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Fertility and economic instability: the role of unemployment and job displacement

Emilia Del Bono · Andrea Weber · Rudolf Winter-Ebmer

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Abstract In this paper, we study the separate effects of unemployment and job displacement on fertility in a sample of white collar women in Austria. Using an instrumental variable approach, we show that unemployment incidence as such has no negative effect on fertility decisions, but the very fact of being displaced from a career-oriented job has. Fertility rates for women affected by a firm closure are significantly below those of a control group, even after 6 years, and this is so irrespective of the incidence or the duration of the associated unemployment spell.

Keywords Fertility · Unemployment · Firm closures · Human capital

JEL Classification J13 · J64 · J65 · J24

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E. Del Bono
ISER, University of Essex, Colchester, UK
e-mail: edelbono@essex.ac.uk

A. Weber
Department of Economics, University of Mannheim, Mannheim, Germany
e-mail: a.weber@uni-mannheim.de

R. Winter-Ebmer (✉)
Department of Economics, University of Linz, Linz, Austria
e-mail: rudolf.winterebmer@jku.at

R. Winter-Ebmer
Institute for Advanced Studies (IHS), Vienna, Austria

1 Introduction

Standard microeconomic models of fertility predict that the demand for children should be negatively correlated to levels of female activity and that during periods of high unemployment, the fall in the opportunity costs of childbearing should induce an increase in the number of births. In other words, fertility should be *counter-cyclical* (Butz and Ward 1979). Empirical observations were consistent with this hypothesis throughout the 1970s and 1980s (Heckman and Willis 1975), but by the end of the 1990s, the cross-country correlation between fertility and female labour market activity turned positive and many European countries witnessed rapid declines in fertility rates and rising levels of unemployment (Bettio and Villa 1998; Ahn and Mira 2002; Engelhardt and Prskawetz 2004). *Pro-cyclical* fertility emerged as a new empirical regularity, and numerous studies aimed at analysing the effect of unemployment on fertility showed a strong negative relationship between these two variables at the aggregate as well as at the individual level.[1]

The literature which relates labour market conditions to fertility has always stressed the idea that unemployment is only one aspect of a more general problem, a problem we may call labour market "instability" and that might be at the roots of the recent trends in fertility rates observed in many European countries. Studies using aggregate unemployment rates to explain individual fertility behavior are to some extent capturing this instability as well. High aggregate unemployment may increase individual unemployment incidence or the risk of losing a job in the near future or at the same time reduce the likelihood of future wage growth (Adsera and Menendez 2011). However, attempts to isolate these different mechanisms or to identify the effects of labour market institutions that increase instability—such as temporary contracts, part-time work, or flexible jobs—have been rather isolated (De la Rica 2005; Gonzalez and Jurado-Guerrero 2006; Adsera 2011).[2]

In this paper, we analyse the relationship between unemployment and fertility in Austria during the period between 1990 and 1998. In order to address the problem of endogeneity of unemployment, we first use job displacement caused by a firm closure as a source of exogenous variation in unemployment. We then try to disentangle the effect of unemployment per se from the effect of an involuntary job separation. That is, we investigate whether fertility is mainly affected by the loss of earnings for not being employed or is also responsive to the change in career prospects and the effort required to find a new job which accompanies any involuntary job separation caused by a firm closure. In doing so, we explore the extent to

[1] See Adsera (2005) for a study of the effects of aggregate unemployment rates on fertility rates across a number of European countries. Perry (2004) shows that the US college-educated females' fertility behaves pro-cyclically whereas Dehejia and Lleras-Muney (2004) report several examples of pro-cyclical fertility, mainly in more developed countries. Kravdal (2002) for Norway and Meron et al. (2002) for France show a negative effect of individual unemployment experience on fertility, while Gutiérrez-Domènech (2008) studies its impact on fertility timing and marriage behaviour in Spain. See also Sobotka et al. (2011) for a recent review on the effect of recessions on fertility.

[2] See Kohler and Kohler (2002), Ranjan (1999), or Kreyenfeld (2010) for studies trying to associate the fertility decline in (Eastern) Europe with general economic uncertainty.

which the negative relationship between fertility and unemployment documented in the literature is mainly driven by contingent income considerations or reflects broader issues related to long-term career prospects and uncertainty about employment opportunities.

Our identification strategy is based on two specific features of the labour market that we study. First, an involuntary job loss due to a firm closure is not always followed by a spell of unemployment; indeed, more than two thirds of displaced women in this study experienced a job-to-job transition. Second, individual variation in unemployment duration in Austria is largely due to seasonal and industry-specific effects (Del Bono and Weber 2008). This allows us to include an indicator for firm closure as well as a variable capturing the incidence or the length of the individual unemployment spell in our empirical model of fertility. To account for the endogeneity of unemployment, we instrument the latter using interactions between firm closure and seasonal, geographical and temporal effects. This way, we explicitly distinguish the effect of job displacement which operates through career and employment considerations from the effect of job displacement which operates through the loss of earnings caused by an unemployment spell.

Our results show that a job separation exerts a negative effect on fertility, while variation in unemployment induced by the firm closure does not have an additional impact. We also document stronger (more negative) effects of displacement for women with higher pre-displacement wages and higher pre-displacement wage growth. We interpret this finding as evidence that career and employment considerations are very important determinants of fertility decisions and matter more than short-run income effects while being unemployed. This evidence is in line with the results recently discussed by Del Bono et al. (2012).

From a policy perspective, this study is important as it provides new evidence that labour market institutions associated with higher uncertainty about employment and lower career and promotion opportunities—such as temporary, part-time, or 0-h contracts—can significantly reduce women's demand for children. The study also suggests that if career breaks are costly in terms of future earnings and employment opportunities irrespective of the length of the interruption, family policies which emphasise the importance of income support during periods of maternity leave might not be the best tool to reconcile motherhood with good labour market outcomes for women.

2 Data and empirical setup

Our analysis is based on the *Austrian Social Security Database* (ASSD) which covers all private sector workers between 1972 and 2007. The data include daily information on employment and unemployment status, total annual earnings paid by each employer and various characteristics of the workers and their jobs (Zweimüller et al. 2009). Our definition of unemployment is based on registration status, i.e. it only includes periods in which individuals are receiving unemployment benefits. Eligibility for unemployment benefits is related to previous employment; as long as

the woman has worked at least 52 weeks in the previous 2 years, she is entitled to receive unemployment benefits of about 55 % of her previous net income.[3]

The availability of employer identifiers creates a linked worker-firm component in the ASSD, which we exploit to define firms. In our sample, we consider firms that have at least one employed worker on the payroll on any of four sampling dates (February 10, May 10, August 10 and November 10) over the years 1990 to 1998. Firm exit dates are defined as the last quarter date in which a firm employs at least one worker. To define firm closures, we apply three selection criteria. First, we exclude firm exits, where more than 50 % of the workforce in the last year jointly transits to the same new employer. Second, we exclude firms operating in agriculture, construction and tourism industries. These sectors are characterised by a high share of seasonal employment which makes it difficult to identify firm entries and exits. Third, we only consider firms with five or more employees on one quarter date during 1972–2002 and restrict the sample to firms with more than three workers in the closing quarter because based on the worker-flow approach, we cannot identify firm closures for very small firms.

Based on this sample of firms, we consider all women between 18 and 35 years employed in white-collar jobs between quarter 1/1990 and quarter 4/1998 and having at least 1 year of tenure in the current firm. These women will therefore all have equal entitlement to unemployment and parental benefits. We focus on women working in white-collar jobs because for them, firm-specific human capital or ability is likely to be more relevant determinants of productivity and an involuntary job separation will be more costly.[4] By contrast, blue-collar jobs are relatively rare among women in Austria and confined to manual occupations in low ranking positions in the production sector, with modest salaries and high job turnover even in the absence of firm closure. Having said that, white-collar jobs may include jobs we define as "career jobs", being those with high earning (growth) prospects as well as other more dead-end jobs in the service sector. We will later differentiate between different types of white-collar jobs.

We define as *displaced* all women working in a closing firm the quarter before closure and as *control* all women who are not affected by a firm closure, i.e. working in a control firm in any quarter, which we call the reference quarter. Because of the downsizing and restructuring in the period prior to firm closure, a non-randomly selected pool of workers may be left at the closing date. To deal with selection over the firm closure process, the literature typically suggests to include worker separations from a longer period prior to the firm closure date (Dustmann and Meghir 2005;

[3]Eligibility for parental leave benefits follows similar rules, with the exception that mothers younger than 25 are eligible after having worked 26 weeks in the previous year. In Austria, women who have children are entitled to 16 weeks of maternity protection, which is usually divided into 8 weeks before and 8 weeks after birth and up to 2 years of parental leave. The maternity protection period is paid at 100 % of the previous salary, the remaining period is paid at a flat rate of 408 Euros per month.

[4]In our companion paper (Del Bono et al. 2012), we study fertility effects of plant closures in more detail and find that negative fertility effects prevail for workers in white-collar jobs in the third tertile of the wage distribution and those with longer pre-displacement tenure and higher wage growth.

Eliason and Storie 2006). This type of solution turns out to be infeasible in our application however. All women who give birth are required by law to leave their jobs for at least 4 months, which means that we must avoid definitions of displacement that potentially include voluntary quits.[5] Finally, in order to make the empirical analysis more manageable, we take a random 5 % sample from the group of control women. The final sample consists of 6,431 observations of women in the displaced group and 157,884 observations of women in the control group.

To derive a measure of fertility for every woman in the labour force, we merge the ASSD with child benefit records from the Ministry of Finance. As take up of child benefits is almost universal in Austria and applies to all children up to age 18, we have access to all births from 1975 to 2005. Our outcome of interest is the number of births per woman after the reference date. This excludes births occurring within 6 months of the reference date, i.e. we do not consider women who are pregnant at the time of displacement. Since job displacement might affect the total number of children as well as the timing of fertility, we look at the path of birth rates up to 6 years following the reference date.

To show the effects of firm closure on labour market and fertility outcomes, we start with a graphical event study, where we pool all observations at the reference date and plot the means of the outcome variables each quarter before and after the reference date separately for the displaced and control groups. Looking at the period before, the reference date establishes the a priori comparability of different groups. This is an important check as closing firms may differ from surviving firms, and women with different unobserved characteristics might select into more or less "risky" firms in terms of their likelihood to close down.

Figure 1 shows the effects of firm closure on labour market outcomes. We plot days employed per quarter in the 20 quarters before and up to 12 quarters after the reference date in the first graph. Employment for both the displaced and control groups is at 100 % in quarters −3 to 0 due to our 1-year tenure requirement. Before that, employment is lower in both groups. Notably, the displaced group has smaller employment in all quarters, but the difference is minor, accounting for 2 or 3 days per quarter at most. After the reference date, we see a huge drop in employment in the displaced group to an employment rate of approximately 75 %. Employment in the control group declines gradually, reflecting the loose labour market attachment of young women in Austria. By the end of the third year, after the reference date, there is still a significant difference in employment between the displaced and control women. The reverse picture is shown for unemployment in the second graph.[6] While unemployment is low in both groups before the reference date it shoots up after displacement. The results for monthly earnings (including zeros if the individual

[5] Using the same data employed in this study, Del Bono et al. (2012) show evidence that the labour market and fertility histories of women employed in the firm 1 year before closure do not differ significantly from those of women in the displaced group.

[6] Unemployment is defined as being in receipt of unemployment benefits and not simply as a period of non-employment.

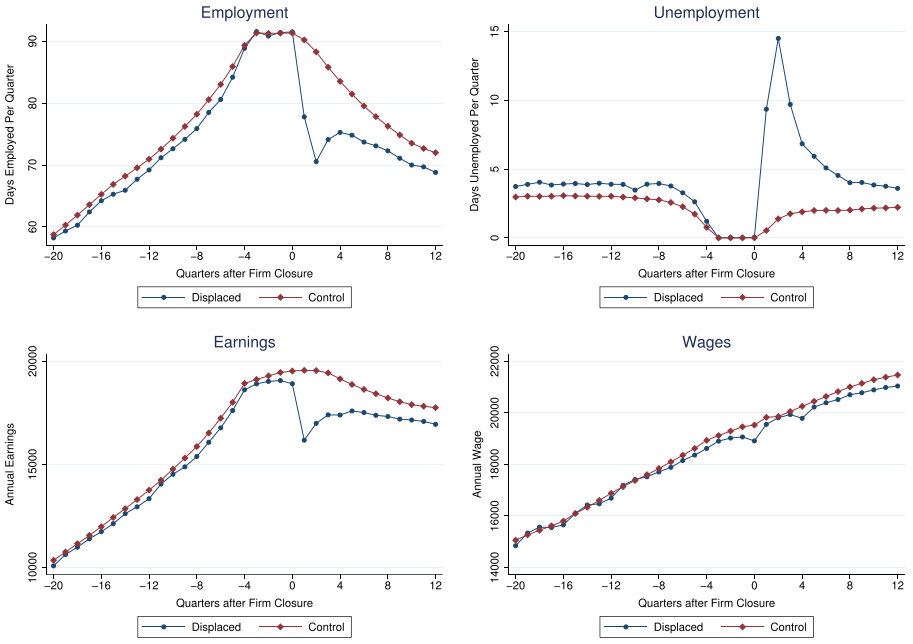

Fig. 1 The impact of plant closure on employment, unemployment and earnings. *Upper panel* Comparison between the average number of days employed/unemployed of displaced and control women by quarter, before and after the reference date. *Lower panel left* average monthly earnings (including zeros for non-employed individuals), *right* daily wages for employed workers. Sample: women aged 18–35 at the time of potential plant closure from white-collar jobs with a least 1 year of tenure

is not employed), shown in the third graph, closely resemble employment, which indicates that earnings loss from job displacement are mostly driven by lower employment rather than wage reductions. Finally, wages for employed workers show that although there are small wage losses after plant closure, these are negligible relative to losses due to unemployment.

Figure 2 plots the average yearly numbers of births in the 14 years before the reference date and 10 years afterward. The mean number of births per year is age-adjusted, i.e. it is based on the residuals of a regression of the number of births on age of the mother and its square. The graph shows that the average number of births per woman decreases rapidly up to the reference date, when it becomes 0, and then shoots up dramatically. This pattern is a consequence of the fact that we select only women with at least 1 year of tenure at the reference date. This means that all women must have been working during the year before closure, and therefore, by construction, they cannot have any children between year -1 and year 0. As these women are also more likely to have been in employment in the periods leading to the reference date, we observe a decreasing birth rate in the years preceding closure. The jump in the probability of a birth after the reference date is also a consequence of our tenure requirement. Conditional on not having had a birth in the last year, these women

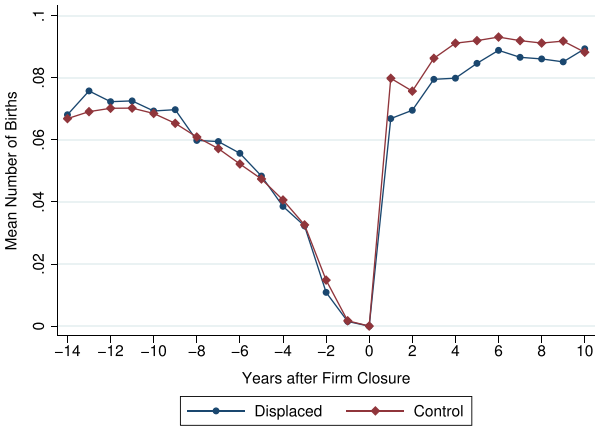

Fig. 2 The impact of plant closure on the average number of births by year. Comparison between the average number of births of displaced and control women by quarter, before and after the reference date. Number of births is age-adjusted. Sample: women aged 18–35 at the time of potential plant closure from white-collar jobs with a least 1 year of tenure

are more likely to have a child in the following period. This graph nicely shows the strong similarity of displaced and control groups before the reference date. The most interesting feature in Fig. 2, however, is the difference in fertility between displaced and control women after job loss, which shows very clearly that fertility is lower after a plant closure.

Table 1 compares the characteristics of women in the displaced group and in the control group. Displaced and control women are remarkably similar in age, nationality, total labour market experience, age at labour market entry, previous earnings (up to 4 years before the reference year), and previous employment (up to 4 years before the reference year), while they differ somewhat in terms of tenure, apprenticeship status and number of previous children. None of these differences are statistically significant. Nevertheless, all our regression results will take these characteristics into account. We do not consider here differences in firm characteristics, as we find that these are usually not useful to capture differences between our treated and control groups and including them in the regressions makes very little differences to the results.[7]

[7]Our checks show that using propensity scores weights constructed using individual characteristics helps to reduce further the (small) pre-displacement differences, seen in Figs. 1 and 2, and balance the treated and control sample. By contrast, propensity score weights constructed using firm characteristics only have no effect on the differences between treated and control groups, either before or after displacement. In the interest of space, we do not report here these results, but refer to our companion paper (Del Bono et al. 2012) for a full discussion on these issues.

Table 1 Individual characteristics

	Control group		Displaced group		All	
	Mean	SD	Mean	SD	Mean	SD
Age	27.07	4.67	27.28	4.65	27.08	4.67
Austrian	0.98	0.14	0.97	0.18	0.98	0.14
Experience (months)	103.80	53.14	105.98	53.99	103.89	53.18
Tenure (months)	49.50	37.43	43.22	35.16	49.26	37.36
Age at labor market entry	16.90	2.42	16.87	2.60	16.90	2.43
Apprenticeship	0.35	0.48	0.41	0.49	0.36	0.48
Earnings 1 year before	734.10	273.52	720.11	292.92	733.55	274.32
Earnings 2 years before	696.00	262.51	688.05	279.47	695.69	263.20
Earnings 3 years before	606.77	307.13	594.02	326.25	606.27	307.91
Earnings 4 years before	536.71	322.00	526.29	332.20	536.31	322.41
% Employment 2 years before	0.93	0.20	0.91	0.22	0.93	0.20
% Employment 3 years before	0.83	0.33	0.80	0.35	0.82	0.34
% Employment 4 years before	0.75	0.39	0.73	0.40	0.75	0.39
Number of previous children	0.38	0.71	0.42	0.72	0.39	0.71
% unemployment 1 year after	0.02	0.08	0.11	0.21	0.02	0.09
Any unemployment 1 year after	0.06	0.25	0.33	0.47	0.08	0.26
Births next 3 years	0.19	0.44	0.17	0.41	0.19	0.43
Births next 6 years	0.43	0.68	0.38	0.65	0.43	0.68
Observations	157,784		6431		164,215	

Variable means and standard deviations in parentheses. Displaced group includes women aged 18 to 35 with at least 1 year of tenure in closing firms at the closure date. Control group is a 5 % random subsample of women aged 18 to 35 with at least 1 year of tenure in firms that do not close within the next 2 years of the reference date. The outcome includes the number of children born between 6 months and 3 (or 6) years after the reference date. None of the differences between control group and displaced group are statistically significant

3 Career interruption versus unemployment

Job displacement can affect fertility decisions through different channels. The first mechanism we consider here is whether it impacts fertility because it triggers a spell of unemployment (Fig. 2). To begin with, we run the following fertility regression:

$$F_i = \alpha + \gamma U_i + Z_i\beta + v_i \tag{1}$$

where F_i is the outcome measure, the number of births in the next 3 or 6 years.[8] U_i is a measure of unemployment, and Z_i is a vector of covariates. We use two different variables to measure unemployment: an indicator variable equal to one if there is

[8]We conducted a similar analysis considering the probability of having *another* child in the next 3 or 6 years as the dependent variable. The results of this analysis are very similar to those presented here on the number of children because the main effects are found for women with no previous children.

positive unemployment in the first year after the reference date (unemployment incidence), and the percentage of time the individual is unemployed during the first year after the reference date (unemployment duration).

Table 2 shows the relationship between fertility and unemployment in our data. In the panel, we report results for unemployment incidence, while in the bottom panel, we adopt a definition of unemployment duration. The first two columns of the table simply show the coefficient of an OLS regression of number of births—after 3 and 6 years—on the different measures of unemployment. As we can see in panel A, a woman experiencing a spell of unemployment in the year after the reference date has much lower fertility than a woman experiencing no unemployment at all, and she will have 17.4 to 15.8 % less children in the next 3 and 6 years, respectively.[9] In panel B, we report the fertility effect of an increase in unemployment as a percentage of the first year after the reference date. The effect of longer unemployment during the first year is much smaller than the effect of the incidence of unemployment itself. The results indicate that a 10 % rise in unemployment, which corresponds to a one standard deviation increase, reduces fertility by 0.003 or 1.6 % after 3 years. The effect is larger after 6 years, with a reduction in 0.01 children or 2.3 %.[10]

There are, however, serious doubts about whether individual unemployment can be considered exogenous with respect to fertility. We could have a problem of reverse causality if, e.g. (planned) fertility decisions have an impact on unemployment. For example, women planning to have a child in the near future might be more likely to lose their job, either because they become less productive or because managers might target these women for temporary layoffs. In addition, there might be unobservable characteristics determining unemployment and fertility at the same time. For instance, women with a high propensity to have children might seek less demanding jobs and careers with lower returns and higher employment uncertainty. Both biases would work in the same direction and induce a bias towards 0 in the estimates. Alternatively, it is possible that women who plan to start a family might seek more stable careers and job security. In all these cases, the OLS coefficient on unemployment could be biased away from 0.

In the next two columns, we use exogenous variation in unemployment brought about by job displacement to obtain a consistent estimate of the effects of unemployment on fertility. The estimation is by two-stage least squares (2SLS), where the first stage regresses the relevant measure of unemployment on a dummy variable which assumes value 1 if the woman had been displaced by a firm closure at the reference date.[11] The instrument has a strong influence on either definition of unemployment

[9] Standard errors are clustered at the individual level. Clustering at the firm level does not change the results in a meaningful way because of the small number of individuals employed within the same firm, particularly in the displaced group.

[10] The average number of children is 0.19 and 0.43 after 3 and 6 years since the reference date, respectively. See Table 1.

[11] The full results of this specification are available on request from the authors. Additional control variables are reported in the footnote of the table. Information about the partner or the marital status of the women was not available in the data. There is no information on the level of educational qualification of the individual either, but this is captured by age of entry in the labour market and apprenticeship status.

as shown by a t test above 70 in the first stage regressions. Once again, estimation results indicate a significant and negative impact of unemployment on fertility. The magnitude of the effect is now two to three times larger than without controlling for the endogeneity of unemployment. Although the standard errors also increase, we can in general significantly distinguish the 2SLS from the OLS estimates. Overall, these results could be taken as evidence that unemployment has a true and non-negligible effect on fertility. Notice that the 2SLS estimates indicate that the OLS coefficients on unemployment are biased towards 0, which would suggest that women with a higher demand for children select themselves into jobs with a higher probability of unemployment.

The instrumental variable estimates in Table 2 show that based on variation due to an unexpected job loss, unemployment has a strong and negative effect on fertility. What we want to examine next is whether it is the experience of job loss per se or the

Table 2 Effects of unemployment on fertility

	OLS		2SLS	
	Births next 3 years	Births next 6 years	Births next 3 years	Births next 6 years
Panel A: any unemployment in the first year				
Unemployment	−0.0330[a]	−0.0680[a]	−0.0667[b]	−0.1222[a]
	(0.0039)	(0.0062)	(0.0207)	(0.0321)
t test			77.033	77.03
R^2	0.0365	0.0814	0.0351	0.0810
Observations	164,215	164,215	164,215	164,215
Panel B: % unemployment in the first year				
Unemployment	−0.0003[b]	−0.0010[a]	−0.0018[b]	−0.0033[a]
	(0.0001)	(0.0002)	(0.0006)	(0.0009)
t test			83.83	83.83
R^2	0.0352	0.0810	0.0342	0.0801
Observations	164,215	164,215	164,215	164,215

Estimations from OLS and 2SLS regressions, where the unemployment variable is instrumented by firm closure dummy (t statistics shown). Unemployment is measured by an indicator for being unemployed in the first year since the reference date (panel A) and by the percentage of time unemployed in the first year after the reference date (panel B). Displaced group includes white-collar women aged 18–35 with at least 1 year of tenure in closing firms at the closure date. Control group is a 5 % random subsample of white-collar women aged 18–35 with at least 1 year of tenure in firms that do not close within the next 2 years of the reference date. The outcome variable births next 3 (6) years measures the number of children born between 6 and 36 (72) months after the reference date. Covariates include maternal age and its square, tenure, experience, indicator for apprenticeship education, previous earnings, previous employment, number of previous children, year, quarter, region and industry dummies. Robust standard errors clustered at the individual level reported. [a]Significant at 1 %, [b]Significant at 5 %

unemployment that usually follows it which leads to the observed decrease in fertility. An unexpected job loss—such as that caused by a plant closure—can have effects on fertility decisions over and above those caused by an unemployment spell. It may cause the loss of a potentially long-term job with career prospects, for example, and thus it may change an individual's future income, whether or not it leads to a spell of unemployment in the immediate aftermath.

In order to test for the existence of an effect of job displacement which is independent of its consequences in terms of unemployment, we exploit the fact that a large share of women affected by firm closure do not experience any unemployment. In our sample of white-collar women, only 32.7 % become unemployed in the first year after firm closure (as compared to 6.5 % of the control group), i.e. more than two thirds of women in our displaced group experience a job-to-job transition. For these women, the effect of firm closure on fertility should operate mainly through the disruption of career prospects and the need to find another job, while short-term income considerations should be less relevant. Our primary strategy is therefore to compare the fertility outcomes of women who experience unemployment and those of women who do not experience unemployment after controlling for their displacement status, i.e. we run regressions of the following type:

$$F_i = \alpha + \tau C_i + \gamma U_i + Z_i \beta + v_i \tag{2}$$

including now C_i as an indicator for firm closure as additional explanatory variable.

Regression models considering the separate effect of firm closure and unemployment on fertility are shown in Table 3. The first two columns report OLS estimates for different measures of fertility (3 and 6 years after the reference date) and the two different measures of unemployment (top and bottom panel, as in Table 2). Both firm closure and unemployment exhibit a negative coefficient, so both tend to be associated with lower fertility. The incidence of unemployment, in panel A, seems to have a larger negative impact on fertility than the experience of job displacement. According to panel B, the impact of longer unemployment, say a one standard deviation increase, appears to be smaller than the effect of job displacement.

As before, unemployment experience should be considered endogenous. We therefore move on to a 2SLS specification, where we use the interaction between firm closure and dummies for years, quarters, regions and industries to predict unemployment.[12] These 2SLS estimates are presented in columns 3 and 4. Columns 5 and 6 show an alternative specification, which features a triple interaction between firm closure, industry and quarter dummies in the first stage regression. The danger with such a strategy is that these excluded interactions might be weak instruments, i.e. showing a low partial correlation with unemployment. However, the F-statistics reported at the bottom of each panel demonstrate otherwise that they are above 60 for the first specification and above 100 in the second.

The rationale behind our identification strategy is that, as shown in the study of Del Bono and Weber (2008), individual unemployment in Austria is subject to significant seasonal and industry-specific variation which is largely due to demand factors.

[12] We have data for 9 years, six regions and four industries (manufacturing, sales, transport and services).

Table 3 Pure displacement versus unemployment effect on fertility

	OLS		2SLS Model 1		2SLS Model 2	
	Births next 3 years	Births next 6 years	Births next 3 years	Births next 6 years	Births next 3 years	Births next 6 years
Panel A: any unemployment in the first year						
Firm closure	−0.0088	−0.0142	−0.0225	−0.0424[b]	−0.0291[b]	−0.0377[b]
	(0.0053)	(0.0083)	(0.0120)	(0.0191)	(0.0126)	(0.0194)
Unemployment	−0.0318[a]	−0.0661[a]	0.0224	0.0457	0.0458	0.0271
	(0.0040)	(0.0063)	(0.0456)	(0.0692)	(0.0456)	(0.0708)
F-stat		71.65	71.65	67.55	67.55	
R^2	0.0356	0.0815	0.0345	0.0800	0.0333	0.0802
Observations	164,215	164,215	164,215	164,215	164,215	164,215
Panel B: % unemployment in the first year						
Firm closure	−0.0147[b]	−0.0220[b]	−0.0178	−0.0356[b]	−0.0226[b]	−0.0318
	(0.0053)	(0.0083)	(0.0115)	(0.0176)	(0.0114)	(0.0175)
Unemployment	−0.0002	−0.0010[a]	0.0001	0.0005	0.0006	0.0001
	(0.0001)	(0.0002)	(0.0011)	(0.0017)	(0.0011)	(0.017)
F-stat			108.73	108.73	107.86	107.86
R^2	0.0352	0.0810	0.0353	0.0806	0.0349	0.0808
Observations	164,215	164,215	164,215	164,215	164,215	164,215

Estimations from OLS and 2SLS regressions, where the unemployment variable is instrumented by firm closure interacted with 8-year, 3 quarter, 3 industry and 5 region dummies (model 1), as well plant closure interacted with industry and quarter dummies only (model 2). F-statistics refer to the joint significance of the excluded instruments in the first stage regression. Unemployment is measured by an indicator for being unemployed in the first year since the reference date (panel A) and by the percentage of time unemployed in the first year after the reference date (panel B). Displaced group includes white-collar women aged 18–35 with at least 1 year of tenure in closing firms at the closure date. Control group is a 5 % random subsample of white-collar women aged 18–35 with at least 1 year of tenure in firms that do not close within the next 2 years of the reference date. The outcome variable births next 3 (6) years measures the number of children born between 6 and 36 (72) months after the reference date. Covariates include maternal age and its square, tenure, experience, indicator for apprenticeship education, previous earnings, previous employment, number of previous children, year, quarter, region and industry dummies. Robust standard errors clustered at the individual level reported. [a]Significant at 1 %, [b]Significant at 5 %

This justifies the use of a set of interactions between firm closure and time, industry and geographical effects as our instrument for unemployment. The main assumption we make here is that the direct effect of firm closure on fertility is independent of time, region or industry.[13] This might not be a valid assumption if, for example, the

[13]Note that the same time (year and quarter), industry and region dummies are in the main fertility regression as well.

direct cost of job displacement varies by industry because the amount of firm-specific human capital destroyed upon displacement is different in different sectors of the economy, and therefore, career costs differ by industry. We think this would be a concern if we were to use a very detailed definition of industry, where each group could represent a set of firms with similar human capital requirements, wage structure and career opportunities. As we adopt here a very broad definition of industry and distinguish among very large aggregates (manufacturing, sales, transport and services), we think that this is not an issue and that industry-specific variation in the effects of firm closure on fertility is mainly demand-led and the result of variation in unemployment rates.

Our identification strategy is based on a set of instruments given by the interaction between two exogenous variables which are separately controlled for in the main equation. An early example of a similar approach is to be found in the study of Lemieux and Card (2001), who investigate the separate effects of veteran status and education on earnings using as an instrument for education the interaction between veteran status and father's education, where father's education is controlled in the main equation. More recently, Chevalier et al. (2013) analyse the impact of family income on children's schooling using the interaction between father's union status and occupation as instruments (the latter two variables are included as separate regressors in the main equation on children schooling) for family income.

Once we take into account the endogeneity of unemployment, our results change. In all specifications, the coefficient on firm closure remains negative, it becomes larger in magnitude and it is in most cases significant. The coefficient of unemployment changes sign (becomes positive) and becomes insignificantly different from 0 in all our specifications. In panel A, the effect of unemployment incidence is very imprecisely estimated, but generally smaller in magnitude than the effect of firm closure. In panel B, the effects of unemployment duration get very close to 0 and have only negligible influence on fertility. This indicates that when comparing displaced women according to their unemployment experience, there are no fertility differences according to the incidence and duration of unemployment. The only negative effect comes through the job loss experience per se. This is consistent with the evidence in Del Bono et al. (2012), who interpret the effects of job displacement on fertility in terms of *employability* and *career* effects. The results are robust to different specifications, as can be seen in columns 3 to 6.

In Table 4, we provide further evidence that career and employment considerations are the main mechanism through which job displacement affects fertility over the next 6 years.[14] Here, we separate our sample into two groups: women with average wage growth below 5 % and those with average annual wage growth above 5 % in the last 3 years before displacement (5 % is roughly the median average growth rate of wages before displacement). We define the latter group as being in "career-oriented jobs", as their wage growth in the past was above average. For these workers, we expect the direct effect of job displacement to be more important. Panel A reports results obtained by estimating a model in which only unemployment is included in

[14] Results for the number of births in the next 3 years are very similar and are available upon request.

Table 4 Heterogeneous effects

	OLS		2SLS	
	Earn. growth < 5 % birth next 6 years	earn. growth > 5 % births next 6 years	earn. growth < 5 % births next 6 years	earn. growth > 5 % birth next 6 years
Panel A: unemployment effects only				
Unemployment	−0.0686[a]	−0.0705[a]	−0.0966[a]	−0.1382[a]
	(0.0099)	(0.0097)	(0.0483)	(0.0529)
F-stat			52.94	49.55
R^2	0.1054	0.066	0.1053	0.0654
Observations	65,119	75,549	65,119	75,549
Panel B: firm closure and unemployment effects				
Firm closure	−0.0077	−0.0167	−0.0155	−0.0409
	(0.0131)	(0.0128)	(0.0281)	(0.0299)
Unemployment	−0.0674[a]	−0.0683[a]	−0.0379	0.0334
	(0.0101)	(0.0099)	(0.0951)	(0.1153)
F-stat			35.99	27.32
R^2	0.047	0.066	0.105	0.064
Observations	65,119	75,549	65,119	75,549

Estimations from OLS and 2SLS regressions by subgroups defined on the basis of pre-displacement wage growth. Panel A presents the effect of unemployment. In this panel, the 2SLS results are obtained using a dummy for firm closure as an instrument, as also shown in Table 2, for the entire sample. Panel B presents estimates of the separate effects of firm closure and unemployment. Here, the 2SLS results are obtained using interactions between firm closure and 8 years, 3 quarters, 5 regions and 3 industry dummies, as per model 1 in Table 3. F-statistics refers to the significance of the excluded instruments in the first stage regression. Unemployment is measured by an indicator for being unemployed in the first year since the reference date. Covariates include maternal age and its square, tenure, experience, indicator for apprenticeship education, previous earnings, previous employment, number of previous children, year, quarter, region and industry dummies. Robust standard errors clustered at the individual level reported. [a]Significant at 1 %, [b]Significant at 5 %

the fertility equation (as seen in Eq. 1), while panel B includes also the firm closure dummy (as seen in Eq. 2). For reasons of space, we report results using only the first definition of unemployment, i.e. whether the woman has experienced any unemployment in the year after the reference date, and only for fertility after 3 years. The 2SLS models are estimated in the same way as before.

As we can see from panel A, there is little difference in the effect of unemployment incidence on fertility for these two groups in the OLS regressions. This result changes, however, when we consider 2SLS estimates. This shows that the negative effect of unemployment as identified by firm closures is much larger for women with a steeper wage profile. The results in panel B, which report the separate effects of firm closure and unemployment, again show that unemployment has a significant

negative effect on fertility in the OLS regressions and that this effect is very similar between the two groups of women. The 2SLS, by contrast, reveal no significant impact of unemployment for both groups and suggest a stronger effect of firm closure for career-oriented women although this is not precisely estimated. While these heterogeneous effects are not conclusive themselves, they are in line with previous results by Del Bono et al. (2012).

4 Conclusions

In this paper, we have shed new light on the impact of labour market instability and unemployment on women's fertility decisions. Our analysis shows that unemployment is highly negatively correlated to fertility rates of Austrian white-collar women. However, if we separate the effect of job loss from that of unemployment–taking the endogeneity of unemployment into account with a suitable IV strategy, we find that the direct impact of unemployment disappears, but the job loss channel remains strongly significant. These results are compatible with a model of fertility which does not stress the income loss due to unemployment, but in which career and job considerations are more important.

We conclude that, while being easily available in typical datasets, unemployment is only an imperfect measure of the type of labour market issues which are relevant for fertility decisions. To understand trends in fertility across countries, we must also look at other indicators such as the prevalence of temporary contracts or the difficulty for young workers to enter the regular labour market.

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