

Are 'born to rebel' last-borns more likely to be self-employed?

Article

Accepted Version

Creative Commons: Attribution-Noncommercial-No Derivative Works 4.0

Han, L. ORCID: <https://orcid.org/0000-0002-2778-3338> and Greene, F. J. (2016) Are 'born to rebel' last-borns more likely to be self-employed? *Personality and Individual Differences*, 101. pp. 270-275. ISSN 0191-8869 doi: <https://doi.org/10.1016/j.paid.2016.06.019> Available at <https://centaur.reading.ac.uk/65813/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

To link to this article DOI: <http://dx.doi.org/10.1016/j.paid.2016.06.019>

Publisher: Elsevier

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

www.reading.ac.uk/centaur

CentAUR

Central Archive at the University of Reading

Reading's research outputs online



1 **Are ‘Born to Rebel’ Last-borns More Likely to be Self-Employed?**

2

3

Abstract

4 This paper investigates birth order effects on adult self-employment. Drawing on Sulloway’s
5 ‘born to rebel’ thesis, we test whether or not last-borns whose parents have no prior self-
6 employment experience are more likely to bear and assume the risks associated with self-
7 employment. We also test if parental self-employment experience moderates the relationship
8 between last-borns and self-employment. Using large-scale life-span data on 6,322 cohort
9 members, a within-family design, and controlling for demographic confounds such as the
10 number of siblings, we find that last-borns from non-entrepreneurial families are more likely
11 to be self-employed than first or middle-borns. However, in families with parental
12 experience of self-employment, we find that last-borns in three or more child families are no
13 more likely to be self-employed than their siblings.

14

15 **Keywords:** birth order, last-borns, risk, self-employment

1. Introduction

As Porter (1990, p.125) suggests, entrepreneurs are ‘at the heart of national advantage’ because they provide jobs, growth, and innovation. To achieve this, entrepreneurial individuals such as the self-employed have to assume and bear risk by making decisions, often with incomplete information, about how to spend limited resources with no guarantee of gain (Bhide, 2000). Subsequently, job fit studies have shown that adults select and remain in self-employment because it fits in with their higher risk-taking propensity (Ekelund et al., 2005; Bonin et al., 2007; Macko & Tyszka, 2009; Ahn, 2010). More broadly, the extant literature has also identified other adult self-employment determinants such as age, gender (Parker, 2009; Storey & Greene, 2010), education (Van der Sluis, Van Praag, & Vijverberg, 2008), social networks (Kim & Aldrich, 2005), role models (Bosma et al., 2012), and a range of familial factors such as having children (Dawson, Henley & Latreille, 2014) and being in a relationship (Özcan, 2011).

However, one reason why research on self-employment determinants remains incomplete is that there is insufficient attention given to how personality traits formed in childhood inform and guide adult self-employment. This is surprising since childhood clearly matters in developing occupational understandings (McGee & Stockard, 1991), and is a period for the “active precursory engagement in the world-of-work” (Hartung, Porfeli & Vondracek, 2005: p. 417). Moreover, there is robust evidence that self-employment is inter-generationally transmitted (Fairlie & Robb, 2007; Sørensen, 2007; Colombier & Masclet, 2008; Lu & Tao, 2010; Mungai & Velarmuri, 2011); and that children of self-employed parents are likely to have higher risk-taking propensities (De Paolo, 2013; Dohmen et al., 2012).

Yet, despite the centrality of risk-taking to self-employment and the inter-generational transmission of self-employment, research, to date, has failed to examine one of the most

1 interesting childhood factors that may be associated with self-employment: birth order
2 effects.

3 In this paper, our aim is to investigate birth order effects on adult self-employment.
4 This is valuable because, except for one pilot study (Robinson & Hunt, 1992), the potential
5 relationship between childhood birth order effects and self-employment remains under-
6 explored. Examining these linkages, therefore, may open up for researchers new pathways
7 for understanding how childhood birth order effects cue and prime the formation and
8 development of later entrepreneurial intentionalities and activities. This is important from a
9 policy perspective because if childhood birth order effects are related to self-employment
10 outcomes, there are opportunities for targeting age-appropriate entrepreneurial programs to
11 help develop entrepreneurial mind-sets among young people. Equally, if ordinal position and
12 self-employment are related, it indicates that birth order could be used as a salient and viable
13 variable in career assessments. Moreover, because, intriguingly, birth order effects remain
14 under-explored in family business studies (Nordqvist, Wennberg & Hellerstedt, 2013),
15 investigating birth order effects may provide insights for self-employed parents seeking to
16 assess which of their children is more likely to be pre-disposed towards following them into
17 self-employment.

18 Our contribution is to focus on two key relationships between birth order and self-
19 employment. First, we draw on Sulloway's (1997) 'born to rebel' thesis to explore if -
20 among families whose parents have no prior experience of self-employment - last-borns are
21 more likely to be self-employed in adulthood. Sulloway suggests that because siblings adopt
22 differing strategies in competing for parental investments, there are systematic and
23 asymmetric differences in the risk-taking propensities of siblings, with, in particular, last-
24 borns being more likely to be 'exploratory, unconventional and tolerant of risk' (Sulloway,
25 2001, p.47). Subsequent birth order studies have found that last-borns have higher risk-

1 taking propensities (Argys et al., 2006; Healey & Ellis, 2007; Wang, Kruger & Wilke, 2009;
2 Sulloway & Zweigenhaft, 2010) and, in commercial contexts, are more likely to support and
3 accept radical product innovations (Saad, Gill & Natarajan, 2005). In sum, consistent with
4 Sulloway's born to rebel thesis, we posit that among families in which the parents have no
5 experience of self-employment that last-borns are more likely than their siblings to be self-
6 employed in adulthood (*Hypothesis 1*).

7 The second key relationship we explore is the moderating effects of an entrepreneurial
8 family of origin context (i.e. prior parental experience of self-employment) on the link
9 between birth order and self-employment. This is an important boundary condition because,
10 in a context where self-employment is the familial norm, it may negate the proclivity of 'born
11 to rebel' last-borns towards self-employment. Indeed, there are a number of reasons why
12 there may be countervailing effects that may either numb or run counter to Sulloway's born
13 to rebel thesis. Prevailing social conventions may promote primogeniture effects so that,
14 regardless of risk-taking propensities, first-borns are more likely to dutifully follow their
15 parents into business (Jimenez, 2009). Another reason is that for last-borns that grow up in
16 familial business contexts, these contexts are the social norm, suggesting that self-
17 employment is both familiar and normal. As such, their risk-taking propensities might be
18 expressed in alternative ways. Indeed, it may be that achievement orientated first-borns -
19 socialized within a self-employment environment – see self-employment as conventional and
20 as less risky. Overall, because of these divergent and countervailing effects, and given that
21 this important boundary condition remains under-researched, our prediction is that parental
22 experience of self-employment moderates the relationship between birth order and self-
23 employment such that last-borns are no more likely than their siblings to be self-employed
24 (*Hypothesis 2*).

25

1 **2. Materials and Methods**

2 **2.1 The British Cohort Study 1970 (BCS70)**

3 The BCS70 is a cohort study that has followed 17,287 British children born in 1970 and
4 covers, through CATI, postal and face-to-face interviews with cohort members and their
5 parents, their physical, social, education and economic activities in a series of successive
6 sweeps: at ages 5 (1975), 10 (1980), 16 (1986), 26 (1996), 30 (2000), 34 (2004), and 38
7 (2008). As is common in cohort studies, the target sample sizes have been impacted by
8 deaths among cohort members; emigration; difficulties in tracking cohort members; and the
9 refusal of cohort members or their parents to take part in the study. This has led to sample
10 attrition over time: 16,571 in 1970 through to 13,135 (1975), 14,875 (1980), 11,622 (1986),
11 9,003 (1996), 11,261 (2000), 9,665 (2004), and 8,874 (2008). However, Elliot and Shepherd
12 (2006) show that these achieved samples did not generally differ from the target samples
13 while Butler et al. (1980) showed that attrition bias of the sample during childhood was
14 minimal.

15

16 **2.2 Sample composition**

17 We restrict data from BCS70 in three main ways: First, we focus on the 8,874 cohort
18 members at age 38 because the ‘prime age’ for being self-employed is around 40 years old
19 (Parker, 2009). Second, we exclude cohort members with non-biological parents/children in
20 the household. To determine birth order, we use age 10 (1980) data. This is because aged 5
21 data are likely to miss children that were born subsequently. Also, age 16 data had lower
22 response rates due to a teacher’s strike (55% (age 16) compared to 79% (age 5) and 89% (age
23 10)) and may miss children who no longer lived in the household. As a robustness check, we
24 compared sibship structure between 1980 and 1986: in both years, there was, on average, 2.4
25 natural children in the household (standard deviation: 1.2). By focusing on age 10, we

1 excluded 593 cohort members who lived in non-biological households, reducing the sample
2 to 8,281. Third, we excluded 1,116 that were inactive in the labour market and the 669 for
3 whom there was no employment data. We also excluded 1,134 singletons and 156 cohort
4 members who were twins¹. Our final sample, therefore, is 6,322 which is made up of 3,245
5 cohort members from two-child families (51.3%); and 3,077 from three or more child
6 families (2,075 in three child families (32.8%), 1,002 in more than three child families
7 (15.9%)).

8

9 **2.3 Sample characteristics**

10 *2.3.1 Self-employment*

11 Our core dependent variable is if the cohort member was self-employed aged 38 (1=self-
12 reported self-employed; 0=self-reported employee). We complement this by comparing self-
13 employed cohort members aged 38 and 34 with employed or labour market inactive (e.g.
14 students, homeworkers) cohort members, and by examining the transition into self-
15 employment between the ages of 34 and 38. Table 1 shows that 15% were self-employed in
16 2008 (UK self-employment rate was 13% in 2008).

17

18 *2.3.2 Sibling structure*

19 In terms of the focal independent variable, Table 1 shows that 48.1% were last-borns with
20 29.4% and 22.5% being first and middle-borns, respectively. Disaggregated, last-borns
21 represented 54% (1,866) of offspring in two child families; 42% (887) of three child families;
22 and 740 (35%) of offspring in families with more than three children.

23

24 *2.3.3 Parental experience of entrepreneurship*

¹ We do not focus on singletons because our hypotheses relate to last-borns: the results for singletons can be found in the supplementary data.

1 To identify parental self-employment, we focus on parents that were self-employed in *both*
2 1970 and 1980 (19%) (1=parent self-employment, 0=otherwise) because we see this as a
3 better measure of parental self-employment than focusing on either a 1970 or 1980 snapshot.
4 Table 1 shows that 18.8% of the cohort members have at least one parent was self-employed.

5

6 *2.3.4 Control variables*

7 Our control measures are: parental wealth (1= outright ownership of house in 1980,
8 0=otherwise); gender (1=female, 0=male); having a degree (1= yes, 0=otherwise); and adult
9 household structure (having a partner: 1=yes, 0=otherwise; number of children). Table 1
10 shows that 12% of cohort member's parents owned a house outright, 49% of cohort members
11 were women, 28% had a degree, 62% lived with a partner, and the average number of
12 children in their household was 1.4. In the following regressions, we also control for the
13 constituent countries of UK geographic effects and adjust standard errors by clustering into
14 these four countries (England, Wales, Scotland and Northern Ireland).

15

1
2

Table 1: Descriptive statistics and correlations

		%	SD	1	2	3	4	5	6	7	8
1	Variables										
1	Self-employed (0,1)	15.0%	0.357	1.000							
2	Gender (0,1)	48.9%	0.500	-.120 ^{***}	1.000						
3	Having a degree (0,1)	27.7%	0.447	-.070 ^{***}	.042 ^{***}	1.000					
4	Number of Children	1.389	1.107	.024 [*]	.075 ^{***}	-.026 ^{**}	1.000				
5	Having a partner (0,1)	61.8%	0.486	-.006	-.012	-.022 [*]	.389 ^{***}	1.000			
6	Parental wealth (0,1)	11.7%	0.321	.060 ^{***}	.000	-.024 [*]	.018	.015			
7	Parental self-employment (0,1)	18.8%	0.391	.099 ^{***}	-.021	-.041 ^{***}	.040 ^{***}	.040 ^{***}	.152 ^{***}	1.000	
8	First-borns (0,1)	29.4%	0.456	-.059 ^{***}	.023 [*]	.013	.017	.035 ^{***}	-.048 ^{***}	-.016	1.000
9	Last-borns (0,1)	15.0%	0.500	.037 ^{***}	-.019	-.009	-.051 ^{***}	-.016	.027 ^{**}	.009	-.662 ^{***}

3 *Note:* Focus is on there being two or more natural siblings in the household and employment active in 2008. ^{***} (1%), ^{**} (5%), and ^{*} (10%) significance levels.

1 **2.4 Statistical Analysis**

2 Because our dependent variable is binary, we use logistic regression analysis to
3 parsimoniously control for confounds of the main and moderation effects (H1 and H2). For
4 each subsequent table (Tables 2-5), four models are provided: those cohort members that
5 were self-employed age 38 (against the employed) (Model 1); the self-employed at age 38
6 (employed and inactive) (Model 2); self-employed at age 34 (employed and inactive) (Model
7 3); and those that transitioned into self-employment between 2004-2008 (Model 4). We also
8 report odds ratios to show last-born birth order effects (H1) and how parental experience
9 moderates adult entrepreneurial activity (H2).

10

11 **3. Results**

12 Our results are organized in five tables. Table 1 reports summary statistics. In Tables 2 and
13 3, we disaggregate between different family sizes to better control for sibship structure: Table
14 2 shows birth order effects for last-borns in two child families; Table 3 shows last born
15 effects in families with three or more children. To complement Table 3, Table 4 shows the
16 direct and moderating results for first, middle and last-borns for all four dependent variables.
17 However, since Table 4 does not show the odds ratio for each birth order effect in three or
18 more child families directly because of the interaction terms, Table 5 presents the odds ratios
19 in a more straightforward way by controlling for both birth order and parental moderating
20 effects. This is advantageous because, particularly in relationship to birth order effects in
21 entrepreneurial families, it identifies which child is most likely to be self-employed.

22

23 **3.1 Hypothesis 1**

24 Table 2 Model 1 shows that last-borns are more likely to be self-employed aged 38 (OR 1.49,
25 $p < .01$). Similar effects are found in Table 2: among all those in the labour market at age 38

1 (OR 1.47, $p < .01$), age 34 (OR 1.39, $p < .01$), and for those transiting into self-employment
2 (OR 1.61, $p < .01$). For families with three or more children, Table 3 shows that last-borns are
3 more likely to be self-employed at age 38 (OR 1.18, $p = .024$) (OR 1.19, $p = .031$) (Models 1 &
4 2, respectively), age 34 (OR 1.12, $p = .115$) (Model 3) and in the transition into self-
5 employment (OR 1.31, $p < .01$) (Model 4). Therefore, for last-borns from two child families,
6 the odds of being self-employed and transitioning into self-employment are about 1.4-1.5 and
7 1.2 times greater, respectively. For last-borns from three child families, these odds are 1.2
8 and 1.3 times greater, respectively, after controlling for the other predictors in our logistic
9 regression models. This supports H1.

10 Table 4 subsequently shows that both last and middle-borns are more likely than first-
11 borns to be self-employed (odds ratios greater than 1). Furthermore, Table 5 shows that
12 middle-borns are more likely to be self-employed than first-borns but that last-borns are more
13 likely to be self-employed than middle or first-borns. This provides further support for H1.

14

15

1

Table 2: Birth order effects in two-child families

	Model 1: Self-employed vs. employed, 2008		Model 2: Self-employed vs. those in the labour market, 2008		Model 3: Self-employed vs. those in the labour market, 2004		Model 4: Individuals who transitioned into self-employment between 2004-2008	
	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z
Gender	0.62	0.0000	0.62	0.0000	0.48	0.0000	0.77	0.0380
Having a degree	0.69	0.0000	0.68	0.0000	0.55	0.0000	1.08	0.6170
Number of children now	1.03	0.0400	1.03	0.0510	1.11	0.0010	0.94	0.0410
Having a partner	0.90	0.0370	0.92	0.0910	0.92	0.4400	0.85	0.1690
Parental wealth	1.52	0.0000	1.53	0.0000	1.41	0.0000	1.27	0.0270
Parental self-employment	1.65	0.0000	1.60	0.0000	2.03	0.0000	1.02	0.8910
Last-borns	1.49	0.0000	1.47	0.0000	1.39	0.0000	1.61	0.0000
Parental self-employment*Last-borns	0.95	0.7180	1.00	0.9840	0.81	0.2420	0.96	0.8203
Constant	0.16	0.0000	0.15	0.0000	0.10	0.0000	0.07	0.0000
Number of observations	2929		3011		3031		2739	
Log likelihood	-1156.03		-1167.96		-898.22		-686.70	
McKelvey and Zavoina's R2	0.06		0.06		0.09		0.04	

2

Table 3: Birth order effects in families with three or more children

	Model 1: Self-employed vs. employed, 2008		Model 2: Self-employed vs. those in the labour market, 2008		Model 3: Self-employed vs. those in the labour market, 2004		Model 4: Individuals who transitioned into self-employment between 2004-2008	
	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z
Gender	0.42	0.0000	0.43	0.0000	0.30	0.0000	0.56	0.0000
Having a degree	0.55	0.0000	0.55	0.0000	0.73	0.0180	0.58	0.0000
Number of children now	1.18	0.0000	1.19	0.0000	1.12	0.0000	1.18	0.0000
Having a partner	0.85	0.0610	0.89	0.1250	0.86	0.0000	0.91	0.0070
Parental wealth	1.24	0.0070	1.23	0.0090	1.42	0.0000	0.99	0.9100
Parental self-employment	2.28	0.0000	2.25	0.0000	1.85	0.0000	2.35	0.0000
Last-borns	1.18	0.0240	1.19	0.0310	1.12	0.1150	1.31	0.0000
Parental self-employment*Last-borns	0.60	0.0060	0.61	0.0150	0.53	0.0170	0.69	0.0110
Constant	0.21	0.0000	0.19	0.0000	0.15	0.0000	0.09	0.0000
Number of observations	2566		2663		2687		2406	
Log likelihood	-1061.42		-1077.69		-824.91		-678.45	
McKelvey and Zavoina's R2	0.10		0.10		0.12		0.08	

1 **3.2 Hypothesis 2**

2 In terms of the moderating effects of parental self-employment, Table 2 shows no significant
3 differences for last-borns in two children families. However, in families with three or more
4 children, Table 3 shows that the odds ratios of the interaction terms for parental self-
5 employment and last-borns are smaller than 1 in all four Models (Model 1: OR 0.60, $p < .01$;
6 Model 2: OR 0.61, $p = .015$; Model 3: OR 0.53, $p = .017$; Model 4: OR 0.69, $p = .011$). This
7 provides partial support for H2. Further, in Table 4 we find, in terms of odds ratios across all
8 four models, that first and middle are more likely to be self-employed than last-borns. Again
9 taking these results from Table 4, Table 5 shows that last-borns are the least likely to be self-
10 employed for each of the four models compared to middle and first-borns, and that it is
11 middle-borns that are most likely to be self-employed in entrepreneurial families. Hence, we
12 find support for H2 that last-borns are no more likely than their siblings to be self-employed.

13 Finally, each of the tables shows that women are much less likely to be self-
14 employed, and there is a consistent pattern across all of our models of the inter-generational
15 transmission of self-employment. Indeed, Table 5 shows that regardless of ordinal position,
16 children whose parents were self-employed have a much higher odds ratio of being self-
17 employed than children whose parents were not self-employed.

18

19

1

Table 4: Birth order effects in families with three or more children: a fuller picture with first and middle-borns

	Model 1: Self-employed vs. employed, 2008		Model 2: Self-employed vs. those in the labour market, 2008		Model 3: Self-employed vs. those in the labour market, 2004		Model 4: Individuals who transitioned into self-employment between 2004-2008	
	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z	Odds Ratio	p>z
Gender	0.42	0.0000	0.43	0.0000	0.30	0.0000	0.55	0.0000
Having a degree	0.56	0.0000	0.55	0.0000	0.74	0.0250	0.59	0.0000
Number of children now	1.18	0.0000	1.19	0.0000	1.12	0.0000	1.17	0.0000
Having a partner	0.86	0.0710	0.90	0.1520	0.88	0.0000	0.92	0.0050
Parental wealth	1.23	0.0060	1.23	0.0070	1.40	0.0000	0.98	0.8410
Parental self-employment	4.33	0.0000	4.29	0.0000	6.70	0.0010	2.46	0.0060
Middle-borns	1.36	0.0000	1.35	0.0000	1.23	0.0900	1.46	0.0000
Last-borns	1.43	0.0000	1.43	0.0000	1.27	0.0000	1.65	0.0000
Parental self-employment*First-borns	0.58	0.0510	0.58	0.0490	0.25	0.0060	1.17	0.0100
Parental self-employment*Middle-borns	0.50	0.0000	0.50	0.0000	0.27	0.0500	0.90	0.7290
Parental self-employment*Last-borns	0.33	0.0000	0.34	0.0000	0.16	0.0000	0.67	0.2020
Constant	0.16	0.0000	0.15	0.0000	0.13	0.0000	0.07	0.0000
Number of observations	2566		2663		2687		2406	
Log likelihood	-1059.18		-1075.52		-822.77		-676.82	
McKelvey and Zavoina's R2	0.11		0.11		0.12		0.08	

2

Table 5: Birth order effects: estimated odds ratios

	Model 1: Self-employed vs. employed, 2008		Model 2: Self-employed vs. those in the labour market, 2008		Model 3: Self-employed vs. those in the labour market, 2004		Model 4: Individuals who transitioned into self-employment between 2004-2008	
	Non-entrepreneurial families	Entrepreneurial families	Non-entrepreneurial families	Entrepreneurial families	Non-entrepreneurial families	Entrepreneurial families	Non-entrepreneurial families	Entrepreneurial families
First-borns	1.00	2.51	1.00	2.48	1.00	1.67	1.00	2.87
Middle-borns	1.36	2.97	1.35	2.92	1.23	2.24	1.46	3.24
Last-borns	1.43	2.05	1.43	2.08	1.27	1.34	1.65	2.73

1 **4. Discussion**

2 The contribution of this study has been to investigate the relationship between birth order
3 effects and adult self-employment. Drawing on the ‘born to rebel’ thesis, we explored if last-
4 borns were more likely to be attracted to the risks involved in self-employment and, because
5 self-employment runs in families, if prior parental self-employment moderated the
6 relationship between last-borns and self-employment. Empirically, we used the large-scale
7 life-span BCS70 data that allows for a between-family design and controls for demographic
8 confounds. Our results were twofold: 1) last-borns from non-entrepreneurial families were
9 more likely to be self-employed; and 2) particularly among three or more child
10 entrepreneurial families, last-borns were less likely to be self-employed than their siblings.

11 These results are valuable for a number of reasons. First, it extends current
12 understandings of self-employment determinants. Prior research has largely focused on what
13 prompts adults towards self-employment. While this research has clarified, among other
14 things, the importance of psychological traits such as risk-taking propensity on self-
15 employment, there has been less emphasis on when and how individuals form risk-taking
16 propensities. In response, Schmitt-Rodermund (2004) and Schroeder & Schmitt-Rodermund
17 (2008) have identified that adolescence is an important stage in the development of
18 entrepreneurial intentionalities, and that experiences both from within and outside the home
19 are important in forming risk-taking propensities. One advantage of our study is that it
20 reveals that there is a need to consider childhood and, in specific, how early familial
21 antecedents such as birth order effects can help shape entrepreneurial activities such as self-
22 employment. Our research, therefore, adds to the self-employment determinants literature by
23 suggesting that researchers need to take a life-span approach that examines how childhood
24 antecedents form and cue later entrepreneurial attitudes, intentions and activities. Moreover,
25 although birth order effects are likely to be one piece of the very complex puzzle of how

1 individuals form an entrepreneurial mind-set, one further implication is that policy makers
2 could consider when they intervene to support the entrepreneurial aspirations of young
3 people. Very many of these interventions focus on those in higher education (OECD, 2012):
4 our results, however, indicate that there is potential value in programs that provide enterprise
5 education for children. Similarly, since our results suggest that birth order effects play a
6 small but significant role in later self-employment, career counsellors may consider ways to
7 incorporate these findings to increase the effectiveness of their career assessment approaches.
8 Last-born young people from non-entrepreneurial families should also be aware that in
9 making their career choices that they may be better suited to more risk-bearing occupations
10 such as self-employment.

11 However, although our results are consistent with a conceptualization of birth order
12 that associates it with assuming and bearing the risks of self-employment, we do not discount
13 alternative explanations for these birth order effects such as in differences social rank
14 (Kristensen & Bjerkedal, 2007). Another reason for being cautious is that other factors such
15 as prior parental self-employment clearly have a more pronounced effect on self-employment
16 than ordinal position. Indeed, our other key result is that birth order effects are moderated by
17 parental self-employment experience, with there being no clear birth order effects for first
18 and last-borns in two child entrepreneurial families. This result is of practical significance
19 because it suggests that there is limited value for self-employed parents - or for their two
20 children - in using birth order as a heuristic device for evaluating which child is more likely
21 to also transition into self-employment. In larger sized families, we also found that both first
22 and middle-borns are more likely to be self-employed than last-borns. This suggests that,
23 alongside an awareness of birth order effects, there is a role for parents in actively involving
24 their offspring from an early age in their business to give their children opportunities to
25 evaluate which of them is suited to following their parents into business.

1 The moderating effects of parental self-employment also suggest that there is a need
2 for further birth order research to consider other moderating factors such as how parental
3 divorce or separation moderates the relationship between ordinal position and adult
4 outcomes. Moreover, because we focused on ensuring that our families are equivalent to
5 reduce methodological issues, one downside of this study is that we chose not to consider
6 non-biological families. Future studies should investigate how these factors impact on birth
7 order and entrepreneurial outcomes such as self-employment. Future studies may also seek
8 to address other limitations of our approach by considering, for example, the relationship
9 between ordinal position and entrepreneurial growth, and the role that birth order plays in
10 family firm succession. This, however, is difficult because no large-scale life-span data
11 considers entrepreneurship other than in terms of individual self-employment. We, therefore,
12 call for family business researchers to explicitly collect in future research designs birth order
13 information to establish which sibling is more likely to transition into the family firm and see
14 it grow. Another limitation is that our data are British. We recognize that birth order effects
15 may have differential impacts in other countries (Chen, 2008).

16 In conclusion, birth order is a lightly understood determinant of self-employment.
17 Using large-scale life-span data, our evidence shows for last-borns from non-entrepreneurial
18 families that they are more likely to be self-employed. This is consistent with the born to
19 rebel thesis. However, we remain cautious about the value of this thesis since we found
20 contradictory evidence that, among children of self-employed parents, last-borns in three or
21 more child families were less likely to be self-employed than their siblings, suggesting that
22 familial context shapes birth order effects.

1 **References**

- 2 Ahn, T. (2010). Attitudes toward risk and self-employment of young workers. *Labour*
3 *Economics*, 17(2), 434-442.
- 4 Argys, L. M., Rees, D. I., Averett, S.L., & Witoonchart, B. (2006). Birth order and risky
5 adolescent behavior. *Economic Inquiry*, 44, 215-233.
- 6 Bhide, A. (2000). *The origin and evolution of new businesses*. Oxford University Press.
- 7 Bonin, H., Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2007). Cross-sectional earnings
8 risk and occupational sorting: The role of risk attitudes. *Labour Economics*, 14(6), 926-
9 937.
- 10 Bosma, N., Hessels, J., Schutjens, V., Praag, M. V., & Verheul, I. (2012). Entrepreneurship
11 and role models. *Journal of Economic Psychology*, 33(2), 410-424.
- 12 Butler, N., Despotidou, S., & Shepherd, P. (1980). *1970 British Cohort Study: Ten-year*
13 *follow-up*. Social Statistics Research Unit, City University: London.
- 14 Chen, J. (2008). *Wealth Constraints and Self-Employment: Evidence from Birth Order* (No.
15 0808). Florida International University, Greater Miami.
- 16 Colombier, N. & Masclet, D. (2008). Intergenerational correlation in self-employment: some
17 further evidence from French ECHP data. *Small Business Economics*, 30, 423-437.
- 18 Dawson, C., Henley, A., & Latreille, P. (2014). Individual motives for choosing self-
19 employment in the UK: does region matter?. *Regional Studies*, 48(5), 804-822.
- 20 De Paola, M. (2013). The Determinants of Risk Aversion: The Role of Intergenerational
21 Transmission. *German Economic Review*, 14, 214–234.
- 22 Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2012). The Intergenerational Transmission
23 of Risk and Trust Attitudes. *Review of Economic Studies*, 79(2), 645-677.
- 24 Ekelund J., Johansson E., Jarvelin, M. R., & Lichtermann, D. (2005) Self-employment and
25 risk aversion - evidence from psychological test data. *Labour Economics*, 12, 649-659.

- 1 Elliott, J., & Shepherd, P. (2006). Cohort Profile: 1970 British Birth Cohort (BCS70).
2 *International Journal of Epidemiology*, 35, 836–843.
- 3 Fairlie, R. W., & Robb, A. (2007). ‘Families, human capital, and small business: Evidence
4 from the characteristics of Business Owners Survey’. *Industrial and Labor Relations*
5 *Review*, 60(2), 225-245.
- 6 Hartung, P. J., Porfeli, E. J., & Vondracek, F. W. (2005). Child vocational development: A
7 review and reconsideration. *Journal of Vocational Behavior*, 66(3), 385-419.
- 8 Healey, M. D., & Ellis, B. J. (2007). Birth order, conscientiousness, and openness to
9 experience: Tests of the family-niche model of personality using a within-family
10 methodology. *Evolution and Human Behavior*, 28(1), 55-59.
- 11 Jimenez, R. (2009). Research on women in family firms: Current status and future directions.
12 *Family Business Review*, 22(1), 53–64.
- 13 Kim, P. H., & Aldrich, H. E. (2005). Social capital and entrepreneurship. *Foundations and*
14 *Trends in Entrepreneurship*, 1(2), 55–104.
- 15 Kristensen, P., & Bjerkedal, T. (2007). Explaining the relation between birth order and
16 intelligence. *Science*, 316, 1717–1717.
- 17 Lu, J., & Tao, Z. (2010). Determinants of entrepreneurial activities in China. *Journal of*
18 *Business Venturing*, 25, 261-273.
- 19 Macko, A., & Tyszka, T. (2009). Entrepreneurship and risk taking. *Applied psychology*,
20 58(3), 469-487.
- 21 McGee, J. & Stockard, J. (1991). From a child’s view: Children’s occupational knowledge
22 and perceptions of occupational characteristics. *Sociological studies of child*
23 *development*, 4, 113-136.

1 Mungai, E., & Velamuri, S. R. (2011). Parental Entrepreneurial Role Model Influence on
2 Male Offspring: Is It Always Positive and When Does It Occur?. *Entrepreneurship*
3 *Theory and Practice*, 35, 337-357.

4 Nordqvist, M., Wennberg, K., & Hellerstedt, K. (2013). An entrepreneurial process
5 perspective on succession in family firms. *Small Business Economics*, 40(4), 1087-1122.

6 OECD (2012) Policy brief on youth entrepreneurship, OECD: Paris.

7 Özcan, B. (2011). Only the lonely? The influence of the spouse on the transition to self-
8 employment. *Small Business Economics*, 37(4), 465-492.

9 Parker, S.C., (2009). *The Economics of Entrepreneurship*, Cambridge University Press:
10 Cambridge, England.

11 Porter, M. E. (1990). *The Competitive Advantage of Nations*. Free Press: New York.

12 Robinson, P. B., & Hunt, H. (1992). Entrepreneurship and birth order: Fact or folklore.
13 *Entrepreneurship & Regional Development*, 4(3), 287-298.

14 Saad, G., Gill, T., & Natarajan, R. (2005). Are laterborns more innovative and
15 nonconforming consumers than firstborns?. *Journal of Business Research*, 58, 902-909.

16 Schmitt-Rodermund, E. (2004). Pathways to successful entrepreneurship: Parenting,
17 personality, early entrepreneurial competence, and interests. *Journal of Vocational*
18 *Behavior*, 65(3), 498-518.

19 Schroeder, E., & Schmitt-Rodermund, E. (2008). Adolescents' entrepreneurial orientation
20 predicted by personality traits and entrepreneurial family background. *International*
21 *Journal of Psychology*, 43(3-4), 561-561.

22 Sørensen, J. B. (2007). Closure and exposure: Mechanisms in the intergenerational
23 transmission of self-employment. *Research in the Sociology of Organizations*, 25(83),
24 124.

- 1 Storey, D.J. & Greene, F.J. (2010). *Entrepreneurship and Small Businesses*, Pearsons:
2 Harlow.
- 3 Sulloway, F. J. (1997). *Born to Rebel: Birth Order, Family Dynamics, and Revolutionary*
4 *Genius*. Vintage: New York.
- 5 Sulloway, F. J. (2001). Birth order, sibling competition, and human behavior. *Conceptual*
6 *challenges in evolutionary psychology*, Springer Netherlands, 39-83.
- 7 Sulloway, F. J., & Zweigenhaft, R. L. (2010). Birth order and risk taking in athletics: A meta-
8 analysis and study of major league baseball. *Personality and Social Psychology Review*,
9 *14*, 402-416.
- 10 Van der Sluis, J., Van Praag, M., & Vijverberg, W. (2008). Education and entrepreneurship
11 selection and performance: A review of the empirical literature. *Journal of Economic*
12 *Surveys*, *22*(5), 795-841.
- 13 Wang, X.T., Kruger, D. & Wilke, D. (2009). Life history variables and risk taking propensity.
14 *Evolution and Human Behavior*, *30*,77-84.