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Spatial panel data estimation, counterfactual predictions, and local economic resilience among British towns in the Victorian era

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ABSTRACT

We explore the relative ability of local economies to retain their long-run growth dynamics when faced by the destabilizing effects of major shocks. Taking annual wage series for nineteen U.K. towns over the historical period 1871–1906, we fit a spatial panel data model to 1871–1890 data and use estimated coefficients to obtain counterfactual predictions of wage levels after the 1890 shock to the end of the post-shock period. This allows us to analyze how actual wages in different towns performed in relation to their counterfactual paths, and to assess their relative resilience to the 1890 and subsequent crises. The key conclusion is that the sectoral composition of local employment is important for economic resilience; our evidence suggests that towns with excessive and increasing specialization in one dominant industry are relatively prone to shocks, because they lack the structural flexibility needed to replace declining sectors with productive and competitive activities, whereas economies with a diversified industrial mix have more scope for restructuring and renewal, and thus are more able to adapt to and tolerate shocks.

1. Introduction

This paper focuses on the differentiated impact of economic shocks on wage levels across towns in England, Scotland and Wales. It differs from many econometric impulse response models in that it is based on spatial econometric models including simultaneous spillover effects across space in a panel data context. The model allows estimation of the underlying trend in the evolution of wages, and this acts as a counterfactual against which the actual wage evolution can be compared. The data relate, unusually, to the historical Victorian period in which the industrial revolution was at its height. The economy of the time was, as now, subject to major shocks and our analysis is aimed at exploring whether these shocks had a permanent effect on the subsequent evolution of the wage levels of different towns. In particular, we focus on the shock of 1890, estimating our model up to this point in time, and then projecting the underlying trend forward. The predicted wage path for each town, from which the effects of earlier major shocks have been purged, acts as a counterfactual. This counterfactual, or projected, path is what we would expect wage levels to follow if the economy was resilient to the effects of the 1890 and subsequent shocks. Towns deviating from the counterfactual are those that are more affected by the 1890 and by subsequent shocks. We show that some of these towns had wage levels consistently below the counterfactual, indicating their proneness to negative effects of economic shocks, thus lacking economic resilience. Other towns that outperformed the counterfactual, with wage levels higher on average, or which recovered well from the effects of shocks and ended up with wage levels above the projected level, we might think of as super-resilient. We explore possible reasons for these different responses to the effects of economic shocks subsequently, drawing on the literature on economic resilience (Hill et al., 2008; Martin, 2012), hysteresis (Cross, 1993; Cross and Allan, 1988; Cross et al., 2009, 2010; Setterfield, 2010), and path dependence and lock-in (Arthur, 1989, 1990, 1994; Boschma and Martin, 2009; David, 1985, 2005, 2007; Martin and Sunley, 2006, 2009; Simmie and Martin, 2010). However detailed discussion of these is outside the scope of the current paper.

Our modeling and forecasting exercise extends over the years before and after the 1890 shock which initiated the 1890–94 downturn. Our full sample period covers four slumps which can be dated (from peak to trough) to 1874–79, 1883–86, 1890–94 and 1901–04, taking the

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annual turning points of the U.K. business cycle as given in Aldcroft and Fearon (1972), Rostow (1948) and Southall (1986). The sectors being most affected by the 1890 shock (as well as earlier and subsequent crises) were Britain's staple export industries, namely textiles and manufacturing of basic metals; all of our sample towns had some stake in these industries, which means that they were all potentially exposed to the negative effects of the shocks, although as we will see they did not react equally to it. By contrast, the contraction in output was much less severe for services and new growth industries such as printing and vehicles, which showed almost no signs of the downturns.[2]

The outline of the paper is as follows. Section 2 shows the model of wage determination adopted to obtain parameter estimates for within-sample data (1871–1890), which are then used to obtain counterfactual wages for the post-recession period (1890–1906). Results from FGS2SLS plus GMM estimation of the model are presented in Section 3. Section 4 explains the ex-post prediction exercise, while results from our counterfactual analysis are discussed in Section 5. The final section summarizes and concludes.

2. The model and data

2.1. Baseline specification

The *Great Britain Historical Database*[3] makes available thirty-five years of town-level[4] wage data, whose cyclical behavior over time and uneven distribution in space make them an interesting measure of local economic performance in our study. It thus gives us Log$Wage_{it}$, which is the average nominal wage rate (pence per week[5]) of skilled engineering workers (i.e. fitters) in each of the sample towns (i) within Great Britain for each of the years (t) from 1871 to 1906.

The basis of our empirical model for Log*Wage* is provided by the extensive literature on the Wage Curve (Bell et al., 2002; Blanchflower and Oswald, 1990, 1994a,b, 1995, 2005; Buettner, 1999; Longhi et al., 2006; Nijkamp and Poot, 2005), which postulates an inverse relationship between the level of pay of individuals and the rate of local unemployment. Blanchflower and Oswald (1990), using U.S. and British micro-data, were among the first to find that, holding other things constant, employees who work in areas of high unemployment earn less than those working in low-unemployment areas. In their book Blanchflower and Oswald (1994a) (see also Blanchflower and Oswald, 1995) they provide additional evidence from individual-level data for twelve countries, estimating an unemployment elasticity of wages of approximately −0.1 (−0.08 for the U.K.); the similarity of the wage curve in different places and between different time periods led them to report it as an empirical law of economics. They also show that the elasticity of the wage curve can vary across different categories, a result which is confirmed by other investigators looking at similar data. For example, Baltagi and Blien (1998), Baltagi et al. (2009a) and Card (1995) find that wages are more responsive to unemployment rate variation (hence the wage curve is more elastic) for men (see also Fingleton and Longhi, 2012) who tend to be employed in sectors with relatively higher entry and exit costs as opposed to women, and also for the young, the skilled, foreigners (Baltagi et al., 2009a), non-union members and private sector workers (Card, 1995) which are categories with relatively smaller bargaining power. For all these groups the link between unemployment and pay is stronger because, in depressed labor markets, they have more difficulty than others finding alternative jobs when threatened by dismissal (e.g. in the event of an industrial dispute), therefore employers do not need to remunerate them so well. This is consistent with Blanchflower and Oswald's bargaining-power explanation for the existence of a wage curve (for a review, see Card, 1995).[6]

To approximate the local unemployment rate we take its value in 1868 i.e. the year immediately before the start of our sample period (as reported in Southall, 1986[7]) and we apply the annual rate of change in U.K. unemployment,[8] which means that the resulting town-specific series follow the track of national unemployment. This gives us Log*LocalUnempRate*. The model specification also includes two recession dummies (*Dum*1874–79 and *Dum*1883–86) to pick up the negative influence on local wages of the international banking crises which troughed in the late 1870s and in the mid-1880s. The additional covariate is the average local wage rate, Log*LocalAvgWage*, averaging across all sectors for which data are available[9]; we prefer this variable to a linear time trend or national GDP as a business cycle measure as it captures cyclical output movements which are town-specific. It should be noted that 'fitters' wages are appropriately excluded from this calculation, since their inclusion in the average would introduce two-way causation between Log*Wage* and Log*LocalAvgWage*. Nevertheless, some endogeneity concerns remain, as Log*LocalAvgWage* will possibly capture local spillovers from intra-town cross-sector linkages whereby productivity variations in one sector affect wage/productivity levels in other sectors within the same town, and thus it may be influenced by 'fitters' wages to some extent. Our instrumentation strategy is explained in Section 4.2 with reference to both Log*LocalAvgWage* and Log*LocalUnempRate*.

2.2. Modeling spatial interaction

Our methodology draws on the burgeoning spatial panel modeling approach now becoming common in spatial econometrics, but it differs in the way that the inter-town interaction is modeled, which in the literature is typically based on some function of inter-town distance. In a system of open trading towns such as those in our sample, we should expect that externality and spillover mechanisms have a role, and that local wages are to some extent determined by the characteristics of and developments in nearby towns as well as being the outcome of local employment and production conditions. We should also expect the existence of (unobserved) effects driving wages in highly interrelated and interacting towns. In spatial econometrics work, these are usually taken to be geographically proximate towns, but they can also be towns which are *close* in some socio-economic sense e.g. size or local employment structure (Corrado and Fingleton, 2012; Fingleton and Le Gallo, 2008). Thus while we have a flexible approach to what we mean by *spatial* interaction, we are driven by an appreciation that failure to acknowledge the presence

[2] Discussion about the effects of the crises on different sectors is based on analysis of historical data from Feinstein (1972).

[3] The wage statistics are taken from Table SN3710 of the Great Britain Historical Database Online (Southall et al., 1999). The original source of wage rates is an unpublished report on *Rates of Wages and Hours of Labour in various industries in the United Kingdom for a series of years* by the Board of Trade Labour Department (1908).

[4] Sample towns are Ashton-under-Lyne, Birmingham, Blackburn, Bolton, Bradford, Cardiff, Edinburgh, Greenock, Halifax, Hull, Leeds, London, Manchester, Newcastle, Nottingham, Sheffield, Sunderland, Wigan and Wolverhampton.

[5] There were 12 pence in a shilling, and 20 shillings or 240 pence in a pound.

[6] Another non-competitive labor market explanation for why, at least in the short-run, wages tend to be lower in labor markets with higher unemployment relates to efficiency wage or labor turnover costs. The argument is that, when unemployment is higher, firms face lower costs of replacing workers while the costs for workers of job losses or of voluntary quits are higher, therefore the wage that firms pay in excess of market-clearing to retain workers or increase their productivity is lower.

[7] The original source is the Amalgamated Society of Engineers (A.S.E.) Monthly Reports available from the Mitchell Library (Glasgow), the British Library of Political and Economic Science, the Trades Union Congress Library and Nuffield College (Oxford). For Wigan, which does not appear in the data, we take the unemployment rate of nearby Warrington.

[8] The source of national unemployment statistics is Feinstein (1972).

[9] Occupations involved are mainly 'patternmakers', 'iron founders', 'smiths' and 'turners' — with gaps (no 'patternmakers' wages are available for Halifax, Hull, Sunderland and Wigan; there are no 'iron founders' wages for Ashton, Cardiff, Edinburgh, Greenock, Newcastle and Sunderland; no 'smiths' wages are available for Edinburgh, Leeds and Sunderland; there are no 'turners' wages for Nottingham). Where available, wages for 'angle-iron smiths', 'holder-ups' and 'riveters' are included. For the latter, the towns concerned are Bolton, Bradford, Hull, Leeds, London, Manchester and Sheffield, as well as Blackburn, Cardiff, Greenock, Halifax, Nottingham and Sunderland, but with gaps.