Modelling labour supply in Poland: elasticity estimates and policy simulations

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Results of labour supply analysis within CenEA's microsimulation research programme:

- Stability of labour supply elasticities (NCN, 2014)
  - first LS estimates for Poland, based on data from 2005, 2007, 2009;
  - elasticity estimates and 2005-2009 policy effect on labour supply.

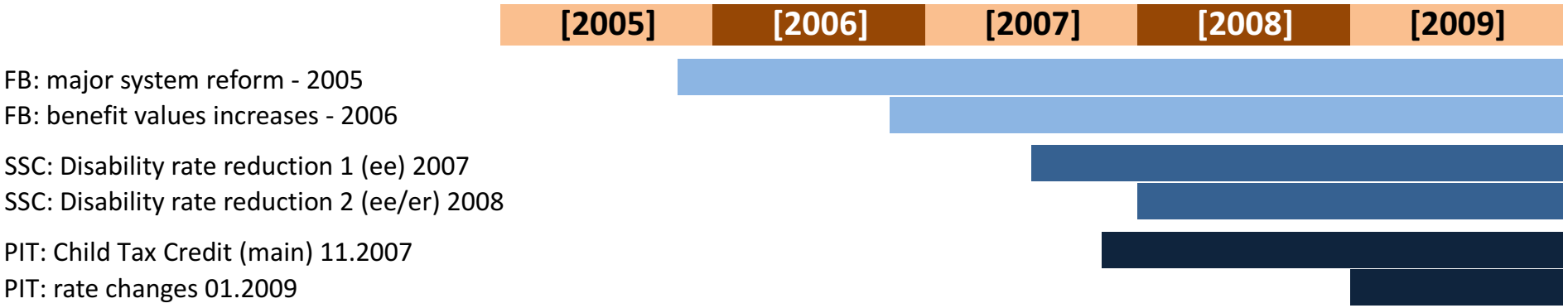
- Simulation of the labour supply effect of the "Family 500+" benefit (NBP, 2016)
  - based on data from 2011, 2012, 2013.

Outline:

- Motivation for the 2005-2009 analysis.
- The basic set up for labour supply modelling:
  - modelling framework: combining microsimulation and utility function estimation;
  - estimation of labour supply elasticities and 2005-09 policy effects for couples.
- Extending the original methodology to simulate response to the "Family 500+" benefit:
  - modelling couples and singles;
  - different sampling approaches;
  - estimates of policy effects.

Motivation for the 2005-2009 analysis:

- Rapid growth of wages in Poland from 2005 - 2009:
  - average wage up by 20.3% in real terms;
  - minimum wage up by 37.7% in real terms.
- Several major reforms to:
  - family benefits (FB),
  - social security (SSC),
  - personal taxation (PIT),
  - parallel reductions in benefit eligibility.



Structural labour supply analysis - model for couples:

- static utility maximization along the lines of van Soest (1995);
- quadratic utility function with the deterministic part represented by:

$$U_{ij}(c_{ij}, w_{ij}^m, w_{ij}^f) = \beta_1 c_{ij} + \beta_2 (c_{ij})^2 + \beta_{3mi} w_{ij}^m + \beta_{3fi} w_{ij}^f + \beta_{4m} pt_{ij}^m + \beta_{4f} pt_{ij}^f +$$

$$+\gamma_{1f} c_{ij} w_{ij}^f + \gamma_{1m} c_{ij} w_{ij}^m + \gamma_{2f} c_{ij} pt_{ij}^f + \gamma_{2m} c_{ij} pt_{ij}^m + \gamma_{3mf} w_{ij}^m w_{ij}^f$$

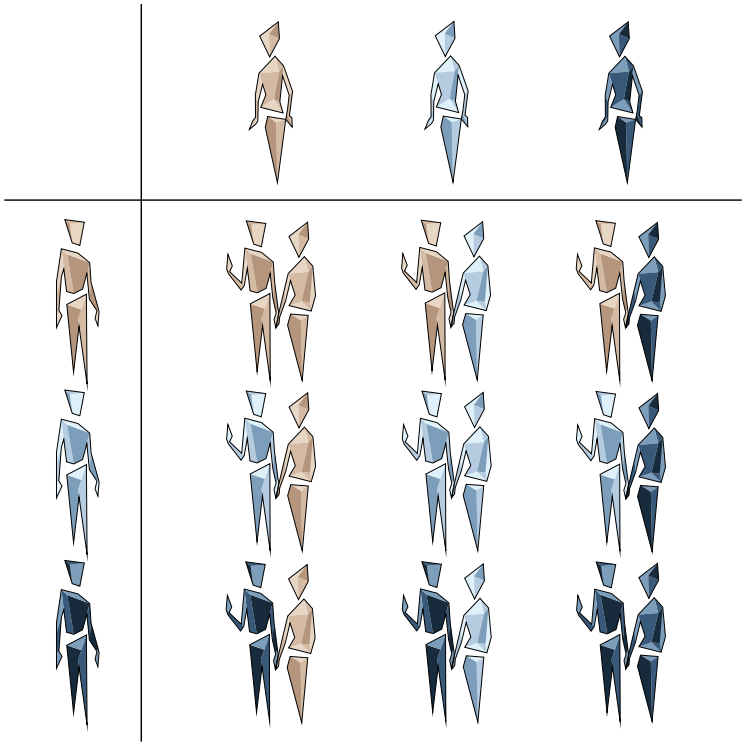
- stochastic form of the utility function with i.i.d. error terms (EV-I):

$$V_{ij} = U_{ij} + \varepsilon_{ij}$$

- parameters β_{ci}, β_{3mi} and β_{3fi} allowed to vary with characteristics (taste shifters)
- estimated with and without unobserved heterogeneity:
  - unobserved heterogeneity: mass point on β_{ci} (Hoynes, 1996);

Structural labour supply analysis - model for couples:

- discretised hours of work: no work, part time and full time:



- observed scenario assumed to maximise utility;
- incomes in different scenarios computed using the microsimulation model;
- budget constraint determined by wages (w_i), hours of work ($T - L_{ij}$), out of work incomes (y_i) and the tax and benefit function (ϖ):

$$C_{ij} = \psi[\omega_i^m, \omega_i^f, (T - L_{ij}^m), (T - L_{ij}^f), X_i, y_i]$$

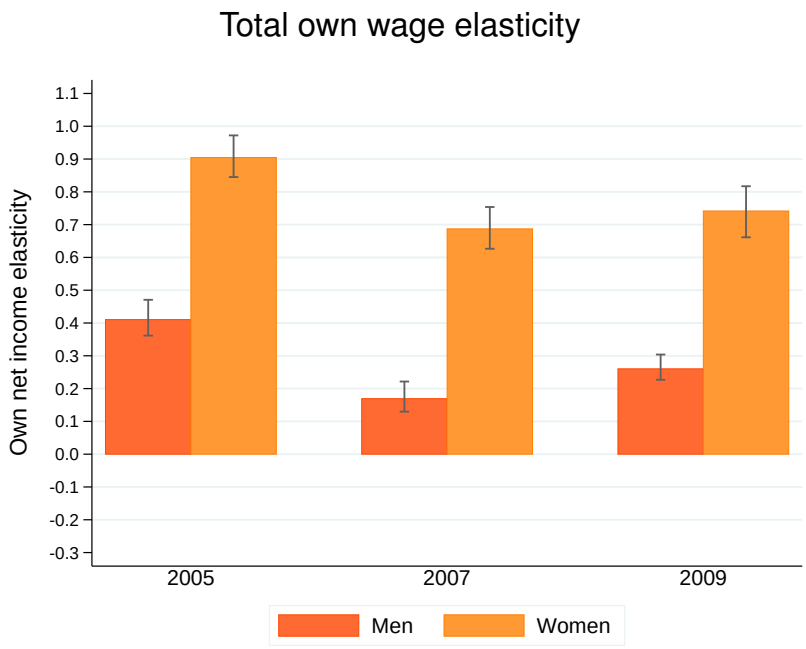
- expected wages (w_i) computed using a selection-corrected wage equation;
- elasticities and reform effects estimated with frequency method (parametric bootstrap to estimate standard errors).

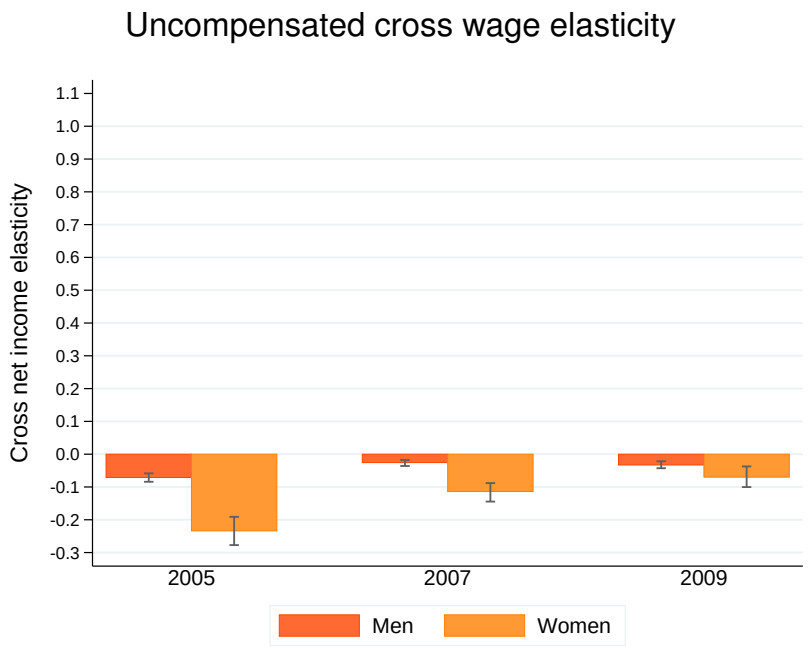
Data and sample statistics

Polish Household Budgets Survey: 2005, 2007, 2009:

- Analysis focused on couples in labour supply flexible households:
  - men aged 18-59, women aged 18-54;
  - not self-employed or student;
  - not receiving disability or retirement pensions;
- Employment status information - full time, part time work:
  - fixed costs cannot be estimated with quadratic utility function.
- Sample covers over 1/4 of all households.

Estimated total own and cross wage elasticities (participation)



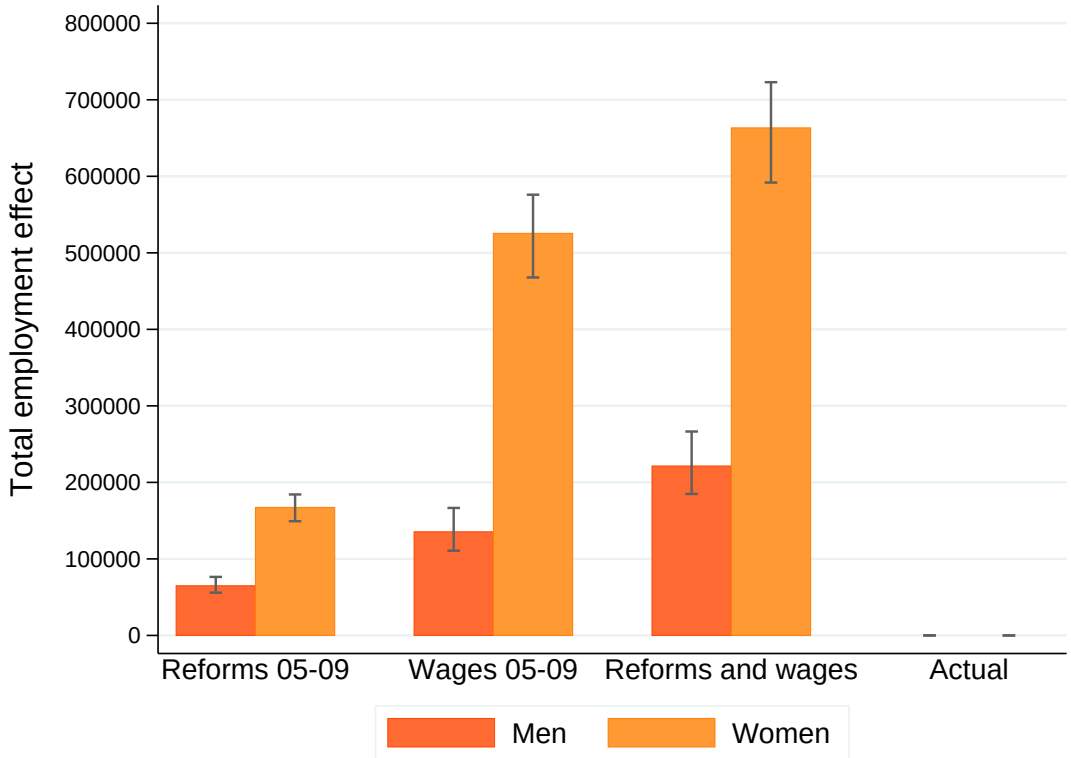


Using the model to simulate response on the labour market:

- Simulations of labour supply (equilibrium) response to changes in modelled financial incentives:
  - change in the optimal labour market scenario.
- Important for interpretation:
  - other things remain unchanged;
  - equilibrium effects may take time;
  - importance of the interplay of supply and demand to determine employment.

Labor supply effect of 2005-2009 reforms and wage changes:

- “Reforms 05-09": 2005 system indexed to 2009 on 2009 data;
- “Wages 05-09": real wages from 2005 on 2009 data and 2009 system;
- “Reforms and wages": real wages from 2005 on 2009 data and 2009 system;
- “Actual": 2005 employment proportions on 2009 data.



Source: Author’s estimates on PHBS data using SIMPL microsimulation model.

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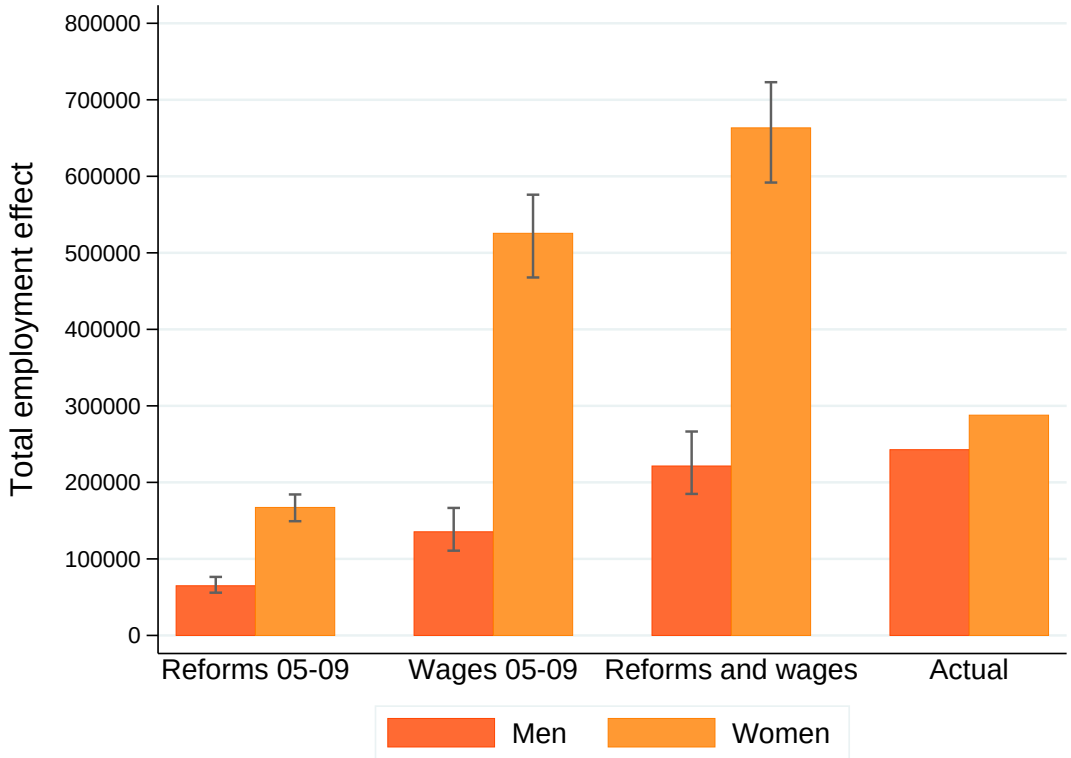

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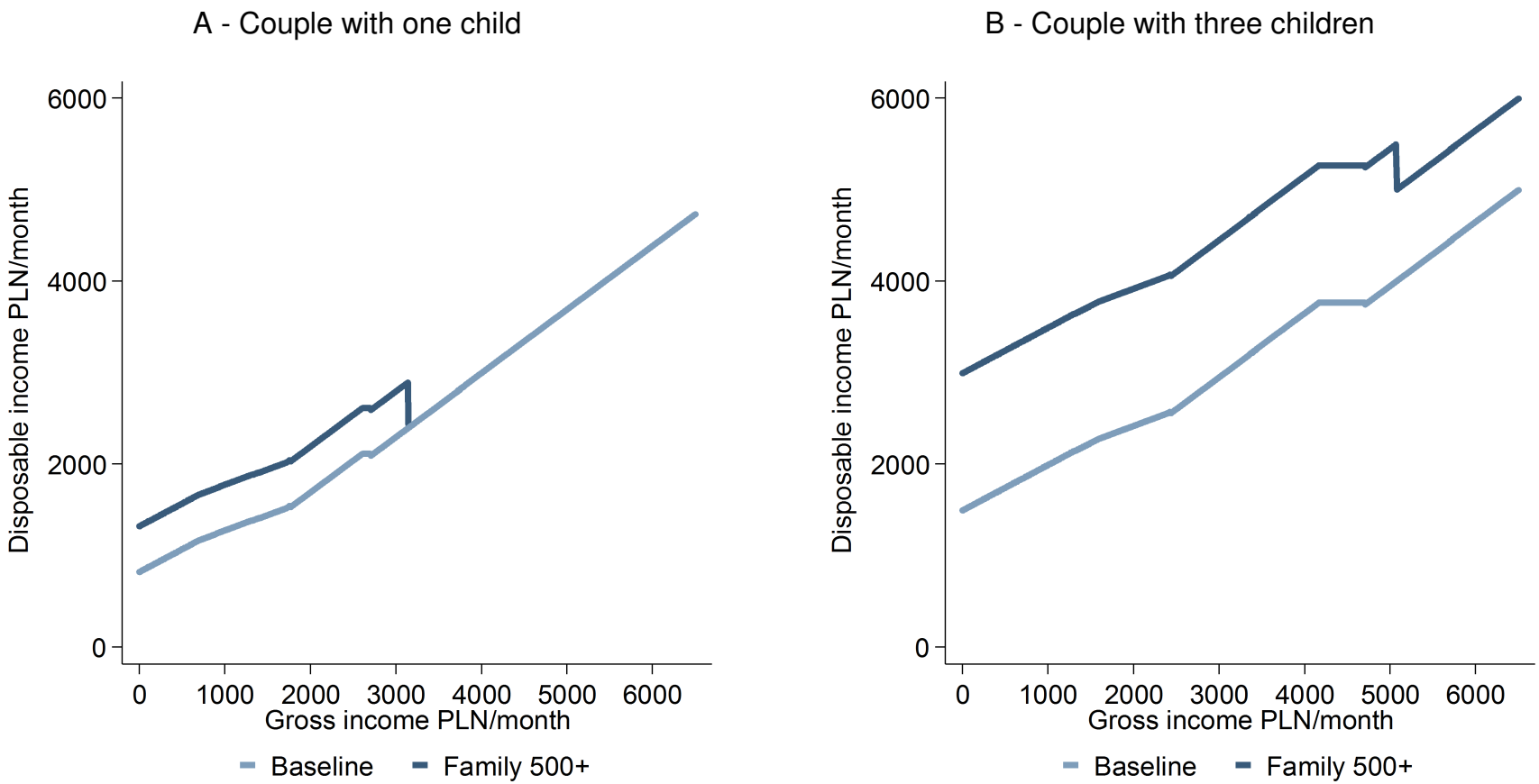
Modelling labour supply effects of the “Family 500+” benefit

Update and extensions of the modelling framework

- Estimation of the model for 2011, 2012 and 2013 data.
- Extension to cover other subsamples of households:
  - couples with one labour supply flexible partner;
  - singles.
- Robustness analysis using different specifications and sample definitions.

“Family 500+” reform: changes in financial incentives

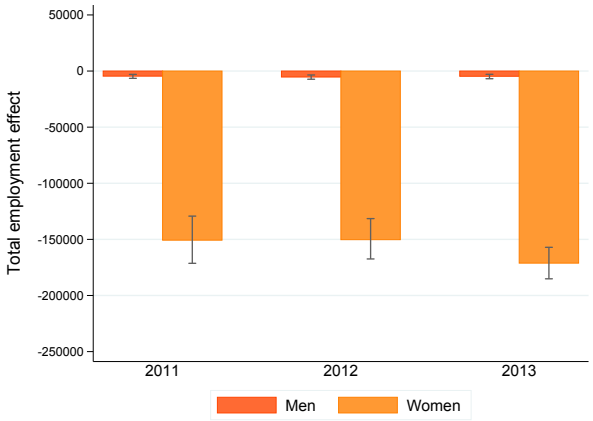


- Total cost of the programme: approx 22bn PLN (1.2% of GDP).
- Benefit received by over 2.7mln families.

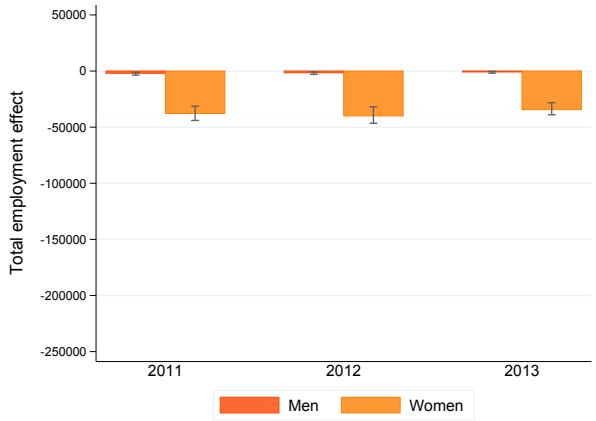
Implications for labour supply of the “Family 500+” reform:

- Simulations on data from 2011, 2012 and 2013. Thee sub-samples:
  - Model A: couples with both flexible partners
  - Model B: couples with one flexible partners
  - Model C: singles

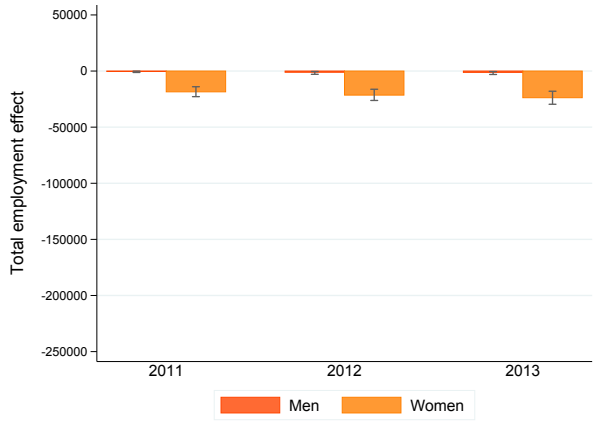
A - two flexible couples



B - single flexible couples



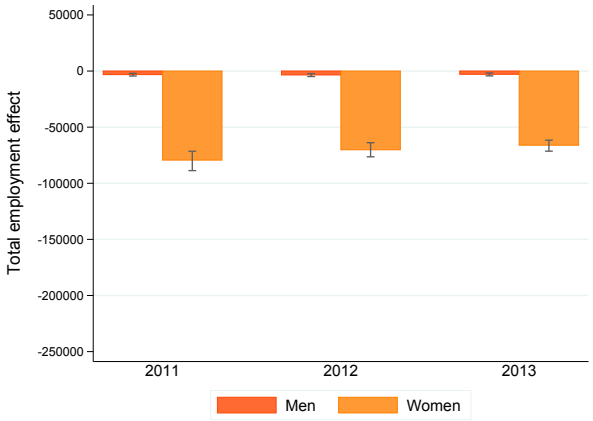
C - lone parents



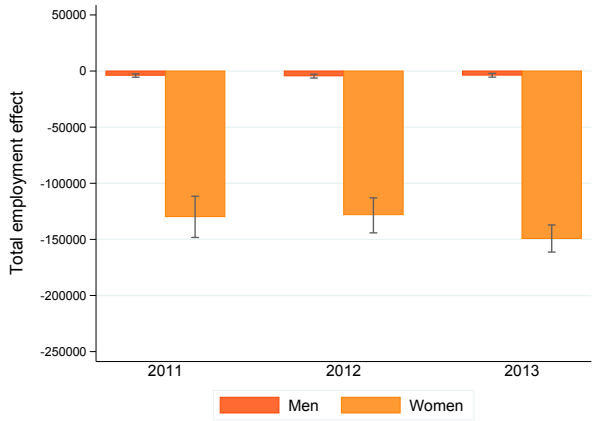
Implications for labour supply of the “Family 500+” reform:

- Simulations on data from 2011, 2012 and 2013. Model A split by characteristics:
  - Model A: couples with one child
  - Model A: parents without higher education
  - Model A: father aged below 35

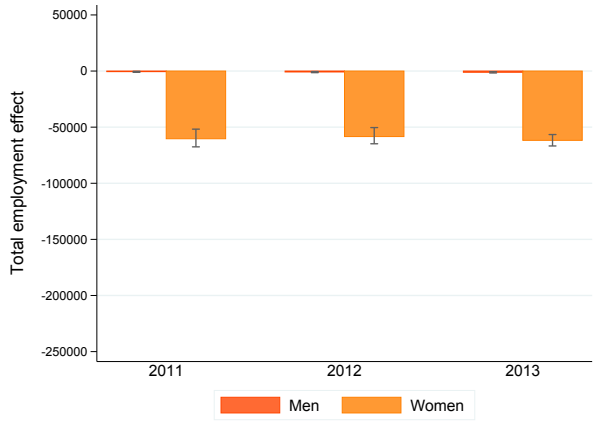
A - Couples with one child



A - Parents without higher education



A - Father aged below 35



Interpreting the results:

- Simulations reflect equilibrium effects in labour supply:
  - combination of inflows and outflows over the adjustment period;
  - results assume stable labour market environment (e.g. demand, wages and prices).
- Developments since the year on which reform was simulated:
  - very dynamic labour market, significant growth in wages (NMW up by 25% since 2013; average wage up by over 10%);
  - reduced relative value of the benefit (and nearly linear relationship between benefit value and LS effect).
- Other aspects which the model does not capture:
  - wage increases which may have resulted from the reform;
  - potential implications of the programme for child care.

Labour supply estimates for Poland