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## **Abstract**

By definition, temporary workers, such as fixed-term, casual and temporary agency workers, have jobs that are far less stable than permanent jobs. However, surprisingly few studies have investigated whether and to what extent this lesser stability translates into longer commutes to work. Using data from the German SOEP and the Australian HILDA Survey, this article investigates the link between temporary employment and length of commutes in different institutional contexts. We compare three types of temporary workers and apply fixed-effects regression, thereby accounting for unobserved worker heterogeneity. We also estimate unconditional quantile regression (UQR) models, thus allowing us to examine how the commuting length differential varies over the commuting length distribution. The results suggest that the link between temporary employment and commuting length varies by employment type and institutional context, as well as location in the distribution. On average, agency work is associated with longer commutes than permanent work in both countries, whereas fixed-term contracts are only associated with longer commutes in Germany. Further, UQR shows these associations are often strongest in the upper end of the distribution. For casual work, mean regression suggests no commuting length differential, whereas the UQR shows negative associations for large parts of the distribution.

**JEL classification:** J61, J81

**Keywords:** Australia; commuting; Germany; longitudinal analysis; quantile regression; temporary employment

## 1. Introduction

Temporary forms of employment, such as fixed-term contracts, casual work and temporary agency work, are an entrenched feature of many Western labour markets. In the EU-28, for example, the share of temporary workers (among employees aged 20 to 64) averaged 10.8% in 2019, and was lying above 15% in several countries (Eurostat 2020). In Germany, the share was slightly below that average (9.3%). In Australia, the comparable fraction is much higher. Data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, for example, show that about 29% of employees were employed on either a fixed-term or casual basis in 2018 (and unlike in Europe, it is casual employment that is numerically dominant). More importantly, researchers have found these types of jobs associated with disadvantages, including lower wages (Kahn 2016; Laß and Wooden 2019; OECD 2015), greater job insecurity (Auer and Danzer 2016; Dawson *et al.* 2017; Green and Leeves 2013) and lower levels of job satisfaction (Aleksynska 2018).

Further, work commutes have increased in terms of distance and time in many industrialised countries over recent decades. In Germany, the proportion of workers commuting 60 minutes or longer (round trip) has increased from 20% in 1991 to 27% in 2016 (Federal Institute for Population Research 2018). In Australia, the corresponding shares are even higher, and have risen from 38% in 2001 to 47% in 2017 (Wilkins *et al.* 2019). This trend towards longer commutes is a source of concern. Lengthy commutes have been shown to be associated with increased stress and decreased subjective well-being (e.g., Chatterjee *et al.* 2020; Evans and Wener 2006; Royal Society for Public Health 2016), reduced job satisfaction (Chatterjee *et al.* 2017; Clark *et al.* 2020; Novaco *et al.* 1990), and an increased probability of changing jobs (e.g., Huinink *et al.* 2014; van Ommeren *et al.* 1999; Wilkins *et al.* 2019).

Despite the pervasiveness of both temporary employment and lengthy commutes, the connection between the two has received relatively little attention from researchers. This is surprising given the length of employment contract, and thus the expected duration of the employment relationship, is likely to impact on workers' willingness both to accept lengthy commutes and to relocate closer to the workplace. Further, the literature that does exist is underdeveloped in at least four key respects. First, previous quantitative empirical studies have focused exclusively on fixed-term contracts: Other types of temporary employment, such as temporary agency work and casual work, have not been investigated. Several of these studies have linked fixed-term contracts to longer daily commutes and/or to a higher likelihood of weekend commuting than permanent workers in a range of Western European countries

(Abraham and Nisic 2007; Lück and Ruppenthal 2010; Parenti and Tealdi 2019; Rürger and Sulak 2017; Schneider and Meil 2008). However, other studies found differing results by country (Viry and Vincent-Geslin 2015) or socio-economic groups (Kersting *et al.* 2020). Second, all mentioned studies were based on cross-sectional or sequence analysis and thus did not account for unobserved worker characteristics that may affect both contract type and commuting length, such as ability, ambition and willingness to be mobile. Third, only one of these studies (Abraham and Nisic 2007) analysed the association of temporary employment with a metric measure of commuting length, and to our knowledge no previous study has investigated how the association varies across the commuting length distribution. Finally, previous studies have focused on central European countries. By contrast, relatively little is known regarding the link between temporary employment and commuting beyond this region of high population density and relatively small countries.

Against this background, our study investigates the link between temporary employment and length of commuting in Australia and Germany. This comparison is promising on both theoretical and practical grounds. From a theoretical standpoint, comparing two countries with fundamentally different institutions allows assessing whether results depend on the macro-structural context (Aisenbrey and Fasang 2017). On the one hand, as mentioned, Australia and Germany both exhibit a substantial share of workers with temporary contracts as well as with lengthy commutes. On the other hand, they differ considerably with respect to labour markets, welfare regimes and geographical structure. For instance, employment protection legislation (EPL) for both permanent and temporary workers is considerably stricter in Germany than Australia (OECD 2020b; 2020c). Australia also stands out internationally through the explicit legal recognition and high prevalence of casual employment. Overall, we expect country differences to moderate the relationship between temporary employment and commuting. However, finding similar results in both countries, despite the institutional differences, would suggest a more robust, general link between contract type and commuting. From a practical standpoint, both countries offer high-quality, large-scale household panel studies — the German Socio-Economic Panel (SOEP) and the HILDA Survey — enabling rigorous, longitudinal analysis.

Our study contributes to the literature first by extending the usual focus on European countries through a comparison of Germany with Australia, and second by investigating three different types of temporary employment, namely fixed-term contracts, temporary agency work, and casual work (for Australia). Third, unlike previous studies, we apply fixed-effects

regression analysis and are thus able to eliminate the confounding effect of time-constant unobserved worker characteristics. Finally, we provide a more comprehensive analysis than previous studies by not only estimating the mean effect of contract type on commuting length but by looking at the association at various points of the commuting length distribution using unconditional quantile regression (UQR). We can thus establish whether temporary employment affects commuting length similarly for workers with short commutes and workers with long commutes.

Investigating the relationship between temporary employment contracts and commuting length is important. At the societal level, trends in temporary employment and commuting length may reinforce each other, with implications for public health, traffic management and the environment. At the individual level, as mentioned earlier, both temporary contracts and long commutes have been linked to adverse worker outcomes. To the extent that temporary employment and lengthy commuting occur together, we may thus observe an accumulation of disadvantages for the affected workers.

## **2. Theory and Hypotheses**

### *Basic Theoretical Framework*

If job seekers are facing a lack of suitable jobs in the local labour market, they can overcome poor career prospects and access additional employment opportunities by searching for and accepting jobs at a greater distance (van Ham *et al.* 2001). While workplace-related spatial mobility is associated with better earning opportunities (Manning 2003; van Ham 2001), it also incurs mobility costs. People who accept a distant job offer have two options: moving closer to the new workplace or covering the distance by daily or weekly commuting (Huber and Nowotny 2013; Petzold 2020). In the following, we discuss how perceived job/workplace (in)stability impacts this decision process and argue that high job/workplace instability reduces the incentives to relocate (Crane 1996).

Our theoretical arguments are based on the assumption that people strive to choose their home and workplace in a way that maximises their (lifetime) utility (Alonso 1964; Haas and Osland 2014; van Ommeren *et al.* 1999). Accordingly, people weigh the expected returns of accepting a job offer against the anticipated costs. The associated returns include both monetary (i.e., wages) and non-monetary rewards (e.g., occupational prestige, meaningful and intrinsically satisfying work, and pleasant and safe working environments). The associated costs arise mainly from the need to cover the distance to the new workplace. The costs of daily

or weekly commuting include material costs, in the form of travel expenses or establishing a second home, and immaterial costs due to the loss of time for alternative beneficial activities, like co-presence with the family and psychological or physical strain during the commute (Chatterjee *et al.* 2020; van Ommeren and Fosgerau 2009). While commuting costs can generally be reduced by moving the (family) home closer to the workplace, relocation usually incurs other types of costs. These are related to setting up a new (family) residence (e.g., search costs) and/or the loss of local-specific capital; for instance, if friends and relatives can no longer be seen on a daily basis (Amundsen 1985; Fischer and Malmberg 2001). If the accumulated costs of at least one mobility alternative are offset by the accumulated returns, then the job offer will be accepted. In this case, people will choose the least costly mobility alternative (Petzold 2020).

Based on our rational-actor approach, we can more specifically infer that people will decide to move nearer to their workplace if the future commuting costs connected to the current place of residence exceed the moving costs plus the future commuting costs after the move. The future commuting costs are, however, not only a matter of residence choice, but also depend on future changes in workplace location. If people have to search for a new job again after moving, the distance to the workplace is likely to increase again, as the probability of finding a suitable job in the same place is relatively low. Put more generally, the higher the probability of a future workplace change, and hence, the more short-term the expected benefits resulting from reduced commuting costs, the more likely it is that people will choose not to move and accept time-consuming commuting. Given temporary contracts typically reduce perceived job/workplace stability, we expect such contracts to also discourage workers from moving closer to their workplace. This leads to our first hypothesis:

H1: Temporary employment will be associated with longer commutes than permanent employment.

#### *Differences by Overall Commuting Length*

Previous research has repeatedly found that the propensity to move closer to the workplace increases with the distance between home and work (Clark *et al.* 2003; Huber and Nowotny 2013; Petzold 2020). However, additional evidence suggests that there is a threshold above which this propensity increases more strongly (Clark *et al.* 2003). Such a non-linear relationship between distance to work and the propensity to reduce commuting length is in line with the finding that people usually perceive moving as relatively costly (van Ommeren *et al.*

1999). While tolerating commuting up to a certain threshold, most people's commuting tolerance sharply decreases after about 45 minutes one-way (van Ham and Hooimeijer 2009). This suggests that the effect of temporary employment on commuting should be stronger when people are faced with substantial commuting lengths, since even permanent employees are unlikely to make distance-reducing moves if the distances are sufficiently short. We therefore expect the following:

H2: The association between temporary employment and commuting length will be stronger towards the top of the commuting length distribution.

### *Differences by Type of Temporary Employment*

*Casual work.* A key characteristic of casual work is that the employer does not need to provide workers any advance commitment about the duration of the employment contract or the specific number of days or hours per week to be worked. Workplace stability can therefore be expected to be relatively low among casual workers, suggesting they have less incentive than permanent workers to move closer to the workplace. However, for several reasons, casual workers may still not be more likely to have lengthy commutes: First, casual jobs are often low-paid and low-skilled (Green and Leeves 2013; Laß and Wooden 2019), and HILDA Survey data show they often involve particularly short shifts. Thus, many workers may be unwilling to accept a casual job that would necessitate lengthy commutes or relocation because the mobility costs would not pay off. Second, van Ham *et al.* (2001) argue that low-skilled jobs are less spatially dispersed than high-skilled jobs, suggesting that workers may often be able to get a casual job close to home. Overall, we thus expect the association between casual work and commuting length to be rather weak.

*Fixed-term contracts.* Here the employment contract stipulates a date or event at which the contract will be terminated, which reduces job security compared to permanent contracts. In contrast to casual work, fixed-term contracts exhibit relatively high qualification requirements in the two investigated countries. In Australia, fixed-term jobs tend to be particularly highly skilled and highly paid (Laß and Wooden 2019). In Germany, both high-skilled and low-skilled workers have a higher likelihood of receiving a temporary contract than mid-skilled workers, but with high-skilled workers most affected (Gebel and Giesecke 2011). This is in contrast to many other European countries, where low-skilled workers are most likely to receive fixed-term contracts (Gebel and Giesecke 2011). Given the relatively high skill level, and correspondingly high pay, connected to fixed-term contracts in Australia and Germany, accepting these types of jobs may be often be worthwhile even if located at a considerable



distance from home. Further, as mentioned, high-skilled jobs are spatially more dispersed, increasing the need for workplace-related spatial mobility. Overall, distant fixed-term job offers can therefore be expected to be equally likely to be accepted as distant permanent job offers; however, because of lesser job security, relocation will be less frequent — and lengthy commutes thus more frequent — for fixed-term positions. Compared to the other temporary employment types considered here, however, job stability is relatively high for fixed-term contracts, suggesting the incentive to relocate is larger for fixed-term than for casual and agency jobs. Whereas casual workers can be dismissed anytime, fixed-term contract workers have a reasonable expectation of their employment lasting at least until the day stipulated in the contract — often several years into the future. And, in contrast to agency workers, the workplace is unlikely to change for the duration of the fixed-term contract. In addition, studies on labour market transitions (Fuller and Stecy-Hildebrandt 2015; McVicar *et al.* 2019; Watson 2013; see also Appendix Table A1) suggest that the chances of subsequently receiving a permanent contract are higher for fixed-term workers than for casual and agency workers.

*Temporary agency work.* The key characteristic of agency work is the tripartite relationship between the employer (the agency), the worker, and the host company (to which the labour service is provided). Job tenure with the agency is usually relatively short, as most agency workers are employed on either casual or (often short) fixed-term contracts. Additionally, frequent changes of workplace due to changes in host companies are the norm. Agency workers are thus subject to an extreme type of workplace instability, meaning each home and workplace combination lasts only for a very short period. Therefore, they will usually not consider relocating closer to work but commute from their (fixed) place of residence to their various workplaces. We thus expect even longer commutes on average for agency workers than for fixed-term contract workers.

Overall, we expect the following differences by employment type:

H3: Among the group of temporary workers, temporary agency workers will have the longest commute, followed by fixed-term contract workers and then casual workers.

### *Country Differences*

Australia and Germany show substantial differences with regard to labour markets, welfare regimes and geographical conditions. Some of these differences may result in differences in the average commuting length, which, in turn, may impact on the strength of the association between employment type and commuting length: As argued above (with H2), contract type

should be most relevant if commutes are relatively long. First, and most obviously, Australia is much larger in size than Germany, which could result in Australians being more likely to accept jobs at a great distance from home. Second, average commutes may also be longer in Australia due to a higher degree of commodification. Social security payments in the case of short- or mid-duration unemployment are much lower in Australia than in Germany (OECD 2020a). Australian workers may therefore feel more pressure than German workers to be employed continuously, which may increase their willingness to accept distant jobs. And indeed, the relatively high share of workers with lengthy commutes in Australia (Wilkins *et al.* 2019) is consistent with the assumption of greater spatial mobility requirements in this country.

However, Australia's population is also much more concentrated than Germany's, with half of the population living in the three largest cities, Sydney, Melbourne and Brisbane (calculations based on Australian Bureau of Statistics 2019). This compares with around 8% of the German population living in Berlin, Hamburg or Munich in 2017 (calculations based on Statistisches Bundesamt 2019). Living in Australia's vast metropolitan areas is associated with long commutes (Wilkins *et al.* 2019). At the same time, however, a lack of affordable housing in the city centres may often prohibit commute-reducing moves. To the extent that relocating closer to work is not a feasible option regardless of contract type, longer commutes will not necessarily result in a stronger relationship between employment type and commute length.

The discussed differences in geographical structure and welfare regime have a rather indirect effect on the link between temporary employment and commuting length by potentially influencing average commuting length. However, there are also institutional differences that may directly impact on this link. Most notably, there are differences in labour market institutions that affect the difference in perceived workplace stability. As previously mentioned, Germany and Australia differ considerably with respect to both the degree of EPL and the difference in the level of EPL between permanent and temporary workers, i.e., the EPL gap (e.g., Barbieri and Cutuli 2016). Over the 2001-2018 period, Germany scored relatively high on the OECD EPL index with respect to the individual dismissal of permanent workers (an average of 2.6 out of 6 points; OECD 2020b) but relatively low on EPL for temporary workers (1.2 points; OECD 2020c), resulting in an EPL gap of 1.4. This reflects relatively high job security for permanent workers compared to temporary workers. In Australia, average EPL for both permanent (1.5 points) and temporary jobs (0.9 points) has been relatively low over the period, giving an EPL gap of 0.6 and thus smaller differences in job security between permanent and temporary workers. The larger job security gap between permanent and

temporary workers in Germany suggests larger differences in the utility from moving closer to the workplace, which should result in a larger gap in commuting length.

Further, in Australia, casual work is explicitly provided for in industry awards (legally enforceable industry-wide determinations, made or assented to by industrial tribunals, which set minimum wages and employment conditions for the large majority of employees), with use legitimised further by the requirement that casual employees receive a wage premium (typically 20% prior to 2010 but gradually raised to a standardised 25% by 2014) (Laß and Wooden 2019). As a result, casual employment has become the prime vehicle for short-term labour supply in Australia. In contrast, there is no formal provision for casual employment in German law, which means short-term workers will usually be employed on fixed-term contracts. Therefore, we may expect the average duration of fixed-term contracts to be longer in Australia than in Germany, which suggests a higher utility of moving closer to work for Australian fixed-term contract workers.

Overall, the differences in labour market regulation suggest larger gaps in perceived workplace stability between permanent and temporary employees in Germany than in Australia. Given the crucial role of workplace stability for the decision between relocating and commuting, these differences suggest that the gap in commuting length between permanent and temporary workers will be larger in Germany. We thus put forward the following hypothesis:

H4: The relationship between fixed-term contracts and agency work on the one hand, and commuting length on the other, will be stronger in Germany than in Australia.

### **3. Data and Methods**

#### *Data and Samples*

The data used come from two long-running household panel surveys, the SOEP (v34) (Liebig *et al.* 2019) and the HILDA Survey (General Release 18) (Department of Social Services and Melbourne Institute of Applied Economic and Social Research 2019). While the SOEP started in 1984, the HILDA Survey commenced in 2001 and was designed to mimic practices of successful household panel studies, and notably the SOEP. The two surveys thus share many common features in terms of sampling methodology and questionnaire design. For example, both surveys interview all adult household members on an annual basis and collect comprehensive information on respondents' employment situation.

For both countries, the analysis is based on a seventeen-year period, namely 2002-2018 for Australia and 2001-2017 for Germany. The first wave of the HILDA Survey (2001) was omitted due to differences in the way commuting time was collected. For the SOEP, the waves 2014 and 2016 had to be excluded given commuting distance is unavailable in these waves. The sample used here is restricted to workers aged between 18 and 64 years who are not doing any studies or training. Students are much more likely to be employed on temporary contracts than other workers, but at the same time their choice of place of residence and workplace is more restrained as they are usually tied to the place of study. We excluded cases with missing information on commuting length as well as outliers with extremely long commutes (i.e., longer than the 99.95<sup>th</sup> percentile). In the HILDA Survey, these are daily commuting times of more than 8.3 hours, and in the SOEP, these are commuting distances of more than 830 kilometres. Additionally, we excluded SOEP respondents who were unable to report a commuting distance because they work in different locations.<sup>1</sup> Note that our sample includes persons who work from home as well as workers who do not travel from their (primary) residence to their workplace on a daily basis (such as weekend commuters). Further, we excluded observations with missing information on our key predictor (contract type) and on any control variables. Finally, we excluded respondents who only contributed one observation given we apply longitudinal methods of analysis.

The final SOEP working sample comprises 79,100 observations for men and 78,694 observations for women. The HILDA Survey working sample consists of 56,086 observations for men and 50,205 observations for women.

### *Method of Analysis and Analytical Strategy*

We investigate our research questions with fixed-effects (FE) regression. The main advantage of this method is the removal of the effect of unobserved (time-constant) person-specific traits. The downside of this approach is that information from workers who never change employment type over the observation period do not contribute to the estimation of the commuting length coefficient. However, due to the long-run nature of the panels and the relatively short duration of temporary jobs, considerable shares of our samples are observed changing employment types (see Appendix Table A1 for yearly transition rates).

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<sup>1</sup> Additional analyses show that the probability of being unable to specify a distance due to multiple locations varies with the type of employment, with only 4% of permanent or fixed-term contract workers but 8% of agency workers and 23% of the self-employed reporting different locations.

For each country, we estimate two sets of models. First, we estimate conventional FE regression models, which quantify the mean effects of the different contract types on commuting length. Second, we apply unconditional quantile regression (UQR) models, but again augmented with fixed effects. These enable us to investigate the association of employment type with commuting length at any point in the commuting length distribution. We apply the Stata command `xtrifreg` recently developed by Borgen (2016), which combines the UQR approach proposed by Firpo *et al.* (2009) with FE estimation. For each country and gender, we present detailed results for nine separate UQRs (i.e., at each decile of the distribution), with standard errors bootstrapped (50 replications) and clustered on individuals.

We run all models separately for women and men given gender differences in both labour market and commuting behaviour. For example, numerous studies have shown that women on average have shorter commuting distances and times than men, which is most likely primarily due to the different roles assigned to women and men in the household (Crane 2007). Also, women are less likely than men to initiate moves for the purpose of their own professional careers when they are living in a partnership (Abraham *et al.* 2010; Mincer 1978).

#### *Dependent Variable: Length of Commute*

In the SOEP, commuting length is measured as the distance (in km) between the workplace and the place of residence, which includes both daily and weekly commuting. This information is available on an annual basis (with the exception of 2014 and 2016). In the HILDA Survey, respondents are asked each year how much time they spend on travelling to and from the place of paid employment in a typical week. While in 2001, respondents could report their commuting time only in hours, the possibility to report minutes was added in 2002 and all later waves. As a result, commuting times for 2001 are not strictly comparable, leading us to exclude this wave from the analysis. We created a measure of daily commuting time in minutes by dividing weekly commuting time by the usual number of days worked per week in the main job and multiplying by 60. Note that this leads to an overestimation of daily commuting times for the (small) group of multiple jobholders who commute to their second job on different days than to their main job.

In order to account for the right-skewed distribution of commuting time/distance in both countries, we took the natural logarithm of these measures to approximate a normal distribution. We added one (km/minute) to all values, which ensures that observations with commuting times/distances of zero can be kept in the analysis, while maintaining the order of

the observations along the commuting length distribution. Coefficients can then be interpreted as percentage changes in length of commute.

While the SOEP and the HILDA measures are not strictly comparable (given one is collecting commuting length as distance and the other as time), we argue that there is a strong correspondence between them. In three waves, the SOEP also collected information on the time spent travelling to work in minutes, providing the opportunity to investigate overlap between the two measures. The correlation between distance and time was 0.68.

### *Independent Variables*

*Employment type.* Information on contract type concerns employment in the main job and is sourced from two broadly comparable questions in the surveys. In the HILDA Survey, employees are asked whether they are employed on a fixed-term contract, a casual basis or a permanent/ongoing basis, with a fourth option “other”. The “other” category had very few cases, and these were thus discarded.

In the SOEP, respondents are asked whether their employment contract is permanent or fixed-term, with a third option “not applicable, do not have an employment contract”. The respondents choosing this last option mainly belong to three groups: The first and largest group are the self-employed; these are assigned to a separate category. Second, many are “Beamte”, a type of state official that is not issued with an employment contract but in the vast majority of cases hired for life. We re-classified these as permanent workers. Third, a considerable number of employees other than “Beamte” reported not to have an employment contract. These cases are difficult to classify because German law generally does not provide for the possibility of employees without employment contracts. We thus decided to keep this group in its own “no contract” category for the main analysis. However, in a robustness check, we test whether results change if no-contract workers are excluded from the analysis.

In both surveys, another question asks workers whether they are employed through a temporary employment agency. While agency workers can in principle be on any type of contract, in Germany, they are mainly on fixed-term contracts, and in Australia most of them are either on casual or fixed-term contracts. We classify all employees who report being employed through a labour-hire firm or temporary employment agency, regardless of their contract type, as temporary agency workers.

Finally, we create a fifth category for the self-employed and unpaid family workers.

*Control variables.* We account for a range of worker and job characteristics that might confound the relationship between temporary jobs and commuting length. In terms of worker

characteristics, we include age and its square, relationship status (differentiating between cohabiting and married persons, with singles being the reference category) and parental status (accounted for by a dummy set indicating the age of the youngest resident own child). We also account for place of residence by including indicators for the sixteen German and eight Australian states as well as a dummy for persons living in rural areas. Further, we include a dummy for a severe health condition. For the SOEP, we follow Otterbach *et al.* (2016) and set this dummy to one if respondents reported to have been officially assessed as severely disabled or partially incapable of work for medical reasons (with the degree of limited functioning rated at 20% or more). For the HILDA Survey, the value is set to one if respondents report the presence of a work-limiting long-term health condition.

In terms of job characteristics, we account for the number of usual weekly working hours (in a quadratic specification) and for a recent job start (by an indicator for workers with a tenure with the current employer of less than four months). We further include a dummy set representing industry, with categories taken from the Cross-National Equivalence File (CNEF), which in turn are based on the International Standard Industrial Classification (v3.1).<sup>2</sup> Due to the low number of miners in Germany, we combine mining and construction into one category in the SOEP. Finally, we include indicators for survey year. In the Australian models, we additionally control for multiple jobholding to account for the fact that the original measure of weekly commuting time relates to all jobs, whereas the number of working days is only known for the main job.

Mean values for all variables, differentiated by employment type and country, are provided in Table 1. With respect to commuting, the table shows that, in both countries, temporary agency workers have the longest commutes, averaging 64 minutes per day in Australia and 33 km one-way in Germany. Differences, however, can be seen with respect to fixed-term contract workers, who have similarly long commutes to permanent workers in Australia, but notably longer commutes in Germany. By contrast, Australian casual workers and German no-contract workers have shorter commutes than permanent workers. Regarding other worker and job characteristics, the table shows that in both countries, all types of temporary workers tend to be younger than permanent workers, are less likely to be married and more likely to be single and childless. They also tend to work fewer hours per week than permanent workers

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<sup>2</sup> The CNEF is a unit-record data file that harmonises a subset of variables from a number of national household panel surveys, including both the HILDA Survey and SOEP (Frick *et al.* 2007).

(particularly Australian casual workers) and to have started their jobs recently. Also, in both countries, temporary workers are highly concentrated in the service industry and, in the case of agency workers, in manufacturing. Casual workers are also overrepresented in wholesale and retail trade.

TABLE 1  
Sample Characteristics by Employment Type (Mean Values)

Variable	Australia					Germany				
	PER	FIX	CAS	TAW	SE	PER	FIX	NOC	TAW	SE
Commuting distance (km)	--	--	--	--	--	19.40	23.36	9.92	33.04	11.96
Commuting time (mins)	57.54	57.48	50.77	64.45	46.63	--	--	--	--	--
Male	0.53	0.45	0.38	0.58	0.68	0.51	0.41	0.27	0.57	0.61
Age	41.40	39.68	39.03	39.10	45.78	43.20	37.37	43.23	39.82	45.88
Relationship status										
Single	0.26	0.29	0.37	0.35	0.16	0.21	0.33	0.20	0.30	0.18
Cohabiting	0.18	0.21	0.18	0.21	0.15	0.12	0.17	0.08	0.15	0.11
Married	0.56	0.50	0.45	0.45	0.69	0.67	0.50	0.72	0.55	0.71
Age of the youngest (resident) child										
No children	0.33	0.41	0.36	0.42	0.19	0.26	0.36	0.18	0.32	0.21
0-3 years	0.14	0.12	0.12	0.13	0.15	0.12	0.15	0.10	0.15	0.13
4-7 years	0.08	0.08	0.09	0.08	0.10	0.11	0.13	0.12	0.09	0.12
8-12 years	0.10	0.09	0.10	0.08	0.12	0.12	0.11	0.15	0.10	0.12
13-16 years	0.08	0.07	0.07	0.07	0.09	0.09	0.07	0.10	0.08	0.09
17 years and older   only non-resident children	0.27	0.23	0.27	0.23	0.34	0.30	0.18	0.34	0.26	0.33
Living in rural areas	0.29	0.31	0.40	0.24	0.36	0.33	0.35	0.41	0.36	0.32
Severe health condition	0.07	0.07	0.13	0.09	0.11	0.06	0.04	0.06	0.05	0.04
Working hours (week)	39.73	39.17	25.23	36.39	40.45	37.99	36.09	23.47	36.12	45.07
Multiple jobholder	0.06	0.09	0.15	0.10	0.08	--	--	--	--	--
Tenure < 4 months	0.05	0.11	0.18	0.29	0.04	0.02	0.13	0.06	0.12	0.02
Industry										
Agriculture	0.01	0.01	0.04	0.02	0.10	0.01	0.01	0.02	0.01	0.05
Energy	0.01	0.01	0.00	0.02	0.00	0.01	0.01	0.00	0.02	0.00
Mining	0.02	0.02	0.01	0.05	0.00	--	--	--	--	--
Construction	0.06	0.04	0.07	0.07	0.20	--	--	--	--	--
Mining or construction	--	--	--	--	--	0.12	0.07	0.11	0.17	0.09
Manufacturing	0.11	0.06	0.07	0.16	0.08	0.17	0.11	0.14	0.23	0.07
Trade	0.13	0.10	0.18	0.06	0.12	0.13	0.15	0.29	0.10	0.18
Transport	0.05	0.03	0.05	0.06	0.04	0.05	0.04	0.04	0.04	0.03
Bank, Insurance	0.05	0.03	0.01	0.05	0.02	0.04	0.02	0.01	0.02	0.04
Other services	0.55	0.67	0.56	0.49	0.41	0.41	0.54	0.30	0.34	0.47
Missing	0.03	0.03	0.01	0.03	0.01	0.05	0.06	0.09	0.09	0.08
N (observations)	66930	8311	12816	2180	16054	127050	10328	5083	3265	12068

PER = permanent; FIX = fixed-term; CAS = casual; TAW = temporary agency; NOC = no contract.



## 4. Results

### *Temporary Employment and Length of Commute – Results of Mean Regression*

Table 2 presents results from conventional linear FE regression establishing the mean effects of temporary employment on commuting length. It shows for both genders in both countries that agency work is linked to significantly longer commutes than permanent employment. For Australian men, for example, working for a temporary employment agency is associated with 9.0 percent longer commutes compared to having a permanent contract, and for German men, agency work increases commuting length by 16.8 percent.<sup>3</sup> For Germany, we further find that fixed-term contracts involve extended commutes compared to permanent contracts for both genders, by an average of 6.4 percent for men and 3.6 percent for women. By contrast, in Australia, fixed-term contracts are not associated with longer commutes for either gender. Likewise, casual work is not linked to significantly longer commutes than permanent employment; if anything, the sign of the coefficients suggests casual work may be associated with shorter, rather than longer commutes. Self-employment, by contrast, is connected to significantly shorter commutes in all cases.

### *Robustness Checks*

We conducted several additional analyses to test the robustness of results (results available upon request). First, we tested whether exclusion of multiple jobholders alters the results for Australia. This may potentially be of relevance given our measure of overall commuting time included time spent travelling to all jobs, yet we could only consider the number of working days in the main job when calculating daily commuting times. As mentioned, the probability of having multiple jobs is not evenly spread across employment types, with temporary workers being overrepresented. We find that for men, the negative association between casual employment and commuting length becomes more pronounced upon exclusion of multiple jobholders; however, it remains statistically insignificant. The results for the other groups of temporary workers remain substantially the same.

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<sup>3</sup> We calculate commuting length differentials as  $100 * (\exp(\beta) - 1)$ , where  $\beta$  is the estimated coefficient.

TABLE 2  
Association between Contract Type and Length of Commute – Results from Linear FE  
Regression

Variable	Australia		Germany	
	Men	Women	Men	Women
Employment type (ref. = permanent contract)				
Fixed-term contract	0.010	0.006	0.062**	0.036*
Casual contract	-0.025	-0.020	--	--
No contract	--	--	-0.073*	-0.101**
Temporary agency work	0.080*	0.126**	0.155**	0.060*
Self-employed	-0.291**	-0.843**	-0.792**	-0.726**
Age	0.044+	0.024	0.007	0.012
Age squared	-0.000**	-0.000**	0.000	-0.000
Relationship status (ref. = single)				
Cohabiting	0.062*	0.004	0.080**	0.082**
Married	0.067**	-0.014	0.088**	0.057*
Age of the youngest resident child (ref = No children)				
0–3 years	0.030	-0.168**	0.022	-0.138**
4-7 years	0.009	-0.193**	0.030	-0.170**
8-12 years	0.037	-0.155**	0.018	-0.180**
13-16 years	0.022	-0.094+	-0.006	-0.143**
17 years and older   only non-resident children	-0.007	-0.113+	-0.012	-0.118*
Living in rural areas	-0.305**	-0.460**	0.423**	0.240**
Severe health condition	0.015	-0.039	0.008	-0.003
Working hours	0.008**	0.015**	0.019**	0.015**
Working hours squared	-0.000**	-0.000**	-0.000**	-0.000**
Multiple jobholder	0.170**	0.281**		
Tenure < 4 months	0.030	0.015	0.063*	0.006
Industry (ref. = Other services)				
Agriculture	-0.142+	-0.357**	-0.127*	0.022
Energy	0.134	0.249+	0.053	0.061
Mining	0.173**	-0.029	--	--
Construction	0.182**	-0.112	--	--
Mining or construction			0.071**	-0.036
Manufacturing	0.003	-0.106**	0.041	0.015
Trade	-0.060*	-0.115**	0.025	0.014
Transport	-0.047	-0.062	0.055	0.132**
Bank, Insurance	0.051	0.007	0.021	0.123*
Missing industry	0.020	-0.036	0.030	-0.004
Constant	2.167**	2.513**	1.799**	1.404**
N (observations)	56086	50205	79100	78694

Models also control for state and calendar year. \*\*, \* and + denote statistical significance at the .01, .05 and .10 levels, respectively.

Second, we tested how the results for Germany change if no-contract workers are excluded from the analysis. In this model, the effects for fixed-term contracts and agency work change only marginally.

Third, we re-ran the analyses after bringing the students, trainees and apprentices back into our sample and adding an indicator for this group to the model. Thereby, the negative coefficient for Australian casual work becomes notably larger and statistically significant at the 5%-level (-0.059 for men and -0.051 for women). In Germany, the positive coefficients for fixed-term and agency work become slightly larger for both genders.

Fourth, we tested whether selective attrition from the panel may influence the results. To this end, we re-ran the models including indicators for whether respondents are non-responding in the next wave and whether respondents have left employment in the next wave. Although some of the coefficients on these indicators were statistically significant, the coefficients on the employment type dummies did not change.

#### *Temporary Employment and Commuting Length along the Distribution*

Table 3 presents results from UQR models investigating the link between temporary employment and commuting length at each decile of the commuting length distribution. To conserve space, we only report the coefficients of interest (but see Appendix Figures A1-A4 for estimates at all 99 percentiles). Regarding fixed-term contracts, the table confirms the result from the mean regression for Australian men and women that there is no difference in commuting length when compared to permanent contracts, but goes further and shows that this holds for almost all points in the distribution. For fixed-term contracts in Germany, the UQR results show very different dynamics across the commuting length distribution for the two genders. For men, we see that, as expected, the fixed-term-permanent commuting length gap is driven by workers in the top half of the distribution; i.e., by workers with relatively long commutes. For women, however, the association is found to be particularly strong in the bottom half of the distribution. Further, most of these coefficients are larger than the coefficient from the mean regression. The strong association in the bottom half of the distribution is, however, offset to some degree by a negative association at the very top (see Appendix Figure A4), resulting in a relatively weak association between fixed-term contracts and commuting length for women in the mean regression. Separate analyses by parental status (results available from the authors upon request) reveal that this strong association in the bottom half of the distribution is largely driven by mothers, who quantitatively dominate the SOEP women sample.

Underlying this trend is the tendency for mothers to change into (dependent) jobs with fixed-term contracts outside the home after a period of self-employment or working from home. In contrast, the pattern for childless women is similar to that of men, with the strongest effects in the upper half of the distribution.

Moving on to temporary agency work, we see that for Australian men, the association is strongest at the bottom and in the middle of the distribution, whereas for Australian women and German men, it is most pronounced in the middle and top of the distribution. Among German women, in turn, agency work is linked to an increase in commuting length for most parts of the distribution, but (similar to fixed-term contracts) with the exception of a negative association towards the top.

The results for casual work are very different to the other groups: Whereas the mean regression only showed a weak and non-significant negative association of casual work with commuting length, the UQR shows that casual contracts are associated with significantly shorter commutes at a range of deciles. Just like for agency work, the effects are mostly found around the middle of the distribution for men, and the middle and top of the distribution for women. As can be seen from Appendix Figures A1 and A2, the obvious discrepancy with the results from the mean regression can be explained by the fact that at the bottom of the distribution – and only there – casual employment is associated with much longer commutes for both genders. These results suggest that the mean regression hides important variations in the effect of casual work on commuting length across the distribution.

## **5. Discussion and Conclusion**

Using data from two large-scale panel studies, this paper has investigated the link between temporary employment and length of commute in Australia and Germany. To provide a more comprehensive picture of this link than previous studies, we used both conventional FE regression and FE UQR, thereby investigating both the mean effect and the association at all deciles of the commuting length distribution. To the best of our knowledge, this paper is also the first to control for the impact of time-constant unobserved worker traits linking contract type and commuting length.

TABLE 3

Association between Contract Type and Length of Commute – Results from FE UQR Regression

	Percentile									
	10th	20th	30th	40th	50th	60th	70th	80th	90th	
<i>Panel A: Men Australia</i>										
Fixed-term contract	6min	12min	24min	34min	48min	60min	72min	96min	120min	
Casual contract	-0.049	-0.008	0.016	0.009	0.021	0.002	0.039+	0.021	0.010	
Temporary agency work	-0.066	-0.043	-0.070*	-0.032	-0.032	-0.030*	-0.048*	-0.035	-0.019	
Self-employed	0.177	0.053	0.093+	0.102+	0.160**	0.056*	0.035	0.018	0.015	
N (observations)	-1.098**	-0.298**	-0.194**	-0.138**	-0.116**	-0.051**	-0.029	0.002	-0.026	56086
	56086	56086	56086	56086	56086	56086	56086	56086	56086	56086
<i>Panel B: Women Australia</i>										
Fixed-term contract	6min	12min	20min	30min	36min	60min	60min	81min	120min	
Casual contract	0.026	-0.003	0.005	-0.016	0.017	-0.002	-0.002	0.012	0.021	
Temporary agency work	0.045	-0.003	-0.040	-0.084**	-0.086**	-0.048**	-0.048**	-0.060*	-0.049**	
Self-employed	0.088	0.105*	0.113*	0.119**	0.167**	0.072*	0.072*	0.172**	0.156**	
N (observations)	-2.036**	-0.791**	-0.715**	-0.480**	-0.474**	-0.220**	-0.220**	-0.262**	-0.169**	50205
	50205	50205	50205	50205	50205	50205	50205	50205	50205	50205
<i>Panel C: Men Germany</i>										
Fixed-term contract	1km	3km	5km	8km	12km	16km	21km	30km	45km	
No contract	0.015	0.041	0.034	0.043	0.048+	0.043+	0.046+	0.075*	0.078*	
Temporary agency work	-0.082**	-0.152**	-0.108*	-0.073	-0.030	-0.020	-0.033	-0.035	-0.016	
Self-employed	0.026	0.055	0.081*	0.138**	0.149**	0.172**	0.175**	0.192**	0.156**	
N (observations)	-1.134**	-1.213**	-0.969**	-0.845**	-0.559**	-0.407**	-0.342**	-0.254**	-0.238**	79100
	79100	79100	79100	79100	79100	79100	79100	79100	79100	79100
<i>Panel D: Women Germany</i>										
Fixed-term contract	1km	2km	3km	5km	7km	10km	15km	20km	30km	
No contract	0.022**	0.058**	0.077**	0.063**	0.025	0.012	0.019	0.033	-0.009	
Temporary agency work	-0.052**	-0.077**	-0.097**	-0.064*	-0.133**	-0.129**	-0.084**	-0.061*	-0.067**	
Self-employed	0.028**	0.040	0.078+	0.074+	0.053	0.070+	0.058	0.074+	0.001	
N (observations)	-0.613**	-0.867**	-0.852**	-0.706**	-0.647**	-0.490**	-0.372**	-0.286**	-0.241**	78694
	78694	78694	78694	78694	78694	78694	78694	78694	78694	78694

Reference category is permanent employment. All models include control variables as in Table 2. \*\*, \* and + denote statistical significance at the .01, .05 and .10 levels, respectively.

Overall, the results for Germany are in line with our general expectation that temporary employment is connected to lengthier commutes than permanent employment (H1). According to our theoretical considerations, this might be due to greater workplace instability and the connected lower willingness and ability to move to the place of work. The results for Germany thus confirm and extend those of previous cross-sectional studies from Europe linking fixed-term contracts to longer daily commutes (e.g., Parenti and Tealdi 2019; Schneider and Meil 2008). In Australia, however, only one subtype of temporary employment, agency work, was found to involve longer commutes. In contrast, the commuting time linked to fixed-term employment is very similar to that of permanent employment, and casual work, if anything, appears to be associated with shorter commutes than permanent employment.

The weaker association in Australia was expected (with H4) and is in line with national differences in EPL, with the EPL gap between German temporary and permanent workers being much larger than that in Australia. In Australia, fixed-term contracts can be of longer duration than in Germany, and may thus be connected to greater job security, rendering Australians more inclined to move closer to their workplace even if the contract is fixed-term. The weaker results for Australia are also in line with the fact that the population is much more regionally concentrated in Australia than in Germany, with relatively expensive housing in Australian city centres possibly prohibiting many workers, regardless of contract type, from moving closer to their workplace.

Further, the results from the UQR showed important differences in the association between employment type and commuting length across the commuting length distribution. Often, and in line with expectations (H2), the association was relatively strong for workers in the middle and/or top of the commuting length distribution. This result indicates that contract type matters significantly at longer distances, where workers are facing the choice between moving and lengthy commutes. However, relatively longer commutes were also found at the very bottom of the distribution for temporary employment in general among Australian men and for casual employment among Australian women. Also, for German women there were pronounced effects in the entire lower half of the distribution.

Additionally, the UQR results have shown that the associations found in the mean regression may be biased towards zero by opposite effects along the distribution. Most importantly, casual employment in Australia is associated with shorter commutes for workers at most parts of the distribution; however, in the mean regression, this effect is entirely covered up by the positive association at the very bottom of the distribution. A similar pattern was observed for German women: In parts of the distribution, fixed-term and agency contracts are associated with greater increases in commuting distance than the mean regression would suggest. In this case, it is a negative association at the top that is weakening the mean result.

We also found that within each country and gender, the strength of the relationship varied considerably between the different types of temporary employment, confirming H3. In both countries, we found the strongest positive association in connection with temporary agency work, which on average is accompanied by an increase in commuting length between 5 and almost 17 percent. This

strong association can be explained by the fact that agency workers are subject to particularly high levels of job insecurity and frequent changes of their hosts and thus workplaces, rendering the option of moving closer to the workplace impractical in most cases.

For fixed-term contracts, the commuting length gap to permanent employment is smaller than for agency work, with the association ranging between no significant difference (Australian men and women) and about a 6% increase (German men). In contrast to agency workers, fixed-term contract workers may under certain conditions be willing to move to their place of work, particularly if their contract is of relatively long duration or they received a credible promise by their employer that their contract would be renewed or converted to permanent in the future.

By contrast, among the three forms of temporary employment considered for the Australian context, casual work was associated with the shortest commutes. In fact, the results from the UQR suggested significantly shorter commutes compared to permanent work for large parts of the commuting length distribution. These results are in line with our reasoning that first, casual jobs are often not sufficiently attractive for workers to accept lengthy commutes, and that second, they can often be found in the proximity of the home and thus often do not require lengthy commutes.

Overall, our findings suggest that there is no general effect of temporary employment on length of commute. Rather, the association varies significantly with the employment type, location in the commuting length distribution, and the institutional context. However, temporary agency work proved to be consistently associated with longer commutes in both of these different welfare state contexts.

Our study has limitations. First, data availability forced us to use different measures of commuting length for the two countries, while a single measure would have been preferable. Second, while use of FE regression allows us to account for time-constant unobserved worker traits, it still does not enable causal inferences to be made with any confidence as our results may still be affected by selection on (time-varying) unobservables. Third, panel data is associated with attrition, raising the possibility of selection bias. That said, addition of controls for attrition had very little impact on the estimated coefficients on our employment type variables.

The findings of this study have implications regarding worker well-being. Particularly for agency workers, but also for fixed-term contract workers in some national contexts, the adverse effects associated with their employment type (such as lower wages and job security) appear to combine with the adverse effects of long commutes (such as increased stress and reduced psychological well-being). The results of the UQR indicate that the relationship between temporary employment and longer commutes is in many cases particularly evident in the medium and long commuting segment. Temporary workers with lengthy commutes should thus be targeted more strongly by preventive measures of occupational health management.

For future research, our results make a case for the use of quantile regression rather than a mere focus on mean results, given the latter may hide considerable variation in effects across the distribution. Extreme effects in the tails may effectively cancel out effects at the rest of the distribution, resulting in mean regression results that are biased towards zero. Further, research on temporary employment should consider that some of the adverse effects of temporary employment could be due to lengthy commutes. Conversely, when studying the consequences of long commutes, the form of employment should be considered. Finally, the relationship between temporary employment and commuting length can vary across the life course, socio-demographic groups, and country contexts. The mechanisms behind this merit further investigation. Thereby, future comparative studies would benefit from the collection of harmonised panel data on employment and commuting across countries.

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## Appendix

TABLE A1  
Year-to-Year Transitions between Employment Types in the Samples

<i>Employment type at time t</i>	<i>Employment type at time t+1</i>					
	<i>Permanent</i>	<i>Fixed-term</i>	<i>Casual</i>	<i>Temporary Agency</i>	<i>Self- employed</i>	<i>Total</i>
<i>Panel A: Australia</i>						
Permanent	50,839	2,836	1,848	523	1,122	57,168
	<i>88.93</i>	<i>4.96</i>	<i>3.23</i>	<i>0.91</i>	<i>1.96</i>	<i>100</i>
Fixed-term	3,282	2,947	384	117	194	6,924
	<i>47.4</i>	<i>42.56</i>	<i>5.55</i>	<i>1.69</i>	<i>2.8</i>	<i>100</i>
Casual	2,447	587	6,258	248	511	10,051
	<i>24.35</i>	<i>5.84</i>	<i>62.26</i>	<i>2.47</i>	<i>5.08</i>	<i>100</i>
Temporary Agency	656	142	238	661	68	1,765
	<i>37.17</i>	<i>8.05</i>	<i>13.48</i>	<i>37.45</i>	<i>3.85</i>	<i>100</i>
Self-employed	911	198	477	59	12,204	13,849
	<i>6.58</i>	<i>1.43</i>	<i>3.44</i>	<i>0.43</i>	<i>88.12</i>	<i>100</i>
Total	58,135	6,710	9,205	1,608	14,099	89,757
	<i>64.77</i>	<i>7.48</i>	<i>10.26</i>	<i>1.79</i>	<i>15.71</i>	<i>100</i>
<i>Panel B: Germany</i>			<i>No contract</i>	<i>Temporary Agency</i>	<i>Self- employed</i>	<i>Total</i>
Permanent	98,685	2,630	1,510	967	922	104,714
	<i>94.24</i>	<i>2.51</i>	<i>1.44</i>	<i>0.92</i>	<i>0.88</i>	<i>100.00</i>
Fixed-term	4,151	3,582	161	409	132	8,435
	<i>49.21</i>	<i>42.47</i>	<i>1.91</i>	<i>4.85</i>	<i>1.56</i>	<i>100.00</i>
No contract	1,708	265	2,016	97	148	4,234
	<i>40.34</i>	<i>6.26</i>	<i>47.61</i>	<i>2.29</i>	<i>3.50</i>	<i>100.00</i>
Temporary Agency	1,119	511	81	875	44	2,630
	<i>42.55</i>	<i>19.43</i>	<i>3.08</i>	<i>33.27</i>	<i>1.67</i>	<i>100.00</i>
Self-employed	707	189	131	45	8,635	9,707
	<i>7.28</i>	<i>1.95</i>	<i>1.35</i>	<i>0.46</i>	<i>88.96</i>	<i>100.00</i>
Total	106,370	7,177	3,899	2,393	9,881	129,720
	<i>82.00</i>	<i>5.53</i>	<i>3.01</i>	<i>1.84</i>	<i>7.62</i>	<i>100.00</i>

Row percentages in italics.

FIGURE A1

Commuting Length Gap across the Commuting Distribution: Australian Men

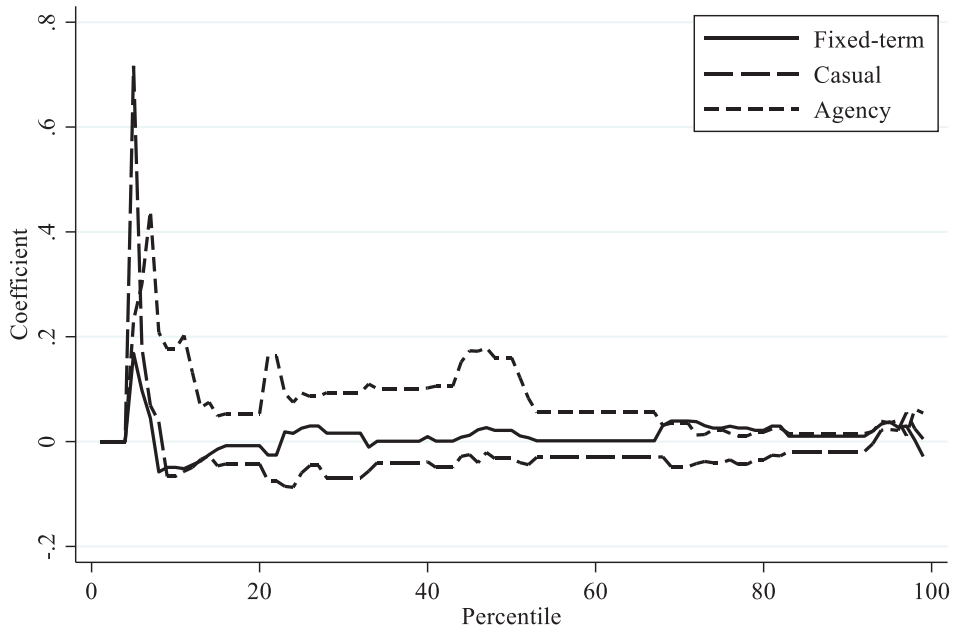


FIGURE A2

Commuting Length Gap across the Commuting Distribution: Australian Women

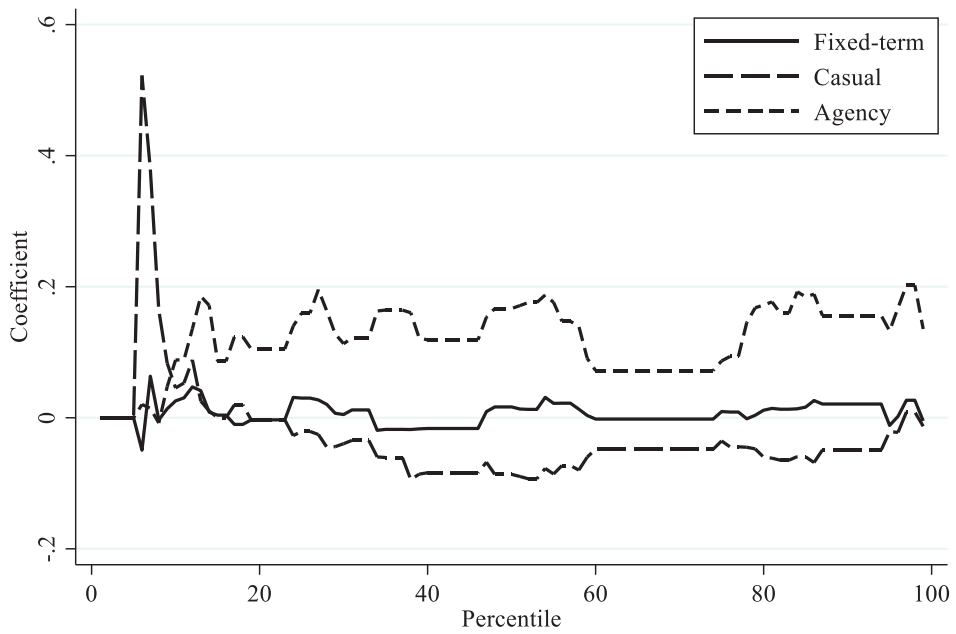


FIGURE A3

Commuting Length Gap across the Commuting Distribution: German Men

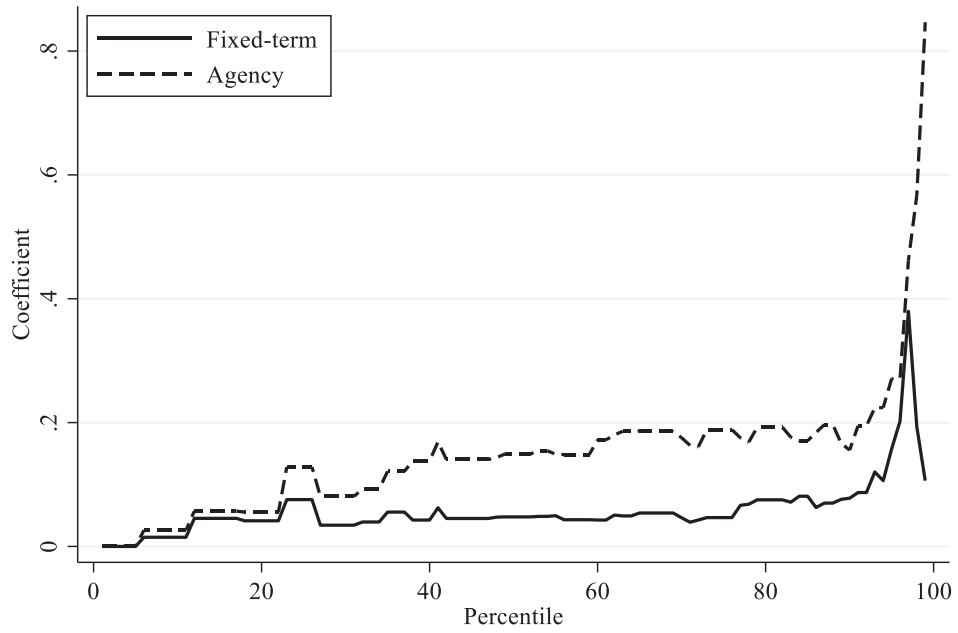


FIGURE A4

Commuting Length Gap across the Commuting Distribution: German Women

