The entrepreneurial earnings puzzle: Mismeasurement or real?

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A review of recent evidence on relative earnings from entrepreneurship versus wage work presents a puzzle: why do individuals become entrepreneurs when entrepreneurs on average apparently earn less than employees? After considering several potential explanations, we empirically analyze one: income underreporting by entrepreneurs. Using a nationwide panel survey representing U.S. households over 15 years, we estimate that entrepreneurs on average earn 4% less per year than employees. However, after correcting for income underreporting, the mean financial gain to entrepreneurship is positive and large, greater than 42%. However, we show that this estimate is built on some unpalatable model assumptions.

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1. Executive summary

Most recent studies show that entrepreneurs earn no more than observationally similar persons working as wage employees, experience significantly higher levels of income risk, and work longer hours than employees. Furthermore, entrepreneurial earnings rise more slowly with tenure than do earnings for employees. These findings imply either irrationality among individuals who become entrepreneurs or the influence of more complex decision processes than simple utility maximization.

Recent work has suggested a number of reasons for the apparent discount to entrepreneurship and the unique earnings profile for entrepreneurs. Two theories might explain most of the stylized facts, given appropriate extensions: learning and labor market frictions. The first theory presumes that people do not know their expected returns in entrepreneurship and enter on chance. Those who are able as entrepreneurs remain, while those less able return to wage work after a short stint in entrepreneurship. The second theory presumes that wages are not always properly matched to ability and predicts that frictions are greatest at the tails of the wage distribution. This implies that those with the best and worst ability are most likely to leave the wage sector for entrepreneurship.

Other analyses suggest that entrepreneurs accept the discount because of particular traits, such as a tendency toward unwarranted optimism, a greater appetite for risk, or overconfidence. Several studies have also found that self-employment brings significantly higher levels of job satisfaction than wage work, perhaps making entrepreneurs more accepting of the earnings discount.

However, there is another and much simpler explanation: a number of studies suggest that if underreporting of entrepreneurial income is taken into account, the evident financial loss to entrepreneurship becomes a rather large average gain. Using a large, nationwide panel survey representing US households over a period of 15 years, we apply a method that uses food consumption data to correct for entrepreneurs’ underreporting of earnings. We find that entrepreneurs, on average, are clearly better off than employees.

Several technical problems remain to be resolved for the underreporting correction method. However, our analysis does suggest that entrepreneurs may, in fact, earn more than their traditionally employed peers. This work may help resolve a fundamental puzzle in entrepreneurship studies, provided the technical measurement and estimation challenges of the underreporting correction can be resolved by alternative empirical models.
Still, underreporting cannot adequately explain all of the stylized facts regarding entrepreneurial earnings. A more fully encompassing economic theory that fully addresses the question of why entrepreneurs exist, and explains the peculiarity of the earnings profile for entrepreneurship, remains to be developed. Neither of the two most promising theories—learning and labor friction—has been subjected to much empirical testing. Additional analysis is needed to test their durability and to develop extensions that would allow them to explain more of the stylized facts around entrepreneurship income.

In exploring the alternative theories explaining the appeal of entrepreneurship even in the face of apparently lower earnings, slower earnings growth, and higher earnings variability, this paper provides an update on a central puzzle in entrepreneurship research. Understanding what draws people to entrepreneurship is a fundamental step in answering the most fundamental question in entrepreneurship: why do entrepreneurs exist?

2. Introduction

Most recent studies show that entrepreneurs earn no more than observationally similar persons working as wage employees (Åstebro et al., 2012a, 2013; Hamilton, 2000; Hartog et al., 2010; Hyttinen et al., 2013; Kawaguchi, 2003; Tergiman, 2010). At the same time, they experience a significant increase in income risk (Åstebro et al., 2012a, 2013; Evans and Leighton, 1989; Hamilton, 2000; Hartog et al., 2010; Hyttinen et al., 2013; Kawaguchi, 2003; Lazear and Moore, 1984; Tergiman, 2010), work longer hours (Ajayi-Obe and Parker, 2005; Blanchflower, 2004; Hurst et al., 2013; Hyttinen et al., 2013), and persist despite the possibility of earning more in wage work (Bruce and Schuetze, 2004; Evans and Leighton, 1989; Hamilton, 2000; Hyttinen and Rouvinen, 2008; Williams, 2000). Entrepreneurial earnings contain a much longer thin upper tail than wages (Albarran et al., 2009; Åstebro, 2012; Gort and Lee, 2007; Hamilton, 2000; Parker, 1997; Sanandaji and Leeson, 2013) and are dominated by a large fraction of individuals earning less than they would by staying employed (Åstebro, 2012; Bernhardt, 1994; Hamilton, 2000). Furthermore, future entrepreneurial earnings are found to rise less quickly with tenure than do earnings for wage workers (Evans and Leighton, 1989; Hamilton, 2000; Kawaguchi, 2003; Lazear and Moore, 1984; Tergiman, 2010). Taken together, these findings raise a critical question: why do individuals become entrepreneurs when working as an employee is both more financially rewarding and less risky?

The stylized facts imply either irrationality among individuals who become entrepreneurs, or the influence of other, more complex, decision processes or theories driving their behavior, rather than expected utility maximization. In order to understand these findings, we review several theories that could explain the decision to enter into entrepreneurship given these stylized facts. We discuss in more detail the two theories that appear to explain most of the facts and draw out implications for future research.

However, there is another, much simpler explanation. Recent work suggests that if underreporting of entrepreneurial income is taken into account, the evident financial loss to entrepreneurship becomes a rather large average gain (Engström and Holmlund, 2009; Feldman and Slemrod, 2007; Hurst et al., 2013; Lyssiotou et al., 2004; Pissarides and Weber, 1989; Schuetze, 2002; Tedds, 2010).

To demonstrate the power of this simple and straightforward explanation, we use a large, nationwide panel survey representing all U.S. households over a period of 15 years to illustrate how underreporting of entrepreneurial earnings may affect estimates of the returns to entrepreneurship. Applying a method that uses food consumption data to correct earnings for underreporting by entrepreneurs (Hurst et al., 2013), we find that entrepreneurs, on average, are clearly better off than employees.

We are still loath to declare victory over other explanations because several technical measurement and estimation problems remain to be resolved for the underreporting correction method. For example, the estimated 42% premium to entrepreneurship is markedly reduced when analyzing expenditures that are less likely to be affected by differences in tastes, such as expenditures for food to be consumed at home: in this case, the estimated premium drops by 30%, suggesting that the homogenous-tastes assumption of the correction model is false. Even if underreporting of earnings can turn the (maybe only apparent) negative returns to entrepreneurs into positive returns, underreporting still explains only a few of the stylized facts which we document above. Therefore, understanding the relevance of the alternate theories which we review that could explain these facts more comprehensively is still of great importance.

In sum, this paper provides an update on a great puzzle in entrepreneurship research: why do individuals become entrepreneurs despite the fact that entrepreneurs apparently earn less than employees do? It is an important puzzle to solve, as it is key to answering one of the most fundamental questions in entrepreneurship: why do entrepreneurs exist?

3. The returns to entrepreneurship

A review of the key findings regarding the returns to entrepreneurship yields six stylized facts, which are summarized in Table 1.2 Results are derived mostly from the U.S. and U.K. simply because there is considerably more data on the financial returns for entrepreneurs from those regions than from elsewhere. A brief summary of typical datasets used to obtain these results is provided in the Appendix A.

3.1. Entrepreneurs earn less than employees

National accounts and panel surveys indicate that entrepreneurial incomes in general have been declining in comparison to wages. Parker (2009) summarizes the evidence from a number of studies and reports relative earnings for U.S. entrepreneurs to

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1 This section includes edited extracts from Ástebro (2012).
2 The topic has previously been reviewed by, among others, Carter (2011), Parker (2009), and Van Praag and Versloot (2007).
Table 1
Key stylized facts regarding the returns from entrepreneurship.

<table>
<thead>
<tr>
<th>Stylized fact</th>
<th>Studies in support of statement</th>
<th>Data in support</th>
<th>Studies not supporting statement</th>
<th>Data not in support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Entrepreneurs earn less than employees.</td>
<td>Alba-Ramirez (1994); Albarran et al. (2009); Amit et al. (1995); Bernhardt (1994); Blanchflower and Shadfordth (2007); Evans and Leighton (1989); Hamilton (2000); Hartog et al. (2010); Hyytinen et al. (2013); Kidd (1993); Lazear and Moore (1984); OECD (1986); Tergiman (2010)</td>
<td>ECPF, FRs, FS, KLIPS, LMAS, NLSY, OECD, PSID, SCF, SCC, SIPP, SPI</td>
<td>Ajayi-Obe and Parker (2005); Bernhardt (1994); Clark and Drinkwater (1998); Constant and Shachmurove (2006); Fairlie (2005); Hartog et al. (2010); Hurst et al. (2010); Kidd (1993); Kneiding and Kritikos (2013); Robson (1997)</td>
<td>BHPS, CE, CPS, Finnish twins, FS, GHS, GSP, NLSY79, PSID, SCC, UK, EVS</td>
</tr>
<tr>
<td>2a. There is a larger variance and larger positive skew of earnings for entrepreneurs.</td>
<td>Hamilton (2000); Hartog et al. (2010); Kawaguchi (2003); Lazear and Moore (1984); Ohyama (2013); Parker (1997, 1999); Tergiman (2010)</td>
<td>BHPS, KLIPS, NLSY79, PSID, SESTAT, SIPP</td>
<td>Hartog et al. (2010) for skew</td>
<td>NLSY79</td>
</tr>
<tr>
<td>2b. A small fraction of individuals make a lot more money in entrepreneurship than in wage work.</td>
<td>Åstebro (2003); Blanchflower and Shadfordth (2007); Gort and Lee (2007); Hamilton (2000); Ohyama (2013); Sanandaji and Leeson (2013); Tergiman (2010)</td>
<td>BM, IAP, KLIPS, PSID, SIPP, SESTAT</td>
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<tr>
<td>4. There is both positive and negative selection into entrepreneurship.</td>
<td>Alba-Ramirez (1994); Andersson and Wadensjö (2011); Åstebro et al. (2011); Bernhardt (1994); Blanchflower (2000); Elfenbein et al. (2010); Evans and Leighton (1989); Hamilton (2000); Hartog et al. (2010); Tåg et al (2013)</td>
<td>SIPP, LMAS, PSID, NLSY66, KLIPS, Swedish national registry, Eurobarometer</td>
<td></td>
<td></td>
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<tr>
<td>5. Entrepreneurs work more hours than do wage workers.</td>
<td>Ajayi-Obe and Parker (2005); Blanchflower (2004); Hurst et al. (2010); Hyttinen et al. (2013)</td>
<td>BHPS, PSID, Eurostat, Finnish twins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Many entrepreneurs persist despite the possibility of earning more in wage work.</td>
<td>Åstebro et al. (2007); Bernhardt (1994); Bruce and Schuetze (2004); Evans and Leighton (1989); Hamilton (2000); Hyttinen and Rovininen (2008); Williams (2000)</td>
<td>LMAS, NLSY, SIPP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


* No support when examining raw data. Support when controlling for self-selection.
* Up to 1995 in the U.K., no support. After 1995, supported.
* Only for the less able.
* Mixed evidence in structural estimation.
* Sunday Times Rich List.
be 48% larger than for wage workers from 1951 to 1954, but only 23% larger from 1975 to 1979. By 1980–1984, entrepreneurs’ average earnings dropped to 10% below wage workers’ and then fell to 20% below from 1985–1988. The U.K. has seen a similar drop in relative earnings for entrepreneurs. Relative earnings declined sharply from a peak, where entrepreneurs, on average, earned 90% more than wage workers in 1979, to approximately earning 35% more in 1993 (Robson, 1997). By 2005, the mean annual earnings for entrepreneurs versus wage workers were almost identical, while the median earnings for self-employed people were clearly below that of wage workers: £12,948 annually for entrepreneurs versus £17,316 annually for employees (Blanchflower and Shadoford, 2007).

Internationally, the results are more variable, but on balance the findings are similar. Kidd (1993) reported a negative difference for Australians, and ten out of eleven countries in the OECD reported lower average returns for entrepreneurs as of 1985 (OECD, 1986). More recent evidence from Spain shows that median earnings were 11% lower for the self-employed than for wage workers between 1985 and 1997 (Albarran et al., 2009). Åstebro (2012) found a median difference in relative earnings of −14% between self-employed and wage workers in Korea. However, it appears that self-employed in Germany on average earn more than their counterparts in paid employment, although the median earnings is similar (Constant and Shachmurove, 2006; Kneiding and Kritikos, 2013). The mean earnings for Canadian self-employed white men were 53% higher than the mean for similar wage workers in 1981, and their earnings were higher at each quartile (Bernhardt, 1994). Nevertheless, mean earnings for entrepreneurs versus wage workers were about equal in Canada by 1988 (Amit et al., 1995), matching the trends in the U.S. and the U.K. Some results from transition economies are available, but must be interpreted within their respective contexts (e.g. Earle and Sakova, 2000; Jackson and Mach, 2009).

Comparisons of gross averages are informative, but earnings must be analyzed by comparing similar individuals to avoid biased results. Ideally, we would like to know what the alternative earnings for a given individual would be. Hamilton (2000) offers an early, careful study of the estimated returns of entrepreneurship that does just that. The main finding of Hamilton’s study was that both net profit and draw (wages plus business income) were less for all entrepreneurs compared to wage workers’ earnings at all points of the earnings distribution. For the first 75% of the distribution, the equity adjusted draw (EAD: draw plus changes in business value) was also lower for entrepreneurs vis-à-vis wage workers, but then grew larger for entrepreneurs at the top 25th percentile. The median lifetime present value of switching to entrepreneurship for an individual in business for 10 years was estimated to be about 35%.

Hamilton’s work has since been updated by several studies (for instance, Åstebro et al., 2012a; Åstebro et al., 2013; Hartog et al., 2010; Hyytinen et al., 2013; Kawaguchi, 2003; Tergiman, 2010). These studies confirm that the estimated average returns to self-employment are negative, or at least not positive. For example, Hartog et al. (2010) estimated the average difference in returns at about 9%, and Tergiman (2010) estimates the same to be about 15%. Older studies also agree with these conclusions (e.g. Alba-Ramirez, 1994; Amit et al., 1995; Evans and Leighton, 1989; Lazear and Moore, 1984). Lazear and Moore (1984) compute lifetime present wealth for employed and self-employed workers across thirteen different occupations and show lower present values for self-employed than employed persons for all except two occupations. However, in Norway, the estimated difference was positive, 16% (Berglann et al., 2011).

Examining the upper end of the ability distribution, entrepreneurs who are science and engineering university graduates appear to earn more than comparable wage workers (Braguinsky et al., 2012; Gort and Lee, 2007). However, for academic entrepreneurs, the financial returns to entrepreneurship are not statistically different from staying employed in academia, either in the U.S. or in Sweden (Åstebro et al., 2012a, 2013).

3.2. Earnings for entrepreneurs show a larger variance and larger positive skew

For the U.S., Lazear and Moore (1984), Evans and Leighton (1989), Hamilton (2000), Kawaguchi (2003), Hartog et al. (2010), and Tergiman (2010) all found that the entrepreneurial earnings distribution has much higher variance than the distribution for employees; the standard deviation is typically three to four times greater. These differences in income risk seem to apply across many different countries and situations. For example, Åstebro (2012) found a value 3.3 times larger in Korea. These results are not due simply to differences between wage workers and entrepreneurs. The conditional variance in earnings among the self-employed is 2.6 times larger than among wage workers (Kawaguchi, 2003), and Åstebro et al. (2013) found that for Swedish academics the standard deviation of income increases 3.4 times for a person after switching to entrepreneurship.

A greater skew for earnings among entrepreneurs is also a standard finding. Hamilton (2000) found that approximately 13% of entrepreneurs earned more than $20 per hour when the EAD measure was used, compared to only 4.2% of employees. This finding also holds across countries. For Korea, Åstebro (2012) reports that earnings are smaller for the self-employed than for wage earners up to the 75th percentile, while earnings are larger for self-employed workers in the upper percentiles. In Spain between 1985 and 1997, the data are also skewed; median earnings were 11% lower for the self-employed, and the 75th percentile was also lower, but the 99th percentile was higher between 1985 and 1997 (Albarran et al., 2009). Finally, Parker (1997) reports a large and increasing skew of the self-employment earnings distribution in the U.K. over the period 1976–1991.

3 Robson (1997) used aggregate national accounts. Using British household panel data instead, Taylor (1996) reported that by 1991 the self-employed on average earned less than the employed (£8.20 per hour versus £9.71).

4 In this study, total earnings include income from all types of capital, including fixed income (bonds, rents) and public stock returns. Capital income dominates wage and business earnings for the self-employed and is three times less for wage workers. There is a clear possibility that including total capital returns may overstate returns to entrepreneurship in this study.
3.3. A small fraction of individuals make a lot more money in entrepreneurship than in wage work

This result follows from the fact that there is a greater positive skew of the earnings distribution in entrepreneurship than in wage work. The implications for earnings at the top of the distribution are shown most forcefully in the studies by Åstebro (2003) and Sanandaji and Leeson (2013). The latter report that the contribution to wealth for the median self-employed worker was just over $365,000, while the median contribution to wealth of billionaires in the U.S. was 4600 times larger.

3.4. Entrepreneurs have a flatter earnings–tenure profile than do wage workers

Hamilton (2000) found that the estimated earnings profiles for entrepreneurs started out lower and were generally flatter than the earnings profiles for workers; increased tenure did not sufficiently compensate for the initial lower salary, except when using the EAD measure and at the top 25th percentile. The latter exception is the only instance in his study where the earnings profile for the self-employed overtook the earnings profile of wage workers. Tergiman (2010) also found a flatter earnings–tenure profile for entrepreneurs, although there was an upswing at the very end of the profile for long-time entrepreneurs. Alba-Ramirez (1994), Evans and Leighton (1989) and Kawaguchi (2003) also found differential earnings–tenure profiles similar to Hamilton’s. The implication is that entrepreneurs cannot expect to regain lost earnings over time compared to staying in wage work. Rather, the earnings gap grows larger over time.

3.5. There is both positive and negative selection into entrepreneurship

Several authors have found positive selection into entrepreneurship (Bernhardt, 1994; Groysberg et al., 2009; Hamilton, 2000). This means that more able individuals are more likely to become entrepreneurs than those who are less able. This finding is hard to square with the result that earnings are lower in entrepreneurship than in wage work. However, Alba-Ramirez (1994), Evans and Leighton (1989), and Hartog et al. (2010) all find negative selection into entrepreneurship, meaning that the worst-performing workers are the most likely to become entrepreneurs. This result could explain why earnings are lower among entrepreneurs than among wage workers. To resolve this discrepancy, Andersson and Wadensjö (2011), Åstebro et al. (2011), Tág et al. (2013), Blanchflower (2000), and Elfenbein et al. (2010), find bimodal entry patterns, with those at either the lowest or highest ability levels most likely to enter entrepreneurship.

3.6. Entrepreneurs work more hours than do wage workers

Multiple studies show that entrepreneurs work more hours than wage workers for the same or less pay. See, for example, Ajayi-Obe and Parker (2005), Blanchflower (2004), Hurst et al. (2013), and Hyytinen et al. (2013) for evidence from the U.K., OECD, U.S., and Finland. U.K. self-employed owners worked on average 8 hours more per week than employees. In fact, across the OECD, in only 2 out of 25 countries do the employed work longer hours than the self-employed, and the self-employed tend to work, on average, between 2 (5%) and 14 (35%) more hours per week.

3.7. Many entrepreneurs persist despite the possibility of earning more in wage work

It is unclear why so many entrepreneurs persist despite lower earning. It may be that entrepreneurs believe that switching back to wage work will carry a large financial penalty. However, Hamilton (2000) finds that entrepreneurs could switch back to wage work and earn more. Hamilton’s result echoes findings in two prior studies, by Bernhardt (1994) and by Evans and Leighton (1989), and it was later replicated by Bruce and Schuetze (2004) for the U.S., Williams (2000) for Germany, and Hyytinen and Rouvinen (2008) for Europe in general. (The latter replications showed that earnings would not be significantly lower if entrepreneurs returned to wage work). Bruce and Schuetze (2004), however, show that to some extent, entrepreneurs seeking to return to employment lack viable employment options, and consequently are more likely to work part time or become unemployed. Another study showed that a large fraction of inventor-entrepreneurs persisted with costly efforts to commercialize their inventions despite receiving credible advice that their ideas were not likely to yield value (Åstebro et al., 2007).

In general, self-employment spells turn out to be short, likely indicating that in most cases entrepreneurs are not successful. For example, Hyytinen and Rouvinen (2008) report three-year survival rates in Europe ranging from 53.5% (Denmark) to 66.9% (Norway). But even for long tenures in entrepreneurship, entrepreneurs could switch back to wage work and earn more (Hamilton, 2000). These results support the finding that years of tenure in entrepreneurship are rewarded less than years of tenure in wage work.

3.8. Summary of empirical regularities

The key empirical regularities on the financial returns to entrepreneurship are summarized in Table 1. Some of the stylized facts are not supported by more than a few articles. These include the flatter earnings profile and persistence in entrepreneurship. This provides opportunities for future replication.

Other facts have more recurring support, such as the lower median, the larger variance, and the greater positive skew of earnings in entrepreneurship. The major divergence in results is around the average return to entrepreneurship, where there is
considerable variation across countries and also over time within countries. The regression estimated mean returns from entrepreneurship seem to hover between $-15\%$ and 0, depending on the type of analysis and estimation method.

### 4. Potential explanations

To understand why people become entrepreneurs, we need a theory that can make sense of the evidence showing, among other things, that becoming an entrepreneur is on average not profitable. A number of competing explanations profess to explain the stylized facts summarized in Section 3. These include rational choice models as well as theories involving preferences and decision biases. Similarly, some theories attempt to account for the skew in entrepreneurial earnings and the relatively flat earnings growth curve. Problems in earnings measurement may also explain the riddle, as these problems may be producing an apparent discount to becoming an entrepreneur that may not actually exist.

#### 4.1. Why do people switch to entrepreneurship if entrepreneurs (apparently) earn less than employees?

Given the apparent discount to entrepreneurship, researchers have wondered why anyone would willingly choose entrepreneurship. A number of theories have been offered to explain the preference for entrepreneurship.

##### 4.1.1. Risk-return tradeoff

As a starting point, we first consider the simple risk-return tradeoff voiced by, for example, Sharpe (1966), which states that an investor should be rewarded for a willingness to take on more risk with a higher expected return, where risk is defined as the standard deviation in returns. This simple theory is not supported for entrepreneurial choice. Entrepreneurs take on substantially more risk than do wage workers—accepting a 3–4 times greater standard deviation in earnings for a negative or trivial increase in earnings.

##### 4.1.2. Matching and learning models

Another set of theories that attempt to explain the appeal of entrepreneurship in spite of its apparently lower returns are matching and learning models (see, for instance MacDonald, 1988), which argue that individuals have unobserved time-invariant sector-specific abilities, as well as sector-specific human capital. Earnings differentials may then reflect selection effects arising from these differences. Workers may switch into entrepreneurship without a clear picture of their entrepreneurial ability; those with poor ability in the sector will leave upon recognizing their lack of ability, making average earnings rise with experience for those who stay. Cross-sectional differences in earnings may then simply reflect selection effects in a population, and thus explain stylized fact 1. MacDonald’s (1988) model further predicts that the self-employed consist of a mix of high-ability experienced business owners and inexperienced, typically low-ability agents, most of whom will eventually return to wage employment. This would be consistent with stylized facts 2a and 2b.

The learning model, however, seems at odds with some of the evidence. While this story would predict a convex earnings profile for entrepreneurs—with time the earnings for survivors would increase non-linearly—most studies find a flat or concave earnings–tenure profile for entrepreneurs (stylized fact 3). Further, changes in the composition of entrepreneurs cannot explain that a given individual on average earns less or no more when switching from employment to entrepreneurship, as has been found in some studies.

Nevertheless, many entrepreneurs invest something in their business at startup.5 The sunk capital investment may make the entrepreneur persist in an effort to realize the income flow from the investment. Assuming up-front and sunk investments, the learning model may thus also explain why many entrepreneurs are willing to remain in business for some time despite the lower realizations from entrepreneurship (stylized fact 6). This extension has not yet been formally modeled, although Åstebro et al. (2007) find support for it. For a sample of inventor-entrepreneurs, they show that even when further investments should not be made because the idea is poor, those who had invested $10,000 invested another $10,000 before quitting. Honoring sunk costs is a pervasive phenomenon, as shown in the review by Sleesman et al. (2012), and this may contribute to sustained poor performance of entrepreneurs.

##### 4.1.3. Preferences and decision biases

Another potential explanation for the entrepreneurship discount is that there is a preference for entrepreneurship beyond earnings. One reason for preferring entrepreneurship to wage work is higher job satisfaction (Benz and Frey, 2008a,b; Blanchflower, 2000; Hundley, 2001). Self-employed workers report they are more satisfied with their jobs because their work provides more autonomy, flexibility, and skill utilization and (strangely) greater job security (Benz and Frey, 2008a; Hundley, 2001). The job satisfaction advantage is relatively small or nonexistent among managers and members of the established professions (Hundley, 2001), and it is larger when comparing against wage earners working in larger organizations (Benz and Frey, 2008a), suggesting that what people really dislike about wage work is bureaucracy.

Additional explanations for the preference for entrepreneurship have been examined, including that entrepreneurs are unrealistic optimists, overweight small probabilities of success, are skew lovers or hyperbolic discounters, or are overconfident.

5 Most entrepreneurs start up with very small amounts of capital; across the 34 countries in the Global Entrepreneurship Monitor dataset, the typical start-up founded between 1998 and 2003 required just $11,400 in capital (Shane, 2009). It remains to be seen whether capital investments matter much for the returns to entrepreneurship in industrialized countries. For developing countries, it appears that the returns to capital are significant, especially at lower (micro) investment amounts (McKenzie and Woodruff, 2006).
self-employment while the wage is linearly increasing with ability. And, as in Lazear (2005), there is a role for skill balance in 
single self-employed agent carries out all tasks. This framework naturally induces convexity in the returns to ability in
organized in one of two ways: in wage firms, each task is carried out by a different specialist employee, while in solo enterprises, a
firm involves a number of distinct tasks, and output depends upon the skill with which each task is carried out. Firms may be
predictions, two of which are of interest here. It predicts that the self-employed earn less than the average of observationally 
earn no more after becoming an entrepreneur. The reason is that it is a model where individuals maximize expected earnings
into entrepreneurship by stars and misfits, it cannot explain the recent empirical result indicating that wage workers, on average,
both positive and negative selection into entrepreneurship. However, although the model generates disproportionate selection
stylized facts 2a, 2b, and 4. Note that this appears to be the only theory among those reviewed that explains the stylized fact of
earnings distributions for entrepreneurs that explain

4.2. Why are entrepreneurial earnings apparently subject to greater variance and larger skew?

Besides the apparently lower earnings possibility, entrepreneurial earnings also have a unique profile, showing wider variance
and skew than wage earnings, and a different growth pattern. There are a number of possible explanations for this.

4.2.1. Improper cross-sectional comparison

The cross-sectional negative earnings differential across wage work and entrepreneurship may exist simply because of a
difference in the earnings—tenure profiles across sectors. A cross-sectional comparison is a snapshot in time that is subject to,
for example, survival bias; it could overrepresent a specific point of the earnings function in one sector. There could therefore be
only an apparent entrepreneurship discount in cross-sectional earnings comparisons that would disappear if wages and
talent entrepreneurial earnings were studied over time. That is, while cross-sectional earnings may differ between two sectors, the
expected present value of self-employment income may still be equal to the paid employment alternative, correcting for income
risk. For this explanation to hold, there must be a substantial overtake of entrepreneurial earnings over wages with time.
However, stylized fact 3 clearly rejects this potential explanation—there is no clear switchover point. Further, the present value of
entrepreneurship is shown to be lower than that of wage work in several studies (Åstebro, 2003; Hamilton, 2000; Lazear and
Moore, 1984). Finally, some studies have found that a given individual on average earns less, or at least not more, when switching
from employment to entrepreneurship (Åstebro et al., 2013; Hartog et al., 2010). We can thus reject this idea as well.

4.2.2. The superstar model

The superstar model (Rosen, 1981) argues that small differences in skills may be amplified by imperfect substitution among
sellers and for technologies where the cost of production does not rise in proportion to the size of the market. Examples include
entertainment and some professional services in which the self-employed dominate (for instance, dentists or lawyers). This
would produce the observed greater variance and skew of returns among the self-employed (stylized fact 2). This model does not,
however, give a clear prediction as to the relative mean earnings of entrepreneurs versus wage workers; that depends on the
distribution of ability and the parameters of the demand and supply functions. To our knowledge, this theory has not been tested
for its ability to explain entrepreneurial earnings.

4.2.3. Labor market frictions

A theory offered by Åstebro et al. (2011) tries to explain both the relatively high earnings of entrepreneurial stars and the low
earnings of the self-employed elsewhere in the distribution with a model that relies only on variations in ability and frictions in
the labor market. They start with a multiple-task framework in which there is complementarity between skills.6 Production in a
firm involves a number of distinct tasks, and output depends upon the skill with which each task is carried out. Firms may be
organized in one of two ways: in wage firms, each task is carried out by a different specialist employee, while in solo enterprises, a
single self-employed agent carries out all tasks. This framework naturally induces convexity in the returns to ability in
self-employment while the wage is linearly increasing with ability. And, as in Lazear (2005), there is a role for skill balance in
determining who becomes self-employed.

The authors then introduce frictions in the labor market, whereby workers are not assigned efficiently either to tasks or to
firms. Mismatching arises because agents of differing ability may become co-workers and the production function exhibits
complementarity in worker abilities. Individuals who find wage employment with a mismatched firm or in the wrong task will
earn a poor wage and may find self-employment an attractive alternative. It is obvious that frictions will in general reduce wages,
but, importantly, the authors show that this effect is greater in the tails of the ability distributions. As a result, the self-employed
tend to be drawn from the tails of the ability distribution. This results in earnings distributions for entrepreneurs that explain
stylized facts 2a, 2b, and 4. Note that this appears to be the only theory among those reviewed that explains the stylized fact of
both positive and negative selection into entrepreneurship. However, although the model generates disproportionate selection
into entrepreneurship by stars and misfits, it cannot explain the recent empirical result indicating that wage workers, on average,
earn no more after becoming an entrepreneur. The reason is that it is a model where individuals maximize expected earnings
between wage work and entrepreneurship.

In a dynamic version of this model, agents may lose jobs involuntarily, resign from their current firms to accept new offers of
employment elsewhere, establish their own businesses, or be unemployed. The dynamic model yields some additional
predictions, two of which are of interest here. It predicts that the self-employed earn less than the average of observationally

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6 Complementarity in skills means that the output of the skill of one worker marginally increases the output of the skill of another, as noted in many
team-production tasks. For example, when the engineer works with the marketer to produce a new product, the two together do better than if one of them
had done both tasks.
equivalent wage workers (stylized fact 1) and that entrepreneurs persist due to frictions in the labor market that sometimes result in a lack of viable employment options (stylized fact 6).

An extension could explain the flatter earnings profiles of entrepreneurs as well (stylized fact 3). One may simply assume that low-ability entrants have low ability because they don't learn very well. In a dynamic model, they would not accumulate skills as fast and would therefore experience flatter earnings growth. If the low performers dominate the population of entrepreneurs, the average earnings–tenure profile in entrepreneurship would be flat. Moreover, individual-specific time-varying earnings–tenure profiles would also be flat (stylized fact 3).

4.3. Why is the earnings–tenure profile relatively flat in entrepreneurship?

Stylized fact 3 indicates that entrepreneurial earnings are found to rise less quickly with tenure than earnings rise for wage workers. None of the prior mentioned theories, maybe with the exception of the extension of the labor market frictions story mentioned directly above, appears easily able to explain this fact. However, several other theories suggest that the earnings–tenure profiles in wage work and entrepreneurship will be different (for instance, Laizer, 1981; Salop and Salop, 1976). While these theories do not explain the entrepreneurial discount, they can help make sense of the relatively flat earnings profiles for self-employment.

4.3.1. Job screening

The job-screening hypothesis suggests that managers devise remuneration schedules to screen out workers who are likely to shirk (Laizer, 1981). Employers initially pay workers less than the workers' marginal product, offering more than the worker's marginal product when he or she has longer tenure. This encourages good workers to hang on and behave. However, in entrepreneurship there is no agency problem (the worker and the owner are the same), and so compensation reflects the worker's marginal product, thus remaining flatter than that of wage workers, with a crossover point beyond which wages are higher than entrepreneurial earnings. Another employee-screening theory assumes asymmetric information in job quitting probabilities (Salop and Salop, 1976); the firm does not know a priori how long a new employee will stick around, and information provided by the employee is not credible. It is costly for firms when workers quit because they must then train new workers. It is therefore optimal for firms to use a tilted-up wage profile as a screening device, so that only workers with low probabilities of quitting apply for jobs. The empirical evidence presented here is of course consistent with both of these stories.

4.3.2. Human capital formation

Another argument for the flatter earnings growth for entrepreneurs is that it is due to their lower human capital formation. Kawaguchi (2003) assumes that people are endowed with different human capital. Entrepreneurs are assumed to have higher returns to human capital than wage workers (see, for instance, Hartog et al., 2010). Entrepreneurs are also shown to have a higher variation in income than do wage workers. Since it is risky to become self-employed, only workers with high human capital select entrepreneurship because of the higher returns to that capital. If the human capital production function is concave (commonly observed in most data sets), workers with higher human capital invest less in their human capital due to higher opportunity costs. Thus, people enter entrepreneurship with higher human capital due to self-selection and tend to have a flatter earnings profile compared with wage workers. Kawaguchi (2003) finds some intriguing support for this theory. However, it rests on differential selection into entrepreneurship and is therefore inconsistent with the results showing that earnings do not increase for people becoming entrepreneurs.

4.4. Summary of theories explaining the empirical results

Table 2 summarizes the theories explaining the returns to entrepreneurship, specifies which of the stylized facts in Table 1 each theory explains—either as-is or in extensions—and provides the more prominent evidence inconsistent with the theory and some representative references.

There appear to be at least two viable theoretical explanations for the entrepreneurship discount and additional observed findings: matching and learning models and labor market frictions. Matching and learning models explain the greater skew and
variance of the return to entrepreneurship (stylized fact 1 and 2). However, the learning model predicts an increase in the average return with tenure as poor-performing entrepreneurs eventually drop out, which we see very little indication of in the data.

The theory of labor market frictions explains four things well: a) that there is a large number of people entering entrepreneurship who would be better off as wage workers (stylized fact 1), b) that there is a small fraction of individuals who make a lot more money in entrepreneurship than in wage work (stylized fact 2), c) that entrants to entrepreneurship are more likely to be drawn from the tails of the wage distribution (stylized fact 4), and d) that many individuals persist in self-employment despite low earnings (stylized fact 6). With an extension, it may also be able to explain stylized fact 3.

None of the theories comparing expected earnings in wage work and entrepreneurship can explain the recent empirical result indicating that wage workers, on average, earn no more after becoming an entrepreneur. The idea that there are various non-monetary preferences or biases for entrepreneurship, the extension of the learning model with sunk costs, as well the extension of the labor market frictions story, however, may explain this result.

5. An assessment of the role of income underreporting

There is one other explanation for the apparent discount to entrepreneurship: that entrepreneurs underreport their income.

5.1. Underreporting of income by entrepreneurs

It has been established that entrepreneurs underreport income to tax authorities more frequently than employees do. For example, 99.5% of wages and salaries were voluntarily reported to U.S. tax authorities in 1987, while only 51% of known self-employment earnings were voluntarily reported (Feldman and Slemrod, 2007). Entrepreneurs also seem to underreport their incomes in surveys. Pissarides and Weber (1989) infer that British households with an entrepreneur underreport their household income by approximately 35%. In general, adjusting for underreporting using observed differences in expenditures between entrepreneurs and employees lifts entrepreneurial mean earnings by between 10% and 40%, turning most previously reported mean/median discounts into premiums. Underreporting of entrepreneurial income may thus explain the estimated negative earnings difference between entrepreneurs and wage workers (stylized fact 1), the number of hours worked (stylized fact 5), and entrepreneurial persistence (stylized fact 6) as being only apparent.

The method developed by Pissarides and Weber (1989), which uses food expenditures to infer underreporting, rests on a number of assumptions—that reporting of food expenditures is accurate; that entrepreneurs have identical food preferences to those of similar-type wage workers; that those who report zero self-employment income report income accurately while those reporting some self-employment income underreport; that underreporting is independent of income or income variation; and that the use of unreported and reported income for food are proportionally the same. Their method estimates a mean shift, but does not allow for the examination of the effect on other parameters of the earnings distribution, such as variance or skew.

Researchers have since tried to relax these assumptions to indicate whether estimations are robust (Hurst et al., 2013; Lyssiotou et al., 2004; Tedds, 2010). Hurst et al. (2013) reported that results are indeed robust to a number of changes in estimation procedures, and across three different data sets. Lyssiotou et al. (2004) relax the assumption of preference-homogeneity and find similar results. Tedds (2010), however, finds that relaxing the assumption that underreporting is a constant fraction of income that is independent of income makes underreporting appear rather small. He first documents that underreporting varies with income and that those with higher income underreport substantially less. He further estimates that when relaxing the assumption of a constant fraction of income underreported, the average Canadian household with self-employed income in the mid-1990s underreported only by approximately $3000.

We are left, then, with the implication that under some restrictive modeling assumptions, entrepreneurs appear to underreport a large fraction of their income in surveys. But under some alternative, and less restrictive, assumptions, this fraction may be significantly smaller. It is not clear if earnings underreporting explains other stylized facts. Consider, for example, that the wage differential appears to increase over time (Evans and Leighton, 1989; Hamilton, 2000; Tergiman, 2010): if entrepreneurs underreport their income, the earnings difference should be constant over time if there was simply a constant measurement difference. This suggests that underreporting is not the factor explaining the increased earnings difference between entrepreneurs and wage workers over time.

Given these findings, it seems productive to explore further the question of how significant underreporting of entrepreneurial income is in explaining the entrepreneurship discount.

5.2. A new analysis of the role of underreporting in explaining the entrepreneurship discount

We undertook an empirical analysis to more fully explore the role of income underreporting in explaining the entrepreneurship discount. In particular, we examine the homogenous-tastes assumption of the standard underreporting-correction. We use 15 years of

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7 These results have been repeated using U.S., Swedish, Finnish, U.K., Spanish, and Canadian data (Engström and Holmlund, 2009; Hurst et al., 2013; Lyssiotou et al., 2004; Schuetze, 2002; Tedds, 2010). Feldman and Slemrod (2007) use a similar design but with charitable contributions reported to tax authorities as the presumed truthful indicator of disposable income; they find somewhat higher underreporting. Lyssiotou et al. (2004) extend Pissarides and Weber’s (1989) model from a single consumer demand equation to a system of equations.

8 Engström and Holmlund (2009) further find that sole proprietors underreport more than those running incorporated businesses, and Schuetze (2002) reports that underreporting varies by occupation, age, and the number of household members who are self-employed. Both articles probably invalidate the basic assumption that the fraction of underreporting is independent of income.
data from the world’s longest-running household panel survey, the Panel Study of Income Dynamics (PSID), which includes a nationally representative sample of U.S. households, to analyze the impact of income underreporting, following the method developed by Hurst et al. (2010). To analyze the robustness of our main result, we also examine the effect of including hybrid entrepreneurs, including those with zero and negative income and those working part time, and correcting for number of hours worked.

5.2.1. Sample construction

The PSID sample contains 39,037 observations on 7371 individuals who were household heads active in the labor force between 1980 and 1987 and between 1990 and 1996. A useful feature of this sample is that a fairly large fraction, approximately 13%, consists of self-employed individuals. We follow the sample construction criteria described by Hurst et al. (2010, p. 9–10).

5.2.2. Variables and data

Table 3 reports the variables used for analysis. The dependent variable in our analysis is the log of food expenditures (measured either as eaten at home and outside, or only eaten at home). There are two key independent variables: log of income (either total family income or family labor income plus family business income) and a dummy variable for being an entrepreneur. Family labor income includes all earnings, asset income, and transfer income received by the household. All data are yearly. Food expenditure and income are reported at the top of the table. The percentage of the sample that is self-employed (on a year basis) is 15.1%.

The table further indicates that in this sample, the self-employed are more likely to be older, more highly educated, and married; they work longer hours; and they are less likely to be black. Differences are particularly large with regard to education and ethnic background; 13.1% of the self-employed have graduate degrees, compared to only 6.6% of wage workers. In addition, 10.4% of the self-employed are black, while 26.9% of wage workers are black. These differences imply there may be pooling differences affecting the estimate of entrepreneurship returns.

5.2.3. Analysis approach

To correct for income underreporting, we follow Hurst et al. (2010). In brief, we estimate the relationship between food expenditures and income for the self-employed versus wage workers. The idea is that if the self-employed report spending more on food than wage workers for a given amount of income, then they are likely underreporting their income. The underreporting can be estimated using the difference in observable food expenditures across the two groups for a given amount of income, all else being equal. The estimating equation is written as

\[ \ln c_i = \alpha + \beta \ln y_i + \gamma D_k + \delta X_i + \tau_t + \theta_m + \epsilon_i \]  \tag{1}

where \( c_i \) is food expenditures; \( y_i \) is income; \( D_k \) is a dummy variable taking the value one if the household has a self-employed head, else zero; \( X_i \) is a vector of demographic controls; \( \epsilon_i \) represents other unobserved determinants of the household’s food expenditures; \( k \) reflects type of household, \( i \) reflects household, \( t \) reflects year, and \( m \) reflects industry (some indices have been dropped for expositional convenience). Beta (\( \beta \)) indicates the average change in food consumption with income across the two groups, while gamma (\( \gamma \)) represents the average difference in food consumption between the two groups. The statistic \( \kappa = \exp(-\gamma/\beta) \) is the fraction of income reported by the self-employed, and \( 1 - \kappa \) is the estimated amount by which the self-employed underreport income. There are two estimation methods: ordinary least squares (OLS) and instrumental variable (IV) regression. In the IV model, household income is instrumented with a set of education dummies to deal with potential measurement error of income. Finally, we correct the reported income figures with the ensuing fraction.

There are several potentially important critiques of this approach (see Section 5.1. Underreporting of net income). Here we address one of the more fundamental assumptions; that entrepreneurs have identical food preferences to similar-type wage workers. Entrepreneurs may spend more on food because their tasks are different from those of the employed, not because they’re hiding income. For example, they may eat out more often for professional networking purposes. While we do not change the structure of the model, we address this critique by computing income underreporting for the case only of food consumed at home. Our assumption is that this expenditure is less likely to be affected by different food preferences/tasks between entrepreneurs and employed.

5.2.4. Results for estimating underreporting

We first analyze whether food expenditure appears to differ between entrepreneurs and wage workers in the PSID. Table 4 report OLS regressions with household food expenditures as the dependent variable, while excluding income. The self-employed indeed have significantly higher total food expenditures than wage workers. However, if one only considers food consumed at home, the magnitude of the difference between self-employed and wage workers is only about 60% of the total food consumption difference. The latter result suggests that if one is concerned about consumption patterns for self-employed and wage workers differing due to task differences, the underreporting adjustment for self-employed will have to be considerably less.

Next, we calculate the predicted fraction of income underreported by the self-employed. To do so we estimate Eq. (1) and from that compute \( 1 - \kappa \). Table 5 reports estimation results where, in addition, demographics, industry, and year are controlled for.

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9 In addition, we—but not Hurst et al.—removed individuals working in the public sector.

10 “All else being equal” includes some important assumptions. We refer the reader to the details of those assumptions and sensitivity analyses in Hurst et al. (2010, 2013). They analyze three different samples and three different types of expenditures: total food expenditures, total nondurable expenditures, and total expenditures. However, the PSID only contains comparable data on food expenditures.
Computing the statistic $1 - \kappa$ in the bottom row, Table 5 concludes that the self-employed do underreport income, on average between 25 and 37%. These results are consistent with Hurst et al. (2013), as well as previous studies. When we use only the differences in food consumed at home, the degree of underreporting by the self-employed is less, but still substantial between 18 and 27%.11

5.2.5. The premium to entrepreneurship given corrected data
To correct incomes for underreporting, we chose $\kappa = 0.68$ (the IV estimate for total family income from Table 5) so that corrected self-employment income = self-employment income / 0.68. We implemented this correction to the personal earnings of the self-employed household head, rather than to his family income. Table 6 compares the resulting differences in personal earnings between wage earners and the self-employed. Comparing columns 1b and 1c, it is clear that correcting earnings for underreporting using the approach presented shifts the earnings distribution for the self-employed substantially upward. Note that everything is shifted up proportionally using this method; the underlying shape of the distribution does not change.12 With the adjustment, both the median and mean earnings for the self-employed clearly exceed those for wage workers, and earnings are higher at all quartiles. Fig. 1 plots the distribution of earnings for wage worker in column 1a and the adjusted self-employment earnings in column 1c. While the adjusted distribution of self-employed earnings has a distinctly higher mean than the distribution of wage earnings, the larger variance, fatter tails, and positive skew still remain.

5.2.6. Robustness analysis
We also considered how results are affected by three coding decisions in Hurst et al. (2010), a) excluding households that earned negative or zero income, b) excluding people who were working part time, c) excluding people who were working both for themselves and for someone else (“hybrids”). All exclusions are instead included, one at a time. See Table 6, columns 2–4. Including households earning negative or zero income reduces mean earnings for the self-employed by 5%, a nontrivial number. Including part-time workers adds a fairly large number of individuals; 300 wage workers (5.2%) and 133 self-employed (23.2%). As a result, the mean earnings for the self-employed drop by 5%. In the PSID there are 93 hybrid entrepreneurs out of 667 self-employed (13.9%). Including these changes the earnings of entrepreneurs very little (0.9% change at the mean). This result is in clear contrast to those obtained by Folta et al. (2010), who found that hybrid entrepreneurs represented as much as 48% of all Swedish entrepreneurs in some sectors and have earnings 23% higher than full-time entrepreneurs. Nevertheless, with these various inclusions the general pattern remains, indicating an absolute premium to most entrepreneurs.

5.2.7. Estimating the premium to entrepreneurship using regression given corrected income data
The premium to entrepreneurship given by the PSID data could be a function of either observable or unobservable composition effects, or both. We reported in Table 3 that the entrepreneurs in the PSID, on average, were quite different from the wage employed. In estimating the premium to entrepreneurship, we therefore control for observable as well as unobservable fixed person-specific effects through regression and report results in Table 7. In a random effects (RE) model, where we control for observables, we pool data across wage workers and the self-employed. Estimation proceeds as in Eq. (2), except that the number of hours is only included

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11 Detailed results are available from the corresponding author.

12 It is possible to affect the shape of the earnings distribution using other models (Lyssiotou et al., 2004; Tedds, 2010).
in one specification (to highlight its marginal effect), and the fixed effect \( \mu_i \) is absorbed by the error term. Identification here represents the value of \textit{being} an entrepreneur. In a fixed effects (FE) specification, we control for person-specific fixed unobservables by including only those who at some point become self-employed. Identification here represents the value of \textit{becoming} an entrepreneur. Estimation of the FE model proceeds as in Eq. (2) except that we include only time-varying regressors (most controls do exhibit some change over time, but the variation is small), and the individual-fixed effect is differenced out. In both cases (RE, FE), we only analyze the first transition to self-employment; earnings for those switching back to self-employment (and subsequent potential switches) are excluded. Eq. (2) is written as

\[
\ln y_i = \beta \ln L_i + \gamma D_k + \delta X_i + \tau_t + \theta_m + \mu_i + \omega_{iktm} \tag{2}
\]

where \( y, D, X, \tau, \) and \( \theta \) are as before, \( L \) is labor input, \( \mu \) is unobserved individual-fixed ability, and \( \omega_{iktm} \) is assumed normally and independently identically distributed. Columns 1a and 1b in Table 7 report FE and RE coefficients for the marginal returns to entrepreneurship (\( \gamma \) in Eq. 2), with data as reported in columns 1a and 1b in Table 6. The coefficients can be interpreted as the mean percentage difference between wage workers and entrepreneurs (RE specification), and the mean percentage increase/decrease in earnings from becoming an entrepreneur (FE specification) by forming the statistic \( 100(e^{\gamma} - 1) \).

FE results show, on average, a 4.2% decrease in earnings when individuals move from the wage sector to self-employment, excluding the underreporting correction, although the earnings difference is not statistically significant. Similarly, the RE results suggest a slight earnings discount for the self-employed.

Columns 2a and 2b report the marginal returns after we correct for underreporting of self-employment earnings. The results are in sharp contrast with those observed in columns 1a and 1b. Both the FE and RE estimates suggest that self-employed individuals receive a significant earnings premium. The earnings of individuals who transitioned into self-employment increased by nearly 42% \( [100(e^{0.347} - 1)] \). Meanwhile, the self-employed on average earned 47% more than wage workers \( [100(e^{0.384} - 1)] \).

In unreported analyses, we computed the mean returns when correcting underreporting only with food eaten at home. The different estimates agree on an earnings premium of approximately 27% to 31%, clearly much less than when using all food consumption to determine the correction. These results demonstrate that the method of correcting earnings underreporting matters very much.

In the following columns, we perform several sensitivity analyses without the correction for underreporting. In columns 3a and 3b, we include additional controls for weekly working hours. Columns 4a and 4b report the marginal returns when including those reporting zero or negative incomes. We set negative and zero values to one dollar to allow the log to be computed. Columns 5a and 5b report results when part-time workers are included; columns 6a and 6b show what happens when we include hybrid

<table>
<thead>
<tr>
<th>Table 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food expenditure difference between wage and self-employed workers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dept var: log(food expenditures)</th>
<th>Eating at home + eating outside</th>
<th>Eating at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total family income</td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>Log of income</td>
<td>Estimate of ( \beta )</td>
<td>0.291***</td>
</tr>
<tr>
<td></td>
<td>Estimate of ( \gamma )</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>Self-employed</td>
<td>0.085***</td>
</tr>
<tr>
<td></td>
<td>Kappa</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>1 - kappa (underreported)</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Notes:
Standard errors are in parentheses. Additional controls include age, race, education, marital status, family size, occupation, industry, and year. Significance levels: *** 0.01, **0.05, *0.1.
entrepreneurs. The results vary slightly across the various data manipulations, most of which indicate negative mean returns to entrepreneurship, although the earnings difference is not significantly different from zero. The estimates typically show a 1% discount to being an entrepreneur and a 4% reduction in average earnings from becoming an entrepreneur.

### 6. Summary and conclusions

#### 6.1. Summary of findings

Why do individuals become entrepreneurs despite the fact that entrepreneurs apparently on average earn less than employees do? We address this puzzle by reviewing recent evidence on the financial returns to an individual from the choice to be or become an entrepreneur in comparison to staying employed: the returns to entrepreneurship. Six stylized empirical facts emerge from this review. We briefly examine seven theories that each explain at least one, and sometimes several, of the six stylized facts. We further develop two of these seven theories by suggesting extensions that will allow the theories to explain most, but not all, of the six stylized facts. We continue by empirically exploring one of the explanations for why entrepreneurs appear to earn less than observationally similar employees: underreporting of income. We show that the estimated mean financial discount to becoming an entrepreneur disappears and instead becomes a large premium when a correction for underreporting of income is applied. This premium persists in various sensitivity analyses but is strongly affected by one assumption: that entrepreneurs have identical food preferences to similar-type wage workers. The estimated premium is markedly reduced when analyzing expenditures that are less likely to be affected by differences in tastes, such as expenditures for food to be consumed at home: in this case, the estimated premium drops by 30%, suggesting that the homogenous-tastes assumption of the correction model is false. Furthermore, other stylized facts remain after making the correction for underreporting, suggesting that underreporting of income is not the explanation for them.

#### 6.2. Implications for future research

The differences between average earnings in entrepreneurship and for wage work vary significantly over time within a country and across nations. In contrast to the averages, the regression estimated mean differences, which at a minimum control for observable differences between wage workers and entrepreneurs, vary less and typically indicate negative returns to entrepreneurship, ranging between −4% and −15% across prior studies.\(^\text{13}\)

It is important to understand the cause of the systematic deviation between averages and regression estimated means. The answer appears to lie in selection. Sometimes individuals who become entrepreneurs are of a different caliber than those who stay employed. In some studies, including this one, they are shown to be more educated and older, have longer work experience, and be drawn from the top of the ability distribution. This would tend to increase their relative average earnings versus

\(^{13}\) Although in Norway the difference was +16.4% (Berglann et al., 2011). However, this estimate is likely biased upwards due to the inclusion of non-entrepreneurial capital income in entrepreneurial returns.
employees and imply a lower regression estimated mean earnings difference than the difference in average earnings. It is therefore important to control for selection when estimating the returns to entrepreneurship. Examining averages may not be very useful.

Underscoring the point that selection determines observed differences in earnings, there is now mounting evidence that entrepreneurs are drawn disproportionally from both tails of wage earners—both stars and misfits (in other places termed opportunity and necessity entrepreneurs) are overrepresented in entrepreneurship. In some professions, it appears that the overrepresentation only appears at the top of the ability distribution (see, for instance, Groysberg et al., 2009). And the formerly unemployed are overrepresented among poorly performing entrepreneurs (Alba-Ramirez, 1994; Andersson and Wadensjö, 2007; Åstebro et al., 2011). Controlling for this bimodal selection into entrepreneurship requires better-calibrated selection models.

Notably, the two theories that explain the entrepreneurship discount with references to pooling effects (the learning and superstar models) fail to explain why the difference in earnings for individuals who switch from wage employment to entrepreneurship is not positive (Åstebro et al., 2013; Hartog et al., 2010; this study). This suggests that researchers may pursue alternatives to trying to control for selection, for example instead analyzing differences in earnings before and after entering entrepreneurship for each given individual; this difference could then be averaged across all entrepreneurs in the sample. This amounts to estimating an individual-fixed effects panel data model, and effectively eliminates unobservable pooling effects.

Underreporting of entrepreneurial incomes may explain the typically estimated negative difference in mean earnings between entrepreneurs and wage workers. However, as we showed, the assumptions behind the correction method matter greatly. Future research should try to more closely calibrate the degree of underreporting. For example, an individual-specific rather than population-level mean correction for underreporting (as in Tedds, 2010) may be more effective, as research indicates that the degree of underreporting varies distinctly by observable characteristics (Engström and Holmlund, 2009; Schuetze, 2002; Tedds, 2010).

Several other stylized facts were considerably less sensitive to datasets, timing, or measurement/estimation methods. We found that without exception the earnings growth of entrepreneurs was typically flat, developing less quickly than the growth in wages for employees. We also found that income variance was significantly higher for entrepreneurs than wage workers. In addition, we observed fatter tails and a greater positive skew of earnings for entrepreneurs and longer working hours, and we noted that entrepreneurs persist despite the potential to earn at least as much in wage employment.

One potential explanation for several of these stylized facts is that there is a preference for entrepreneurship driven, for example, by higher job satisfaction or a preference for task variety (Åstebro and Thompson, 2011). Decision-making biases, for instance that entrepreneurs are overconfident optimists, skew lovers, and/or hyperbolic discounters, may also explain these facts. While it has been documented that entrepreneurs have higher levels of job satisfaction than wage workers (see, for example, Benz and Frey, 2008a,b), we know less about the impact of the other potential explanations. It is clear from several recent studies that entrepreneurs are different from wage workers in many respects, both in their preferences and in how they think. But it is unclear whether, how, and how much preferential and cognitive differences affect the returns to entrepreneurship. Similar to the mismeasurement story, decision-making biases may explain the entrepreneurial discount, the persistence in entrepreneurship, and the greater number of hours worked.
Table 7
The effect of self-employment on earnings.

<table>
<thead>
<tr>
<th></th>
<th>FE (1a)</th>
<th>RE (1b)</th>
<th>FE (2a)</th>
<th>RE (2b)</th>
<th>FE (3a)</th>
<th>RE (3b)</th>
<th>FE (4a)</th>
<th>RE (4b)</th>
<th>FE (5a)</th>
<th>RE (5b)</th>
<th>FE (6a)</th>
<th>RE (6b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean return to self-employment</td>
<td>-0.039</td>
<td>-0.002</td>
<td>0.347†</td>
<td>0.384†</td>
<td>-0.033</td>
<td>-0.014</td>
<td>-0.041</td>
<td>0.002</td>
<td>-0.069*</td>
<td>-0.025</td>
<td>-0.028</td>
<td>0.006</td>
</tr>
<tr>
<td>Individuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obs.</td>
<td>574</td>
<td>5813</td>
<td>574</td>
<td>5813</td>
<td>567</td>
<td>5796</td>
<td>586</td>
<td>5854</td>
<td>707</td>
<td>6113</td>
<td>667</td>
<td>5853</td>
</tr>
<tr>
<td>Correcting for underreport (kappa = 0.68)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Control for working hours</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Including households reporting negative or zero income</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Including part-time workers</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Including male heads who worked both as self-employed and as wage workers</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes: The table contains results from two estimation methods: fixed effects (FE), and random effects (RE) panel data. Clustered standard errors are given in parentheses. Control variables include age, race, marital status, family size, education, occupation, industry, and year. Significance levels: †<0.01 or better, *<0.1.

Two theories might explain most of the stylized facts: matching and learning (e.g. MacDonald, 1988) and labor market frictions (Åstebro et al., 2011). The first theory presumes that people do not know their expected returns in entrepreneurship and enter on chance. Those who are able as entrepreneurs remain, while those less able return to wage work after a short stint in entrepreneurship. The second theory presumes that wages are not always properly matched to ability and that frictions are greatest at the tails of the wage distribution. This implies that those with the best and worst ability are most likely to leave the wage sector for entrepreneurship. Although the first theory is very established and the second one new, neither has been subjected to much empirical testing. Additional analysis is needed to test their durability.

The first theory may be extended to explain entrepreneurial persistence by assuming that entrepreneurs enter with an investment that is sunk. Entrepreneurs must honor this sunk cost when comparing future alternative options, which means the formal model will no longer be one of (myopic) present value optimization. The second theory could probably be extended as well to explain the flatter earnings profiles of entrepreneurs. One could assume that low-ability entrants have low ability because they don't learn very well. In a dynamic model, they would not accumulate skills as quickly as those with greater ability and would therefore experience flatter earnings growth. What remains to be developed is a dynamic model of skill accumulation with an underlying distribution of abilities. Such a model may be able to explain the individual-specific discount to entrepreneurship. The development of both theoretical extensions remains to be worked out.

6.3. Limitations

There are two great challenges staked out in this paper, and these challenges also reflect the limitations of the paper. First, we would like to have a more fully encompassing economic theory that addresses the question of why entrepreneurs exist. The simple answer—that people choose entrepreneurship because they can earn more money as entrepreneurs than in wage work and previous analyses showing otherwise have used bad (underreported) data—is only partially true, at best. Alternative theories are substantially more complex, but address more of the stylized facts; the challenge is to develop and test these further. The second challenge is to develop alternative empirical models to correct for the apparent underreporting of income by entrepreneurs. It is beyond doubt that entrepreneurs underreport some of their income; the question is, how much? To address this challenge, more of the assumptions in the original model developed by Pissarides and Weber (1989) may need to be relaxed, and new estimation models probably need to be developed.

Acknowledgments

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Appendix A

Table A1
Major sources of publicly available data on the returns to entrepreneurship.

<table>
<thead>
<tr>
<th>Data source</th>
<th>Country</th>
<th>Condensed data description</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current population survey</td>
<td>USA</td>
<td>Monthly representative survey of about 50,000 households. Data include employment, unemployment, earnings, hours of work, school enrollment, income, previous work experience, health, employee benefits, work schedules, age, sex, race, marital status, educational attainment, occupation, industry, and class of worker. Microdata extract purchased.</td>
<td><a href="http://www.census.gov/cps/">http://www.census.gov/cps/</a></td>
</tr>
<tr>
<td>National Longitudinal Survey of Youth 1979</td>
<td>USA</td>
<td>Nationally representative sample of 12,686 young men and women 14–22 years old when first surveyed in 1979. Interviewed annually through 1994 and then biannually, following the youth over time. Data include start and stop dates for each job held since the last interview, employment status, wages, business earnings, hours worked. Measures of actual labor market experience, tenure with a specific employer, and employer mobility are easily calculated. Additional information include personal, spouse, and family characteristics and job satisfaction. Freely downloadable microdata.</td>
<td><a href="http://www.bls.gov/nls">http://www.bls.gov/nls</a></td>
</tr>
<tr>
<td>National Longitudinal Survey of Youth 1997</td>
<td>USA</td>
<td>Nationally representative sample of approximately 9000 youths 12–16 years old as of December 31, 1996, starting 1997. In that round, the youth and one parent were interviewed. Continued annually, following the youth over time. Freely downloadable microdata.</td>
<td><a href="http://www.bls.gov/nls">http://www.bls.gov/nls</a></td>
</tr>
<tr>
<td>Panel study of income dynamics</td>
<td>USA</td>
<td>Begun in 1968, a nationally representative sample of over 18,000 individuals in 5000 families; follows households over time. Data cover employment, income, wealth, expenditures, family status, health, marriage, childbearing, child development, philanthropy, education, and numerous other topics. Freely downloadable microdata.</td>
<td><a href="http://psidonline.isr.umich.edu/">http://psidonline.isr.umich.edu/</a></td>
</tr>
<tr>
<td>Survey of income and program participation</td>
<td>USA</td>
<td>Continuous monthly series of national panels, with sample size ranging from approximately 14,000 to 36,700 interviewed households. All household members 15 years old and over are interviewed. Duration of each panel ranges from 2½–4 years. Data include income, labor force information, program participation and eligibility data, and general demographic characteristics. Additionally include personal history, childcare, wealth, program eligibility, child support, utilization and cost of health care, disability, school enrollment, taxes, and annual income. Freely downloadable microdata.</td>
<td><a href="http://www.census.gov/sipp/">http://www.census.gov/sipp/</a></td>
</tr>
<tr>
<td>Survey of consumer finances</td>
<td>USA</td>
<td>Detailed triennial survey starting of the balance sheets, pension, income, and other demographic characteristics of 4500 representative U.S. families, starting in 1983. A supplemental sample is selected to disproportionately include wealthy families, except the 400 wealthiest people in the U.S., who are excluded. A new sample is drawn for each survey. Freely downloadable cross-sectional microdata.</td>
<td><a href="http://www.federalreserve.gov/">http://www.federalreserve.gov/</a> pubs/oss/2/scfindex.html</td>
</tr>
<tr>
<td>International Social Survey Programme 1989, 1997, 2005</td>
<td>Intl</td>
<td>Work orientation; preference for being self-employed or being an employee; characterization of the respondent’s work and work satisfaction (scale); physical exhaustion after work; personal opportunity to influence the organization of the workday or work process; difficulties in handling personal matters during working hours; frequency of the impairment of the family life by work requirements and vice versa; existence of a side job; self-assessment of psychological characteristics of personality. Demographics, family, employment status, hours worked, income, occupation; span of control; company size; religious denomination; religiousness; union member; self-assessment on a left-right continuum; city size; region; original country of origin or ethnic group affiliation, among others. Freely downloadable cross-sectional microdata. 43,440 observations in 2005 sample.</td>
<td><a href="http://zacat.gesis.org/webview/index.jsp?object=http://zacat.gesis.org/obj/Study/ZA4150">http://zacat.gesis.org/webview/index.jsp?object=http://zacat.gesis.org/obj/Study/ZA4150</a></td>
</tr>
<tr>
<td>British Household Panel Survey</td>
<td>Britain</td>
<td>Begun in 1991, wave 1 panel consists of some 5500 households and 10,300 individuals. Additional samples of 1500 households in each of Scotland and Wales were added in 1999, and in 2001 a sample of 2000 households in Northern Ireland was added. Follows households over time. Questions similar to PSID, with special topics inserted in each wave. Freely downloadable microdata.</td>
<td><a href="http://www.iser.essex.ac.uk/bhps">http://www.iser.essex.ac.uk/bhps</a></td>
</tr>
<tr>
<td>European Community Household Panel (ECHP)</td>
<td>Europe</td>
<td>Survey based on a standardized questionnaire and annual interviewing of a representative panel of households and individuals in each country, covering a wide range of topics: income, health, education, housing, demographics and employment characteristics, etc. The total duration of the ECHP was 8 years, 1994–2001. The first-wave sample contained 60,500 nationally representative households. Approximately 130,000 adults aged 16 years and over were interviewed in the then 12 member states. Austria (1995) and Finland (1996) have since joined the project. Data for Sweden is available from 1997.</td>
<td><a href="http://circa.europa.eu/irc/dsis/ecpanel/info/data/information.html">http://circa.europa.eu/irc/dsis/ecpanel/info/data/information.html</a></td>
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</table>

References


