Comments on "Compensating Wage Differentials for the Timing of Work: Continuous versus Split Work Shifts in Spain" by Catalina Amuedo-Dorantes and Sara de la Rica

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Introduction

- This paper deals with an interesting problem: The gender implications of the workplace time schedule in Spain.
- It is a nice and promising piece of work, based on an original research question. I am grateful to the authors for letting me use their data for this discussion.[1]
- The paper focuses on wage compensating differentials, but one could also look at the implications of work schedules for occupational choice (e.g. managerial or professional jobs as opposed to public sector jobs).
- Aside from gender, one could also look at the implications of the Spanish work schedule for time spent with children or spouses, children's schooling success, night's sleep, or long-term health. There is much to be learned from international comparisons.
- I provide some general comments and discuss the interpretation of the results.

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[1] I would like to thank Cristian Bartolucci for his superb research assistance.

Summary

- This paper considers wage equations for men and women using Spanish time use data. The objective is to estimate the effect of continuous vs split work shift on wages.
- To allow for endogeneity of shift type the authors resort to a switching-model, using household size and an indicator of the presence of children as exclusion restrictions.
- The OLS effects of continuous shift on wages are zero for both men and women.
- The effects that allow for endogeneity are zero for men but negative and large for women.
- The results are interpreted as saying that only women pay a price for resorting to continuous shift jobs.

A dual labor market: "jornada continua vs jornada partida"

- The basic variable is based on the following question (Encuesta de Empleo del Tiempo 2002-2003, INE): "¿Cómo es su jornada? Continua / Partida."
- Interestingly this question is not mandatory in the harmonized European TUS.
- "Jornada partida" workers finish late (at 7) because they (i) start late, (ii) have long lunch breaks, and (iii) work fewer hours on Fridays. Retailing is a special case in point.
- "Jornada continua" workers finish early (at 3) because they (i) start early, (ii) have no lunch breaks (at least nominally), and (iii) may work one or two afternoons.
- 50% of men and 60% of women are in continuous shifts.
- Neither of the two Spanish modes are really comparable to typical European shifts.
- They are both unusual when compared with the 8–4/9–5 schedule with 1/2 hour lunch break that is common in many countries.

Other data-related issues

Interval data

- The wage data are coded in intervals of 500 euro. An ordered probit would be a better method of estimation than treating mid points of intervals as actual observations. Moreover, a special problem is posed by the open-ended intervals at the extremes.

Working hours vs timing of work

- The time use data provides accurate information on both the number of hours worked and timing of work at individual level.
- The distinction between full time and part time work is conventional. Within so-called full time jobs there may be substantial variation in effective hours of work. The time use data is ideal for revealing such variation.
- The focus on split vs continuous shifts may hide differences in effective number of hours, not just an issue of timing. If there are indivisibilities in production, workers working fewer hours might earn less.
- Therefore, it may be important to control for hours worked.

Public sector jobs

- Continuous shift jobs are closely associated with public sector jobs (80% of public sector jobs are continuous shift, but only 44% of private sector jobs).
- Salaries are higher in public sector jobs. The Table shows the situation:

Table 1: Log Wages

	Shift	Mean	Std.Dev.	#Obs.	%
Female public					
	Split	2.15	.495	298	6%
	Cont.	2.01	.493	1283	28%
Female private					
	Split	1.64	.494	1534	34%
	Cont.	1.64	.500	1443	32%
All public					
	Split	2.15	.53	668	5%
	Cont.	2.06	.47	2635	22%
All private					
	Split	1.76	.48	4895	41%
	Cont.	1.79	.47	3897	32%

Public sector jobs (continued)

- Large sections of the Spanish public sector labor market are characterized by excess labor supply. This is in contrast to other countries where the public sector struggles to recruit and retain staff (e.g. nurses in UK hospitals, Propper & Van Reenen, 2008).
- This is due to the fact that job security, wages, and work conditions at public sector jobs compare favorably to alternative private sector opportunities for many workers.
- A private sector job may be preferred by those seeking a professional or managerial career, possibly involving higher risk, higher job mobility, and longer working hours.
- Continuous shifts have traditionally been widespread in public sector jobs, with exceptions mainly confined to section heads and executive positions.
- There is therefore a potentially strong process of endogenous self-selection into public sector jobs, which may obscure the split vs continuous shifts divide emphasized in the paper.
- As a first approximation it is worth documenting separate results for public and private sector jobs.

Identification by nonlinearity

- Identification of selection models by nonlinearity has long been discredited and it does not lead to credible results.
- Write the endogenous switching model as

$$\begin{aligned} Y &= \begin{cases} \alpha_1 + X\beta_1 + \varepsilon_1 & \text{if } J = 1 \\ \alpha_0 + X\beta_0 + \varepsilon_0 & \text{if } J = 0 \end{cases} \\ J &= 1\left(Z\gamma + v \geq 0\right) \end{aligned}$$

  or

$$Y = \alpha_0 + X\beta_0 + \left(\alpha_\Delta + \varepsilon_\Delta\right) J + J \times X\beta_\Delta + \varepsilon_0$$

  where $\varepsilon_\Delta = \varepsilon_1 - \varepsilon_0$, $\alpha_\Delta = \alpha_1 - \alpha_0$, and $\beta_\Delta = \beta_1 - \beta_0$.
- The variable J is endogenous because v is correlated with both ε_0 and the heterogeneous return ε_Δ. In the special case where $\varepsilon_\Delta = 0$, 2SLS is consistent.
- In IV terms identifying the parameters by the nonlinearities amounts to having $Z = X$, $\varepsilon_\Delta = 0$, and using $\Phi\left(X\gamma\right)$ as instrument for J.
- The only reason why this nominally works is because the nonlinearity is treated as an exclusion restriction having assumed that X only enters linearly in the equation.
- This is not convincing because in general there is no presumption of an exclusively linear association between Y and X beyond convenience.

How good are the instruments?

- Household size and children are not good instruments for the continuous shift dummy.
  - Firstly because they are not good predictors.
  - Secondly because the presence of children may correlate with unobserved determinants of productivity like job effort.
- The external instruments lack predictive power (household size being the better predictor of the two instruments)
- For females, h-size has a negative effect on wages that is significant at the 20% and a positive effect on continuous shift that is significant at the 32% level.
- Assuming $\varepsilon_\Delta = \beta_\Delta = 0$, we can estimate by either 2SLS or LIML the following equation for separate samples of men and women

  $$Y = \alpha_0 + X\beta_0 + \alpha_\Delta J + \varepsilon_0.$$

  We get the results shown in the table below.
- Contrary to switching-ML, linear IV is insensitive to distributional assumptions, and provides complementary information on the basic identification content of the exclusion restrictions.

How good are the instruments? (continued)

Table2: Estimates of the effect of continuous shift on log wages

	Male	Female
OLS	0.003	0.003
	(0.34)	(0.17)
2SLS	0.02	-0.34
	(0.02)	(0.69)
LIML	0.06	-0.81
	(0.04)	(1.05)
#obs.	7536	4558
Controls: age, age2, college, married, private sector, regional and industry dummies.		
External IVs: h.size, children		
t ratios in brackets		

- The weak relevance of the instruments is evidenced in the large disparity between 2SLS and LIML, which theoretically should be asymptotically equivalent.

A reinterpretation of the results

- The large magnitude of the negative effects also shows up in the switching ML estimates of α_Δ and is behind the main result in the paper. Namely, that there is a wage differential due to continuous shift for women but not for men.
- The magnitude of the differential is economically large even if it will not be statistically significant, at least using 2SLS or LIML estimates.
- This is the result of the exclusion restriction that says that h-size and children have no effect on wages except through the type of shift indicator.
- Given that the OLS effect is zero and the IV effect is negative (for women), this would suggest a *positive* endogeneity bias, if interpreted that way. That is, a positive correlation between continuous shift (J) and unobserved wage determinants (ε_0), pointing to higher productivity women being over-represented in continuous shift jobs.
- This is not particularly plausible and an alternative explanation is that the exclusion restrictions are not satisfied.
- The result can be rephrased as saying that h-size creates a zero or positive wage differential for men but a negative differential for women.
- The predictive effect of children on wages is known to be negative for women and positive or zero for men. This is consistent with the results in the paper.

An alternative instrument

- The suggested instrument for continuous shift status is the continuous shift status of the partner if there is one. I consider a subsample of workers with a working partner.
- This instrument is motivated in the preference for coordination or for being together. This question has been explored in time use work by Dan Hamermesh and others.
- There are both supply and demand issues of synchronicity in the labor market:
  - –Synchronicity of working schedules among couples.
  - –Synchronicity of schedules across firms.
- The validity of this instrument relies on the absence of assortative mating, so it is not perfect, but it can nevertheless show the direction of the bias relative to OLS.
- Another consideration is that estimates are based on a specific subsample.
- The results are interesting:
  - – The new instrument is strong.
  - – A continuous shift has no effect for men and a positive but imprecise effect for women. The female OLS effect is still zero, so endogeneity bias is now *negative*.
  - – The positive effect for women comes exclusively from the private sector.
  - – The zero effect for men is the result of a small positive effect in the private sector and a large negative effect in the public sector.

Table3: Estimates Using Partner's Shift Type as Instrument for Continuous Shift

	$\nabla W/\nabla Cont$ OLS	$\nabla W/\nabla Cont$ IV	$\nabla Cont/\nabla IV$ OLS	$\nabla W/\nabla IV$ OLS	#Obs
Female	0.01	0.26	0.12	0.03	1431
	(0.38)	(1.30)	(4.93)	(1.35)	
Male	−0.02	−0.02	0.12	−0.002	1447
	(0.75)	(0.10)	(4.90)	(0.10)	
Female priv	0.04	0.38	0.13	0.05	834
	(1.30)	(1.45)	(3.70)	(1.55)	
Female pub	−0.06	0.04	0.87	0.004	597
	(1.42)	(0.11)	(2.81)	(0.11)	
Male private	0.01	0.16	0.12	0.02	979
	(0.32)	(0.72)	(3.78)	(0.73)	
Male public	−0.09	−0.42	0.14	−0.06	468
	(2.15)	(1.53)	(3.37)	(1.64)	

Controls: age, age2, college, married, private sector, regional and industry dummies. t ratios in brackets. Subsample of workers with working partners.