



Do different factors explain male and female self-employment rates?



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ABSTRACT

This article challenges the assumption that the factors associated with the self-employment choices of women differ from those of men; specifically, we test the extent to which women are influenced by standard economic factors compared with family and social issues. We find that economic factors influence the self-employment choices made by men and by women in the long and short-run. Although some findings were sensitive to the chosen self-employment measure our short-run findings, in particular, are at variance with the interpretation that self-employed women are less likely to be influenced by economic factors than their male counterparts. Consequently, we argue that gender-based explanations have exaggerated the importance of social factors in the self-employment choices made by women.

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1. Executive summary

Self-report data suggests that the factors influencing the self-employment choices exercised by men and women differ substantially. It indicates that men are more likely to emphasise the role of standard economic factors such as the state of the economy, access to credit and economic opportunity when considering self-employment. In contrast, social factors such as work–life balance/flexible working, parenthood, childcare concerns and esteem issues are more likely to be emphasised by women. The evidence presented in this article, however, does not support this clear differentiation. Using official, rather than self-report data, it demonstrates that macro-economic factors provide a powerful explanation for participation in self-employment for both men and women in the long and short-run.

The context for the study is a detailed analysis of contemporary socio-economic influences upon male and female self-employment choices. The findings are drawn from advanced statistical analyses of official time-series data from the United Kingdom over a 30 year period and focus on statistical concepts of co-integration. We examine the factors influencing self-employment rates amongst men and women over both the short and the long-run using two self-employment measures. These

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are then linked not only to economic factors such as, GDP, interest rates, unemployment, and access to finance and incomes in waged and self-employment, but also to social factors such as, marriage, divorce and fertility rates. Finally, a political party variable is included, together with a number of government policies expected to influence self-employment.

We find strong statistical associations between macro-economic indicators and female self-employment rates in the short and long-run; this suggests that women, similar to men, are strongly influenced by economic considerations such as the state of the economy, when considering self-employment. In fact, GDP and house prices appear to have a more powerful impact upon women. We also find that social factors usually influence men and women in a broadly similar manner. The key exceptions are that unemployment and fertility raise self-employment rates but only for men and that, in the long run, divorce lowered self-employment but only for women. Thus, we suggest it is inappropriate to align social factors with women and economic factors with men as an explanation for gender differences in self-employment choices; rather, both factors are influential upon men and women – if in differing ways.

Finally, we find that employee remuneration levels influence self-employment, with increasing income levels – for men and women – reducing self-employment rates in the short-run. We suspect the efforts of the UK Labour government (1997–2010) to improve incomes for low paid employees, combined with an expansion in the labour market, partly explains the fall in self-employment rates during this period.

The evidence within this article challenges dominant stereotypical assumptions which underpin the prevailing literature that women are more likely to prioritise social factors in their self-employment decisions. Such assumptions arise from superficial descriptive analyses, often founded upon small samples of self-report data which fail to capture the complexity of socio-economic influences within the household and male and female life-course decisions over time. Accordingly we argue that time-series data are most appropriate to study the long-run patterns and dynamics associated with self-employment decisions in relation to macroeconomic variables; moreover, panel data studies and recent advances in statistical literature should be used to uncover such underlying relationships.

Linking long and short-run social and economic changes with self-employment rates leads us to dispute the presence of clear gendered differences; it cannot be assumed that there is an inherent association between women, self-employment and social factors reflecting a feminised propensity towards the social sphere. This assumption is prejudicial and inaccurate, it risks perpetuating gender-biased analyses within contemporary and future theorising; this must be addressed if the research agenda regarding the influence of gender upon men and women's self-employment choices is to move forward.

2. Introduction

During the last four decades women's formal labour force participation has grown substantially (Cloid et al., 2011; DiCecio et al., 2008; Gutierrez-Domenech and Bell, 2004). Reflecting this trend, more women are also pursuing careers in self-employment, but men continue to be more than twice as likely to be self-employed (Díaz García and Welter, 2011; OECD, 2009). In addition, prevailing evidence suggests men and women prioritise differing factors within self-employment; so, for the former, self-report data suggests economic factors such as the state of the economy and access to credit are more influential (DeMartino and Barbato, 2003; Kepler and Shane, 2007). In contrast, for women it is assumed that social factors such as work–life balance (Shelton, 2006), parenthood (Georgellis and Wall, 2005), childcare concerns (Kirkwood and Tootell, 2008) and esteem issues (Taylor and Newcomer, 2005) have a greater impact. Thus, reflecting gender stereotypical assumptions, women are considered to prioritise socially-related issues when considering self-employment and, are less concerned with economic factors than their male counterparts.

The arguments and evidence we present in this article do not support this characterisation; rather, they suggest the gendered differences between reported attitudes to, and actual participation in, self-employment is not that simplistic or clear-cut. Specifically, we challenge the presumption that when entering self-employment, women are more likely to value and prioritise social rather than economic factors. We acknowledge that our findings are limited to one country, the United Kingdom (UK) and to one measure of enterprise – self-employment. Nevertheless, this study differs from the extant research as it does not rely upon self-report data, the key limitations of which are the difficulty of verifying the answers given and of generalising from the small, and often unrepresentative, samples from which they are derived. We also avoid the use of cross-sectional frameworks (Georgellis et al., 2005) and instead undertake time-series modelling over a time span of more than 30 years using official data. Unlike cross sectional studies, this approach allows us to analyse long-run patterns and dynamics associated with self-employment decisions by gender in relation to economic variables whilst at the same time, it mitigates statistical issues related to non-stationarity and endogeneity (see the discussion by Parker, 2004, pp. 29–30).

Our novel contribution lies within an examination of factors influencing self-employment rates amongst men and women over both the short and the long-run. Linking long and short-run social and economic changes with self-employment rates leads us to dispute the presence of clear gendered differences. Consequently, we challenge assumptions that women's self-employment choices reflect a gendered bias towards social factors.

To support these arguments, we examine the role of alternative employment options, personal circumstances, macro-economic conditions and government policies on self-employment. We develop the earlier work of Parker (1996) and Cowling and Mitchell (1997) in five ways. First, we extend the time period by more than a decade; second, we include new variables to capture social, as well as economic influences; third, we estimate separate models for men and women to allow for gender differences in the determinants of self-employment; fourth, we use the vector autoregressive (VAR) methodology to capture immediate (short-run) and permanent (long-run) changes and deal with statistical issues related to non-stationarity and co-integration. Finally, we provide a robustness check to examine the sensitivity of the results to different definitions of the

self-employment rate. Drawing from this analysis, we find that in the short-run, there appear to be few gender-related differences in terms of the economic factors influencing self-employment. In the long-run, women continue to be strongly influenced by economic considerations, but additionally they are more strongly influenced by marital factors and family-related obligations. We therefore, question the simplistic notion that the enterprise decisions of women are primarily influenced by social and particularly, family-based motives whereas those of men are more driven by economic factors.

To explore and illustrate these arguments, the discussion is organised as follows: Section 3 explores how the choice between waged work and self-employment differs according to gender; from this analysis, two hypotheses are derived. The first is that although both males and females are influenced in their self-employment choice by marital and family-related obligations, the association is stronger for women. The second hypothesis is that over time, economic factors are of less importance for women in explaining changes in self-employment. Section 4 describes the data whilst Section 5 presents the statistical model. Section 6 provides the results, distinguishing between short and long-run effects, with the final section exploring the implications of the results and highlighting issues for future development.

3. Background and hypotheses derivation

3.1. Economic theory and empirical evidence on self-employment entry

Economic theory assumes that self-employment is a choice — albeit not necessarily a perfectly informed one. The factors influencing this choice are ‘the rules of the game,’ on the basis of which individuals assess whether it is better for them to be in one of two states — or perhaps some combination of these states: waged employment; self-employment. Economists also assume that individuals derive utility from being unemployed or economically inactive (see, for example, Carrasco, 1999). Therefore, we can simply write the expected utilities as follows:

$$\begin{aligned} E(U_{se}) &= f(\theta, k, r, X) \\ E(U_w) &= g(w, X) \\ E(U_u) &= z(b, X) \\ E(U_i) &= l(a, X). \end{aligned} \quad (1)$$

Expected utility from self-employment, $E(U_{se})$, for example, is a function of entrepreneurial ability (θ), available capital (κ), the real interest rate (r) and individual characteristics, tastes and preferences (X). Expected utility in paid employment, $E(U_w)$ is a function of the wage rate (w) and X . Expected utility in unemployment, $E(U_u)$ depends on unemployment insurance (b) and X . Finally, expected utility when economically inactive, $E(U_i)$, depends on benefit income available whilst out of the labour force (a) and X . An individual will therefore be self-employed if:

$$E(U_{se}) > \max\{E(U_w), E(U_u), E(U_i)\}. \quad (2)$$

Although the above theory models individual decisions, it can also be extended to the macro level. Consistent with the economic theory discussed above, early evidence based on aggregate UK data suggested that economic variables are good predictors of future self-employment. Parker (1996), using data from 1959 to 1991, showed that alternative income opportunities³ and unemployment had a significant effect on self-employment rates (for similar results see also Clark and Drinkwater, 2000). Parker also found that the higher the interest rate, the lower the number of self-employed and that higher tax rates raise the self-employment rate, reflecting opportunities for tax evasion/avoidance when compared with wage/salary earnings (see also Parker and Robson, 2004 for OECD countries). Cowling and Mitchell (1997) addressed similar issues, and also considered the importance of liquidity constraints by examining the effect of rising house prices in overcoming this credit constraint. Using time-series data from 1972 to 1992 they found a strong positive effect of house prices on UK self-employment rates (for similar results, see also Black et al., 1996 and Blanchflower and Shadforth, 2007). The self-employed/wage-employed income differential and long-term unemployment also had a positive effect on the self-employment rate. Nevertheless, economic effects were more persistent in the long-run rather than the short-run in both studies.

Turning to international evidence, an early time-series study by Blau (1987), using US data from 1948 to 1982, found that only increases in tax rates at high income levels induced shifts toward self-employment (see also Long, 1982 and more recently Bruce, 2000). Shane (1996), however, using US time-series data from 1899 to 1988, found that economic variables had weak explanatory power, although other US and international studies (Alba-Ramirez, 1994; Schiller and Crewson, 1997; Schuetze, 2000) reported stronger associations between self-employment and economic factors. However, most of these early studies examined the non-stationary properties of the data; moreover, they did not incorporate the concept of co-integration, developed by Engle and Granger (1987), which builds on error corrections models and provides a powerful framework for studying both long and short-run relationships.

More recent work however, has adopted econometric techniques to surmount problems associated with the use of non-stationary series. Fiess et al. (2010), using data for Central and Latin America countries and applying the Johansen co-integration procedure, found strong long-run associations between informal self-employment and macroeconomic fluctuations.

³ Leung (2006) found the alternative employment earnings variable to be stronger for females than for males — a point to which we return later.

In addition, [Bruce and Moshin \(2006\)](#), using US data from 1950 to 1999, used bivariate co-integration tests to conclude that most of the tax variables were not co-integrated or had only a small effect on self-employment activity (see also [Briscoe et al., 2000](#); [Fairlie and Meyer, 2000](#); [Parker, 2003](#)). Finally, [Saridakis et al. \(2012\)](#), using panel co-integration techniques, found a positive and statistically significant long-run association between self-employment and unemployment in Southern European and Western European countries.

3.2. Gender differences in self-employment entry

Within this discussion, we define gender as a binary categorisation of socially constructed masculine and feminine characteristics broadly mapped onto biological males and females ([Bradley, 2007](#)). Critical evaluations of the intersection of gender and entrepreneurship emerged as a coherent strand of research from the late 1980s ([Ahl, 2006](#); [Díaz García and Welter, 2011](#)). This body of work has now grown considerably with a recent literature review identifying over 700 related academic papers ([Neergaard et al., 2011](#)). However, the review acknowledges that much of this literature draws heavily upon small samples using self-report data and micro-econometrics techniques; there remains a notable absence of time-series analyses or macro panel data sets.

Despite these limitations, a number of key themes have emerged. Echoing occupational segregation in waged employment, women's enterprises are over-represented in crowded, low value-added segments of the service sector ([Marlow et al., 2009](#); [Wilson and Tagg, 2010](#)). In addition, they also demonstrate slower growth rates ([Fairlie and Robb, 2009](#); [Marlow and McAdam, 2013](#)) which reflect sectoral constraints and part-time operational preferences (utilised to combine domestic labour and economic activity) ([Gurley-Calvez et al., 2009](#); [Jayawarna et al., 2013](#)). Indications drawn from aggregate data suggest that about half of all self-employed women work part-time (fewer than 30 h per week)⁴ and approximately a third base their businesses within the home ([Bosma and Harding, 2006](#); [Thompson et al., 2009](#)).⁵ Hence, it has been argued that self-employment may be viewed as a substitute for part-time employment ([Georgellis and Wall, 2005](#)), enabling women to work flexibly to accommodate family-related obligations ([Boden, 1999](#); [Duberley and Carrigan, 2012](#)).

Just as female part-time wage employment is characterised by reduced status and returns ([Manning and Petrongolo, 2008](#)), undertaking self-employment on such a fragmented basis, particularly if home-based, limits the potential of the firm ([Rouse and Kitching, 2006](#)). Moreover, such operating constraints do not appear to be compensated by improved work–life balance. [Desmedt \(2010\)](#) and [Jayawarna et al. \(2013\)](#) found home-based enterprises offered a poor solution to combining caring/household labour and economic activity for two critical reasons. First, the legitimacy of the enterprise is compromised by association with the domestic sphere. Second, time flexibility is undermined when reconciling competing enterprise/household demands; relatedly, growth ambitions are difficult to realise given the constraints of these competing pressures. Overall, the returns to such enterprises were modest, irrespective of the commitment of the owners.⁶ Research exploring women's attitudes towards, and experiences of, self-employment has explored the influence of household responsibilities, social stereotypes and performance profiles at length ([Greene et al., 2011](#); [Marlow and McAdam, 2013](#); [McAdam, 2012](#)). This provides some consensus that the profile of women's life course events differs markedly from that of men, and so shapes their relationship with employment and self-employment ([Davis and Shaver, 2012](#)) this does not reflect an essential deficiency in terms of women's ability or propensity for self-employment but instead suggests a response to social norms and stereotyping. However, surprisingly little attention has been afforded to the effects of broader shifts within the gendered dynamics of contemporary households upon the propensity for self-employment.

One such notable shift is the rate of divorce which is now an increasingly common life-course event ([Vandecasteele, 2011](#)). In addition to the social ramifications of divorce, it lowers the asset-base of individuals ([Cubeddu and Rios-Rull, 2003](#)) and, as such, would be expected to affect entry rates into self-employment. So, for men, a shift from wage/resource sharing within the household to one of direct alimony payments (especially if providing financial support for children) whilst supporting themselves (and possibly a new family unit) within a second household is likely to lower capital and available time reserves and thus, self-employment propensity ([Shapiro and Cooney, 2007](#)). However, for women the effects of divorce appear to be even more damaging. The loss of a male earner from the household is unlikely to be compensated for a female wage given that, on average, women have lower incomes and, in addition, are far more likely to have custody and care of children. Thus, whilst divorce may lower the asset-base of both men and women generally, it appears to have particularly damaging socio-economic implications for women. As [Vandecasteele \(2011, p. 246\)](#) notes,

'partnership dissolution has a poverty triggering effect for people of all educational levels and all social classes. In line with previous research, we found that partnership dissolution affects the poverty entry risk of women more strongly'.

Conversely however, the alleged flexibility and lack of formal entry barriers may make self-employment more attractive to those whose employment options are restricted by lone parenthood and/or a lack of formal skills or recent work experience. As [Özcan \(2011\)](#) argues, some accumulated forms of social capital that accrue from a prior marriage – such as experience in a

⁴ For males, using official data from National Statistics we estimate that on average 10% of self-employed men have worked part-time over the last three decades.

⁵ However, there is a strong positive correlation between full-time and part-time female self-employment (0.86) whereas the correlation is weaker between full-time and part-time male self-employment (0.36).

⁶ The findings from these studies are supported by the [OECD \(2012\)](#); self-employed women earn less than men reflecting sectoral differences, operating profiles, limited investment and expansion risks.

household family business – may not be entirely removed by divorce. On balance however, the negative impact of divorce upon most women in terms of lost household income, personal status and future prospects (Galbraith, 2003; Glick, 2010) is likely to outweigh any such retained social/entrepreneurial capital. This suggests self-employment represents a poor choice for divorced women, particularly mothers, seeking to supplement alimony payments in a context of limited resources and constrained time flexibility (Georgellis et al., 2005). Accordingly, we see two important but differing barriers represented by divorce upon the household; on the one hand men (if they do not enter/create a new family unit) may have more time to dedicate to self-employment. Yet, whether they create a new family unit or not, they are likely to be financially constrained by having to fund their own living expenses and those of their previous household. Women, particularly mothers, on the other hand are likely to be both financially and time-constrained in terms of the resources to dedicate to self-employment.

Another potential influence on female self-employment is the decline in the male/female wage gap (Siegel, 2012) since, as reflected in Eq. (1), higher wages lower the attraction of self-employment. In addition, increasing European regulatory provisions to formalise employment-related benefits such as paid maternity, parental and paternity leave also encourages female selection into waged work (Klyver et al., 2013). In short, the extent to which the increase in women's activity rates is “converted” into self-employment depends at least in part upon the relative returns and benefits accruing from waged and self-employment.

Falling fertility rates are also coterminous with increasing female economic participation (Fine, 2010); this may, in turn, be expected to lead to a higher likelihood of female self-employment. Thus, we might expect that having more time to devote to economic activity would encourage women to pursue self-employment. Yet, reflecting the arguments above, declining fertility also gives women more time to invest in their human capital and compete for higher status and hence, better remunerated wage employment. This may be a more attractive prospect than the uncertainty of self-employment. The evidence on this is again not easy to interpret. Wellington (2006) found that in the US, women with more children were more likely to be self-employed. However this may reflect the alleged flexibility of self-employment in a context of limited state support for child care (Daly and Rake, 2003) since the US is one of only four global economies (along with Papua New Guinea, Swaziland, Liberia) which does not regulate for paid mandatory maternity leave (Fass, 2009).

An additional contemporary trend which may have conflicting implications for self-employment has been a decline in the marriage rate. The responsibilities of marital relationships, such as household and childcare expenses, may reinforce the need for secure employment making uncertain self-employment less attractive than waged employment (Özcan, 2011). Yet, marriage may also serve to amalgamate household skills, facilitate the leverage of joint networks and enable the combination of financial capital so strengthening the resource-base for either, or both, partners should they enter self-employment (Aldrich and Cliff, 2003; Devine, 1994; Parker, 2008). This may be particularly important where significant quantities of capital are required for the enterprise to reach minimum efficient scale. In effect, such resource amalgamation may be expected to increase the propensity towards self-employment.

The flow of self-employment resources between marital partners within households is, however, unlikely to be equal. Social norms suggest a woman should support her husband's firm through unpaid or low paid labour; this reflects a natural extension of the ‘wifely’ role (Hamilton, 2006; Marlow and McAdam, 2013; Wheelock et al., 2003) preserving the hierarchical ordering of the marriage relationship and the primacy of the male partner. Accordingly, reciprocal support/resource flows within the marital household are likely to be constrained for women (Fletcher, 2010; Lewis and Massey, 2011). The contemporary trend towards cohabitation, rather than marriage, may also have implications for resource flows between partners. Özcan (2011) shows that the resource pooling, associated with marriage, is less likely to occur within co-habitation, possibly because of shorter and/or more uncertain relationship tenures. However, it is argued that the positive role-model effect of having a successful self-employed partner increases a woman's likelihood of becoming self-employed (Greene et al., 2011).

A persistent theme within the literature exploring the influence of gender upon women's propensity for self-employment is that of access to finance. Self-employed women report disadvantageous access to finance per se and being subject to higher charges for loans (Bellucci et al., 2010; De Bruin et al., 2007; Kim, 2006; Marlow and Patton, 2005; Muravyev et al., 2009; OECD, 2012). However, once controls for sector and size are introduced (Blanchflower et al., 2003; Freel et al., 2012; Storey, 2004), there is scant support for direct gender discrimination as a significant factor explaining either funding rejection or fuelling discouragement.⁷ Instead, explanations of funding disparities appear more likely to reflect the propensity of women to begin smaller, part-time and/or home based enterprises in low cost sectors with associated growth constraints. Whilst Kepler and Shane (2007) suggest this reflects higher risk aversion amongst women, Marlow and McAdam (2013) argue it may simply be a response to a more volatile life-course engagement which often channels women towards smaller firms in sectors with fewer growth prospects. This, rather than essential gendered characteristics, is more influential in shaping demands for finance.

Drawing these arguments together – and noting their contradictions – it is apparent that the socio-economic context influencing self-employment choice is critically gendered. This emerges through a myriad of influences ranging across changes in labour force participation, marriage/co-habitation, divorce and fertility rates. It suggests these factors may explain why self-employment rates have changed over time for these two groups. Accordingly, our first hypothesis is:

H1. Marital factors and family-related obligations affect self-employment choice, but this association is stronger for women than men.

⁷ They find that the absence of educational qualifications, portfolio business ownership and being unemployed are the dominant influences. Discouragement is where the business owner did not apply for a loan given fear of rejection (Kon and Storey, 2003).

We have already noted the plethora of studies, primarily using self-report data, seeking to understand how gender might influence women's entry into self-employment and the subsequent performance of their enterprises. Such studies frequently assert not only that these differences exist, but that they also reflect aspiration or motivation differences between men and women. For example, Manolova et al. (2008, p.77) argue:

'Relative to men, women associate a greater number of desired outcomes with the establishment of a new venture and in particular perceive that starting a new venture is associated with status, whereas men are primarily focussed on self-realization, financial success and autonomy'.

If that were the case, then we would expect the 'standard' economic variables identified by Parker (1996) and Cowling and Mitchell (1997) to be more effective in explaining changes in male self-employment rates and less effective in explaining female rates. So for example, Schiller and Crewson (1997) using cross-sectional data for the US finds that unemployment duration only has a statistically significant effect upon men's experiences of self-employment whilst Kepler and Shane (2007) argue that certain dimensions of entrepreneurship are more likely to be emphasised by women. Thus, they assume the flexibility of self-employment is valuable in alleviating tensions between work and family roles (Duberley and Carrigan, 2012). Additionally, Taylor and Newcomer (2005, p. 24) consider gaining self-regard as one – amongst a number of factors – that distinguish gender-related motivation for self-employment:

'As compared to men (who are usually motivated by material rewards) [our emphasis]...for women business owners the idea of starting a business often originates almost from the desire to fulfil an old dream, a desire for recognition by others'.

Similarly, Kepler and Shane (2007, p. 28) found a strong link between male self-employment and economic incentives:

'Male entrepreneurs score higher on the scale measuring the motivation to start a business to make money and this difference is statistically significant'.

However, their results largely point to similarities, rather than differences, when linked to firm performance (see also, Ahl, 2006; Robb and Watson, 2012; Watson, 2002).

Kepler and Shane (2007) are also keenly aware that their own, as well as the majority of other studies, use self-report data where verification is either difficult or impossible; in addition, they express concern over sample size and representativeness.⁸ Indeed, their own empirical work points to the absence of a significant gender variable influencing new venture performance when preferences, motivation and expectations are controlled. However, they do obtain two statistically significant results; first, male entrepreneurs are more likely to be motivated towards start-up by money and second, women are more likely to indicate that business start-up is less important for them than spending time with the family. In effect, Kepler and Shane (2007) provide limited support for the existence of a divide with men prioritising economic factors, such as wealth generation or building a business.⁹ In contrast, they suggest women are more likely to respond to non-economic factors such as opportunities for flexible work, family circumstances and social regard.

Overall, this review suggests that economic factors are likely to be key influences upon male self-employment choice; these factors are captured by variables such as interest rates, differences in wage/self-employed earnings, changes in GDP and unemployment. In contrast, changes in these economic factors might be expected to have weaker explanatory power in a female self-employment model, where changing labour market circumstances, parental and marital status would be more powerful. We therefore, propose the following second hypothesis:

H2. Economic factors are less important for women than men in explaining changes in self-employment rates over time.

4. Data

4.1. Self-employment rate: the dependent variable

The ideal dataset for testing the above hypotheses would be an annual census of all individuals and all enterprises over a long period of time, together with data on the full range of economic and social variables described above. However, no such data exist for the UK. Instead, there are a range of data options, with each having limitations. The five UK enterprise datasets¹⁰ are described in Storey and Greene (2010) where it is argued that a bank-based data set currently has the most complete coverage. Unfortunately, that data set is only comprehensive in more recent times; thus, the only long-term option is self-employment data. This has four merits: it is produced annually, it distinguishes between men and women, it is broadly similar in construction since 1973 and it can be used for international comparisons. The disadvantages are that it relies on self-classification with no specific

⁸ For example, the DeMartino and Barbato (2003) finding of men being more economically driven is derived from a group of 261 entrepreneurs in the United States with MBAs. In no sense therefore, can this group be regarded as "typical" business owners.

⁹ Even this however is not a consistent finding. Leung (2006) for example finds a powerful role for changes in economic factors such as the gender pay gap in influencing changes in self-employment rates for females.

¹⁰ These are for the relevant period up to 2007: VAT registrations, Global Entrepreneurship Monitor (GEM); Company Incorporations; Labour Force Survey; and British Bankers Association.

checks, it relates to individuals and not businesses and it provides no guide to enterprise performance. Despite such limitations, it has the crucial benefits of being consistently available from 1973 to 2007 and distinguishes between men and women. It is therefore, the most appropriate of the options available. For some countries, the inclusion or exclusion of agriculture is important, but this sector is minimal in the UK and so, it is excluded from our analysis.

Comparisons over time require the calculation of a self-employment rate. The number of total self-employed, $SE (Total)_t$, was taken from the Labour Force Survey (LFS) and divided by the total workforce. We then distinguish between males, $SE (Male)_t$, and females, $SE (Female)_t$. Fig. 1 plots total, male and female, self-employment rates annually over 35 years. During that time, UK male self-employment varied from a low of 8% of the workforce at the end of the 1970s to a peak of almost 14% in the middle 1990s. Since then, it has declined, although it rose slightly in most years after 2000. Despite the substantial growth over this period, and the faster increase in the female self-employment rate, the rate for men in 2007 was twice that for women.

4.2. Independent variables: socio-economic factors and policy variables

Definitions and summary statistics for two groups of variables are shown in Table 1, and correlation coefficients in Table 2.¹¹ The first are the economic variables used by Parker (1996) and/or Cowling and Mitchell (1997). These are the gender-specific unemployment rate¹² ($UNEM_t$) the ratio of self-employment to employee income ($INCOM_t$), the real interest rate ($INTR_t$), house prices ($HOUSEP_t$) and the number of stoppages at work ($STRIKES_t$).¹³ We also include an additional economic variable – Gross Domestic Product per capita (GDP_t), since economic prosperity could create opportunities for the self-employed, in which case it would carry a positive sign. Alternatively, as more secure professional earnings rise with economic propensity (Iyigun and Owen, 1998; Lucas, 1978), an individual may be less willing to risk becoming self-employed, implying a negative sign.

The second group of variables are those which emerge as potentially important from our earlier discussion of gender issues – husband/wife divorce ($DIVR_t$), male/female marriage (MAR_t) and fertility rates ($FERTR_t$). These three variables are intended to capture family circumstances, access to funding and resources relevant to the transition to self employment. These socio-demographic variables however, change only slowly over time – in contrast with the economic variables, many of which fluctuate considerably in the short-run.

In addition, we have also created a third group of dummy variables to capture government initiatives seeking to encourage business ownership, self-employment or alterations in labour market conditions. The impact of two key policy initiatives, both used by Parker (1996) and/or Cowling and Mitchell (1997), are captured in our model with step dummy variables. The first dummy (LGS_t) is the Loan Guarantee Scheme, implemented in 1981, through which the UK government acted as the guarantor on private sector loans to small and young firms. A second dummy (EAS_t) captures the effect of Enterprise Allowance Scheme, introduced in 1983 – and its successor, the Business Start-up Scheme, which made transfer payments to the unemployed when they started their own business.

Following the work by Manning and Petrongolo (2008) we have also estimated extended models incorporating several labour market interventions by government. These are: the introduction of the National Minimum Wage (1999), the Part-Time Workers Regulation (2000) and the Right to Request Flexible Working (2003). If self-employment is a substitute for part-time employment, such policy interventions may have a negative effect on self-employment, especially for women, by making waged employment relatively more attractive. Finally, we include a political party-specific dummy variable to assess potential differences between the Labour and Conservative parties on the grounds that philosophically, the former is believed to be less orientated towards individualised self-employment and new business creation.

5. Econometric issues

The analytical challenge faced within this article is that the key variables of interest – self-employment and macro-economic conditions – are not validly examined in a standard regression framework because they contravene key assumptions that underpin ordinary (OLS) or generalised least squares (GLS). A (weakly) stationary time-series has to be characterised by a constant mean, a constant variance and a covariance independent of time. These stationary properties are required to avoid the risk of obtaining spurious findings (Granger and Newbold, 1974; Hill et al., 2008). To address this issue, non-stationary data are often transformed to stationary time-series after first-differencing. However, this is not an option available here as it eliminates the trend component which is one of our focal interests.

Consequently, we use the concept of co-integration, introduced by Engle and Granger (1987). This provides an effective framework for estimating models without differencing the variables and allows long-run trends in a time-series to be examined. The full statistical properties of the model are presented in Appendices 1 and 2.

¹¹ The footnotes in Table 1 show that we also experimented with four other variables: age decomposition, immigration, the tax regime and measures of innovation.

¹² Parker (1996) and Cowling and Mitchell (1997) actually used total unemployment rates but unemployment by gender is more appropriate for the current article.

¹³ We are aware that the effect of the wage ratio may be gender specific (Manning and Petrongolo, 2008) but, due to data limitations, we are unable to distinguish between men and women. We also attempted to collect gender-specific education data such “participation in education and training”. However, although it exists, the time-series is too short for its inclusion here.

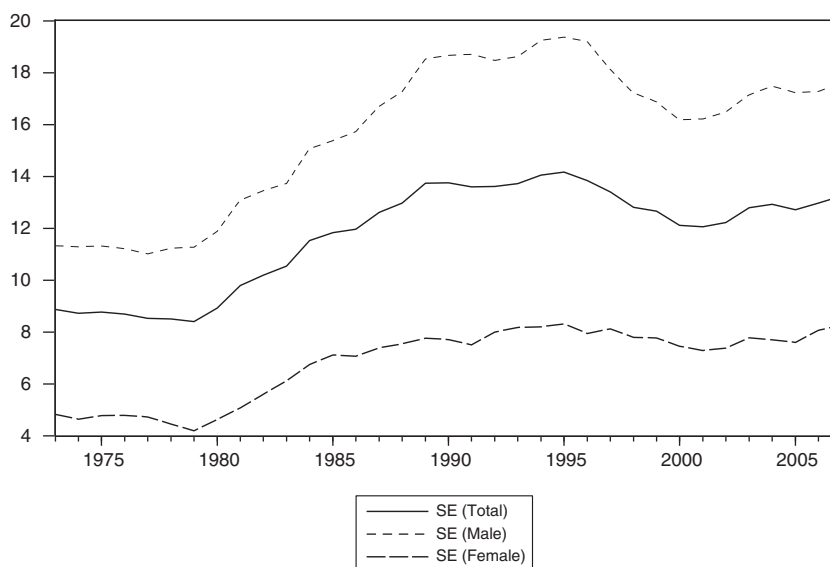


Fig. 1. Percentage of workforce self-employed by gender, 1973–2007.

6. Results

6.1. Long-run estimates: Johansen co-integration approach

Table 3 demonstrates that there are both differences and similarities in the factors influencing the self-employment rate (defined as the ratio of self-employment to labour force) by gender. Reflecting previous studies (e.g., Blanchflower, 2000), we find that unemployment, $UNEM_t$, has a positive and significant long-run effect on male self-employment (Column II). However, it has

Table 1

Summary statistics of time-series, 1973–2007.

Variable	Data source	Mean	Std. dev.	Min	Max
$SE (Total)_t$: Total self-employment rate	National Statistics	2.449	0.180	2.128	2.651
$SE (Male)_t$: Male self-employment rate	National Statistics	2.736	0.196	2.399	2.964
$SE (Female)_t$: Female self-employment rate	National Statistics	1.895	0.227	1.434	2.117
$UNEM (Total)_t$: Total unemployment rate	National Statistics	1.933	0.343	1.308	2.468
$UNEM (Male)_t$: Unemployment rate	National Statistics	1.971	0.401	1.099	2.510
$UNEM (Female)_t$: Unemployment rate	National Statistics	1.871	0.299	1.459	2.451
$INCOM_t$: Ratio of self-employment to employee income	National Statistics	−2.077	0.069	−2.237	−1.962
$INTR_t$: Real interest rate	National Statistics	1.976	4.506	−15.689	7.852
GDP_t : GDP per capita	National Statistics	2.696	0.225	2.376	3.077
$HOUSEP_t$: House prices (all houses)	Nationwide Building Society	10.679	0.834	9.110	12.108
$DIVR (Total)_t$: Total divorce rate	Population and Vital Statistics	2.509	0.125	2.128	2.653
$DIVR (Male)_t$: Male divorce rate	Population and Vital Statistics	2.511	0.127	2.128	2.660
$DIVR (Female)_t$: Female divorce rate	Population and Vital Statistics	2.505	0.124	2.128	2.646
$MAR (Total)_t$: Total marriage rate	Population and Vital Statistics	1.690	0.180	1.351	1.963
$MAR (Male)_t$: Male marriage rate	Population and Vital Statistics	3.718	0.337	3.109	4.289
$MAR (Female)_t$: Female marriage rate	Population and Vital Statistics	3.539	0.298	3.006	4.034
$FERTR_t$: Fertility rate	National Statistics	0.574	0.046	0.489	0.708
$STRIKES_t$: Stoppages at work in the UK	National Statistics	6.291	1.117	4.754	7.988

Notes:

- Variables are transformed into natural logarithms. The $INTR_t$, however, is in non-logged form since it contains both positive and negative values.
- We also experimented by including a set of demographic characteristics (age decomposition and non-British immigration). Generally, these variables have a weak association with enterprise activity, although there was some evidence of a long-run association between the age group 45–69 and male self-employment. For female self-employment the association seems to hold only in the short-run. We suggest this relationship between age and self-employment is better explored with disaggregated panel data since aggregate demographic variables tend to move slowly and there is generally little local variation to exploit.
- We also constructed a continuous variable showing differences between income tax (plus National Insurance) and corporation tax. This series is found, however, to be stationary, $I(0)$, and thus, it cannot be treated as a 'long-run forcing' variable for the explanation of self-employment. We allow, however, the change in tax variable to enter the short-run error correction model (ECM), but the coefficient is found to be statistically insignificant.
- Data on the number of resident patent applications is not statistically significant in our long-run and short-run equations, possibly because patents lodged are an imperfect proxy for innovation in the UK.

no significant effect upon women (Column III). This is likely to reflect, at least in part, data issues. This is because economically inactive males are more likely than females to register as unemployed through claiming state benefits and hence, appear in the data (Blosfield and Drobnivc, 2001; Nordenmark, 1999).

This contrasts with the sign on $INCOM_t$ – the ratio of self-employment to employee earnings. This is significant at the 0.10 level for women (with an elasticity of 0.866) but not for men – confirming the study of Leung (2006) who found the gender pay gap had a stronger influence on female, than on male, self-employment. However, this becomes non-significant in Columns IV and V when the marriage variable is included, possibly because marriage generally not only provides greater financial security for women but also increases household responsibilities and reduces the incentive for self-employment.

The impact of a change in interest rate ($INTR_t$), on self-employment rates is interesting. In Column I, for males and females combined, increased interest rates lower self-employment, but this effect disappears when the two groups are separated. However, when controlling for marriage, we find that a rise in interest rates lowers self-employment rates for both women and men. This suggests a greater reluctance amongst married individuals of either sex to borrow in order to enter self-employment.

We also find that an increase in GDP per capita (GDP_t) stimulates self-employment amongst men but has the opposite effect on women. Recalling that this data covers the period 1973 to 2007 it may be that, particularly in the earlier part of the period, the increase in women's self-employment was a response to a dip in male earnings. This chimes with evidence from Devine (1994) who notes that within the household, secure male earnings act as a 'safety-net' device for women considering self-employment, implying that the security and levels of secondary incomes are influential upon this decision. In addition, Klyver et al. (2013) argue that the expansion of good quality employment, with associated benefits, axiomatically discourages women from selecting into risky self-employment. Interestingly, the size of the coefficients of the two (opposite) effects is similar in magnitude (as shown in Columns II–III), which probably explains the insignificance of this variable when total self-employment is examined. Finally, house prices ($HOUSEP_t$) and the number of stoppages at work ($STRIKES_t$) exert the same directional effect, whilst increases in house prices prompt self-employment (the effect being stronger for women) whereas, stoppages at work lowers self-employment amongst both groups. The former effect was greater in magnitude for women, whereas the latter was found to be more persistent for men. We assume this is because men are more likely to be employed in sectors where industrial action is more widespread and are more likely to be trade union members (Edwards, 2006). Thus, the frequency and impact of such industrial action has been considerably greater upon men in the past, although it has perhaps declined in more recent times given shifts in patterns of employment and industrial action.

Turning to marital factors and family-structure variables, we find that divorce ($DIVR_t$) lowers female self-employment. Our finding is compatible with those of Cameron (1997) and Vandecasteele (2011) suggesting that divorce has a detrimental influence upon the resources and collateral available to the business owner. Drawing upon the construct of house-hold self-employment, as Devine (1994) argues, women are more likely to select into self-employment in the presence of a partner with a secure income and divorce removes this safety net option for women. In addition, as Parker (2008) suggests, spouses might co-ordinate their occupational choices to diversify risk. Divorce therefore, may influence both wealth and risk-aversion. Thus, whilst there are a range of negative impacts from divorce for men in terms of financial and time resource constraints plus, the potential loss of free spousal labour (Hamilton, 2006), the higher coefficient on $DIVR$ points to women being more severely affected by divorce.

Overall, the long-run results provide support for Hypothesis 1 suggesting that marital factors and family-related obligations are more closely linked to the self-employment rates of women than men. However, these long-run results do not support Hypothesis 2. In contrast to previous work, we find that macro-economic factors do influence female self-employment, with some effects being larger in magnitude in the female, than in the male, self-employment equations. Thus, our evidence does not link neatly or consistently with assumptions that the self-employment decisions of women are more strongly linked to social issues whereas economic considerations are prioritised by men.

6.2. Short-run results: error correction models (ECMs)

Individuals making employment decisions respond to both immediate considerations and expected future changes. To evaluate the impact of short term considerations, a short-run 'error-correction' specification is also obtained from each of our models which allow only the first-differences of the (weakly) exogenous variables to enter the VECM to enable an evaluation of their short-run impact. The results are shown in Table 4.¹⁴

The results indicate that both men and women respond to immediate changes in the ratio of self-employment to employee earnings ($INCOM_t$) although for the latter, similarly to the long-run estimates and for similar reasons, this result is sensitive to the inclusion of the marriage variable. In addition, a rise in the real interest rate ($INTR_t$) lowers male self-employment but it has a greater effect for women, and for all self-employed, after controlling for marriage rate in the VAR equation. This may be a greater deterrent for women if they are pursuing self-employment as a work and family-balancing solution rather than as a strategic route to advancing career and socio-economic status (Budig, 2006; Jayawarna et al., 2013).

¹⁴ All the diagnostic tests are passed, implying no evidence of serial correlation, heteroscedasticity, non-normality or functional form misspecification. Additionally, the R^2 are 0.874, 0.832 and 0.803 (Columns I–III, respectively) suggesting that most of the variation has been explained. The full sample results reported in Column I show the coefficient of the error correction term has the correct sign and is statistically significant. The estimate of the full model suggests that about 37% of any deviation from the long-run relationship is eliminated each year (i.e. disequilibria appear moderately-lived). We observe, however, a slightly faster speed of adjustment to equilibrium for females than males.

Table 2

Correlations of time-series variables.

	$SE (Total)_t$	$SE (Male)_t$	$SE (Female)_t$	$UNEM (Total)_t$	$UNEM (Male)_t$	$UNEM (Female)_t$	$INCOM_t$	$INTR_t$
$SE (Total)_t$	1							
$SE (Male)_t$	0.9975*	1						
$SE (Female)_t$	0.9855*	0.9753*	1					
$UNEM (Total)_t$	0.3631*	0.3569*	0.3126	1				
$UNEM (Male)_t$	0.5118*	0.5099*	0.4664*	0.9780*	1			
$UNEM (Female)_t$	0.0508	0.0363	−0.0010	0.9221*	0.8224*	1		
$INCOM_t$	0.7259*	0.7120*	0.7470*	−0.0443	0.0635	−0.2384	1	
$INTR_t$	0.6458*	0.6432*	0.6116*	0.5136*	0.5709*	0.3651*	0.4380*	1
GDP_t	0.7578*	0.7617*	0.8067*	−0.1763	0.0065	−0.4795*	0.6275*	0.3766*
$HOUSEP_t$	0.8170*	0.8205*	0.8469*	0.0187	0.1895	−0.2824	0.5537*	0.4937*
$DIVR (Total)_t$	0.8144*	0.8323*	0.7886*	0.5209*	0.6627*	0.2005	0.3693*	0.6601*
$DIVR (Male)_t$	0.8188*	0.8369*	0.7910*	0.5255*	0.6671*	0.2041	0.3757*	0.6598*
$DIVR (Female)_t$	0.8113*	0.8294*	0.7849*	0.5198*	0.6608*	0.2006	0.3625*	0.6623*
$MAR (Total)_t$	−0.6812*	−0.6883*	−0.7412*	0.1796	−0.0114	0.5011*	−0.5527*	−0.2716
$MAR (Male)_t$	−0.7666*	−0.7718*	−0.8171*	0.0937	−0.0945	0.4173*	−0.5938*	−0.3818*
$MAR (Female)_t$	−0.7511*	−0.7571*	−0.8035*	0.1102	−0.0796	0.4357*	−0.5864*	−0.3604*
$FERTR_t$	−0.3206	−0.3294	−0.3760*	−0.1069	−0.2287	0.1304	−0.1233	−0.1131
$STRIKES_t$	−0.8234*	−0.8336*	−0.8554*	0.0329	−0.1642	0.3905*	−0.6249*	−0.3728*

Note:

*Significant at the 5% level.

Interestingly, GDP_t has a negative short-run effect on male self-employment rates whereas a positive effect was found in the long-run model. This suggests that deteriorating economic conditions discourage men from entering self-employment in the short term. We assume this reflects the limited market prospects for new firms in depressed conditions such that the alternative of temporary low paid wage employment or even short term unemployment, may be preferred if imminent economic improvement is anticipated. However, if such conditions persist in the long-run then, in the absence of waged employment options, men are more likely to move into self-employment.¹⁵ The findings for women are more consistent with the long-run estimates, although the short-run estimates are halved in magnitude.

Table 4 also shows that increases in house prices ($HOUSEP_t$) significantly increase self-employment overall in the short-run. This confirms the long-established links between business ownership and house prices in the UK (Black et al., 1996) and the magnitude of this effect is similar to that found in the long-run model. More surprising perhaps is that its effect is greater for women.

We now turn to two public policy variables that have received considerable attention in previous empirical work.¹⁶ The LGS_t exerts a positive and significant effect on both male and female self-employment rates suggesting that financial constraints apply to both groups. However, the EAS_t has no significant effect on male self-employment, although it does enhance one of the female self-employment measures. This is surprising on two grounds. First is the scale of the programme – with close to 200,000 participants in the peak years between 1987 and 1989 (Storey, 1994) – it was funding around one in three new firms during that time and, on those grounds, would have been expected to have raised male self-employment rates. Second, as only those who were registered as unemployed and claiming benefit were eligible for EAS, most of whom were men, it seems strange that the impact should primarily be upon women. The most likely explanation for the latter result is that during this period there were far fewer self-employed women so even a comparatively small increase has a marked effect.

We also estimate and extend short-run models by including a range of labour market interventions introduced by the Labour government during its period of office (1997–2010) such as the minimum wage, enhanced maternity leave and flexible working policies, all of which we hypothesised would reduce the relative attractiveness of self-employment by improving conditions for waged workers, and women in particular. In addition, we control for the fertility variable in the specification, which is found to be integrated of order zero. Table 4 indicates that no individual policy initiatives were significant in explaining changes in overall self-employment rates. However, it is plausible that collectively, they may have influenced male self-employment since the coefficient of the Labour government dummy (LP_t) was negative and statistically significant for men. This again is an unexpected result since we would expect regulatory change to enhance the attractiveness of waged employment – particularly for lower earners, the majority of whom are women (Manning and Petrongolo, 2008). The expected effect would be to make self-employment less attractive for women; however, we find the opposite result. The most plausible explanation is that a combination of a tight labour market, and better quality waged opportunities acting as a ‘fall-back’ position, reduced the risks of self-employment. This encouraged women to make the transition given that potential losses and related risks were reduced.

Finally, the fertility rate variable ($FERTR_t$)¹⁷ has a negative and statistically significant effect, but only on male self-employment. This may reflect a greater willingness by men to risk self-employment when they have fewer dependents. Alternatively, in the longer

¹⁵ This different response to economic circumstances is empirically long-established (Storey, 1991).

¹⁶ Neither the EAS_t nor the LGS_t could be included in the long-run equation because they were in operation only for a limited period.

¹⁷ The fertility rate in year $t - 1$ was included in the regression in an attempt to surmount possible simultaneity bias between self-employment decision and the family formation (see also Coppola and Di Cesare, 2008).

GDP_t	$HOUSEP_t$	$DIVR (Total)_t$	$DIVR (Male)_t$	$DIVR (Female)_t$	$MAR (Total)_t$	$MAR (Male)_t$	$MAR (Female)_t$	$FERTR_t$	$STRIKES$
1									
0.9646*	1								
0.6422*	0.7500*	1							
0.6346*	0.7413*	0.9994*	1						
0.6409*	0.7500*	0.9996*	0.9992*	1					
−0.9596*	−0.9003*	−0.5864*	−0.5781*	−0.5834*	1				
−0.9866*	−0.9589*	−0.6755*	−0.6675*	−0.6732*	0.9845*	1			
−0.9833*	−0.9481*	−0.6620*	−0.6540*	−0.6595*	0.9903*	0.9992*	1		
−0.4159*	−0.3564*	−0.5309*	−0.5314*	−0.5275*	0.4775*	0.4627*	0.4725*	1	
−0.9509*	−0.9248*	−0.7378*	−0.7350*	−0.7364*	0.9459*	0.9633*	0.9638*	0.4619*	1

run, falling fertility enables women to improve their human capital whilst limiting their caring responsibilities, enabling them to obtain better waged employment.

Overall, our short-run results provide less consistent support for [Hypothesis 1](#), suggesting that family issues also influence male self-employment rates. Regarding [Hypothesis 2](#), our results are similar to our long-run estimates suggesting

Table 3

Estimated co-integrating vector (normalised).

Long-run Dep. variable Self-employment/labour force (SE)					
Variable	I	II	III	IV	V
	$SE (Total)_t$	$SE (Male)_t$	$SE (Female)_t$	$SE (Total)_t$	$SE (Female)_t$
$UNEM (Total)_t$	0.403** [0.004]			0.477** [0.014]	
$UNEM (Male)_t$		0.362** [0.011]			
$UNEM (Female)_t$			−0.005 [0.962]		−0.201 [0.325]
$INCOM_t$	0.490 [0.274]	0.717 [0.120]	0.866* [0.054]	0.273 [0.646]	0.657 [0.225]
$INTR_t$	−0.013* [0.083]	−0.011 [0.190]	0.003 [0.705]	−0.033** [0.001]	−0.027** [0.001]
GDP_t	1.198 [0.227]	2.243* [0.060]	−2.426** [0.006]	1.826 [0.202]	−4.621** [0.007]
$HOUSEP_t$	0.276** [0.000]	0.221** [0.001]	0.280** [0.000]	0.633** [0.000]	0.808** [0.000]
$DIVR (Total)_t$	−0.569** [0.013]				
$DIVR (Male)_t$		−0.276 [0.282]			
$DIVR (Female)_t$			−0.947** [0.002]		
$MAR (Total)_t$				−1.539** [0.007]	
$MAR (Female)_t$					−2.351** [0.001]
$STRIKES_t$	−0.181** [0.006]	−0.159** [0.030]	−0.162* [0.073]	−0.201** [0.011]	−0.055 [0.596]
Trend	−0.055** [0.012]	−0.075** [0.005]	0.024 [0.247]	−0.131** [0.002]	−0.036 [0.500]

Notes:

• The p -value of the LR statistic is given in square brackets, distributed as $\chi^2(1)$.

** Significant at the 5% level.

* Significant at the 10% level.

Table 4

Error correction models.

Short-run Dep. variable Change in self-employment/labour force (ΔSE)							
Variable	I	II	III	IV	V		
	$\Delta SE (Total)_t$	$\Delta SE (Male)_t$	$\Delta SE (Female)_t$	$\Delta SE (Total)_t$	$\Delta SE (Female)_t$		
<i>ecm1</i> (−1)	−0.370** (0.039)	−0.436** (0.053)	−0.459** (0.064)	−0.224** (0.031)	−0.211** (0.037)		
$\Delta INCOM_t$	0.110 (0.080)	0.192* (0.094)	0.270* (0.135)	0.023 (0.103)	0.075 (0.167)		
$\Delta INTR_t$	−0.002** (0.000)	−0.002** (0.000)	−0.001 (0.001)	−0.003** (0.000)	−0.005** (0.001)		
ΔGDP_t	−1.191** (0.234)	−1.313** (0.285)	−1.005** (0.400)	−0.934** (0.282)	−0.686 (0.457)		
$\Delta HOUSEP_t$	0.197** (0.041)	0.159** (0.050)	0.213** (0.071)	0.219** (0.049)	0.172** (0.081)		
$\Delta STRIKES_t$	0.006 (0.016)	−0.003 (0.019)	−0.021 (0.028)	0.012 (0.020)	−0.004 (0.032)		
LGS_t	0.066** (0.012)	0.073** (0.015)	0.102** (0.022)	0.072** (0.016)	0.109** (0.026)		
EAS_t	0.027* (0.015)	0.018 (0.016)	0.076** (0.031)	0.027* (0.018)	0.035 (0.033)		
Intercept	−0.059** (0.009)	−0.906** (0.110)	4.459** (0.647)	−0.864** (0.119)	3.436 (0.613)		
Serial correlation	F(1,23) = 0.009 [0.926]	F(1,23) = 0.001 [0.970]	F(1,23) = 1.875 [0.184]	F(1,23) = 0.008 [0.777]	F(1,23) = 0.705 [0.410]		
Functional form	F(1,23) = 0.039 [0.844]	F(1,23) = 0.000 [0.994]	F(1,23) = 1.051 [0.316]	F(1,23) = 0.023 [0.988]	F(1,23) = 0.039 [0.845]		
Normality	$\chi^2 = 1.179$ [0.555]	$\chi^2 = 0.391$ [0.823]	$\chi^2 = 2.259$ [0.323]	$\chi^2 = 0.757$ [0.685]	$\chi^2 = 1.445$ [0.485]		
Heteroscedasticity	F(1,31) = 0.153 [0.699]	F(1,31) = 0.715 [0.404]	F(1,31) = 1.164 [0.289]	F(1,31) = 0.131 [0.720]	F(1,31) = 1.480 [0.233]		
R ²	0.874	0.832	0.803	0.811	0.737		
Observations	33	33	33	33	33		
Models with additional policy dummies and 1 (0) time-series variables:							
<i>NMW_t</i>	0.002 (0.015)	0.010 (0.019)	0.010 (0.031)	0.004 (0.018)	0.011 (0.036)		
<i>PTWR_t</i>	−0.024 (0.015)	−0.021 (0.018)	−0.024 (0.030)	−0.029 (0.017)	−0.036 (0.035)		
<i>FW_t</i>	0.019 (0.011)	0.013 (0.014)	−0.011 (0.025)	0.013 (0.014)	0.008 (0.030)		
<i>LP_t</i>	−0.031** (0.009)	−0.060** (0.011)	0.010 (0.019)	−0.034* (0.011)	0.000 (0.021)		
$\Delta FERTR_{t-1}$	−0.568** (0.146)	−0.643** (0.184)	−0.389 (0.298)	−0.606** (0.172)	−0.309 (0.356)		

Notes:

- Standard errors are in parentheses. The *p*-values of the diagnostic test statistics are given in square brackets. Δ is the difference operator.
- When we included time-series data on lending under LGS, we found that the *LGS_t* coefficient was statistically significant in male equation, but the elasticity was rather small in magnitude. Also the *EAS_t* coefficient appeared more strongly to be associated with female self-employment rate.

** Significant at the 5% level.

* Significant at the 10% level.

that economic factors influence both women and men, with some short-run elasticity estimates actually being higher for women than men.

6.3. Sensitivity analysis: differences in the self-employment definition

We now test whether any of these results reflect differences in the self-employment definition. Prior work has noted the sensitivity of findings to definitions of the self-employment rate — specifically whether the denominator should be the labour force¹⁸ or the population (for a comprehensive discussion see, Blanchflower, 2000). The argument for using the labour force as the denominator is that women's economic participation has risen over the period to become closer to that of men. Hence, using

¹⁸ Labour force or economically active population or active population includes both employed and unemployed people but not the economically inactive such as pre-school children, school children, students and pensioners.

population as the denominator points to apparently lower rates of female self-employment whereas, using the labour force as the denominator, could artificially inflate changes since the denominator is small(er) in the early years. We are agnostic in this regard and used both the population-based¹⁹ and the labour force as a denominator.²⁰

Although the results are not presented here for brevity,²¹ the long-run estimates are generally analogous to those reported previously, indicating similar patterns and associations for men and women. One notable exception however, is the coefficient on the divorce variable which is found to be negative and statistically significant for men using the population-based denominator. This may suggest that divorce is an important predictor for male self-employment activity, especially for those who do not participate in the labour force. The short-run estimates indicate the economic factors influence both men and women, with some variables having a greater impact on men (e.g. *INCOM_t*) than women and vice versa (e.g. *HOUSEP_t*).

Overall, this suggests that economic factors are prioritised by both men and women in terms of self-employment choices in the long and short-run. Although some findings were sensitive to the chosen self-employment measure, our long and short-run findings continue to be at variance with the interpretation that self-employed women are less likely to be influenced by economic factors than their male counterparts.

7. Conclusions

7.1. Key findings and implications

This article has explored the factors influencing self employment rates amongst men and women in the UK. This discussion was contextualised through an exploration of women's increasing economic participation in waged employment within developed economies over four decades. However, this propensity to enter waged employment has not been matched by enterprise creation rates where, in Europe as a whole, men are almost twice as likely to be self-employed as women (Díaz García and Welter, 2011; OECD, 2009). The growing literature exploring the impact of gender upon entrepreneurial ambitions and behaviours frequently ascribes such differences to stereotypical gendered assumptions articulated within the context of self-employment (Greene et al., 2011). In effect, it is argued that, given their association with the domestic sphere and related responsibilities, there is a gendered imperative for women to prioritise social motives. Accordingly, it is argued that women are more likely to begin, and then manage, their enterprises to reflect social priorities and, in addition, for those with caring demands, that such responsibilities can be flexibly accommodated (Duberley and Carrigan, 2012; Wellington, 2006). Generic assumptions persist that women place greater weight upon non-economic factors such as family considerations or esteem when making a self-employment choice. In contrast, men are argued to be more influenced by financial/economic considerations.

To test this, we take time-series data for the UK over four decades and utilise advanced macro-econometric methods to deal with issues related to nonstationarity and co-integration. We also distinguish clearly between both short-run and long-run effects of social and economic factors on self-employment by gender, whilst avoiding the problems associated with qualitative analysis such as the recall bias noted by Fraser et al. (2007) and measurement error. Finally, we use two metrics to capture self-employment rates, one normalised by population and the other by labour force. Our conclusion is clear: there are strong statistical associations between changing economic factors and both the short and long-run changes in female self-employment. Accordingly, it is valid to infer that women are significantly influenced in their self-employment choices by economic considerations, such as the state of the economy and access to finance. Indeed, GDP and house prices appear to have a more powerful long-run impact upon women than men.

A second critical outcome of this discussion is that social, as well as economic, factors influence self-employment. However, it is incorrect to infer that these social factors exclusively, or even primarily, influence women's choices. Instead, we find that social factors influence both men and women in a broadly similar fashion. The two key exceptions are that (1) unemployment increases self-employment rates – but only for men, and (2) in the long run, divorce lowers self-employment – but only for women.

Our third notable result is that conditions amongst wage earners exert a strong influence upon self-employment choices; improved conditions amongst wage earners – whether male or female – reduce self-employment rates. We suspect that, post-1997, the efforts of UK Labour governments to improve working conditions for low income wage workers may, in part, explain the fall in self-employment rates during its term of office – but this effect is observed only for males.

Consequently, we make the case that time-series data are more appropriate for describing long-run patterns and dynamics between self-employment rate and macroeconomic variables than survey data and micro-based approaches. Specifically, by observing and analysing a sequence of data ordered in time, rather than at one point, we can observe how the variables move, identify structural changes and patterns of co-movement and importantly, study the dynamics associated with the self-employment decision. Illustrating this argument, our findings are clearly incompatible with the view that the self-employment decisions made by women are not influenced by standard economic factors. In effect, our results expose the problem of building theory upon what people say they do (self-report data) rather than what they actually do over time according to more encompassing official data.

¹⁹ Using the adult population (16 and over) made no systematic difference to the total population-based results.

²⁰ The correlation between the two gender-specific denominators (male and female labour force) is estimated at 0.49. For this reason, we carry out a robustness analysis by comparing our results when the rate is calculated using the total population by gender as a denominator. In this case, the correlation between the two gender-specific denominators (male and female population) is estimated at 0.98. The comments of the referees on this point were most helpful.

²¹ These are available from the authors on request.

7.2. Limitations and directions for future research

Our study is limited by its focus upon one economy – the UK. Further time-series work, on other countries, is important to investigate whether similar or different patterns emerge. Of particular interest would be the results for countries which initially had low levels of self-employment, but where public programmes were put in place to address gender imbalances. In addition, we strongly suspect a different picture would emerge, particularly for women, if a distinction were made between full and part-time activity. However, the UK data is too short a time-series for this currently to be satisfactorily undertaken. The implementation of recently developed (micro or macro) panel data techniques may also provide further insights, especially concerning variables with high local variation (e.g. demographic variables) and models that control for the effect of omitted variable bias and allow for the inclusion of a wider range of covariates. A number of co-integration statistics for panel data have also been proposed (Kao, 1999; Pedroni, 1999, 2004) to study long-term economic relations, and there is now a growing empirical literature regarding this area (for review, see Georgellis et al., 2005). In short, the statistical techniques for such work are now available.

Less tractable however, is the availability of time-series datasets that capture the slippery concepts of family, social context and human capital (e.g. education) which we would like to have included in this study. For example proxies for changes in the overall 'social dynamics of the household', reflecting the point in the life course of the business owner when the self-employment choice is exercised would be most helpful (Davis and Shaver, 2012). Another deficiency is our inability to examine the role played by the state system of financial support for both men and women and how this influences self-employment choices. The plea of researchers for more and better data to address omitted variable bias is familiar but, even when such data are available they frequently fail to support often well-established theorising. Of some surprise, at least to us, was the absence in our work of any statistical relationship with immigration, taxation or the age structure of the population.

Nevertheless, what remains clear is that there is considerable interest in the influence of gender upon propensity towards, and experiences of, self-employment. Regarding our contribution to this debate, our data and analysis present robust analytical insights which challenge persistent assumptions concerning gender stereotypes and self-employment. Our contention that within the household, women are as, if not more, influenced than men by economic considerations – is at variance with those who primarily examine social and family-related factors. We do not dismiss the influence of the prevailing socio-economic context; clearly differentiated gendered effects will shape the self-employment choices/experiences of men and women given life-course events, sectoral channelling and unequal caring/domestic responsibilities. However, our evidence does not imply that women essentially prioritise the social sphere. In effect, within developed economies, given the educational attainments of contemporary women, pressures towards economic participation for all social actors, falling fertility rates and that the ideal of the 'male breadwinner' is a thing of the past (Vogler, 2005) it would actually be surprising if self-employed women were not as motivated towards economic factors as their male counterparts.

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Appendix 1. Unit root tests

1.1. The (augmented) Dickey–Fuller (ADF) test

This test is performed by estimating Ordinary Least Square (OLS) and comparing the t -statistic on the coefficient with the appropriate critical values provided by MacKinnon (1991).²² The null hypothesis is that the time-series is non-stationary. The equation is augmented by lagged first-differences of the dependent variable up to an order k to correct for autocorrelation in the error terms; we use the Akaike Information Criterion (AIC) to select the order of the ADF regression. Table A1 presents the ADF results of the natural logarithms of the variables (only the $INTR_t$ is in non-logged form since it also contains negative values).²³ The results indicate that the self-employment rate variable and the other time-series considered here are non-stationary in the level form but stationary after first-differencing, $I(1)$. The only exceptions are the time-series of the MAR (Male) _{t} and $FERTR_t$ that were found to be $I(0)$. Thus, they cannot be treated as a 'long-run forcing' variable for the explanation of self-employment so, we focus on the remaining explanatory variables.

²² For the ADF test the following model is considered: $\Delta y_t = \mu(+\gamma t) + \alpha y_{t-1} + \sum_{i=1}^k \delta_i \Delta y_{t-i} + \varepsilon_t$. If the time series y_t has a unit root, the coefficient α should be zero (see Dickey and Fuller, 1979).

²³ The Ng and Perron (2001) test, which is a modified version of the Dickey and Fuller (1979) test and Phillips and Perron (1988) test, provides similar results.

Table A1
Unit root tests.

Variables	Level	First diff.
$SE (Total)_t^a$	−1.457 (1)	−3.322 (0)*
$SE (Male)_t^a$	−1.276 (1)	−3.416 (0)*
$SE (Female)_t^a$	−1.598 (1)	−3.786 (0)*
$UNEM (Total)_t^a$	−1.805 (2)	−4.237 (1)*
$UNEM (Male)_t^a$	−1.587 (2)	−4.794 (1)*
$UNEM (Female)_t^b$	−0.152 (1)	−2.766 (0)*
$INCOM_t^b$	−0.033 (0)	−5.996 (0)*
$INTR_t^a$	−2.703 (2)	−7.061 (1)*
GDP_t^a	−2.353 (2)	−4.588 (1)*
$HOUSEP_t^a$	−2.562 (1)	−3.311 (1)*
$DIVR (Total)_t^a$	−1.973 (0)	−6.774 (0)*
$DIVR (Male)_t^a$	−1.911 (0)	−6.715 (0)*
$DIVR (Female)_t^a$	−2.055 (0)	−6.951 (0)*
$MAR (Total)_t^a$	−2.061 (0)	−4.837 (1)*
$MAR (Male)_t^a$	−3.555 (1)*	−4.721 (2)*
$MAR (Female)_t^a$	−2.707 (0)	−5.038 (1)*
$FERTR_t^a$	−3.161 (1)*	−4.230 (1)*
$STRIKES_t$	−2.174 (1)	−4.611 (1)*

Notes:

- The figures reported are *t* ratios of the estimated coefficients. Lag length chosen using the Akaike Information Criterion (Akaike, 1974), with a maximum lag order of 2, is reported in parentheses.

* Prob. < 0.1.

^a Regression includes an intercept and a linear trend.^b The regression includes no intercept and no trend.

1.2. Unit root tests in the presence of structural breaks

There is one point however, that deserves further attention; there appears to be a break in the self-employment series at the beginning of the 1980s, perhaps reflecting the era of the newly-elected Thatcher government committed to creating an ‘enterprise culture’ in Britain (Storey, 1994). Hence, the Dickey–Fuller test may be biased towards non-rejection of the non-stationary null hypothesis. To overcome this issue, we use the Zivot and Andrews (1992) test and allow for a break in the intercept (results are available upon request). We find that the break is in 1980 and the estimated *t*-statistic is −3.301, which is less than the critical value at the 5% level. Hence, the null hypothesis of non-stationarity cannot be rejected.²⁴ The null cannot be rejected even when we allow for a break in both intercept and trend (the break point is found to be in 1987 in this case). Similar conclusions emerge when we implement the Clemente et al. (1998) unit-root test with single (optimal break point is found in this case to be 1985) or double mean (optimal break points are 1985 and 1999) shifts.

Appendix 2. Co-integration in multivariate system

2.1. The VAR model

We use the vector autoregressive methodology and the Johansen approach to test for co-integration in a multivariate framework. The co-integration rank is determined in a partial system to address possible simultaneity between some variables of a self-employment model. Specifically, we estimate the following error correction model (see also Greenslade et al., 2002 and Johansen, 1995; Johansen, 1988 for more information):

$$\Delta y_t = c_0 + c_1 t + \omega \Delta x_t + \sum_{j=1}^{p-1} \Gamma_{yj} \Delta z_{t-j} + \Pi_y z_{t-1} + \Psi_y w_t + v_{yt} \quad j = 1, \dots, p-1$$

where

- $z_t = (y'_t, x'_t)'$.
- y_t being a vector of jointly determined $I(1)$ variables. Following the existing literature, we allow for endogeneity between self-employment rate, unemployment (Saridakis et al., 2012; Thurik et al., 2008) and divorce/marriage (Cameron, 1997; Parker, 2008) variables.

²⁴ The null hypothesis is also accepted for the self-employment series by gender.

Table A2

Co-integration LR test based on maximal eigenvalue of the stochastic matrix.

Null	Alternative	Eigenvalues	Trace statistics	95% critical value
<i>Model I: SE (Total)_t, UNEM (Total)_t, INCOM_t, INTR_t, GDP_t, HOUSEP_t, DIVR (Total)_t, STRIKES_t</i>				
$r = 0$	$r = 1$	0.857	64.31*	40.12
$r \leq 1$	$r = 2$	0.629	32.73	33.26
$r \leq 2$	$r = 3$	0.321	12.77	25.70
<i>Model II: SE (Male)_t, UNEM (Male)_t, INCOM_t, INTR_t, GDP_t, HOUSEP_t, DIVR (Male)_t, STRIKES_t</i>				
$r = 0$	$r = 1$	0.773	48.97*	40.12
$r \leq 1$	$r = 2$	0.580	28.64	33.26
$r \leq 2$	$r = 3$	0.348	14.11	25.70
<i>Model III: SE (Female)_t, UNEM (Female)_t, INCOM_t, INTR_t, GDP_t, HOUSEP_t, DIVR (Female)_t, STRIKES_t</i>				
$r = 0$	$r = 1$	0.889	72.44*	40.12
$r \leq 1$	$r = 2$	0.607	30.84	33.26
$r \leq 2$	$r = 3$	0.365	15.02	25.70
<i>Model IV: SE (Total)_t, UNEM (Total)_t, INCOM_t, INTR_t, GDP_t, HOUSEP_t, MAR (Total)_t, STRIKES_t</i>				
$r = 0$	$r = 1$	0.863	65.71*	40.12
$r \leq 1$	$r = 2$	0.606	30.75	33.26
$r \leq 2$	$r = 3$	0.534	25.22	25.70
<i>Model V: SE (Female)_t, UNEM (Female)_t, INCOM_t, INTR_t, GDP_t, HOUSEP_t, MAR (Female)_t, STRIKES_t</i>				
$r = 0$	$r = 1$	0.891	73.30*	40.12
$r \leq 1$	$r = 2$	0.594	29.74	33.26
$r \leq 2$	$r = 3$	0.381	15.82	25.70

Note:

* Significant at the 5% level.

- x_t being a vector of weakly exogenous, $I(1)$, variables. To examine the assumption of weak exogeneity we follow Harbo et al. (1998). We regress the changes of the weakly exogenous variables on the error correction term, the lagged differences of all variables (to address problem with autocorrelation) and a constant and find that these variables do not react to disequilibrium.
- Δ is the difference operator.
- $\Pi_y (= a\beta')$ is the long-run multiplier matrix where a denotes the adjustment coefficients and β the co-integration vectors.
- ω and Γ_{yy} captures the short-run dynamic effects, the deterministic component w_t contains policy dummies and additional $I(0)$ variables.

2.2. Co-integration analysis

Our test of the null hypothesis that the variables included in the VAR are not co-integrated (namely $r = 0$) uses the Johansen co-integration approach and makes inferences based on maximal eigenvalue of the stochastic matrix (the trace statistic produces largely similar results). The test is a likelihood ratio test but it does not have the usual Chi-squared distribution. The distribution is a multivariate extension of the Dickey–Fuller distribution. The null hypothesis $r = 0$ is tested against the alternative that $r = 1$, against the alternative $r = 2$, etc. The maximum eigenvalue statistic rejects the null hypothesis of no co-integrating vectors in favour of exactly one co-integrating vector ($r = 1$) for all models.²⁵ Table A2 presents the results of the co-integration test based on the maximum eigenvalue statistic. The co-integrating relationship is not identified, however, unless normalisation is imposed. The estimated long-run coefficients are identified after normalising the self-employment rate coefficient to one.

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²⁵ When the models are estimated controlling for both divorce and marriage rates the maximum eigenvalue and the trace statistics favour $r = 2$. From economic theory, however, we expect and are interested in one long-run relation amongst these variables and thus, we estimated the models by including one of the marital status variables at a time.

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