fluctuations introduces measurement error bias into OLS estimation, resulting in coefficients that are biased towards zero.[5]

17. There are two general approaches to reduce this bias: the first is to obtain better estimates of permanent incomes, while the second is to employ instrumental variables (IV). The first approach is typically preferred when longitudinal data is available, whereas IV strategies are pursued when it is not. We take the first approach. We average the father's income over several years as a proxy for his permanent income. The procedure of averaging reduces the noise from transitory fluctuations, leading to a measure that more closely resembles permanent incomes. This is the approach used by Solon (1992) and has been shown to significantly reduce the bias.[6]

18. We follow Solon's approach of taking all possible two- to five-year averages of fathers' incomes as our proxy for permanent income. For example, if we use a three-year average of fathers' incomes, we can choose to average over 1996-1998, 1997-1999, 1998-2000, and

[5] See for instance Solon (1989). This problem is less important for sons' incomes.

[6] There is more recent work involving sophisticated bias-reduction methods which are beyond the scope of this paper.

so on. We stop the analysis at five-year average incomes due to the short duration of our sample. The implication for our work is that, as with Solon (1992), some, though not all the bias, would have been eliminated. In the Appendix to the paper, we report estimates of intergenerational correlation using all possible combinations and show that intergenerational correlation was in fact relatively stable across the combinations.

Missing Father's Incomes Arising From Non-Work

19. Due to fluctuations in employment status, it is common to find that the fathers may not have worked every year. This gives rise to potential selection problems where those with lower job attachment may be excluded from the estimation, thus introducing another source of bias to intergenerational correlation. To address this, we work with balanced and unbalanced samples, as with Solon (1992). The balanced sample restricts attention only to fathers who worked throughout the entire 1996-2000 period. As a consistency check, we compare the results with the unbalanced sample which consists of fathers who worked at least the 2, 3, 4 or 5 years used to calculate his average income. This way, fathers with weaker job attachment are included in the unbalanced sample. The results from both types of samples were compared and found to be similar. These comparisons are also reported in the Appendix to this paper.

FINDINGS

Older cohorts yield higher ρ

20. We estimate equation (1) by OLS, using annual and monthly incomes separately for the 1969-1973 and 1974-1978 cohorts. The key results are summarized in Table 3, while the other coefficients and regression diagnostics may be found in Table A1 of the Appendix. The intergenerational correlation is estimated to be between 0.22 and 0.30. Lower correlations were found for younger cohorts, and when incomes were measured annually.

21. The discrepancy between estimates from annual and monthly incomes illustrates the role of measurement error. As workers may not be working the entire year, this variation in intensity of work introduces measurement error in fathers' annual incomes. Average monthly incomes more accurately reflects a person's skills and ability and hence lifetime incomes, and thus reduces some of this downward bias. Table 3 indeed shows that with monthly incomes, ρ increases by about 4-5 points. In fact, a worker's skills price would be best reflected by hourly incomes, if this data were available and accurately measured. Unfortunately it was unavailable from administrative records. Therefore, we consider the estimates from monthly incomes to be our preferred measures of intergenerational correlation.

TABLE 3: INTERGENERATIONAL CORRELATION COEFFICIENTS USING ANNUAL AND MONTHLY LOG-INCOMES.

Cohort	Intergenerational Correlation Coefficient (ρ):	
	Annual Income	Monthly Income
1969-1973	0.26 (0.009)	0.30 (0.008)
1974-1978	0.22 (0.007)	0.27 (0.006)

*Standard errors in parentheses.

22. The higher intergenerational correlation for the older cohort is consistent with life-cycle patterns. Early career incomes reflect educational attainment more, and the father-son

correlation is likely to be lower. As the son nears the middle of the life cycle, "start-of-career" effects no longer dominate. Over time, the correlation increasingly reflects the contribution of unobserved skills and experience, and hence the above results may reflect a rise in intergenerational correlation.

23. The smaller sample size of the older cohort compared to the younger cohort (around 15,000 observations vs. 24,000 observations) suggests that retirement or lower job attachment of older fathers could have been an important factor. We check this by comparing the estimates from the balanced and unbalanced samples in Tables A2 with Table A3. First note that the sample sizes of the unbalanced sample are always larger because of the inclusion of father-son pairs where the fathers worked fewer than five years over 1996-2000. Next observe that ρ in the balanced sample tends to be slightly higher than in the unbalanced sample, usually by 0.02 or less. This provides some indicative evidence that excluding father-son pairs where fathers had lower job attachment may introduce some selection bias, but its effect appears to be relatively small, and it appears to raise, not lower the correlation.

24. Finally we consider the bias reduction from averaging (Table A2). Observe that in virtually all cases, the single-year measurement of fathers' incomes results in the lowest correlation, whereas the five-year average results in the highest correlation. As more years of fathers' incomes are used, the coefficient does indeed increase. However, the increase is relatively small, and the estimates are quite stable across the various combinations of years used. In our view, this shows the advantages of a large sample size.

Sons who have poor fathers remain poor

25. The correlation estimates obtained above describes the conditional mean relationship, or "on-average" mobility between fathers and sons. Some authors such as Eide and Showalter (1999) have focused on conditional quantile relationships and found that the intergenerational earnings correlation in the US was greater at the bottom of the son's earnings distribution than at the top (i.e. low mobility tends to occur at the bottom of the son's income distribution). We check if such a pattern exists for Singapore by estimating equation (1) using quantile regression at the 10th, 30th, 50th, 70th and 90th percentiles of the son's income distribution and depict the results graphically in Figures 1 and 2.[7] Similar to Eide and Showalter (1999), we find that the intergenerational correlation decreases as the son's income percentile increases, but increases slightly near the top of the distribution, meaning that the father's income is a more important explanatory variable for son's income at the bottom of son's conditional income distribution than at the top. Unlike Eide and Showalter (1999), this pattern is much less pronounced. At the 10th percentile, Eide and Showalter (1999) find a father-son correlation of 0.67 in the US, whereas we find lower correlation estimates of 0.36 and 0.27 at the 10th percentile for our older and younger cohorts respectively. Indeed, a casual inspection of Figures 1 and 2 will suggest that in all but one case the slope coefficients by quantiles (blue line) are not statistically different from the average slope estimate (yellow line).[8] Hence there is some evidence, though not strong, of lower mobility among the poor.

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[7] Estimates tables are excluded in order to keep the paper short, but are available from the author upon request.

[8] The exception is the 10th percentile for the 1969-1973 cohort. Recall that the standard error of $\boldsymbol{\beta_0}$ (OLS) is 0.01.

FIGURE 1: ESTIMATES OF SLOPE (β_0) BASED ON QUANTILE REGRESSION, 1969-1973 COHORT. (INCLUDING 95% CONFIDENCE INTERVAL)

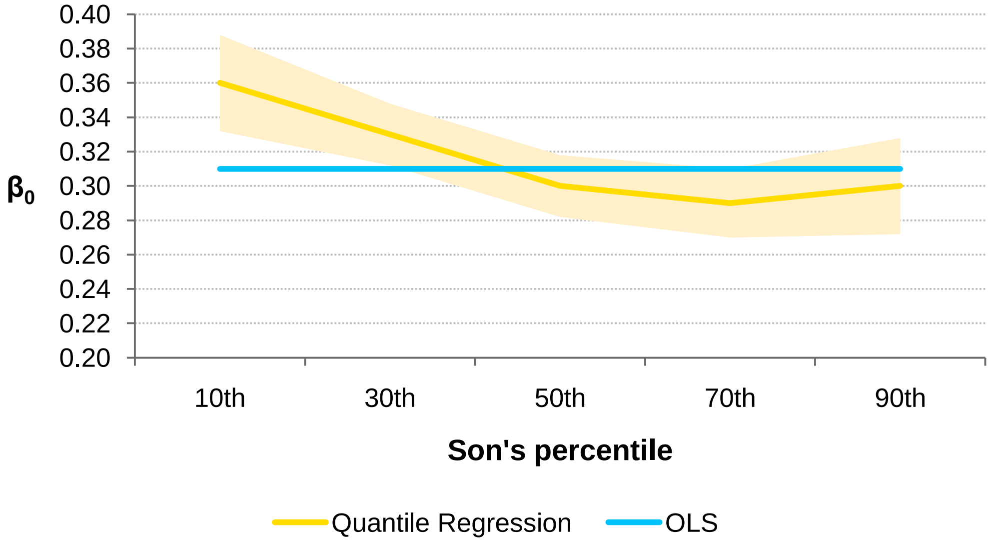
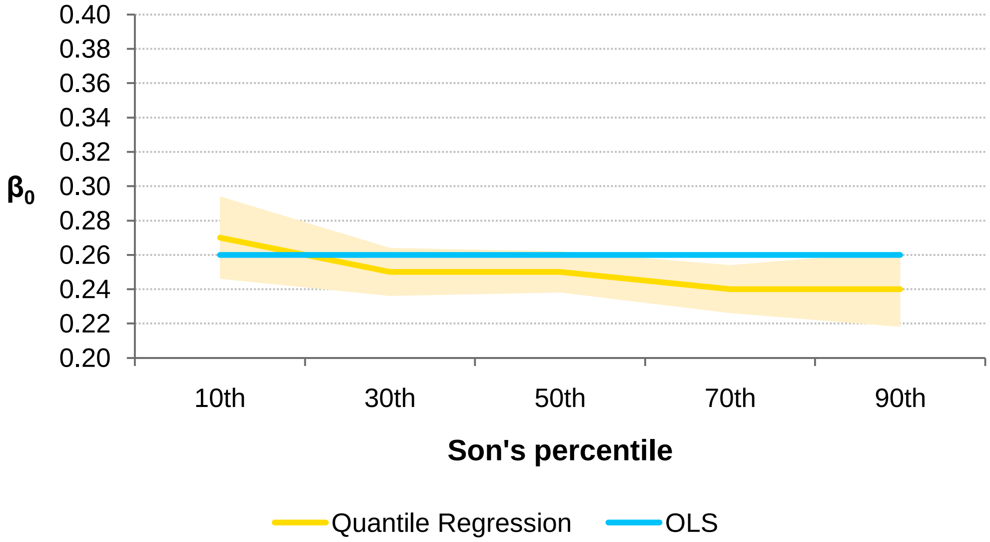


FIGURE 2: ESTIMATES OF SLOPE (β_0) BASED ON QUANTILE REGRESSION, 1974-1978 COHORT. (INCLUDING 95% CONFIDENCE INTERVAL)



Parent-Child Correlation in Education

26. A measure of intergenerational correlation in educational attainment provides a useful comparison with our measure of intergenerational income mobility. In Table 4, we present a cross-tabulation of the highest educational attainment of fathers and their children. The father's education is indicated in the row, while child's education is indicated in the column. The top left cell reports the proportion of children attaining primary education, given a father with primary education.

TABLE 4: CROSS TABULATION OF FATHER AND CHILD EDUCATIONAL ATTAINMENT[9]

		Child					Child's Average Advancement over Father
		Pri	Sec	Upp	Dip	Uni	
	Pri	0.10	0.29	0.16	0.25	0.20	2.2
	Sec	0.04	0.23	0.16	0.25	0.32	1.6
Father	Upp	0.02	0.13	0.12	0.22	0.52	1.1
	Dip	0.01	0.08	0.10	0.16	0.65	0.4
	Uni	0.01	0.06	0.11	0.09	0.72	-0.5
Overall		0.06	0.23	0.15	0.23	0.33	1.6

27. Two simple summary measures of Table 4 are reported. First, the right-hand column measures the weighted average number of educational categories in which the child exceeds the father. This is in fact an application of Bartholomew's measure, where a value of 2.2 in the first row means that given a father with primary education, the average child attains 2.2 levels higher, i.e. upper-secondary. Second, Spearman's rank correlation, analogous to the income correlation coefficient but for categorical values, is calculated to be 0.31, similar in magnitude to our income correlations. Though not strictly comparable, rank correlation in parent-child educational attainment does not appear to be high. In summary, the evidence suggests that intergenerational mobility in incomes and in educational attainment have been moderate to high.

CONCLUSION

28. Our study followed closely the methodologies of Solon (1992) and Eide and Showalter (1999). We obtain an intergenerational correlation coefficient of around 0.22 to 0.30 for Singapore depending on whether annual or monthly incomes were used. Although quantile regression reveals a declining correlation as we move up the son's income distribution, similar to that found for the US by Eide and Showalter, the relationship in Singapore is much less pronounced. We also find our estimates quite robust to different ways of measuring incomes, and across different percentiles of the income distribution. Contrary to earlier work by Ng and collaborators, these results suggest a relatively high degree of intergenerational mobility, at least for the cohorts born between 1969 and 1978. Insofar as the cohorts

[9] The data used is a joint sample of ***males and females*** from cohorts born between 1972 and 1978, and who were successfully matched with fathers with valid education records. Whereas the rest of this paper focuses on sons as females have a different pattern of employment from males, there is little gender difference in educational attainment for these cohorts. Therefore we include females in this measure also. Education for the child refers to the highest qualification at the age of 29 whereas education for the father is not age-restricted. Due to data quality issues, only those born 1972 and after were included in this exercise. The notations "Pri", "Sec", "Upp", "Dip", and "Uni" refer to primary, secondary, upper-secondary, diploma, and university education respectively. Secondary refers to General Certificate of Examination (GCE) 'O'-level and equivalent education, while upper secondary refers to GCE 'A'-level and Institute of Technical Education (ITE) Certificate.

somewhat overlap with the 2002 Youth Survey (they would have been aged 24 to 33 in 2002), they suggest somewhat higher mobility than previous work.[10]

29. To show what this means in terms of income transition, Table 5 simulates an income transition matrix corresponding to a correlation of 0.3. Given a father in the 1st quintile, the son's odds of reaching the top quintile is 10 percent; and given a father at the median (3rd quintile), the son has fairly even odds of reaching every quintile.

TABLE 5: TRANSITION PROBABILITY MATRIX IF ρ =0.30, ASSUMING A BIVARIATE NORMAL DISTRIBUTION

ρ = 0.30		Son's Quintile				
		1st	2nd	3rd	4th	5th
Father's Quintile	1st	0.33	0.24	0.19	0.15	0.10
	2nd	0.24	0.22	0.21	0.19	0.15
	3rd	0.19	0.21	0.21	0.21	0.19
	4th	0.15	0.19	0.21	0.22	0.24
	5th	0.10	0.15	0.19	0.24	0.33

30. What accounts for this relatively high level of mobility in Singapore? One factor often cited is the significant expansion in educational opportunity during the 1960s to 1980s, which coincided with three decades of rapid economic transition. A simple cross-tabulation of father-child educational attainment for the children born in 1972-1978 suggests a fairly large increase in the child's educational attainment over the father. Thus, mobility appears to have been relatively high during the decades of economic transition, benefitting in particular the younger cohorts.

31. We conclude with a discussion of a few unexplored directions in this work at least for the Singapore case. First, the relatively high mobility found in this paper may not be generalised to other cohorts, in particular younger cohorts. Second, as the literature suggests, our estimates may be improved upon if comparison were made between father and son at similar stages in the life cycle. Third, our study stopped at the use of 5-year income averages in measuring permanent income. Subsequent work should explore longer averages and take a deeper look at measurement error in permanent income. These and other issues will enrich our understanding of social mobility, but can only be addressed with data of longer horizon, and thus remain work for the future.

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[10] Compared to a selection of OECD countries in Corak (2006), our estimates appear to be moderate – below that of the US and UK which exceed 0.4, similar to that of Germany at around 0.3, and higher that of Canada and some Nordic countries (0.2 or less). However, due to the wide variation in data quality and context, these should be taken as indicative comparisons only.

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Appendix

Table A1: Estimation of Father-Son Correlation (Balanced Sample)

	1969-1973 Cohort		1974-1978 Cohort	
Variable	**Annual Incomes**	**Monthly Incomes**	**Annual Incomes**	**Monthly Incomes**
Intercept	1.68	-1.19	-0.04	0.41
	(5.870)	(4.940)	(3.230)	(2.540)
Father's mean income over 1996-2000	0.29	0.31	0.24	0.26
	(0.010)	(0.010)	(0.010)	(0.010)
Son's age as at end-2008	0.01	0.08	0.23	0.12
	(0.310)	(0.260)	(0.200)	(0.160)
Son's age as at end-2008 (squared)	0.0000	-0.0010	-0.0031	-0.0014
	(0.004)	(0.004)	(0.003)	(0.002)
Father's mean age over 1996-2000	0.19	0.18	0.13	0.11
	(0.020)	(0.020)	(0.020)	(0.010)
Father's mean age-squared over 1996-2000	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Adj R-Sq	0.08	0.11	0.06	0.09
Number of Observations	15,400	15,400	24,100	24,100

*Standard errors in parentheses.

Table A2: OLS Estimates of β_0 – Different Averages of Father's Income (Balanced Panel)

eriod of father's income	Num obs	Annual Incomes				Monthly Incomes			
		β_0	Std Err	σ(father)/ σ(son)	ρ^*	β_0	Std Err	σ(father)/ σ(son)	ρ^*
Panel A: 1969-1973 Cohorts									
1996	15,400	0.26	0.008	0.93	0.24	0.30	0.008	1.00	0.30
1996-1997 (2 yr average)	15,400	0.28	0.009	0.89	0.25	0.30	0.008	0.99	0.30
1996-1998 (3 yr average)	15,400	0.29	0.009	0.88	0.26	0.31	0.008	0.99	0.30
1996-1999 (4 yr average)	15,400	0.30	0.009	0.87	0.26	0.31	0.008	0.98	0.30
1996-2000 (5 yr average)	15,400	0.29	0.009	0.88	0.26	0.31	0.008	0.98	0.30
1997	15,400	0.27	0.009	0.90	0.25	0.29	0.008	1.01	0.29
1997-1998 (2 yr average)	15,400	0.29	0.009	0.89	0.26	0.30	0.008	0.99	0.30
1997-1999 (3 yr average)	15,400	0.29	0.009	0.88	0.26	0.31	0.008	0.99	0.30
1997-2000 (4 yr average)	15,400	0.29	0.009	0.89	0.26	0.31	0.008	0.98	0.30
1998	15,400	0.27	0.009	0.92	0.25	0.29	0.008	1.01	0.30
1998-1999 (2 yr average)	15,400	0.28	0.009	0.90	0.25	0.30	0.008	1.00	0.30
1998-2000 (3 yr average)	15,400	0.27	0.009	0.91	0.25	0.30	0.008	0.99	0.30
1999	15,400	0.25	0.008	0.94	0.24	0.28	0.008	1.02	0.29
1999-2000 (2 yr average)	15,400	0.25	0.008	0.96	0.24	0.29	0.008	1.01	0.29
2000	15,400	0.20	0.007	1.06	0.21	0.26	0.007	1.06	0.28
Panel B: 1974-1978 Cohorts									
1996	24,100	0.22	0.007	0.96	0.21	0.24	0.006	1.09	0.26
1996-1997 (2 yr average)	24,100	0.23	0.007	0.92	0.21	0.25	0.006	1.08	0.27
1996-1998 (3 yr average)	24,100	0.24	0.007	0.91	0.22	0.25	0.006	1.08	0.27
1996-1999 (4 yr average)	24,100	0.24	0.007	0.90	0.22	0.26	0.006	1.07	0.27
1996-2000 (5 yr average)	24,100	0.24	0.007	0.91	0.22	0.26	0.006	1.07	0.27
1997	24,100	0.22	0.007	0.92	0.21	0.24	0.006	1.09	0.26
1997-1998 (2 yr average)	24,100	0.23	0.007	0.92	0.22	0.25	0.006	1.09	0.27
1997-1999 (3 yr average)	24,100	0.24	0.007	0.91	0.22	0.25	0.006	1.08	0.27
1997-2000 (4 yr average)	24,100	0.24	0.007	0.91	0.22	0.25	0.006	1.08	0.27
1998	24,100	0.22	0.007	0.95	0.21	0.24	0.006	1.12	0.27
1998-1999 (2 yr average)	24,100	0.23	0.007	0.93	0.22	0.25	0.006	1.09	0.27
1998-2000 (3 yr average)	24,100	0.23	0.007	0.93	0.22	0.25	0.006	1.09	0.27
1999	24,100	0.22	0.007	0.97	0.21	0.24	0.006	1.11	0.27
1999-2000 (2 yr average)	24,100	0.22	0.007	0.97	0.21	0.24	0.006	1.11	0.27
2000	24,100	0.18	0.006	1.05	0.19	0.22	0.005	1.16	0.26

*Correlation coefficient computed as β_0 * σ(father) / σ(son).

Table A3: OLS Estimates of β_0 – Different Averages of Father's Income (Unbalanced Panel)

Period of father's income	Num obs	Annual Incomes				Monthly Incomes			
		β_0	Std Err	σ(father)/ σ(son)	ρ*	β_0	Std Err	σ(father)/ σ(son)	ρ*
Panel A: 1969-1973 Cohorts									
1996	22,300	0.20	0.006	1.07	0.22	0.27	0.006	1.047	0.28
1996-1997 (2 yr average)	20,600	0.25	0.007	0.97	0.24	0.29	0.007	1.000	0.29
1996-1998 (3 yr average)	18,900	0.27	0.008	0.92	0.25	0.30	0.007	0.988	0.29
1996-1999 (4 yr average)	16,900	0.29	0.008	0.89	0.25	0.31	0.008	0.965	0.30
1996-2000 (5 yr average)	15,400	0.29	0.009	0.88	0.26	0.31	0.008	0.976	0.30
1997	21,800	0.20	0.006	1.09	0.21	0.26	0.006	1.058	0.27
1997-1998 (2 yr average)	19,900	0.24	0.007	0.98	0.24	0.28	0.007	1.012	0.29
1997-1999 (3 yr average)	17,600	0.27	0.008	0.91	0.25	0.30	0.007	0.988	0.30
1997-2000 (4 yr average)	15,900	0.28	0.009	0.91	0.25	0.30	0.008	0.988	0.30
1998	20,700	0.19	0.006	1.12	0.21	0.26	0.006	1.058	0.27
1998-1999 (2 yr average)	18,200	0.24	0.007	0.98	0.24	0.28	0.007	1.012	0.29
1998-2000 (3 yr average)	16,400	0.26	0.008	0.94	0.24	0.29	0.008	1.000	0.29
1999	19,300	0.19	0.006	1.13	0.21	0.25	0.007	1.070	0.27
1999-2000 (2 yr average)	17,200	0.23	0.007	1.00	0.23	0.27	0.007	1.023	0.28
2000	18,500	0.17	0.006	1.18	0.20	0.24	0.007	1.093	0.26
Panel B: 1974-1978 Cohorts									
1996	31,100	0.17	0.005	1.10	0.19	0.21	0.005	1.147	0.25
1996-1997 (2 yr average)	29,300	0.20	0.006	0.99	0.20	0.23	0.005	1.122	0.26
1996-1998 (3 yr average)	27,500	0.22	0.006	0.95	0.21	0.24	0.005	1.095	0.26
1996-1999 (4 yr average)	25,600	0.24	0.007	0.92	0.22	0.25	0.006	1.081	0.27
1996-2000 (5 yr average)	24,100	0.24	0.007	0.91	0.22	0.26	0.006	1.068	0.27
1997	30,800	0.17	0.005	1.11	0.19	0.21	0.005	1.176	0.25
1997-1998 (2 yr average)	28,800	0.20	0.006	1.01	0.20	0.23	0.005	1.135	0.26
1997-1999 (3 yr average)	26,500	0.22	0.006	0.96	0.21	0.24	0.005	1.108	0.27
1997-2000 (4 yr average)	24,800	0.24	0.007	0.93	0.22	0.25	0.006	1.081	0.27
1998	29,900	0.17	0.005	1.13	0.19	0.21	0.005	1.189	0.25
1998-1999 (2 yr average)	27,300	0.21	0.006	1.01	0.21	0.24	0.005	1.135	0.27
1998-2000 (3 yr average)	25,500	0.23	0.006	0.96	0.22	0.24	0.005	1.108	0.27
1999	28,600	0.17	0.005	1.14	0.19	0.21	0.005	1.189	0.25
1999-2000 (2 yr average)	26,500	0.20	0.006	1.02	0.21	0.23	0.005	1.135	0.26
2000	28,200	0.16	0.005	1.18	0.19	0.20	0.005	1.216	0.24

*Correlation coefficient computed as β_0 * σ(father) / σ(son).