Descriptive Finding

Is a positive association between female employment and fertility still spurious in developed countries?

Takashi Oshio

Contents

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Takashi Oshio[1]

Abstract

BACKGROUND
The cross-sectional association between female employment and fertility across developed countries turned from negative to positive during the mid-1980s. The conventional view is that the observed positive association is spurious owing to country-specific heterogeneity.

OBJECTIVE
We revisit the validity of this view using recent data up to 2017 from 24 countries belonging to the Organisation for Economic Co-operation and Development (OECD).

METHODS
Based on the data downloaded from the OECD database, we estimate the time-series association between the female labor force participation rate (FLFP) and total fertility rate (TFR) by fixed-effects regression models, which can control for country-specific heterogeneity.

RESULTS
The more recent the data set used, the more likely it is that the time-series correlation will be positive between FLFP and TFR, even after controlling for country-specific heterogeneity. We also observe that public spending on families, especially in the form of benefits in kind, starts increasing once FLFP becomes sufficiently high.

CONCLUSIONS
A positive correlation between female employment and fertility in developed countries is no longer attributable to country-specific heterogeneity. The results are supportive of the view that higher female employment can make socioinstitutional contexts more favorable for childbearing, leading to a positive association between FLFP and TFR.

CONTRIBUTIONS
This study underscored the need for further investigation of the association between female employment and fertility, which is likely to have changed in recent decades.

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1. Background

From an economic viewpoint, the increasing role of women in the labor market is expected to raise the opportunity cost of childbearing and thereby reduce fertility (Becker 1981). If this is correct, there should be a negative association between female employment and fertility. However, the cross-sectional association across developed countries turned from negative to positive during the mid-1980s (Ahn and Mira 2002; Apps and Rees 2004; Martínez and Iza 2004; Rindfuss, Guzzo, and Morgan 2003). This change has prompted a debate about the relevance of the perceived conflict in women about choosing between work and childcare.

Some researchers explain that the change in the association between female employment and fertility is attributable to the reduced incompatibility in women between the role of mother and worker (Rindfuss, Guzzo, and Morgan 2003), thereby increasing the availability of market childcare or childcare support (Ahn and Mira 2002; Apps and Rees 2004; Martínez and Iza 2004), as well as increasing the wages of working women (Ahn and Mira 2002).

In sharp contrast to these arguments, Kögel (2004) finds no positive association between female employment and fertility when using time-series data. He argues "the reversal in the sign of the cross-country correlation is most likely due to a combination of two elements: First, the presence of unmeasured country-specific factors and, second, country-heterogeneity in the magnitude of the negative time-series association between fertility and female employment" (Kögel 2004:46). He applies fixed-effects (FE) models to country-level time-series (quinquennial) data from countries belonging to the OECD by splitting the estimation period into two: 1960–1985 and 1985–2000. He shows that the time-series association between female employment and fertility remained negative, although the magnitude and significance level of this association declined after 1985.

Kögel's (2004) observation reminds us that we should be cautious in interpreting any causality that changes the positive association between female employment and fertility observed from cross-country data. Indeed, it has been argued that both female employment and fertility tend to move in the same direction led by the third variable, which includes social norms and socioinstitutional background (Engelhardt, Kögel, and Prskawetz 2004) and that there could even be a long-run causality from fertility to female employment (Mishra and Nielsen 2010). Meanwhile, a comprehensive survey of micro-level studies (Matysiak and Vignoli 2008) stressed a significant change in the association between female employment and fertility over time.

In the same vein, and even more generally, Myrskylä, Kohler, and Billari (2009) observed that in developed countries with a high Human Development Index (HDI), the HDI-fertility correlation is reversed with a higher HDI level. Their finding suggests that

the association between female employment and fertility would also turn from negative to positive once the level of female employment becomes sufficiently high, inspiring debate on their association, including some critical views on this turnaround (Furuoka 2009; Harttgen and Vollmer 2014).

The present study investigates whether a time-series association between the FLFP and TFR is positive even after controlling for country-specific fixed effects if the statistical analysis is based on more recent data than that used by Kögel (2004), who used data up to the year 2000. It is plausible to predict that the factors that are assumed to be fixed for each country in the FE models should not stay fixed over time in reality. We cannot rule out the possibility that a positive association between female employment and fertility in developed countries is no longer spurious.

2. Methods

2.1 Data

Two key variables in the present study were FLFP and TFR, whose data was downloaded from the databases of the OECD website (OECD 2019; OECD.Stat 2019). With respect to FLFP, we consider its value for women aged between 15 and 64 years following Kögel (2004) and many other studies. We use the annual data of 24 countries listed in Table 1. Of the 36 countries in the OECD, we exclude eight transition countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, and Slovenia), considering that their socioeconomic factors and social policies may differ substantially from traditional Western countries, and that the data for their countries is available only since the 1990s or later. We obtain similar results even if we include these countries (available from the author upon request). We further exclude three middle-income countries (Chile, Mexico, and Turkey) and Israel, whose TFR (3.11) was well above the OECD average (1.67) in 2017.

For reference, we also collect data for public expenditure on families, which are available from the OECD Social Expenditure Database (SOCX) (2019), in terms of its ratio to the gross domestic product (GDP). Public expenditure on families comprises cash benefits and benefits in kind, the latter of which are evaluated in pecuniary terms. According to the OECD's categorization, cash benefits include family allowances and maternity and parental leave, while benefits in kind include early childhood education and care and home help/accommodation. We focus on cash benefits and benefits in kind as a percentage of GDP. Data is available from 1980 to 2016 in most of the 24 countries studied.

2.2 Analytic strategy

We first examine the evolution of annual cross-sectional correlations between FLFP and TFR. Then, we estimate two simple regression models to explain country-level TFR solely by FLFP: pooled ordinary least squares (OLS) and FE models.

We assume the association between FLFP and TFR is expressed as:

$$\text{TFR}_{it} = \alpha + \beta \text{FLFP}_{it} + u_i + \varepsilon_{it},$$

where i and t denote country and year, respectively, u_i summarizes time-invariant, country-specific effects, and ε_{it} is an error term. OLS models ignore country-specific effects and hence cannot obtain an unbiased estimator of β. FE models include country-specific effects and control for them assuming that they are correlated with FLFP, in contrast to random effects (RE) models, which assume that country-specific effects are uncorrelated with FLFP. OLS models with dummy variables for each country obtain the same results as FE models.

In the current study, the F test rejects the null hypothesis of the absence of country-specific effects in all model specifications, confirming the preference of FE models to pooled OLS models. In addition, the Hausman test rejects the null hypothesis that country-specific effects are not correlated with FLFP, confirming the preference of FE models to RE models.

To examine how the FLFP-TFR correlation has been evolving since 1970, we compare the estimated coefficients (β) of FLFP among six 20-year estimation periods: 1970–1989, 1975–1994, 1980–1999, 1985–2004, 1990–2009, and 1995–2017 (23 years for the last period), by sliding the starting year by five years each. We also graphically show how FLFP is associated with two types of public expenditure on families for reference: cash benefits and benefits in kind.

3. Results

Figure 1 shows that the cross-sectional correlation coefficient between FLFP and TFR across 24 countries changed from negative to positive in the mid-1980s, confirming a fact that had already been observed in preceding studies (e.g., Ahn and Mira 2002; Rindfuss, Guzzo, and Morgan 2003; Kögel 2004). The FLFP-TFR correlation has remained consistently positive since the mid-1980s; however, it has been declining modestly in recent years largely due to a reduced cross-country covariance of FLFP and TFR.

Figure 1: **Cross-sectional correlation coefficients between total fertility and female labor force participation rates**
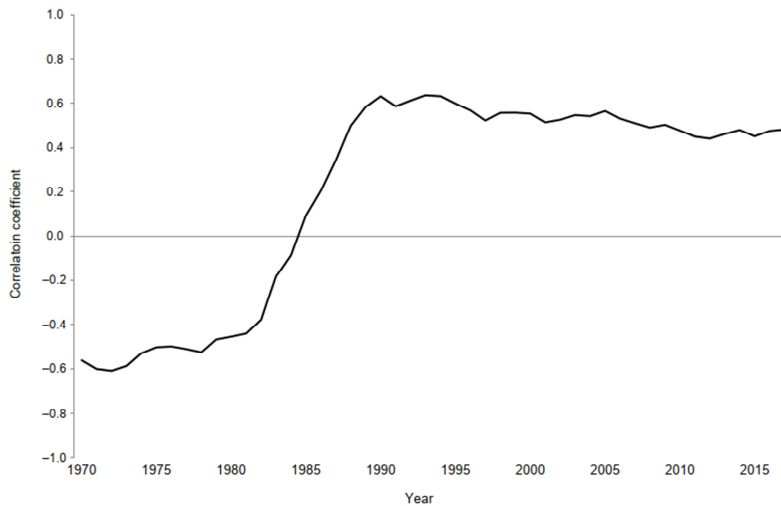
Note: Information about the countries and their numbers used to calculate the correlation coefficients are available upon request from the author.
Source: The author's calculation is based on OECD (2019) and OECD.Stat (2019).

Table 1 summarizes TFR and FLFP in each estimation period and compares the estimated coefficients (β) of FLFP in pooled OLS and FE models estimated to explain TFR in each estimation period. We first observe that while FLFP has been steadily rising, TFR has remained almost flat since 1985–2004 after dropping in previous periods. The estimated β demonstrates different evolutions between pooled OLS and FF models; it turned from negative to positive in the pooled OLS model in 1980–1999, in line with the results in Figure 1. Meanwhile, FE models reveal that β remained negative until 1985–2004, with its magnitude showing a clear downtrend, and turned positive in 1990–2009.

To compare the results with those in Kögel (2004), we also estimated regression models using quinquennial data between 1960–1985 and 1985–2000 as his study did. From 1960–1985 to 1985–2000, β turned from negative to positive (from –1.41 [0.48] to in 0.87 [0.22]) in pooled OLS models, whereas it rose but remained negative (from –4.17 [1.00] to –0.70 [0.38]) in FE models (the figures in the brackets are standard errors). These results are consistent with those in Kögel (2004).

Table 1: **Total fertility rate, female labor force participation rate (FLFP), and estimated coefficients (*β*) of FLFP in regression models to explain TFR in each estimation period**

| Estimation period	TFR		FLFP		Pooled OLS		Fixed effects		N
	M	(SD)	M	(SD)	β	(SE)	β	(SE)	
1970–1989	1.91	(0.46)	0.514	(0.124)	−1.35 ***	(0.20)	−3.47 ***	(0.33)	305
1975–1994	1.79	(0.36)	0.546	(0.124)	−0.30 *	(0.15)	−2.16 ***	(0.29)	361
1980–1999	1.70	(0.29)	0.576	(0.118)	0.42 ***	(0.12)	−1.71 ***	(0.22)	412
1985–2004	1.65	(0.25)	0.604	(0.110)	1.00 ***	(0.10)	−0.67 ***	(0.13)	450
1990–2009	1.65	(0.27)	0.632	(0.099)	1.40 ***	(0.11)	0.29 *	(0.12)	471
1995–2017	1.64	(0.26)	0.662	(0.088)	1.46 ***	(0.11)	0.47 ***	(0.10)	552

Notes: TFR: total fertility rate, FLFP: female labor force participation rate.
*** $p < 0.001$, * $p < 0.05$
Source: The author's calculation is based on OECD (2019) and OECD.Stat (2019).

Figure 2 compares the estimated β between pooled OLS and FE models. The estimated *β* shows a clear uptrend from negative to positive values in both models; however, in 1980–1999 and 1985–2004, *β* was positive in the pooled OLS model while negative in the FE model.

Figure 2: **Evolution of the estimated coefficients (*β*) of the female labor force participation rate in regression models to explain the total fertility rate**
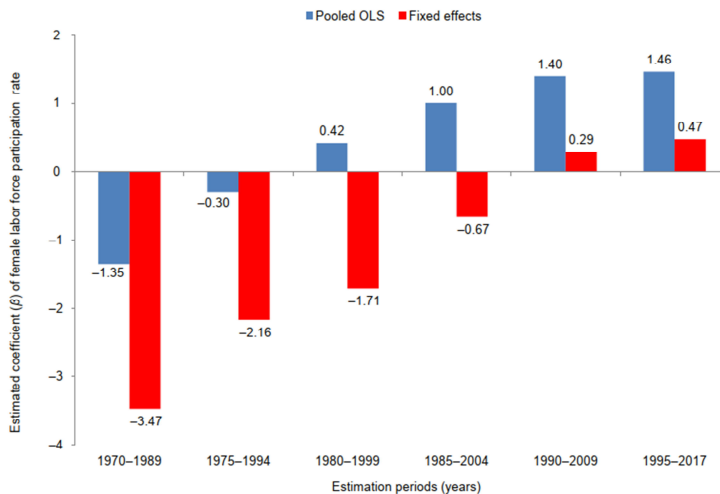

Note: Based on the results presented in Table 1.
Source: The author's calculation based on OECD (2019) and OECD.Stat (2019).

The results presented in Table 1 and Figure 2 suggest long-term, structural changes in the relationship between FLFP and TFR. To graphically illustrate them, Figure 3 plots the dots of their combinations in each year and country using 24-country data pooled in 1970 and 2017. To roughly capture the evolution over time, we color the combinations observed in the first 35 years (1970–2004) and those observed in the remaining 13 years (2005–2017) in blue and red, respectively. The figure also includes a fitted quadratic curve, which shows a U-shaped relationship between FLFP and TFR, like the turnaround of the HDI-TFR correlation observed in Myrskylä, Kohler, and Billari (2009). The U curve bottoms out when the FLFP is around 0.6, which is the FLFP's threshold to reverse the FLFP-TFR correlation from negative to positive.

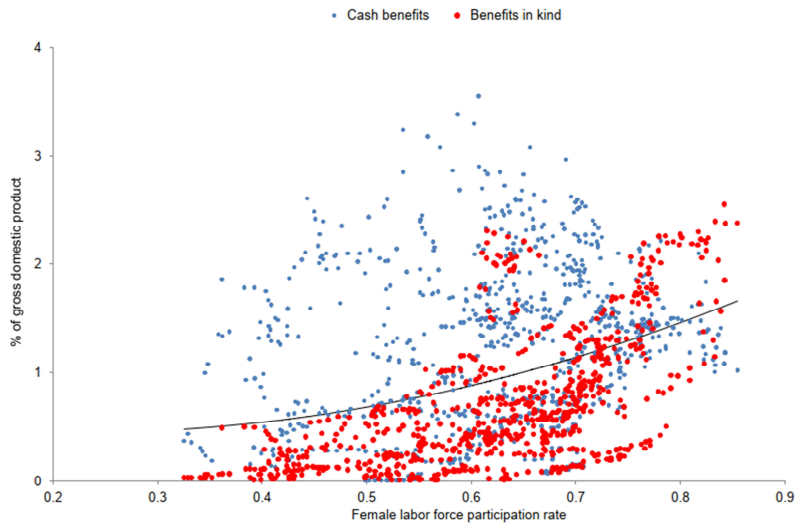**Figure 3:   Female labor force participation and total fertility rates**
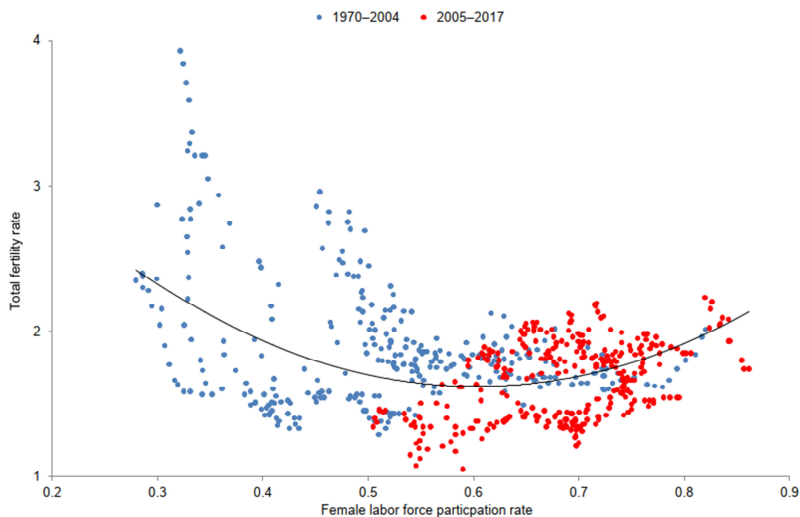
Notes: Data of 24 countries pooled in 1970–2017 (*N* = 968) are used. The fitted quadratic curve is given by TFR = 4.42 (0.19) – 9.29 (0.68) FLFP + 7.70 (0.58) FLFP^2,
R^2-adjusted = 0.167, and it is estimated to bottom when FLFP = 0.60 (0.06), where the figures in the parentheses are standard errors.
Source: Based on OECD (2019) and OECD Social Expenditure Database (2019).

Finally, Figure 4 demonstrates how cash benefits and benefits in kind, both expressed as percentage of GDP, are related to FLFP, using a 24-country data pooled in 1980 and 2016. In contrast to there being no clear relationship between cash benefits and FLFP, benefits in kind gradually start rising once FLFP exceeds 0.5–0.6.

Figure 4: **Female labor force participation rate and public expenditure on families**

4. Discussion

We examine the time-series association between FLFP and TFR in developed countries using a 24 country-level annual data from 1970 to 2017 and obtain two key findings. First, the more recent the data set used, the more likely it is that the time-series association will be positive between FLFP and TFR, even after controlling for country-specific heterogeneity. This observation differs from the results of Kögel (2004), who stresses that the time-series association between female employment and fertility remained negative. This difference can be explained by the difference in the estimation periods; he covers 1960–2000, while the current study covers a more recent period: 1970 to 2017. Thus, using the recent dataset, there is now no inconsistency between cross-country and time-series observations; both indicate a positive association between FLFP and TFR.

Although these results do not tell us anything about the causality from FLFP to TFR, it should be emphasized that their observed positive cross-country association can no longer be entirely attributed to country-specific heterogeneity. Moreover, a reversal

of the sign of their association obtained from the FE models highlights the importance of the change in country-specific factors that are assumed to be fixed during the estimation period. The evaluation of the observed correlation between FLFP and TFR depends heavily on the observation time and period. Consistently, the FLFP-TFR correlation observed in the pooled cross-country data in 1970–2017 reveals that it turned from negative to positive when FLFP exceeded a certain level, which is around 0.6 according to the dataset used in this study. In many countries, LFP exceeded that level during the 1980–1990s, when the FLFP-TFR correlation observed in time-series data turned from negative to positive.

This study does not identify the factors that caused the change in the relationship between FLFP and TFR. However, the results suggest that the socioinstitutional background has gradually become more favorable to women trying to balance work and childbearing. Specifically, we observe that public expenditure on families, especially in the form of benefits in kind, started increasing once FLFP reached 0.5–0.6, which is largely consistent with the upturn of the FLFP-TFR correlation. These findings are consistent with Kalwij's (2010) finding of positive effects on TFR of expenditure on family policy programs. The observations are also supportive of the view that higher female employment, which gradually transforms socioinstitutional contexts to become more favorable for childbearing, eventually reverses the sign of the FLFP-TFR association.

It should be noted that the present study has several limitations and issues to be addressed in future studies. First, we use the period TFR mainly because of data availability in the OECD dataset and comparability with earlier research, but it may not be the most reliable indicator of fertility for this type of analysis (Bongaarts and Feeney 2010; Sobotka and Lutz 2010). It would be more convincing to examine how FLFP has been associated with cohort or tempo-adjusted TFR, if their data are available, rather than assuming the hypothetical cohort that is supposed to present current fertility conditions.

Second, our analytic methodology has much room for improvement. For example, we focus only on FLFP as a regressor to explain TFR and hence we cannot rule out the possibility that the estimation results may have biases due to omitted variables. In addition, it is up to further research to study whether time-specific fixed effects or their interaction with country-specific fixed effects confound the FLFP-TFR association, because we consider only country-specific fixed effects.

Third, we disregard meso- and micro-level determinants of fertility. Determinants of fertility must be multidimensional and should interact with each other, as suggested by a survey of fertility studies (Balbo, Billari, and Mills 2013). Hence, there should be other mechanisms working to bring about the observed positive association between FLFP and TFR. Among others, changes in social norms regarding women's work and

childbearing, division of labor within families, or employers' commitment to support childcare are likely to have affected TFR (Engelhardt, Kögel, and Prskawetz 2004).

Fourth, sustainability of the positive association between FLFP and TFR remains to be investigated even if it does not indicate any causality. Partly reflecting macroeconomic conditions, TFR has apparently been leveling off in developed countries in recent years. Additionally, the average age of women giving birth has increased – from 27.4 years in 1970 to 30.6 years in 2016, the OECD average (OECD Family Database 2019) – and this may eventually limit the rise in TFR, as well as the effects of policy measures to enhance fertility. Hence, a simple extrapolation of the recent positive association between FLFP and TFR cannot be justified for fertility projection.

5. Conclusions

The present study confirmed the positive association between female employment and fertility, even after controlling for country-specific heterogeneity. In this sense, the observed cross-country association cannot be considered spurious any longer. We cannot exclude the possibility that higher female employment can make socioinstitutional contexts more favorable for childbearing, leading to a positive association between FLFP and TFR. Overall, this study underscored the need for further investigation of the association between female employment and fertility, which is likely to have changed in recent decades.

6. Acknowledgments

References

Ahn, N. and Mira, P. (2002). A note on the changing relationship between fertility and female employment rates in developed countries. *Journal of Population Economics* 15(4): 667–682. doi:10.1007/s001480100078.

Apps, P. and Rees, P. (2004). Fertility, taxation and family policy. *Scandinavian Journal of Economics* 106(4): 745–763. doi:10.1111/j.0347-0520.2004.00386.x.

Balbo, N., Billari, F.C., and Mills, M. (2013). Fertility in advanced societies: A review of research. *European Journal of Population* 29(1): 1–38. doi:10.1007/s10680-012-9277-y.

Becker, G.S. (1981). *A treatise on the family*. Cambridge: Harvard University Press.

Bongaarts, J. and Feeney, G. (2010). When is a tempo effect a tempo distortion? *Genus* 66(2): 1–15.

Engelhardt, H., Kögel, T., and Prskawetz, A. (2004). Fertility and women's employment reconsidered: A macro-level time-series analysis for developed countries, 1960–2000. *Population Studies* 58(1): 109–120. doi:10.1080/0032472032000167715.

Furuoka, F. (2009). Looking for a J-shaped development-fertility relationship: Do advances in development really reverse fertility declines? *Economics Bulletin* 29(4): 3067–3074.

Harttgen, K. and Vollmer, S. (2014). A reversal in the relationship of human development with fertility? *Demography* 51(1): 173–184. doi:10.1007/s13524-013-0252-y.

Kalwij, A. (2010). The impact of family policy expenditure on fertility in Western Europe. *Demography* 47(2): 503–519. doi:10.1353/dem.0.0104.

Kögel, T. (2004). Did the association between fertility and female employment within OECD countries really change its sign? *Journal of Population Economics* 17(1): 45–65. doi:10.1007/s00148-003-0180-z.

Martínez, D.F. and Iza, A. (2004). Skill premium effects on fertility and female labor force supply. *Journal of Population Economics* 17(1): 1–16. doi:10.1007/s00148-003-0150-5.

Matysiak, A. and Vignoli, D. (2008). Fertility and women's employment: A meta-analysis. *European Journal of Population* 24(4): 363–384. doi:10.1007/s10680-007-9146-2.

Mishra, V. and Nielsen, S.R. (2010). On the relationship between female labour force participation and fertility in G7 countries: Evidence from panel cointegration and Granger causality. *Empirical Economics* 38(2): 361–372. doi:10.1007/s00181-009-0270-1.

Myrskylä, M., Kohler, H.-P., and Billari, F.C. (2009). Advances in development reverse fertility declines. *Nature* 460(7256): 741–743. doi:10.1038/nature08230.

OECD (2019). Fertility rates (indicator). https://data.oecd.org/pop/fertility-rates.htm.

OECD Family Database (2019). http://www.oecd.org/els/family/database.htm.

OECD Social Expenditure Database (SOCX) (2019). http://www.oecd.org/social/expenditure.htm.

OECD.Stat (2019). https://stats.oecd.org/.

Rindfuss, R.R., Guzzo, K., and Morgan, S.P. (2003). The changing institutional context of low fertility. *Population Research and Policy Review* 22(5–6): 411–438. doi:10.1023/B:POPU.0000020877.96401.b3.

Sobotka T. and Lutz, W. (2010). Misleading policy messages derived from the period TFR: Should we stop using it? *Comparative Population Studies* 35(3): 637–664.