ASTRONOMICS IN ACTION: THE GRADUATE EARNINGS PREMIUM AND THE DRAGON EFFECT IN SINGAPORE*

NICHOLAS SIM†
University of Adelaide

Abstract

This paper investigates the return to university education in Singapore using a new estimation strategy related to Chinese traditions where children born in the Year of the Dragon are believed to be superior. Because parents might time the arrival of their offspring on a Dragon year, this causes the Dragon cohort to be larger and university entry more competitive. I find evidence in support of a negative "Dragon effect" on university education attainment, and exploiting it for identification, I find that university education has a *ceteris paribus* effect of raising earnings by at least 50 percent on average.

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†Corresponding information: School of Economics, University of Adelaide, Adelaide SA 5000, Australia; E-mail: nicholas.sim@adelaide.edu.au.

"While U.S. and Latin American currencies portray images of national independence heroes, Singapore's 2-dollar bill – the most widely circulated since there is no smaller denomination – shows students in a classroom listening to a professor, with a university in the background. Underneath, there is just one word, 'Education'."

– *Singapore's Obsession with Education*, Miami Herald, 8 September 2009

1 Introduction

Since the groundbreaking work of Mincer (1974), academics everywhere have looked closely into the question of what the return to education might be.[1] However, because of data (or the lack thereof), the literature has little to say about Singapore even though it has a well-regarded educational system that consistently ranks among the best in the world.[2,3] In this paper, I employ a recent survey from the Singapore National Youth Council to address one aspect of this issue – the return to university education. In Singapore, having a university education is usually perceived to be good for one's career, and there has long been a discussion on the extent to which this is true.[4] Such conversations would have benefited from econometric work had data been available.

Therefore, it is my hope to offer some evidence on the causal link between university education and earnings outcome in Singapore, which identification is no doubt a difficult challenge as in any research that focuses on estimating the return to education. Specifically, while the positive association between education and earnings is a virtually ubiquitous fact, *prima facie* evidence of

[1] See Psacharopoulos and Patrinos (2004) for a review.

[2] Singapore ranks among the top nations in 8th grade mathematics and science according to the Trends in International Mathematics and Science Study (TIMMS) of Boston College. See "Study rates Singapore best in math, science", `http://www.bc.edu/bc_org/rvp/pubaf/chronicle/v5/N27/timss.html`. In addition, Singapore has two universities placed in the top 50 of the Quacquarelli Symonds' (QS) rankings of world universities. See "NTU jumps 83 places in university ranking", The Straits Times, 4 October 2012.

[3] The academic literature on the return to education in Singapore is very small, with two journal articles due to Toh (1999) and Sakellariou (2003), and policy papers by Low et al. (2004) and Yong et al. (2007). I thank Chris Sakellariou for conversations on the existing literature related to Singapore.

[4] For example, because a university education is thought to be good for one's career, there has long been a strong demand for universities in Singapore. Recently, the idea of granting more Singaporeans places at universities was discussed more by a member of the Singapore parliament. See "Room for more graduates" by Yee Jenn Jong, `http://yeejj.wordpress.com/2012/08/29/room-for-more-graduates/`. However, a minister later remarked that "Singaporeans do not need to be university graduates to be successful." See "University degree 'not vital for success': Khaw Boon Wan", The Straits Tmes, 05 May 2013.

income gaps may fail to represent what the return to education actually is. Because individuals tend to make educational choices according to their abilities, such income gaps would contain not only the return that is associated with education, the quantity of interest, but also the return on unobserved abilities, which is the confounding effect. Over the years, economists have sought to address this issue by employing various strategies to disentangle the causal effect of education from the confounding effect of unobserved abilities in the data, but these existing strategies are not easily adaptable here. For example, the popular existing methods that employ within-twin comparisons or changes in compulsory schooling laws cannot be implemented here due to data constraints and the lack of important schooling reforms in Singapore.[5] In fact, the dataset used here was not collected for the purpose of economic research, but for the understanding of Singapore's youths in sociological terms. Given these limitations, a new estimation strategy, one that makes the most of the "tight space" afforded by the dataset, must be considered.

To this end, I propose to exploit an (ability) independent shifter of cohort size, generating the so-called "Dragon effect", as an attempt to pin down the causal link between university education and earnings outcomes. In Singapore, Chinese is the largest ethnic group with Malays, Indians and Eurasians completing the country's main demographic composition.[6] According to Chinese traditions, there are twelve creatures on the Chinese zodiac, each representing a specific lunar year in a twelve-lunar year cycle. Among these creatures, towering above all the rest in stature is the Dragon. Believing that children born in the Year of the Dragon are superior, some parents might adopt birthing strategies to time the arrival of their offspring on a Dragon year.[7] Indeed, systematic spikes in birth rates during a Dragon year can be observed in Singapore and in other

[5]Studies that attempt to account for differences in various unobserved endowments by contrasting the earnings outcomes of identical twins with different levels of schooling include Ashenfelter and Krueger (1994), Behrman, Rosenzweig, and Taubman (1994), Isacsson (1999), Miller, Mulvey, and Martin (1995, 2006), and Li, Liu and Zhang (2012), while the use of natural and policy experiments include Angrist and Krueger (1991), Acemoglu and Angrist (2001), Oreopoulos (2006), Maurin and Xenogiani (2007), and Pischke and von Wachter (2008).

[6]Chinese is the dominant ethnic group that comprises slightly above 70 percent of the total local population.

[7]In recent times, such birth strategy has even involved the utilization of assisted-reproduction technology. For instance, the Wall Street Journal reported a surge in the demand for assisted-reproduction clinics in the U.S., China and elsewhere that is tied to the Dragon year. See "Having a Baby in Year of the Dragon Is Too Lucky to Be Left to Chance", Wall Street Journal, January 23 2012.

Asian countries where Chinese culture is prevalent.[8] For example, Figure 1 plots the birth rate for resident women aged 15 to 49 in Singapore from 1970 to 2009.[9] While the fertility rate exhibits a declining trend, it increases during the Dragon years of 1976, 1988 and 2000. For instance, the 1976 Dragon cohort is seen to temporarily halt the rampant downward fertility trend in the early 70s; the "golden" Dragon of 2000, an exceptionally auspicious year, is associated with a notable upward spike in fertility at a time when the decline in fertility rate continues to be persistent.[10]

With this empirical observation in mind, the rationale behind my identification strategy is as follows. As the Dragon cohort is larger than usual, competition for entry into university would be more intense, leading to what is known as the "Dragon effect". An example can be found in the most recent admissions exercise involving a Dragon cohort, where the National University of Singapore and Nanyang Technological University – the largest universities in the country – saw applications to their undergraduate programs surged to record numbers.[11] Since university places are limited, some prospective students with grades good enough for entry in a typical year might find themselves squeezed out by the increased competition.[12] Therefore, the Dragon squeeze acts as a negative shock by causing some otherwise "qualified" individuals to miss out on university.

The empirical analysis focuses on a sample of males aged between 25 to 34 drawn from a new dataset, the 2010 wave of the National Youth Survey, kindly provided by the Singapore National Youth Council. Exploiting the Dragon effect, the main result concludes that university education has a *ceteris paribus* effect of approximately raising one's earnings by at least 50 percent on average. This conclusion is robust to including parental income as an additional control, an impor-

[8] See Yip et al. (2002) and Wong and Yung (2005) for the case of Hong Kong. Goodkind (1991, 1996) provided an analysis on the timing of birth in Asian societies including China, Hong Kong and Singapore.

[9] Data from the Population Trends 2010, a publication of the Statistics Singapore.

[10] The declining fertility rate in the early 70s up to 1986 is due to the "Stop at Two" policy that encourages families to stop at two children. Recognizing the severe decline in the fertility rate, the "Stop at Two" policy was replaced by a "Three-Child Policy" in 1986, leading to a briefly but sharply increasing fertility trend that culminated on the 1988 Year of the Dragon.

[11] See "Polytechnic grads put squeeze on university places", The Straits Times, 15 March 2008.

[12] See "Average grades? Getting into uni is a squeeze", The Straits Times, 30 May 2007. In this article, it was reported that "a rise in the number of university applications ... partly due to the Dragon Year cohort, has resulted in those scoring average grades being squeezed out of a varsity spot". To get a sense of the level of competition for entry, I have contacted the National University of Singapore and Nanyang Technological Institute to enquire about their actual application numbers and the number of places available, but they are unable to release such information.

tant observation as a person's unobserved ability may be linked to parental income in two ways: parental income may be correlated with the individual's 1) *innate* ability if high-earning parents have higher levels of ability on average and if innate ability is transmitted from parents to children, and 2) *late* ability if parents have the financial means to help nurture their child's cognitive and other relevant skills. Therefore, given the possible link between omitted ability and parental income, the robustness of the graduate earnings premium to controlling for parental income offers some support that the Dragon-effect induced variation in university educational attainment is not confounded by omitted ability.

Of separate interest is the question of whether in Singapore, association with the Dragon cohort could affect a person's pursuit of university education. For instance, to some members of the public, the bar for university entry seems to be higher for the Dragon cohort;[13] but from the government's perspective, enough has been done to ensure that there is no Dragon squeeze.[14] Although this conversation is an important one, it has not been addressed by a systematic empirical analysis. Filling this in, I find that the probability of university educational attainment is not invariant to the Dragon effect. Rather, on average, a person from the Dragon cohort is less likely to have a university education compared to another from a non-Dragon cohort. My results also show that the Dragon effect may vary across ethnicity. Compared to a Chinese from the Dragon cohort, a non-Chinese from the same cohort is even less likely to be university educated, implying that the adverse implication of the Dragon effect may be stronger for non-Chinese minorities in Singapore.

Since the independent variation in university educational attainment is generated by the Dragon effect, one might wonder if the estimated return to university education is merely "locally" relevant with respect to the Dragon cohort. This paper offers some evidence to support a counter-argument, using a policy experiment that goes back to the difficult early years of Singapore as a newly independent republic. Faced with a double whammy of poor infrastructure and a booming population, the goverment tried to rein in population growth with a policy encouraging families to exercise

[13] See "A, B, E but no place in local universities", The Straits Times, 29 May 2007.

[14] See "No squeeze in university admission for dragon year cohort", Ministry of Education (Singapore), `http://www.moe.gov.sg/media/forum/2007/20070531.htm`; "More places for Dragon Year cohort", The Straits Times, 31 May 2007.

the restrain of having two children at most. Fertility rate in Singapore took a subsequent nosedive and was nearly halved by the early 1980s, about 10 years after the policy implementation, which roughly coincides with Monkey zodiac. Consequently, the policy induced smaller-than-usual Monkey cohort provides an alternative estimation strategy in the reverse direction. In contrast to the Dragon effect, I find that the Monkey effect is positively associated with the likelihood of university education attainment. Importantly, using the Monkey effect as a driver of the cross-sectional variation in university educational attainment, the same conclusion – that having a university education would approximately raise one's earnings by at least 50 percent on average – holds. Therefore, the main conclusion about the graduate earnings premium estimate is robust to the choice of using the Dragon or Monkey effect for identification, providing some indication that this result has broader relevance to both Dragon and non-Dragon cohorts of young working men in Singapore.

Before concluding, it should be mentioned that this paper is related to a handful of studies that explore the economic implications of cultural superstitions and the predictive content of astrology in economics.[15] Such research comes under the domain of *Astronomics*, a word coined by Bennett and Barth (1973). A related paper is Wong and Yung (2005), who ask if there is an additional return for being a *Dragon* in the Hong Kong labor market. However, this paper differs from Wong and Yung (2005) in that finding evidence to support the relevance of *Astronomics* is not its main focus. Rather, the contribution of this paper is the utilization of a consequence of *Astronomics*, i.e. the Dragon effect, as an empirical strategy to estimate the return to university education.

The rest of the paper is organized as follows. Section 2 describes the dataset, outlines the regression framework and the estimation strategy. Section 3 reports our findings, and Section 4 concludes with some further remarks.

[15] See, *inter alia*, Bennett and Barth (1973), Woo and Kwok (1994), Chau et al. (2001).

2 Data and Methodology

This paper focuses on the sample of males aged 25 to 34 based on the 2010 wave of the National Youth Survey (NYS) compiled by the Singapore National Youth Council. The NYS is a small scale survey of 1232 youths between 15 to 34 years old.[16] The focus on males conditioning on age 25 years or older is motivated by three considerations. First, Singaporean men typically complete university by 25 years old as they must undergo compulsory national service with the military, police or civil defence force before university enrollment. Second, they may receive an income top-up from their workplace as compensation for meeting their national service obligations and for subsequently serving in the reserve forces.[17] Third, because female labor force participation in Singapore is weaker, the education-earnings relationship may be less evident for females than for males.[18] Therefore, since males and females enroll into university and join the workforce at different times, and since there are considerations related to weaker labor force participation of females and gender-based human resource management practice concerning Singaporeans (due to national service), restricting to the sample of males may yield sharper results for our analysis.

2.1 The Model

The main estimating equation considers how $\log(w_i)$, the log of wage for individual i, is related to university education as

$$\log(w_i) = \rho_w + \alpha c_i + \gamma' z_i + u_i, \tag{1}$$

where c_i is a dummy variable that indicates if i is a university graduate, ρ_w is an intercept term, and z_i is the set of control variables that includes person i's age in all specifications as a way to capture

[16] The NYS dataset is the only one available for the study of the effect of tertiary education on earnings in Singapore.

[17] This is a prevalent human resource management practice in the civil service.

[18] In Singapore, the female labor participation rate in Singapore is 56.5 percent, much lower than the 76.5 percent for males. Gender discrimination and home production are thought to have an impact on the labor force attachment of females. For instance, Hamermesh and Biddle (1994) find evidence of discrimination against "unattractive" individuals in the labor force, in particular, women who are deemed "unattractive" have lower labor force participation rates. Greenwood, Seshadri, and Yorukoglu (2005) argued that the diffusion of home appliances such as washing machines and freezers had played an important role in freeing up time from housework and this had encouraged women to participate in the labor force. Nevertheless, this may not be an important factor in Singapore given that an urbanized area as it is, the diffusion of home appliances should be widespread.

experience and age-earnings profile. There are two inter-related reasons why controlling for age is important. Firstly, age is correlated with the Dragon indicator, our instrumental variable, which is described below. Secondly, earnings may increase with age. In this paper, I omit the squared of age because when added to the regressions, it is statistically insignificant and causes age to be statistically insignificant as well (see Table A1 of the Appendix).[19] This, perhaps, suggests that the well-documented "inverted-U" age-earnings profile is not particularly relevant here, possibly because this paper looks only at a sample of young working men who are at the point in their lives where earnings are expected to grow with age.

The main parameter of interest in Eq. (1) is α, which measures the return to university education (c_i). To exploit the Dragon effect as an identification strategy, I relate c_i to a Dragon indicator (D_i) as

$$c_i = \rho_c + \beta D_i + \phi' z_i + w_i, \tag{2}$$

where $D_i = 1$ if individual i is born in 1976 and 1977 and $D_i = 0$ if otherwise. To simplify our discussion, the Dragon cohort is henceforth referred to individuals who are assigned $D_i = 1$. Equation (2) can be used to test if the Dragon effect is present. If so, β should be estimated with a negative sign since by hypothesis, the Dragon effect is associated with tougher competition for places at universities.

The construction of D_i as an indicator of both 1976 and 1977 is based on two considerations. The first consideration pertains to the fact that the Dragon year in this study runs from 31 January 1976 to 17 February 1977, thus straddling across 1976 and 1977.[20] The second consideration is related to an institutional feature in Singapore where pre-university education is offered mainly at a junior college or a polytechnic.[21] Students on the junior college pathway would normally have received 12 years of education prior to university, while those on the polytechnic pathway

[19] Similar to this paper, Fan et al. (2010) exclude the squared of age in their analysis of the return of university education in China. Besides its function as a proxy for work experience, age is an important control variable because it is directly correlated with the Dragon indicator. Therefore, the regression will be inconsistent without controlling for age.

[20] Wong and Yung (2005) assign 1976 as the Dragon year and ignored the portion of the Dragon year in 1977.

[21] Junior colleges are two years pre-university institutions that offer the GCE (General Certificate of Education) A'Level examination, which is a university pre-requisite.

would normally have an extra year of schooling (i.e. 13 years in total). Given these pathways, where polytechnic graduates apply for university a year later, the Dragon effect could potentially be felt by non-*Dragons* of the 1977 cohort who undertook the junior college pathway as they had to compete for university with *Dragons* of the 1976 cohort coming through the polytechnic system.[22]

Even though the Dragon indicator is constructed based on the Gregorian (solar) calendar and not the Chinese lunar calendar, this distinction is not crucial here. Firstly, the Gregorian and the Chinese lunar calenders substantially overlap. Secondly and perhaps most importantly, the Dragon indicator is intended for capturing the Dragon effect that could affect those who are born during 1976 and 1977, and not to identify a person's actual zodiac, which would be important if our goal were to examine the economic implications of superstitions, as in Wong and Yung (2005) who ask if the effects of superstition are strong enough such that one's affiliation with the Dragon zodiac is looked upon favorably by the labor market.

2.2 Threats to Identification via the Dragon Effect

The validity of exploiting the Dragon effect as an identification strategy rests on the assumption that the Dragon indicator is orthogonal to the error term u_i. There are two ways where this identifying assumption could be violated.

First, there might be business cycle effects where individuals from the same cohort are hit by the same shock when entering the job market.[23,24] Such cohort effects are potentially contained in u_i. Because the Dragon indicator exploits information about birth cohorts for estimation, this could cause D_i to be correlated with u_i. Hence, to see if there are cohort effects on earnings beyond what age has accounted for, it is useful as a preliminary exercise to explore the statistical significance of the full set of cohort dummies when they are included in earnings equation, i.e. Eq. (1). If cohort effects are important in explaining earnings, we should at least be able to reject

[22]For a recent anecdote, see "Polytechnic grads put squeeze on university places", The Straits Times, 15 March 2008.

[23]Another common shock is cohort size.

[24]I am grateful to an anonymous referee for this suggestion.

the test of joint significance, even in the event that each cohort dummy is individually statistically significant. As it turns out (see Table A2 of the appendix), the cohort dummies are jointly and individually statistically insignificant, hence cohort effects do not appear to be important in explaining earnings.[25]

Second, since u_i contains information about one's ability, the identifying assumption would be violated if ability levels are somewhat linked to Chinese astrology. While it seems unlikely that *innate* ability is related this way,[26] *late* ability could be related to the year of birth, especially when it falls on a Dragon year. For instance, anticipating that university admissions would be tougher for the Dragon cohort, parents might prepare their children more intensively for exams; students could be exposed to a more competitive environment in schools. These factors could shape a person's ability and potentially influence his future labor outcomes.[27]

To see if D_i might be uncorrelated with ability and hence orthogonal to u_i, one could perhaps check how sensitive the estimates are when parental income is included as an additional control. This is because parental income may contain information about a child's ability in two ways. Firstly, high-earning parents presumably have higher levels of ability on average than low-earning parents. If ability is transmitted from parents to children perhaps through genes or culture, then parental income may be correlated with the individual's unobserved *innate* ability. Secondly and also pertinently, high-earning parents would also have the financial means to help nurture their child's cognitive and other relevant skills, hence develop their child's *late* ability.[28]

Therefore, given that unobserved ability may be related to parental income, we may check how

[25]Let C be the total number of cohorts. Because the intercept term and age are both in Eq. (1), only $C-2$ cohort dummies can be included, i.e. two cohort dummies must be excluded. However, the p-value of the test of joint significance does not depend on which two cohort dummies are excluded from the regression.

[26]Even in the seminal work of Bennett and Barth (1973 p.1475), they conclude that "the empirical evidence offers little support for the predictive power of astrology... the prospects for astronomics appear to be dismal".

[27]Johnson and Nye (2011) find that Asian immigrants to the United States born in the 1976 Dragon year are more educated than comparable immigrants from non-Dragon years. Incidentally, they also find that Asian mothers of these Dragon year babies are more educated, wealthier, and slightly older than Asian mothers of non-Dragon year children, evidence which suggests that parents who planned for Dragon babies are also more likely to put in greater investment in developing their child's human capital.

[28]For example, wealthier households are in a better position to afford music lessons for their children, which may be beneficial for *late* ability considering the evidence that music training in childhood (not merely music listening) is associated with general and long-lasting intellectual benefits that cannot be attributed to confounding variables such as family income *per se* and parents' education (Schellenberg 2005).

robust the estimates are to controlling for parental income. If identification via the Dragon effect is questionable, our estimates would be fragile when toggling between excluding and including parental income as a control. In the data, parents' total income is given in intervals. Hence, I construct a dummy variable for high parental income defined by total income exceeding SGD 5000, which covers the top three parental income categories in the data.

2.3 Further Comments on the Data

To estimate Eqs. (1) and (2), two issues have to be addressed here. Firstly, the NYS earnings data (in Singapore dollars) is only presented in intervals. Therefore, I estimate Eq. (1) using interval regression together with modeling Eq. (2) with a Probit framework.[29] Secondly, my sample does not distinguish between graduates of local and overseas universities, where graduates of overseas universities include those who went abroad for their studies and those who stayed behind to complete an overseas degree program through distance-learning. Given that the Dragon effect is less relevant to students who can afford to undertake foreign degree programs, and since my dataset does not distinguish between graduates of local versus foreign universities, the Dragon effect is likely to be weakened in the regressions.

Figure 2 summarizes the frequency of some key variables – 1) income, 2) highest qualification level, 3) year of birth, and 4) ethnicity. In the sample, about 36 percent of individuals are graduates.[30] While nearly 62 percent of individuals in the sample earn less than SGD 3,000, much of this proportion is due to non-graduates, as 83 percent of non-graduates in the sample earn less than SGD 3000 compared to 26 percent of graduates. On ethnicity, Chinese comprises roughly

[29]The joint estimation of Eqs. (1) and (2) can be implemented using Roodman's (2009) `cmp` package in Stata. The intervals are based on the following categories – SGD 0-500, 500-1000, 1,001-1,500, 1,501-2,000, 2,001-3,000, 3,001-5,000, 5,001-7,500, 7,501-10,000, 10,001 and above. Since the logs of earnings is the dependent variable in Eq. (1), the assumption of log normality of earnings is imposed as an approximation in order to proceed. The interval regression of Eq. (1) then employs an ordered Probit model where bounds on the intervals are known.

[30]This is larger than the 23 percent graduates among total labor force reported by the 2010 Census of Population, which is based on resident non-student aged 15 years to 70 years. This smaller proportion of graduates from the census data is due to the fact that workers up to 70 years of age are included, where the proportion of graduates among older cohorts is much lower. For instance, among individuals from the age group 25-44 years, 40 percent are university graduates. In contrast, among individuals from the age group 45-70, only 12 percent are graduates.

71 percent of the sample with Malays and Indians making up the other 13 percent and 14 percent, which is somewhat similar to the population proportion of 74, 13 and 9 percent respectively. Those who are born during 1976 and 1977, i.e. the individuals who are picked up by the Dragon indicator (whom I call the Dragon cohort), make up 20 percent of the sample. The Dragon cohort is slightly better educated, where 40 percent of them are university graduates compared to 35 percent among non-Dragon cohorts. This resembles, to some extent, a finding by Johnson and Nye (2011) that Asian immigrants to the United States born during the 1976 Dragon year are more educated than comparable immigrants from non-Dragon years. However, such statistics do not imply causality, as the regressions below show that being a *Dragon* is associated with a lower probability of being a university graduate, which is consistent with the notion that it is more competitive for students from the Dragon cohort to secure placements at universities.

3 Results

As a preliminary exercise, I first revisit the analysis of Wong and Yung (2005) on whether there is an additional return for being a *Dragon* after partialling out the contribution of schooling and experience. In their work, they find no conclusive evidence that association with the Dragon cohort has a *direct* effect on earnings. In the context of Singapore, I first estimate a variant of the Wong-Yung framework based on the model[31]

$$\log(w_i) = a_0 + a_1 c_i + \delta' z_i + \phi D_i + u_i. \tag{3}$$

This is essentially Eq. (1) with D_i included as an additional control variable.

Table 1 reports the estimation results based on Eq. (3). To conserve space, the intercept estimate is omitted from all the tables. Based on the various regression specifications, I find a quantitatively robust and highly statistically significant effect where university education contributes

[31] Wong and Yung (2005) regresses the log of earnings on a Dragon indicator, years of experience and experience squared, and years of schooling and schooling squared. Years of experience is proxied in this paper by age. Since the focus is on the university graduate premium, I control for c_i here in place of years of schooling.

to an approximately 50 percent increase in earnings on average. In addition, age is statistically significant only when the squared of age is omitted from the regression (compare Columns (2) and (3)), and this provides some motivation for excluding the squared of age in the remaining analysis. Importantly, in line with Wong and Yung (2005), the Dragon indicator is statistically insignificant when the effects of education and age are taken into consideration. Hence, there is no evidence of a return to being a Dragon beyond that of education and experience (as proxied by age).

Nonetheless, even in the absence of a *direct* effect on earnings, the Dragon indicator may have an *indirect* effect through the education channel. For instance, estimating Eq. (2), Panel B of Columns (3)–(4) in Table 2 reports the marginal effect of the Dragon indicator on university education attainment. These results show that the probability of getting a university education is not invariant to the Dragon effect. In fact, a person from the Dragon cohort is roughly 25 percent less likely to be university educated on average as compared to someone from a non-Dragon cohort. If university education and earnings are linked, the Dragon indicator would have an indirect effect on earnings through its influence on university education attainment.

The statistically significant link between university education attainment and the Dragon indicator is meaningful on its own as it is related to the debate on the Dragon squeeze in Singapore. From the public perspective, university admissions seem to be harder for the Dragon cohort. However, from the government's perspective, the Dragon cohort need not worry given the assurance that "dragon year effect has in fact been accommodated for by increased places".[32] Because the Dragon effect arises from the combination of larger cohort size, which can be inferred from data, and the limited supply of university places where public information is unavailable, we may assess the efficacy of the government response of increasing university intake by studying whether the Dragon effect exists, which it does as Columns (3)–(4) show.

The presence of a strong Dragon effect is especially striking given that there are two mitigating factors in the context of Singapore. First, the Dragon effect should be weakened by the fact that the two pathways to university – through a junior college or polytechnic — would help to split up

[32]See "No squeeze in university admission for dragon year cohort", Ministry of Education (Singapore), `http://www.moe.gov.sg/media/forum/2007/20070531.htm`.

the Dragon cohort into different university intakes. Second, it should also be weakened by the fact that university graduates in my sample include graduates of overseas universities. For them, the competition for entry into local universities, hence the Dragon squeeze, may be less of a concern. Given these mitigating factors, the prominent Dragon effect observed here suggests that the public may be justified in suspecting that getting into university had been harder for the Dragon cohort.

Through a simple cross-sectional regression, Columns (1)–(2) of Table 2 show that having a university education contributes roughly to 50 percent increase in earnings, similar to what Table 1 has shown. While this result is based on an unidentified model, it nonetheless provides a useful starting point for investigating the direction of bias, which may help us to get a sense of where the "bounds" of the estimated graduate earnings premium are. For instance, ability and self-selection bias should in principle cause simple cross-sectional estimates to overstate the return to education, in which case the results in Columns (1)–(2) of Table 2 would reflect some upper bounds on the graduate earnings premium. However, measurement error in self-reported education levels could have an attenuation effect that counteracts the effect of omitted ability. If the effect of measurement error is powerful enough, simple cross-sectional analysis may understate the true contribution of university education, producing results that reflect some lower bounds on the graduate earnings premium.[33]

Recognizing the statistical significance of the Dragon effect for university education, Columns (3)–(4) report the estimation results using the Dragon indicator as an instrument, where the return to university education estimates are larger than those in Columns (1)–(2). For instance, Panel A of Columns (3)–(4) shows that university education has a *ceteris paribus* effect of raising one's earnings by around 72 to 78 percent on average. These estimates are bounded below by the simple cross-sectional estimates in Columns (1)–(2). Hence, from a conservative perspective, this implies that the return to university education is at least 50 percent on average.

Our main conclusion is largely in line with the literature in two ways. First, the estimated

[33]OLS estimates of the return to education are also useful as they could be "reasonably consistent", in the words of Hertz (2003), especially in the context of developed countries. This comes from the possibility where the upward bias from omitted ability is nearly offset by the downward bias from measurement error. For instance, Ashenfelter and Rouse (1998) find that that simple cross-sectional estimates are only marginally upward biased.

magnitude of the return to university education in Singapore is similar to past findings related to other countries – for example, for Australia, Borland et al. (2000) find that full-time employed graduates earn 65 percent more than non-graduates on average, and for China, Fan et al. (2010) find that the return to a four-year university education is about 60 percent. Second, the larger estimates in Columns (3)–(4) compared to Columns (1)–(2) also resemble much of the literature that finds the IV estimate of the return to education to be typically larger than the OLS estimate, where the weaker OLS estimate is possibly symptomatic of measurement error in self-reported education data (Card 2001).[34]

Before concluding, it should be mentioned that the estimates of the return to university education and the Dragon effect are highly robust to the inclusion of parental income as an additional control variable. Despite the statistical significance of parental income in Column (4), the estimates of the return to university education and the Dragon effect in Column (4) are very similar to the ones in Column (3) (where parental income is omitted). For example, Panel B shows that the estimated Dragon effect is identical up to two significant figures while Panel A shows that the return estimates in both Columns (3)–(4) are about 20 percentage points larger than their respective simple cross-sectional estimates in Columns (1)–(2). This is an important observation considering that parental income may be related to a child's *innate* or *late* ability; because if the Dragon indicator were indeed correlated with such unobserved abilities, thus violating the exclusion restriction, our results would be fragile to introducing parental income as an additional control. Hence, the resilience of our estimates offers some support that the Dragon indicator is independent of unobserved ability and thus using the Dragon effect is perhaps reasonable from the identification standpoint.

[34]For instance, in all nine key studies discussed in his review, Table II of Card (2001) reports that the IV estimates of the return to schooling are larger than the OLS estimates, a phenomenon he attributes to measurement error in self-reported schooling. Nevertheless, Hertz (2003) argues that for less developed countries, omitted variable bias may be less important as other factors such as liquidity constraints and family constraints are possibly more relevant in schooling decisions. For the case of South Africa, he finds an upward bias in the OLS estimates after correcting for measurement errors in the data.

3.1 Ethnicity Effects

The implication of the Dragon effect may be heterogeneous across ethnicity, especially across Chinese and non-Chinese in Singapore. Firstly, due to culture, non-Chinese students may be less conscious about the adverse implications of the Dragon effect. Secondly, non-Chinese minorities are more likely to come from lower income households. So while private tuition is widespread in Singapore, it is also costly, thus potentially disadvantaging the non-Chinese because of their family circumstance.[35] For example, George (1992) finds that 32 percent of Chinese students received private tuition compared to 25 percent among Malay students. At the same time, the average household income of Chinese is 58.6 percent greater than that of Malays, an indication that the lower average household income of Malays could be linked to the lower incidence of private tuition among Malay students.[36] For these reasons, the Dragon effect may have a stronger impact on the non-Chinese in Singapore.

Indeed, among the non-Chinese, Columns (7)–(8) of Table 2 show that a member of the Dragon cohort is 27 percent less likely to be university educated on average. In contrast, among the Chinese, Columns (5)–(6) show a muted effect of a 24 percentage point reduction faced by the Dragon cohort. From the policy perspective, addressing the stronger ramifications of the Dragon effect with respect to the minorities appears to be important, especially since across ethnic groups, there may be large differences not only in how the Dragon effect affects one's university education attainment on average, but also in the graduate earnings premium. For example, Panel A of Columns (5)–(6) shows that among the Chinese, university education has *ceteris paribus* effect of raising earnings by around 50 percent on average, although the statistical significance is not strong. This effect is much smaller when compared to the approximately doubling of earnings on average among non-

[35]For instance, the hiring of private tutors for children is widespread in Singapore. Even as early as the 1980s, 19 percent of the student population received private tuition, which has risen to more than 32 percent among all students a decade later, where the turnover in the private tuition industry exceeded SGD 200 million (see Ho et al. 1998). This student population includes everyone from pre-primary to the university level. For anecdotal stories about private tuition in Singapore, see "I am a kiasu parent too", The New Paper, 6 June 2010, and "Remedial, tuition, supplements... and still not enough", The New Paper, 1 June 2010.

[36]Based on the 2000 Census of Population by the Statistics Singapore, the average household income is SGD 3237 for Chinese, SGD 2040 for Malays, and SGD 3093 for Indians.

Chinese graduates (see Columns (7)–(8)). In other words, non-Chinese Singaporeans have more to gain from having a university education, but those from the Dragon cohort are also more adversely affected by the barrier to university education that arises from the Dragon effect.[37]

3.2 Non-Dragon Cohort Effects?

Is the Dragon indicator capturing the actual "Dragon effect"? In other words, could a non-Dragon indicator influence the attainment of university education in a negative way as well? In terms of auspiciousness, the Dragon has no equal. Therefore, unlike the Dragon year, the anticipation of a non-Dragon year should not have an impact on childbearing mentality, hence, there should be little evidence of a negative association between a non-Dragon indicator and the attainment of university education as is observed with respect to the Dragon indicator.[38] If such negative effects are absent, this would offer further support that the Dragon indicator is *not* capturing non-relevant factors that might serendipitously produce a misleading "Dragon-esque" effect.

For non-Dragon cohorts, I construct the following indicator variables: the Goat indicator is assigned to individuals who are born during 1978/9, the Horse indicator during 1979/80, the Monkey during to 1980/1 and the Rooster during to 1981/2.[39] These indicators do not overlap with the Dragon indicator, which is assigned to individuals who are born during 1976/7.

The results, contained in Table 3, show that a negative effect on university education is absent with respect to all non-Dragon indicators. For instance, Panel B of Columns (5)–(6) reports a statistically significant positive "Monkey effect", where a person from this Monkey cohort is 19 percent more likely to be university educated on average. Even though the other non-Dragon indicators are statistically insignificant at the 10 percent level, the magnitude of the marginal effect

[37]This is not to say that there is discrimination. As mentioned, there may be cultural and socio-economic reasons that explain why the Dragon effect is stronger with respect to the minorities.

[38]There could be other much weaker effects of non-Dragon years on cohort sizes. For instance, it is considered inauspicious to have daughters born in the Year of the Fire Horse, which occurs once every six decades, the last year being 1966. By tradition, females of the Fire Horse zodiac are considered "free-spirited" and "strong-willed", thus would be less preferable as marriage partners. However, such years are rare and while parents can choose the timing the birth, they cannot choose gender. Therefore, these idiosyncratic non-cohort effects would be very weak.

[39]These indicators are defined over two years as the lunar year overlaps with two years on the Gregorian calendar.

of each of these indicators is similar, ranging from 0.1145 (11.45 percent) in Column (4) for the Goat indicator to 0.1452 in Column (8) for the Rooster indicator. This offers some evidence that the Dragon indicator is picking up the actual Dragon effect – since the presence of a negative association between university education and a non-Dragon indicator is indicative of the possibility that the Dragon indicator is capturing something else.

At first glance, the existence of a statistically significant "Monkey effect" appears somewhat puzzling as nothing in Chinese traditions suggests that the year of the Monkey is so inauspicious that as a birthing strategy, families would deliberately avoid having a child on a Monkey year, so that the Monkey cohort is smaller and competition for university entry weaker.[40] In the context of Singapore, I argue that this "Monkey effect" could be related to a policy going back to the early years of Singapore as a newly independent republic, during which Singapore was a poor but populous nation. With severely limited infrastructure and booming population growth, the government had to make a necessary but unpopular decision to reduce the birth rate. So over 17 years beginning from 1969, the government put in place their "Stop at Two" policy encouraging families to exercise the restrain of having two children at most, where compliance is advocated through a system of incentives and penalties. For example, abortion was legalized and even encouraged for pregnancies involving a third or subsequent child.[41] Parents were encouraged to undergo voluntary sterilization and were rewarded in terms of reimbursement of delivery fees and priority for primary school admissions for their children. Non-compliers who had a third or subsequent child during the policy period were penalized in several ways, which included delivery fee hikes and disqualification of paid maternity leave (Wong and Yeoh 2003). These measures were so effective that by the early 1980s, which coincides with the Monkey zodiac, the fertility rate was nearly halved.[42] Therefore, unlike students from the burgeoning Dragon cohort, students from this smaller Monkey

[40] Since the years 1980 and 1981 are indicated by the Monkey dummy, one might suspect that the "Monkey effect" is related to a reduction in the cohort size due to some external shock, where incidentally, the global economy experienced a negative shock due to the second oil crisis in 1979. However, this hypothesis is untenable, as Singapore's real average GDP growth rate between 1979 and 1981 was instead in excess of 8 percent per annum.

[41] By the 1980s, about a third of pregnancies in a given year were terminated (Singh et al. 1996).

[42] While fertility rate exhibits a general declining trend, the decline in the fertility rate starting from 1969 is accelerated by the "Stop at Two" policy. This claim is supported by the fact that once the "Stop at Two" policy ended in 1986, the declining fertility rate came to a halt and rebounded somewhat sharply. See Figure 1.

cohort would have found university entry to be relatively easier, which is picked up by the statistically significant "Monkey effect", a peculiarity that is driven by policy and not superstitious beliefs.

3.3 Local versus External Validity

Our instrument, the Dragon indicator, targets a specific subset of individuals in our sample, the Dragon cohort. If the true causal effect of university education is heterogeneous across the population under consideration (i.e. young working men in Singapore), our estimates of the graduate earnings premium may only be relevant in the local sense with respect to the Dragon cohort.[43] Ideally, one hopes that the relevance of these estimates can be extrapolated to the non-Dragon cohorts in our study as well, so that our findings are not just locally but also "externally" valid. This will be the case if the causal effect is homogeneous across the population under consideration, because then, the local effect pertaining to some group of individuals will also reflect the same causal effect pertaining to others within the population.[44] Therefore, given that different instruments may target different subsets of individuals, homogeneity of the causal relationship (hence external validity) would be a plausible scenario if similar causal estimates emerge from the use of different instruments.

In empirical work, seeking evidence for external validity this way is challenging because it requires the availability of least another instrument, targeting a different subset of individuals, to re-estimate the causal relationship. Fortuitously, the statistically significant "Monkey effect" in our study can be exploited for this purpose. As explained, the "Stop at Two" policy of Singapore govenment had led to a dramatic decline in the birth rate. This provides an experiment in the reverse direction of the Dragon effect, in that the smaller-than-usual Monkey cohort size induced by "Stop at Two" imply that students from this cohort would have found university entry to be easier. Therefore, the Monkey indicator offers us another instrument to re-estimate the graduate

[43] See Imbens and Angrist (1994).
[44] See Angrist and Pischke (2009, p.167).

earnings premium, so that by comparing how similar the new and baseline estimates are, we may get a sense on whether external validity of the baseline estimates with respect to young working men in Singapore is a reasonable claim.

Table 3 reports the estimation results when the Monkey instrument is used as an instrument for university education attainment. When controlling for age only, Panel A of Column (5) shows that university graduates earn about 84 percent more than non-graduates. When controlling for both age and parental income, Panel A of Columns (6) shows that the estimated earnings premium is about 78 percent. These results are similar to the baseline estimates, even though the "baseline" identification strategy targets individuals (i.e. the Dragon cohort) who are mutually exclusive to the ones by the alternative strategy (i.e. the Monkey cohort), where the Dragon effect is completely opposite of the Monkey effect (compare Panel B in Columns (5)–(6) of Table 3 with Columns (3)–(4) in Table 2). In addition, as these estimates are larger than the simple cross-sectional estimates, they are consistent with the conclusion that having a university education would increase one's earnings by at least 50 percent on average. Therefore, the main conclusion about the return to university education is robust to whether the Dragon or Monkey indicator is used, and this provides some indication of its broader relevance that extends to both Dragon and non-Dragon cohorts.[45]

4 Conclusion

Singapore is a leading example of how an impoverished state can achieve rapid economic development through investing in education. While the country has advanced significantly, its emphasis on university education remains unabated. Even in recent times, public spending on universities has risen to nearly a third of the country's education budget and fresh commitment has been made to increase university participation rates in future.[46] Although the continued focus on education

[45]Ideally, it would be helpful to pick up similar effects from the other cohorts that are due to the "Stop at Two" policy in order to provide stronger evidence on the issue of external validity. However, I am unable to do so as the Monkey indicator is the only statistically significant determinant of university education among other non-Dragon indicators.

[46]Among primary schools, secondary schools and junior colleges, and universities, the government on universities is the largest at about SGD 2.95 billion. Source: Yearbook of Statistics, 2012. The Singapore government also plans to

is befitting to the aspirations of many Singaporeans who see university education as indispensable for prosperity and social prestige, the literature has not provided much clarification on how one's job prospect could be enhanced by attending a university in the Singapore context.[47] Using a new dataset provided by the National Youth Council, this paper investigates the return to university education by proposing an estimation strategy that exploits the Dragon effect for identification. From a conservative perspective that takes into account of both simple cross-sectional and instrumental variable estimates, the main result shows that having a university education in Singapore has a *ceteris paribus* effect of approximately raising one's income by at least 50 percent on average, which reflects a relatively healthy earnings premium for university graduates in the Singapore job market.

The only mythical creature on the Chinese zodiac, the Dragon is often regarded as a symbol of might and intelligence.[48] Past or present, many Asian families across the world have clung on to the belief that children born in the Year of the Dragon will be destined for wealth and success. In contrast, however, academic research such as Wong and Yung (2005) have found no evidence of an economic return for being a *Dragon*. If anything, this paper further suggests that being a *Dragon* in an Asian society such in Singapore might even harm one's future, since the larger Dragon cohort may intensify the level of competition for university entry, making university education a harder goal to reach. Therefore, it is interesting to further investigate if *Dragons* may in fact be worse off on average, perhaps starting with Asian societies such as Hong Kong and Taiwan to see if the Dragon effect exists in these places as well.[49]

increase the university participation rate from 26% as of 2011 to 30% by 2015. Source: Ministry of Education, 2011.

[47]It is not uncommon for graduates to be placed on different career tracks and salary scales from non-graduates, which implies that certain well-paying positions could be inaccessible without a university degree. The Singapore Civil Service is an example where this division occurs. And the dichotomy between graduates and non-graduates is not limited to employment outcomes alone. For a long time, graduate "singles" were encouraged by the government to network among themselves through membership with the Social Development Unit (SDU), a government agency exclusively set up to promote marriages among university graduates.

[48]See "Enter the dragons: A baby boom for Chinese across Asia" by Rebecca Lim, 20 January 2012, `http://www.bbc.co.uk/news/world-asia-16589052`.

[49]It is possible to collect larger datasets for the study of Hong Kong and Taiwan. For instance, Taiwan collects cross-sectional labor force survey data annually since 1979. For the case of Hong Kong, the Hong Kong census data that contains information on earnings and education levels can be used.

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Table 1: Preliminary Regressions

	(1)	(2)	(3)
	Log of Earnings		
University	0.5691***	0.5666***	0.5213***
	(0.066)	(0.066)	(0.065)
Dragon	-0.1001	-0.2513	-0.08724
	(0.108)	(0.168)	(0.105)
Age	0.0607***	-0.3813	0.0595***
	(0.016)	(0.377)	(0.015)
Age^2		0.0077	
		(0.007)	
High Parental Income			0.3673***
			(0.095)
N	198	198	198

Note: Standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2: Baseline Estimation Results

	(1)	(2)	(3)	(4)
	No Instrument		Dragon Instrument	
	Panel A: Log of Earnings			
University	0.5793***	0.5299***	0.7842***	0.7163***
	(0.0650)	(0.0639)	(0.243)	(0.235)
Age	0.0504***	0.0505***	0.0428***	0.0438***
	(0.011)	(0.011)	(0.014)	(0.013)
High Parental Income		0.3699***		0.3150***
		(0.095)		(0.118)
	Panel B: University			
Dragon			-0.2595***	-0.2542***
			(0.070)	(0.087)
Age			0.0700***	0.0689***
			(0.018)	(0.018)
High Parental Income				0.2922***
				(0.112)
N	198	198	198	198

Note: Standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Panel A is based on interval estimation of Eq. (1) and Panel B is based on Probit estimation of Eq. (2). Panel A reports the estimated coefficients and Panel B reports the marginal effects.

Table 3: Estimation Results for Chinese and Non-Chinese

	(1)	(2)	(3)	(4)
	Chinese		Non-Chinese	
	Panel A: Log of Earnings			
University	0.5730*	0.4557	1.0667***	1.0546**
	(0.343)	(0.295)	(0.377)	(0.421)
Age	0.0502***	0.0516***	0.0221	0.0215
	(0.015)	(0.013)	(0.033)	(0.034)
High Parental Income		0.3793**		0.3587*
		(0.150)		(0.211)
	Panel B: University			
Dragon	-0.2435**	-0.2419**	-0.2758**	-0.2723**
	(0.115)	(0.118)	(0.105)	(0.107)
Age	0.0548***	0.0542***	0.1069***	0.1061***
	(0.021)	(0.022)	(0.032)	(0.032)
High Parental Income		0.3799***		0.1200
		(0.127)		(0.206)
N	140	140	58	58

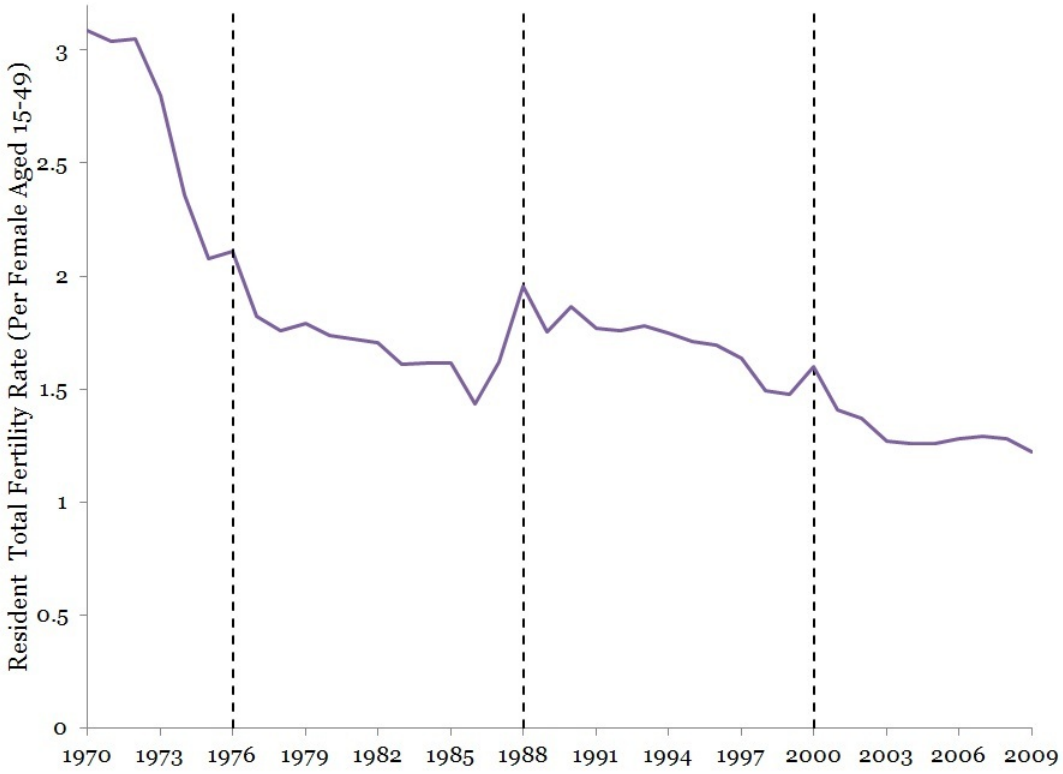
Note: Standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Panel A is based on interval estimation of Eq. (1) and Panel B is based on Probit estimation of Eq. (2). Panel A reports the estimated coefficients and Panel B reports the marginal effects.

Table 4: Non-Dragon Cohort Effects

	(1) Horse	(2) Goat	(3) Monkey	(4) Rooster
	Panel A: Log of Earnings			
University	0.6279**	0.4819	0.7763***	0.6028**
	(0.296)	(0.374)	(0.264)	(0.301)
Age	0.0470***	0.0522***	0.0417***	0.0479***
	(0.015)	(0.017)	(0.014)	(0.015)
High Parental Income	0.3411***	0.3841***	0.2974**	0.3485***
	(0.128)	(0.145)	(0.124)	(0.129)
	Panel B: University			
Horse	0.1245			
	(0.092)			
Goat		0.1145		
		(0.092)		
Monkey			0.1906**	
			(0.091)	
Rooster				0.1452
				(0.090)
Age	0.0324**	0.0357***	0.0402***	0.0441***
	(0.013)	(0.013)	(0.013)	(0.013)
High Parental Income	0.3018***	0.3015***	0.2929**	0.3160***
	(0.113)	(0.113)	(0.112)	(0.112)
N	198	198	198	198

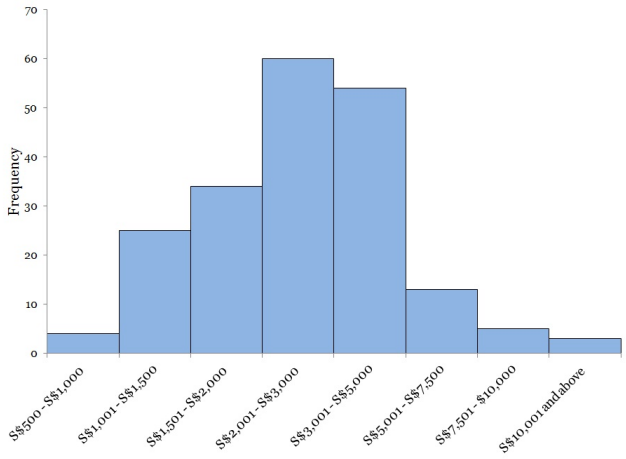
Note: Standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Panel A is based on interval estimation of Eq. (1) and Panel B is based on Probit estimation of Eq. (2). Panel A reports the estimated coefficients and Panel B reports the marginal effects.

Figure 1: Birth Rate of Singapore Resident Women Aged 15 to 49

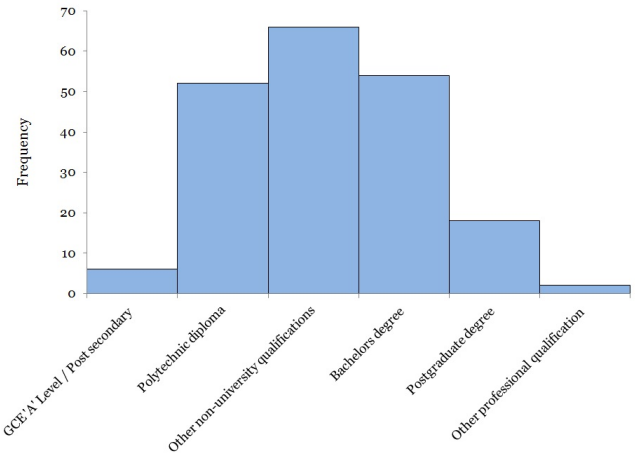


Source: Population Trends 2010, Statistics Singapore.
Note: The years 1976, 1988 and 2000 coincide with the Year of the Dragon.

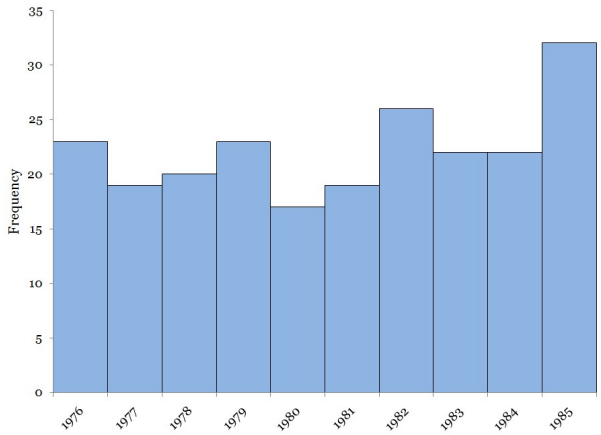
Figure 2: Distribution of Key Variables



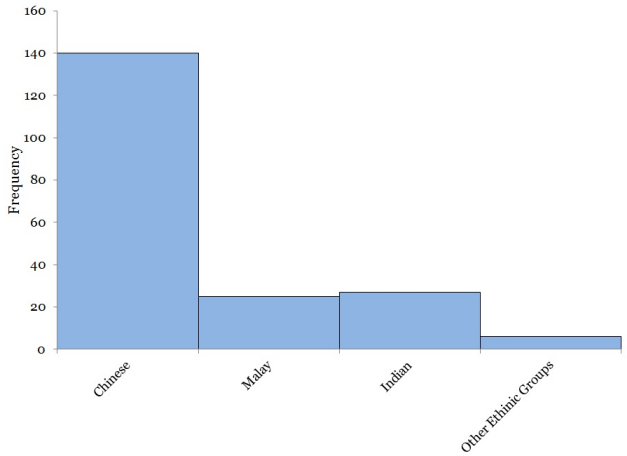
(a) Income (SGD)



(b) Highest Qualification Level



(c) Year of Birth



(d) Ethnicity

This figure plots the distribution of earnings, educational attainment, age and ethnicity for male individuals aged 25 to 34, based on the 2010 National Youth Survey.

Appendix

Table A1: Baseline Regressions Controlling for Both Age and Age^2 (Refer to footnote 19)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	No Instrument		Dragon Instrument		Chinese		Non-Chinese	
	Panel A: Log of Earnings							
University	0.5796***	0.5317***	0.8431***	0.7838***	0.7664**	0.5745*	1.0014***	1.0223**
	(0.065)	(0.064)	(0.255)	(0.231)	(0.390)	(0.306)	(0.388)	(0.419)
Age	0.0392	-0.0223	-0.0848	-0.1247	-0.2461	-0.1864	0.4137	0.2170
	(0.252)	(0.244)	(0.287)	(0.269)	(0.344)	(0.295)	(0.584)	(0.582)
Age^2	0.0002	0.0012	0.0021	0.0028	0.0050	0.0040	-0.0065	-0.0033
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.010)	(0.010)
High Parental Income		0.3718***		0.3006**		0.3388**		0.3494*
		(0.096)		(0.117)		(0.152)		(0.211)
	Panel B: University							
Dragon			-0.2925*	-0.3053**	-0.2392	-0.2432	-.3025**	-.3149
			(0.121)	(0.120)	(0.174)	(0.186)	(0 .154)	(0.152)
Age			-0.0506	-0.1177	0.1088	0.0816	-0.1560	-0.2451
			(0.439)	(0.449)	(0.513)	(0.540)	(0.869)	(0.887)
Age^2			0.0021	0.0033	-0.0009	-0.0005	0.0045	0.0060
			(0.008)	(0.008)	(0.009)	(0 .009)	(0.015)	(0.015)
High Parental Income				0.2917**		0.3710***		0.1316
				(0.113)		(0 .128)		(0.212)
N	198	198	198	198	140	140	58	58

Note: Robust standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Panel A is based on interval estimation of Eq. (1) and Panel B is based on Probit estimation of Eq. (2). Panel A reports the estimated coefficients and Panel B reports the marginal effects. Estimates of the intercept are omitted.

Table A2: Preliminary Regressions with Cohort Dummies

	(1)	(2)
	Log of Earnings	
University	0.5657***	0.5117***
	(0.069)	(0.066)
Age	0.0341	0.0586
	(0.160)	(0.146)
cohort 1985	0.0073	0.2225
	(1.354)	(1.228)
cohort 1984	-0.1238	0.0898
	(1.195)	(1.083)
cohort 1983	-0.1698	-0.0712
	(1.039)	(0.944)
cohort 1982	-0.1150	0.0395
	(0.878)	(0.795)
cohort 1981	0.0461	0.1455
	(0.727)	(0.656)
cohort 1980	0.0591	0.1330
	(0.566)	(0.512)
cohort 1979	-0.0729	-0.0326
	(0.410)	(0.370)
cohort 1978	0.1754	0.2174
	(0.270)	(0.243)
High Parental Income		0.4010***
		(0.104)
Intercept	6.6871	5.8436
	(5.346)	(4.866)
N	198	198
Joint significance of cohort dummies (p-value)	0.3197	0.1902

Note: Robust standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$.

Supplementary Materials - Not for Publication

Table S1: Estimation with Linear Probability Model in the First Stage

	(1)	(2)
	Panel A: Log of Earnings	
University	0.9265**	0.8564*
	(0.426)	(0.439)
Age	0.0375*	0.0388*
	(0.022)	(0.021)
High Parental Income		0.2738*
		(0.162)
	Panel B: University	
Dragon	-0.2802**	-0.2604**
	(0.121)	(0.116)
Age	0.0650***	0.0618***
	(0.016)	(0.016)
High Parental Income		0.2791***
		(0.103)
N	198	198

Note: Robust standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Panel A is based on interval estimation of Eq. (1) and Panel B is based on estimating a linear probability model based on (2). Both Panels A and B report the estimated coefficients. Estimates of the intercept are omitted.

Table S2: Estimation with Different Control Groups

	(1) Excluding N'Levels and Below	(2) Excluding O'Levels and Below
	Panel A: Log of Earnings	
University	0.6237***	0.6760***
	(0.179)	(0.232)
Age	0.0505***	0.0443***
	(0.013)	(0.015)
High Parental Income	0.3142***	0.3331***
	(0.122)	(0.125)
	Panel B: University	
Dragon	-0.2756**	-0.3006***
	(0.111)	(0.116)
Age	0.0616***	0.0641***
	(0.016)	(0.017)
High Parental Income	0.2486**	0.2231**
	(0.100)	(0.110)
N	175	154

Note: Robust standard errors in parentheses, $^{*}p < 0.1$,$^{**}p < 0.05$, $^{***}p < 0.01$. Column (1) excludes individuals with N'Levels or primary school education from the sample. Column (1) excludes individuals with O'Levels, N'Levels or primary school level education from the sample. Panel A is based on interval estimation of Eq. (1) and Panel B is based on Probit estimation of Eq. (2). Panel A reports the estimated coefficients and Panel B reports the marginal effects. Estimates of the intercept are omitted.