Why is the Rate of Single Parenthood Lower in Canada than in the U.S.? A Dynamic Equilibrium Analysis of Welfare Policies

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Abstract

A critical aspect of welfare policies is whether they should target certain groups, as Aid to Families with Dependent Children (AFDC) program did in the U.S., or be universal with financial need being the only criteria, as in Canada. We contrast the Canadian and the U.S. policies within an equilibrium model of household formation and human capital investment on children. Policy differences we consider are: eligibility, dependence of transfers on the number of children, and generosity of transfers. Our simulations indicate that the policy differences can account for the higher rate of single-parenthood in the U.S. They also show that Canadian welfare policy is more effective for fostering human capital accumulation among children from poor families. Interestingly, a majority of agents in our benchmark economy prefers a welfare system that targets single mothers (as the U.S. system does), yet does not (unlike the U.S. system) make transfers dependent on the number of children.

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1. Introduction

A recurring question in the design of social policy is whether rules that target aid to those who need it most might be less effective in reducing long-run poverty than programs that offer aid to a wider population.[2] Targeting disadvantaged families on the basis of characteristics that make poverty particularly dire, such as single motherhood, can provide larger average benefits with lower total cost. However, since these characteristics are endogenous, targeting aid weakens the incentives to avoid poverty. Thus welfare payments designed to help children of single parents can, at least in principle, increase the fraction of children who are born to single parents. A universal system reduces the risk of such outcomes. Which type of system is more efficient depends critically on the relative responsiveness of potential recipients along the margins targeted.

Until recently, the main U.S. welfare program, Aid to Families with Dependent Children (AFDC), via its rules governing eligibility and benefits, penalized women for marriage and rewarded them for non-marital fertility. Could it be that such policies actually increased poverty and single-motherhood? Although the general conclusion in recent reviews by Moffitt (1997) and Moffitt (2003) is that welfare is likely to affect family structure, the debate is still going on if the response of family decisions, like marriage and fertility, to the incentives implied by welfare programs is large enough to have significant effects on family structure.[3] Central issues in the empirical estimation of these effects are the possibility of reverse causality, i.e. that welfare policies are responses to poverty as well as vice versa, how to account for the interactions between welfare and labor supply, marriage and fertility decisions, and how to capture forward-looking behavior. These issues are discussed in detail by Moffitt (1997) and Keane and Wolpin (2002).

Canadian welfare programs are much less biased against marriage and less responsive to higher fertility.[4] They are also more generous on average than U.S. programs. While AFDC

[2] See Akerlof (1978) for an earlier analysis of targeted and universal programs and Atkinson (1995) for a recent review.

[3] This literature on incentive effects of the U.S. welfare system can be traced back at least as far as discussion of the negative income tax by Friedman (1962).

[4] There are surprisingly few papers on the effects of Canadian welfare system. In an early paper Allen (1993) found large and significant effects of welfare benefits on single motherhood. A recent paper by Fortin, Lacroix, and Drolet (2004) also report significant effects of welfare benefits on duration of welfare spells.

in the U.S. was largely limited to single mothers, Canadian welfare programs, in principle at least, required that recipients be neither single nor parents; these programs also benefit married parents as well as married and unmarried childless adults. Our empirical analysis shows a single parent with no earnings and one child receives about 82% higher transfers in Canada than in the U.S. Also, under the U.S. system the effect of an extra child on single parents' income is more significant. While in the U.S. a single mother with no children gets about 25% more transfer income when she has one child, the same number is only 19% in Canada.

Our empirical analysis also shows that there are important differences between the U.S. and Canada in terms of single motherhood. In 1994, about 24% of children below age 8 was living with single mothers in the U.S., while the same figure was only 17% in Canada. For older children (between ages 9 and 18), the difference was even more striking: 25% versus 15%. Hence, both single-parenthood and marital instability were quite more prevalent in the U.S. than in Canada. Such differences raise a natural question: how much of them can be explained by differences in welfare programs?

We use a model of marriage, fertility and investment on children to simulate the long-run outcomes of a change from universal to targeted welfare policies. We first ask if Canada had adopted a social policy similar to that which prevailed until recently in the U.S., would the number of children with single-parents in Canada have looked more like that of the U.S.? In order to answer this question, we first simulate our model economy so that income inequality and welfare recipiency in the steady-state equilibrium follow the same patterns with respect to family structure as in the Canadian data. We then simulate the Canadian economy under alternative social policies and compare the long-term distribution of children across different family types in economies that are identical except for the parameters of the government transfer policies.

The basic policy differences we consider are: 1) eligibility, 2) dependence of transfers on the number of children, and 3) average level of transfers. We find that these policy differences can account for the gap between Canada and the U.S. in proportion of children with single parents. We then ask which type of policy is more effective in helping children

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Recently, Canadian Self-Sufficieny project, an experimental reform to Welfare in Canada, generated a large body of literature – see, among others, Bitler, Gelbach, and Hoynes (2006), Zabel, Schwartz, and Donald (2006), and Wilk, Boyle, Dooley, and Lipman (2006).

from poor families. Our results show that the Canadian policy is more effective in making poor children better off than a U.S.-type policy. Furthermore, most of the disadvantage of a U.S.-type policy comes from the subsidy to fertility. Why does the implicit subsidy to fertility have a disequalizing effect? As in Knowles (1999), even small increases in the fertility differential between poor and rich parents will have strong effects on the steady-state income distribution when productivity levels are persistent across generations.

Finally, we ask which one of the policies that we consider is the most preferred one. Although the children from poor families receive higher human capital investment under the Canadian policy, this policy is more expensive since it requires a higher tax collection as well. Interestingly, it turns out that, except for the poorest 20% of the population, agents in our model economy prefer a welfare system that targets single mothers (as the U.S. system does), yet does not (unlike the U.S. system) make transfers dependent on the number of children.

It is important to note that we solve for the equilibrium of the marriage market under each policy. Thus we not only account for how the marriage and divorce decisions of women might respond to welfare programs, but we also incorporate the response of men to the effects of welfare on marriage prospects. In the model, family structure affects children's outcomes by changing the optimal shares of time and income devoted to investment in children's human capital. For understanding poverty, an important feature of our model is that it distinguishes among children of two-parent families, children from divorced parents, and those whose parents were never married. This is critical for the exercise in question because empirical studies, e.g. McLanahan and Sandefur (1994), suggest that children's outcomes as adults (such as employment and wages) and teenage fertility depend at least as much on family structure as they do on family income.[5]

We focus in this paper on policies that prevailed until mid-1990s. This choice is motivated by the significant changes in social policies on both sides of the border after mid-1990's. A major change in U.S. was the introduction of lifetime time limits on welfare recipiency after 1996 reform. More importantly, each state is now given much more freedom in policy design which make an aggregate portrait of current system very difficult. The welfare reform in

[5] In a related paper, Greenwood, Guner, and Knowles (2000), we show that parental investment in children's human capital is central for understanding why large increases in rates of single-motherhood persisted long after welfare payments had stabilized in the U.S.

Canada wasn't as clear-cut as it was in U.S., although the welfare system became "leaner and meaner" during the last decade (see National Council of Welfare (1997) and Battle and Mendelson (2001)). Because our analysis is confined to steady-states, we cannot draw from it any predictions regarding the immediate effects of such changes.[6] Greenwood, Guner, and Knowles (2000) show, however, that when a similar theory is used to model the transition path between social policies, it turns out that the effects of AFDC on fertility and investment in children's human capital induces substantial inertia in the economy. This suggests that the type of simulation-based analysis developed here may be essential for the design of social policy as it may take many years for the effects of real-life policies to become evident.

Our approach is complementary to the standard empirical approach in that we build into the model the types of responses that are difficult to observe directly, and see whether the model's output is consistent with the relationships we observe in the data. While our formulation of the policy differences is simplistic, our approach treats the effects of different policy regimes on the behavior and composition of households in terms of the optimal responses of individual agents, both to the policy parameters, and to each other. The emphasis on marriage-market equilibrium makes it difficult to incorporate more realistic policies, but allows us to address directly the incentive issues that have surrounded public debate regarding the effect of these programs on the composition of the population by household structure.

The model here is based on the general framework developed in Greenwood, Guner, and Knowles (2003). The current paper is part of the growing literature on quantitative models of family; see, among others, Aiyagari, Greenwood, and Guner (2000), Regalia and Ríos-Rull (1999), Erosa, Fuster, and Restuccia (2002), Chade and Ventura (2002), Fernandez, Guner, and Knowles (2005) and Da-Rocha and Fuster (forthcoming). This paper is also related to recent papers that focus on the labor-market effects of social policies in an equilibrium framework. Heckman, Lochner, and Taber (1998), for example, analyze the effects of tuition subsidies within a general equilibrium model with an explicit college enrollment margin and show that the effects can be much smaller than the ones reported in previous partial equilibrium analysis. Lise, Seitz, and Smith (2003) evaluate the labor market effects of the Canadian Self-sufficiency Project, and show that partial and general equilibrium effects of such a program can be quite different.

[6] For evaluations of these recent reforms see Meyer and Sullivan (2004) for the U.S. and Brzozowski (2005) for Canada.

In the next section, we compare income inequality, social policies, and family structures in the two countries. This is followed first by a formal development of the model and then by a description of the procedure used to calibrate the model to Canadian data. We then evaluate the effects of introducing an AFDC-style policy.

2. Income and Family Structure in the U.S. and Canada

It is well documented that income distribution in the U.S. is more unequal than in Canada. Gini coefficient for the household disposable income per equivalent adult was 0.368 in the U.S. and 0.287 in Canada in 1994, and while the households at the bottom 10% of the income distribution had about 34% of median income in the U.S. the same number for Canada was 47% (Gottshalk and Smeeding, 2000). Social policies play an important role in these differences. According to Gottshalk and Smeeding (2000) while earnings distribution for the U.S. and Canada are similar at the lower tail, the households in Canada enjoy a substantially higher post tax transfer income.

Comparing social policies in the U.S. and Canada is a complex task, partly because there are many different ways policies might vary on paper, but also because poor families can benefit from a multitude of social programs, some of which are national in scope, like food stamps in the U.S. and child tax credits in Canada, while others, like welfare payments, vary according to the local jurisdictions, such as city, state and province. Furthermore, policies that are similar on paper may be administered quite differently across different jurisdictions, so that assembling an accurate picture of the social policy within each country is actually an ill-defined task. Nevertheless, it is clear that the differences across countries are much larger than the differences within countries, so some abstraction is justified.[7]

In this section, we proceed by measuring the social policies in terms of the transfer income actually reported by households in representative household surveys. Social transfers include old-age or retirement benefits, child or family allowances, training allowances, unemployment

[7] This view is also supported by the work of Blank and Hanratty (1993). They show that while there exists substantial variation in social programs within each country, these intra-country differences generate only small changes in poverty rates. The potential effects of cross-country differences on the other hand are much more significant.

benefits and non-cash benefits, such as food and housing and means-tested social assistance, such as welfare.

Given household survey data for both countries, our approach is to estimate how transfer income depends on the earnings, marital status, and family size of the recipients. This procedure results in an aggregate portrait of transfer payments in each country, and this is essential for identifying the key differences in social policy between the two countries, as well as for evaluating our simulation results.[8]

The data are from the 1994 household surveys disseminated by the Luxembourg Income Study (LIS). The U.S. data is an extract from the 1994 Current Population Survey and the Canadian data from the 1994 Survey of Consumer Finances.[9] More recent data is available, but the U.S. system has been changing rapidly over the last few years as support for welfare reform grew, and many states had changed their policies even before the reformed welfare system Temporary Assistance for Needy Families (TANF) replaced AFDC in 1996. Hence the year 1994 was chosen because it seemed more likely to reflect a longer-run outcome from the characteristic welfare system of the U.S., rather than the new policy. In all calculations, Canadian dollars were converted to U.S. by dividing by 1.2, a number drawn from the 1994 purchasing power party (PPP) index disseminated by the World Bank.

Table 1 shows basic characteristics of the household samples for each country. Households were included in our sample if they had children. Our data includes the ages of the three youngest children. The total number of children in the household is available, though not the total children ever born to each parent.[10] In Table 1 households were classified as belonging to Period 0 if the age of the youngest child was less than 8. If the youngest child was between 9 and 18, then the household was classified as Period 1. This division reflects the compressed life cycle structure of the model to be developed here. Because Canadian data does not distinguish between divorced women and never married mothers, the marital status

[8]This approach is not without shortcomings from an econometric perspective since the decision of a rational agent whether to become a welfare recipient generally depends on both the generosity of the benefits and the outside opportunities.

[9]These are stratified samples, so the data analysis is based on the household weights included with each survey.

[10]In order to more accurately reflect the implications of social policy for children, the samples were reweighted by taking the product of the household weight and the number of children.

of parents was partitioned between married and single. Thus the single category includes widows, never-married women, and divorced women.

The table reveals a number of significant differences between the two countries. The key differences between countries concern the distribution of children across family structure. In the U.S., 23% of period-0 children live with single parents, compared to 17% in Canada. Even more striking is the growth in the share of U.S. kids with single parents as the children age: 25% of U.S. children over the age of 9 live with single parents, compared to 15% in Canada. Thus not only is single-parenthood more common in the U.S., but children in two-parent families are at a higher risk of suffering a household breakup in the U.S. The income of single-parent families is roughly the same in both countries. The average level of transfers to these families is higher in Canada, but this difference is not statistically significant, due to the high standard deviation of this statistic. Married families however receive on average a much lower amount of income from government transfers in the U.S. than in Canada.

In assessing the significance of these income differences, it is important to bear in mind that both parental income and family structure have significant effects on the future income of the children. In the U.S. for instance, Stokey (1996) argues, on the basis of a number of empirical studies, that the intergenerational correlation of income is on the order of 0.7. For Canada, Colak (2006) reports higher degrees of mobility across generations, but note that mobility is substantially less among low-income families. According to McLanahan and Sandefur (1994), the effect of being the child of a single parent in the U.S. is substantial, and they report that only about a half of this effect is explained by the lower income of single-parent families.

The observed patterns of social policy so far do not imply that U.S. policy favors single parents at the expense of married: it may be simply that married parents, having higher incomes, are much less likely to apply for welfare. This point is addressed in Table 2, which displays the coefficients estimated by regressing social transfer income for each country on household characteristics.

These results in Table 2 make a number of points about the difference between the two countries. First, it is clear that the Canadian system is much more generous than the U.S. system. Transfer income of a single parent with no earnings and one child, for example, is about 82% higher in Canada. Table 2 also implies the second point, which is that under the U.S. system the effect of an extra child on single parents income is more significant. While in the U.S. a single mother with no children gets about 25% more transfer income when she has one child, the same number is only 19% in Canada. Finally, being single results in a higher transfer in the U.S. than in Canada.

Thus the data, even at this *cursory* level of analysis, reflects the basic patterns that motivate this paper: marital instability appears to be much more common in the U.S. and the social policy of the U.S. seems more targeted towards single mothers than married parents.

Finally, Table 3 shows the relationship between female earnings and fertility in the data. In both countries number of children a female has declines with her earnings and the effect of female earnings on fertility is similar in two countries, although and the level of fertility is higher in the U.S. than in Canada. Note that the level of fertility is quite low (even for age interval 36-45) in Table 3, since the calculations are based on the number of children in the household and not on the number of children ever born.

3. The Model

The basic structure of the model is based on Greenwood, Guner, and Knowles (2003). The economy is populated by overlapping generations that live two periods as children and two periods as adults. We refer to the first and second periods of adulthood as young and old below. The mass of each of these age groups is equally divided between a continuum of males and one of females, distinguished by their productivity levels (types). Let the productivity of agents be denoted by x for females, and by z for males and assume that they are contained in the finite sets $\mathcal{X} = \{x_1, x_2, \ldots, x_N\}$ and $\mathcal{Z} = \{z_1, z_2, \ldots, z_N\}$. Each adult is endowed with one unit of time.

On becoming young adults (after two periods with their children), agents learn their productivity levels and meets potential spouses from the same cohort. Potential couples then draw a random match quality, denoted by $\gamma \in \mathcal{G} = \{\gamma_1, \gamma_2, ..., \gamma_M\}$. At this point, the productivity of each potential partner is common knowledge, as is the quality of their match. If both parties agree, a marriage ensues; otherwise both remain single. At the start of the second period, each agent learns her next-period productivity, and if married, that of her spouse as well as the future match quality. Married agents then decide whether to stay together or divorce. There is no remarriage for divorced agents. At this time, agents who remained unmarried in the first period meet new potential partners (among those who also remained single in the first period) and can choose to marry.

A newly matched couple, young or old, draws its match quality from the following distribution

$$\Pr\left[\gamma = \gamma_i\right] = \Gamma(\gamma_i).$$

For a married young couple, the match quality in the second period, γ', depends on the initial draw and represented by

$$\Pr\left[\gamma' = \gamma_j \mid \gamma = \gamma_i\right] = \Lambda(\gamma_j \mid \gamma_i)$$

After the matching decisions of the first period, young married couples and young single females decide how many children to have, how much to work, and how much of the mother's time and family income should be spent on educating the children. Young males simply decide how much to work. Hence, whether married or single, males allocate their time between leisure and labor, while that of females is allocated across labor, leisure and the nurture of the children.[11] Children are not differentiated by sex until they become adults. Let k denote the number of children; we assume that $k \in \mathcal{K} = \{0, 1, ..., K\}$. Similarly, after the matching decisions of the second period, households decide how to allocate their time and income. We assume that females can have children only when they are young and if their parents get divorced, children stay with their mothers. There is a child support payment system in effect. A divorced male has to pay π percent of his second period income per child that he has to support.

Education per child in a family with k children is an increasing, deterministic function of parental spending on education, denoted by d, and the nurture time of the mother, denoted by t, and is represented by

$$e = Q\left(t, d, k\right).$$

Consumption per capita of a household with income level Y that has a adults and k kids is given by

$$c = \frac{1}{\Psi(a, k)} Y,$$

[11] Including father's time allocation to children's education would have been too burdensome computationally. Empirical studies suggest mothers spend much more time with children than fathers do in the U.S. – see, for example, Juster and Stafford (1985).

where $\Psi(a,k)$ is the adult-equivalent size of a household with a adults and k children.

Agents' per period utility function depends on c, k, e, and γ (if married) and are given by

$$F\left(c,e,k,1-l-t,\gamma\right)=\begin{cases}\nu^{c}\left(c\right)+\nu^{e}\left(e,k\right)+\nu^{\ell}\left(1-l-t-\phi_{f}k\right)-\gamma, & \text{if married}\\ \nu^{c}\left(c\right)+\nu^{e}\left(e,k\right)+\nu^{\ell}\left(1-l-t-\phi_{f}k\right), & \text{if single}\end{cases},$$

for females. Females put l units of their time to market work and t units of their time to child care. There is also a fixed time cost of having k children, denoted by $\phi_f k$. Note that both married and single females can have children so both e and k enters into their utility function. Similarly, the utility function for males is given by

$$M\left(c,e,k,1-n,\gamma\right)=\begin{cases}u^{c}\left(c\right)+u^{e}\left(e,k\right)+u^{\ell}\left(1-n-\phi_{m}k\right)-\gamma, & \text{if married}\\ u^{c}\left(c\right)+u^{\ell}\left(1-n\right). & \text{if single}\end{cases}.$$

Note that a single (or divorced) male does not care about the human capital investment of children. Males simply allocate n units of their time to market work and face (if married) a fixed time cost of having k children. We assume that the household decisions of married couples are determined by the Nash solution to the fixed-threat bargaining game in which the threat point is the value of being single.[12]

In the first period of adult life, the probability of different productivity realizations depend on the education received during childhood and are denoted by

$$\Pr\left[x=x_i\mid e\right]=\Pi^{x}\left(x_i|e\right)\ \text{ and }\ \Pr\left[z=z_i\mid e\right]=\Pi^{z}\left(z_i|e\right),$$

where $e=e_{-1}+e_{-2}$ is the total human capital investment that a child receives during his/her childhood (which depends on the marital history of his/her mother). The probability distributions $\Pi^{x}\left(x_i|e\right)$ and $\Pi^{z}\left(z|e\right)$ are stochastically increasing in e in the sense of first-order stochastic dominance.[13]

[12] There is a large literature on different approaches to households decision making. See Del-Boca and Flinn (2006) for a recent review and empirical evidence in favor of Nash Bargaining solution.

[13] We do not differentiate between early and late education in order to reduce computational burden. See Restuccia and Urrutia (2004) and Caucutt and Lochner (2005) for models of human capital accumulation in which this distinction is explicitly modeled.

The productivity in the second period of adult life does not depend directly on childhood education, but rather on the initial productivity draw, and given by

$$\Pr\left[x' = x_j \mid x = x_i\right] = \Delta^x(x_j|x_i) \text{ and } \Pr\left[z' = z_j \mid z = z_i\right] = \Delta^z(z_j|z_i),$$

where x' and z' denote next period's productivity levels.

Finally, each household can receive welfare payments in the economy. Welfare payments that a household receives depend on the family type, number of children, and family income. For households with no labor income, we denote by $w_g(k)$, w_b, and $w_m(k)$ the guarantee income level for a single female, a single male and a married couple, respectively. As labor income increases, however, welfare payments are reduced at rate r. Welfare payments are financed by a lump sum tax τ on households. We assume that households who are on welfare do not pay this lump-sum tax. We also assume that divorced males' welfare payments are subject to child support payments. Given these assumptions, income of a young single female of type x who has k kids and works l units is given by $w_g(k) + xl(1 - r)$ if she is on welfare and by $xl - \tau$ if she is out of welfare. Similarly, for a divorced female who has k children and her ex-husbands has zn units of income, her income is given by $xl + \pi knz - \tau$ if she is out of welfare and by $w_g(k) + (1 - r)xl + \pi knz$ if she is on welfare.

4. Equilibrium

Since agents live for two periods, second period decisions are rather straightforward. We start by characterizing old agents' problems and then, given the values assigned to the second period outcomes, define the value functions for the first period.

4.1. Single Old

A single old female can be never married or divorced. For a never-married female, individual state is given by her type, x, and the number of children she has, k. Divorced agents receive child support payments from their ex-husbands so the current productivity of their ex-husband, z, is a also a state variable. Problem of a divorced female is given by

$$G_2(x, k, z) = \max_{l,t,d} F\left(c, e, k, 1 - l - t, 0\right) \tag{Pg2}$$

subject to

$$c = \Psi(1,k)\max\{xl + \pi z N_2^s(z,k)k - d - \tau, w_g(k)(1-r)xl + \pi z N_2^s(z,k)k - d\}]$$

and

$$e = Q(t,d,k),$$

where the function $N_2^s(z,k)$ denotes the labor supply of a single male who has k children from his first period marriage. For a never-married old female, the problem is simply given by setting $z = 0$.

The value of being a single old male is given by the following problem

$$B_2(z,k) = \max_n M(c,0,0,1-n,0) \tag{Pb2}$$

subject to

$$c = \max\{zn(1-\pi k) - \tau, (w_b + (1-r)zn)(1-\pi k)\}.$$

where k denotes the number of children for whom he has to pay child support. Note that for a never-married old male, $k = 0$. Let $N_2^s(z,k)$ be the labor supply decision associated with this problem.

4.2. Married Old

Consider a couple of type (x,z,γ,k) that is married at the start of the second married and has been married in the first period as well. Their problem is given by

$$\max_{l,t,n,d}\ [F(c,e,k,1-l-t,\gamma) - G_2(x,k,z)] \times [M(c,e,k,1-n,\gamma) - B_2(z,k)] \tag{Pm2}$$

subject to

$$c = \Psi(2,k)\max\{xl + zn - d - \tau, w_m(k) + (1-r)(xl+zn) - d\},$$

and

$$e = Q(t,d,k).$$

Here $B_2(z,k)$ and $G_2(x,k,z)$ are the threat points for the husband and wife. They are the values of being single in the second period, and are given by the solutions to the old single agent problems, (Pg2) and (Pb2). Let the resulting utility levels for an old husband and wife in a (x, z, γ, k)-marriage, or the values for M and F in (P2m) evaluated at the optimal choices be represented by $H_2(x, z, \gamma, k)$ and $W_2(x, z, \gamma, k)$.

Each party faces a decision: should s/he choose married or divorced life for the period. A married female will remain married if and only if $W_2(x, z, \gamma, k) \geq G_2(x, k, z)$. Similarly, a married male will remain so if and only if $H_2(x, z, \gamma, k) \geq B_2(z, k)$. The matching decision of an age-2 couple who is considering divorce is then given by the following indicator function:

$$I_2^m(x, z, \gamma, k) = \begin{cases} 1, \text{ if } W_2(x, z, \gamma, k) \geq G_2(x, k, z) \, and \; H_2(x, z, \gamma, k) \geq B_2(z, k) \\ 0, \text{ otherwise,} \end{cases} \tag{I2}$$

The problem of a couple who has just matched at the start of the second period is identical to (Pm2), with $k = 0$ in $B_2(z, k)$ and $z = 0$ in $G_2(x, k, z)$. Let $I_2^s(x, z, \gamma, k)$ be the indicator function for a newly-matched couple in the second period.

4.3. Young

Consider first a young female of type x who meets a young male of type z in the marriage market and that their match quality is γ. Suppose that the expected lifetime utility of single life for the female is $G_1(x)$ while the expected lifetime utility from marriage is $W_1(x, z, \gamma)$. She will choose to get marry if $W_1(x, z, \gamma) \geq G_1(x)$, and to remain single otherwise. Let $B_1(z)$ and $H_1(x, z, \gamma)$ denote the corresponding first period values for males. Since her partner faces the same decision, the marriage will occur if and only if $W_1(x, z, \gamma) \geq G_1(x)$ *and* $H_1(x, z, \gamma) \geq B_1(z)$.

How is $G_1(x)$ determined? The value of being a young single female of type x, $G_1(x)$, is the sum of current utility and expected future utility, which in turn depends on the values of single life and married life in the second period. It is given by

$$\begin{aligned} G_1(x) \;&=\; \max_{c,e,d,l,t,k} \{F(c, e, k, 1 - l - t, 0) + \beta E\{W_2(x', z', \gamma', k) I_2^s(x', z', \gamma', k) \qquad \text{(Pg1)} \\ &\quad + G_2(x', k)[1 - I_2^s(x', z', \gamma', k)]\}, \end{aligned}$$

subject to

$$c = \frac{1}{\Psi(a, k)} \max\{w_g(k) + (1 - r)xl - d, xl - d - \tau\},$$

and

$$e = Q(t, d, k).$$

The term $E\{W_2(x', z', \gamma', k)I_2^s(x', z', \gamma', k) + G_2(x', k)[1 - I_2^s(x', z', \gamma', k)]\}$ represents the expected value of entering into second period as a single female. A single female of type x will have a new productivity draw x', meet a single male of type z', and draw a match quality γ'. A similar problem determines the value of being a young single male, $B_1(z)$, as

$$\begin{aligned} B_1(z) \quad = \quad & \max_{c,n}\{M(c, 0, 0, 1 - n, 0) + \beta E\{H_2(x', z', \gamma', k)I_2^s(x', z', \gamma', k) \\ & + B_2(z')[1 - I_2^s(x', z', \gamma', k)]\}, \end{aligned} \quad \text{(Pb1)}$$

subject to

$$c = \max\{w_b + (1 - r)zn, zn - \tau\},$$

where the term $E\{H_2(x', z', \gamma', k)I_2^s(x', z', \gamma', k) + B_2(z')[1 - I_2^s(x', z', \gamma', k)]\}$ now captures the probability of meeting a type-x' female with k kids.

The decision problem facing a young married couple indexed by (x, z, γ) is

$$\begin{aligned} & \max_{c,e,k,l,t,n}\{F(c, e, k, 1 - l - t, \gamma) + \beta E[W_2(x', z', \gamma', k)I_2^m(x', z', \gamma', k) \\ & + G_2(x', k)[1 - I_2^m(x', z', \gamma', k)] - G_1(x)\} \\ & \times\{M(c, e, k, 1 - n, \gamma) + \beta E[H_2(x', z', \gamma', k)I_2^m(x', z', \gamma', k) \\ & + B_2(z', k)I_2^m(x', z', \gamma', k)] - B_1(z)\}, \end{aligned} \quad \text{(Pm1)}$$

subject to

$$c = \frac{1}{\Psi(a, k)} \max\{w_m(k) + (xl + zn)(1 - r) - d, xl + zn - \tau - d\}$$

and

$$e = Q(t, d, k).$$

Here $G_1(x)$ and $B_1(z)$ represent the female's and male's threat points defined in problems (Pg1) and (Pb1).

The maximized value of the first term in braces gives the value of being in a (x, z, γ) marriage for the female, $W_1(x, z, \gamma)$, while the second term yields $H_1(x, z, \gamma)$. Once we have these first period values, we can define a marriage indicator for the first period as $I_1(x, z, \gamma) = 1$ if and only if $W_1(x, z, \gamma) \geq G_1(x)$ and $H_1(x, z, \gamma) \geq B_1(z)$.

Since we assume x and z take values from finite sets, let $\Phi_1(x_i)$ and $\Omega_1(z_i)$ be the distribution of female and male agents who participate in the first period's marriage market, and $\Phi_2(x_i, k)$ and $\Omega_2(z_i)$ be the distribution of female and male agents who participate in the second period's marriage market. First, note that the second period distributions, $\Phi_2(x_i, k)$ and $\Omega_2(z_i)$, together with transition functions for x and z, i.e. Δ^x and Δ^z, define the expectations in problems (Pg1), (Pb1) and (Pm1). Therefore, given $\Phi_2(x_i, k)$ and $\Omega_2(z_i)$, the values of being married and single in the first period, i.e. $G_1(x)$, $B_1(z)$, $W_1(x, z, \gamma)$, and $H_1(x, z, \gamma)$, can be calculated. Second, the values functions G_2, B_2, W_2 and H_2 are determined trivially since agents live only for two periods. Third, given these value functions, marriage indicators, $I_1(x, z, \gamma)$, $I_2^s(x, x, \gamma, k)$, and $I_2^m(x, x, \gamma, k)$ can be constructed. Finally, given the marriage indicator functions and the education decisions associated with first and second period value functions, we can update $\Phi_1(x_i)$, $\Omega_1(z_i)$, $\Phi_2(x_i, k)$ and $\Omega_2(z_i)$.

This updating involves two parts. The first part is trivial. The distribution of agents in the first period marriage market, i.e. $\Phi_1(x_i)$ and $\Omega_1(z_i)$, first period marriage indicators, and fertility decisions are used to determine $\Phi_2(x_i, k)$ and $\Omega_2(z_i)$. The second period distributions simply consist of agents who decided not to or could not to get married in the first period. The second part involves updating $\Phi_1(x_i)$ and $\Omega_1(z_i)$. Given marital histories we can use fertility and education decision to update $\Phi_1(x_i)$ and $\Omega_1(z_i)$ in line with transition functions $\Pi^x(x_i|e)$ and $\Pi^z(z_i|e)$. This updating procedure is characterized formally in the Appendix.

A steady state equilibrium for this economy consists of a fixed point between household decisions about marriage, fertility and education, and the distribution of agents in the first and second period marriage market. We solve this fixed point problem numerically.

5. Computational Analysis

The first step in the computational analysis is to select functional forms and parameterize the model to be able to generate a set of observables regarding the distribution of children by parent's marital status and income distribution by family structure. To this end, we first set $N = 13$ and choose the grid points (values of x_i's and z_j's) two standard deviations around the mean of log wages that are reported in Table 4. In the benchmark calibration, people can choose to have kids from the following set $k \in \{0, 1, 2, 3, 4, 5\}$, which is the smallest non-binding set for k. We restrict the number of match quality shocks to two, i.e.

$\gamma \in \mathcal{G} = \{\gamma_1, \gamma_2\}$, and set the stochastic structure to be *iid*, i.e.

$$\Pr[\gamma = \gamma_1] = \Pr[\gamma = \gamma_2] = 0.5 \text{ and } \Pr[\gamma' = \gamma_1 | \gamma = \gamma_1] = \Pr[\gamma' = \gamma_2 | \gamma = \gamma_2] = 0.5.$$

Second, there are few parameters that can be chosen to be consistent with available empirical evidence. We interpret a model period as ten years and set $\beta = 0.67$ which corresponds to a 4% yearly interest rate. Economies of scale in household consumption is given by

$$c = \frac{1}{\Psi(a,k)} Y = \frac{1}{(a+bk)^{\theta}} Y = \frac{1}{(a+0.4k)^{0.5}} Y.$$

There is a large empirical literature on household economies of scale. We take the functional form for $\Psi(a,k)$ from Cutler and Katz (1992), and set b and θ to what they consider as consensus and intermediate values in the literature, respectively.

Third, we set $\pi = 0.0607$, hence a divorced male pays about 6.1% of his income child support payments per child he is supporting. According to Bertrand, Hornick, Paetsch, and Basa (2003), based on more than 33,000 divorce cases between 1998 and 2002 period, the mean monthly child support payment was \$544 and the mean annual income of paying parents was \$43,532. Hence, a divorced father paid about 15% his income as child support payments.[14] Of course, unlike our model economy, some parents do not pay the child payments that are due. According to Bertrand, Hornick, Paetsch, and Basa (2003), about 10% of divorce cases and associated child support payments were contested. Taking this as a measure of potential non-compliance by ex-husbands, and assuming two kids per divorce (as in our benchmark economy), effective payment per child is about 6.07%.

Finally, we borrow the parameters for the child quality production function from Greenwood, Guner, and Knowles (2003):

$$e = Q(t,d,k) = \left(\frac{t}{k^{\chi_1}}\right)^{\alpha} \left(\frac{d}{k^{\chi_2}}\right)^{1-\alpha} = \left(\frac{t}{k^{0.4}}\right)^{0.5} \left(\frac{d}{k^{0.5}}\right)^{1-0.5} = \frac{1}{k^{0.45}} t^{0.5} d^{0.5}.$$

The rest of the parameter values are calibrated to match a set of targets from the data. We assume that momentary utility functions are given by

$$F(c,e,k,1-l-t,\gamma) \equiv \frac{c^{\sigma_1}}{\sigma_1} + \frac{k^{\sigma_2}}{\sigma_2} \frac{e^{\sigma_{3f}}}{\sigma_{3f}} + \delta \frac{(1-l-t-\phi_f k)^{\sigma_4}}{\sigma_4} - \gamma$$

[14] Fathers had custody in only about 8% of cases.

for females, and by

$$M(c,e,k,1-n,\gamma) \equiv \frac{c^{\sigma_1}}{\sigma_1} + \frac{k^{\sigma_2}}{\sigma_2}\frac{e^{\sigma_{3m}}}{\sigma_{3m}} + \delta\frac{(1-l-t-\phi_m k)^{\sigma_4}}{\sigma_4} - \gamma.$$

for males.

We assume that $\Delta^x(x_j|x_i)$ and $\Delta^z(z_j|z_i)$ are discreet approximations to log normal distributions. These distributions map first period productivity levels into second period productivity levels, and determine the volatility of earnings from the first to the second model period. We assume that for a female with first period productivity level x, her next period productivity x' is a draw from a lognormal distribution with mean $2.29(1-\rho)+\rho\ln x$ and standard deviation s. Similarly, a male's productivity evolves to $z' \sim \ln N(2.65[1-\rho]+\rho\ln z, s)$. Hence, both males and females have on average a $\rho\%$ chance of keeping their current productivity and $(1-\rho)\%$ chance of moving to the mean productivity.

We also assume that $\Pi^x(x_i|e)$ and $\Pi^x(z_i|e)$ are discreet approximations to log normal distributions. These functions map accumulated education during childhood, $e = e_{-2} + e_{-1}$, into first period's productivity levels. We assume that $\Pi^x(x_i|e)$ is a discreet approximation to log normal distribution with mean $m_x e^{\eta}$ and standard deviation of s_e; and similarly $\Pi^z(z_i|e)$ a discreet approximation to a log normal distribution with mean $m_z e^{\eta}$ and standard deviation of s_e.

The parameters we need to determine are then: eight utility parameters, $\{\sigma_1, \sigma_2, \sigma_{3f}, \sigma_{3m}, \phi_m, \phi_f, \delta, \sigma_4\}$, two match quality levels, $\{\gamma_1, \gamma_2\}$, welfare policy parameters, $\{w_m(k), w_g(k), w_b, r\}$, parameters determining stochastic structure of productivity levels between periods 1 and 2, $\{\rho, s\}$, and parameters that map childhood histories in education into first period productivity levels, $\{m_z, m_x, \eta, s_e\}$. We calibrate these parameters to match an equal number of targets from the data.

1. In the data, about 17% of younger children and about 15% of older children live with single parents. Two match quality levels, $\gamma_1 = 0$ and $\gamma_2 = 1.439$, are chosen to generate these statistics.

2. In the data, incomes differ significantly by marital status. On average, a single mother earns about 24% of the income of a married couple when she is young and about 32% of income of a married couple when she is old. The curvature of the utility from consumption, $\sigma_1 = 0.48$, is picked to generate this match.

3. In the data, single females use about 12% of their time for the market work when they are young and about 16% of it when they are old (assuming a weekly time endowment of 122 hours). Parameter of the utility from consumption, $\sigma_4 = 0.255$, is picked to match these statistics.

4. In the data, transfer incomes amount to about 10.64% of married couples income in the first period. The labor supply parameter $\delta = 2.7$ is picked to generate the right amount of welfare dependence for married couples in the first model period.

5. The overall fertility level is 2 per female in the model (which generates a stationary population structure). Low income families tend to have more children than high income families; the dependence of fertility on income generated by the model is shown in Figure 1. Figure 1 shows the relation between female earnings and fertility in the model and in the data (for age interval 25-35 as documented in Table 3).[15] We set $\sigma_2 = 0.302$ to get the overall fertility level of 2, and picked the remaining parameters that determine fertility, $\sigma_{3m} = 0.325$, $\sigma_{3f} = 0.22$, $\phi_m = 0.025$ and $\phi_f = 0.05$, to generate a relation between income and fertility similar to what we observe in the data.

6. To calibrate Δ^x and Δ^z, we set $\rho = 0.69$, i.e. both males and females have on average a 69% chance of keeping their current productivity and 31% chance of moving to the mean productivity level. In the data, transfer incomes amount to about 9.49.% of married couples income in the second period. Parameter ρ was chosen to generate the same level of welfare dependence in the model economy. Note that given welfare dependence in the first period for married couples, welfare dependence in the second period is determined by the mass of households at the low end of the productivity distribution. This allows us to pin down the level of income mobility between two periods. Given ρ, the parameter s is then selected so that the standard deviation of second period distribution of female and male types in the steady state are consistent with the data in Table 4, i.e. standard deviation of log earnings is about 0.63 for males and 0.67 for females.

7. To calibrate Π^x and Π^z, we set $m_z = 14$, $m_x = 9.86$, $s_e = 0.4$, and $\eta = 0.525$. These

[15] Data source for Figure 1, as it was for Table 3, is Luxembourg Income Study.

four parameters were chosen so that the initial (period 1) distribution of female and male types in the steady state, i.e. $\Phi_1(x_i)$ and $\Omega_1(z_j)$, are consistent with the data, i.e. the four moments of these distributions match the ones reported in Table 4.

8. Finally, in order to calibrate our welfare parameters, we use Canadian data on welfare payments. According to the National Council of Welfare (2000), in British Columbia, Ontario, and Quebec welfare incomes constitute about 48% of the single mothers' average income. We set $w_g(k) = w_g = 1.3$ which is about 48% of average income for single females in the benchmark economy. Then we used the ratio of welfare payments for single mothers to that for single males and married in the data to set $w_b = 0.65$ and $w_m(k) = w_m = 1.8$.[16] We set $r = 0.66$ based on the estimate by Charette and Meng (1994). This variable captures how welfare payments are reduced with household income and therefore is a summary measure of quite complex rules.[17]

Table 5 lists the parameter values (except those that are selected to match the statistics in Table 4) and the corresponding targets. Table 6 compares statistics from Table 1 with their analogs from the model economy for married and single agents. Overall, the model generates a good fit with the data on the moments that are most directly linked to family structure: the share of children by age in single-parent families, the relative earnings of young married and single mothers, and the relation between female earnings and fertility. The main divergences between the model results and the data are quantitative rather than qualitative. Single mothers (especially when young) are less dependent on welfare in the model than they are in the data. A single mother gets about 47.8% of her income from welfare when young and 51.75% of it from welfare when old. In contrast, the welfare dependence of young and old single mothers are 83.7% and 59.7% in the data, respectively. The model also generates a higher fertility differential between single and married parents than in the data.

[16] According to Cragg (1996) and Barrett and Cragg (1998), most welfare spells are shorter than 10 years (a model period), although for single mothers with children spells can be quite long (more than 2 years). However, Barrett and Cragg (1998) show that more than half of single mothers who exit welfare return to it after a year.

[17] The available estimates for the U.S. welfare system are quite varied and range from low values of around 30% by McKinnish, Sanders, and Smith (1999) to much higher rates of 70-90% by Hoynes (1997) and Keane and Wolpin (2002).

5.1. Discussion

Table 7 reports additional statistics from the benchmark economy. These statistics highlight two aspects of our calibration strategy that we did not discuss in detail above. First, in the simulations we assume that the match quality shocks are *iid* with $\Pr[\gamma = \gamma_1] = \Pr[\gamma = \gamma_2] = 0.5$ and $\Pr[\gamma' = \gamma_1|\gamma = \gamma_1] = \Pr[\gamma' = \gamma_2|\gamma = \gamma_2] = 0.5$. This is undoubtedly restrictive. However, given that γ_1 and γ_2 are selected to generate the fraction of children living with single mothers, the simple life-cycle structure of the model restricts our ability to generate additional statistics that can be used for calibrating the stochastic structure of math qualities. After all, the fraction of children living with single mothers is simply determined by the fertility behavior and the marital status of population. The only additional statistics that the model generates is the fraction of population who is divorced in the second period. In the model (see Table 7), about 10% of second period population is divorced. This compares surprisingly well with the data. According to 1996 Census, about 10% of females between ages 35 and 59 were divorced.[18]

Second, we borrow the parameters for $Q(k, d, t)$ from Greenwood, Guner, and Knowles (2003). Their calibration is based on the fraction of income that single and married parents spend on their children. In the benchmark economy, married couples spend about 18% of their income on children while the same number for single parents is about 33%. A simple calculation from Statistics Canada (1999) show that the model is not far from the data. In 1997, married couples with children spend about 22% of their total consumption expenditure on children, while the same number for single households were about 28%.[19] Given these

[18] Available at http://www.statcan.ca/english/census96/oct14/law.htm

[19] In order to calculate spending on children, we take from Statistics Canada (1999), Table 3, total consumption spending as well as spending on food, shelther, household operations, furnishing, clothing, transportation, health, personal care, recreation, reading materials, and education. We consider education as totally spent on children. For the rest of the items, we allocate 20% of spending in married couple househeolds and 28% of spending in single mother housheolds to children. We arrive at these allocation rules from our economies of scale parameters. Married couples have 1.8 children in the data, hence weighting children as 0.4 adults, children consume (1.8)(0.4)/(2+(1.8)(0.4)) = 0.20 of household consumption. For single mothers, who have 1.6 children in the data, we get (1.6)(0.4)/(1+(1.6)(0.4)) = 0.28. By dividing total consumption of children by total consumption (which includes additional items like spending on alcohol and tobacco), we find the fraction of total spending on children.

differences in spending and the number of children (Table 6), the model generates significant differences in human capital investment on children. In the model economy, human capital investment per children in married couple household is about 3 times as high as the human capital investment in single-mother families.

6. Policy Experiments

Given that the model can reproduce the basic features of the Canadian data discussed above, we now conduct policy simulations in order to compute the impact on family structure and inequality of moving from the Canadian-style welfare policy of our benchmark model to the more targeted type of welfare policy that was in effect in the U.S. The basic policy differences we consider are: 1) eligibility of married women and single men, 2) dependence of transfers on the number of children, and 3) average level of transfers. In this section, we modify the benchmark model by introducing these differences sequentially. Our objective is to find out to what extent such differences could explain the higher proportion of single-parent children in the U.S., which of these differences is most important for our explanation, and what type of policy is most effective in making the poor better off in the long run.

The results of these policy experiments are reported in Table 8a together with the data for the U.S. economy. In Experiment 1, we simply assume that Canada stops providing welfare payments to married people and single males. Instead only single mothers are eligible for welfare. As Table 8a demonstrates the first experiment does not affect the number of children with single mothers. The income inequality measures also remain the same.

In Experiment 2, we make welfare payments for single mothers dependent on the number of children; in particular we set assume that $w_g(k) = a + bk$. To determine the parameters a and b, we know from Table 2 that in the U.S. having children increase income of a single mother (with no additional earnings) by about 25%. Hence, $\frac{a+b}{a} = 1.25$. We also require that under this policy, a single female with 3 children (average number of children that welfare mothers have in the benchmark economy) receives the same welfare payments as they did in Experiment 1, i.e. $a + 3b = 1.3$. The policy parameters that satisfy these two restrictions turns out to be $w_g(k) = 0.748 + 0.184k$. The effects of this policy are dramatic: the number of kids with single mothers and the income gap between single mothers and married couples widen significantly. Indeed, the average number of children with young single mothers jumps to about 31% in the model in contrast to 23% for the U.S. economy. Income inequality also worsens. A young single mother has now about 19% of married couples income (instead of 22%). The same statistics for an old single mother is 23% (instead of 27%).

The U.S. welfare payments, however, are not as generous as the Canadian ones. In Experiment 3, we reduce the welfare payments to reflect the average AFDC and food stamps payments in the U.S. We set $w_g(k) = 0.575 + 0.141k$, where a single mother (with 1 and 3 children) receive about 10% of average income as welfare payments. In this final experiment the average number of children with young single mothers is about 22.7%, a number very close to 23.12% for the U.S. economy. The model creates, however, much less single mothers for the second period than the U.S. economy. The fraction of children with an old single mother is about 16.52% in the model whereas it is 25.32% in the U.S.

In order to understand results in Table 8a, Table 8b repeats the same analysis keeping the marital decisions at their benchmark economy.[20] A comparison between Tables 8a and 8b shows that although Experiment 1 does not affect the fraction of children with single mothers, there are two opposite forces in play. If we kept the marital decisions in their benchmark values, the number of children with single mothers would be smaller than the benchmark economy (16.68% versus 17.10%). This occurs as non-marital fertility declines slightly from 2.66 to 2.65 kids per single mother. Despite the decline in non-marital fertility, the fraction of kids with single mothers does not decline much with Experiment 1, since this decline is compensated by higher degree of single motherhood. Since married couples do not receive welfare anymore, marriage is less attractive for those low productivity females who are matched with low productivity males. These same females, however, prefer to have fewer children as this increases the expected value of married life (in particular married life out-of -welfare) next period.

For Experiments 2 and 3, Table 8b shows that both marriage and fertility decisions move in the same direction. The non-marital fertility increases from 2.66 to 3.7 with Experiment 2 and from 2.66 to 3.4 with Experiment 2. Table 8b also shows that the fertility decisions plays the major role in these experiments. Even if marriage decisions were intact, Experiment 2 would still increase the fraction of children with young single mothers to about 26.7%.

[20] For this experiment we change the parameter values but assume that marriages are determined exogenously according to indicator functions, I_1, I_2^m and I_2^s from the benchmark economy. Given these marriage rules agents make all other decisions optimally.

This is about 70% of the total increase from 17% to 31%. Similarly, Experiment 3 would make in about 21.0.7% of children living with young single mother (instead of 22.7%) if the benchmark marriage decisions were kept intact. Indeed, in both Experiments 2 and 3, per child human capital in single mother households increases. With experiment 2, for examples, single mothers make 5% more human capital investment on their children than they do in benchmark economy. This positive effects is however more than compensated by the rise in the number of kids living in single mother households.

Finally, it is important to note that income differences between single and married households remain pretty much the same if we keep marriage decisions intact. This should not be surprising as the productivity distribution of single females remain constant with intact marriage decisions. In Table 8a, the income inequality worsens as marginal low female shifts from marriage to single motherhood.

6.1. Effectiveness of Social Policy

In this section we revisit the economies studied in the previous two sections, in order to find out which social policies are most effective in making poor children better off and reducing inequality. In Table 9, we show the average education level of children by their percentile rank in the income distribution (with benchmark values normalized to 100). What is striking in these results is that the Canadian policy is much more effective than Experiment 3, which is the policy that most closely resembles AFDC. Parents in all five income quantiles invest more in children under the Canadian policy than under the AFDC-like policy (those in the lowest income quantile invest about 8% more, while the ones in the highest quantile invest about 2% more). Furthermore, most of the disadvantage of AFDC comes from the subsidy to fertility (Experiment 2). The restriction of welfare to unmarried women does not have much impact on children's education.

Table 10 shows that the implications for income inequality are also in line with results in Table 8a. Experiment 1, the restriction of transfers to the unmarried, minimizes the ratio of mean income in the highest-income quantile to the mean income in lowest income quantile. It also minimizes the income gap between married households and single-mother households. The policy that maximizes inequality is Experiment 2, which is a generous version of the AFDC policy, with rewards for extra fertility.

6.2. Preferred Policy

The tax rate implied by the Canadian policy is about 28% higher than the tax required to pay for Experiment 3. Thus if inequality or children's education are the predominant concerns of social policy, then it is clear that the Canadian policy is better suited than the U.S. policy to address this. However it may be that the average income under the U.S. policy is sufficiently higher so as to outweigh this advantage.

In Table 11a and 11b, we show the relation between the percentile rank of the household and their expected utilities in the steady-state economies under different policies.[21] These rankings (again with benchmark values normalized to 100) are the same for men and women and show that poorest households are best off under the Canadian (Benchmark) policy, while richer quantiles have the highest utility under the policy that excludes married people from welfare (Experiment 1). The other policies are never the second choice of these households; in particular, Experiment 3, which most resembles the former U.S. policy, is ranked third by all households. The fact that majority of people prefer a welfare policy that targets single females reflects the cost effectiveness of these policies in helping children raised in single-mother families. Agents in this economy are better off when these children receive better education since educational investments determines the steady state productivity distributions. While agents prefer to be in an economy where single mothers receive welfare, they do not want to make these welfare payments dependent on the number of children, since this results in higher fertility and makes the welfare payments per child much less effective.

7. Conclusion

In this paper we asked to what extent the higher rate of single-parent children and larger income inequality in the U.S. were long-run responses to the differences in the social transfer regimes in the two countries. Our basic hypothesis is that single-motherhood and long-run poverty are connected by human capital investment in children and both are affected by the structure of the welfare policy. The large theoretical and empirical literature on welfare policies does not tell us whether targeting the most needy groups will reduce or increase the

[21] The numbers in Table 11 are calculated as the expected lifetime utility of an agent who is randomly thrown into the model economy.

rate of single-parent children in the long-run, since there are conflicting effects. It is also not clear whether fertility targeting is worse or better than marital status targeting.

We constructed an equilibrium model of the interaction between family structure and social policy. The basic premise is that family structure decisions are not only dependent on the human capital of the parents, but in turn helps to determine the human capital of the children. In the model, marriage and divorce decisions depend on the outside options of both partners, which in turn depend on the decisions of all other adults, because these determine the probability distribution of potential spouses.

We calibrated the steady-state equilibrium of this model to the Canadian economy on the basis of an empirical analysis of household survey data drawn from the Survey of Consumer Finances, 1994. The parameters of the calibrated model were chosen so as to generate the following features of the data: the distribution of children across dual and single-parent households, the earnings differential between single and dual parents, a replacement rate of average fertility, and a pattern of lower fertility for higher-income households. The social policy was set to resemble an average Canadian welfare policy.

The main result of this paper is that when the social policy in our benchmark economy is replaced by one that resembles the AFDC policy in the U.S., the fraction of children with single parents does indeed increase significantly. If we consider only the average proportion of children, then almost all of the difference between the two countries is explained by this change in social policy alone. We identify three critical differences between the two approaches to social policy: compared to the Canadian policy, the AFDC policy tends to exclude married parents, makes payments more dependent on fertility, and has lower average levels of payments. We find that these policy differences can account for the higher fraction of single mothers in the U.S. economy. In particular, while in the benchmark economy (Canada), about 17% of children live with young single-mothers, the same number jumps to 22.7% when we implement a AFDC style policy. In the U.S. about 23.12% of young (between ages 0 and 8) lives with single mothers. The changes in welfare policy alone, however, is not able to generate much higher rate of older (9 to 18 years old) children who live with single mothers in the U.S.

Our results also suggest that the Canadian policy is more effective than the AFDC-style policy in helping poor children and in reducing the level of income inequality among households. The U.S. policy on the other hand is less costly and results in higher average income. Nevertheless in terms of ex-ante utility all households in our model economy prefer to be born into an economy with the Canadian policy than the AFDC-style policy. Interestingly, while for the poorest households the Canadian policy is the most preferred one, the majority of households prefers an in-between policy: one that targets single mothers but does not provides fertility bonuses.[22]

[22] Although the emphasis of the analysis has been on differences in welfare policy, it is worth noting that the model is also amenable to the analysis of other types of policy that affect or respond to family structure, such as alimony, child-support and other divorce-contingent transfers.

8. Appendix — Stationary Equilibrium

Let denote an old single mother's level of human capital investment in her children in problem (Pg2) by $e = E_2^s(x, k, z)$, old married couple's level of human capital investment per child in problem (Pm2) by $e = E_2^m(x, z, \gamma, k)$. Similarly, let $k = K^s(x)$ be the fertility decision and $e = E_1^s(x)$ be the education decision of a young single female in problem (P1g), and let $k = K^m(x)$ be the fertility decision and $e = E_1^m(x, z, \gamma)$ be the education decision of young married couple in problem (P1m). Then, the average number of children per female in this economy is given by

$$\begin{aligned} \mathsf{k} &= \sum_{i=1}^{N}\sum_{j=1}^{N}\sum_{h=1}^{M} \Phi_1(x_i)\,\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h)K^m(x_i, z_j, \gamma_h) \\ &\quad + \sum_{i=1}^{N} \Phi_1(x_i)\,[1 - \sum_{j=1}^{N}\sum_{h=1}^{M} \Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h)]K^s(x_i). \end{aligned}$$

To understand this formula, note that the probability of a type-(x_i, z_j, γ_h) marriage between young adults is $\Phi_1(x_i)\,\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h)$. This match will generate $K^m(x_i, z_j, \gamma_h)$ kids. The odds that a woman will be type x_i and remain single are $\Phi_1(x_i)\,[1 - \sum_{j=1}^{N}\sum_{h=1}^{M} \Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h)]$. This woman will have $K^s(x_i)$ children. In a stationary equilibrium the growth rate of the population, g, will therefore be $g = \sqrt{\frac{\mathsf{k}}{2}}$.

8.1. Steady-State Matching Probabilities

Young Adults: The probabilities of meeting a young female and male of a given type in the marriage market are $\Phi_1(x)$ and $\Omega_1(z)$. To determine these probabilities, let $\Upsilon^{mm}(x_i, z_j, \gamma_h, x_k, z_l, \gamma_n)$ represent the fraction of females who were married in both periods and transited from state (x_i, z_j, γ_h) to (x_k, z_l, γ_n). Likewise, let $\Upsilon^{ss}(x_i, x_k)$ denote the fraction of females who were single in both periods, and transited from x_i to x_k, and $\Upsilon^{ms}(x_i, z_j, \gamma_h, x_k, z_l)$ denote the fraction of females who suffered a marriage breakup, etc. Hence,

$$\begin{aligned} \Upsilon^{mm}(x_i, z_j, \gamma_h, x_k, z_l, \gamma_n) &\equiv \Phi_1(x_i)\,\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h) \\ &\quad \times I_2^m(x_k, z_l, \gamma_n, k^m)\Lambda(\gamma_n|\gamma_h)\Delta^x(x_k|x_i)\Delta^z(z_l|z_j), \end{aligned}$$

$$
\begin{aligned}
\Upsilon^{ss}(x_i, x_k) &\equiv \Phi_1(x_i)\,[1 - \sum_{j=1}^{N}\sum_{h=1}^{M}\Gamma(\gamma_h)\Omega_1(z_j)I_1^s(x_i, z_j, \gamma_h)] \\
&\quad \times\Delta^x(x_k|x_i)[1 - \sum_{l=1}^{N}\sum_{n=1}^{M}\Gamma(\gamma_n)I_2^s(x_k, z_l, \gamma_n, k^s)\Omega_2(z_l)],
\end{aligned}
$$

$$
\begin{aligned}
\Upsilon^{ms}(x_i, z_j, \gamma_h, x_k, z_l) &\equiv \Phi_1(x_i)\,\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i, z_j, \gamma_h)\Delta^x(x_k|x_i)\Delta^z(z_l|z_j) \\
&\quad \times \{\sum_{n=1}^{m}\Lambda(\gamma_n|\gamma_h)[1 - I_2^m(x_k, z_l, \gamma_n, k^m)]\},
\end{aligned}
$$

$$
\begin{aligned}
\Upsilon^{sm}(x_i, x_k, z_l, \gamma_n) &\equiv \Phi_1(x_i)\,[1 - \sum_{j=1}^{S}\sum_{h=1}^{m}\Gamma(\gamma_h)\Omega_1(z_j)I_1^s(x_i, z_j, \gamma_h)] \\
&\quad \times I_2^s(x_k, z_l, \gamma_n, k^s)\Gamma(\gamma_n)\Delta^x(x_k|x_i)\Omega_2(z_l), \qquad (8.1)
\end{aligned}
$$

where $k^m \equiv K^m(x_i, z_j, \gamma_h)$ and $k^s \equiv K^s(x_i)$.

Then, it is easy to see that the odds of meeting a young woman of type x_r in the marriage market are given by

$$
\begin{aligned}
\Phi_1(x_r) &= \{\sum_{i,j,k,l,h,n}\Pi^x(x_r|E_1^m(x_i, z_j, \gamma_h) + E_2^m(x_k, z_l, \gamma_n, K^m(x_i, z_j, \gamma_h))) \\
&\quad \times\Upsilon^{mm}(x_i, z_j, \gamma_h, x_k, z_l, \gamma_n)K^m(x_i, z_j, \gamma_h) \\
&\quad + \sum_{i,k}\Pi^x(x_r|E_1^s(x_i) + E_2^s(x_k, K^s(x_i), 0))\Upsilon^{ss}(x_i, x_k)K^s(x_i) \\
&\quad + \sum_{i,j,k,l,h}\Pi^x(x_r|E_1^m(x_i, z_j, \gamma_h) + E_2^s(x_k, K^m(x_i, z_j, \gamma_h), z_l)) \\
&\quad \times\Upsilon^{ms}(x_i, z_j, \gamma_h, x_k, z_l)K^m(x_i, z_j, \gamma_h) \\
&\quad + \sum_{i,k,l,n}\Pi^x(x_r|E_1^s(x_i) + E_2^m(x_k, z_l, \gamma_n, K^s(x_i))) \\
&\quad \times\Upsilon^{sm}(x_i, x_k, z_l, \gamma_n)K^s(x_i)\}/\mathsf{k}. \qquad (8.2)
\end{aligned}
$$

The probability of meeting a type-z_r young man is determined analogously:

$$\begin{aligned}\Omega_1(z_r) \;=\; & \{\sum_{i,j,k,l,h,n} \Pi^z(z_r|E_1^m(x_i,z_j,\gamma_h)+E_2^m(x_k,z_l,\gamma_n,K^m(x_i,z_j,\gamma_h))) \\ & \times\Upsilon^{mm}(x_i,z_j,\gamma_h,x_k,z_l,\gamma_n)K^m(x_i,z_j,\gamma_h) \\ & +\sum_{i,k}\Pi^x(z_r|E_1^s(x_i)+E_2^s(x_k,K^s(x_i),0))\Upsilon^{ss}(x_i,x_k)K^s(x_i) \\ & +\sum_{i,j,k,l,h}\Pi^z(z_r|E_1^m(x_i,z_j,\gamma_h)+E_2^s(x_k,K^m(x_i,z_j,\gamma_h),z_l)) \\ & \times\Upsilon^{ms}(x_i,z_j,\gamma_h,x_k,z_l)K^m(x_i,z_j,\gamma_h) \\ & +\sum_{i,k,l,n}\Pi^z(z_r|E_1^s(x_i)+E_2^m(x_k,z_l,\gamma_n,K^s(x_i))) \\ & \times\Upsilon^{sm}(x_i,x_k,z_l,\gamma_n)K^s(x_i)\}/\mathsf{k}.\end{aligned}$$

Old Adults: Next, how are the odds of meeting a single age-2 type-x female with k children, $\Phi_2(x,k)$, or of a single age-2 type-z male, $\Omega_2(z)$ determined in stationary equilibrium? This depends upon the number of single agents who remain unmarried from the previous period. So, how many are there? Again, the number of married and single one-period-old type-x_i females are given by $\Phi_1(x_i)\sum_{j=1}^{N}\sum_{h=1}^{M}\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i,z_j,\gamma_h)$ and $\Phi_1(x_i)[1-\sum_{j=1}^{N}\sum_{h=1}^{M}\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i,z_j,\gamma_h)]$. Given this supply of one-period-old single females, the quantity of two-period-old type x_k single females will be $\sum_{i=1}^{N}\Delta^x(x_k|x_i)\Phi_1(x_i)[1-\sum_{j=1}^{N}\sum_{h=1}^{M}\Omega_1(z_j)\Gamma(\gamma_h)I_1^s(x_i,z_j,\gamma_h)]$.

Let

$$\mathsf{N}(x_i,k)=\begin{cases}1, \text{ if } K^s(x_i)=k,\\ 0, \text{ otherwise,}\end{cases}$$

be an indicator function representing the number of children that a single one-year-old female of type x_i has. Then, the odds of drawing a single two-period-old type-x_k female with k children in the marriage market, or $\Phi_2(x_k,k)$, will be given by

$$\Phi_2(x_k,k)=\frac{\sum_{i=1}^{N}\mathsf{N}(x_i,k)\Delta^x(x_k|x_i)\Phi_1(x_i)[1-\sum_{j=1}^{N}\sum_{h=1}^{M}\Gamma(\gamma_h)\Omega_1(z_j)I_1^s(x_i,z_j,\gamma_h)]}{\sum_{k=1}^{N}\sum_{i=1}^{S}\Delta^x(x_k|x_i)\Phi_1(x_i)[1-\sum_{j=1}^{N}\sum_{h=1}^{M}\Gamma(\gamma_h)\Omega_1(z_j)I_1^s(x_i,z_j,\gamma_h)]}.$$

The same formula for the odds of meeting a single two-period-old male of type z_l, or for $\Omega_2(z_l)$, reads

$$\Omega_2(z_l) = \frac{\sum_{j=1}^{N} Z(z_l|z_j)\Omega_1(z_j)[1 - \sum_{i=1}^{N}\sum_{h=1}^{M}\Gamma(\gamma_h)\Phi_1(x_i)\, I_1^s(x_i, z_j, \gamma_h)]}{\sum_{l=1}^{N}\sum_{j=1}^{N} Z(z_l|z_j)\Omega_1(z_j)[1 - \sum_{i=1}^{N}\sum_{h=1}^{M}\Gamma(\gamma_h)\Phi_1(x_i)\, I_1^s(x_i, z_j, \gamma_h)]}. \qquad (8.3)$$

References

Aiyagari, S., J. Greenwood, and N. Guner (2000): "On the State of the Union," *Journal of Political Economy*, 108(2), 213–244.

Akerlof, G. (1978): "The Economics of Tagging as Applied to the Optimal Income Tax, Welfare Programs, and Manpower Planning," *American Economic Review*, 68(1), 8–19.

Allen, D. W. (1993): "Welfare and the Family: The Canadian Experience," *Journal of Labor Economics*, 11(1),part 2, S201–S223.

Atkinson, A. B. (1995): "On Targeting Social Security: Theory and Western Experience with Family Benefits," in *Public Spending and the Poor*, ed. by D. Van-De-Walle, and K. Nead, pp. 25–90. World Bank-The Johns Hopkins University Press, Baltimore.

Barrett, G. F., and M. I. Cragg (1998): "An Untold Story: The Characteristics of Welfare Use in British Columbia," *Canadian Journal of Economics*, 31(1), 165–188.

Battle, K., and M. Mendelson (2001): "Benefits for Children: Canada," in *Benefits for Children: A Four Country Study*, ed. by K. Battle, and M. Mendelson, pp. 93–186. Caledon Institute of Social Policy, Ottowa.

Bertrand, L. D., J. P. Hornick, J. J. Paetsch, and N. Basa (2003): "The Survey of Child Support Award: Analysis of Phase 2 Data Collected Through January 31, 2002," Research Report Presented to Family, Children and Youth Section Department of Justice of Canada, 2003-FCY-4E.

Bitler, M., J. B. Gelbach, and H. W. Hoynes (2006): "Distributional Impacts of the Self-Sufficiency Project," Working Paper.

Blank, R. M., and M. J. Hanratty (1993): "Responding to Need: A Comparison of Social Safety Nets in Canada and the United States," in *Small Differences That Matter:*

Labor Markets and Income Maintenance in Canada and the United States, ed. by D. Card, and R. B. Freeman, pp. 191–232. University of Chicago Press, Chicago.

Brzozowski, M. (2005): "Welfare Reform and Consumption among Single Mother Households: Evidence from Canadian Provinces," Economic Policy Research Institute Working Paper no. 2005-10, University of Western Ontario.

Caucutt, E. M., and L. J. Lochner (2005): "Early and Late Human Capital Investment, Borrowing Constraints, and the Family," Mimeo, University of Western Ontario.

Chade, H., and G. Ventura (2002): "Taxes and Marriage: A Two-Sided Search Analysis," *International Economic Review*, 43(3), 955–985.

Charette, M., and R. Meng (1994): "The Determinants of Welfare Participation of Female Heads of Household in Canada," *Canadian Journal of Economics*, 27(2), 290–306.

Colak, M. (2006): "Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility," Institute for the Study of Labor (IZA) Discussion Papers 1993.

Cragg, M. I. (1996): "The Dynamics of Welfare Use in Canada," *Canadian Journal of Economics*, 29, S25–S32.

Cutler, D. M., and L. F. Katz (1992): "Rising Inequality? Changes in the Distribution of Income and Consumption in 1980s," *American Economic Review*, 82(2), 546–551.

Da-Rocha, J. M., and L. Fuster (forthcoming): "Why are Fertility and Female Participation Rates Positively Correlated across OECD Countries," *International Economic Review*.

Del-Boca, D., and C. Flinn (2006): "Household Time Allocation and Modes of Behavior: A Theory of Sorts," Mimeo, NYU.

Erosa, A., L. Fuster, and D. Restuccia (2002): "Fertility Decisions and Gender Differences in Labor Turnover, Employment, and Wages," *Review of Economic Dynamics*, 5(4), 856–892.

Fernandez, R., N. Guner, and J. Knowles (2005): “Love and Money: A Theoretical and Empirical Analysis of Household Sorting and Inequality,” *Quarterly Journal of Economics*, 120(1), 273–344.

Fortin, B., G. Lacroix, and S. Drolet (2004): “Welfare Benefits and the Duration of Welfare Spells: Evidence from a Natural Experiment in Canada,” *Journal of Public Economics*, 88, 1495–1520.

Friedman, M. (1962): *Capitalism and Freedom*. University of Chicago Press, Chicago, IL.

Gottshalk, P., and T. M. Smeeding (2000): “Empirical Evidence on Income Inequality in Industrialized Countries,” in *Handbook of Income Distribution*, ed. by A. B. Atkinson, and F. Bourguignon, pp. 261–307. Elsevier, Amsterdam, The Netherlands.

Greenwood, J., N. Guner, and J. Knowles (2000): “Women on Welfare,” *American Economic Review*, 90(Papers and Proceedings), 383–388.

——— (2003): “More on Marriage, Fertility and the Distribution of Income,” *International Economic Review*, 44(3), 827–862.

Heckman, J. J., L. Lochner, and C. Taber (1998): “General Equilibrium Treatment Effects: A Study of Tuition Policy,” *American Economic Review*, 98(Papers and Proceedings), 381–386.

Hoynes, H. W. (1997): “Work, family, and Family Structure: What Have We Learned?,” in *Fiscal Policy: Lessons from Economic Research*, ed. by A. Auerbach, pp. 101–16. Cambridge University Press, Cambridge, UK.

Juster, F. T., and F. P. Stafford (1985): *Time, Goods, and Well-Being*. University of Michigan Press, Ann Arbor, Michigan.

Keane, M. P., and K. I. Wolpin (2002): “Estimating Welfare Effects Consistent with Forward-Looking Behavior. Part I: Lessons from a Simulation Exercise,” *Journal of Human Resources*, 37(3), 570–599.

Knowles, J. (1999): “Social Policy, Investment in Children and Equilibrium Poverty,” Mimeo, University of Pennyslvania.

Lise, J., S. Seitz, and J. Smith (2003): "Equilibrium Policy Experiments and the Evaluation of Social Programs," Mimeo, Queen's University.

McKinnish, T., S. Sanders, and J. Smith (1999): "Estimates of Effective Guarantees ad Tax Rates in the AFDC Program for the Post-OBRA Period," *Journal of Human Resources*, 34(2), 312–345.

McLanahan, S., and G. Sandefur (1994): *Growing Up with a Single Parent: What Hurst, What Helps*. Harvard University Press, Cambridge, MA and London,UK.

Meyer, B. D., and J. X. Sullivan (2004): "The Effects of Welfare and Tax Reform: the Material Well-Being of Single Mothers in the 1980s and 1990s," *Journal of Public Economics*, 88(7).

Moffitt, R. A. (1997): "The Effect of Welfare on Marriage and Fertility: What do We Know and What do we Need to Know?," Institute for Research on Poverty Working Paper No. 1153-97.

——— (2003): "The Temporary Assistance for Needy Families Program," in *Means-Tested Transfer Programs in the United States*, ed. by R. A. Moffitt. The University of Chicago Press/National Bureau of Economic Research.

National Council of Welfare (1997): "Another Look at Welfare Reform," Discussion paper, Minister of Public Works and Government Services, Ottawa.

——— (2000): "Welfare Incomes 1997 and 1998," Discussion paper, Minister of Public Works and Government Services, Ottawa.

Regalia, F., and J.-V. Ríos-Rull (1999): "What Accounts for the Increase in Single Households and the Stability in Fertility?," Barcelona, Spain: Universitat Pompeu Fabra, Department of Economics, Working Paper No. 1999.

Restuccia, D., and C. Urrutia (2004): "Intergenerational Persistence of Earnings: The Role of Early and College Education," *American Economic Review*, 94(4), 1354–1378.

Statistics Canada (1999): "Spending Patterns in Canada 1997," Statistics Canada Income Statistics Division Expenditure Surveys Section Catalogue No. 62-202-XIB.

Stokey, N. L. (1996): "Shirtsleeves to Shirtsleeves: The Economics of Social Mobility," Discussion paper, Nancy L. Schwartz Lecture, 1996.

Wilk, P., M. H. Boyle, M. D. Dooley, and E. L. Lipman (2006): "The Effects of Self-Sufficiency Project on Children," Social Research and Demonstration Corporation Working Paper 06-09.

Zabel, J., S. Schwartz, and S. Donald (2006): "An Econometric Analysis of the Impact of the Self-Sufficiency Project on the Employment Behavior of Former Welfare Recipients," IZA Discussion Paper no.2122.

TABLE 1: Average Sample Characteristics

	Married Parents				Single Parents			
	Period 1		Period 2		Period 1		Period 2	
	US	Canada	US	Canada	US	Canada	US	Canada
Observations*	10174	4635	4118	5279	3059	970	1396	949
% of Kids	76.88	82.69	74.68	84.76	23.12	17.31	25.32	15.24
Family:								
DPI	40201.67	37372	45485	40698.87	16725	17963	21041	21105
(std. dev.)	26111.65	17747	27969	21853.23	12435	10570	14365	12036
Fam. Earnings	47609.55	41739	54664	45840.8	11237	10077	17491	13349
(std. dev.)	38684.35	28061	40642	36560.26	16076	14329	17627	17084
Govt. Transfers	1743.22	4441.9	1786.7	4350.42	5964.3	8434	4005.4	7962.3
(std. dev.)	4311.29	5305.1	4478.7	5492.46	5766.4	5811.7	5191.1	6353.8
Kids	2.62	2.03	2.11	2.64	2.77	1.91	1.95	2.32
(std. dev.)	1.24692	0.8842	0.8396	1.15082	1.5093	0.8455	45.767	22.491
Mother:								
Age	33.66	31.77	40.41	38.19	31.26	30.16	38.41	37.39
(std. dev.)	6.0202	5.1372	5.4107	5.0156	6.8529	6.3745	5.7859	5.6299
Educ.	12.94	13.3	13.09	12.84	11.64	12.12	12.38	12.29
(std. dev.)	2.9024	2.319	2.6619	2.474	2.4041	2.4449	2.4859	2.3981
Weekly Hours	22.22	18.81	27.45	21.9	22.52	13.78	30.53	17.95
(std. dev.)	18.6678	18.193	17.339	18.1763	19.675	18.469	17.687	19.371
Wage	11.97	11.63	12.35	11.76	9.71	11.99	10.92	12.81
(std. dev.)	8.7898	7.0344	9.89	7.6254	10.285	6.9128	7.4095	14.633
Father:								
Age	35.93	34.28	42.67	40.83	.	.	.	.
(std. dev.)	6.8999	5.7613	6.5831	5.9225	.	.	.	.
Educ.	13.11	13.36	13.42	12.93	.	.	.	.
(std. dev.)	3.2667	2.4845	3.1827	2.7371	.	.	.	.
Weekly Hours	43.25	37.37	42.59	37.54	.	.	.	.
(std. dev.)	14.1447	17.558	15.006	18.009	.	.	.	.
Wage	16.83	16.08	18.52	17.54	.	.	.	.
(std. dev.)	13.461	8.4992	12.698	12.363	.	.	.	.

*Sample observations unweighted; percentages reflect household weights.

SOURCES: Luxembourg Income Study, 1994

TABLE 2: Social Policy Regression Results

Variables		USA	Canada
Intercept	Estimate	709.56	4760
	(t-ratio)	6.42	31.09
Kids	Estimate	858.04	1281.84
	(t-ratio)	30.94	30.33
Single Mom	Estimate	2779	1886.76
	(t-ratio)	30.07	13.05
	N	16197	11421

*Dependent variable = total public transfers received. The regressions also include age and earnings controls. SOURCE: Authors calculations from Luxembourg Income Study.

TABLE 3: Fertility by Female Earnings in 1994 Survey Data

Female Earnings Quintile	Statistic	USA Age Interval		Canada Age Interval	
		25-35	36-45	25-35	36-45
1	mean	1.95	1.68	1.6	1.53
	std	52.45	53.31	19.12	20.76
	median	2	2	2	2
	N	5315	5976	4543	4716
2	mean	1.34	1.28	1	1.16
	std	47.53	49.5	17.06	17.31
	median	1	1	1	1
	N	1096	1179	716	808
3	mean	1.04	1.08	0.87	1.15
	std	44.17	42.73	17.69	17.76
	median	1	1	1	1
	N	1088	1159	636	745
4	mean	0.99	1.09	0.78	1.01
	std	44.51	45.72	17.46	17.74
	median	1	1	0	1
	N	1062	1108	606	742
5	mean	0.84	1.13	0.78	1.08
	std	41.37	44.46	18.06	18.77
	median	1	1	0	1
	N	1055	1126	620	690

SOURCES: Luxembourg Income Study, 1994

Table 4: Log Hourly Wage Distributions

	Canada	
	Men	Women
Mean	2.65	2.29
Std.	0.63	0.67

SOURCES: Luxembourg Income Study, 1994

Table 5: Parameter Values

Parameter	Value	Target	Model	Data
γ_1	0	Fraction of Kids with Single Mothers (period 1)	17.10%	17.31%
γ_2	1.439	Fraction of Kids with Single Mothers (period 2)	15.23%	15.24%
σ_1	0.480	Single females' Income/Married Couples' Incomes (period 1)	0.22	0.24
σ_2	0.302	Aggregate Fertility	2	
σ_{3f}	0.220	Income Fertility Relation	Figure 1	
σ_{3m}	0.325	Income Fertility Relation	Figure 1	
σ_4	0.255	Single females' labor supply (period 1)	0.12	0.12
ϕ_f	0.05	Income Fertility Relation	Figure 1	
ϕ_m	0.025	Income Fertility Relation	Figure 1	
δ	2.70	Transfer Income/Family Income (married, period 1)	10.89	10.64
ρ	0.690	Transfer Income/Family Income (married, period 2)	9.93	9.49
$w_g(k)$	1.3	Welfare income/average income of single females	0.48	0.48
$w_m(k)$	1.8	welfare payments to married/welfare payments single mothers	1.38	1.38
w_b	0.65	welfare payments to single males/welfare payments to single mothers	0.5	0.5

Table 6: Calibration

	Married Parents				Single Parents			
	Period 1		Period 2		Period 1		Period 2	
	Model	Canada	Model	Canada	Model	Canada	Model	Canada
Children	82.90	82.69	84.77	84.76	17.10	17.31	15.23	15.24
Fam. Earnings*	1.00	1.00	1.00	1.00	0.22	0.24	0.27	0.32
Transfers/Income (%)	10.89	10.64	9.93	9.49	47.80	83.70	51.75	59.65
Fertility	1.88	2.03	NA	2.64	2.66	1.91	NA	2.32
Labor Supply								
Mother	0.33	0.17	0.25	0.20	0.12	0.12	0.13	0.16

*Canadian data for Fam. Earnings are based on Table 1. The numbers are normalized to total family earnings of married couples

** Canadian data for labor supply is based on Table 1. Weekly hours are normalized by 112 hours.

Table 7: Benchmark Economy

	Marital Status (%)		Spending on Children**		Human Capital Investment*	
	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2
Married	87.31	86.71	0.18	0.18	1.00	1.00
Single	12.69	13.29	0.34	0.33	0.34	0.39
Never Married		2.69		0.35		0.33
Divorced		10.6		0.28		0.40

*As a fraction of young married couples' income

**As a fraction of household income

TABLE 8a: Welfare Experiments

	Married Parents				Single Parents			
	Period 0		Period 1		Period 0		Period 1	
	Model	US	Model	US	Model	US	Model	US
Benchmark Economy								
% of Kids	82.90	76.88	84.77	74.68	17.10	23.12	15.23	25.32
Fam. Earnings*	1.00	1.00	1.00	1.15	0.22	0.24	0.27	0.37
Expt. 1: restriction to single mothers								
% of Kids	82.97	76.88	85.40	74.68	17.03	23.12	14.60	25.32
Fam. Earnings*	1.00	1.00	1.00	1.15	0.22	0.24	0.27	0.37
Expt. 2: Expt. 1 + fertility bonus								
% of Kids	69.03	76.88	76.65	74.68	30.97	23.12	23.35	25.32
Fam. Earnings*	1.00	1.00	0.98	1.15	0.19	0.24	0.23	0.37
Expt. 3: Expt. 2 + lower base payment								
% of Kids	77.26	76.88	83.48	74.68	22.74	23.12	16.52	25.32
Fam. Earnings*	1.00	1.00	0.99	1.15	0.21	0.24	0.28	0.37

*Earnings data are based on Table 1. The numbers are normalized to total family earnings of married couples

TABLE 8b: Welfare Experiments (with benchmark mariage decisions)

	Married Parents				Single Parents			
	Period 0		Period 1		Period 0		Period 1	
	Model	US	Model	US	Model	US	Model	US
Benchmark Economy								
% of Kids	82.90	76.88	84.77	74.68	17.10	23.12	15.23	25.32
Fam. Earnings*	1.00	1.00	1.00	1.15	0.22	0.24	0.27	0.37
Expt. 1: restriction to single mothers								
% of Kids	83.32	76.88	85.42	74.68	16.68	23.12	14.58	25.32
Fam. Earnings*	1.00	1.00	1.00	1.15	0.22	0.24	0.27	0.37
Expt. 2: Expt. 1 + fertility bonus								
% of Kids	73.31	76.88	77.66	74.68	26.69	30.97	22.34	23.35
Fam. Earnings*	1.00	1.00	0.98	1.15	0.22	0.24	0.24	0.37
Expt. 3: Expt. 2 + lower base payment								
% of Kids	78.99	76.88	80.02	74.68	21.01	23.12	19.98	25.32
Fam. Earnings*	1.00	1.00	0.99	1.15	0.21	0.24	0.24	0.37

*Earnings data are based on Table 1. The numbers are normalized to total family earnings of married couples

TABLE 9: Human Capital Investment in Children

		Household Income Quantile				
	mean	1st	2nd	3d	4th	5th
Benchmark	100.00	100	100	100	100	100
Expt. 1: restriction to single mothers	100.84	101.94	100.09	100.23	100.59	100.52
Expt. 2: Expt. 1 + fertility bonus	94.15	75.80	87.95	94.67	95.09	95.15
Expt. 3: Expt. 2 + lower base payment	98.12	92.02	98.47	99.24	99.00	98.62

TABLE 10: Income Inequality

	Married/Single	5th quantile/1st quantile
Benchmark	3.787	3.873
Expt. 1: restriction to single mothers	3.755	3.798
Expt. 2: Expt. 1 + fertility bonus	4.088	5.312
Expt. 3: Expt. 2 + lower base payment	3.763	4.194

TABLE 11a: Utility Distribution --- Females

	Household Income Quantile				
Economy	1st	2nd	3d	4th	5th
Benchmark	100	100	100	100	100
Expt. 1: restriction to single mothers	99.959	100.099	100.108	100.114	100.082
Expt. 2: Expt. 1 + fertility bonus	99.068	99.053	98.825	98.871	98.993
Expt. 3: Expt. 2 + lower base payment	99.074	99.313	99.398	99.501	99.644

TABLE 11b: Utility Distribution --- Males

	Household Income Quantile				
Economy	1st	2nd	3d	4th	5th
Benchmark	100	100	100	100	100
Expt. 1: restriction to single mothers	99.975	100.232	100.193	100.210	100.173
Expt. 2: Expt. 1 + fertility bonus	94.553	97.012	97.979	98.216	98.235
Expt. 3: Expt. 2 + lower base payment	98.437	99.619	99.660	99.570	99.571

Figure 1: Income and Fertility