The Wage Response to Shocks: The Role of Inter-Occupational Labour Adjustment☆

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HIGHLIGHTS

- This paper examines the role of industrial and occupational structure on wages
- The commonly-used shift-share approach can be misleading
- Search and bargaining effects are 2.8 times the effects predicted by shift-share
- Accounting for occupational adjustments is important

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ABSTRACT

How do cities' average wages adjust to a shock, e.g. trade-induced or technology-induced, shifting the industrial and/or occupational composition of employment? This question is commonly answered using a shift-share analysis, which imputes the effects of composition changes on cities' average wages in a purely mechanical way. This paper argues that a shift-share approach can be misleading if compositional shifts spill over into industrial and occupational wages. Using data on Germany, this paper finds that the spillover effects from a shift in industrial and occupational composition are large and imply a total effect on cities' average wages of 2.8 times the effect that is predicted by a shift-share exercise. In addition, results indicate that in the case of Germany, accounting for adjustments along the occupational mix is crucial to identify these spillovers, even if one is only interested in the effect of an industry-specific shock.

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1. Introduction

A large body of literature documents changes in the wage structure in the U.S. and internationally over the last few decades. A well-known fact is that average wages have stagnated since 1970 and understanding why is an important issue.[1] One populist conjecture is that shifts in the industrial and occupational composition of jobs have contributed to poor labour market outcomes. In particular, many good jobs have been displaced due to technological change and rising globalization pressures, causing average wage growth to slow down as individuals shift employment from good into less desirable jobs. The notion of a good job refers to a job that pays more for the same level of human capital.

The objective of this paper is to evaluate how one can best assess the role of changes in both industrial and occupational structure of employment on cities' average wages in Germany. The common approach to addressing this question is to perform a shift-share analysis, which is a purely mechanical way of imputing the effects of composition changes on cities' average wages.[2] In the case of a sectoral shift only, such an approach consists in multiplying each industrial wage premium in a base year by the corresponding change in industrial employment shares and then summing up across industries. For instance, consider a city in which the steel industry pays a 20% wage premium relative to the average and employs 20% of the workers of the city. Assume that the

[1] See for instance Acemoglu (2002) and Katz and Autor (1999) for a discussion of changes in the wage structure and earnings inequality.

[2] See for instance Bound and Johnson (1992) and Lemieux (2002) for a discussion of decomposition methods.

high-paying steel industry disappears and that its workers switch to other industries which do not pay any premium. In this example, a shift-share exercise predicts that this industrial composition shift gives rise to a 4% decrease in the average wage of the city, which is modest considering the importance of the decline of the steel industry.

An inherent characteristic of this approach is that it ignores the potential general equilibrium effects that a shift in the industrial and/or occupational composition of employment may cause on within-industry and within-occupation wages. Using the previous example, shift-share assumes that the only channel through which the decline of the high-paying steel industry affects sectoral wages is through standard supply and demand mechanisms (labour reallocation across sectors) but that shifting *composition* towards low-paying industries does not affect wages in other sectors. If the general equilibrium effects are large, a shift-share approach may not provide a good approximation of the effects of employment composition changes on cities' average wages.

Recent work by Beaudry et al. (2012), henceforth BGS, shows that the spillover effects from a shift in industrial composition on within-industry wages can be substantial and that therefore, a shift-share approach can lead to consequential misestimation of the total effect on cities' average wages. Using a search and bargaining model, the authors show that changes in industrial composition affect industrial wages by modifying workers' outside options. In this framework, shifting employment towards high-paying industries improves outside options and translates into higher wages in *all* sectors of the economy (including the sectors which are not directly affected by the employment shift). The authors propose a way of estimating these sectoral wage spillover effects and show how they can be added to a shift-share analysis to provide a more reliable means of calculating the effects of composition changes on average city wages. Using U.S. Census data over the years 1970 to 2007, they find that a shift in industrial composition generates changes in cities' average wages that are over threefold the magnitude predicted by a shift-share approach.

This paper studies the effects of compositional shifts on cities' average wages using a search and bargaining framework that accounts for potential general equilibrium effects. However, this study differs from BGS in two dimensions. First, the empirical exercise is performed for Germany. Until the 1990s, West German firms were governed by collective sectoral agreements that were negotiated between employer associations and large unions. It is only around the time of its re-unification and economic integration in 1989 that the country shifted towards a more decentralised labour market. Since one can easily conjecture that Germany responds to local forces that differ from those shaping wage setting in the U.S., it is a priori unclear whether Germany also conforms to the predictions of search and bargaining theory and thus, whether shift-share is as inadequate in Germany as it is in the U.S.

Second, this study adds occupations and evaluates the role of both industrial and occupational changes on cities' average wages simultaneously. The approach of BGS is exclusively designed to understand how a shock shifting the sectoral composition of employment (e.g. a trade-induced shock) spills over into industrial wages. Such a shock hardly ever produces only one type of adjustment, but is generally accompanied by a change in the occupational structure. An attractive feature of adding occupations is that it allows separating out within–from across-industry wage spillover effects. Moreover, this extension allows to examine whether disregarding inter-occupational labour adjustment may produce a biased estimate of the sectoral wage spillover effect due to the fact that a change in the occupational structure is unlikely orthogonal to changes in industrial composition.

In addition, a framework that explores the wage effects of sectoral and occupational shifts simultaneously is particularly useful in thinking about shocks that directly affect occupations (e.g. technology, offshoring or outsourcing). A recent literature shows that, likely as a result of technological change, there have been large changes in the occupational

structure of the economy, with employment becoming increasingly concentrated at the top and the bottom of the occupational skill distribution.[3] In light of these recent developments, it appears important to assess whether shifts in the occupational structure of employment also generate general equilibrium wage effects of the type implied by search and bargaining theory.

In order to evaluate the wage effects of both industrial and occupational composition changes simultaneously, the paper decomposes workers' mobility in three dimensions: within industry (across occupations), within occupation (across industries) and across both occupations and industries. The idea underlying this decomposition is that, depending on human capital specificity, an unemployed worker may be more likely to find a job within his prior industry and/or occupation.

Whether human capital is primarily industry- or occupation-specific is important as it possibly affects the set of outside options with which a worker can potentially bargain and, as a result, the extent to which a shift in the industrial versus occupational composition of employment spills over into wages. For instance, in the extreme situation in which human capital cannot be transferred across industries, jobs outside a worker's prior industry do not constitute outside options as the probability of actually switching across industries is zero. In such a case, a shock shifting the occupational structure of employment will generate wage spillovers while one changing industrial composition will not create any general equilibrium effects, and this even in the presence of search and bargaining mechanisms. Similarly, if skills are exclusively occupation-specific, shifts in industrial composition only will produce spillover effects.

Several contributions of the human capital literature have discussed the importance of skill specificity and observed mobility for wages and found evidence of both industry-specific (Parent, 2000) and occupation-specific (Kambourov and Manovskii, 2009; Sullivan, 2010) human capital. While human capital specificity is often associated with the wage losses accompanying job displacement, this paper suggests that skill specificity may affect wages even in the absence of actual labour movements (or shifts in productivity). In particular, search and bargaining mechanisms imply that, by diminishing the threat point in the Nash bargaining game, higher skill specificity translates into lower wages.

Using an instrumental variable strategy, the paper finds that simultaneously accounting for changes in the industrial and occupational composition of employment is crucial to identify their effects on average city wages. In the particular case of Germany, focusing only on industries would lead to the conclusion that the sectoral wage spillover is statistically insignificant and would thus suggest that a shift-share approach is adequate. By contrast, taking into account both changes in the industrial and occupational composition of employment shows that both dimensions generate large wage spillovers effects but that they happen to offset each other because of the co-movements in the two sets of changes. When both dimensions are accounted for, results indicate that the total effect of these composition changes on cities' average wages is 2.8 times — a result very close to that found in the U.S. — as large as would have been suggested by a shift-share approach. Thus, although it may be more centralised than the U.S., Germany also appears to conform to the predictions of search and bargaining theory.

The rest of the paper is organized as follows. Section 2 discusses shift-share analysis. The section emphasizes that the approach may provide a biased estimate of the total effect of a compositional shift on cities' average wages in the presence of general equilibrium effects. Section 3 extends BGS search and bargaining model to illustrate how these general equilibrium effects can araise and in particular, to show how shifts in both industrial and occupational composition

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[3] For studies on the polarization phenomenon, see for instance Acemoglu and Autor (2011), Autor et al. (2006), Autor et al. (2003), Dustmann et al. (2009), Goos and Manning (2007), Goos et al. (2009) and Spitz-Oener (2006).