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A search for evidence of skill mismatch in the aftermath of the great recession

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Using matched individual-level data from the Current Population Survey, this article identifies a significant trend shift upwards in schooling among prime-age labour force leavers following the 2008–2009 recession. However, further evidence discredits skill mismatch as an explanation for that trend shift.

Keywords: skill mismatch; great recession; labour force participation; labour supply; educational attainment

JEL Classification: J24; J21; J22; E24

I. Introduction

School enrolments are typically found to be counter-cyclical. The opportunity cost of taking time out of the labour force declines during recessions, increasing the incentive to continue or return to school in order to improve post-recession labour market outcomes. Barr and Turner (2012) find that post-secondary enrolment response varies substantially across demographic groups and that the response was significantly greater during the Great Recession of 2008–2009. Barr and Turner (2012) find that increased generosity of student financial aid, classification of formal education by a state as 'training' for purposes of Unemployment Insurance (UI) receipt, and the unprecedented extension of UI benefits all contributed significantly to the rise in post-secondary enrolments during the Great Recession.

The purpose of this article is to test an additional hypothesis that might explain higher enrolments during the Great Recession and its aftermath – skill mismatch. Skill mismatch is often suggested as a reason why labour market weakness lingered well beyond the official end of the recession (for example, see Estavao and Tsounta, 2011; Charles *et al.*, 2012; Sahin *et al.*, 2012). If in response to the economic crisis, and in an effort to boost productivity, employers reclassified tasks across occupations, requiring more and different skills for those occupations than were required before the recession, then workers re-entering the labour market post-recession will find their skills are misaligned with employers' demands. A natural response would be for workers to go back to school to realign their skills with the needs of the labour market. We find no evidence that increased schooling was in response to widespread skill mismatch, suggesting, rather, that lower opportunity cost and other factors noted by Barr and Turner (2012), such as changes in student loan and unemployment insurance practices, are the more likely explanations for the unprecedented rise in schooling during and after the Great Recession.

II. Data

The Current Population Survey (CPS) is a monthly survey administered by the US Bureau of Labor Statistics (BLS) in order to assess the activities of the population and to

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estimate current labour market statistics. Each person in the CPS is interviewed for four consecutive months, not interviewed for eight months, and then interviewed again for four months. Hence, we can identify those people who were in the labour force last year (either employed or unemployed) and not in the labour force this year, and why they are not in the labour force.[1] These individuals will be referred to as labour force leavers. In addition, we also know which industry and occupation the person identified with a year ago. Since the analysis depends on observing an individual in both years, each observation is weighted by a simple average of the CPS basic weight in t and $t - 1$ (for example, see Shimer, 2012). The data used for the analysis begin in September 1996 and end in June 2012, exactly 3 years after the end of the recession.

Unfortunately, movers are lost from the sample. In order to reduce the potential attrition bias (for example, see Stewart (2007)), we construct and apply inverse probability weights to observations in the matched sample to make it more representative of the full sample. The appendix in Hotchkiss *et al.* (2012) details this procedure and shows that inverse probability weights reduce the differences in the means between the full sample and the matched sample dramatically to inconsequential levels.

A person classified as out of the labour force is asked for the primary reason why he/she was neither working nor looking for a job. The answer can be classified into five options: (1) ill or disabled, (2) in school, (3) taking care of someone in the household, (4) retired or (5) other.[2] As would be expected, the predominant reason for labour force absence among 16- to 24-year-olds is schooling, and the predominant reason for absence among those of 55 years and older is retirement. Hotchkiss *et al.* (2012) found no significant change in the schooling trend among these youngest and oldest groups. The analysis in this article focuses exclusively on prime-age workers – those who are 25–54 years old – for whom a significant upward trend shift in schooling (and the most potential for skill mismatch) is found.

III. Methodology for Determining Significance of Trend Shifts

A test statistic developed by Andrews (1993) allows the determination of whether there has been any change in the trends for reasons people give for being absent from the labour force, particularly comparing reasons given prior to, during and after the 2008 recession. The basic idea of the Andrews (1993) test involves comparing the goodness of fit of alternative models with different assumptions on parameter stability. Assuming that the series of interest y_t (e.g. share of reason for nonparticipation) follows a linear trend with parameter stability, the null hypothesis implies that y_i can be written as follows:

$$y_t = a_0 + a_1 \times t + e_t \quad \text{for} \quad t = 1 \ldots TT \qquad (1)$$

The alternative hypothesis is the existence of a one-time structural change in time T, such that:

$$y_t = a_{10} + a_{11} \times t + e_{1t} \quad \text{for} \quad t = 1 \ldots T \qquad (2)$$

$$y_t = a_{20} + a_{21} \times t + e_{2t} \quad \text{for} \quad t = T + 1 \ldots TT \qquad (3)$$

In the case that T is known, one can form Wald, Lagrange multiplier (LM) or likelihood ratio statistics to test the null hypothesis of no structural change: $a_{10} = a_{20}$ *and* $a_{11} = a_{21}$, or, rather, structural stability. Since we are performing a test of model specification and in order to be conservative in our hypothesis testing, we rely on the LM test statistic (see Cameron and Trivedi, 2005).

Because there is a possibility of more than one break point in a series, we modify the implementation of this test to improve its power to detect the presence of multiple structural changes in the series trend. Instead of using all the information available, we restrict the construction of the test to a window of ±2 years from a given point in time, T, designated as the break point. The null hypothesis tested here is that, at any given T, there is no structural change when comparing the trend up to 2 years before T and the trend observed for 2 years after T.[3]

Figure 1 contains the trend shares, for 25- to 54-year-old labour force leavers, for each reason given for nonparticipation (Panel a) along with the Andrews (1993) test statistics and LM critical values indicating whether a statistically significant change took place in the series trend at a given point of time, T (Panel b). Whenever the statistic exceeds the critical values at time T, trend of the series 2 years prior to T is statistically significantly different than the trend in the series for 2 years following T. The larger the value of the test statistic at time T, the more confident we are of a structural change at that point in time.

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[1] The use of year-to-year flows removes concerns of seasonality and captures longer term changes in behaviour. However, it is not known what took place during the year between observations, merely that the person was in the labour market a year ago (either employed or unemployed) and not in the labour market the next, and the reason for nonparticipation.

[2] The BLS defines the other category as individuals with transportation and/or childcare issues that prevent an individual from working as well a number of individuals with undefined reasons.

[3] The June 2012 end point of our data allows our four-year window (±2 years) to capture changes in behaviour a full year post recession. Time windows of 2, 4 and 6 years all produce fairly consistent results. Test statistics calculated between July 2010 and June 2011 make use of less than 2 years of data beyond t.
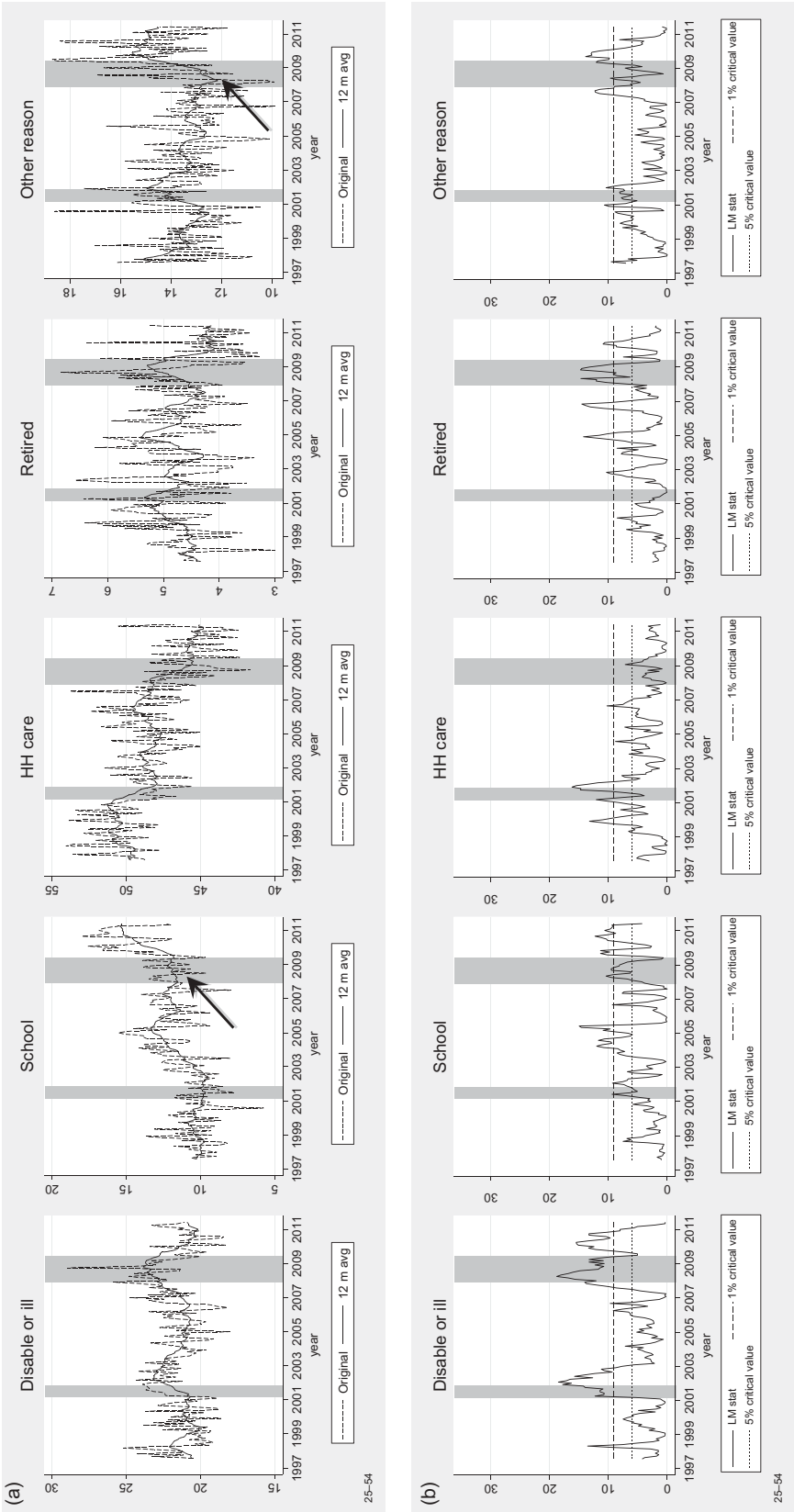
Fig. 1. **Share trends by reason and Andrews (1993) test statistics and critical values for significant change in trend, each reason given for nonparticipation, persons 25–54 years old. (a) trend shares by reason for nonparticipation. (b) Andrews test statistics**

Notes: See footnote 4. Critical values from Andrews (2003) are used.

Panel (a) illustrates the direction of the trend change (upward or downward shift, or arrest of an increasing or decreasing trend), while Panel (b) indicates the significance of a trend shift. This set of figures indicates significant upward trend shifts during or immediately following the recession in the absence reasons of schooling and other reason (highlighted by arrows). These significant upward trend shifts for these reasons are also seen among both men and women separately (see Hotchkiss *et al.,* 2012). Disability, household care, and retirement all experienced significant *downward* shifts in trend during the recession, among this age group.

IV. Results: Searching for Evidence of Skill Mismatch

The purpose of the analysis is to determine whether the evidence of an upward trend shift in schooling as the reason given for labour market absence is consistent with the hypothesis of skill mismatch. If skill mismatch is present, we would expect it to be most acutely felt among workers in industries/occupations that experienced the greatest employment losses during the economic crisis.

Table1 shows the share of the sample of labour force leavers who were exiting jobs in industry/occupation pairs based on whether their industry and occupation was a net gainer or net loser of jobs between December 2007 and June 2009. Just over half of the sample are in jobs that lost employment during the recession in both industry and occupation categories. Only 5% of labour force leavers were in occupations that gained employment but

Table 1. Per cent of labour force leavers in occupations and industries either increasing or decreasing employment between December 2007 and June 2009

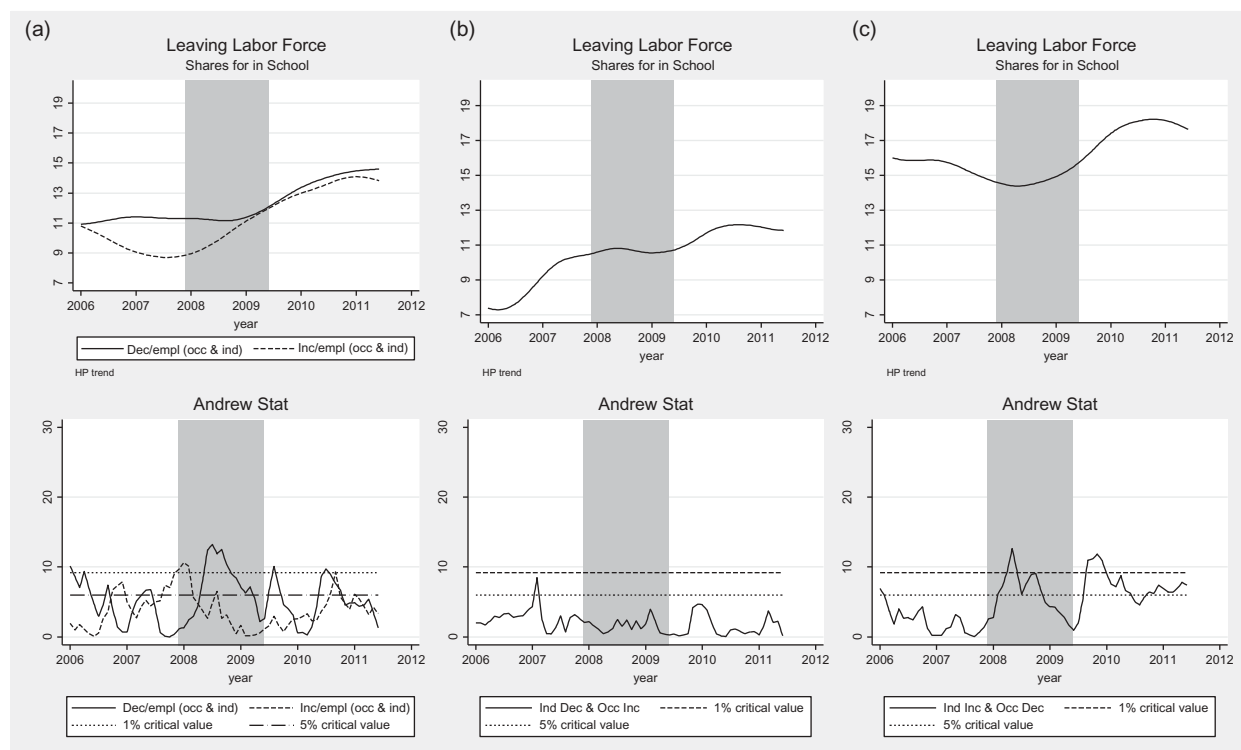| Industry | Occupation | | |
	Decreasing employment	Increasing employment	Total
Decreasing employment	62433161	5933382	68366543
	91.32%	**8.68%**	
	68.19%	*18.28%*	*55.12%*
	50.34%	4.78%	
Increasing employment	29123284	26532352	55655636
	52.33%	**47.67%**	
	31.81%	*81.72%*	*44.88%*
	23.48%	21.39%	
Total	91556445	32465734	124022179
	73.82%	**26.18%**	

Notes: Cell percentages are shaded, row percentages are in italics, and column percentages are bold.

industries that lost employment, while roughly 23% were in occupations that lost employment while their industries gained. Overall, the share of the sample in employment-losing *occupations* (74%) exceeded the share of the sample in employment-losing *industries* (55%).

The top row of charts in Fig.2 present the shares of labour force leavers giving schooling as the reason for nonparticipation by employment loss/gain in their occupations and industries (the series are smoothed using a Hodrick-Prescott (HP), 1997, filter). Panel (a) presents the extreme cases where the person's occupation and industry either both lost or both gained employment. Panel (b) reflects the experience of those whose industry lost employment, but occupation gained employment. And, Panel (c) reflects those whose industry gained employment, but occupation lost employment.

The second row of charts in Fig.2 contains the Andrews (1993) test of trend shifts in the series above (and a more accurate picture of the timing of the change in share trends, since the series in the top row are smoothed by a HP filter). Labour force leavers, regardless of whether they were associated with industries and occupations that decreased or *increased* employment during the recession, experienced significant upward trend shifts in their shares absent for schooling. Among those whose occupation and industry both experienced either employment decreases or increases (Panel a), those facing increases saw the more dramatic rise in the absent share in schooling. The labour force leavers who were in industries and occupations that experienced employment growth of contrasting directions, shown in Panels (b) and (c), also experienced upward shifts in schooling. However, the increase was not statistically significant for those whose industry employment was decreasing but occupation employment was increasing. This likely results from the small fraction of the sample (5%) in this category.

If skill mismatch was a significant motivator for the increased schooling share among 25- to 54-year-old labour force leavers, then we would expect to see greater evidence of this trend shift among workers hardest hit during the recession, with no particular impact on workers in sectors not as severely affected. This is not the case. The widespread nature of the rise in schooling being given as a reason for nonparticipation suggests that it was motivated by a cyclical decline in labour market opportunity cost, or other factors noted by Barr and Turner (2012), rather than by a need to realign skills post-recession in response to a mismatch of skills in the labour market. This lack of evidence supporting the idea of skill mismatch is consistent with other research addressing this question (for example, see Appelbaum, 2010; Tasci and Zaman, 2010; Valletta and Kuang, 2010; Hobijn *et al.*, 2011; Jayadev and Konczal, 2011;

Fig. 2. **Share trends of labour force leavers giving schooling as the reason for being out of the labour force and Andrews (1993) statistics for significant changes in the trends, by person's occupation and industry employment loss/gain category. (a) Industry and occupation both incr. or both decr. (b) Industry decreasing and occupation increasing. (c) Industry increasing and occupation decreasing**

Notes: An HP (1997) filter is used to isolate the trend component for each data series for better visualization; however, the Andrews test statistics are estimated based on the raw data. Critical values from Andrews (2003) are used.

Mian and Sufi, 2012; Rothstein, 2012). However, the evidence here does not rule out pockets of mismatch where local skill supply is not matching local skill demand.

Acknowledgements

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