The lasting health impact of leaving school in a bad economy: Britons in the 1970s recession

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Abstract: This paper investigates whether leaving school in a bad economy deteriorates health in the long-run. It focuses on individuals in England and Wales who left full-time education in their last year of compulsory schooling immediately after the 1973 oil crisis. Unemployment rates sharply increased in the wake of the 1973 oil crisis, so that between 1974 and 1976, each school cohort faced worse economic conditions at labour-market entry than the previous one. Our identification strategy relies on the comparison of very similar pupils – born the same year and with a similar quantity of education (in months) – whose school-leaving behaviour in different economic conditions was exogeneously implied by compulsory schooling laws. Unlike school-leavers who did postpone their entry on the labour market during the 1980s and 1990s recessions, we provide evidence that pupils' decisions to leave school at compulsory age immediately after the 1973 oil crisis were not endogenous to the contemporaneous economic conditions at labour market entry. We use a repeated cross section of individuals over 1983-2001 from the General Household Survey (GHS) and take a lifecourse perspective, from 7 to 26 years after school-leaving. Our results show that poor economic conditions at labour-market entry are particularly damaging to women's health. Women who left school in a bad economy are more likely to report poorer health and to consult a general practitioner over the whole period under study (1983-2001). Additional evidence suggests that they are also more likely to suffer from a longstanding illness/disability over the whole period. As for men, the health impact of poor economic conditions at labour-market entry is more mixed, and not robust across all specifications. However, we never find that leaving school in a bad economy is beneficial to their health. Finally, our results show that leaving school in a bad economy does not have a lasting impact on labour-market outcomes from 7 to 26 years after school-leaving, neither for men, nor for women.

Keywords: Health, School-leaving, Macroeconomic shocks.

JEL Classification: C10, I10.

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Les effets persistants sur la santé de finir ses études quand les conditions économiques se dégradent : les britanniques face à la crise du début des années 1970

Abstract: Nous nous intéressons à l'entrée sur le marché du travail lorsque la conjoncture économique se dégrade, et aux conséquences sur la santé que cela engendre à long terme. Il y a en effet de bonnes raisons de supposer que sortir du système scolaire dans une conjoncture dégradée ait un effet négatif et persistant sur la santé. Pour tester cette hypothèse, nous mobilisons des données Britanniques issues de la General Household Survey (GHS) sur la période 1983-2001. Nous considérons des individus quittant le système scolaire à l'âge minimum de scolarité obligatoire. Afin de créer un choc exogène sur le timing d'entrée sur le marché du travail (et sur les conditions économiques prévalentes à ce moment-là), nous exploitons (i) la forte hausse des taux de chômage générée par la crise pétrolière de 1973 et (ii) des règles de scolarité obligatoire en Angleterre et au Pays de Galles. Nos résultats montrent que les femmes ayant quitté le système scolaire lorsque la conjoncture s'était fortement dégradée sont en plus mauvaise santé sur toute la période 1983-2001, c'est-à-dire de 7 à 26 ans après l'entrée sur le marché du travail. Nos résultats pour les hommes vont dans le même sens, mais sont plus mitigés, car moins robustes selon les spécifications.

Keywords: Santé, Sortie du système scolaire, chocs macroéconomiques.

JEL Classification: C10, I10.

1 Introduction

Recent studies in health economics show that socioeconomic circumstances during infancy and early-childhood years have a bearing on health outcomes and mortality later in life (Almond, 2006; Kesternich et al., 2014; Lindeboom et al., 2010; Van den Berg et al., 2006). There is indeed growing evidence there are critical periods for health – in utero and early infancy, but also during childhood and young adulthood (WHO, 2000). This paper investigates whether leaving full-time education in a bad economy is such a critical period for health, i.e. whether it is detrimental to health in the long-run. This is an important question from a policy perspective, as the youth has suffered disproportionately during the Great Recession (Bell and Blanchflower, 2011). Young cohorts who left full-time education in the late 2000s faced historically high unemployment rates. To the extent that leaving school in a bad economy has a lasting and negative impact on health, this situation will most likely generate important health disparities in the future.

There are some reasons to believe that poor economic conditions at school-leaving¹ lead to lower health in the long-run. First, higher unemployment rates at school-leaving may lead to greater stress and trigger addictive behaviours or mental disorders in the short-run. There is indeed evidence that individuals at a high risk of unemployment are more likely to adopt risky health behaviours and suffer more from depressive symptoms in bad times (Charles and DeCicca, 2008; Dave and Kelly, 2012; Dee, 2001).² As a result, health may fall immediately after school-leaving. If this initial decrease in health is not compensated over the lifecourse, it will generate lasting health disparities between individuals who left school in a bad economy and their luckier counterparts. A second empirical pattern motivating this study has to do with the fact that poor economic conditions at labour-market entry lead to persistent and negative career effects. Recent evidence in labour economics indeed shows that those who graduate in bad economies suffer from underemployment and are more likely to experience job mismatching since they have fewer jobs from which to choose (Kahn, 2010). For instance, graduating from college in a recession has a large, negative and persistent effect on men's wages in the USA and Canada (Kahn, 2010; Oreopoulos et al., 2012).³ Poor economic conditions at labour-market entry also have adverse effects on men's probability of being employed, especially among the low-educated – although this negative effect generally fades out over the next few years (Gaini et al., 2012; Genda et al., 2010; Stevens, 2007). Workers who enter firms in economic downturns may initially be placed in lower-level jobs with less important tasks and less promotions (Gibbons and Waldman, 2006), so that graduating in a recession may have negative effects on various dimensions of job quality e.g. job stress, perceived job security, working hours, career prospects or more generally working conditions.⁴ Overall, there is evidence that adverse economic

¹We use the phrase "school-leaving" or "leaving school" in this paper to mean leaving full-time education.

²There is a important literature on the short-term health effect of contemporaneous economic fluctuations. Most studies consider the whole population and use aggregated data. Quite surprisingly, they point to health and health behaviours being countercyclical, at least in the short-run (Buchmueller et al., 2007; Gerdtham and Ruhm, 2006; Neumayer, 2004; Ruhm, 2000, 2003, 2004, 2005). In contrast, recent researchers' findings show that the impact of contemporaneous macroeconomic conditions is highly heterogeneous across worker's ex-ante employment probabilities.

³According to Kahn (2010), the catch-up process for wages is as long as 15 years in the US. Similarly, Kondo (2007) finds a negative effect of a recession at labour-market entry on wages in the USA, although the effect is weaker for women than for men.

⁴There is not much work on these aspects to date. A notable exception is Schoar and Zuo (2011), on career prospects.

conditions at graduation have negative consequences on labour-market outcomes – with highly-skilled workers and individuals with a strong attachment to the labour force suffering from larger penalties. As there is both theoretical and empirical evidence that career outcomes are linked to health, one may expect that leaving school in a bad economy has a negative and lasting impact on health through the cumulative impact of these worse career outcomes. Income is indeed generally thought to improve health (Currie, 2009; Duleep, 1986; Gardner and Oswald, 2007; Grossman, 1972), job loss is associated with lower health, adverse health behaviours and higher mortality rates (Browning and Heinesen, 2012; Deb et al., 2011; Eliason and Storrie, 2009a; Salm, 2009; Sullivan and Von Wachter, 2009), while other job dimensions – such as job stress, perceived job insecurity, long working hours, harmful working conditions, downward occupational mobility – have been shown to deteriorate health (Caroli and Godard, 2014; Fischer and Sousa-Poza, 2009; Fletcher et al., 2011; Llana-Nozal, 2009; Robone et al., 2011). Overall, these three empirical patterns make a strong case for the study of the long-term health consequences of leaving school in a bad economy.

In this paper, we examine the impact of leaving full-time education in a bad economy on middle and long-term health in England and Wales. We focus on individuals who left full-time education in their last year of compulsory schooling after the 1973 oil crisis. The proportion of pupils who left full-time education at compulsory age in the 1970s was remarkably high in the UK – 50 percent, according to Micklewright et al. (1989). Our identification strategy builds on two sources. First, it relies on the comparison of very similar individuals – born the same year and with a similar quantity of schooling (in months) – whose school-leaving behaviour in different economic conditions was exogeneously induced by compulsory schooling laws. More specifically, within a same birth cohort, pupils born at the end of the calendar year (September to December) were forced to leave school almost a year later than pupils born earlier in the year (January to August). Second, it exploits the sharp increase in unemployment rates generated by the 1973 oil crisis. Between 1974 and 1976, each school cohort indeed faced worse economic conditions at labour-market entry than the previous one.⁵ As a consequence, unlucky pupils born in September-December faced higher unemployment rates at labour-market entry than pupils born in January-August of the same calendar year.

Of course, a potential selection issue has to do with the fact that pupils’ decisions to leave school at compulsory age may be endogenous to the contemporaneous economic conditions at labour-market entry. Prior research has indeed linked schooling choice to decreased labour-market opportunities (Betts and McFarland, 1995; Card and Lemieux, 2001; Gustman and Steinmeier, 1981) and shows that individuals tend to remain in school during economic downturns. We show, however, that this is not the case in our setup. Unlike school-leavers who did postpone their entry on the labour market during the 1980s and 1990s recessions, pupils’ decisions to leave school at compulsory age between 1974 and 1976 were not

The authors show that economic conditions when CEOs enter the labour market have a long-lasting impact on their career paths and managerial styles – they are less promoted and are in less prestigious occupations than their luckier counterparts.

⁵We focus on pupils who left school at compulsory age between 1974 and Easter 1976 – e.g. the 1958 and 1959 birth cohorts. We do not consider older individuals so as to abstract from the effect of the increase in school-leaving age from 15 to 16 from September 1972 on. In our setup, all individuals are affected by the 1972 reform, so that our identification strategy does not rely on the comparison on pre-reform cohorts and post-reform cohorts.

endogeneous to the contemporaneous economic conditions at labour-market entry. We argue that the 1973 oil crisis was highly unexpected and that pupils who were in their last year of schooling at that time did not anticipate the adverse career effects of leaving school when unemployment rates were high.

We use a repeated cross section of individuals over 1983-2001 from the General Household Survey (GHS) and take a lifecourse perspective⁶, from 7 to 26 years after school-leaving. We investigate the middle to long-term impact of leaving school in a bad economy on health status, health care and health behaviours. We examine the potential labour-market mechanisms by which adverse economic conditions at school-leaving may affect later health. Our results show that poor economic conditions at labour-market entry are particularly damaging to women's health. Women are more likely to report poorer health and have a higher probability of consulting a general practitioner over the whole period (1983-2001). Additional results suggest that they have a higher propensity to suffer from a longstanding illness or disability. As for men, the health impact of poor economic conditions at labour-market entry is more mixed, and not robust across all specifications. Depending of the specification used, our effects range from health-damaging effects to insignificant ones. However, we never find a positive health effect of poor economic conditions at labour-market entry on men's health. Finally, we find that leaving school in a bad economy does not have a lasting impact on labour-market outcomes from 7 to 26 years after school-leaving, neither for men, nor for women.

This paper relates to several strands of literature. First and foremost, it contributes to the emerging literature investigating the long-term health consequences of graduating in a bad economy. To our knowledge, only a very limited number of studies (Cutler et al., 2015; Hessel and Avendano, 2013; Maclean, 2013) have addressed this question. So far, results turn out to be mixed. Maclean (2013) uses US data – the National Longitudinal Survey of Youth 79 (NLSY79) – and exploits the variation in school-leaving state unemployment rates to identify the effect of leaving school in a bad economy on health at age 40. Members of her sample left school between 1976 and 1992. As time or location of school-leaving may be endogeneous to the contemporaneous unemployment rate, she uses instrumental-variable (IV) methods to deal with selection problems related to what she refers to as "endogeneous sorting". She finds that men who left school when the state unemployment rate was high have a higher probability to report poor or fair health as well as depressive symptoms and have lower physical functioning at age 40. Surprisingly, she finds that women leaving school in a bad economy tend to have fewer depressive symptoms at age 40. Hessel and Avendano (2013) use European data, namely the Survey of Health, Ageing and Retirement in Europe (SHARE). They consider individuals aged 50 and over who left school from 1957 onward. They use country-specific unemployment rates and trend deviations based on the reported year of leaving full-time education. According to their results, poor conditions at school-leaving predict worse health status among women and better health status among men. They provide evidence that highly-educated women are particularly affected. However, the authors acknowledge that both selection into higher education and causation mechanisms may explain this association. Finally, Cutler et al. (2015) use the Eurobarometer data and consider economic fluctuations over 50 years across 31 countries. They show that higher un-

⁶The GHS is a new cross-section in each year so that, although we cannot track any particular individual over time, we can track birth cohorts.

employment rates at graduation are associated with lower income, lower life satisfaction, greater obesity, more smoking and drinking later in life, for both men and women. According to their results, education seems to play a protective role, especially when unemployment rates are high. In a series of recent papers Maclean (2014a,b,c) specifically tests whether leaving school in an economic downturn persistently affects drinking behaviour, body weight and the probability of access to an employer-sponsored health insurance. She uses the same methodology and data as in Maclean (2013) and finds that men, but not women, who leave school in a bad economy consume more drinks and are more likely to report heavy and binge drinking than otherwise similar men. Unlucky men have lower bodyweight and are less likely to be overweight and obese at age 40. Finally, she finds that both men and women are less likely to have access to an employer-sponsored health insurance up to 18 years after school-leaving.

Overall, the evidence provided by the literature is rather mixed. Of course, differences in the age groups considered may account for these conflicting results. Differences in terms of labour markets, social security schemes and social policies between the US and Europe may also play a role. In spite of this, additional evidence is needed to understand the long-term health consequences of leaving school in a bad economy – and particularly its heterogeneous impact across gender.

Our paper contributes to the existing literature in several ways. First, our identification strategy is different in spirit from the ones previously used in the literature. Rather than considering long periods of economic fluctuations and exploiting the variation in country (or state) school-leaving unemployment rates, we focus on two birth cohorts only – the 1958 and 1959 cohorts. Our strategy relies on the comparison of similar individuals – born the same year and with a similar quantity of education – whose school-leaving behaviour in different economic conditions was exogeneously induced by compulsory schooling laws. As a consequence, our results cannot possibly be biased by country-specific (or state-specific) cohort effects. Second, we show that pupils’ decisions to leave school at compulsory age between 1974 and 1976 were not endogenous to the contemporaneous economic conditions at labour-market entry – unlike school-leavers during the 1980s and 1990s recessions. There is no need, then, to deal with problems related to endogenous sorting of school-leaving and our results do not rely on the usual assumptions when implementing instrumental-variables models. Third, our data allow us to adopt a lifecourse perspective, which is only present in the paper by Cutler et al. (2015). Finally, we focus on low-educated individuals. There are some good reasons to focus on pupils leaving school at compulsory age : first, they represent a sizeable proportion of pupils in England and Wales in the mid-70s (approximately 50%). Second, whether they should be more affected than highly-educated individuals by high unemployment rates at labour-market entry – i.e. whether education plays a protective role – remains an open question. On the one hand, economic theory predicts less persistence of poor economic conditions at school-leaving for low-skilled workers and those with weak attachment to the labour force. On the other hand, education has been hypothesised to increase one’s ability to cope with negative shocks and uncertainty (Cutler et al., 2015; Cutler and Lleras-Muney, 2006; Smith, 2004). If, according to Cutler et al. (2015), education does play a protective role, leaving school at compulsory age in a bad economy will act as a double whammy. Individuals who leave school early typically have worse health statuses,

and more rapidly declining health statuses over the lifecourse than higher-educated ones. If they are disproportionately affected by poor economic conditions at labour-market entry, this will further exacerbate health disparities among education groups. In this context, investigating the long-term health impact of leaving school in a bad economy among low-educated individuals seems crucial.

The rest of the paper is organised as follows. Section 2 sketches an economic model of the link between poor economic conditions at labour-market entry and long-term health. Sections 3 presents the institutional framework and Section 4 the empirical approach. Section 5 describes the data that we use. Section 6 reports our results and Section 7 concludes.

2 An economic model

In this section, we propose an economic model of the link between economic conditions at school-leaving and health in the long-run. Our model is an extension of the Grossman model of the demand for health (Grossman, 1972). More specifically, it relies on the innovative conceptual framework developed by Galama and Van Kippersluis (2010) in which multiple mechanisms and their cumulative long-term effects can be studied in a structural model of socioeconomic status and health over the life cycle.

Following the usual formulation, health is treated as a form of health capital and individuals derive both consumption (health provides utility) and production benefits (health increases earnings) from it. Health is modeled as a stock that deteriorates over the lifespan and its deterioration can be counteracted by health investment in curative and/or preventive care. Individuals maximize their life-time utility functions :

$$\int_0^T U(t)e^{-\beta t} dt$$

where T denotes the life span and β is a subjective discount factor. Individuals derive utility $U(t) = U[C_h(t), C_u(t), H(t)]$, where $C_h(t)$ denotes healthy consumption (e.g. healthy food, healthy neighborhood), $C_u(t)$ unhealthy consumption (e.g. smoking or drinking) and $H(t)$ health status. In our framework, time t is measured from the time an individual completes her education and joins the labour force. Utility increases with healthy consumption ($\frac{\partial U(t)}{\partial C_h(t)} \geq 0$), unhealthy consumption ($\frac{\partial U(t)}{\partial C_u(t)} \geq 0$) and with health ($\frac{\partial U(t)}{\partial H(t)} \geq 0$). Individuals maximise their life-time utilities given a budget and a time constraint, and health is defined as :

$$H(t) = I_m(t)^\alpha + (1 - d(t))H(t - 1)$$

where $H(0)$ and $H(T)$ are respectively the initial and end conditions. Health can be improved through investment in curative medical care $I_m(t)$ and deteriorates at rate $d(t) = d[t, C_h(t), C_u(t), z(t), I_p(t); \xi(t)]$. The health production function $I_m(t)^\alpha$ is assume to exhibit decreasing-returns-to-scale ($0 < \alpha < 1$). $d(t)$ depends on healthy consumption $C_h(t)$, unhealthy consumption $C_u(t)$, "job-related health stress" $z(t)$ (which is interpreted broadly as all physical working conditions and psychological aspects of work that

can be harmful to health), investment in curative care $I_p(t)$ and on a vector of exogenous functions $\xi(t)$.

Consumption can be healthy ($\frac{\partial d(t)}{\partial C_h(t)} \leq 0$) or unhealthy ($\frac{\partial d(t)}{\partial C_u(t)} > 0$). Preventive care is modeled analogous to curative care as an activity that provides no utility ($\frac{\partial U(t)}{\partial I_p(t)} = 0$) but is demanded for its health benefits ($\frac{\partial d(t)}{\partial I_p(t)} < 0$). Greater job-related health stress $z(t)$ accelerates the "ageing" process ($\frac{\partial d(t)}{\partial z(t)} > 0$).

In this framework, poor economic conditions at school-leaving can affect health through two distinct – although not mutually exclusive – mechanisms :

1. **An "initial shock effect".** In this scenario, higher unemployment rates at school-leaving lead to greater stress. This triggers addictive behaviours as well as mental disorders in the short-run, so that health falls immediately after school-leaving. This decrease in health causes the desired level of medical care to rise, but not necessarily enough to restore the health status at the counterfactual level – i.e. the health status of luckier individuals.

To be more specific, let us consider two identical individuals a (who left school in a bad economy, i.e. who is "treated") and c ("non-treated") that differ only in their health at school-leaving. Individual c is supposed to be in better health than individual a ($H^c > H^a$) at school-leaving but is otherwise identical to individual a . A smaller health status ($H^a < H^c$) results in a higher optimal level of investment in curative care $I_m^a > I_m^c$. Following Galama and Van Kippersluis (2010), two scenarios can be considered. In scenario 1, the elasticity of health investment with respect to health is assumed to be small. In this scenario, the gap between individuals a and c tends to widen over time.⁷ In scenario 2, the elasticity of health investment with respect to health is assumed to be high. In this case, the gap between individuals a and c is likely to close as individuals age.⁸

2. **A "cumulative effect".** In this scenario (3), we do not assume an "initial shock effect" at school-leaving. Rather, we assume that leaving school in a bad economy has a negative and lasting impact on health through the cumulative impact of worse career outcomes – and in particular through the effect of lower life-time earnings. In our framework, differences between individuals in life-time earnings operate similar to an increase in endowed wealth.⁹ Wealthier individuals invest more in curative and preventive care, and their level of healthy consumption is higher. They also engage in work that is more conducive to health, i.e. jobs associated with lower levels of job-related health stress. Overall, higher life-time earnings protect health by encouraging healthy life styles and enabling individuals to work and live in healthy environments. In this scenario, poor economic conditions at school-leaving lead to lower health in the long-run through the cumulative impact of lower earnings.

Figure 1 presents the evolution of health during the lifespan. The red dashed curves show the potential scenarios for treated individuals, whereas the black solid curve presents the evolution of health for those

⁷In this scenario, individual a tends to consume less healthy consumption $C_h(t)$ and invests less in preventive care $I_p(t)$, while the effect on unhealthy consumption $C_u(t)$ and job-related health stress is ambiguous.

⁸In this scenario, individual a consumes less unhealthy consumption $C_u(t)$, engages less in job-related health stress $z(t)$, and invests more in preventive care $I_p(t)$, while the effect on healthy consumption $C_h(t)$ is ambiguous.

⁹There are indeed reasons to believe that the life-time wealth effect dominates the effect of the increased opportunity cost of time due to higher current earnings (Galama and Van Kippersluis, 2010).

who are untreated. The blue vertical line stands for the entry on the labour market. The "initial shock" hypothesis is consistent with the idea that health status among treated individuals falls in the short-term (scenarios 1 and 2). In scenario 1, the desired level of medical care rises in order to restore health, but not enough to restore the counterfactual level of health in the long-run. In scenario 2, this level rises as its counterfactual level, so that no health disparities are observed in the long-run. The "cumulative effect" hypothesis is depicted by scenario 3. In this scenario, differences in life-time earnings lead to a widening health gap between treated and non-treated individuals. Note that this health gap may be persistent in the long-run even if earnings among treated and non-treated individuals finally catch up at some point.

3 Institutional framework

This section describes the compulsory schooling laws in England and Wales (see section 3.1) and provides graphical evidence of the sharp increase in unemployment rates after the 1973 oil crisis (see section 3.2).

3.1 Compulsory schooling in England and Wales

The British compulsory schooling laws specify the maximum age at which pupils have to start school and the minimum age at which pupils are allowed to leave school.

The official school-starting age is the beginning of the term starting after the child's fifth birthday. Hence, entry rules determine that a school cohort consists of children born between the first day of September and the last day of August in the following calendar year (Del Bono and Galinda-Rueda, 2007). In other words, due to the discontinuity introduced by the school-entry rule, students within a same birth cohort belong to different school cohorts. There is evidence that compliance with school-entry requirement is almost perfect and that grade repetition (or grade skipping) is almost non-existent in England and Wales (Grenet, 2013; Sharp et al., 2002).

The current school leaving age of 16 was increased twice in England and Wales¹⁰, from age 14 to 15 in 1947 and from age 15 to 16 in 1972.¹¹ The proportion of children leaving education at the first legal opportunity in the UK is high by the standards of other industrialised countries (Micklewright et al., 1989). In the early 1960s, only about 20% of pupils stayed in full-time education after having reached the minimum school-leaving age (Del Bono and Galinda-Rueda, 2007; McVicar and Rice, 2001). In our data, this proportion amounts to 50% in the mid-1970s. After the 1972 Raising Of the School-Leaving Age (ROSLA), students in their last year of compulsory schooling were normally attending secondary school (Year 11) while the less academically inclined were in vocational training. Two types of qualifications could be obtained at the end of Year 11 : the General Certificate of Education Ordinary Level (GCE O level) or the Certificate of Secondary Education (CSE). Both credentials were awarded at the end of junior secondary school, after an examination (Grenet, 2013).

Unlike other countries – and unlike the USA –, the implementation of compulsory schooling in England

¹⁰The education system in Scotland is different and not considered here.

¹¹Several studies use these changes in minimum school-leaving age to identify the returns to education on labour market outcomes and health (Clark and Royer, 2013; Devereux and Hart, 2010; Grenet, 2013; Harmon and Walker, 1995; Oreopoulos, 2006). Note that in our setup, however, all individuals are affected by the 1972 ROSLA reform. Our identification strategy does not rely on the comparison on pre-reform cohorts and post-reform cohorts.

and Wales differs in that a student is not allowed to leave school on the exact date (birthday) in which she reaches the school-leaving age. Between school years 1963-1964 and 1996-1997, (see the Education Act of 1962, Appendix C), the rules governing school exit implied that pupils who reached age 16 between the 1st of September and the 31st of January had to complete their education until the following Easter. Students who reached the age of 16 between the 1st of February and the end of August were forced to leave school at the end of the summer term, typically in May/June. Pupils born between the end of the summer term and August – i.e. pupils born in July or August – were thus allowed to leave school before their 16th birthday, i.e. at age 15.

To show how these exit rules support our identification strategy, we present in Figure 2 the authorised school-leaving date with respect to students' month-year of birth. It makes it clear that students born in the same calendar year belonged to different school cohorts due to the discontinuity introduced by the school entry rule (see column 3). It also provides evidence that, within the same birth cohort, the oldest pupils – born between January and August – were allowed to leave school at Easter or in May/June of year t whereas the youngest – born between September and December – were not allowed to leave school until the following Easter of year $t+1$. Figure 3 provides an illustration of how the compulsory schooling rules operate by taking the 1958 birth cohort as an example. Note that, due to the discontinuities introduced by both school-entry and school-exit rules, pupils born in different months had a similar quantity of schooling (in months) at the end of full-time education. A maximum difference of three months of education upon reaching the final year of schooling was induced by the existence of two specific school-leaving dates (Easter or the end of the summer term). It is highly unlikely, however, that this three-month difference should have an impact on health. Clark and Royer (2013) indeed show that the additional year of schooling induced by the 1972 ROSLA reform had no effect on health whatsoever. In this context, it seems highly unlikely that a three-month difference in compulsory schooling may have a determinant impact on health – especially as the pupils considered by Clark and Royer (2013) are very similar to the pupils considered here.

3.2 Unemployment rates

The sharp and unprecedented increase in the oil price from three to ten dollars a barrel in October 1973 had serious effects on the balance of payments of the industrial nations, which were oil-importer countries. This first world-wide recession had strong effects on unemployment rates in a number of industrialised countries, including the UK (Bhattarai, 2011).¹²

Figure 4 provides evidence of the sharp increase in unemployment rates after the 1973 oil crisis. The 1973 oil crisis – which occurred in October 1973 – is symbolised by the vertical dark blue line on the left-hand side. The blue line shows the unemployment rates for all individuals aged 16-64¹³ and the red

¹²Thus, it can reasonably be argued that the 1973 crisis was not endogenous to health in the UK.

¹³Unemployment rates (UR) are provided by the Office for National Statistics (ONS). UR for individuals aged 16-25 are not available on a monthly basis from the ONS for the period under study. We compute UR for the 16-25 on an annual basis using the 1975 and 1977 waves of the UK Labour Force Survey (LFS). Our computations show that UR among the 16-25 were high, and increased from 7.34% in 1975 to 9.05% in 1977, corresponding to a 23% increase within a two-year period. This increase lies in the same range of magnitude as the increase in UR experienced by individuals aged 16-64 – from 4.5% in 1975 to 5.6% in 1977, corresponding to a 24% increase.

and green lines show the unemployment rates for men and women respectively. As shown in Figure 4, unemployment rates gradually increased between 1974 and 1978 – when the economy recovered – with the sharpest increase between 1974 and 1976. The vertical blue areas on Figure 4 indicate the periods at which each school cohort was allowed to leave school, i.e. at Easter/May/June. As made clear by the graph, each school cohort faced significantly higher unemployment rates than the previous school cohort.¹⁴

4 Empirical approach

Section 4.1 presents our main identification strategy as well as the model we estimate. Section 4.2 discusses the validity of this identification strategy and presents a placebo test. Section 4.3 introduces a difference-in-differences strategy as an additional specification.

4.1 Identification strategy and model

We consider pupils who left school at minimum school-leaving age and who entered the labour market between Easter 1974 and Easter 1976, i.e. the 1958 and 1959 birth cohorts. We do not consider older individuals so as to abstract from the effect of the increase in school-leaving age from 15 to 16 from September 1972 on.

Our identification strategy relies on the comparison of similar individuals – born the same year and with a similar amount of education (in months) – whose school-leaving behaviour in different economic conditions was exogeneously induced by compulsory schooling laws (both school entry and exit rules). More specifically, within a same birth cohort, pupils born at the end of the calendar year (September to December) were forced to leave school almost a year later than pupils born earlier in the year (January to August). We exploit the fact that between 1974 and 1976, each school cohort faced worse economic conditions at labour market entry than the previous one (due to the sharp increase in unemployment rates generated by the 1973 oil crisis). Thus, within each birth cohort, pupils born between September and December faced higher unemployment rates at labour-market entry than pupils born between January and August. Note that our identification strategy does not rely on the comparison on individuals who left school *before* and *after* 1973.¹⁵ In our setup, all individuals are affected by the 1973 oil crisis. However, some pupils (the "treated") left school in worse conditions than otherwise similar pupils.¹⁶

¹⁴The unemployment rate increased by 0.7 percentage point between Easter/May/June 1974 and Easter/May/June 1975. It increased by 1.1 percentage point between Easter/May/June 1975 and Easter/May/June 1976. This increase was somewhat milder between 1976 and 1977 as well as between 1977 and 1978 (a 0.1 percentage point increase in both cases).

¹⁵This is because pupils who left school at minimum school-leaving age before and after the 1973 oil crisis are not comparable. Those who left school at compulsory age *before* the crisis were 15 years old, while those who left school at compulsory age *after* the crisis were 16 years old (due to the 1972 ROSLA reform). This difference in years of education makes it difficult to attribute the differences in health outcomes to economic conditions at labour-market entry.

¹⁶The 1973 oil crisis had a disproportionate impact on some regions – typically in Wales and the North of England. However, we do not use this additional regional variation. First, we do not have reliable data on UK regional unemployment rates at a sufficiently disaggregated level in the 1970s. Second, we do not have information on the actual region in which the individual lived at age 16.

We use a repeated cross-section of individuals over 1983-2001 to estimate the following equation by standard probit, for men and women separately :

$$H_i^* = \alpha + \gamma T_i + BirthYear_i + f(BirthMonth_i) + InterviewYear_i + \epsilon_i \quad (1)$$

where H_i^* denotes the latent health status of individual i and is only observed as:

$$H_i = \mathbb{1}_{\{H_i^* > 0\}} \quad (2)$$

and where T_i is a dummy variable taking value 1 if individual i is treated, i.e. born between the 1st of September and the 31st of December and value 0 if non-treated, i.e. born between the 1st of January and the 31st of August. $BirthYear_i$ is a dummy variable for individual i 's year of birth. $InterviewYear_i$ is a dummy variable for individual i 's interview year.¹⁷ $f(BirthMonth_i)$ is a linear function of age in months within a birth year. We define it as $(12 - BirthMonth_i)$, where $BirthMonth_i$ denotes the month of birth of respondent i and varies from 1 to 12.¹⁸ We include this linear function of age in Equation (1) to account for the fact that within each birth cohort, treated individuals (born September-December) are younger than non-treated pupils (born January-August). As age and health are negatively correlated, not taking into account this age difference – which is a difference in months within a birth cohort – may lead us to underestimate the negative impact of leaving school in a bad economy.¹⁹ Finally, ϵ_i denotes the error term.

Equation (1) estimates the average effect of leaving school in a bad economy on health over the whole period ($\hat{\gamma}$). But our empirical approach also allows us to take a lifecourse perspective. To do so, we compute the marginal effects of the treatment associated with each interview year over 1983-2001.²⁰ This allows us to investigate whether the impact of poor economic conditions at labour-market entry on health is driven by middle or long-term effects.

A key assumption is that pupils in their last year of compulsory schooling do not stay strategically in school when the economy deteriorates, i.e. do not engage in what we refer to as "endogeneous timing". If pupils anticipate the adverse effects of leaving school in a bad economy and enroll in an additional year of schooling, our estimates will be biased. We discuss this point in section 4.2.1. A second identifying assumption is that if there are no other institutional differences within each birth cohort generating differences in health among the treated and the non-treated apart from school-exit rules (see section 4.2.2 for a discussion on school-entry rules and section 4.2.3 for a discussion on the differential incentives to

¹⁷We control for *InterviewYear* to account for the fact that we observe individuals at different points in time. We choose to include a dummy indicating the year in which an individual is interviewed rather a dummy indicating the survey wave in which she is interviewed. This is because a survey wave can be conducted over several years – usually two.

¹⁸One may worry that introducing simultaneously the variables T_i , $BirthYear_i$ and $(12 - BirthMonth_i)$ in Equation (1) should lead to multicollinearity issues. When estimating Equation (1), we find that the VIF (Variance Inflation Factor) criterion is lower than 10 for all variables, suggesting inconsequential multicollinearity (see the rule of thumb provided by Hair et al. (1995)).

¹⁹As expected, estimating Equation (1) without the linear function of age in months yields very similar estimates, although of lower magnitude and less significant (results are not shown but available upon request).

²⁰More specifically, we estimate Equation (1) and substitute the interaction term $T_i * InterviewYear_i$ for T_i . Interview-year specific marginal effects correspond to the estimated marginal effects associated with the interaction terms.

take GCE O-level/CSE examinations induced by the January/February discontinuity), we can safely attribute observed differences in health to the impact of labour-market conditions at labour-market entry. To the extent that individuals born between January and August and individuals born between September and December are identical in all observable and unobservable characteristics (see section 4.2.4 for a discussion of the potential effects of season of birth) the differences in health status will be driven only by school-exit rules and hence different unemployment rates at labour-market entry, thus allowing us to identify the health consequences of leaving school in a bad economy.

4.2 Validity of the identification strategy

4.2.1 Endogenous timing of school-leaving

Time of school-leaving may be endogeneous to the contemporaneous economic conditions. The sign of the bias arising from endogeneous timing, however, is difficult to predict. On the one hand, school-leavers who avoid leaving school in a bad economy may have unobserved characteristics (e.g. financial resources, other parental characteristics) that allow them to postpone their entry on the labour market. On the other hand, it is likely that only the most capable and hardworking are able to leave school during a bad economy since their abilities allow them to secure desirable jobs regardless of the economic conditions. These characteristics may be correlated with subsequent health, in which case our estimates will be biased.

Whether pupils in their last year of compulsory schooling stay strategically in school when the economy deteriorates is an empirical question. For each birth cohort, Figure 5 shows the proportion of pupils who left school at compulsory age among the treated and non-treated group. It also pictures the one-year growth in school-leaving unemployment rates (calculated for the March-June period) faced by the youngest school cohort (treated) – as compared to the previous school cohort (non-treated). When considering the 1958 and 1959 birth cohorts, Figure 5 shows that within each birth cohort, the proportion of pupils who left school at compulsory age among the treated and the non-treated group is equal, indicating that school-leaving behaviour in last year of compulsory schooling was not shaped by the sharp increase in unemployment rates generated by the 1973 oil crisis. Although treated pupils from the 1958 (1959) birth cohort faced a 21% (resp. 23%) increase in unemployment rates as compared to luckier pupils born January-August, they did not enroll in an additional year of schooling.²¹ When considering younger birth cohorts, however, we do find that a sharp growth in unemployment rate (e.g. the 1980s and 1990s recessions) is associated with a significant decrease in the proportion of treated pupils leaving school at compulsory age.²²

²¹One may argue that even if the *proportion* of pupils who left school at compulsory age is equal in the treated and non-treated group, the *composition* of each group might be different. Due to the lack of information on individual characteristics at age 16, we cannot test this assumption in a proper way. However, we use information on father's occupation and show that among pupils born the same year who left school at compulsory age, the proportion of pupils whose father was in a manual occupation was equal whether they were treated or not.

²²The two proportions are significantly different for the 1963-1964 and 1973-1974 birth cohorts. Interestingly, this result seems to suggest that rather than high unemployment rates or even increasing unemployment rates, it is a sharp increase in unemployment rates – typically occurring during recessions – that induces endogeneous timing among pupils in their last year of education.

Overall, we find no evidence that school-leavers born in 1958-1959 – the cohorts that we consider – did engage in endogenous timing of school-leaving. When considering younger birth cohorts, however, we do find that a sharp growth in unemployment rate (e.g the 1980s and 1990s recessions) is associated with a decrease in the proportion of treated pupils leaving school at age 16. It can be hypothesised that pupils in their last year of compulsory schooling in 1974-1976 did not anticipate the adverse consequences of high unemployment rates at labour market entry – contrary to school-leavers in the 1980s and 1990s recessions. It may be due to the fact that the 1973 oil crisis was highly unexpected and was the first post-war crisis to generate such a sharp increase in unemployment rates.

4.2.2 School-entry rules

School-entry rules introduce a discontinuity between August-born and September-born children. This discontinuity implies that students within a same birth cohort belong to different school cohorts. This institutional feature may generate health differences within a same birth cohort between treated and untreated pupils by means of age-relative rank, school-cohort size or job-experience effects. We discuss these issues in what follows.

Age-relative rank

School-entry rules imply that treated individuals (born September-December) are the oldest pupils in their *school cohort*, while untreated pupils are the youngest.²³ Yet, there is evidence that relative age effects play a role in school performance. More specifically, older people in a given school cohort tend to have higher wages than younger individuals in the same school cohort – which is interpreted as an indication of the persistence of maturity effects related to age differences between students in the same class (Plug, 2001). As treated pupils are the oldest in their school cohort – and to the extent that relative maturity effects positively affect adult labour market and health outcomes – we should measure a lower bound, i.e. underestimate the negative impact of poor economic conditions at labour market entry on long-term labour market and health outcomes.

School-cohort-size effects

Since treated and non-treated pupils belong to different school cohorts, another concern has to do with school-cohort sizes. School-cohort size has been shown to have a negative impact on labour market outcomes due to an excess of supply on the labour market (Berger, 1985, 1989; Korenman and Neumark, 1997; Macunovich, 1999; Morin, 2011; Welch, 1979). We focus on three school cohorts only, which are not likely to be different in size.²⁴ To the extent that cohort-size effects exist, however, we should measure a lower bound : the fertility rate peaked in 1957 and declined after that, so that for a given birth year the youngest school cohort (treated) would have higher wages on average than the previous school cohort.

²³Conversely, treated individuals (born September-December) are the youngest pupils in their *birth cohort*, while untreated pupils are the oldest.

²⁴Cohort sizes do not vary substantially from one year to the next. This is why studies have focused on long-term (typically 8-25 years) variations in cohort size (Morin (2011)).

Job-experience effects

School-entry rules imply that within a birth cohort, treated pupils start school one year later than non-treated pupils. As starting school later entails the opportunity cost of entering the labour market later, treated pupils lack one year of job experience as compared to non-treated pupils. However, whether an additional year of job experience has a positive or negative impact on health is not clear. On the one hand, it leads to higher life-time earnings, which is beneficial to health. On the other hand, it implies a longer exposure to adverse working conditions, if any. To the extent that we consider low-skilled individuals, this possibility is not to be discarded. Hence, the direction of the effect of an additional year of job experience on health is not clear.

4.2.3 Differential incentives to take GCE O-level/CSE examinations

Depending on their date of birth (before or after January 31st), individuals within a same school cohort were allowed to leave school only after one of two specific dates (Easter or the end of the summer term) upon reaching their final year of schooling. Pupils who left school at the end of the summer term, however, had higher incentives to take the exam at the end of Year 11 (O-Level/CSE qualifications) in which they could be awarded nationally-recognized qualifications.²⁵ In this context, the January/February discontinuity might introduce a bias in our analysis : treated pupils (born between September and December) are allowed to leave at Easter, and have less incentives to take the exam at the end of the year. It might impact their educational achievement as well as their adult labour market and health outcomes.

We check in the robustness section that this differential incentive in taking the exams at the end of Year 11 is not likely to bias our results.

4.2.4 Season-of-birth effects

Our identification strategy assumes that individuals born between January and August and individuals born between September and December are identical in all observable and unobservable characteristics. Yet, a growing body of literature has shown the importance of season-of-birth effects on subsequent labour and health outcomes (Bound and Jaeger, 1996).

First, the seasonality of births varies from one social group to another. On US data, Kestenbaum (1987) reports that children born to high-income families are more likely to be born in spring.²⁶ In our framework, it implies that untreated pupils should have more favourable parental sociodemographic characteristics. To the extent that children born to high-income families are in better health on average, this would lead us to overestimate the impact of poor economic conditions at labour-market entry on adult health outcomes. Beyond parental socio-economic characteristics, some health differences have been proved to

²⁵Del Bono and Galinda-Rueda (2007) exploit this January/February discontinuity in a regression discontinuity design and estimate the impact of three additional months of compulsory schooling on educational attainment and longer labour market outcomes. In this paper, we do not exploit this January/February discontinuity for two reasons : (i) unemployment rates do not vary enough between Easter and the end of the summer term and (ii) our sample would probably be too small to detect any effect.

²⁶Note, however, that we do not find evidence of this in our data. When considering the whole GHS sample and using information on father's occupation (manual or not), we find that the proportion of individuals whose father was in a manual occupation was the same whether individuals were born in September-December or earlier in the year.

show dependence with respect to birth date, too (Bound and Jaeger, 1996). Doblhammer and Vaupel (2001) have shown a positive relationship between being born in October to December and longevity at age 50.²⁷ This month-of-birth effect suggests that even in the presence of parental socio-demographic characteristics, treated pupils should be in better health than untreated pupils, which would lead us to underestimate the impact of economic conditions at entry on adult health outcomes.

4.2.5 Placebo test

Overall, only job-experience effects should lead us to overestimate the negative health impact of poor economic conditions at labour-market entry. As a first step, we check that our estimates are not upward-biased due to job-experience effects by running a placebo test on the 1953-1954 birth cohorts. The 1953-54 birth cohorts faced very similar school-leaving unemployment rates at the end of compulsory schooling. Moreover, the same schooling rules applied for these cohorts (see the 1962 Education Act, Appendix C), except that the minimum school-leaving age was then 15. School-leaving unemployment rates (averaged over March-June) varied from 2.475 to 2.675 over a three-year period (1968-1970).²⁸ Importantly, all pupils born in 1953-1954 who left school at compulsory age did so after the major events of 1968.

4.3 A difference-in-differences approach

As a second step, we implement a difference-in-differences analysis. This strategy allows us to eliminate any systematic differences between September-December born children and January-August born children (e.g. job experience, season-of-birth, or any other time-invariant characteristic). We use the 1953-1954 cohorts as a "control" group and estimate the following equation by a linear probability model :

$$H_i = \alpha + \chi T_i + \delta D_i + \beta T_i \times D_i + BirthYear_i + f(BirthMonth_i) + InterviewYear_i + \epsilon_i \quad (3)$$

where D_i is an indicator variable taking value 1 if individual i is born in 1958-1959 and value 0 if born in 1953-1954. $\hat{\beta}$ is the difference-in-differences estimator. It corresponds to the difference in health between the treated and untreated individuals across the 1958-59 and 1953-54 cohorts. We assume that if the treated had not been subjected to the treatment (i.e. an increase in unemployment rates at school-leaving as compared to the previous school cohort), both treated and untreated groups would have experienced the same trend in health (Lechner, 2010).

5 Data

We use data from the General Household Survey (GHS). The GHS is an annual survey of over 13,000 households and a nationally representative survey of private households in Great-Britain.²⁹ It ran from

²⁷They show that those born in the northern hemisphere in October to December live about as much as 0.6 year longer than those born in April to June. As expected, data for Australia show that, in the Southern Hemisphere, the pattern is shifted by half a year. They conclude that the month-of-birth effect is most likely explained by the seasonal availability of fresh fruit, vegetables and eggs to the pregnant mother in the first and second trimesters.

²⁸Unemployment rates from the Labour Force Survey (LFS) are not available prior to 1973. We use instead unemployment rates from administrative data – namely the monthly "registrant count" (borrowed from Denman and McDonald (1996)) – to compute these averages.

²⁹See Data Appendix B.1 for more information on the sampling procedures and sample sizes in GHS.

1972 to 2011 as a repeated cross-sectional survey.

Among other things, it includes information on demographics (including month-year of birth from 1983 to 2001³⁰, the survey waves that we use), education (including the age at which the individual left full-time education and the highest qualification obtained), labour market characteristics (including earnings and employment status) and health (including health status, health care and health behaviours). Importantly, a number of the GHS respondents left full-time education immediately after the 1973 oil crisis, a period that experienced thriving unemployment rates.

We restrict our sample to all individuals born in 1958 and 1959 and who left full-time education in their last year of compulsory education. By doing so, we consider individuals who entered the labour market between Easter 1974 and Easter 1976. We further exclude truands, i.e. pupils who left full-time education before compulsory age, and pupils born in July/August.³¹ We also exclude individuals reporting that they never went to school or individuals whose highest qualification was equivalent to Year 12 or more.³² Finally, we restrict our sample to individuals who lived in England and Wales at the time the survey was carried out because we examine school-leaving rules operating in these countries.³³ As the outcomes of interest are not collected consistently over the period (see Data Appendix B.2), we include all possible observations for each outcome to maximise sample size. Overall, our sample consists of a maximum of 1096 men over the 1986-2001 period and 1921 women over 1983-2001.

In addition to the variables mentioned above – month-year of birth, the age at which the individual left full-time education, the highest degree obtained and the region in which she lives – we use some information on health status, health care and health behaviours. The GHS contains several health indicators that are comparable over the 1983-2001 period. They include self-reported health status – dichotomised as poor (fair or bad health) versus good health –, the presence of a longstanding illness or disability and whether the respondent restricted his activity during the two weeks preceding the interview due to illness or injury. In addition, we create several dummy variables indicating whether the respondent consulted a General Practitioner (GP) during the two weeks preceding the interview or whether she went to hospital as an outpatient/inpatient during the twelve months preceding the interview. The GHS also includes

³⁰Month and year of birth in 1983-1985 are only available for women who completed the Family Information section. They are available for all respondents over 1986-2001.

³¹Under the 1962 Education Act, legislation allowed pupils born between the summer-leaving date (May/June) and the 31st of August to leave school at the summer-leaving date preceding their 16th birthday – i.e. at age 15. In this context, our sample should (i) include pupils born in July/August who left school at age 15 (ii) exclude pupils born in July/August who left full-time education at age 16, as the minimum school leaving age was not binding for them. Yet, patterns of school leaving seem to be quite different for pupils born in July/August. In particular, the proportion of pupils who left full-time education at compulsory age (i.e. at age 15) among pupils born in July/August is significantly lower than the proportion of pupils who left full-time education at compulsory age (i.e. at age 16) among pupils not born in July/August. It may be due to the fact that employers were reluctant to hire individuals under age 16. Being a 15 year-old at labour-market entry can be interpreted as a negative signal (e.g. being a truand). By excluding all individuals born in July/August from our sample, leaving school at age 16 becomes equivalent to leaving school at compulsory age.

³²Obviously, individuals who left full-time education at compulsory age could have engaged in further education and obtained higher degrees in adulthood (e.g. A-Level equivalent degrees or higher degrees etc.). However, the proportion of individuals reporting Year 12-equivalent or higher degrees amounts to 20% in our sample, which is surprisingly high. One concern could be that the reported age at which individuals left full-time education suffers from measurement error. To minimise measurement error in this variable, we exclude individuals whose highest qualification was equivalent to Year 12 or more. Results are robust to re-introducing these observations (although results for men become marginally significant in the main specification).

³³Our data do not allow us to take into account migration patterns from Scotland or Northern Ireland, which is likely to generate some noise.

self-reported health behaviours such as smoking and drinking (which are measured in alternate years). Finally, the GHS provides information on the economic status of the individual – employed or self-employed, unemployed according to the ILO definition, keeping house, and other statuses, e.g. other unemployed, unable permanently, student, retired or other. For those currently employed or self-employed, it indicates the time with the present employer. Finally, we use the usual gross weekly earnings from main job (available and measured in a consistent way over the 1984-2001 period) as our main measure of earnings.³⁴

Summary statistics for all the variables mentioned are shown separately by gender in Tables 1 and 2. We also provide a breakdown of our sample by survey wave and birth cohort in Table 3.

6 Results

6.1 The impact of leaving school in a bad economy on health

In this section, we successively present our main results (see section 4.1), the placebo test (see section 4.2.5) as well as the results obtained when implementing the difference-in-differences approach (see section 4.3).

6.1.1 Main results

Probit estimates of Equation (1) are presented in Table 4 for men and women respectively. Each line presents the marginal effect (resp. standard error and number of observations used in the model) of having left school in a bad economy (i.e. being treated) for a different health outcome. All our models include dummy variables for interview and birth years as well as a linear function of age – see Equation (1). Our results show that over the whole period (1983-2001), men who left school in a bad economy face a 17 percentage-point increase in the probability of having ever smoked (at the 5% significance level). As regards the other health outcomes, the marginal effects for men do not appear to be statistically significant at conventional levels. Leaving school in a bad economy, however, seems to be particularly health-damaging for women. Marginal effects in Table 4 imply that women who left school in a bad economy have a 11 percentage-point higher probability of reporting poor self-rated health (at the 10% significance level) over the whole period (1983-2001). Consistently, women are also more likely to consult a GP during the last two weeks (a 12 percentage-point probability increase, at the 5% significance level) over the whole period. In contrast, leaving school in a bad economy does not seem to affect women’s propensity to restrict their activities due to illness or injury, to suffer from a longstanding illness/disability, nor to go to the hospital during the 12 months preceding the interview. It does not seem to be particularly harmful to women’s health behaviours such as smoking and drinking, either.

Figures 6 to 8 present the impact of having left school in a bad economy on health outcomes in a

³⁴Usual gross weekly earnings are measured in pounds. When running regressions, we take the logarithm of earnings as the outcome variable.

lifecourse perspective. While estimates in Table 4 provide the average impact of poor economic conditions at labour-market entry over the whole period (1983-2001), Figures 6 to 8 allow investigating whether this impact is driven by middle or long-term effects. Each figure pictures interview-year specific marginal effects over 1983-2000 of having left school in a bad economy (i.e. of being treated) for a different health outcome, for men and women separately. For the sake of conciseness, these figures are only presented for health outcomes previously found to be significant in Table 4. For instance, Figure 6 shows the interview-year specific marginal effects of poor economic conditions at labour-market entry on the probability of having ever smoked for men. Correspondingly, Figure 7 (resp. Figure 8) shows the marginal effects of poor economic conditions at labour-market entry on the probability of reporting poorer health (resp. consulting a GP) for women.

Overall, these figures show that the average impact of leaving school in a bad economy on health does not seem to be particularly driven by middle or long-term effects – for each figure, the majority of marginal effects lie above the zero line for all interview years. This suggests that men’s smoking behaviour as well as women’s health seem to be negatively affected by poor economic conditions at labour-market entry over the whole period under study.

6.1.2 Placebo test

We investigate to which extent being born between January and August (as compared to being born between September and December) influences health and labour outcomes not in terms of economic conditions at labour-market entry but by means of unobservable characteristics (age relative rank, season-of-birth effects etc.). As a first step, we re-run our probit models on the 1953-1954 cohorts. Results are presented in Table 5. As expected, we find no significant effect of being born between January and August – as compared to being born between September and December – on any health outcome. All coefficients are insignificant at conventional levels.

6.1.3 A difference-in-differences approach

The placebo test has provided first evidence that our main results were not likely to be biased by any systematic (unobservable) differences between September-December and January-August born children. To further investigate this matter, we implement a difference-in-differences (DiD) strategy. This strategy uses the 1953-54 cohorts as a "control" group. It controls for any systematic differences between September-December born children and January-August born children. Linear probability estimates of Equation (3) are presented in Table 6 for men and women respectively. Marginal effects in Table 6 imply that women who left school in a bad economy face a 6 percentage-point increase in the probability of reporting poor self-rated health (at the 10% significance level) over the whole period (1983-2001). Correspondingly, poor economic conditions at labour-market entry increase by 6 percentage points women’s probability of consulting a GP during the last two weeks (at the 5% significance level). When controlling for any systematic differences between September-December and January-August born children, we find that women are also more likely to suffer from a longstanding illness/disability (a 8 percentage-point increase, significant at the 1% level) over the whole period. Overall, the results obtained for women

when implementing a DiD strategy confirm our findings from the main analysis. In particular, the DiD estimates are in the same range of magnitude as those presented in Table 4. Our main results for men, however, are not robust to the DiD specification. Results from Table 6 show that the effect of poor economic conditions at labour-market entry on men’s smoking behaviour is no longer significant.

Overall, our findings when implementing the DiD strategy make us confident that our main estimates for women capture the true effect of poor economic conditions at labour-market entry – as opposed to any systematic differences between September-December and January-August born children.

6.2 The impact of leaving school on labour-market outcomes

Labour market characteristics can be viewed as mechanisms by which leaving school in a bad economy affects long-term health. To investigate this, we regress labour market proxies on the treatment variable T_i , on year-of-birth and interview dummies as well as on the linear function of age. Models are estimated by OLS or probit – depending on the nature of the dependent variable (continuous or dichotomous)).

Table 7 presents the effect of leaving school in a bad economy on labour-market outcomes for men and women respectively. We find no effect on unemployment, inactivity patterns and earnings³⁵, neither for men, nor for women. While women who left school in a bad economy do not seem to have been in their current job for a shorter period of time, men have a higher probability of being in their current job for less than one month (coeff : 0.074, significant at the 5% level). This is consistent with the idea that poor economic conditions at labour-market entry have a negative effect on job tenure. However, the fact that untreated individuals have an additional year of job experience as compared to treated ones (which is due to the fact that they entered the labour market one year earlier) could also account for this result. This effect should be captured by our DiD estimates, though. When implementing the DiD model on labour-market proxies, the effect on job tenure (i.e. being in a current job for less than one month) for men vanishes, suggesting that our previous result was mostly driven by job-experience effects. Other DiD estimates (not shown) are very similar to the ones presented in Table 7.

Overall, we do not find that leaving school in a bad economy has a lasting impact on labour-market outcomes 7 to 26 years after school-leaving. This is not really surprising, though, as we do consider low-educated individuals. Economic theory indeed predicts less persistence of poor economic conditions at school-leaving for low-skilled workers subsequent labour-market outcomes. Stevens (2007), Gaini et al. (2012) and Genda et al. (2010) provide evidence that the negative effect of graduating in a bad economy on labour-market outcomes vanishes after a few years (usually four or five) when considering low-educated individuals in Germany, France and the USA.

6.3 Robustness Checks

This section performs several robustness checks using our main specification (see Equation (1)).

³⁵Our results hold when estimating Tobit models for earnings (results not shown but available upon request)

6.3.1 Differential incentives to take GCE O-level/CSE examinations

One may worry that treated pupils have fewer incentives to take examinations at the end of Year 11. It might impact their educational achievement and later health outcomes. To control for this potential bias, we re-run our regressions controlling by a dummy variable indicating whether the individual holds a Year-11-equivalent qualification (O-level, CSE etc.). Our results are virtually unchanged.

6.3.2 Alternative empirical approach

Up to now, our treatment variable has been a dummy variable indicating whether an individual was born at the end of the calendar year or earlier in the year (see Equation (1)). A possible drawback of this approach is that it linearises the impact of the treatment across the two birth cohorts – which may be problematic to the extent that treated pupils do not face the same increase in school-leaving unemployment rates as compared to non-treated pupils across the two birth cohorts (a 0.7 and a 1.1 point increase respectively).

To deal with this potential problem, we estimate the following equation by standard probit :

$$H_i^* = \lambda + \pi UR_i + BirthYear_i + f(BirthMonth_i) + InterviewYear_i + \eta_i \quad (4)$$

where H_i^* denotes the latent health status of individual i and is still observed as a dummy variable. UR_i stands for the school-leaving unemployment rate faced by individual i and the other variables are presented in section 4.

Probit estimates of Equation (4) are presented in Table A1 and are very similar to the ones presented in the main analysis (see Table 4), although less precisely estimated. In particular, estimates in Table A1 imply that a one-point increase in school-leaving unemployment rates leads to a 10 percentage-point increase in the probability of reporting poor health (at the 10% significance level), and a 8 percentage-point increase in the probability of consulting a GP (at the 15% level) among women. As for men, a one-point increase in school-leaving unemployment rates leads to a 14 percentage-point increase in the probability of having ever smoked (although the effect is marginally significant at the 15% level). Using this specification, we also find that men’s health is negatively affected by poor economic conditions at labour-market entry : a one percentage-point increase in school-leaving unemployment rates leads to a 13 percentage-point increase in the probability of reporting poor health (at the 15% significance level) and a 7 percentage-point increase in the probability of restricting one’s activity due to illness or injury (at the 10% significance level).

7 Conclusion

In this paper, we investigate the impact of leaving school in a bad economy on long-term health status, health care consumption and health behaviours. We consider pupils in England and Wales who left school in their last year of compulsory schooling immediately after the 1973 oil crisis and whose school-leaving behaviour in worse economic conditions was exogeneously induced by compulsory schooling laws. We pro-

vide evidence that these pupils did not engage in endogeneous timing. We use a repeated cross section of individuals over 1983-2001 from the General Household Survey (GHS) and take a lifecourse perspective. We find that poor economic conditions at labour-market entry are particularly damaging to women's health. Women who left school in a bad economy are more likely to report poorer health and to consult the General Practitioner over the whole period under study (1983-2001). Additional evidence suggests that they are also more likely to suffer from a longstanding illness/disability over the whole period. As for men, the health impact of poor economic conditions at labour-market entry is more mixed. Men who left school in a bad economy seem to be negatively affected in various dimensions (smoking status, and to some extent health status), although these effects are not robust to all specifications. This may be due to a power problem, as our sample for men is smaller in size than that of women. Finally, we do not find any significant effects of poor economic conditions at labour-market entry on subsequent labour-market outcomes (from 7 to 26 years after school-leaving), which is consistent with the literature.

The large and lasting health-damaging impact that we find among women raises the issue of the mechanisms through which poor economic conditions at labour-market entry affect long-term health. Our results are consistent with both the "initial shock" and the "cumulative effect" hypotheses. Our data, however, do not permit to disentangle the two effects. A promising avenue for future research would consist in investigating which hypothesis is most likely to hold in the data.

There are some limitations to our study. The most notable is the small sample size, which generates quite imprecise results. In particular, the subsample of men is rather small, so that our results on this population cannot be interpreted as ruling out any damaging impact of poor economic conditions at labour-market entry on health outcomes.

A potential extrapolation of our findings is that the Great recession will have lasting and negative health effects among lower-educated individuals. However, the external validity of our findings depends on the similarity between the 1958 and 1959 GLS cohorts and current cohorts of school-leavers. In the mid-1970s, 50% of pupils left school at compulsory age, while less than 20% do so nowadays. Moreover, there is evidence that the 1973 oil crisis and the current Great recession did not have the same effects on unemployment rates, wages and working conditions in the UK Gregg and Wadsworth (2011). In this context, the extent to which our results can be generalized to young people who entered the labour market during the Great Recession is an open issue.

Bibliography

- ALLISON, P. (2012): “When Can You Safely Ignore Multicollinearity?” *Statistical Horizons*, September 10.
- ALMOND, D. (2006): “Is the 1918 Influenza pandemic over? Long-term effects of in utero Influenza exposure in the post-1940 US population,” *Journal of political Economy*, 114, 672–712.
- BANERJEE, A., E. DUFLO, G. POSTEL-VINAY, AND T. WATTS (2010): “Long-run health impacts of income shocks: wine and phylloxera in nineteenth-century France,” *The Review of Economics and Statistics*, 92, 714–728.
- BELL, D. N. AND D. G. BLANCHFLOWER (2011): “Young people and the Great Recession,” *Oxford Review of Economic Policy*, 27, 241–267.
- BERGER, M. C. (1985): “The effect of cohort size on earnings growth: A reexamination of the evidence,” *The Journal of Political Economy*, 93, 561–573.
- (1989): “Demographic cycles, cohort size, and earnings,” *Demography*, 26, 311–321.
- BETTS, J. R. AND L. L. MCFARLAND (1995): “Safe Port in a Storm: The Impact of Labor Market Conditions on Community College Enrollments,” *The Journal of Human Resources*, 30, pp. 741–765.
- BHATTARAI, K. (2011): “Impact of exchange rate and money supply on growth, inflation and interest rates in the UK,” *International Journal of Monetary Economics and Finance*, 4, 355–371.
- BOUND, J. AND D. A. JAEGER (1996): “On the Validity of Season of Birth as an Instrument in Wage Equations: A Comment on Angrist & Krueger’s “Does compulsory school attendance affect schooling and earnings?”,” National bureau of economic research (NBER) Working Paper No. 5835.
- BROWNING, M. AND E. HEINESEN (2012): “Effect of job loss due to plant closure on mortality and hospitalization,” *Journal of Health Economics*, 31, 599–616.
- BROWNING, M., A. MOLLER DANO, AND E. HEINESEN (2006): “Job displacement and stress-related health outcomes,” *Health Economics*, 15, 1061–1075.
- BRUNNER, B. AND A. KUHN (2014): “The impact of labor market entry conditions on initial job assignment and wages,” *Journal of Population Economics*, 27, 705–738.
- BUCHMUELLER, T. C., M. GRIGNON, F. JUSOT, AND M. PERRONNIN (2007): “Unemployment and mortality in France, 1982-2002,” Centre for Health Economics and Policy Analysis (CHEPA) Working paper 07/04, McMaster University.
- BURGESS, S., C. PROPPER, H. REES, AND A. SHEARER (2003): “The class of 1981: the effects of early career unemployment on subsequent unemployment experiences,” *Labour Economics*, 10, 291–309.

- CARD, D. AND T. LEMIEUX (2001): *An Economic Analysis of Risky Behavior Among Youth*, University of Chicago Press, Chicago, chap. Dropout and enrollment trends in the post-war period: what went wrong in the 1970s, pp 439–432.
- CAROLI, E. AND M. GODARD (2014): “Does Job Insecurity Deteriorate Health? A causal approach for Europe.” *Forthcoming in Health Economics*, doi: 10.1002/hec.3122.
- CHARLES, K. K. AND P. DECICCA (2008): “Local labor market fluctuations and health: is there a connection and for whom?” *Journal of Health Economics*, 27, 1532–1550.
- CLARK, D. AND H. ROYER (2013): “The effect of education on adult mortality and health : evidence from Britain,” *American Economic Review*, 103, 2087–2120.
- COCKX, B. AND M. PICCHIO (2013): “Scarring effects of remaining unemployed for long-term unemployed school-leavers,” *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 176, 951–980.
- CURRIE, J. (2009): “Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development,” *Journal of Economic Literature*, 47, 87–122.
- CUTLER, D., W. HUANG, AND A. LLERAS-MUNEY (2015): “When Does Education Matter? The Protective Effect of Education for Cohorts Graduating in Bad Times,” *Social Science & Medicine*, 127, 63–73.
- CUTLER, D. M. AND A. LLERAS-MUNEY (2006): “Education and health: evaluating theories and evidence,” National Bureau of Economic Research (NBER) Working Paper No. 12352.
- DAVE, D. M. AND I. R. KELLY (2012): “How does the business cycle affect eating habits?” *Social Science & Medicine*, 74, 254–262.
- DEB, P., W. GALLO, P. AYYAGARI, J. FLETCHER, AND J. SINDELAR (2011): “The effect of job loss on overweight and drinking,” *Journal of Health Economics*, 30, 317–327.
- DEE, T. S. (2001): “Alcohol abuse and economic conditions: evidence from repeated cross-sections of individual-level data,” *Health Economics*, 10, 257–270.
- DEL BONO, E. AND F. GALINDA-RUEDA (2007): “The long-term impacts of compulsory schooling : evidence from a natural experiment in school leaving dates.” *CEE Discussion Papers 0074, Centre for the Economics of Education, LSE*.
- DENMAN, J. AND P. McDONALD (1996): “Unemployment statistics from 1881 to the present day,” *Labour Market Trends*, 104, 5–18.
- DEVEREUX, P. J. AND R. A. HART (2010): “Forced to be rich? Returns to compulsory schooling in Britain,” *The Economic Journal*, 120, 1345–1364.
- DOBLHAMMER, G. AND J. W. VAUPEL (2001): “Lifespan depends on month of birth,” *Proceedings of the National Academy of Sciences*, 98, 2934–2939.

- DULEEP, H. O. (1986): “Measuring the effect of income on adult mortality using longitudinal administrative record data,” *Journal of Human Resources*, 21, 238–251.
- ECONOMOU, A., A. NIKOLAOU, AND I. THEODOSSIOU (2008): “Are recessions harmful to health after all?: evidence from the European Union,” *Journal of Economic Studies*, 35, 368–384.
- ELIASON, M. AND D. STORRIE (2009a): “Does job loss shorten life?” *Journal of Human Resources*, 44, 277–302.
- (2009b): “Job loss is bad for your health—Swedish evidence on cause-specific hospitalization following involuntary job loss,” *Social Science & Medicine*, 68, 1396–1406.
- FISCHER, J. A. AND A. SOUSA-POZA (2009): “Does job satisfaction improve the health of workers? New evidence using panel data and objective measures of health,” *Health Economics*, 18, 71–89.
- FLETCHER, J. M., J. L. SINDELAR, AND S. YAMAGUCHI (2011): “Cumulative effects of job characteristics on health,” *Health Economics*, 20, 553–570.
- FREDRIKSSON, P. AND B. ÖCKERT (2006): “Is Early Learning Really More Productive? The Effect of School Starting Age on School and Labor Market Performance,” IZA Working Paper No. 1659.
- GAINI, M., A. LEDUC, AND A. VICARD (2012): “A scarred generation? French evidence on young people entering into a tough labour market,” Institut National de la Statistique et des Etudes Economiques (INSEE), Working Paper DESE G 2012/05.
- GALAMA, T. J. AND H. VAN KIPPERSLUIS (2010): “A theory of socioeconomic disparities in health over the life cycle,” Tinbergen Institute Discussion Paper No. 10-079/3.
- GARDNER, J. AND A. J. OSWALD (2007): “Money and mental wellbeing: A longitudinal study of medium-sized lottery wins,” *Journal of Health Economics*, 26, 49–60.
- GENDA, Y., A. KONDO, AND S. OHTA (2010): “Long-term effects of a recession at labor market entry in Japan and the United States,” *Journal of Human Resources*, 45, 157–196.
- GERDTHAM, U. AND C. RUHM (2006): “Deaths rise in good economic times : Evidence from the OCDE,” *Economic and Human Biology*, 4, 298–316.
- GIBBONS, R. AND M. WALDMAN (2006): “Enriching a Theory of Wage and Promotion Dynamics inside Firms,” *Journal of Labor Economics*, 24, 59–108.
- GREGG, P. AND J. WADSWORTH (2011): *The labour market in winter: the state of working Britain*, Oxford University Press.
- GRENET, J. (2013): “Is extending compulsory schooling alone enough to raise earnings? Evidence from French and British compulsory Laws,” *The Scandinavian Journal of Economics*, 115, 176–210.
- GROSSMAN, M. (1972): “On the concept of health capital and the demand for health,” *The Journal of Political Economy*, 80, 223–255.

- GUSTMAN, A. L. AND T. L. STEINMEIER (1981): “The impact of wages and unemployment on youth enrollment and labor supply,” *The Review of Economics and Statistics*, 63, 553–561.
- GUTIÉRREZ-DOMÈNECH, M. (2008): “The impact of the labour market on the timing of marriage and births in Spain,” *Journal of Population Economics*, 21, 83–110.
- HAIR, F. J. J., R. E. ANDERSON, R. L. TATHAM, AND W. C. BLACK (1995): *Multivariate data analysis*, 3rd edn. New York: Maxwell Macmillan.
- HARMON, C. AND I. WALKER (1995): “Estimates of the economic returns to schooling in the United Kingdom,” *American Economic Review*, 85, 1278–1296.
- HASHIMOTO, Y. AND A. KONDO (2012): “Long-term effects of labor market conditions on family formation for Japanese youth,” *Journal of the Japanese and International Economies*, 26, 1–22.
- HERSHBEIN, B. J. (2012): “Graduating High School in a Recession: Work, Education, and Home Production,” *The BE journal of economic analysis & policy*, 12, 1–30.
- HESSEL, P. AND M. AVENDANO (2013): “Are economic recessions at the time of leaving school associated with worse physical functioning in later life?” *Annals of Epidemiology*, 23, 708–715.
- KAHN, L. B. (2010): “The long-term labor market consequences of graduating from college in a bad economy,” *Labour Economics*, 17, 303–316.
- KELLY, I. R., D. M. DAVE, J. L. SINDELAR, AND W. T. GALLO (2012): “The impact of early occupational choice on health behaviors,” *Review of Economics of the Household*, 10, 1–34.
- KESTENBAUM, B. (1987): “Seasonality of birth: two findings from the decennial census,” *Social Biology*, 34, 244–8.
- KESTERNICH, I., B. SIFLINGER, J. P. SMITH, AND J. K. WINTER (2014): “The effects of World War II on economic and health outcomes across Europe,” *Review of Economics and Statistics*, 96, 103–118.
- KONDO, A. (2007): “Differential effects of graduating during a recession across race and gender,” Institute for Social and Economic Research and Policy (ISERP) Working Paper No. 07-05.
- (2012): “Gender-specific labor market conditions and family formation,” *Journal of Population Economics*, 25, 151–174.
- KORENMAN, S. AND D. NEUMARK (1997): “Cohort crowding and youth labor markets: a cross-national analysis,” National Bureau of Economic Research (NBER) Working Paper No. 6031.
- LECHNER, M. (2010): “The estimation of causal effects by difference-in-difference methods,” University of St. Gallen, Department of Economics working paper series (2010-28).
- LINDEBOOM, M., F. PORTRAIT, AND G. J. VAN DEN BERG (2010): “Long-run effects on longevity of a nutritional shock early in life: the Dutch Potato famine of 1846–1847,” *Journal of health economics*, 29, 617–629.

- LENA-NOZAL, A. (2009): “The effect of work status and working conditions on mental health in four OECD countries,” *National Institute Economic Review*, 209, 72–87.
- MACLEAN, J. C. (2013): “The health effects of leaving school in a bad economy,” *Journal of Health Economics*, 32, 951–964.
- (2014a): “Does leaving school in an economic downturn impact access to employer-sponsored health insurance?” *IZA Journal of Labor Policy*, 3, 19.
- (2014b): “Does leaving school in an economic downturn persistently affect body weight? Evidence from panel data,” *mimeo*.
- (2014c): “The Lasting Effects of Leaving School in an Economic Downturn on Alcohol Use,” *Industrial and Labor Relations Review*, doi: 10.1177/0019793914556243.
- MACUNOVICH, D. J. (1999): “The fortunes of one’s birth: Relative cohort size and the youth labor market in the United States,” *Journal of Population Economics*, 12, 215–272.
- MCVICAR, D. AND P. RICE (2001): “Participation in further education in England and Wales: an analysis of post-war trends,” *Oxford Economic Papers*, 53, 47–66.
- MICKLEWRIGHT, J., M. PEARSON, AND S. SMITH (1989): “Has Britain an early school-leaving problem?” *Fiscal Studies*, 10, 1–16.
- MORIN, L.-P. (2011): “Cohort size and youth earnings: evidence from a quasi-experiment,” Canadian Labour Market and Skills Researcher Network (CLSRN) Working Paper No. 85.
- NEUMAYER, E. (2004): “Recessions lower (some) mortality rates : evidence from Germany,” *Social Science & Medicine*, 58, 1037–1047.
- O’CALLAGHAN, E., T. GIBSON, H. A. COLOHAN, D. WALSHE, P. BUCKLEY, C. LARKIN, AND J. L. WADDINGTON (1991): “Season of birth in schizophrenia. Evidence for confinement of an excess of winter births to patients without a family history of mental disorder.” *The British Journal of Psychiatry*, 158, 764–769.
- OREOPOULOS, P. (2006): “Estimating average and local average treatment effects of education when compulsory schooling laws really matter,” *American Economic Review*, 96, 152–175.
- OREOPOULOS, P., T. VON WACHTER, AND A. HEISZ (2012): “The short-and long-term career effects of graduating in a recession,” *American Economic Journal: Applied Economics*, 4, 1–29.
- PLUG, E. J. (2001): “Season of birth, schooling and earnings,” *Journal of Economic Psychology*, 22, 641–660.
- ROBONE, S., A. M. JONES, AND N. RICE (2011): “Contractual conditions, working conditions and their impact on health and well-being,” *The European Journal of Health Economics*, 12, 429–444.

- RUHM, C. (2000): “Are Recessions Good For Your Health?” *The Quarterly Journal of Economics*, 115, 617–650.
- RUHM, C. J. (2003): “Good times make you sick,” *Journal of Health Economics*, 22, 637–658.
- (2004): “Macroeconomic conditions, health and mortality,” National bureau of economic research (NBER) Working Paper No. 11007.
- (2005): “Healthy living in hard times,” *Journal of Health Economics*, 24, 341–363.
- SALM, M. (2009): “Does job loss cause ill health?” *Health Economics*, 18, 1075–1089.
- SCHOAR, A. AND L. ZUO (2011): “Shaped by booms and busts: How the economy impacts CEO careers and management styles,” National bureau of economic research (NBER) Working Paper No. 17590.
- SHAM, P. C., E. O’CALLAGHAN, N. TAKEI, G. K. MURRAY, E. H. HARE, AND R. M. MURRAY (1992): “Schizophrenia following pre-natal exposure to influenza epidemics between 1939 and 1960.” *The British Journal of Psychiatry*, 160, 461–466.
- SHARP, C., D. HUTCHISON, AND W. KEYS (2002): “Comparing School Systems to Explain Enduring Birth Date Effects: A Response to McDonald (2001),” *Compare*, 32, 239–241.
- SMITH, J. P. (2004): “Unraveling the SES: health connection,” *Population and Development Review*, 30, 108–132.
- STEVENS, K. (2007): “Adverse Economic Conditions at Labour Market Entry: Permanent Scars or Rapid Catch-up,” Department of Economics, University College London, Job Market Paper.
- SULLIVAN, D. AND T. VON WACHTER (2009): “Job displacement and mortality: An analysis using administrative data,” *The Quarterly Journal of Economics*, 124, 1265–1306.
- VAN DEN BERG, G. J., M. LINDEBOOM, AND F. PORTRAIT (2006): “Economic conditions early in life and individual mortality,” *The American Economic Review*, 96, 290–302.
- WATSON, C. G., T. KUCALA, C. TILLESKJØR, AND L. JACOBS (1984): “Schizophrenic birth seasonality in relation to the incidence of infectious diseases and temperature extremes,” *Archives of General Psychiatry*, 41, 85–90.
- WELCH, F. (1979): “Effects of cohort size on earnings: the baby boom babies’ financial bust,” *The Journal of Political Economy*, 87, S65–S97.
- WHO (2000): “The implications for training of embracing : a life course approach to health,” World Health Organization (WHO).
- WOLBERS, M. H. (2007): “Employment Insecurity at Labour Market Entry and Its Impact on Parental Home Leaving and Family Formation A Comparative Study among Recent Graduates in Eight European Countries,” *International journal of comparative sociology*, 48, 481–507.

Figure 1: The evolution of health depending on the scenario.

Reading : The red dashed curves show the potential scenarios for treated individuals, whereas the black solid curve presents the evolution of health for those who are untreated. The blue vertical line stands for the entry on the labour market.

Figure 2: Compulsory schooling rules by month-year of birth

Birth year (1)	Month of birth (2)	School starting date (3)	Allowed to leave school (4)
1958	January	Sept. 1963	Easter 1974
1958	February	Sept. 1963	May/June 1974
1958	March	Sept. 1963	May/June 1974
1958	April	Sept. 1963	May/June 1974
1958	May	Sept. 1963	May/June 1974
1958	June	Sept. 1963	May/June 1974
1958	July	Sept. 1963	May/June 1974
1958	August	Sept. 1963	May/June 1974
1958	September	Sept. 1964	Easter 1975
1958	October	Sept. 1964	Easter 1975
1958	November	Sept. 1964	Easter 1975
1958	December	Sept. 1964	Easter 1975
1959	January	Sept. 1964	Easter 1975
1959	February to August	Sept. 1964	May/June 1975
1959	September to December	Sept. 1965	Easter 1976

Figure 3: Focus on the 1958 birth cohort

Reading : A pupil born between the 1st of September 1958 and the 31st of December 1958 is allowed to leave school at Easter 1975.

Figure 4: Unemployment rates for all individuals aged 16-64 over the 1973-1979 period, seasonally adjusted.

Source : Labour Force Survey (LFS), provided by the Office for National Statistics (ONS).

Figure 5: Proportion of pupils leaving school at compulsory age among the treated and the non-treated; Growth in school-leaving unemployment rate.

Reading: Figure 5 displays the proportion of pupils leaving school at compulsory age among the treated (in red) and non-treated group (in blue); The dashed green line shows the growth in school-leaving unemployment rate (calculated for the March-June period) faced by pupils belonging to the youngest school cohort (treated) – compared to pupils born the same year but belonging to the previous school cohort (non-treated).

Figure 6: Health behaviour for men

(a) Ever smoked

Note : Interview-year specific marginal effects of the treatment are computed by estimating Equation (1) and substituting the interaction term $T_i * InterviewYear_i$ for T_i .

Figure 7: Health status for women

(a) Poor health

Note : Interview-year specific marginal effects of the treatment are computed by estimating Equation (1) and substituting the interaction term $T_i * InterviewYear_i$ for T_i .

Figure 8: Health care for women

(a) GP consultation

Note : Interview-year specific marginal effects of the treatment are computed by estimating Equation (1) and substituting the interaction term $T_i * InterviewYear_i$ for T_i .

Table 1: Summary statistics of demographic and health variables

	Men			Women		
	Mean	s.e	<i>N</i>	Mean	s.e	<i>N</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Demographics						
Age	33.20	(4.20)	1096	31.19 ^a	(5.00)	1921
Health status						
Poor self-rated health (yes/no)	0.30	(0.46)	1044	0.34	(0.47)	1909
Longstanding illness/disability (yes/no)	0.26	(0.44)	1096	0.23	(0.42)	1917
Restricts activity due to longstanding illness/injury (yes/no)	0.08	(0.27)	1095	0.13	(0.33)	1920
Health care						
GP consultation last 2 weeks (yes/no)	0.12	(0.32)	1094	0.21	(0.41)	1920
Outpatient/inpatient spell last 12 months (yes/no)	.16	(.37)	1094	.24	(.43)	1918
Health behaviours						
Smoking status			619			1029
Currently smokes (yes/no)	0.43	(0.50)		0.42	(0.49)	
Has smoked but does not anymore (yes/no)	0.33	(0.47)		0.27	(0.44)	
Ever smoked (yes/no)	0.76	(0.43)		0.69	(0.46)	
Self-reported drinking behaviour			597			945
High to moderate alcohol consumption (yes/no)	0.52	(0.50)		(0.34)	0.47	

Notes : ^a : Women are on average younger than men because they are observed over the whole period (1983-2001) while men are only observed over 1986-2001 (see Table 3).

Table 2: Summary statistics of labour-market characteristics

	Men			Women		
	Mean	s.e	<i>N</i>	Mean	s.e	<i>N</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Economic status			<i>1096</i>			<i>1920</i>
Employed or self-employed (yes/no)	0.84	(0.37)		0.58	(0.49)	
Unemployed (yes/no)	0.10	(0.31)		0.06	(0.23)	
Keeping house (yes/no)	0.01	(0.09)		0.34	(0.47)	
Other (yes/no)	0.05	(0.21)		0.02	(0.15)	
For those currently employed or self-employed						
Usual gross weekly earnings from main job (in pounds)	283.72	(880.68)	<i>819</i>	109.92	(99.03)	<i>970</i>
Time with present employer			<i>724</i>			<i>861</i>
Less than 1 month (yes/no)	0.02	(0.13)		0.03	(0.17)	
Between 1 and 3 months (yes/no)	0.04	(0.20)		0.06	(0.24)	
Between 4 and 6 months (yes/no)	0.04	(0.20)		0.06	(0.24)	
Between 7 and 12 months (yes/no)	0.08	(0.27)		0.11	(0.31)	
Between 1 and 5 years (yes/no)	0.20	(0.40)		0.34	(0.47)	
Five years or more (yes/no)	0.61	(0.49)		0.38	(0.49)	

Table 3: Number of observations by survey wave and birth cohort

	Men	Women	All
	(1)	(2)	(3)
Survey wave			
1983	-	159	159
1984	-	153	153
1985	-	127	127
1986	100	130	230
1987	92	140	232
1988-1989	83	140	223
1989-1990	82	102	184
1990-1991	74	126	200
1991-1992	107	124	231
1992-1993	76	97	173
1993-1994	85	109	194
1994-1995	93	98	191
1995-1996	71	121	192
1996-1997	92	118	210
1998-1999	62	85	147
2000-2001	79	92	171
Birth cohort			
1958	544	972	1516
1959	552	949	1501
Total number of observations	1096	1921	3017

Notes: (1) The GHS was conducted annually, except for breaks in 1997-1998 when the survey was reviewed, and 1999-2000 when the survey was redeveloped. (2) Month and year of birth in 1983-1985 are only available for women who completed the Family Information section. They are available for all respondents over 1986-2001.

Table 4: The impact of leaving school in a bad economy on health outcomes (1958-59 cohorts)

	Men			Women		
	m.e.	s.e.	<i>N</i>	m.e.	s.e.	<i>N</i>
<i>Probit regressions</i>						
Health status						
Poor self-rated health	0.081	(0.078)	1043	0.106*	(0.057)	1907
Longstanding illness/disability	-0.034	(0.069)	1095	0.051	(0.051)	1915
Restricts activity	0.056	(0.045)	1094	0.040	(0.041)	1918
Health care						
GP consultation last 2 weeks	-0.001	(0.049)	1093	0.119**	(0.052)	1918
Hospital consultation	0.000	(0.058)	1095	0.026	(0.051)	1919
Health behaviour						
Currently smokes	0.093	(0.105)	618	0.042	(0.079)	1027
Ever smoked	0.170**	(0.078)	618	0.086	(0.071)	1027
Moderate to heavy drinking	-0.028	(0.107)	596	0.012	(0.080)	943

Notes : *** p-value<0.01, ** p-value<0.05, * p-value<0.1. Marginal effects (m.e.) are presented (computed as marginal probability effects at the sample mean value of the regressors). Robust standard errors in parentheses (s.e.). Our models include dummy variables for interview and birth year as well as a linear function of age in months – see Equation (1).

Table 5: Placebo test on health outcomes (1953-54 cohorts)

	Men			Women		
	m.e.	s.e.	<i>N</i>	m.e.	s.e.	<i>N</i>
<i>Probit regressions</i>						
Health status						
Poor self-rated health	-0.059	(0.095)	631	-0.073	(0.071)	1204
Longstanding illness/disability	-0.007	(0.092)	664	0.047	(0.066)	1210
Restricts activity	0.012	(0.058)	663	-0.002	(0.045)	1213
Health care						
GP consultation last 2 weeks	-0.047	(0.051)	664	-0.008	(0.056)	1211
Hospital consultation	-0.105	(0.061)	664	-0.089	(0.054)	1213
Health behaviour						
Currently smokes	-0.035	(0.127)	390	0.073	(0.098)	653
Ever smoked	0.050	(0.089)	362	0.052	(0.081)	653
Moderate to heavy drinking	-0.177	(0.132)	372	-0.001	(0.097)	617

Notes : *** p-value<0.01, ** p-value<0.05, * p-value<0.1.. Marginal effects (m.e.) are presented (computed as marginal probability effects at the sample mean value of the regressors). Robust standard errors in parentheses (s.e.). Our models include dummy variables for interview and birth year as well as a linear function of age in months – see Equation (1).

Table 6: Differences-in-differences analysis : the impact of leaving school in a bad economy on health outcomes

	Men			Women		
	coeff	s.e.	<i>N</i>	coeff	s.e.	<i>N</i>
<i>Linear probability models</i>						
Health status						
Poor self-rated health	0.014	(0.049)	1674	0.061*	(0.033)	3111
Longstanding illness/disability	0.013	(0.047)	1759	0.063**	(0.030)	3125
Restricts activity	0.017	(0.030)	1757	0.025	(0.023)	3131
Health care						
GP consultation last 2 weeks	0.008	(0.033)	1757	0.075***	(0.028)	3129
Hospital consultation	-0.052	(0.039)	1759	0.017	(0.029)	3132
Health behaviour						
Currently smokes	0.010	(0.068)	1008	-0.027	(0.046)	1680
Ever smoked	0.018	(0.052)	1008	0.013	(0.042)	1680
Moderate to heavy drinking	-0.084	(0.069)	968	0.035	(0.046)	1560

Notes : *** p-value<0.01, ** p-value<0.05, * p-value<0.1. Marginal effects are obtained by estimating Equation (3) and computed as marginal probability effects at the sample mean value of the regressors. Robust standard errors in parentheses (s.e.).

Table 7: The impact of leaving school in a bad economy on labour-market outcomes (1958-59 cohorts)

	Men			Women		
	m.e.	s.e.	<i>N</i>	m.e.	s.e.	<i>N</i>
<i>Probit regressions</i>						
Economic status						
Keeping house	0.017	(0.033)	495	0.053	(0.057)	1918
Unemployed	0.017	(0.050)	1095	-0.002	(0.026)	1918
For those currently employed						
Less than 1 month	0.074**	(0.048)	512	0.034	(0.037)	805
Less than 3 months	0.022	(0.048)	613	0.053	(0.059)	861
Less than 6 months	0.001	(0.057)	723	0.029	(0.068)	861
Less than 1 year	0.053	(0.078)	723	-0.035	(0.077)	861
Less than 5 years	0.046	(0.098)	723	-0.091	(0.089)	861
More than 5 years	-0.046	(0.098)	723	0.091	(0.089)	861
<i>Linear regressions</i>						
Earnings (log)	-0.041	(0.094)	799	-0.115	(0.151)	957

Notes : *** p-value<0.01, ** p-value<0.05, * p-value<0.1. Marginal effects (m.e.) are presented (computed as marginal probability effects at the sample mean value of the regressors). Robust standard errors in parentheses (s.e.). Our models include dummy variables for interview and birth year as well as a linear function of age in months – see section 4.

A Tables

Table A1: The impact of leaving school in a bad economy on health outcomes : An alternative approach using school-leaving unemployment rates (LFS)

	Men			Women		
	m.e.	s.e.	<i>N</i>	m.e.	s.e.	<i>N</i>
<i>Probit regressions</i>						
Health status						
Poor self-rated health	0.127 ^μ	(0.082)	1043	0.101*	(0.059)	1907
Longstanding illness/disability	-0.031	(0.076)	1095	0.066	(0.053)	1915
Restricts activity	0.074*	(0.043)	1094	0.034	(0.041)	1918
Health care						
GP consultation last 2 weeks	0.026	(0.054)	1093	0.078 ^μ	(0.051)	1918
Hospital consultation	-0.029	(0.063)	1095	0.018	(0.054)	1919
Health behaviour						
Currently smokes	0.076	(0.114)	618	0.043	(0.084)	1027
Ever smoked	0.144 ^μ	(0.097)	618	0.126	(0.078)	1027
Moderate to heavy drinking	0.022	(0.117)	596	0.023	(0.085)	943

Notes : *** p-value<0.01, ** p-value<0.05, * p-value<0.1, ^μ p-value<0.15. Marginal effects (m.e.) are presented (computed as marginal probability effects at the sample mean value of the regressors). Robust standard errors in parentheses (s.e.). Our models include dummy variables for interview and birth year as well as a linear function of age in months – see Equation (4).

B Data appendix : Sample and variable construction

B.1 Changes to sampling procedures and sample sizes over time

According to the GHS Time Series Dataset User Guide (2007), "the sampling procedure used on the GHS has changed over time, resulting in different sample sizes between survey years. However, the changes to the GHS sample procedures and sample size were relatively small. As a result it was decided by ONS that these changes were likely to have little impact on the reliability of the estimates. Particularly as a representative sample of the population has been achieved for each survey year."

Non-response weights are only available in the GHS after 2000. As a consequence, all our estimates are unweighted.

B.2 Inconsistencies in variables over time

According to the GHS Time Series Dataset User Guide (2007), "in general variables in the GHS have remained fairly consistent over time. However as the GHS has been revised and research interests have changed, some variables have been modified over the past 30 years to reflect this. For example the marital status variable was revised in the 1986 survey to include a category for cohabitation. Similarly, some questions were only included on a few survey years, or in more recent rounds of the survey series, which limits analysis over time."

Those variables that were only available for a few years, or had substantially changed over time were not used in the analysis.

C School leaving age legislation in England and Wales

Relevant extracts of the 1962 Education Act are borrowed from Del Bono and Galinda-Rueda (2007).

Education Act 1962: relevant extracts from Section 9

Applies to 15 year old individuals in 1963, i.e. people born in 1947 or afterwards.

(2) If he attains that age on any date from the beginning of September to the end of January, he shall be deemed not to have attained that age until the end of the appropriate spring term at this school.

(3) If he attains that age on any date on or after the beginning of February but before the end of the appropriate summer term at his school, he shall be deemed not to have attained that age until the end of that summer term.

(4) If he attains that age on any date between the end of the appropriate summer term at this school and the beginning of September next following the end of that summer term (whether another term has then begun or not) he shall be deemed to have attained that age at the end of that summer term. [...]

(7) In this section, "the appropriate spring term", in relation to a person, means the last term at this school which ends before the month of May next following the date on which he attains the age in question, and "the appropriate summer term" [...] means the last term at this school which ends before the month of September next following that date [...].

Education School leaving Act 1976: relevant extracts from Section 1

Subsections (3) and (4) in Section 9 of the Education Act of 1962 were substituted by the following subsections of Section 1 of the Education School leaving Act 1976 in order to give a more precise meaning to the notion of school leaving dates, particularly for those born after the end of January.

(3) If he attains that age after the end of January but before the next May school leaving date, he shall be deemed not to have attained that age until that date.

(4) If he attains that age after the May school leaving date and before the beginning of September next following that date, he shall be deemed to have attained that age on that date. A new subsection was added at the end of Section 9 of the Education Act of 1962, according to which:

(8) In this section the May school leaving date means the Friday before the last Monday in May.