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# Valuing productivity costs using the friction-cost approach: Estimating friction-period estimates by occupational classifications for the UK

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## Abstract

The friction cost approach has been proposed as an alternative to the human capital approach in estimating productivity costs. However, it is difficult, in practice, to apply this approach due to limited availability of context-specific data. Using national and firm-level data on vacancy durations sourced from 4 organisations, we estimated vacancy durations, and consequently, length of friction period for the United Kingdom disaggregated by occupational classification. We found comparable estimates to previously reported friction periods elsewhere. The disaggregated friction period analysis confirmed occupational class has an effect on the estimated length of the friction period. The research presents estimates on vacancy durations and friction periods necessary to use the friction cost approach in a practical way in economic evaluations.

## KEYWORDS

friction cost approach, friction period, lost productivity, productivity costs, vacancy duration

## 1 | INTRODUCTION AND BACKGROUND

The friction-cost approach was pioneered by health economists in the Netherlands to contribute to the growing debate on how best to estimate productivity costs in economic evaluation (Koopmanschap, Rutten, et al., 1995; Koopmanschap & van Ineveld, 1992; Liljas, 1998; Sculpher, 2001). This approach limits productivity losses to a friction period, with friction costs broadly comprising lost production during the friction period and the costs of hiring and training new individuals (Koopmanschap & Rutten, 1996). The friction period is a parameter that is used to limit productivity loss to the period required to restore production levels within an organisation as a result of reduced productivity due to illness (Koopmanschap & Rutten, 1996; Koopmanschap & van Ineveld, 1992). It has been argued that this approach generates more realistic estimates of productivity loss than the traditionally used human capital approach, particularly if replacement of workers by labour reserves is possible (Koopmanschap et al., 1995).

In spite of notable advantages in generating more realistic costs when using the friction cost approach, a recent review shows that few studies have applied the friction-cost approach within economic evaluations in countries outside the Netherlands setting (Kigozi, Jowett, et al., 2016). This could be attributed to the absence of relevant and reliable data necessary for its application, with particular reference to the friction period, for which there are no ready and reliable estimates outside the Netherlands (Koopmanschap et al., 1995; Pritchard & Sculpher, 2000). The duration of a vacancy has been suggested as a proxy for estimating a friction period (Brouwer & Koopmanschap, 2005). This is the period employers take to successfully fill an employment vacancy (Van Ours & Ridder, 1991).

To date, little is known about vacancy durations and how these can be used to generate friction period estimates. An important challenge for any method to become widely used is whether there are data and tools for its practical application in any

setting. We explored this issue for the UK setting. To date, only four UK studies, (Adams, Greig, et al., 2002; Andrews, Bradley, et al., 2008; Beaumont, 1978; Roper, 1988) have explored aspects of vacancy data. However, they do not provide the sort of information required to estimate the friction period for use in productivity cost valuations, and as much of these data are relatively old, they also do not illustrate current labour market conditions. More generally, within the international literature, economic evaluations that have included productivity costs based on the friction cost approach have tended to use a single average friction period. This ignores differences between types of employees in the labour market, and thus could potentially lead to inaccurate estimation of productivity costs (Koopmanschap & Rutten, 1996; Koopmanschap et al., 1995). A stratification of friction periods by individual subgroups based on education status has been conducted (Koopmanschap et al., 1995), and some occupation-specific friction-period estimates reported outside the UK context (Hanly, Koopmanschap, et al., 2016), but as yet, there has not been a comprehensive stratification based on occupational status. However, occupational status is often collected in economic evaluation studies and is clearly more directly relevant to vacancy durations and hence friction periods (Andrews et al., 2008). In this study, we aimed to estimate average duration of vacancies in the UK, and consequently assess the impact of occupational classifications on the estimated friction period in the UK.

## 2 | METHODS AND DATA

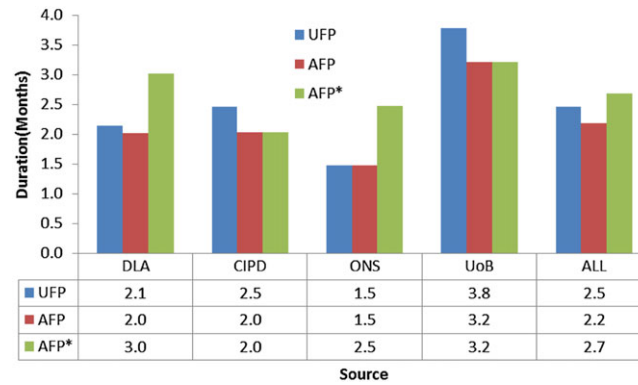
Data for this study were sourced from four different organisations within the UK spanning the period 2007–2011 and represent more recent up-to-date national data. The first source was the Office of National Statistics (ONS), for which data on a range of national statistics are routinely collected including vacancy duration data (<http://www.nomisweb.co.uk/default.asp>). The second source was a survey from the Chartered Institute of Professional Development (CIPD), the largest human resource (HR) professional body in the UK. The organisation previously collected HR vacancy duration statistics data through annual surveys (CIPD, 2007; CIPD, 2008; CIPD, 2009). A third organisation, DLA Piper firm, a global law firm that offers a HR measurement and benchmarking service and collects performance data on a range of indicators from over 400 contributing organisations was also identified and surveyed for data on vacancy duration data (DLA PIPER, 2012). Finally, vacancy duration data statistics were purposively collected from the University of Birmingham HR department as part of a primary data collection exploration process. In each case, respondents for the organisation were asked for the time taken to fill a vacancy, grouped by relevant standard occupational classification categories.

As part of the analysis, data from the four organisations were standardised to ensure a uniform length of the friction period and standard occupational classification categories. The standard period considered for this analysis was the average period taken to fill a vacancy, from when a vacancy is raised to when an individual actually starts working in the position. To ensure comparability between the datasets, each friction-period estimate was based on the average vacancy duration plus an additional period of 4 weeks, in line with previous literature (Kigozi et al., 2016; Koopmanschap et al., 1995) in order to cover the full length of a friction period for all datasets. This period was added to allow for recruitment, successful uptake of a position and necessary training following replacement as this was not captured in the DLA Piper and ONS datasets.

In order to make the findings more representative of the overall UK working population, a grossing weighting factor of the total number of vacancies nationally in each occupational class for each year covering the period 2007–2011 was applied to the vacancy duration estimates obtained using the weighted average statistical analysis technique. Grossing is the process of applying a factor(s) to survey sample data in order to yield estimates applicable to the overall population. The grossing factors were applied for two reasons: first, to ensure compensation for survey design, that is, over sampling of some occupations and under sampling others, and second, to take account of any nonresponse bias, that is, survey rates achieved for different occupational classifications. The standard occupational classification weights were derived from the UK ONS. ONS labour force survey (<http://www.ons.gov.uk>) data were considered appropriate for this adjustment as they provide the largest annual comprehensive national estimates of jobs across the entire UK economy. Finally, the adjusted data from the four data sources were pooled together to generate an overall average friction period.

## 3 | RESULTS

The sample considered was broadly representative of the UK working population spanning diverse occupational classifications drawn out from each organisation. Figure 1 shows the results of the adjusted vacancy durations and the pooled average vacancy duration for the period 2007 to 2011. After adjusting for the proportion of jobs in each classification at the national level and the additional 4-week period for recruitment and training before taking on the vacancy, the adjusted



**FIGURE 1** All organisations—summary of friction period estimates for UK in months (number), by occupational level [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

**TABLE 1** Friction-period estimates for UK in months (number), by occupational level, for 2009–2011 (DLA Piper dataset)

Year	Occupational classification Average (median; LQ–UQ)		
	ALL <sup>a</sup>	1 <sup>b</sup>	2 <sup>c</sup>
2009	2.3 (2.0;1.5–1.8)	2.6 (2.3;1.5–3.1)	1.9 (1.5;1.2–1.8)
2010	2.2 (2.0;1.4–2.7)	2.6 (2.4;1.6–3.1)	2.0 (1.7;1.3–2.3)
2011	2.3 (2.0;1.5–2.7)	2.5 (2.3;1.5–3.1)	2.0 (1.7;1.3–2.4)
Unadjusted values	2.2 (2.0;1.5–2.4)	2.5 (2.3;1.5–3.1)	1.9 (1.6;1.2–2.1)
Adjusted for national UK vacancy values	2.0	2.6	2.0
Overall adjusted*	3.0	3.6	3.0

<sup>a</sup>All employees.

<sup>b</sup>Managerial/professional.

<sup>c</sup>Operational/support.

\*Includes average duration of 1 month for time taken for an individual to start work.

**TABLE 2** Friction-period estimates for UK in months (number), by occupational level, for 2007–2009 (CIPD)

Year	Occupational classification average(n)				
	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>
2007	4.1 (761)	3.2 (814)	1.7 (797)	1.9 (678)	1.5 (611)
2008	4.1 (723)	3.0 (733)	1.7 (737)	1.9 (670)	1.5 (642)
2009	4.3 (703)	3.1 (720)	1.6 (717)	1.8 (657)	1.5 (633)
ALL	4.2	3.1	1.7	1.9	1.5
Adjusted for national UK vacancy values	4.2	3.1	1.7	1.9	1.5

Note. CIPD = Chartered Institute of Professional Development.

<sup>a</sup>Managerial and senior official occupations.

<sup>b</sup>Professional and technical occupations.

<sup>c</sup>Administrative and secretarial occupations.

<sup>d</sup>Service occupations.

<sup>e</sup>Elementary occupations.

vacancy duration for this period ranged from 2 to 3.2 months. The pooled average friction period was 2.7 months (Figure 1).

The data are then presented by occupational classification with some notable variations (Tables 1–4; Figure 2). The data showed that variations were observed in the friction-period estimates between the occupational classifications in

**TABLE 3** Friction period estimates for UK in months, by occupational level, for 2007–2011 (based on vacancies filled by job centre plus and alternative recruitment channels; ONS)

Year	Occupational level (average)				
	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>
2007	1.6	1.7	1.4	1.9	1.4
2008	1.6	1.9	1.4	1.8	1.4
2009	2.0	1.8	1.2	1.7	1.2
2010	1.4	1.5	1.2	1.6	1.3
2011	1.3	1.4	1.2	1.5	1.2
ALL	1.6	1.7	1.3	1.7	1.3
Adjusted for national UK vacancy values	1.6	1.7	1.3	1.7	1.3
Adjusted overall*	2.6	2.7	2.3	2.7	2.3

Note. ONS = Office of National Statistics.

<sup>a</sup>Managerial and senior official occupations.

<sup>b</sup>Professional and technical occupations.

<sup>c</sup>Administrative and secretarial occupations.

<sup>d</sup>Service occupations.

<sup>e</sup>Elementary occupations.

\*Includes average duration of 1 month for time taken for an individual to start work.

**TABLE 4** Estimated friction period in months, by occupational level, for 2009–2011 (based on vacancies filled by the University of Birmingham, UK)

Year	Occupational classification (average)				
	1 <sup>a</sup>	2 <sup>b</sup>	3 <sup>c</sup>	4 <sup>d</sup>	5 <sup>e</sup>
2009	5.0	3.9	2.9	2.9	2.1
2010	6.6	5.2	3.2	2.9	2.3
2011	6.0	4.3	3.0	2.4	3.0
ALL	5.8	4.4	3.0	2.7	2.5
Adjusted for national UK vacancy values	5.6	4.5	3.0	2.7	2.5

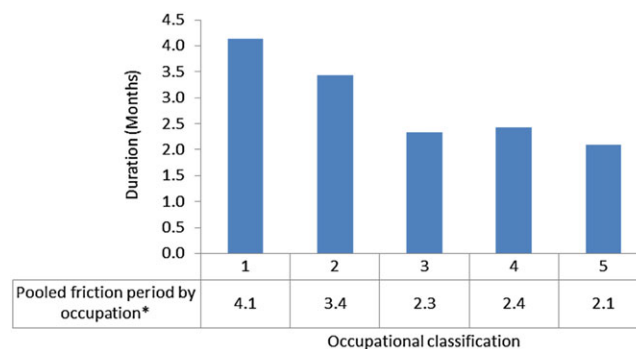
<sup>a</sup>Managerial and senior official occupations.

<sup>b</sup>Professional and technical occupations.

<sup>c</sup>Administrative and secretarial occupations.

<sup>d</sup>Service occupations.

<sup>e</sup>Elementary occupations.



**FIGURE 2** Average friction period estimates for the UK, by occupational classifications [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

the exploratory primary data collection exercise dataset (range, 2.5 [elementary profession] to 5.6 [senior managers]; Table 4) and in the CIPD dataset (range, 1.5 [elementary profession] to 4.2 [senior managers]; Table 2) datasets. Relatively, less variation in friction periods was observed across the different occupational classification categories in the other two datasets (Tables 1 and 3). These data, however, mask the variability in the findings as limited summary data were available from most of the data sources (Tables 2, 3, and 4) with the exception of the DLA Piper dataset (Table 1) that had limited data on medians, lower quartile, and upper quartile ranges. The pooled average duration of a friction period from three data sources stratified by occupational classifications is presented in Figure 2, ranging from 4.1 months in managers and senior officials to 2.1 months in elementary occupations).

## 4 | DISCUSSION

As the desire to incorporate productivity costs within economic evaluation increases in various settings (Krol, Papenburg, et al., 2015), there is the need for more precise and accurate estimates to be generated for the different approaches. For estimating friction costs, relevant and reliable data are required to generate friction periods for the practical application of the friction cost approach. In this study, we provide detailed estimates of vacancy durations, and hence friction periods that can be applied within a UK setting.

This study highlights potential sources of routine friction-period data for researchers within the UK. The pooled average duration of a friction period incorporating all data sources was 2.7 months with wide variations in the friction period across occupational categories from the four organisations (ranging from 1.5 to 5.6 months). This variation shows the need to further assess the impact of using stratified friction-period estimates in economic evaluation studies that apply this approach to estimating productivity costs. Our analysis of vacancy duration data reveals a clear association between friction periods and occupation. Friction periods varied between occupational classifications and were higher in senior occupational roles than in lower level occupations such as skilled, services, and elementary workers. This variation of friction periods by occupation in our results may possibly be explained by various reasons. It might be difficult to recruit highly trained senior level occupational workers. Higher level occupational category jobs such as senior managers generally have a smaller pool of individuals to choose from, resulting in prolonged recruitment periods compared to lower category occupational jobs. An alternative suggestion, which seems reasonable, is that unobserved factors such as potential consequences associated with unsuitable recruitments at the senior level, as well as stricter requirements for employees at this level, can also prolong the time it takes to fill the vacancy. In addition, once identified, such employees require longer notice to leave periods for their employees. Indeed, an exploratory exercise as part of this research from the University of Birmingham data showed higher job notice period estimates of 6 to 12 weeks for this category of employees. Overall, the findings in this research are consistent with results of van Ours and Ridder (1991) and DeVaro (2005) who found increased vacancy durations in highly paid jobs and jobs requiring highly educated individuals.

Economic evaluations using friction-period estimates have been very limited to date within the UK. These have reported a friction period of about 90 days (Maniadakis & Gray, 2000) and 180 days (Lewis, James, et al., 2007) without clear information on the source of these estimates. Internationally, few researchers have studied vacancy durations or provided detailed estimates of vacancy duration (Beaumont, 1978; Erdogan-Ciftci & Koopmanschap, 2011; Roper, 1988; Van Ours & Ridder, 1991). A conference abstract reported estimated vacancy durations in 2009 for the Netherlands, Belgium, Germany, France, the UK, Norway, and Sweden as ranging between 40 and 80 days using a combination of national aggregate stock and time series data on vacancies (Erdogan-Ciftci & Koopmanschap, 2011), but no further details were provided. The findings within this research show that the average friction period is broadly similar to these existing estimates, but provides a stronger basis for using such estimates in the UK, as well as more detailed information across different occupations.

An important finding is that if friction periods differ according to occupational levels as has been shown by the vacancy duration estimates presented here, then the current practice of using a single friction period for the labour market could potentially have an impact on estimates of overall friction related costs and on overall cost-effectiveness estimates.

The nature of the datasets provides one limitation that should be considered in interpreting the results. Data were obtained from different sources using different collection methods, and only limited summary data were available for most of these datasets. This restricted the possibility of generating more detailed information such as standard deviations and other measures of dispersion. Despite this limitation, some important implications can be drawn for this research. First, this work provides the best current estimates of friction periods for the UK. Second, it is clear that few attempts have been made at generating friction-period estimates in different country settings. This research contributes to this area by highlighting



possible sources of vacancy durations and illustrates how researchers from different country settings can generate friction periods from routine data.

## 5 | CONCLUSION

Economic evaluations that have applied the friction-cost approach outside the Netherlands context are scarce, in contrast to the theoretical interest in, and associated advantages of, this method. In part, this may be because of a lack of appropriate data in estimating key parameters such as the friction period. The analysis here reports a pooled friction-period estimate for the UK of 2.7 months and shows that the friction period is correlated to occupational classification. These findings provide the most up-to-date estimates to guide future economic evaluations and research in the application of the friction-cost approach in the UK.

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## CONFLICT OF INTEREST

The authors have no conflict of interest.

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