SOME RECENT DEVELOPMENTS IN LABOUR ECONOMICS

Peter J. Dolton*

This article takes a short personal 'helicopter ride' over the main policy issues in the UK labour market, putting them into the context of the developments which have taken place in applied econometrics. We overview NIESR's role in the study of labour economics in postwar Britain and review some recent advances of importance in the current Institute research agenda.

Keywords: labour economics, unemployment, education, training, minimum wages, immigration.

JEL codes: J0, J3, J5, J6.

Introduction

We are witnessing major events in the labour markets of the world's economies. There are mounting pressures to migrate from less developed countries. We are rightly concerned about the balance of wages and labour market opportunities by gender and ethnicity. We are alarmed by the projections of inequality across generations and its possible consequences for economic growth. The balance of how public-sector wages are determined and revised, relative to private sector jobs – and the consequences – have never been more precarious. The role of government in determining minimum wages and migration rules and quotas is less certain than ever. How increasing use of robots, 'big data' and machine learning will affect our working hours is uncertain in a world of zero hours contracts and the 'gig economy'. The appropriate level of individual and state investment in conventional forms of education and training to maximise returns is now less than clear. The role that social media and informal networks play in our decisions and life outcomes is only just being understood. Unemployment, relatively speaking, seems to be less of a problem that it was in the past – but why does so much poverty and inequality persist?

Labour economists have sought to understand all these changes using the tools of rigorous econometric models. Advances in these methods have called into question some of our earlier findings and overturned previously long held views which are arguably now outdated.

This overview article provides a personal 'helicopter ride' over these major questions and the past and current NIESR agenda of analysis and appraises how new econometric tools may help us provide new answers to some of these key questions. Along the way we will draw out the themes of how empirical econometric work, although constrained by data availability and technical computing issues, has developed. We will pause in the conclusion to review how some present limitations hold back labour economists from analysing the key issues of the day for the UK economy.

The main questions of empirical labour economics

Some of the most fundamental concerns of policy relevant labour economics in the UK in the past 50 years have been: the wage elasticity of labour supply for men and women; the measuring of gender (and other forms of) discrimination in the labour market; the rate of return to education and policy implications for university fees and the funding of higher education; is there such a thing as 'overeducation' and what are the consequences of educating young people to education levels they may not use in their jobs in the future; the role of training in manpower planning and specifically the role of the firm in the provision of specific and general training; the effect of mass youth unemployment training programmes; the effect of the National Minimum Wage on employment and earnings; the impact of immigration on employment and earnings of indigenous workers; unemployment duration and the effects of unemployment benefit on the incentive to work and the role of active

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Table 1. Number of articles containing keywords in the *National Institute Economic Review* (NIER) from 1959–2018

Keywords	Number of titles containing keywords in NIER
Labour market	1584
Unemployment	1500
Wages	1499
Trade Unions	1493
Productivity	1469
Pensions	682
Minimum Wages	559
Education	552
Training	529
Inequality	157
Discrimination	148
Immigration	171
Poverty	89

Source: http://journals.sagepub.com/home/ner.

labour market policies to alleviate unemployment; the relationship between working hours and productivity; the reasons why productivity is falling – this is known as the 'productivity puzzle' in the UK; the increase in income inequality and the extent to which it is caused by skill-biased technical change; the consequences of wages settlement disparities in the public and private sectors; the role of trade unions in determining wages and conditions of work and the reason for the demise in trade union membership; the determination of pensions and the role of pension reform in the determination of lifetime income and retirement decisions.

This list is not exhaustive, but still it is not possible to overview all these developments in this confined space. Table 1 gives a fair reflection of the emphasis of research in labour economics at NIESR on different topics over the years – although, of course, only a fraction of the authors are or have been on the staff at NIESR. The table tabulates the number of titles of articles appearing in the *National Institute Economic Review* (NIER) which contain specific key words. In what follows we zoom in on some of those topics that have preoccupied prominent former colleagues and current NIESR labour economics staff providing a perspective on labour trends over time and the prevailing applied econometric methodology. First, however, we need to contextualise the developments which have taken place in applied econometrics.

The econometric methodology of labour economics

Arguably, labour economics and econometrics as subjects were born around the same time, in the early 1930s – econometrics with the writings of Frisch, Koopmans, Tinbergen, and Marschak and others in the Cowles Foundation[1] and labour economics with the books by Hicks (1932) and Douglas (1934). By the early 1960s the first undergraduate textbooks in the two subjects appeared, Johnston (1963) in econometrics, and Phelps Brown (1962) and Robertson (1961) in labour economics. The early preoccupations of the two subjects strongly influenced each other, the modelling of time series fluctuations and the business cycle naturally lending itself to considerations of modelling aggregate demand, employment and unemployment. It is evident that the developments and advances in labour economics have been amongst the first fields on economics to take on board the latest advances in econometrics. In turn, the questions thrown up by attempting to model the duration of unemployment, the effect of human capital acquisition on earnings – and many other questions – have undoubtedly clarified the minds of econometricians to study the questions of parameter identification and sensitivity and the extent to which such estimates can, or cannot, be regarded as causal. Clearly much of what is studied in labour economics today is only possible with modern econometric methods. But equally, many of those methods would not have been developed without the stimulus of labour economists asking applied econometric questions.

It is perhaps useful to characterise the development of labour economics over the past 40 years into five generations according to the type of applied work that has been undertaken and the prevailing dominant methods of the age. These methods were, in part at least, driven by the availability of data, but also in part by the speed of computing power and the advances in statistical and econometric methodology. The reasons for characterising these developments is that the methods used have partly determined the kinds of questions which can be addressed by labour economists. It is not the place of this overview to describe these methods fully as this is done elsewhere (van der Klaauw, 2014).

1st Generation: Observational descriptive statistics and basic time series econometric analysis (up to around 1970)

This work was based on simple estimation of basic regression models applied to basic aggregate variables which were, for the most part, measured from official statistics over time. The catalyst for a huge literature on the macroeconomic time series analysis of unemployment was the seminal paper by Phillips (1958).This work did

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not have the benefit of large administrative data, cohort data or panel data. The overriding concern became the modelling of multiple equation systems using OLS, 2SLS and 3SLS. These modelling concerns facilitated the development of large-scale macroeconomic models of the economy.[2] The available data limited the questions which could be addressed and these methods also underwent a major revolution when the problems of spurious regression and stationarity were highlighted by Granger and Newbold (1974). Unsurprisingly, since then the focus in labour economics has been more microeconometric.

2nd Generation: Selectivity/endogeneity modelling and instrumental variables (1974 onwards)

The whole issue of endogeneity and sample selection bias was brought into sharp focus by Heckman (1979) and others from 1974 to 1979. The first questions that were addressed with these methods were to examine specifically female labour supply and labour force participation along with assessment of the negative income tax experiments. It was found that the relevant estimated labour supply elasticities were considerably affected by selectivity bias if the appropriate selection methods were not used. The estimation methods which became current, and are still used today in many areas in economics, were pioneered for use in labour economics.[3] They involved the use of two-stage estimation methods with strong assumptions regarding identifying exclusion restrictions or the suitability of Instrumental Variables (IV) – the econometric theory of which had been developed decades earlier by Sargan (1958) and others. Many of the advances in this field used newly available panel data and called for careful examination of what the multi-equation structure was and which variables were appropriate exclusion restrictions in any specific equation in order to ensure that the models were identified. These methods of estimation are still in vogue amongst current PhD students largely as a result of the success of the 'Mostly Harmless' book by Angrist and Pischke (2008) which devoted over 100 pages to extolling the virtues of IV estimation methods.

3rd Generation: Duration data, structural models and Bayesian methods (1979 onwards)

As panel and cohort data became available three further estimation modelling methods have also been used by labour economics which are not so straightforward to characterise. Duration data modelling beginning with the seminal contributions of Nickell and Lancaster (see Lancaster, 1979) were widely used to study the duration of unemployment and specifically involved the 'hazard function estimation' of the probability of leaving unemployment at time, T, given that the state had not been left up until time T: structural models which explicitly model dynamic lifetime decisions taking into account lifetime constraints and future uncertainty by using backward induction methods. Examples of the use of this technique in economics has been in modelling job search and the transitions of young people through states and into the labour market (see Wolpin, 1987). A third method used by a limited number of labour economists has been Bayesian estimation methods. This involves explicitly modelling posterior distributions of parameters of interest based on assumptions on the underlying likelihood function and priors to model the data.

4th Generation: Counterfactuals, statistical matching and experimental methods (1983 onwards)

The pioneering paper of Rosenbaum and Rubin (1983) on statistical matching signalled a new era of evaluation methodology predicated on being able to fix up non-random selection into treatment by matching the members of the treated and control group. This method and all its variants became the *de facto* standard for doing the Active Labour Market Policy evaluations of training on JTPA and other major US programmes. The methods have been widely adopted the world over as a way of trying to perform evaluations of policy interventions when there is non-random selection into the treatment.

5th Generation: Bounds, RDD, LATE, partial identification, non-parametric, experimental methods, network and analysis and cross-section dependence (1999 onwards)

If one were to attempt to summarise and characterise the direction of applied empirical work in labour economics over the past 10–20 years it would be to say that the emphasis is now on the attempt to identify 'causal parameter estimates' which suggests definitively that a change in the regressor of interest would lead to a change in the outcome variable of policy concern. The current holy grail in labour economics (and other fields) is for the estimation of a relationship which yields a policy parameter of direct policy interest but can be estimated via a form of 'natural or other experiment' and the outcome can be assured. Arguably exploiting changes in the compulsory School Leaving Age – a Regression Discontinuity Design (RDD) – or relaxing the underlying assumptions on regression to yield only weak inequalities which define bounds on the range of parameter estimates

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– Bounds Analysis (or Partial Identification) are techniques which have attractive properties in certain contexts with specific data. Likewise exploiting other changes in the law or further social experiments afford the applied empirical researcher an opportunity to be able to identify a parameter of considerable policy importance. It is highly likely that these estimation methods will only become more important in labour economics research into the future.

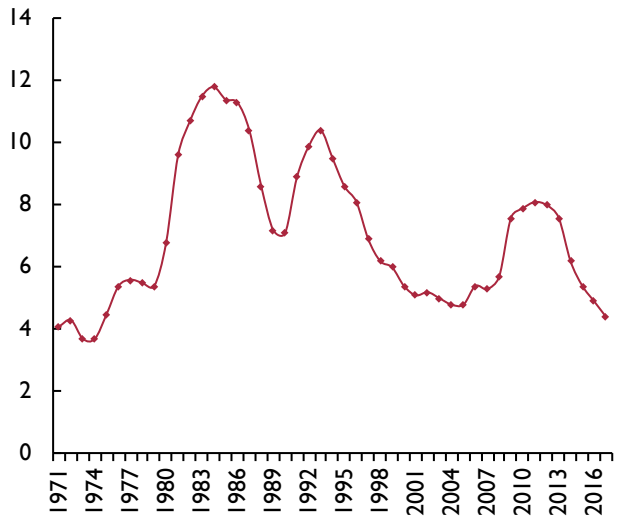
Some recent developments and priorities in UK empirical labour economics

Unemployment

An examination of figure 1 provides all the motivation which is needed to understand the huge interest which was generated by the large rise in unemployment in the UK which went from a steady state full employment rate of 2–4 per cent in the 1960s and early 1970s to a huge high of around 13 per cent by 1984. There is no doubt that the biggest economic issue of the 1980s in the UK (and other advanced countries) was the high level of unemployment and all its attendant problems. Many of these years from 1980–90 were also accompanied by very high levels of inflation and high average earnings growth as shown in figure 2. This figure shows that for much of the period from 1964 up until 2008 earnings were growing faster than the RPI. Since the Great Recession of 2008 the reverse has been true.

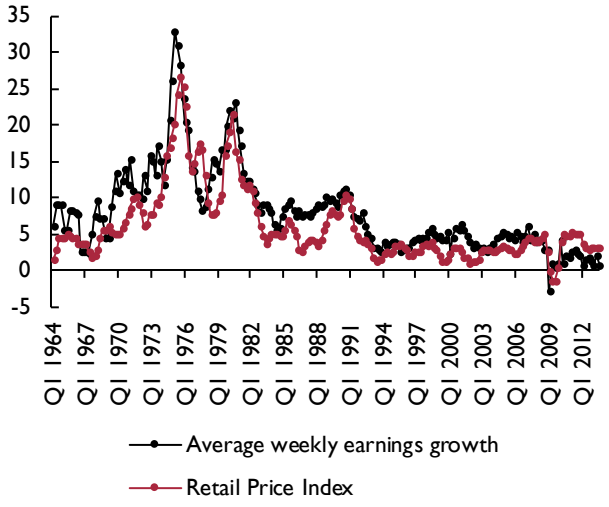
An early exposition of the unemployment problem was presented in the paper by Bowers *et al.* (1972), which set out how unemployment was related to vacancies in the standard Unemployment-Vacancy (U-V) relationship and provided early applied econometric evidence. An example of an article in the NIER which contributed hugely to the understanding of unemployment is that by Layard and Nickell (1985) which actually contained the main ideas in their seminal book with Jackman (Layard *et al.* 1991). The NIER was also up to the mark in tracking the implications of early aggregate macro modelling and of the real-wage employment debate and publishing articles which simulated reforms and shocks – for example Andrews *et al.* (1985). This work naturally led to NIESR's macro-economic model becoming one of the key forecasting tools to track the British economy. It remains so, despite many other macro models having fallen by the wayside. The emphasis on the study of unemployment as the major problem in the British economy was also recognised in the invitation of Dow (1991) to present the Keynes Lecture to the Royal Academy on the same topic. Here the emphasis was explicitly on how the economy was in a high unemployment–high wage inflation trap and setting this position into some historical context. The theme was further continued by Britton (1994) who focussed his discussion on how a return to full employment may be possible. Many of the issues that were important around this period were brought together by NIESR staff and others in the edited volume on the UK labour Market (Barrell, 1994). Later, Riley and Young (2007) considered the effects of technology shocks and changes in the supply of skilled labour for full employment, quantifying these

Figure 1. Unemployment rate aged 16 and over (seasonally adjusted)



Source: ONS.

Figure 2. Annual percentage change in nominal wages compared to RPI inflation Q1 1964 to Q1 2013



Source: ONS.

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effects in an empirical framework that built on the NIESR's macroeconomic model.

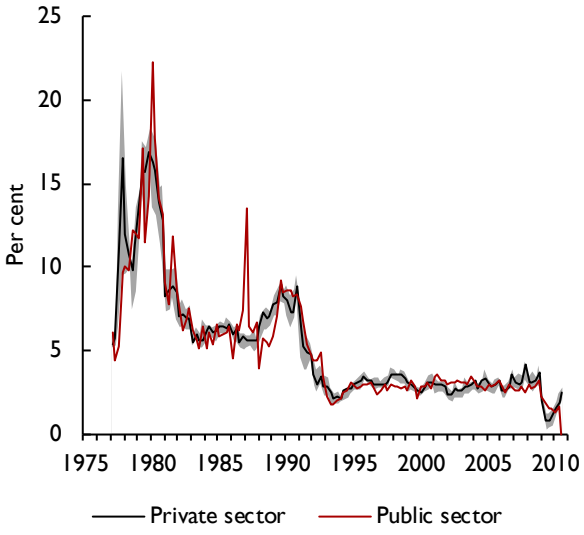
Wrapped up in the problem of high aggregate unemployment was the tricky problem of the high and persistent problem of the disproportionally high level of youth unemployment. This problem was studied by Hart (1988) in some detail using first generation econometric methods. Second and third generation methods were being used around the same time (Dolton, 1993, and Dolton *et al*. 1994) to study the youth labour market, youth unemployment and the effects of training. Third and fourth generation methods have also been used by current NIESR staff to study unemployment duration and the effects of both the Restart unemployment programme (Dolton and O'Neill, 1996, 2002 and Boys *et al*. 2007) and the New Deal programmes. NIESR studies have also considered the effects of interventions to reduce the time spent out of work amongst lone parents and sick or disabled people (Kirby and Riley, 2004).

Public-private wage settlements and pensions

Figures 3 and 4 summarise the position in the UK economy in relation to public and private sector wage increases. Over the long run, in figure 3 we see that the period of huge pay rises in the late 1970s and early 1980s have led into a period of real stability when, specifically, the Pay Review Bodies (PRBs) have done an excellent job of keeping pay rises in the public sector in check. However, as figure 4 shows, since the crash of 2008 annual public sector wage rises in the UK have basically been pegged at 0 or 1 per cent in order to keep a tight control over public spending and exercise fiscal restraint. During this time private sector wages have been rising – mainly in line with inflation. This has now created a sizeable gap between public and private sector wages in the economy. These pressures have built up with the declining real value of earnings in the public sector. Matters are now coming to a head. Most recently NHS staff have been given a three-year pay deal which will give them around a 6 per cent pay hike on average. The details of this deal are that it is skewed towards the lowest paid in the NHS. This will inevitably lead to knock-on effects throughout the other public sector pay review bodies and their remit groups (see Dolton *et al*., 2014). This then prompts clearly important questions: firstly, how will these pay rises be afforded; secondly, will they give rise to inevitable tax rises to pay for them; and finally what will be the knock-on consequences for future wage and price inflation in the UK economy and its consequences for the UK economy? These basic motivations have been behind the recent work by Dolton *et al*. (2018) looking into the extent to which public sector wage increases cause private sector pay increases or vice versa in both the short or long run.

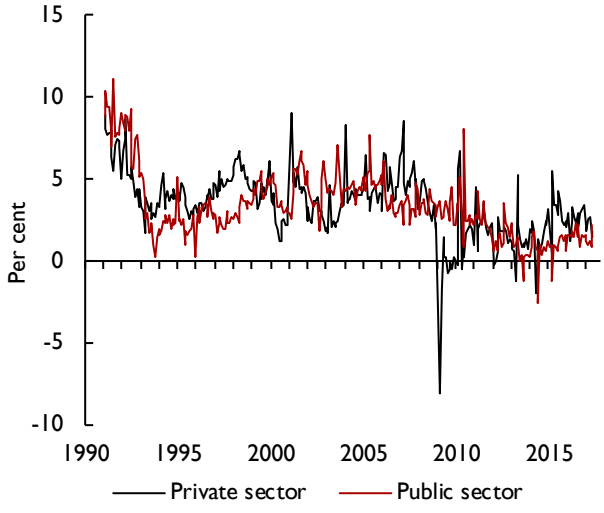
The real pattern of wage increases in the public sector is that wage increases in the public and private sector tend to follow each other with a lag. Determining whether it is public sector pay that follows private sector pay, or the reverse is true, is not a straightforward matter and

Figure 3. Pay settlements (average, interquartile range over sectors)



Source: CBI, IDS, IRS.

Figure 4. Average weekly earnings growth (incl. bonuses and arrears)



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requires careful econometric analysis. What is clear is that PRBs do look at the level of the RPI and private sector wage increases in the previous year in making their recommendations. What is also likely is that higher private sector wages will have an effect on the price of goods and services and the RPI with an appropriate lag. But equally, higher public-sector wages must be paid for by higher taxes, and so this will also have some effect on inflation.

It is best to consider public and private sector wage comparisons in terms of wage increases as any analysis based on levels of actual pay is fraught with comparability problems. On average, public-sector workers earn more than private sector workers – but they typically have very different jobs with different qualifications and years of professional training. These complexities are abstracted from if we consider changes in pay rather than the absolute level of pay. There are some other important complications to this story. Specifically, public sector jobs tend to have: longer holidays, shorter working hours, less chance of redundancy and better pensions. Until recently most public-sector pension schemes have been based on a final salary (defined benefit) scheme which gives retirees some fraction of their final salary based on their years of service. For example, civil servants used to have a scheme which was in 60ths – so that a worker serving 30 years could retire on half their final pay.

In contrast, private sector employees were more usually in defined contribution (DC) schemes where they pay the same fraction of their earnings into a pot each year and the total is then used to buy an annuity on retirement. Typically, these schemes were much less generous. In compensation, many comparable jobs are more highly paid in the private sector than their counterparts in the public sector. So, there was a 'compensating wage differential' paid to private sector employees in recompense for their worse conditions of service. Typically, private sector workers are paid more, earlier in their career, but suffer later on and particularly so into their retirement. All this means that simple wage comparisons are not sensible. What needs to be done is to factor all compensation conditions into the calculation of 'Total Reward' – i.e. the value of pay and pensions and conditions of employment over the whole life cycle.

The tentative findings are that it is the private sector (and especially the manufacturing sector which induces and drives the public-sector increases). We are presently extending this research to examine explicitly: the role of globalisation and the traded sector, intra sectoral shocks and employment flows and the role of labour market trade union pressures. Our research could have important implications for understanding how pay settlements across sectors condition the forces in the UK economy.

Since 2008 virtually all public-sector pensions have been converted to Career Average schemes from Defined Benefit (DB) schemes (See Danzer and Dolton, 2012 and Danzer *et al*., 2016). This major change was necessary to balance the public sector fiscal position. What has gone largely uncommented on is that this will cause a seismic shift in personal income and wealth of individuals. For most public-sector workers, it will leave them between 10–40 per cent worse off in terms of the real value of their pension when they retire relative to the generation who retired on a full DB pension from an equivalent job. (Danzer and Dolton, 2012; Danzer *et al*., 2016). The incontrovertible truth is that individuals are not saving enough for their retirement and to meet the cost of their own health and social care into old age. The state is largely withdrawing from its responsibilities in this area and, as yet, individuals have not understood that these reforms will leave them much poorer into their old age. Further NIESR research is underway to examine how much worse the situation on public sector pensions has become over the past four years and what the implications might be.

Wages, poverty, discrimination and intergenerational inequality

An important area of policy which has been an underlying theme to research work at NIESR relates to wages, poverty and inequality. The first definitive empirical data studies of wages and pay by occupation were conducted in the 1950s and 1960s at NIESR (see Chapman and Knight, 1953, and Routh, 1965). These are still the standard works on the subject. In addition, the first systematic overview of postwar poverty in Britain was published by NIESR in 1973 (see Fiegehen *et al*., 1973).

Path-breaking work of considerable policy importance was also done at NIESR by Ermisch on a series of questions relating to lone parenthood (Ermisch, 1991) and other key aspects of the economic consequences of demographic change including pensions and housing considerations of the UK ageing population.

A major concern for the medium-term future for the UK are the forces which are shaping intergenerational

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inequality. None other than David Willetts (2010), former government minister, quite clearly predicted the consequences of rising student loan debt, the longer lag between young people getting jobs and getting on the housing ladder and the prospect of poorer pensions discussed above. He suggests that the older generation have been 'ripping off' the younger generation. How we solve this problem when the old still vote in large numbers to safeguard their inflation-proofed old age pensions and preserve social care budgets is a question which no government seems to be willing to tackle for fear of being cast out of office (or never getting into office in the first place). The consequences of events and politics over the post-crash period from 2008 onwards on intergenerational inequality needs to be comprehensively reappraised.

One of the current important areas of recent UK government policy is in the area of gender pay discrimination policy. There is a huge literature on the measurement of discrimination, appropriate decompositions, and empirical estimation which uses 2nd and 3rd generation estimation methods (see Dolton and Makepeace, 1986a, 1986b, 1987, 1993, and Dolton *et al.*, 1996). In 2017 the government issued an instruction to compel all firms who employ over 250 employees to publish their pay gap between men and women within the company. This policy is naïve for a number of important reasons. Firstly, it disregards the important conditioning information which is necessary to contextualise what any employee is paid. The distribution of earnings by gender conditional on experience, qualifications, levels of responsibility and other characteristics is the most relevant. Secondly it disregards the endogeneity of labour force participation and household decision making. A basic gender gap or even simple means could arguably be worse than using anything. At best these reported pay gaps could be wrong; at worst they could be downright misleading.

Education and training

A prominent theme in the work of NIESR since the 1980s has been the study of education, qualifications and training: its provision, organisation, comparison across countries, and its consequences in terms of the quality of labour, return to education and ultimately labour productivity.[4] Sig Prais, Hilary Steedman and co-authors published in excess of 30 articles on this subject. It would be no exaggeration to say that NIESR led the field in the rigorous assessment of qualifications, education and training assessment during this period. (See for example, Prais, 1993 and 1995). There has also been a steady stream of research on the wider relationship between education and economic performance (see Worswick, 1984). Research work in this area on the assessment of apprenticeships and vocational qualifications continues today at NIESR with the joint venture of the Centre for Vocational Education Research with the LSE.

One area of huge importance and many papers is the estimation of the rate of return to education (RoRtE). Many papers published by prominent authors in the 1980s and 1990s suggested, using 2nd generation IV methods, that the RoRtE could be as high as 15 per cent. If true this would mean that a massive expansion of further and higher education was justified. Hence, we had policy advisers and politicians strongly advocating a large expansion of universities. Indeed, over this period there was a large rise in staying on at school and, in turn a large rise in higher education participation.

A recent paper (Dolton and Sandi, 2017), has revisited the empirical literature RoRtE in the UK. Courtesy of exogenous UK government school leaving-age reforms, this is a particularly interesting setting to investigate this important parameter. The paper's contribution to the debate is twofold. First, it examines the robustness of the papers based on UK data which rely on the Raising of the School Leaving Age (ROSLA) IV. They do this by using all the available data and examining the sensitivity of the results to the specification of the polynomial used to describe the assignment variable (i.e., date of birth) away from the Regression Discontinuity Design (RDD) threshold. The replication analysis attests to the sensitivity of previous RoRtE estimates to the specific functional form chosen. Since, in reality, the 'true function' is not known, the analysis highlights the importance of reporting goodness-of-fit tests and checking the robustness of RDD analysis to alternative polynomials of the controls. Since the analysis is in a context where more informative instrumental variables were available to retrieve the RoRtE, this conclusion is particularly relevant.

This paper also generalises the IV approach of the previous papers by using the month of birth in conjunction with the ROSLA in the calculation of a more accurate IV. The analysis provides more consistency in the results with RoRtE estimates generally found at 6 per cent. By redefining the instrument to reflect directly the extra exogenous education administered to the treated population, the authors find estimates of the RoRtE that are close to the lowest in the literature at 6 per cent.

The main conclusion of this empirical research is that the RoRtE based on the ROSLA policies in the UK is 6 per

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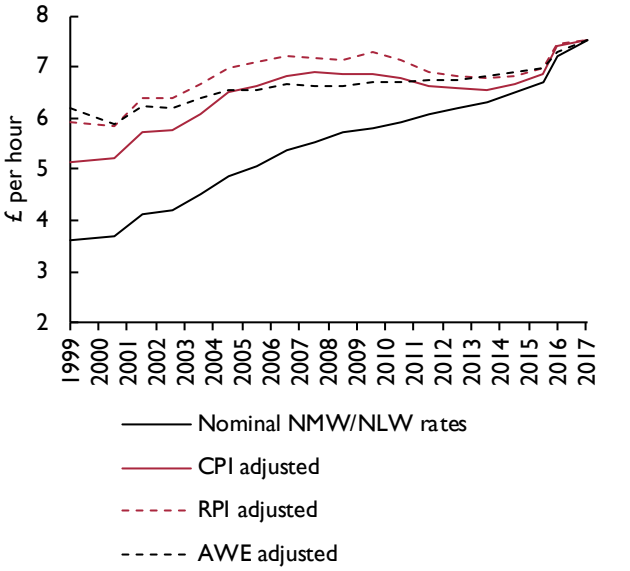
cent for males. Compared to previous estimates, these results are more robust to the inclusion of alternative controls and the generalisation of the binary ROSLA IV. The results show the use of more general IVs estimates which are smaller and more precise. But the general finding is a caution to all applied work – namely that estimates appear very sensitive to the specification used to describe the underlying unobservable trends in education and earnings in the data: the estimates range from 5–6 per cent and are statistically significant when using polynomials of order three or four to 0–3 per cent and non-statistically significant when using polynomials of order one and two, further reflecting the importance of reporting goodness-of-fit tests and checking the robustness of RD analysis to alternative polynomials. Such findings have a potentially massive importance to education policy and the continued expansion of university places when much of the latter was based on the spurious rationale of a RoRtE of around 15 per cent. Using IV methods Kirby and Riley (2008) also estimated the return to an additional year of schooling in the UK to be 6 per cent for males, but argued that the social return to schooling was greater than this due to externality effects.

With the massive expansion of higher education also came the move from student grants to fees and loans. This change was initiated by the Dearing Report in 1994 but many of the most sensible suggestions mooted at the time were not taken up (see Dolton *et al.*, 1997). These included having a variable university fee which could vary by subject and institution. It currently makes no sense that the student who studies medicine at Cambridge pays the same fee as someone studying the history of art at a little known former college. The consequences are that currently we have a crisis relating to mounting student debt for large numbers of graduates with little chance of ever getting a graduate job at a decent salary. Differential fees by subject and institution would allow the market to work and over time students would be able to make much more informed decisions which related to their future earnings potential. These problems are still at the heart of the current looming university funding crisis which promises to be a real problem if, and when, the next government either decides to cut fees in half (the Conservatives) or abolish fees altogether (the Labour Party).

Trade unions, industrial relations and the minimum wage

By any standards the introduction of the National Minimum Wage (NMW) and its new version of the National Living Wage have been a huge success. Almost all the literature which has assessed the effects of the policy on employment have found zero or only modest negative effects. At the same time the positive effects on reducing inequality have been clear and marked. One fact that is seldom understood is that the NMW, since its introduction, has marched ahead of average earnings, the RPI and the CPI over the period to 2017. This is shown in figure 5 which graphs the value in £ per hour of the relative value of each of these quantities back over time. So, the NMW was £3.50 per hour in 1999 and this has risen to £7.50 per hour by 2017. In contrast £7.50 in 2017 deflated by the RPI or CPI would have been worth over £6.00 per hour. Likewise, Average Earnings has only risen from a little over £5.00 per hour to £7.50 per hour over the same 1999–2017 period. This means that those in receipt of the NMW and now the NLW have got steadily better off relative to those in work but who are paid just above the NMW or the NLW. Arguably, this means that the segment of the population who have fared the worst in relative terms over the past 20 years are not those in receipt of the NLW, but those in work on low pay.

Figure 5. Real and relative value of the NMW/NLW, UK, 1999–2017



Source: LPC estimates based on ONS data: AEI including bonuses (LNMQ) 1999–2000, AWE total pay (KAB9) 1999–2017, CPI (D7BT) 1999–2017, and RPI (CHAW) 1999–2017, quarterly, seasonally adjusted (AEI and AWE only), UK (GB for AEI and AWE).
Notes: The AWE series began in January 2000 and the AEI series ended in July 2010. Our earnings series is estimated using AEI (including bonuses) from April 1999–January 2000 and AWE (total pay) from January 2000–April 2017.

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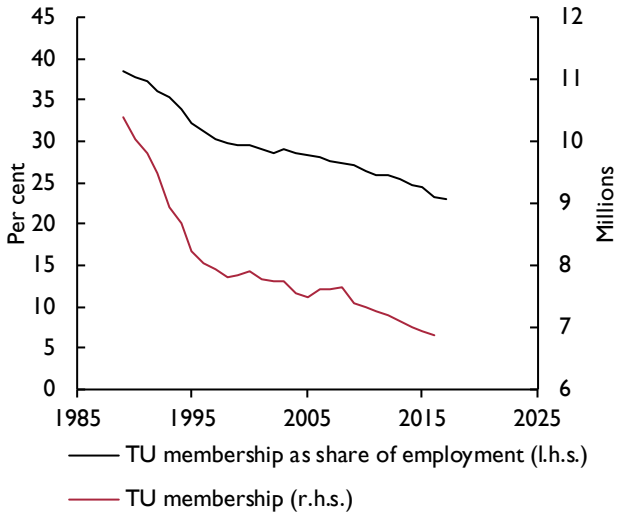
Since the Blair government introduced the NMW into the UK in 1999 there has been a constant stream of papers attempting to identify the consequences. For the most part, these papers have used a naïve form of the 2nd Generation approach to the question and run models of employment (or other outcomes) on some measure of the strength or 'bite' of the NMW – as measured by the Kaitz index.[5] These papers largely ignore the thorny issue of the endogeneity of the NMW variable (Kaitz index) as well as the autoregressive properties of the employment variable in the model. Clearly the concern is that the relative measure of the MW variable may be directly affected by the level of employment or unemployment in the economy and hence the simultaneous use of this variable as if it were an exogenous explanatory variable may be spurious. To analyse this problem Dolton *et al.* (2015) utilised a dynamic specification with a lagged employment variable that serves as further 'control' for that (potential) part of the MW variable that is influenced by the employment rate in previous periods. The results suggested that the bite of the MW does not explain changes in employment.[6]

The conclusion from their spatial model estimations is that overall there may be incremental employment effects of upratings to the MW in a year-on-year context. The years where the estimations revealed a small positive coefficient are 2003, 2004, 2007 and 2010 which are historically some of the years when the NMW uprating started to exceed the RPI rise in the cost of living and hence the uprating of the NMW was relatively generous and where there is a boom in the economy and hence a potential measurement error problem in the modelling of employment. In contrast, the underlying effect of the presence of the NMW is reflected in the Kaitz index coefficient. In the spatial models this coefficient is nearly always negative and significant suggesting that the effective implementation of the NMW has an underlying negative impact on employment. It should be stressed that the measured marginal effects were consistently attenuated when they condition out for the presence and severity of the recession in the regional context. These conclusions are robust to two different definitions of the geography used to perform the estimation. Additionally, they remain after utilising a non-parametric estimation for the variance-covariance matrix.

The findings are interesting as they rationalise the controversial debate in the literature as to why one might get negative impacts of the MW – i.e. due to the effect of the presence of the MW rather than its uprating. The results are also consistent with much of the recent literature focusing on the introduction

Figure 6. Trade union membership



Source: ONS, based on LFS.

of the NMW but also because they explain why it may be possible to get both zero and positive effects. These results thus present quite a departure from the literature, which has studied the employment effects of the minimum wage but never distinguished between the effect of imposing a MW and uprating the MW on a regular basis. Kennan's (1995, pg. 1955) excellent review of Card and Krueger (1995) argues that when studying the effects of minimum wages on employment "*we are looking for employment rate changes of about one percentage point, and such changes happen all the time, even from one month to the next. In short, we are looking for a needle in a haystack*" [emphasis added]. I agree with this conclusion and accordingly suggest the total effect of invoking and uprating a MW will nearly always be insignificantly different from zero. This also demonstrates that the reason for some of the literature finding positive effects of the MW is that it does not distinguish between the issues of: spatial dependence, the endogeneity of the MW (in the form of the Kaitz index), recessionary demand shocks, and the steady state trend in the employment series. The suggestion from this UK evidence is that failing to take account of these complications could lead to spuriously positive (or negative) MW effects with underestimated standard errors where strong spatial dependence is clearly present. Although the evidence in Dolton *et al.* (2015) is only for one country, the results suggest it may be possible to reconcile the perennial debate between the pro and anti-MW lobbies. Dickens *et al.* (2014) use fifth generation RDD methods to study the effects of

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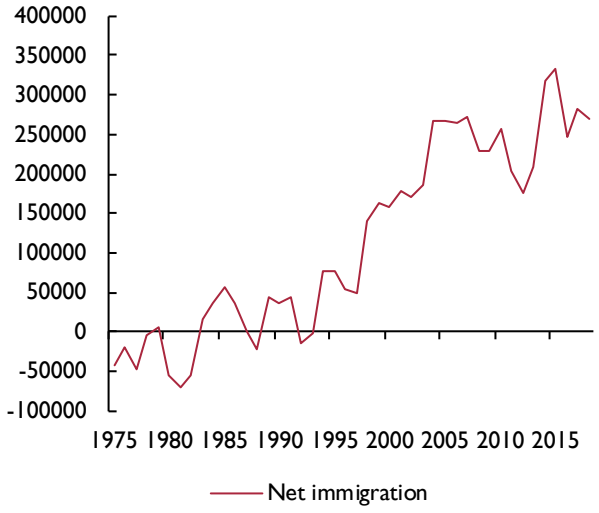
the change in the rate of the NMW when individuals qualify for the adult rather than the young adult rate. In this setting they find that the higher minimum wage increases the rate of employment of low-skilled individuals.

A major change in the UK labour market from the mid 1980s onwards has been the dramatic fall in trade union membership. Figure 6 graphs this, both in terms of the absolute number of trade union members (right hand scale), and also the fraction of those who are employed who are in a union (left hand scale). This trend was in large part a result of the Thatcher reforms of industrial relations which also saw a dramatic fall in strike activity. A key paper, by Brown and Wadhwani (1990) which analysed the economic effects of this legislation since 1979 was published in the NIER. It suggested, rather controversially, that the suggested effects of this legislation on wages and employment did not occur and that these legislative changes did not provide improvements in productivity.

Immigration and the consequences of Brexit

The topic of immigration is now of major concern to the UK. One of the earliest pioneering 1st generation type studies on the topic was completed at NIESR by Jones and Smith (1970). They found that immigration had no depressing effect on wages or output per head – this sounds familiar – but it was not known in 1970. They did however suggest that policies to encourage regional dispersion of migrants was desirable. Although hugely controversial at the time, it is clear that unquestionably NIESR was nearly 50 years ahead of its time in this field too! An important paper published a full 40 years later in the NIER, by Wadsworth (2010) clearly set out the evidence which was being accumulated by the Migration Advisory Committee (MAC) and signalled a more rigorous approach to the evaluation of migration policy. This approach was clearly necessary in the light of the massive rise in net immigration into the UK between 1975 and 2018. Figure 7 charts this rise, which culminated in a net inflow, at its height in 2016 of nearly 350,000 people a year. Mitchell *et al.* (2011) suggested that much of this rise may be associated with immigration policy in the UK and abroad. Arguably many have seen this large rise as a major contributory explanation of the Brexit referendum vote in 2016.

Figure 7. Net immigration numbers to the UK 1975–2018



Source: Long-term migration by citizenship data, ONS.

Interest in the economic effects of migration at the NIESR and elsewhere revived after the expansion of the European Union in 2004, with Riley and Weale (2006) investigating the pattern of European migration into the UK. Fast forward to today and there is no doubt that the UK stands on the edge of a massive change assuming that Brexit takes place. There is huge interest in this topic and the papers by Portes (2016a, 2016b) in the NIER on the possible consequences of Brexit are amongst the most widely downloaded. It seems likely that the free movement of labour across Europe will cease sometime in the next 1–5 years. What might be the consequences for the UK? The truth is that nobody knows. In a recent report for the Cavendish Coalition (Dolton *et al.*, 2018) NIESR examined the position of health workers in the NHS over the past 3–4 years. Using data from around 300 NHS Trusts we were able to chart the inflows and outflows by nationality into all the main categories of hospital jobs over the whole UK through these 300 or so NHS Trusts. There is good detailed evidence of what has been happening since the UK Brexit referendum. Understandably we have not been able to recruit the same numbers of doctors and nurses from the EU as before and it is also clear that many of these EU staff employed in the UK in recent years are now deciding to return to Europe. Perhaps even more disturbing still is that this research found evidence that higher NHS staff turnover has a link to worse patient outcomes.

Recently NIESR (Aitken *et al.*, 2018) was engaged to examine the employment and wage consequences of migration by the MAC from the Home Office. It is revealing that the most up to date previous evidence published in 2012 by Manacorda *et al.* (2012) uses data which end in 2005. It speaks volumes that our work, which is yet to be finalised, is virtually alone in attempting to provide

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an up to date econometric assessment of these important relationships. This is perhaps one of the more important short-run questions for the UK economy – what will be the consequences of Brexit for UK manpower into our key occupations. At present, it is very hard to predict the future position if we do not know what will be the outcome of the Brexit negotiations. Specifically, will free movement of labour be abandoned, and if so what will replace it in terms of visas and work permits and what might be the effect of such policies on the employment of key groups of manpower where we presently rely heavily on overseas immigration? We cannot assume that simply encouraging high-skilled immigrants and putting a block on low skilled immigrants as suggested by the MAC is the full answer. Where do many of the UKs crop pickers, retail serving staff, bar staff, cleaners presently come from?

Networks

In all of the 1st to 4th generation applied econometric work in labour economics the modelling assumption is that the units of observation are independent. Clearly, this is not true if people are connected to others via networks of social media, firms relate to their competitors or suppliers or over geographical areas which have contiguous areas next to them and there are spillover effects. In labour economics, the most common concern has been that individuals, say in a class of pupils, have interaction with their peers. One can write the basic form of the 'peer effects' or Linear in Means model as:

$$y = \alpha\iota + \beta Gy + \gamma x + \delta Gx + \varepsilon \qquad (1)$$

where y is some outcome of interest, written in vector form, for K individuals. The vector x is some exogenously determined characteristic of these individuals[7] and G is the adjacency matrix characterised by zeros and ones to indicate non-connection and connection between individuals respectively. We also assume that $E(\varepsilon|x,G) = 0$. This assumption implies that the x and G are exogenous to the determination of unobserved heterogeneity. Such an assumption is a major limitation of the model. Note also that, for estimation, some assumption needs to be made about $E(\varepsilon\varepsilon')$. Given the structure of the model it is unlikely that it is realistic to assume that $E(\varepsilon\varepsilon') = \sigma^2 I$. This in turn implies that $E(yy')$ will have a non-standard form and this could pose additional problems. Alternatively, certain kinds of variance-covariance restrictions could provide opportunities for identification. This provides a logical link to the spatial econometrics literature in which some specific form is assumed for the Variance-Covariance structure – usually geographical contiguity or some other instrument. (See Dolton *et al.*, 2015, for an example applied to the spatial identification of minimum wage effects.)

This model suggests that each person's outcome could be a function of the average of other's outcomes to whom they are connected and possibly to the average of other's characteristics. The former effect, captured by β, is called the *endogenous effect*. The latter effect, captured by δ, is the *exogenous effect*. This model has been used by lots of authors to attempt to capture – so-called – 'peer effects' by simply including the mean values of peer's y's and x's as regressors in their outcome equation. Regrettably it is usually the case that these network effects are either not identified or it is hard to interpret exactly what is being measured by their estimation.

So far the results in the labour economics literature have not taken into account networks and cross-section dependences. In essence, this ignores the most difficult problem. Namely, how do we proceed when the G adjacency matrix is endogenous – so that the process by which people form links to other members in a network is determined by unobserved heterogenous factors – like personality, charisma, energy, drive, enthusiasm, sense of humour, and other character traits – which themselves may also be important in the determination of any outcome of interest. In this situation, it will potentially be difficult to determine effects which are due to the true endogenous (or exogenous) effect of networks rather than to the process of the formation of a network – how can I be sure that I have estimated the endogenous effect of having obese friends, on my obesity, when the impact could really be down to the fact that I hang out with people like myself in terms of personality and outlook on life and they just happen to be obese? The practical econometric problems of identifying network effects are summarised by Dolton (2017a) and Barbone and Dolton (2018) find good evidence that high school network effects are significant in later career earnings using a generalisation of an IV identification strategy on the G contiguity matrix directly. These pioneering methods could have important applications in any situation where we are modelling units of observation which are not iid. This is a very common scenario in labour economics.

The future of work and working hours

Working hours in most countries have been falling over the past 50–100 years (Dolton, 2017b). The trend has accelerated in the past 20 years. There are numerous potential drivers of this trend, including: changing demand conditions, shifts in preferences over labour–leisure trade-offs, active pressure from employee trade unions, technological advances improving workplace

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productivity, enlightened governments introducing maximum working hours legislation, and demographic changes in the pattern of work by men and women. It would be difficult to econometrically disentangle the relative importance of these different factors.

Although working hours across the world are falling, considerable heterogeneity remains. In some countries people work 70 per cent more hours per year, on average, than in other countries. Much of this variation is due to differences in the prevalence of part-time work and patterns of female labour market participation. Some redistribution of market work is clearly taking place within the household. Lower working hours do not necessarily mean lower total output or lower productivity. As working hours decrease, workers focus more on work–life balance considerations and how to spend their leisure time.

On the negative side, labour markets in many countries are still not very flexible – in that hours of work cannot be chosen by many employees. Not all workers are experiencing lower working hours; for example, some highly educated workers are now working longer hours. The onset of advanced technology and increasing use of robots is likely to affect the availability of routine jobs and the demand for labour for many low and semi-skilled workers. The distributional and welfare implications of lower working hours are not completely clear and could cause greater inequality.

Looking ahead, the question of how reducing working hours will affect productivity is significant. In addition, how individuals divide up their leisure and work time and what is the appropriate work–life balance in an increasingly technological future are important concerns. Declining working hours, their variation, and their distribution over different occupations and sectors is a topic of great importance. There is constant pressure to reduce working hours on grounds of work–life balance considerations. There is debate as to whether and how this can be achieved through technological change, without causing a regressive redistribution of income away from less skilled workers. This balance will be a major challenge to policy makers.

Cautions and looking to the future

If pressed to draw some personal conclusions from this brief overview I would suggest that there is no substitute for careful rigorous applied econometric work. The principles of data replication and the careful re-estimation of basic underlying models when new data or new estimation methods are discovered are central to good applied economics. Another issue of importance is that the UK now lags behind other countries, notably the Scandinavian countries, in making administrative and census data available to researchers. What is of great value in this field is being able to link different public administrative datasets together to answer new questions. A notable example that would make a huge difference to labour economics is the proper use of merged individual tax data from Her Majesty's Revenue and Customs (HMRC). Access is limited and so far, very restricted. Of course, we must ensure all the data security and ethical safeguards of data access are in place. But this is done in other countries and the UK is now well behind in making this happen. A further important example is the access to detailed geographical location coding and the possibility to merge data on these locations into our data on people, or firms etc. One of the examples discussed above (Dolton *et al.*, 2015) has relied on the use of detailed geographic data and it can make a big difference. Often, for many of our most valuable datasets this information is supressed. I optimistically expect to see these data restrictions change in the next few years.

On a bleaker note, I am less confident about the future health of funded research in applied economics in the UK and fear for the smaller and smaller number of Economics Departments that are left in our universities. The elite in our profession who edit and publish in the top five general journals in economics (predominantly edited from the US) are largely uninterested in mainstream applied economics or the empirical reality of the UK labour market. The issue is compounded by the fact that, as Heckman and Moktan (2018) have actually shown, these journals have a disproportionate influence on publishing and tenure decisions in the profession which itself is inward looking and approving of those inside the circle – and this may not be efficient (Akerlof, 2017). In addition, another Nobel laurate, Deaton (with Cartwright 2016) has warned of blanket use of RCTs in situations where they may not be applicable. Indeed, there are many circumstances where the extensive margin and external validity of estimated parameters of interest to policy makers have been jettisoned in the quest for 'causal estimation' using models in an experimental setting which they argue are preferably since they have a 'structural interpretation'. Often the parameters reported are now not of general policy relevance to policy makers in the UK. Their 'causal' interpretation within a narrow model appeals to editors as it helps to push economics closer to the status of economics as a science. The reality is that it takes it ever further away from what the real issues are for the economy. The Economics panel in the University Research Excellence Framework (REF) exercise rank and reward highly papers in these 'top five' journals.

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The irony is compounded by the fact that the REF now wants to reward research work that has a 'high impact factor' – where basically impact is measured by writing a paper that 'actually changes policy' – and is credited accordingly. Little of the research cited in the impact factor statement is also listed in the top ranked papers submitted to the REF exercise proper. In short – 'the emperor has no clothes' and there are few establishment economists who are prepared to say so (cited recent papers by US Nobel Laurates excepted). This is at the heart of what is wrong with UK economics. Policy makers need more work that actually influences policy and matters for the economy and attaches less weight to research which examines more technical models and estimates parameters which have little relevance to the UK economy. Arguably, this is what NIESR has always tried to do.

In summary, we must be careful in our quest for ever more rigorous 'causal estimates' not to hunt precision of parameter estimates at the cost of ignoring the real policy related (externally valid) parameters which are harder to estimate but have real relevance to policy makers. If economists vacate the policy domain in the search for ever more, top-five journal articles, we will find, to our cost, that other 'policy wonks' are only too happy to inhabit this space and fill the ears of politicians with advice based on defunct political dogma or poorly constructed aggregate statistics, unfounded assertions and mere hunch.

NOTES

1 See Morgan (1990) for detailed references.
2 See Barrell *et al.* (2018) for a review of NIESR's important continuing role in this macro-modelling.
3 See Maddala (1983) for a comprehensive survey.
4 A separate article considers this topic in its own right (see Mason *et al.* in this *Review*).
5 The Kaitz index is the NMW expressed as a fraction of the average (or median) wage (sometimes expressed proportional to a measure of concentration).
6 NIESR staff have contributed a number of studies to this literature focusing on the employment impact of the NMW, e.g. Dickens *et al.* (2015).
7 Note that x could be a set of chracteristics with no loss of generality.

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