

THE IMPORTANCE OF FAMILY: A MACROECONOMIC PERSPECTIVE

Oliwia Komada

FAME|GRAPE

Warsaw School of Economics

o.komada@grape.org.pl

Magda Malec

Warsaw School of Economics

mm50714@doktorant.sgh.waw.pl

1. Introduction

Plenty of economic phenomena cannot be explained in the absence of family structure. For example, the immense changes in women's labor force participation are strongly affected by family structure: married women work less than single, and mothers work less than childless women (Greenwood et al. 2017). A significant share of these differences is a result of the family-specific design of tax and social security systems (Borella et al. 2019). Family structure is also a natural framework for studying intergenerational mobility and parent-child correlations. More and more macroeconomics papers reconcile the importance of a family and explicitly model decisions within the household. In this paper, we propose a systematic overview of this stream of literature.

We are not the first ones to review family economics in the context of macroeconomics, e.g. Browning et al. (2014). Doepke and Tertilt (2016) provide an excellent summary of advances in family economics and its successes in explaining classic macroeconomics phenomena. We extend their study by focusing on family-dependent policy interventions, the joint aspect of taxation, and the impact of labor market structure on fertility. What is more, an outstanding guideline of family economics models by Greenwood et al. (2017) pointed out several remaining research questions – concerning childcare subsidies, fertility policies, taxation, and within-family insurance. We prove that many of them have already received a satisfactory empirical and theoretical answer.

The definition of family differs substantially across macroeconomics literature. However, we can systematize these definitions using two dimensions: the household structure and decision process. We can distinguish two types of households: the first consists of the parent(s) and child(ren), the second consists of husband and wife. The latter fits analyzing gender inequality, unequal tax treatment, or family-dependent components of social security. The parent(s) and child(ren) family structure is the most common and helps explaining human

capital accumulation, inequality, and fertility decisions. Both setups are employed to study different drivers of women's labor force participation.

In terms of the decision-making process, we can distinguish unitary households and households based on game-theoretic bargaining models. The members of the unitary household maximize the so-called household utility function, which describes the joint interests of all household members under aggregated budget constraint. However, the formation, as well as the dissolution of a partnership, usually require decisions of the individuals involved. Thus, it always contains the possibility of conflict. Bargaining models better reflect this feature and describe household behavior as the cooperation of utility-maximizing individuals. Despite that, the unitary household is a typical framework, even in recent literature. Models with bargaining are mostly used to describe the formation and stability of marriage and recently to analyze fertility decisions.

In the following part of the paper, we review both macroeconomics and family economics literature in the context of labor force participation, fertility choice, human capital accumulation, inequality and taxes, and social security. Depending on the policy in question, the literature proposes models with significantly different structures and features, e.g., types of heterogeneity, choice set, applied utility functions, and model timing. All of them contribute to the mechanism of the model and its fit to the data (Borella et al. 2018). We discuss below different model setups, with particular caution to policies' welfare effect. In this way, we provide a method guideline useful for future research.

2. Working parents and fertility

The labor-force participation of women increased sharply during the twentieth century. Even a more considerable increase has been observed for married women. However, the employment rate of married women with and without children still differs substantially. The size of the gap varies noticeably across countries. Child-related transfers and family policies can account for a considerable part of this variation (Hannusch 2019). Childcare and parental leaves are essential tools for reducing labor market cost of motherhood and, therefore, more gender equality in the labor market.

Almost all OECD countries offer paid leaves to parents of a newborn (parental leaves). However, systems differ significantly between countries both in terms of length of parental leave and the generosity of transfers.

There is a consensus in the literature that parental leave has a positive impact on the labor market. Byker (2016) shows that the availability of parental leave increases labor-force attachment. Parental leave increases labor force participation as well (Blau and Khan 2016; Stichnoth 2019; Yamaguchi 2019).

The welfare effects of parental leave are not unambiguous. Erosa et al. (2010) show that the introduction of paid parental leave benefits women substantially due to the redistribution effect and a stronger bargaining position on the labor market. The increase in women's welfare occurs at the expense of the welfare of men, and aggregate welfare effects are negative. However, Bastani et al. (2019) show that

parental leave leads to welfare improvement if we account for the fact that firms have to offer standardized contracts to all employers. Without parental leave, more family-oriented worker obtains a suboptimal level of contract flexibility due to asymmetric information or anti-discrimination legislation.

The critical but absent ankle in researches mentioned above is household structure and, thus, insurance within a family. As Tominey (2016) shows, parental leave enables mothers to come back to work quickly if the father receives negative productivity shock, thus reduce the magnitude of a negative income shock. Blundell et al. (2018) obtain similar results. Lower-income risk comes at the expense of time spent with children. When negative income shock hits fathers, mothers work more, as residual earner model would predict. Due to the complementarity of leisure between wife and husband, working mothers spend less time with children and stay at home fathers do not compensate for that. Thus, if we take into consideration the welfare of the child, the effect is ambiguous. Both studies consider the US economy, where parental leave is unpaid. Paid parental leave would lead to a higher degree of insurance within the family because income smoothing may happen without cutting time devoted to childcare.

Public childcare addresses the asymmetry in childcare burden. Doepke and Kinderman (2019) show that the fertility level across countries increases with the fraction of the childcare burden taken by fathers. Using a quantitative model of household bargaining, they show that policies targeted to help mothers, i.e., public childcare, increases fertility level and welfare more effectively than nontargeted policies (e.g., direct child transfers). Childcare helps limit the depreciation of mothers' human capital. Guner et al. (2020) analyze public childcare in a model where human capital is a direct function of labor force participation. More affordable childcare relaxes time constraints and thus increases labor force participation. Hence human capital and welfare increase as well.

The natural alternative to maternal childcare is grandparental care. The access to grandparents' help increases mothers' labor force participation (see e.g. Posadas and Vidal-Fernandez 2013; Yu et al. 2019). However, it not necessarily leads to an increase in women's income due to lower mobility (Garcia-Moran and Kuehn 2017). There is also plenty of empirical evidence of the positive impact of formal childcare on child development (Currie and Thoms 1995; Boca et al. 2016b).

The marketization of childcare is a more and more important alternative to informal and public childcare as the gender gap shrinks, and income inequality grow. The marketization of childcare help explains why over the last 40 years, the US total fertility rate has been rather stable, while female wages have continued to grow. Rising relative wages increase women's labor supply and, due to higher opportunity cost, lower fertility at first. However, it also leads to a reallocation of home production and childcare from women to men and a marketization of childcare, which counteracts the first-order effect (Siegel 2017).

The marketization of childcare may also explain why highly educated women no longer have fewer children, contrary to a standard assumption of strictly negative fertility-income relation (Jones et al. 2010). Hazan and Zoabi (2015) argue that

there are three possible explanations: group composition, medical advantages, and marketization of home production, including childcare. As more women get an education, more highly educated women enter marriages and build a family. Medical improvement enables highly educated women to realize postponed fertility. Finally, women with high education can reduce the time spent on childcare and purchase more services as substitutes. Bar et al. (2018) propose a theoretical framework to formalize this intuition. They assume that parental time investment is necessary to raise a child. However, parental time may be substitute by paid childcare. Due to increment in income inequality, the relative price of childcare drop for high-income households. They showed that changes in inequality could quantitatively account for much of the changing relationship between mothers' education and fertility over time.

Not only fertility and family policies shape the labor market decisions of parents, but also the labor market condition affects fertility decisions. Wage uncertainty is an essential channel of this interaction. Having a child is a long-term commitment; thus, more insecurity regarding future income implies lower intended fertility rate and longer postponement of first birth (Sommer 2016).

Guner et al. (2019) study how uncertainty created by temporary and open-ended contracts combined with the inflexibility of work schedules reduces the fertility level of women with higher education. In a life-cycle model with endogenous fertility, endogenous labor, and skill formation, they show that reduction of the labor market duality and inflexibility of work schedules increase the completed fertility of college-educated from 1.52 to 1.88. Due to reform, women have more children and have them earlier. The labor force participation of women increases. The employment gap between mothers and non-mothers shrinks. Lopes (2019) use a similar setup to study the effect of the decline of job security in Portugal on fertility. She shows that job security is especially crucial at first birth. For subsequent birth decisions, the income effect is relatively more important.

Another significant stream of literature analyzes the interaction between fertility and income risk on the aggregate level. On the one hand, wages decline observed during recessions lowers the cost of having a child in terms of foregone earnings. Thus, fertility may increase during the recession. On the other hand, the presence of the borrowing constraints makes poorer households unable to cover the consumption cost of an additional child (Papagni 2006, Filoso and Papagni 2015). The above mechanism may be reinforced by the "added- worker" effect and even further by the gender asymmetry within the industries (Coskun and Dalgic 2019). Empirical studies show fertility decline during the Great Recession (Matysiak et al. 2018), the Great Depression (Sobotka et al. 2011, Jones and Schoonbroodt 2016), the fall of the Berlin Wall (Liepmann 2018), and post-communist countries (Billingsley 2010). It suggests that the economic constraints and uncertainty channel are more important than the lower opportunity cost of having a child.

Lower fertility, due to labor market uncertainty, should concern social planner. The stochastic character of fertility (see Wolpin 1984; Hotz and Miller 1993), implies that the total number of children depends not only on couples' intentions but also on the stochastic realization of those intentions. Thus, there is a risk of obtaining

too high or too low fertility as an outcome. Imperfect contraception, combined with income risk, may lead to unwanted pregnancies. Abortions are important fertility control mechanisms, especially when unplanned pregnancy coincides with unfavorable income realization (Choi 2017, Miller et al. 2020). Income shocks cause postponing birth. Taking into account the decline in fertility with women's age, it may lead to suboptimal fertility realization. Both IVF and abortions help to overcome the market's incompleteness in the aspect of fertility and to close the gap between the desired and the realized number of children.

3. Human capital accumulation

With family structure, two channels are affecting human capital accumulation of the young generation – characteristics of parents and parental investments. In light of rising inequality, one needs to realize that human capital investments are the vehicle for social mobility. Since education also generates positive externalities (e.g., peer group effect, exchange of ideas), there is also a strong inducement for governments to promote investments in human capital. Moreover, market imperfections distort private investment choices, making room for policy interventions. Since they are very costly, it is necessary to quantify their effects. There is extensive empirical literature on this subject (Acemoglu and Angrist 2001; Krueger and Lindahl 2001; Heckman and Mosso 2014).

The inability to finance human capital investments through financial markets (and because of their imperfections) is often listed as the leading cause of policy intervention (Keane and Wolpin 2001). However, in an excellent overview of human capital policies, Heckman and Carneiro (2003) estimated that "only 8% of American youth are credit constrained in the traditional usage of that term". Still, despite empirical skepticism towards intergenerational borrowing constraints hypothesis (Mulligan 1999; Heckman and Mosso 2014; Boca et al. 2016a), the literature widely employed Becker and Tomes (1986) model for policy analysis. A key feature in their approach is that parents cannot borrow for human capital investments against the future income of their children. Recently, their two-period framework expands in a way that parents can invest in the human capital of their children along the multiple life stages, which is also in line with empirical result (Cuhna et al. 2006).

Challenging previous findings, Caucutt and Lochner (2019) investigate the role of borrowing constraints in a life-cycle model with two stages of human capital investments. Later on, they extend the analysis into a dynastic framework. To provide a tool for quantitative analysis, they equipped their model with earnings shocks that allow wages to variate within education classes. Also, their borrowing constraints depend positively on the future human capital of an individual. They find that almost half of the young parents and 12% of old parents face borrowing constraints. Increasing the borrowing limit of the young parents by only half of the average monthly income improves early human capital investments by 11% and college graduation rates by 10%. These effects are more

significant for college-educated parents because they are the ones facing credit constraints for offspring's human capital investments.

Koeniger and Prat (2018) combined both characteristics of parents and parental investments with a parental decision on bequests. They employ a dynastic model featuring hidden stochastic abilities and ex ante heterogeneous productivity persistent across generations. First, they find that parental human capital investments should be decreasing in bequests. It stems from the fact that receiving inheritance translates to the increase in wealth and hence to the decrease in labor force participation (see also Holtz-Eakin et al. 1993). Second, because the abilities of children are positively correlated with parental earnings, publicly provided human capital investments should be increasing in parental labor income and decreasing in their wealth. Third, the optimal policy is to tax bequests and subsidize human capital accumulation. The risky human capital investments and hidden abilities of children are the driving force of this result. The study also provides a compelling argument in the discussion about the persistence of earnings across generations. According to the paper, the intergenerational earnings elasticity observed in data is close to the social optimum.

4. Inequality and taxes

The importance of inherited wealth and parental background has recently attracted much attention in the academic literature (Boserup et al. 2018; Abott et al. 2019; Fogli and Guerrieri 2019). With the development of finite-horizon models, it becomes possible to study intergenerational interactions in the macroeconomic framework – for example, in the context of taxation and other policies supporting equity. Even though the intergenerational mobility seems to be stable over the last decades (Chetty et al. 2014), with rising inequality providing the equality of opportunities assumes growing importance.

A standard approach in taxation literature is to judge against two criteria of equity and efficiency. While equity is hard to measure and its evaluation requires explicitly defined criteria, the efficiency indicate minimizing distortions to economic output. Until recently, Chamley (1986) and Judd's (1985) result suggested optimality of zero capital income tax rate (ergo taxation on wealth, bequests, or any accumulated factor). It stems from the fact that tax on capital income generates distortion on intertemporal choices. However, Straub and Werning (2020) show that when the intertemporal elasticity of substitution is less than or equal to one, the long-run optimal tax rate is positive. For elasticity higher than one, the tax rate converges to zero, but it might stick to positive values for ages before so. They were not the first ones to challenge the zero tax rate result (Piketty and Saez 2013). By relaxing assumptions about the model, i.e., accounting for idiosyncratic labor income shocks (Krueger and Ludwig 2018) or accidental bequests (Blumkin and Sadka 2004), the result of untaxing capital can be overturned. Intergenerational transfers can take the form of passing estates, inheritance, accidental bequests, and *inter vivos* (during lifetime) gifts. All of them might be taxed, and the general conclusion from the latest literature is that they should

be (Kopczuk 2013; Piketty and Saez 2013; Saez and Stantcheva 2018). The rationale behind it is that taxes on transfers are highly progressive, and they level the wealth concentration. Koeniger and Prat (2018) find that at the social optimum, the wedge for human capital is much lower than the wedge for bequests. Hence, human capital investments are often subsidized, whereas bequests should be universally taxed. However, there was no agreement on this matter for a long time. To understand those conflicting results, one should focus on model choices that drive the differences. Curiously enough, the motivations behind bequeathal decisions are also crucial in determining the efficiency of taxation (Gale et al. 2001; Cremer and Pestieau 2006).

Becker and Tomes (1979), followed by Davies (1986), show that in dynastic framework with idiosyncratic labor productivity shocks, the rise in estate tax increases long-run inequality and deteriorates welfare. They model pure dynastic altruism and, in their setup income of subsequent generations, directly enter the utility function of the current generation. This model choice causes two amplifying effects. Firstly, the higher the taxes on bequests, the lower the averaging labor productivity luck in a lineage. This inheritance effect alters "how much luck" is passed from the previous generation on to the present and consequently changes current income. Secondly, the rise in taxes leads to a drop in government revenues through redistribution effect. As a result, the lump-sum transfer from the government to households is lower, causing inequality to increase. However, the direction of the redistribution effect changes with the employed utility function.

Under the *warm-glow* or *joy-of-giving* motive, bequest taxation has an equalizing effect. In this setup, bequest enters the utility function as a consumption expenditure in the last period of life. Further, with Cobb-Douglas preferences, taxation is neutral to average wealth and thus, by lowering the variance of bequests, indicates lower wealth inequality. As proved by Bossman et al. (2007), followingly by Wan and Zhu (2019), the redistribution effect dominates the inheritance effect. Redistribution reduces the variance of wealth while keeping the average wealth constant and consequently decrease the inequality, measured not only as a coefficient of variation but also as the Gini coefficient. This result also holds for different forms of constant relative risk aversion (CRRA) utility function (Heer 2001; De Nardi and Yang 2016).

As pointed out by Cremer and Pestieau (2006), there are two primary ways to tax intergenerational wealth transfers – with the estate and inheritance taxation. What is worth emphasizing, both taxes can implement the optimal allocation, but we refrain from a detailed review on this topic. However, drawing from the literature on optimality, one should stress that from a policy perspective, the inheritance tax is preferable. Firstly, the optimal formula of bequest taxation depends much not only on the magnitude of inheritance but also on the behavioral response of future generations (Piketty and Saez 2013). Hence, it seems reasonable to impose a tax on the donee rather than the donor (Kopczuk 2013). Secondly, when allowing for household heterogeneity in the number of children, it is not possible to derive optimal estate tax formula independent of the family size (Fahri and Werning

2010). At the same time, there exists the inheritance tax that implements the optimal allocation. Furthermore, when heterogeneous households treat their children unequal with their share in a bequest, a social optimum may require progressive inheritance taxation rather than estate taxation that is calculated on the aggregate (Cremer et al. 2011). Nevertheless, the existing wealth transfers taxation schemes are very far from the optimal formulas derived in the literature. For more details on optimality, see Chari and Kehoe (1999), Golosov et al. (2003), Kocherlakota (2005), Fahri and Werning (2010), Piketty and Saez (2013) and Stantcheva (2020).

By incorporating family structure into macroeconomics models, it becomes possible to study another aspect of taxation – separate versus joint taxation. With separate household taxation, each earner's marginal tax rate increases only in his own income; in systems of joint taxation, one earner's marginal tax rate increases not only in his own income but also in the income of someone else. Thus, it heavily influences the labor supply within the household, and consequently partially explains gender differences in labor force participation (Apps and Rees 2004; Kaygusuz 2010; Guner et al. 2012; Guner et al. 2014; Bick and Fuchs-Schündeln 2017; Borella et al. 2019). Moreover, it is also significant from the perspective of optimality. Wu and Krueger (2020) demonstrate that when accounting for joint taxation and idiosyncratic wage shocks, the optimal degree of tax progressivity is substantially lower than what suggest one-earner models. It stems from the fact that in one-earner models, the progressivity, precautionary savings, and social security are the only sources of insurance against idiosyncratic shocks. To capture this mechanism, one should account for endogenous labor, or alternatively residual, or binary labor supply for the secondary earner in two-earner models.

Using a model with binary labor supply for the secondary earner, Kleven et al. (2009) portray the household decision as a multi-dimensional screening problem. Brett (2007) and Cremer et al. (2012) also employed this approach. In their setup, the decision-makers are heterogeneous with respect to marital status, abilities, and taste for work. Those parameters are unobservable by the principal (government or tax authorities) who wants to maximize social welfare. Those studies build extensively on the literature solving one-dimensional screening problem in the spirit of Mirrlessian optimality (Apps and Rees 2011; Alesina et al. 2011). In fact, optimal taxation calls for negative jointness. It means that the tax rate on the secondary earner should be decreasing in the earnings of the primary worker. It results from a social planner's interest in redistribution from two-earner households to one-earner households with low primary earnings. Surprisingly, many tax-transfer schemes in Europe feature negative jointness, which is driven by many family-based governmental transfers (Kleven et al. 2009). However, reforms that lower the tax burden on the secondary earner in the household are welfare improving through the labor supply channel.

The negative jointness as an optimal tax scheme also results from the study by Gayle and Shephard (2019). Their approach includes a marriage market equilibrium and intra-household allocations on top of the usually employed screening problem.

Introducing joint versus separate taxation is welfare improving, but those gains are relatively small. However, the welfare gains are increasing as the gender wage gap is growing.

5. Family and social security

There are three main reasons why accounting for families is essential in the social security context: the design of the pension system, insurance within the family, and the pension-fertility link.

First, family structure affects retirement incentives and, thus, decisions. Pension benefits design implies a high implicit tax and discourages the labor supply of the secondary earner. Borella et al. (2019) show that elimination of survivor benefits and spousal pension would increase labor force participation of married women by 10-20 percentage points. A similar magnitude of labor force reaction has been presented by Guner et al. (2012). Sánchez-Marcos and Bethencourt (2018) replicate those results in a model that accounts for human capital loss due to nonparticipation. Groneck and Wallenius (2019) and Kaygusuz (2015) use a simpler model with a less elastic labor supply. They account for a 6% increase in women labor force supply due to the elimination of the family dependent components. Nishiyama (2019) shows that labor market effects are much smaller if one accounts for utility from home production. Survivor benefits and spousal pension imply redistribution mostly to single-earner married households and thus favor married women over singles — such redistribution calls welfare concerns in the context of the rising share of single mothers. In all of the mentioned papers, elimination of family dependent components of the pension system increases welfare.

The design of pension benefits also leads to coordination in couple's retirement decisions, see Coile (2004), and Casanova (2010) for the US. However, couples use to retire together, even if the pension system does not generate such strong incentives as US spousal pension, see Hospido and Zamarro (2014). The potential reason may be couples' preferences, namely leisure complementarities between spouses and assortative mating. If couples enjoy spending leisure time together, the marginal utility of retirement would be higher if the spouse is already retired. Similarities in preference for leisure can explain retirement at a similar time. Michaud et al. (2019) show evidence of complementarities in partners' leisure and a positive correlation between partners' labor supply preferences. However, the first channel dominates. Even if the reason behind joint retirement is not well understood yet, the spillover effects of pension system reform are huge and cannot be ignored. For example, Coile (2004) finds that the omission of spillover effects biases the estimated effect of policies aimed to enhance longer labor force participation by 13% to 20%. Thus, there is a need to replace the individual model of retirement by a collective model of multi-person households while studying pension system reform.

Second, the family helps mitigate wage risk. When negative income shock realized, a single individual can adjust their labor and savings. For individuals living in couples, there is an additional channel of insurance; namely, the labor

supply of both partners can be adjusted. De Nardi et al. (2019) show that in the US, family insurance plays a more critical role than the one offered by the government. On the other hand, in countries with more generous welfare states like the Netherlands, family insurance was "crowded-out" by government transfer. Nakabayashi (2019) proposes a model to explain the differences in the size of government support across nations. A more extended welfare state is likely to be chosen in civil law countries, like Germany or Japan, whose family law arranges a higher duty of support within the family. Thus, government insurance is higher in countries that use to have a high level of family insurance.

Family and government insurance works differently for different income levels of individuals. Income risk is the highest for impoverished and wealthy households, i.e., the first and the last decile of earnings. The common pattern across countries is that family risk-sharing plays a more prominent role for high-income individuals, and government insurance is mostly addressed to poor households, see De Nardi et al. (2019). However, even after government transfer, in the US, the standard deviation of income remains the highest among the first decile of earners. Those households are also more likely to be run by a single individual (or single parent) and thus have limited access to family insurance, see Watson and McLanahan (2011) and Schneider et al. (2019).

Third, there is plenty of cross-country evidence that fertility level is negatively correlated with the size of pension system. The observed pattern is in line with the Boldrin and Jones' (2002) model of fertility decisions. In contrast to Barro and Becker's (1989) model where children are a consumption good, Boldrin and Jones (2002) assume that children serve investment purposes and ensure parental consumption in the after-work periods. As the size of the old-age support offered by the government increases, the incentives to have children shrink. Boldrin et al. (2015) show that the size of the pension system accounts for 55-65% of the observed difference in the US-Europe fertility rate. Fenge and Scheubel (2017) use the introduction of Bismarck's pension system and show the negative impact of public pensions on fertility. Billari and Galasso (2014), based on the pension benefits cut in 90-ties in Italy, show that even in modern societies, investment motive prevails, and benefits cut implies a rise in fertility rate.

The fertility rate is not only lower but also too low in the presence of the pension system. Schoonbroot and Tertilt (2014) show that the lack of property rights for children's future income implies too low child-related investment. The public pension system operating on a PAYG basis offers a contract between parents and unborn children and forces born children to support retired parents, thus complete the market. However, the standard PAYG pension system links the aggregate income of future generations, therefore the average fertility rate, with the pension benefits on today's parents. Hence children generate private cost and public benefits. Fenge and Meier (2009) and Fenge and von Weizsäcker (2010) show that the socially optimal fertility rate may be obtained by the mix of standard PAYG system and individual fertility-related pensions. Child-related subsidies may achieve the same allocation as a fertility-related pension (see Fenge and Meier 2009). Cremer et al. (2011) show that if endogenous human capital

accumulation is taken into account, one should consider subsidy education and tax the number of children.

6. Conclusion and avenues for further research

The growing stream of macroeconomic literature acknowledges that the interactions within the family are vital in explaining many economic regularities. We propose a systematic review of this literature in the context of inequality and taxes, human capital accumulation, social security, labor force participation, and fertility choice. We concentrate on externalities and market failures that appear or escalate when one accounts for interaction within the family. We discuss the policy recommendations addressing these externalities and market failures. We put special attention to the welfare effect and critical elements of the models' that drive the results. Hence, we present a method guideline valuable for future research.

Incorporating recent advances in empirical work on human capital accumulation is a major challenge for family economics. First, the literature neglects the interactions between siblings in family structure and different parental preferences towards children, depending on birth order or gender. Second, there is usually a complementarity in the accumulation of human capital in different stages of life. However, empirically, this is not the case. Even though the life-cycle models capture well the ongoing process of acquiring human capital, the early investments prove to be the most effective. Third, empirical literature stands clearly that income risk affects not only fertility decisions but also human capital investment. Since low-income individuals face high volatility of income, it would be useful to account for that feature in the context of social mobility. Lastly, in the vast majority of papers, the fertility is exogenous. However, the interactions between fertility timing and human capital investments are distinct. Investing in the quality of a child takes time and money – resources constrained for young parents. With fertility rates dropping below replacement rates, the analysis of policies in this framework may be crucial.

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References

- Abbott B., Gallipoli G., Meghir C., Violante G.L., (2019), *Education Policy and Intergenerational Transfers in Equilibrium*. Journal of Political Economy, 127(6), 2569-2624.
- Acemoglu D., Angrist J., (2001), *How Large are Human-Capital Externalities? Evidence from Compulsory-Schooling Laws*. NBER Macroeconomics Annual 2000, Vol. 15, 9-74.

- Alesina A., Ichino A., Karabarbounis L., (2011), *Gender-Based Taxation and the Division of Family Chores*. American Economic Journal: Economic Policy, 3(2), 1-40.
- Apps P., Rees R., (2004), *Fertility, Taxation and Family Policy*. The Scandinavian Journal of Economics, 106(4), 745-763.
- Apps P., Rees R., (2011), *Optimal Taxation and Tax Reform for Two-Earner Households*. CESifo Economic Studies, 57(2), 283-304.
- Bar M., Hazan M., Leukhina O., Weiss D., Zoabi H., (2018), *Why did rich families increase their fertility? Inequality and marketization of child care*. Journal of Economic Growth, 23(4), 427-463.
- Barro R., Becker G., (1989), *Fertility Choice in a Model of Economic Growth*. Econometrica, 57(2), 481-501.
- Bastani S., Blumkin T., Micheletto L., (2019), *The Welfare-Enhancing Role of Parental Leave Mandates*. The Journal of Law, Economics, and Organization, 35(1), 77-126.
- Becker G.S., Tomes N., (1979), *An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility*. Journal of Political Economy, 87(6), 1153-1189.
- Bick A., Fuchs-Schündeln N., (2017), *Quantifying the disincentive effects of joint taxation on married women's labor supply*. American Economic Review, 107(5), 100-104.
- Billari F.C., Galasso V., (2014), *Fertility decisions and pension reforms. Evidence from natural experiments in Italy*. IdEP Economic Papers 1403, USI Università della Svizzera italiana.
- Billingsley S., (2010), *The Post-Communist Fertility Puzzle*. Population Research and Policy Review, 29(2), 193-231.
- Blau F.D., Kahn L. M., (2013), *Female Labor Supply: Why Is the United States Falling Behind?* American Economic Review, 103(3), 251-256.
- Blumkin T., Sadka E., (2004), *Estate taxation with intended and accidental bequests*. Journal of Public Economics, 88(1-2), 1-21.
- Blundell R., Pistaferri L., Saporta-Eksten I., (2018), *Children, time allocation, and consumption insurance*. Journal of Political Economy, 126, S73-S115.
- Boca D.D., Flinn C., Wiswall M., (2016a), *Transfers to Households with Children and Child Development*. Economic Journal, 126(596), 136-183.
- Boca D.D., Pasqua S., Suardi S., (2016b), *Child Care, Maternal Employment, and Children's School Outcomes. An Analysis of Italian Data*. European Journal of Population, 32(2), 211-229.
- Boldrin M., De Nardi M., Jones L.E., (2015), *Fertility and Social Security*. Journal of Demographic Economics, 81(3), 261-299.
- Boldrin M., Jones L., (2002), *Mortality, Fertility, and Saving in a Malthusian Economy*. Review of Economic Dynamics, 5(4), 775-814.
- Borella M., De Nardi M., Yang F., (2018), *The aggregate implications of gender and marriage*. The Journal of the Economics of Ageing, 11, 6-26.
- Borella M., De Nardi M., Yang F., (2019), *Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labor Supply?* (Working Paper No. 26097). National Bureau of Economic Research.
- Boserup S.H., Kopczuk W., Kreiner C.T., (2018), *Born with a Silver Spoon? Danish Evidence on Wealth Inequality in Childhood*. The Economic Journal, 128(612), F514-F544.
- Bossmann M., Kleiber C., Wälde K., (2007), *Bequests, taxation and the distribution of wealth in a general equilibrium model*. Journal of Public Economics, 91(7), 1247-1271.
- Brett C., (2007), *Optimal nonlinear taxes for families*. International Tax and Public Finance, 14(3), 225-261.

- Browning M., Chiappori P.A., Weiss Y., (2014), *Economics of the Family*. Cambridge University Press.
- Byker T.S., (2016), *Paid Parental Leave Laws in the United States: Does Short-Duration Leave Affect Women's Labor-Force Attachment?* American Economic Review, 106(5), 242-246.
- Casanova M., (2010), *Happy together: A structural model of couples' joint retirement choices*. Working Paper, UCLA.
- Caucutt E., Lochner L.J., (2019), *Early and Late Human Capital Investments, Borrowing Constraints, and the Family*. Journal of Political Economy.
- Chamley C., (1986), *Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives*. Econometrica, 54(3), 607-622.
- Chari V.V., Kehoe P.J., (1999), *Optimal fiscal and monetary policy*. [in:] Handbook of Macroeconomics (Vols. 1, Part C, 1671-1745).
- Chetty R., Hendren N., Kline P., Saez E., (2014), *Where is the land of Opportunity? The Geography of Intergenerational Mobility in the United States*. The Quarterly Journal of Economics, 129(4), 1553-1623.
- Choi S., (2017), *Fertility risk in life-cycle*. International Economic Review, 58(1), 237-259.
- Coile C., (2004), *Retirement Incentives and Couples' Retirement Decisions*. Topics in Economic Analysis, Policy, 4(1).
- Coskun S., Dalgic H., (2020), *Fertility Response to Business Cycles: "Gender Asymmetry in Industries"*. University of Mannheim Working Paper, 35.
- Cremer H., Gahvari F., Pestieau P., (2011), *Fertility, human capital accumulation, and the pension system*. Journal of Public Economics, 95(11), 1272-1279.
- Cremer H., Lozachmeur J.M., Pestieau P., (2012), *Income taxation of couples and the tax unit choice*. Journal of Population Economics, 25(2), 763-778.
- Cremer H., Pestieau P., (2006), *Chapter 16 Wealth transfer taxation: A survey of the theoretical literature*. [in:] Kolm, S.C., Ythier J.M. (eds.), *Handbook of the Economics of Giving, Altruism and Reciprocity* (Vol. 2, 1107-1134).
- Cunha F., Heckman J.J., Lochner L., Masterov D.V., (2006), *Chapter 12 Interpreting the Evidence on Life Cycle Skill Formation*. [in:] E. Hanushek, F. Welch (eds.), *Handbook of the Economics of Education* (Vol. 1, 697-812).
- Currie J., Thomas, D., (1995), *Does Head Start Make a Difference?* American Economic Review, 85(3), 341-364.
- Davies J.B., (1986), *Does Redistribution Reduce Inequality?* Journal of Labor Economics, 4(4), 538-559.
- De Nardi M., Fella G., Knoef M., Paz-Pardo G., Van Ooijen R., (2019), *Family and Government Insurance: Wage, Earnings, and Income Risks in the Netherlands and the U.S.* (No. w25832; p. w25832). National Bureau of Economic Research.
- De Nardi M., Yang F., (2016), *Wealth inequality, family background, and estate taxation*. Journal of Monetary Economics, 77, 130-145.
- Doepke M., Kindermann F., (2019), *Bargaining over babies: Theory, evidence, and policy implications*. American Economic Review, 109(9), 3264-3306.
- Doepke M., Matthias, Tertilt, M., (2016), *Families in macroeconomics*. In Handbook of macroeconomics (Vol. 2, pp. 1789-1891).
- Erosa A., Fuster L., Restuccia, D., (2010), *A general equilibrium analysis of parental leave policies*. Review of Economic Dynamics, 13(4), 742-758.
- Farhi E., Werning I., (2010), *Progressive Estate Taxation*. The Quarterly Journal of Economics, 125(2), 635-673.
- Fenge R., Meier V., (2009), *Are family allowances and fertility-related pensions perfect substitutes?* International Tax and Public Finance, 16(2), 137-163.

- Fenge R., Scheubel B., (2017), *Pensions and fertility: Back to the roots*. Journal of Population Economics, 30(1), 93-139.
- Fenge R., von Weizsäcker J., (2010), *Mixing Bismarck and child pension systems: An optimum taxation approach*. Journal of Population Economics, 23(2), 805-823.
- Filoso V., Papagni E., (2015), *Fertility choice and financial development*. European Journal of Political Economy, 37, 160-177.
- Fogli A., Guerrieri V., (2019), *The End of the American Dream? Inequality and Segregation in US Cities* (Working Paper No. 26143). National Bureau of Economic Research.
- Gale W.G., Hines J.R., Slemrod J., (2011), *Rethinking Estate and Gift Taxation*. Brookings Institution Press.
- García-Morán E., Kuehn Z., (2017), *With strings attached: Grandparent-provided child care and female labor market outcomes*. Review of Economic Dynamics, 23, 80-98.
- Gayle G.L., Shephard A., (2019), *Optimal Taxation, Marriage, Home Production, and Family Labor Supply*. Econometrica, 87(1), 291-326.
- Golosov M., Kocherlakota N., Tsyvinski A., (2003), *Optimal Indirect and Capital Taxation*. The Review of Economic Studies, 70(3), 569-587.
- Greenwood J., Guner N., Vandenbroucke G., (2017), *Family Economics Writ Large*. Journal of Economic Literature, 55(1), 1346-1434.
- Groneck M., Wallenius J., (2019), *It Sucks to Be Single! Marital Status and Redistribution of Social Security*. SSE Working Paper Series in Economics, No. 2017:1.
- Guner N., Kaygusuz R., Ventura G., (2012), *Taxing women: A macroeconomic analysis*. Journal of Monetary Economics, 59(1), 111-128.
- Guner N., Kaygusuz R., Ventura G., (2014), *Income taxation of U.S. households: Facts and parametric estimates*. Review of Economic Dynamics, 17(4), 559-581.
- Guner N., Kaya E., Marcos V.S., (2019), *Labor Market Frictions and Lowest Low Fertility*. Mimeo.
- Guner N., Kaygusuz R., Ventura G., (2020), *Child-Related Transfers, Household Labor Supply and Welfare*. Forthcoming in Review of Economic Studies.
- Hannusch A., (2019), *Taxing Families: The Impact of Child-related Transfers on Maternal Labor Supply*. CRC TR 224 Discussion Paper Series. University of Bonn and University of Mannheim, Germany.
- Hazan M., Zoabi H., (2015), *Do Highly Educated Women Choose Smaller Families?* The Economic Journal, 125(587), 1191-1226.
- Heckman J., Carneiro P., (2003), *Human Capital Policy [in:] Inequality in America: What Role for Human Capital Policy?* MIT Press, 2003.
- Heckman J.J., Mosso S., (2014), *The Economics of Human Development and Social Mobility*. Annual Review of Economics, 6(1), 689-733.
- Heer B., (2001), *Wealth Distribution and Optimal Inheritance Taxation in Life-cycle Economies with Intergenerational Transfers*. The Scandinavian Journal of Economics, 103(3), 445-465.
- Holtz-Eakin D., Joulfaian D., Rosen H.S., (1993), *The Carnegie Conjecture: Some Empirical Evidence*. The Quarterly Journal of Economics, 108(2), 413-435.
- Hospido L., Zamarro G., (2014), *Retirement patterns of couples in Europe*. IZA Journal of European Labor Studies, 3(1), 12.
- Hotz V.J., Miller R.A., (1993), *Conditional Choice Probabilities and the Estimation of Dynamic Models*. The Review of Economic Studies, 60(3), 497-529.
- Jones L.E., Schoonbroodt A., Tertilt M., (2010), *Fertility Theories: Can They Explain the Negative Fertility-Income Relationship?* In NBER Chapters (pp. 43-100). National Bureau of Economic Research, Inc.

- Jones L., Schoonbrodt A., (2016), *Baby Busts and Baby Booms: The Fertility Response to Shocks in Dynastic Models*. *Review of Economic Dynamics*, 22, 157-178.
- Judd K.L., (1985), *Redistributive taxation in a simple perfect foresight model*. *Journal of Public Economics*, 28(1), 59-83.
- Kaygusuz R., (2015), *Social security and two-earner households*. *Journal of Economic Dynamics and Control*, 59, 163-178.
- Kaygusuz R., (2010), *Taxes and female labor supply*. *Review of Economic Dynamics*, 13(4), 725-741.
- Keane M.P., Wolpin K.I., (2001), *The Effect of Parental Transfers and Borrowing Constraints on Educational Attainment*. *International Economic Review*, 42(4), 1051-1103.
- Kleven H. J., Kreiner, C.T., Saez E., (2009), *The Optimal Income Taxation of Couples*. *Econometrica*, 77(2), 537-560.
- Kocherlakota N.R., (2005), *Zero Expected Wealth Taxes: A Mirrlees Approach to Dynamic Optimal Taxation*. *Econometrica*, 73(5), 1587-1621.
- Koeniger W., Prat J., (2018), *Human capital and optimal redistribution*. *Review of Economic Dynamics*, 27, 1-26.
- Kopczuk W., (2013), *Incentive Effects of Inheritances and Optimal Estate Taxation*. *American Economic Review*, 103(3), 472-477.
- Krueger A.B., Lindahl M., (2001), *Education for Growth: Why and for Whom?* *Journal of Economic Literature*, 39(4), 1101-1136.
- Krueger D., Ludwig A., (2018), *Optimal Taxes on Capital in the OLG Model with Uninsurable Idiosyncratic Income Risk* (Working Paper No. 24335). National Bureau of Economic Research.
- Liepmann H., (2018), *The impact of a negative labor demand shock on fertility – Evidence from the fall of the Berlin Wall*. *Labour Economics*, 54, 210-224.
- Lockwood L.M., (2018), *Incidental bequests and the choice to self-insure late-life risks*. *American Economic Review*, 108(9), 2513-2550.
- Lopes M., (2019), *Job Security and Fertility Decisions*. Working Paper, Universidad Carlos III de Madrid.
- Matysiak A., Sobotka, T., Vignoli D., (2018), *The Great Recession and Fertility in Europe: A Sub-National Analysis* VID Working Paper 2/2018.
- Michaud P.C., Van Soest A., Bissonnette L., (2019), *Understanding joint retirement*. *Journal of Economic Behavior, Organization*.
- Miller S., Wherry L.R., Foster, D.G., (2020), *The Economic Consequences of Being Denied an Abortion* (Working Paper No. 26662). National Bureau of Economic Research.
- Mulligan C.B., (1999), *Galton versus the Human Capital Approach to Inheritance*. *Journal of Political Economy*, 107(S6), S184-S224.
- Nakabayashi M., (2019), *From family security to the welfare state: Path dependency of social security on the difference in legal origins*. *Economic Modelling*, 82, 280-293.
- Nishiyama S., (2019), *The joint labor supply decision of married couples and the U.S. Social Security pension system*. *Review of Economic Dynamics*, 31, 277-304.
- Papagni E., (2006), *Household borrowing constraints, fertility dynamics, and economic growth*. *Journal of Economic Dynamics and Control*, 30(1), 27-54.
- Piketty T., Saez E., (2013), *A Theory of Optimal Inheritance Taxation*. *Econometrica*, 81(5), 1851-1886.
- Posadas J., Vidal-Fernandez M., (2013), *Grandparents' Childcare and Female Labor Force Participation*. *IZA Journal of Labor Policy*, 2(1), 14.
- Saez E., Stantcheva S., (2018), *A simpler theory of optimal capital taxation*. *Journal of Public Economics*, 162, 120-142.

- Sánchez-Marcos V., Bethencourt C. (2018), *The effect of public pensions on women's labor market participation over a full life cycle*. *Quantitative Economics*, 9(2), 707-733.
- Schneider D., Harknett K., Stimpson M., (2019), *Job Quality and the Educational Gradient in Entry Into Marriage and Cohabitation*. *Demography*, 56(2), 451-476.
- Schoonbroodt A., Tertilt M., (2014), *Property rights and efficiency in OLG models with endogenous fertility*. *Journal of Economic Theory*, 150(1), 551-582.
- Siegel C., (2017), *Female relative wages, household specialization and fertility*. *Review of Economic Dynamics*, 24, 152-174.
- Sobotka T., Skirbekk V., Philipov D., (2011), *Economic Recession and Fertility in the Developed World*. *Population and Development Review*, 37(2), 267-306.
- Sommer K., (2016), *Fertility choice in a life cycle model with idiosyncratic uninsurable earnings risk*. *Journal of Monetary Economics*, 83, 27-38.
- Stantcheva S., (2020), *Dynamic Taxation* (Working Paper No. 26704). National Bureau of Economic Research.
- Stichnoth H., (2019), *Short-run fertility effects of parental leave benefits: Evidence from a structural model*. *Empirical Economics*.
- Straub L., Werning I., (2020), *Positive Long-Run Capital Taxation: Chamley-Judd Revisited*. *American Economic Review*, 110(1), 86-119.
- Tominey E., (2016), *Female labour supply and household employment shocks: Maternity leave as an insurance mechanism*. *European Economic Review*, 87, 256-271.
- Wan J., Zhu S., (2019), *Bequests, estate taxes, and wealth distributions*. *Economic Theory*, 67(1), 179-210.
- Watson T., McLanahan S., (2011), *Marriage Meets the Joneses: Relative Income, Identity, and Marital Status*. *Journal of Human Resources*, 46(3), 482-517.
- Wolpin K.I., (1984), *An Estimable Dynamic Stochastic Model of Fertility and Child Mortality*. *Journal of Political Economy*, 92(5), 852-874.
- Wu C., Krueger D., (2020), *Consumption Insurance Against Wage Risk: Family Labor Supply and Optimal Progressive Income Taxation*. Forthcoming in *American Economic Journal: Macroeconomics*.
- Yamaguchi S., (2019), *Effects of parental leave policies on female career and fertility choices*. *Quantitative Economics*, 10(3), 1195–1232.
- Yu H., Cao J., Kang S., (2019), *Fertility Cost, Intergenerational Labor Division, and Female Employment* (SSRN Scholarly Paper ID 3334963). Social Science Research Network.