Deroutinization of Labor and Second Birth in Germany: The Moderating Role of Childcare

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Honorata Bogusz[1], Anna Matysiak[1], and Michaela Kreyenfeld[2]

[1]Interdisciplinary Centre for Labour Market and Family Dynamics, Faculty of Economic Sciences, University of Warsaw
[2]Hertie School

Abstract

Technological change and globalization have transformed the structure of labor markets in advanced economies, resulting in a cleavage between workers who perform abstract tasks in high demand and routine tasks in low demand. To date, only a few studies have addressed the fertility effects of these long-term changes. This study contributes to the literature by investigating the association between the changing demand for tasks at the regional level and second births, while considering the moderating role of childcare availability. We calculate abstract and routine task intensities using data from the Employment Survey of the German Federal Institute for Vocational Education and Training, which we link to individual fertility and employment histories of women from the German Pension Fund (2 percent random sample). We find that the predicted probabilities of second births are positively related to abstract task intensity at both the occupational and regional levels, and negatively related to routine task intensity. We hypothesize that the availability of childcare might moderate these relationships.

1 Introduction

Over the last few decades, advancements in technology and the effects of globalization have brought about significant changes in labor markets within advanced economies (Acemoglu & Johnson, 2023; World Bank, 2019). These shifts have also led to new divisions in the workforce, contributing to widening gaps in wages, job security, job flexibility, and career opportunities. A key divide now seems to exist between workers engaged in abstract (cognitive) tasks and those involved in routine tasks. The demand for abstract tasks—whether analytical or social/interpersonal—has been steadily increasing, particularly in rapidly growing high-tech industries and specialized areas like consumer services, business, and education (Acemoglu & Autor, 2011; Cortes et al., 2021). The expansion of information and communication technologies has enabled workers in abstract jobs to gain more flexibility in how and where they work, although this often comes with increased responsibility for their work outcomes (Van Echtelt et al., 2009). Meanwhile, the demand for workers performing routine work has been declining, as these tasks are more susceptible to automation or being outsourced to countries with cheaper labor (Acemoglu & Autor, 2011; World Bank, 2019). This transition from routine tasks to more abstract ones has been termed *deroutinization* by labor economists.

These developments may not only exacerbate labor market inequalities between highly skilled and lower-skilled workers but could also influence family-related decisions, such as the timing and likelihood of becoming parents and transitioning to higher order births. Demographers widely agree that factors like

earning prospects (Oppenheimer, 1997), job security (Adserà, 2011; Alderotti et al., 2021), and the ability to balance paid work and family life (Begall et al., 2014; Osiewalska et al., 2024) are crucial determinants of family formation. The increasing demand for highly skilled workers and the greater flexibility in work schedules offer abstract workers better opportunities to earn a living and to balance work with family responsibilities, thereby enhancing their conditions for having children. However, these same labor market changes disadvantage low-skilled workers by rendering routine job tasks obsolete (Arntz et al., 2017b). Since these structural shifts in the labor market are long-lasting, unlike the temporary nature of economic recessions, they may lead to enduring changes and growing disparities in fertility behavior between workers in abstract versus routine jobs. Understanding how these labor market dynamics influence childbearing is essential, not only for interpreting past fertility trends but also for anticipating future patterns.

Previous demographic research has offered substantial evidence on the relationship between unemployment, income, type of work contract, and subjective perceptions of employment and financial uncertainty with birth behavior (Adserà, 2011; Alderotti et al., 2021; Kreyenfeld, 2009; Matysiak et al., 2021). By employing well-established measures of employment and economic uncertainty, these studies have illustrated how economic vulnerability and the challenges of balancing paid work with caregiving responsibilities influence birth transitions, with patterns differing by context and gender. Recently, demographers have begun exploring the impact of these structural, rather than cyclical, labor market changes on fertility, but most studies adopted a macro approach (Anelli et al., 2024; Matysiak et al., 2023; Seltzer, 2019). In a micro study on cognitive work and entry to parenthood in Germany, workers in highly abstract jobs (i.e., those in high demand) were found to postpone their first birth, but were overall the least likely to remain childless at the end of their reproductive age, implying that structural shifts in the labor market are exacerbating disparities between low-skilled and highly skilled individuals, not only within the labor market but also in the realm of family formation (Bogusz et al., 2024). We believe that structural labor market changes might affect transitions to higher-order births as well, because they result in a growing class divide between workers with abstract jobs and those with routine jobs. While the debate on the education-fertility nexus is lively (Ciganda et al., 2024; Neels et al., 2024), recent studies have shown a positive relationship between (occupation-based) social class and second birth in Germany (Kreyenfeld et al., 2023), Spain (Baizan, 2020), as well as Austria, France, Norway, and the United Kingdom (Baizan, 2021).

In this study, we contribute to the debate on how structural labor market changes affect fertility. More specifically, we examine how the process of deroutinization, reflected in a transition from routine to abstract jobs in local labor markets, affects the transition to a second birth in Germany. In line with the past literature on the labor market situation of young adults and their fertility behaviors, we expect that deroutinization leads to a decline in second-birth risks among workers most exposed to the negative employment consequences of this change, namely those who perform routine jobs. We thus anticipate that routine workers will display lower second-birth probabilities in regions where the deroutinization process is most advanced (i.e., regions with a low prevalence of routine jobs and/or high availability of abstract jobs), and higher probabilities in regions with a greater availability of routine jobs. We also expect the expansion of abstract jobs, which benefit the employment and earning opportunities of abstract workers, to affect their second-birth risks; though this relationship is more complex, as attractive employment opportunities may also conflict with childrearing. As a result, we hypothesize that abstract workers will have higher second-birth probabilities in regions with high availability of abstract jobs and/or low availability of routine jobs than routine workers, provided that the region offers good childcare opportunities. In contrast, where abstract workers have good employment opportunities but childcare provision is poor, we anticipate their second-birth probabilities to be as high as, or even lower than, those of routine workers.

This study is situated in Germany, where structural changes in the labor market are particularly pronounced, as evidenced by the widespread adoption of industrial robots (Dauth et al., 2021; Deng et al., 2023) and the increasing demand for cognitive labor (Bogusz et al., 2024; Rohrbach-Schmidt & Tiemann, 2013; Spitz-Oener, 2006). Germany is also one of the few European countries that maintains modern-

ized manufacturing and competes in production processes (Dauth et al., 2017; Thelen, 2019), rendering it potentially susceptible to import competition. Additionally, Germany is characterized by a conservative welfare regime, where many women transition to part-time employment upon becoming parents (Arntz et al., 2017a). Historically, cohort fertility rates in Germany were among the lowest in Europe, with high rates of childlessness (Sobotka, 2017). For instance, the cohort fertility rate dropped from 1.72 for women born in 1950 to 1.56 for those born in 1965 (Human Fertility Database, 2024). In recent years, the link between employment characteristics and fertility has become less gendered, with both men's and women's unemployment and low wages contributing to lower fertility rates (Lambert & Kreyenfeld, 2023). Finally, it is important to note that East–West differences in fertility behavior have largely converged since unification (Goldstein & Kreyenfeld, 2011). However, childcare use remains much lower in West Germany than in East Germany (Statistisches Bundesamt, 2024).

2 Data and Methods

To address the recent structural changes in the labor market, we adopt the task-based approach, which originates from labor economics (Autor et al., 2003). This approach assumes that jobs are composed of various tasks requiring specific skills. As technology and globalization reshape these tasks—some being automated and others outsourced—they alter the demand for certain skills, impacting workers' labor market prospects. We assess the task content of occupations using data from the 2006 Employment Survey conducted by the German Federal Institute for Vocational Education and Training (Hall & Tiemann, 2020). This data enables us to create measures of abstract and routine task intensity at the three-digit occupational level (Rohrbach-Schmidt & Tiemann, 2013). We then merge these occupation-specific contextual data with micro-level information from the German Pension Fund (2 percent random sample) covering the years 2012–2019 (i.e., those for which occupational codes are available; Forschungsdatenzentrum der Rentenversicherung (FDZ-RV), 2024a, 2024b). We focus on women, as the data do not contain information about births for men. Linking partners is impossible. However, the data contain regional codes corresponding to the region (Landkreise—the third level of administrative territorial division in Germany) in which a person lives. We leverage this information to link data on the share of children aged below three in daycare open at least seven hours a day in a region (see Figure 1; Statistisches Bundesamt, 2024).

To analyze transitions to the second birth, we employ discrete event-history models with a cloglog link and duration measured in months in a piecewise constant fashion. We start observing mothers in the month they had their first child and stop observing them once they transition to the second child or end their reproductive life (we observe the last births at age 49). The data are right-censored for women who have neither reached age 49 nor had a second birth. The total number of women in our sample is 69,297, while the total number of person-months is 2,280,568. Around 75 percent of women who gave birth to their first child between 2012 and 2019 transitioned to a second birth within that period. Most second births occur in the second year following the first birth.

The abstract and routine task intensities are the primary covariates of interest. We average the occupation-level measures over individuals in childbearing age (20-49) to obtain abstract and routine task intensities at the regional (Landekreis) level. Abstract task intensity is higher in metropolitan areas and lower outside of them, while routine task intensity is higher in rural areas and lower in cities (see Figure 2). In the first step, we interact the task intensities at the occupational level (lagged by one year) with those expressed at the regional level (separately for the abstract and routine measures) to see to what extent the impact of occupational-level task intensity on the transition to the second birth depends on what jobs are available in the region. The occupation-level continuous task measures are transferred into the following four categories: low [0, 33), medium[33, 66), high [66, 100], and the residual category (inactive, unemployed, occupation missing). We do not use them as continuous variables, to account for individuals without valid task measures

in the sample (however, we do not show results for the "residual" category). In all models, we control for the Bundesland in which a woman lives, age (in years), as well as calendar year and month fixed effects. We do not control for education for the following reasons. First, data on educational attainment are incomplete in the register of the German Pension Fund—information for 30 percent of people is missing in a non-random way. Second, education can be characterized as a bad control in our setting (Cinelli et al., 2022), as having a highly abstract job almost perfectly predicts being highly educated (but not the other way around). We present model results as average predicted probabilities.

3 Results

We now move to a discussion of the relationships between abstract/routine work and second-birth transitions. Figure 3 presents the average predicted probabilities of a second birth from estimations where we interact occupational-level task intensities with regional-level task measures. We find a positive gradient between the occupation- and region-level abstract task measures and second-birth risks: the predicted probability of a second birth increases with both measures and women with highly abstract jobs working in highly abstract regions have the highest predicted probability of transitioning to a second birth. The relationship is the opposite for the routine measure: the predicted probability of a second birth decreases with both the occupation- and region-level measures, and it is the lowest for women with highly routine jobs working in highly routinized regions. As anticipated, women with routine jobs overall have lower birth risks than women with abstract jobs, but contrary to expectations, the predicted probabilities for the latter decrease even more with the routinization at the regional level, not with deroutinization.

In the next step of this ongoing analysis, we plan to investigate why the birth risks of women with highly routine jobs decrease with elevated routinization. So far, we have calculated the routine-level task measures using information for all workers of childbearing age. We believe that further insight could be gained by computing gender-specific task measures at the regional level. This would allow us to assess which jobs are available specifically to women and men. Next, we will conduct models with a triple interaction between task measures at the occupational and regional levels, as well as the share of children under three years old in full-time daycare (separately for Western and Eastern Germany). This will enable us to verify our expectation that the birth risks of workers with abstract jobs might be influenced not only by the type of work accessible in the region but also by the availability of full-time daycare. Finally, we plan to address the issue of birth timing vs. quantum. We will pursue this avenue either by computing cumulative (by age) parity progression ratios by covariate constellations (see e.g. Bogusz et al., 2024; Neels et al., 2024), or by estimating mixture cure models (see e.g. Lambert & Kreyenfeld, 2023). These additional analyses will be completed before the International Population Conference in July 2025.

Figure 1: Share of children below 3 years old who are in a seven or more hours daycare, by region (Landkreise).

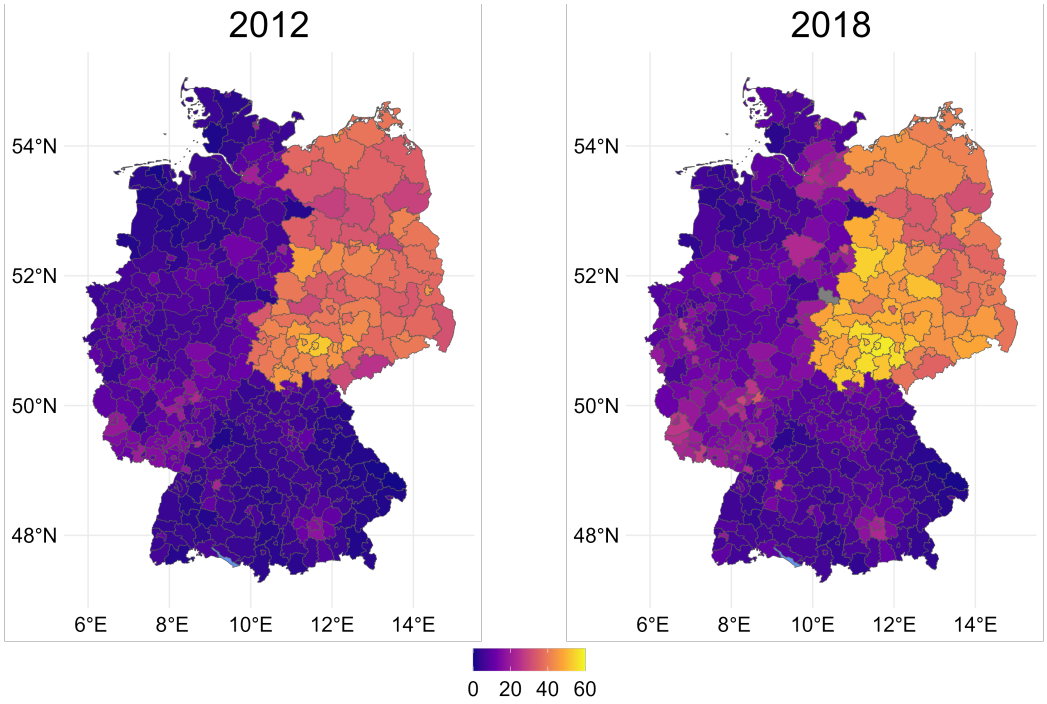


Figure 2: Task intensities in 2019, by region (Landkreise).

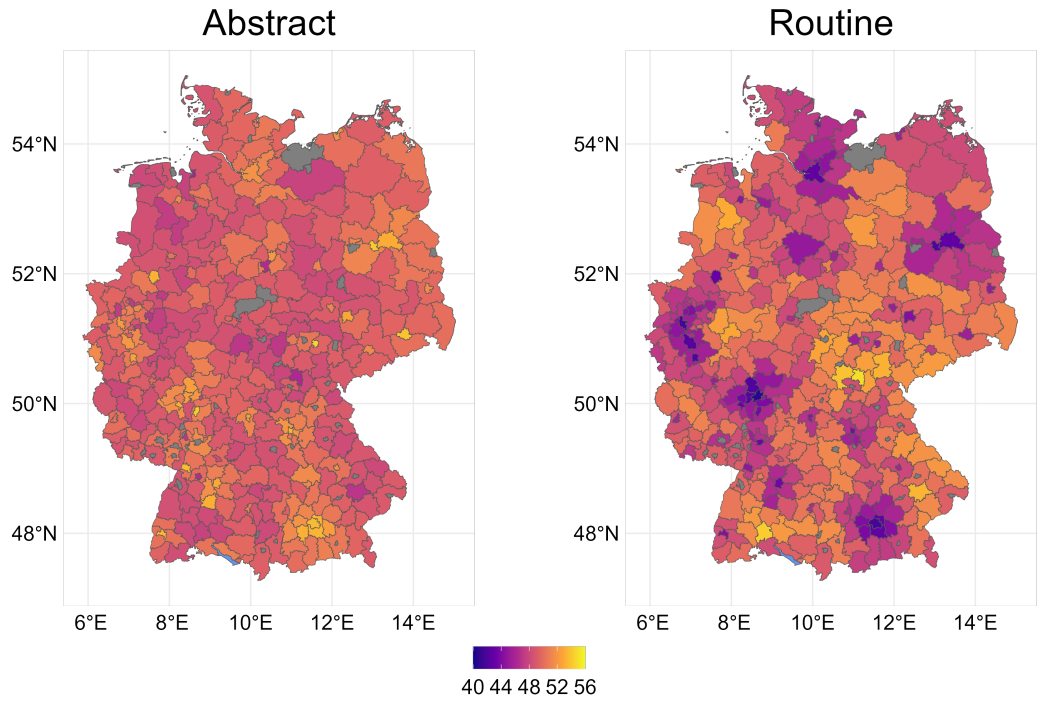
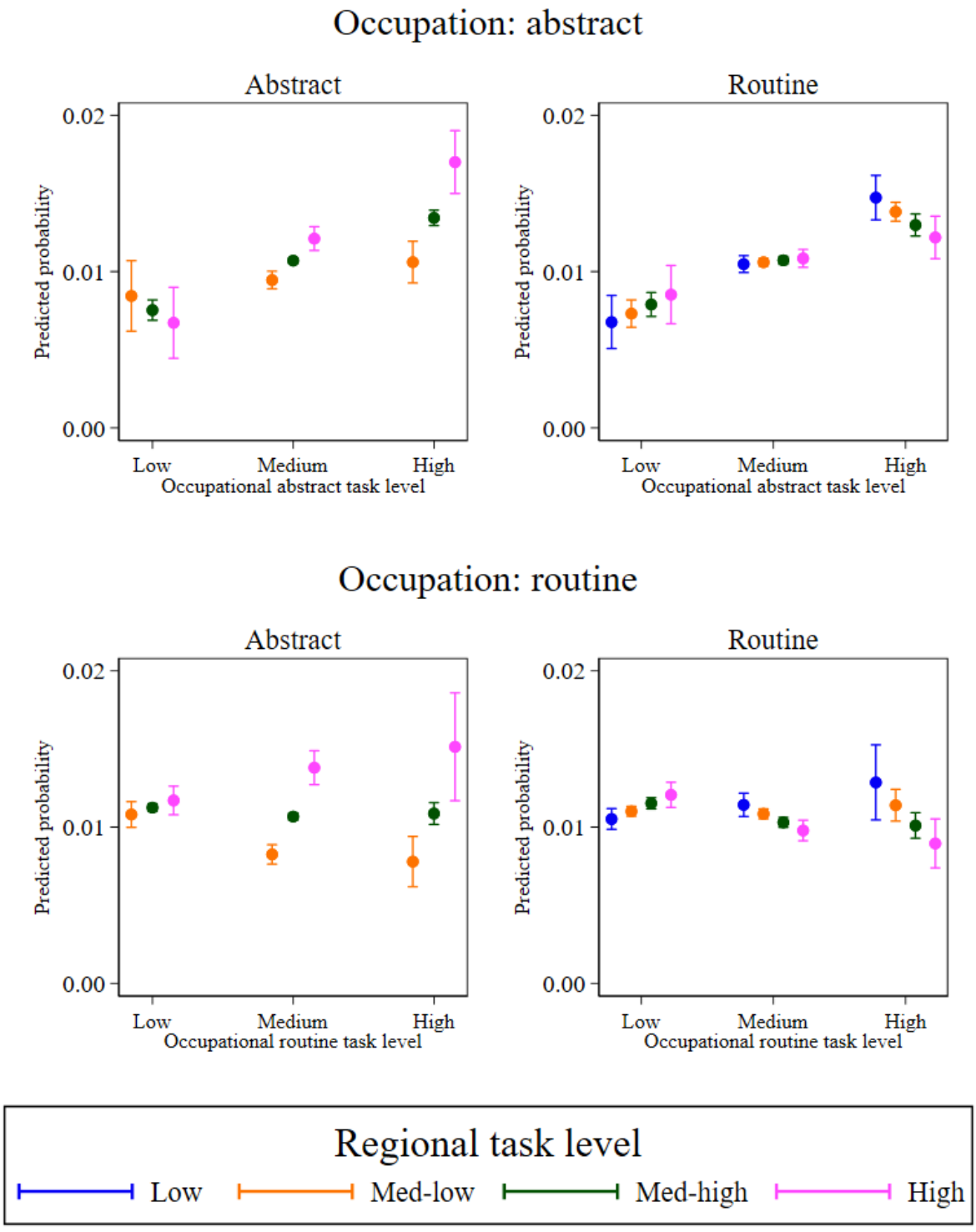


Figure 3: Average predicted probabilities from second-birth models (with 95 per cent confidence intervals): Interaction of women's task measures with regional task measures, Germany. N = 2,280,568.



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