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Informal Family Insurance and the Design of the Welfare State

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Informal Family Insurance and the Design of the Welfare State[*]

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Abstract

We study the problem of unemployment benefit provision when the family is also a provider of social insurance. As a benchmark, a simple model is presented where risk-sharing motives govern intra-family transfers and more generous unemployment benefits, provided by the State, crowd out family risk-sharing arrangements one-for-one. The model is then extended to capture the idea that the State has an advantage vis-a-vis the family in the provision of insurance because it can tax individuals, whereas the family must rely on self-enforcing agreements. In this case, the effect of State transfers on intra-family transfers is found to be more than one-for-one. Thus, somewhat perversely, both informal transfers and total insurance transfers to the unemployed fall as the State's generosity increases. This does not imply that the optimal Welfare State is zero. Our results still hold when families are assumed to be better than the State at monitoring the job search activities of the unemployed.

JEL classification: H42, H53, D1, I38.
Keywords: Self-enforcing contracts, Optimal welfare generosity.

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I. Introduction

A large literature in economics has analyzed the problem of optimal unemployment benefit provision and the impact of unemployment benefits on the unemployment rate (see Feldstein (1976), Baily (1978), Shavell and Weiss (1979), inter alia; important empirical papers are Ehrenberg and Oaxaca (1976), Feldstein (1978), Nickell (1979), inter alia). An influential recent review by Atkinson and Micklewright (1991) has pointed out that a shortcoming of this literature is the fact that it does not allow for several of the major institutional features observed in actual unemployment compensation programs around the world. They point out that a richer view of these programs is needed before drawing any policy conclusions from such studies. One important feature that has been ignored by previous studies of unemployment compensation programs is the potential of families as insurance providers. Yet, in a world without government, families may provide much of the social insurance available to an individual.

The presence of families providing insurance introduces a number of questions which we need to answer when designing a welfare program. When family members are bound together by the provision of insurance, we need to know if a more generous Welfare State will weaken family links. Do more generous unemployment benefits increase total insurance available to an individual, or do they merely crowd out the amount of insurance provided by family networks? What is the mechanism through which this occurs? Could the State make things worse, maybe by destroying informal insurance to such an extent that total insurance actually falls? What are the implications of these considerations for the optimal size of the Welfare State? This paper attempts to provide some answers to these questions by linking the work on the optimal Welfare State, with that on the informal (non-market) insurance activities of families.

The traditional approach in economics to modelling family activities follows the work of Barro (1974) and Becker (1991), and assumes altruistic preferences. Within this framework, considerable attention has been given to the idea that altruistic families may undo government actions through transfers between different generations. An alternative approach treats intra-family

transfers as a counterpart to the exchange of services provided by family members. While this has been the standard approach in anthropology for decades, economists have only recently begun to apply the 'exchange model' to study insurance against uncertain longevity (Kotlikoff and Spivak (1981)), insurance against accidents (Arnott and Stiglitz (1991)) and in-kind services (Bernheim et al (1985), Cox (1987)). This paper follows the non-altruistic approach to model family insurance against unemployment, and then introduces the government as a second source of insurance.[1]

An important problem in modelling insurance amongst self-interested members of an extended family is that of contract enforcement. Although exchange models, such as Kotlikoff and Spivak (1981), show that intra-family transfers may have nothing to do with altruistic feelings, they do, however, rely on there being some level of mutual trust and honesty to avoid the problem of these informal transfers within the family being legally non-enforceable. The problem is that if person A makes a private transfer to person B who has had an unlucky spell, B may not reciprocate whenever the luck changes and A needs assistance. The government does not have this problem when operating an insurance scheme since it can force lucky members to contribute through the power to tax. In fact, the ability to coerce individuals to contribute in such a way is one of the features that political scientists use to define the State.[2] The present paper follows the important work of Kimball (1988) and Coate and Ravallion (1993) in assuming that families only

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[1] The anthropology literature has repeatedly emphasized the potential of families as providers of unemployment insurance. Peace (1979), in his study of migrant Nigerian workers, writes, *"All that can be asserted is that most [members of the network] manage to generate some surplus from time to time that is mostly used in the support of members in difficulty. This brings us to the second major function of migrants' networks: they are support units which allocate available surplus finances in such a way as to come to terms with insecure conditions of employment..."* p 31. Although the focus of our model is unemployment risk, it can also be used to study other risks, such as that of a family member becoming a single mother. See the Discussion in Section III.

[2] See, for example, the entry on origins of the State in *The Social Science Encyclopedia*, Kuper and Kuper (1996).

have available self-enforcing contracts.[3] That is, we model informal insurance schemes by focusing on a group of individuals that interact repeatedly and punish defectors by preventing them from entering risk-sharing arrangements in the future. Hence the punishment for defection is autarky. The State is modelled as a second source of insurance, which it funds by taxation.

The main result of the paper is that State-provided unemployment benefits can crowd out intra-family transfers more than one-for-one. The intuition for this result is as follows: any increase in State-provided unemployment benefits would be followed by a one-for-one reduction in intra-family transfers as families try to return to the initial level of risk-sharing. However, the increased generosity of State benefits makes defecting from the informal family risk-sharing contract more attractive. Hence, family transfers must be reduced even further to keep the informal risk-sharing contract incentive compatible. This result implies a dramatic departure from the predictions of previous exchange and altruistic models.[4]

This result has important implications for the theory of the optimal size of unemployment benefit programs (and perhaps of the Welfare State more generally) in the presence of families. It does not mean, for example, that the State should not provide social insurance. If families are naturally weak, in the sense that they can enforce very little informal insurance transfers even when the State provides zero unemployment benefits, social welfare increases when the State takes over the provision of social insurance from the family. If, on the other hand, families can sustain generous informal insurance arrangements (maybe because the rate of time preference is low or because social stigma is very costly to defectors), then the State can maximize social welfare by either staying out, or by becoming the sole-provider of unemployment benefits.

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[3] Although we use the word "families", the ideas in this paper apply to more general informal insurance arrangement that exists between individuals, who may or may not be related by blood or marriage.

[4] For example, market imperfections, such as liquidity constraints, can be introduced into altruistic models to show why Ricardian equivalence may fail, implying that State actions will be only partially offset by private actions (i.e. less than one-for-one crowding out). In the present paper, rather than *lessening* the effect of changes in the generosity of the Welfare State on family risk-sharing transfers, the "market imperfections" we introduce actually *increase* the size of the effect.

The more than one-for-one crowding out result arises because the State changes the opportunity cost of belonging to a family. Thus, the Welfare State affects the amount of informal insurance that families can sustain (without the help of the legal system) by changing the punishment available for those who default - in other words, by changing the set of admissible contracts. Formally, this result is related to the work of Rotemberg and Saloner (1985) on the business cycle's effect on collusive agreements, and Baker, Gibbons and Murphy (1994) on the relationship between explicit and implicit incentive contracts in business organizations.[5]

The paper extends the model to consider the realistic possibility that families have an informational advantage (vis-a-vis the State) about the characteristics and activities of their members. Specifically, we assume that families are in a better position than the State to know if unemployed members are actively searching for a job. The main result is unchanged: more generous unemployment benefits provided by the State crowd out intra-family transfers more than one-for-one. The intuition for this result is as follows: family members would like to maintain the existing level of risk-sharing and so are bound to reduce intra-family transfers one-for-one with any increase in State unemployment benefits. However, unlike families, the State cannot eliminate the negative incentive effects of its unemployment benefit program on job search activities by making its benefits conditional on search effort. Consequently, higher State benefits reduce search effort and increase unemployment. Employed family members bear a greater tax burden to support the greater numbers of unemployed and become more willing to defect. In addition, defecting from the informal family risk-sharing contract has become more attractive due to the higher State benefits. Both these effects reduce intra-family transfers even further, so we again have more than one-for-one crowding out. The optimal size of the Welfare State when families are strong is zero. Increasing State benefits would serve only to increase the unemployment rate due to the moral hazard problem and collapse the high intra-family transfers, so there can be no role for the State.

[5] We believe that it may also be argued that a similar logic underlies the important work of Kranton (1994) on the interaction of market and reciprocal exchange in primitive society, and Prendergast and Stole (1996) on monetizing exchange.

If families are sufficiently weak, however, it becomes optimal for the State to intervene and become the sole-provider of social insurance.

Arnott and Stiglitz (1991) first proposed this "peer monitoring view" of the family in a model where market insurance reduces the care an individual takes to avoid accidents, but non-market insurance may not have this effect due to the ability of members to monitor each other. They note that non-market insurance displaces insurance provided by the market but may ameliorate moral hazard problems and, therefore, increase social welfare. They do not, however, allow for the informational asymmetry to affect the aggregate cost of risk (whereas in our model a more generous Welfare State may increase the unemployment rate), nor do they consider problems of the enforcement of informal contracts between family members.[6]

The model tries to capture two stylized facts that commonly arise in discussions of the Welfare State and the family. The first is the observation that large extended families seem to be more frequent in countries where the Welfare State is not very developed (think of Italy, or countries in Latin America, for example). In contrast, relatively generous Welfare States are often associated with smaller families (think of Holland or Sweden). Policy debates already incorporate the idea that the optimal size of the Welfare State must take into account the importance of family networks. For example, a recent entry comparing public spending across countries noted:

> *Finally, comparisons with the Asian tigers may be unfair: these countries can get away with lower social transfers because families tend to offer much greater support to their members than in industrial nations.*
>
> *The Economist, p.96, April 6, 1996*

The second stylized fact pertains to electoral competition between political parties. Political

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[6] There is a small literature in development economics that has applied this 'peer monitoring view' to credit markets (see Besley (1995) for a review). The present paper can also be seen as an application of the literature on the public provision of private goods to the case of social insurance. The main papers in this literature focus on goods that cannot be consumed from both providers at the same time, such as education or health care (e.g. Besley and Coate (1991) and Stiglitz (1974)).

scientists have long argued that successful parties either give priority to individual interests and liberty, or to collective demands. In practice, this means that political parties which support a small Welfare State also oppose laws and agencies that are perceived to compete with traditional family institutions. The Conservative Party in the U.K. and the Republican Party in the U.S. are sometimes found towards this end of the policy spectrum.[7] The following remarks provide an example:

> ***"Now, this means that my challenge to the American people is real simple. You really want to dramatically reduce power in Washington? You have to be willing to take more responsibility back home. You really want to reduce the bureaucracy of the Welfare State? You have to accept greater responsibility back home …. These are not small things. Welfare reform, emphasizing work and family."***
>
> ***U.S. Representative Newt Gingrich[8]***

In other words, we would like to understand why political parties (and voters) seem to associate a large Welfare State with weak families. It seems that a model which explains optimal welfare generosity in the presence of families should be consistent with these policy groupings by successful political parties.

In section II we present a model showing the interaction between the transfer decisions of the family and those of the State. The basic setting is extended in section II.B. to capture the State's advantage at enforcing contracts through the power to tax. The implications for the optimal size of unemployment benefit programs in the presence of families are also discussed. Section II.C. extends the model to consider the possibility that families have an advantage relative to the State in monitoring the job search activities of their unemployed members. Section III discusses the

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[7] See, for example, the article "Holding the baby: Politicians of all persuasions want to support the family. That is easier said than done", *The Economist*, January 31, 1998.

[8] Excerpts from remarks delivered before the Washington Research Group Symposium, Washington D.C. on November 11, 1994. Reported in Moss (1996).

implications of the model and presents some direct evidence. Section IV concludes.

II. The Model

The economy is populated by M infinitely lived, risk-averse individuals who have instantaneous utility z(x), where x is income, $z_x > 0$ *and* $z_{xx} < 0$*. Denote derivatives with subscripts. The discounted expected utility of an unemployed and employed worker are determined by*

$$rA = z(b) + j(B - A) \tag{1}$$

and

$$rB = z(W) + t(A - B) \tag{2}$$

where A and B denote the life-time utilities of being unemployed and employed, respectively, b is the endogenously determined total transfers received by the unemployed, j is the endogenously determined outflow rate from unemployment into employment, r is the exogenous rate of time preference and t is the exogenous inflow rate into unemployment. The inflow rate, t, constitutes the stationary employment risk which workers desire insurance against. The net wage is W (= w-n), where w is the gross wage and n is the premium required to support the transfers. Solving (1) and (2) simultaneously gives

$$rA = \frac{jz(W) + (t+r)z(b)}{j+t+r} \tag{3}$$

and

$$rB = \frac{(j+r)z(W) + tz(b)}{j+t+r} \tag{4}$$

Assume that individuals form networks of friends, neighbours and relatives (which we shall call 'families') for the purpose of sharing labour income risk. Families are identical. There are three further assumptions. First, labour income risk is not correlated across members of the family. This may be questionable as members of the family may tend to work in the same industry or area.[9] Second, assume families are sufficiently large so that at any point in time a constant proportion of members are unemployed and must receive support from their family. Thus, if a family has m members, um of them will always be unemployed and (1-u)m will always be employed, where u is the family unemployment rate. Since we are assuming that the number of family members is kept fixed, the Welfare State is not able to affect the family by changing its optimal size. This ignores a number of important issues. For example, by increasing the number of members, the family is able to pool risk more efficiently.[10] On the other hand, gathering information about the activities and characteristics of all members may become more difficult in larger families.[11] Third, we assume that individuals are unable to save due to the absence of a capital market, which is an obvious and potentially important alternative means for workers to deal with employment shocks. To the extent that saving can also be used to smooth employment

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[9] Dasgupta (1993) reports work by Udry (1990) and others that have shown that, even in very primitive environments, households diversify their activities in order to reduce the extent to which their incomes are correlated with one another. Estimates of the share of idiosyncratic risk in the variance of total household income is over 75 per cent.

[10] For detailed infinite horizon models of risk sharing without commitment and a small number of agents, see Thomas and Worrall (1988) and Kocherlakota (1996). The main modification to our model of an assumption of small families is that it makes the solution non-stationary and also introduces a risk-pooling advantage to the State. Since the focus of the present paper is on the consequences of the State's advantage at enforcing contracts, rather than pooling of risks, we assume large families. For empirical evidence of our assumption of a constant proportion of unemployed members, see Peace (1979) who reports that it is not possible for network members to have money in hand for several successive months *"because networks must carry unemployed members on a recurrent basis"* p 31.

[11] For a start in this direction, see Arnott and Stiglitz (1991). A standard result in the literature, however, suggests that reasonable risk-sharing can be achieved with a surprisingly small family. Thus, a better risk-pooling ability is *not* likely to be the main advantage of the State (vis-a-vis the family) in the provision of insurance.

shocks, the development of capital markets may have similar effects on family risk-sharing arrangements as to the development of the Welfare State.[12]

Equilibrium in the labour market implies that flows into and out of unemployment are equal: jum = t(1-u)m. Consequently,

$$j = \frac{(1-u)t}{u} \tag{5}$$

Family risk-sharing is governed by a budget constraint. Employed family members pay a premium, n^f, to support transfers of b^f, which we shall refer to as "family transfers", to each unemployed member. The family budget constraint is given by $(1-u)n^f m = ub^f m$. Hence $n^f = ub^f/(1-u)$. Thus transfers within the family are motivated solely by risk-sharing concerns, as in Kotlikoff and Spivak (1980). The State also provides transfers to the unemployed, which we shall refer to as "public transfers". This requires that the M(1-U) employed in the economy pay a premium (through taxes) to provide for the UM unemployed, who each receive a transfer of b^p. U is the aggregate unemployment rate. The expression $(1-U)n^p = Ub^p$ is the State's budget constraint. Total transfers are given by $b = b^f + b^p$.

We shall assume that the State moves first to establish the level of public transfers which maximizes aggregate social welfare, taking account the subsequent reaction of families. Each family responds to the level of public transfers by setting its own level of transfers to maximize the welfare of a random member. Hence, Stackelberg equilibria are analyzed.[13]

II. A. "Benchmark Case": Enforceable Family Contracts

Assume initially that families can use the same "contracting technology" as the State. Thus

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[12] The effect of insurance arrangements on precautionary savings is well understood, having been studied - in particular - by Kotlikoff, Shoven and Spivak (1986).

[13] Note the element of dynamic inconsistency: the State must be able to commit to the Stackelberg benefit level (e.g. through legislation).

families can legally enforceable any level of insurance transfers they choose.[14] Families choose transfers to maximize the welfare of a random member - given public transfers - subject to the family budget constraint. The problem of the family is to

$$\max_{b^f} \quad M = [\,u\,A + (1-u)\,B\,] \tag{6}$$

such that

$$n^f = \frac{ub^f}{1-u}$$

Substituting for the budget constraint, the First Order Condition (FOC) for families is

$$M_{b^f}(b^f, b^p, u) = \frac{(t+ru)(z_b(b) - z_W(W))}{j+r+t} = 0 \tag{7}$$

M_{b^f}(.) is the partial derivative of M(.) with respect to b^f. Total transfers, b, are the sum of family and public transfers, $b^f + b^p$. The net wage, W, equals $w-ub^f/(1-u))-Ub^p/(1-U)$. If we assume that families are identical and share the same unemployment risk, then the unemployment rates within each family are the same (i.e. u = U) and W = w-Ub/(1-U).

Equation (7) implies that family members will set their own level of family transfers so as to achieve full insurance. Let $b^f = f(b^p, U)$ be the optimal level of family transfers, for a given level of public transfers and unemployment.

Proposition 1 (One-for-One Crowding Out): When there are no moral hazard problems, and family contracts are enforceable, increases in the level of public transfers crowd out family transfers one-for-one.

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[14] Throughout sections II.A. and II.B. we assume that there are no moral hazard problems arising from the provision of State unemployment benefits. In other words, higher public transfers do not cause higher unemployment.

Proof: The FOC (7) implies that $W = b$ ($= b^f + b^p$), where $W = w - ub^f/(1-u) - Ub^p/(1-U)$. When $u = U$, $W = w - Ub/(1-U)$. Consequently, $b^f = w(1-U) - b^p$ and

$$\frac{\partial b^f}{\partial b^p} = -1 \tag{8}$$

When the level of public transfers increases, the sum of family and public transfers remains fixed. Any increase in public transfers crowds out family transfers one-for-one.

Social Welfare: Enforceable Family Contracts

The State's problem is to set the level of public transfers to maximize social welfare, given the State's budget constraint and the response of families.[15] Hence the State chooses to

$$\max_{b^p} \quad S = [UA + (1-U)B] \tag{9}$$

such that

$$(i) \quad n^p = \frac{Ub^p}{1-U}$$

$$(ii) \quad b^f = f(b^p, U)$$

Constraint (i) is the State's budget constraint, whereas constraint (ii) defines the level of transfers which families choose, for a given level of public transfers and unemployment.

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[15] It is assumed both in this section, and subsequent ones describing the State's social welfare problem, that the only social benefits of families come from the provision of insurance against unemployment. A richer model would allow for other benefits that arise from the existence of families (such as education, crime prevention, etc).

Proposition 2: ***When there are no moral hazard problems, and family contracts are enforceable, the size of the Welfare State (i.e. the size of publicly provided insurance transfers to the unemployed) is irrelevant to social welfare.***

Proof: Families set transfers so that, regardless of public transfers, they are always fully insured (from the FOC (7)). Substituting for the constraints (i) and (ii) in the social welfare function (9), gives $z(W)/r$, ***where*** $W = b^f + b^p = w(1-U)$. ***Since*** U ***does not vary with benefits, social welfare is independent of the level of public transfers.*** #

In the next section, the setting is extended to the case where there is a difference in the ability of the State and families to enforce contracts.

II. B. Non-enforceable Family Contracts

In order to reflect the State's advantage at enforcing contracts, we now make the following assumption:

Assumption 1. ***The State can fully enforce risk-sharing contracts using the power to tax the employed. Families only have available self-enforcing contracts.***

The problem for families now is that the promise of unemployed members to reciprocate transfers in the future is not credible as there is no legal enforcement of family risk-sharing contracts.[16] To overcome this problem, families enter informal contracts whereby members will refuse to provide insurance transfers forever to anyone defaulting on their obligations towards the unemployed. In other words, the penalty for default is to exclude the worker from enjoying family

[16] Authors such as Coate and Ravallion (1993) argue that *"illiteracy, cultural intimidation by modern institutions, and problems of asymmetric information..."* make informal insurance contracts relevant even when a formal insurance market does exist.

risk-sharing arrangements in the future.[17] This introduces a constraint on the set of informal contracts that are enforceable. Consequently, we analyze the family problem of maximizing a random member's expected utility subject to a budget constraint, and the "enforceability constraint".

Assume that family members exercise the following trigger strategy: each employed member continues to contribute a premium payment, $n^f = ub^f/(1-u)$, enabling the unemployed members to receive a transfer, b^f (in addition to the public transfer) so long as all other employed members also contribute the premium payment. Then the family is maintained only so long as the value to members from not cheating, R, exceeds the value from cheating, C.[18] In other words, $R \geq C$ where

$$R = \frac{(j+r)z(w - \frac{ub^f}{1-u} - \frac{Ub^p}{1-U}) + tz(b^f + b^p)}{r(j+r+t)} \tag{10}$$

and

$$C = \frac{(j+r)z(w - \frac{Ub^p}{1-U}) + tz(b^p)}{r(j+r+t)} \tag{11}$$

The term for C simply states that employed defectors (those who stop contributing towards the support of unemployed family members) will be punished by not receiving b^f should they fall unemployed. The only transfer available for the defector will be whatever transfer the State

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[17] We ignore other punishments which may be available to families, such as stigmatizing defectors, or depriving them from affection, etc. Then playing a simple trigger strategy would not be optimal (see Abreu (1988)). The possibility of renegotiation between the family and unemployed defectors is also ignored. Although non-cooperation between the family and the defector is credible (i.e. it is a Nash equilibrium of the subgame), the players could renegotiate to leave the punishment phase for an equilibrium where everybody is better off (see Farrell and Maskin (1989)). A clear exposition appears in Gibbons (1992).

[18] See Kimball (1988) and Coate and Ravallion (1993) for a more complete characterization of informal insurance arrangements.

provides. Simplifying, yields the condition

$$F(b^f, b^p, u, U) = (j+r)[z(w - \frac{Ub^p}{1-U} - \frac{ub^f}{1-u}) - z(w - \frac{Ub^p}{1-U})]$$

$$+ t[z(b^f + b^p) - z(b^p)] \geq 0 \qquad (12)$$

Call equation (12) the "enforceability constraint".[19] If this constraint cannot be satisfied for any $b^f > 0$, then families can provide no self-enforcing insurance arrangements for their own members (whereas the State enforces the premium payments - which provide for the public transfers, b^p - through its power to tax).[20]

On the other hand, if the enforceability constraint can be satisfied for positive family transfers - given the level of public transfers - then the optimal level of family transfers, constrained by the requirement that these transfers be self-enforcing, may imply that families are now unable to achieve their desired full insurance. This is because of the temptation of members to shirk on their premium payments. The problem for the family is to

$$\max_{b^f} \quad M = [u A + (1-u) B] \qquad \textbf{(13)}$$

such that

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[19] The more general term is "incentive compatibility constraint". Moral costs from defecting would add a negative term to the right-hand side of equation (12).

[20] We are assuming that the identity of the family member does not change the cost of defecting on him or her. Alternatively, we could assume that individuals have a distribution of love/affection over the other members of the family. This would imply, for example, it is more costly to defect on your brother than on your third cousin. The enforceability constraint would then only bind for the two most distant members of the extended family.

$$(i)\quad n^f = \frac{ub^f}{1-u}$$

The family budget constraint is given by (i) and the enforceability constraint is given by (ii). Substitute for the budget constraint (i) in the objective function, M. The solution is then

$$M_{b^f} + \lambda F_{b^f}(b^f, b^p, u, U) = 0 \qquad \textbf{(14)}$$

$$F \geq 0, \qquad \lambda \geq 0, \qquad F.\lambda = 0 \qquad \textbf{(15)}$$

where λ is the Lagrange multiplier associated with the enforceability constraint (ii). When $\lambda = 0$, the enforceability constraint is not a binding condition: $F(b^f, b^p, u, U) > 0$, and the solution is simply $M_{b^f} = 0$. Hence, $z_b(b) - z_w(W) = 0$ (see equation (7)), and family members are fully insured.

When $\lambda > 0$, the enforceability constraint binds and the level of family transfers will be

$$(ii)\quad F(b^f, b^p, u, U) \geq 0$$

governed by the equation $F(b^f, b^p, u, U) = 0$, which implicitly defines family transfers in terms of public transfers. At such points, increasing family transfers further would collapse the informal risk-sharing arrangements, since the value from cheating would exceed the value from continuing transfer premium payments (F(.) becomes negative). More formally, when the enforceability constraint binds, $\delta F/\delta b^f \leq 0$.

Remark: (i) The level of family transfers decreases with the rate of time preference when family contracts are non-enforceable, and the enforceability constraint binds. (ii) For a sufficiently low rate of time preference, families are able to enforce full insurance on their

own.

Proof: See Appendix I. #

The intuition for this result is that the present value of the future discipline - activated when a family member is discovered cheating - falls as the rate of time preference rises. Consequently, the rate of time preference may be used as an indicator of family strength in the model. For a sufficiently low rate of time preference, the present value of the future discipline - activated when a family member is discovered cheating - can be made large enough to make it not worthwhile for any family member to defect on their premium payments. We can now characterize the behaviour of total transfers as a function of public transfers.

Proposition 3 (More than One-for-One Crowding Out, Part I): *When there are no moral hazard problems, and family contracts are non-enforceable, increases in the level of public transfers crowd out family transfers by more than one-for-one.*

Proof: See Appendix I. #

This result is driven by the properties of the enforceability constraint. Start from a position of equilibrium and consider an increase in public transfers. The immediate effect is that it improves the life-time utility of someone defecting from the family by reducing the cost of falling unemployed (see term C in equation (11)). As for employed family members, the immediate effect is that they now find that they have too much insurance (see term R in equation (10)). By simply offsetting the increase in public transfers through a one-for-one reduction in family transfers, employed family members would return to the same level of insurance they had before the State increased transfers. But this is no longer an equilibrium since defecting is now not so bad an

option. Hence the family must further reduce transfers so that employed family members still wish to be a part of future arrangements.

Since total transfers decrease as public transfers increase, there will exist a level of public transfers, b^P, at which point family transfers are completely extinguished. Thereafter total transfers are equal to public transfers. Let the solution to the family problem equal $b^f = g(b^p, U)$ (where $u = U$, if we assume that families are identical and share the same unemployment risk).

In Figure 1 in Appendix II, the curve ABC shows the variation of total transfers, $b^f + b^p$, with public transfers for strong families and the curve DEC shows the variation of total transfers with public transfers for weak families.

Social Welfare: Non-enforceable Family Contracts

The State's problem is to set the level of search and public transfers to maximize social welfare, given the State's budget constraint and the response of families. The State's problem is to

$$\max_{b^p} \quad S = [UA + (1-U)B] \qquad \textbf{(16)}$$

such that

$$(i) \quad n^p = \frac{Ub^p}{1-U}$$

$$(ii) \quad b^f = g(b^p, U)$$

The State's budget constraint is defined by (i), whereas (ii) is the solution to the family problem.

***Proposition 4 (Optimal Size of the Welfare State, Part I):** When there are no moral hazard problems, and family contracts are non-enforceable, the social welfare maximizing level*

of public transfers depends on the natural strength of families1.[21] ***If families can enforce full insurance on their own, there exist at least two levels of public transfers which yield a social welfare optimum. Otherwise, there exists a unique level of public transfers maximizing social welfare.***

Proof: See Appendix I. #

When families can enforce full insurance on their own, the State may achieve the social welfare optimum in two ways. The first is by setting a relatively low level of transfers, denoted b_1^P ***in Figure 1 in Appendix II, and letting the strong families provide the difference between that level and full insurance through informal insurance arrangements (where the curve ABC shows the variation of total transfers with public transfers for strong families). Increasing public transfers beyond the relatively low level at*** b_1^P ***leads to reductions in total transfers (see Proposition 3), and reductions in social welfare. The second option for the State is to set transfers equal to full insurance, at*** b_2^P***. A bad choice is an intermediate value of transfers, like*** b^{PP}***. At this point, the ability of families to enforce their own transfers collapses and social welfare is low. Social welfare is depicted by the line*** $A'B'C'$ ***in the second quadrant in Figure 1.***

When families are weak, the only way the State may deliver a high level of insurance is by being the sole provider. The line DEC in Figure 1 shows how total transfers vary with public transfers for weak families. In these circumstances, the State is better off by increasing public transfers beyond E, until $b^p = b_2^P$***, and having the role for family risk-sharing disappear.***

<u>II. C. Non-enforceable Family Contracts and Moral Hazard Problems</u>

In order to reflect the informational advantage of families, we now introduce the following

[21] For example, the rate of time preference is an exogenous parameter of the model that determines the potential size of informal family insurance arrangements (see Remark 1).

additional assumption:

<u>Assumption 2:</u> The State is unable to perfectly monitor the job-search activities of family members.

The effect of the State's moral hazard problem is modelled as follows. Assume that family unemployment is described by the function: u(e), where $u_e < 0$ and e is the search effort of the unemployed which is observable to the family but not the State. The instantaneous utility of a worker depends negatively on search effort: z(x,e) where $z_e < 0$ (and the discounted expected utility of an unemployed and employed worker, A and B respectively, are otherwise the same as equations (3) and (4)). Higher public transfers may now result in less search effort by workers.

This more general case combines the relative strengths of both families and government: whereas the State is unable to perfectly monitor the activities of family members (which potentially leads to unemployment within families being a positive function of public transfers), the State has the advantage of enforcing contracts through the law.

If the enforceability constraint (see equation (12)) cannot be satisfied for any $b^f > 0$, then families can provide no self-enforcing insurance arrangements for members. The State enforces the premium payments which fund public transfers through taxation. However, if the enforceability constraint can be satisfied for positive family transfers - given the level of public transfers - the requirement that family transfers be self-enforcing may mean that families are not able to be fully insured, due to the temptation of members to shirk on their premium payments. The problem for the family is to

$$\max_{b^f, e} \quad M = [u(e)A + (1 - u(e))B] \qquad \textbf{(17)}$$

such that

$$(i) \quad n^f = \frac{u(e)b^f}{1 - u(e)}$$

$$(ii) \quad F(b^f, b^p, u(e), U) \geq 0$$

The family budget constraint is given by (i), and the enforceability constraint is given by (ii).[22] Substitute for the budget constraint (i) in the objective function, M. The solution is then

$$M_e + \mu F_e(b^f, b^p, u(e), U) = 0 \qquad \textbf{(18)}$$

$$M_{b^f} + \mu F_{b^f}(b^f, b^p, u(e), U) = 0 \qquad \textbf{(19)}$$

where μ is the Lagrange multiplier associated with the enforceability constraint (ii). For identical families, the unemployment rate within each family is the same and equal to the aggregate unemployment rate i.e. u(e) = U.

When μ = 0, the enforceability constraint is not binding: $F(b^f, b^p, u(e), U) > 0$ (from (20)) and the solution is comprised simply of the two conditions: $M_e = 0$ and $M_{b^f} = 0$. The latter implies that $z_b(b) - z_W(W) = 0$ and family members are fully insured.

When μ > 0, the enforceability constraint binds: $F(b^f, b^p, u(e), U) = 0$ (from (20)). At such points, increasing family transfers further would collapse the informal risk-sharing arrangements, since the value from cheating would exceed the value from continuing transfer premium payments. Together with (18) and (19), we now have three equations in the three unknowns (b^f, e and μ). These equations define search effort, e (and hence the unemployment rate) as a function of public transfers: $u(e(b^p))$. When $e_{b^p} < 0$, due to the State's moral hazard problem, higher public transfers reduce search effort and increase unemployment, in which case another "More than One-for-One Crowding Out" result is obtained.

$$F \geq 0, \qquad \mu \geq 0, \qquad F.\mu = 0 \qquad \textbf{(20)}$$

[22] The family anticipates the effect of changes in the level of search effort by family members on the family unemployment rate, but not on the aggregate unemployment rate of the economy.

Proposition 5 (More than One-for-One Crowding Out, Part II): When there are moral hazard problems arising from the provision of public transfers which increase unemployment, and family contracts are non-enforceable, increases in the level of public transfers crowd out family transfers by more than one-for-one.

Proof: See Appendix I. #

If public transfers are increased, the immediate effect is that the life-time utility of a defector from the family is improved (see term C in equation (11)). By simply offsetting the increase in public transfers with a one-for-one reduction in family transfers, employed family members would return to the same level of insurance they had before the State increased transfers, ceteris paribus (see term R in equation (10)). However, the increase in public transfers leads to higher unemployment. Employed family members bear a greater tax burden to support the unemployed and thus become more willing to defect. In addition, defecting is now not so bad an option since the public transfers available to defectors have increased.[23] For both these reasons - the outside option effect and the tax effect - the family must further reduce transfers to lower transfer premiums, so that the employed family members will still wish to be a part of future arrangements.

Since total transfers decrease as public transfers increase, there will exist a level of public transfers at which point family transfers are completely extinguished. Thereafter total transfers are equal to public transfers. Let the solution to the family problem equal $b^f = h(b^p, U(b^p))$ ***(where*** $u(e(b^p)) = U(b^p) = U$ ***for identical families in equilibrium).***

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[23] These two effects always dominate an opposing third effect, which also exists: the higher level of unemployment means that employed family members have more to lose if they choose to defect and subsequently fall unemployed, since they would receive only public transfers (and no family transfers) for a longer expected duration.

Social Welfare: Non-enforceable Family Contracts and Moral Hazard Problems for the State

The State's problem is to set the level of public transfers to maximize social welfare, given the State's budget constraint, and the response of families. Thus

$$\max_{b^p} \quad S = [U(b^p)A + (1-U(b^p))B] \qquad \textbf{(21)}$$

such that

$$(i) \quad n^p = \frac{U(b^p)b^p}{1-U(b^p)}$$

$$(ii) \quad b^f = h(b^p, U(b^p))$$

Constraint (i) is the State's budget constraint, whereas constraint (ii) is the solution to the family problem, which defines the self-enforceable level of family transfers maximizing family welfare.

In contrast to the case presented in section II. B., there will in general exist only one level of public transfers which yields a social welfare optimum. Either the State, or families, provide transfers. The equilibrium depends on the strength of families.

To determine whether the State should intervene in the provision of insurance, let S^{FAM} be the level of welfare when there are no public transfers, so that families can provide their highest enforceable level of transfers.

Furthermore, let S^{PUB} be the highest level of social welfare attainable when the State is the <u>sole-provider</u> of transfers. In other words, S^{PUB} is the value of social welfare when public transfers are b^{PUB}, defined as: $S^{PUB} = max_{bp}\ [U(b^p)A + (1-U(b^p))B]$ such that $n^p = U(b^p)b^p/(1-U(b^p))$. The aggregate unemployment rate varies with public transfers due to the moral hazard problem which results from families choosing their optimal level of search effort, e, subject to the family budget constraint (i.e. families choose e to $max_e\ [u(e)A + (1-u(e))B]$ such that $n^f = u(e)b^f/(1-u(e))$).

Proposition 6 (Optimal Size of the Welfare State, Part II): *If $S^{PUB} < S^{FAM}$, the social welfare optimum occurs when families are the sole providers of transfers. If $S^{PUB} > S^{FAM}$, the social welfare optimum occurs when the State is the sole provider of transfers.*

Proof: See Appendix I. #

If families are sufficiently strong to provide full insurance for members (so the enforceability constraint is non-binding) when the State provides zero transfers, then there can be no role for the State. Increasing public transfers would serve only to increase unemployment, due to the moral hazard problem, which arises only when part of the total transfers is paid by the State. With higher rates of unemployment, welfare can never return to the level that families alone were able to provide.

Furthermore, even not so strong families (for whom the enforceability constraint binds) may make it optimal for the State to withdraw from the provision of transfers - even though they may be unable to provide full insurance for their members. In Figure 2 in Appendix II, families set transfers equal to b_1^{FAM} (less than full insurance) and achieve welfare, S_1^{FAM}. While the enforceability constraint binds - with both the State and families providing positive transfers - raising public transfers would lead to reductions in total transfers (see Proposition 5), increases in unemployment, and reductions in social welfare along the line AB.[24] Once families were completely destroyed, increasing public transfers further would increase total transfers but cause unemployment to continue to rise, and welfare to remain less than S_1^{FAM}. The line ABC in Figure 2 shows how total transfers vary with public transfers. Social welfare is depicted by the line $A'B'O'$ (in the second quadrant).

However, when families are sufficiently weak, there becomes not just a partial role for the State - in fact, the State should become the sole provider of transfers. The line DEC in Figure 2

[24] Social welfare, $U(b^p)A+(1-U(b^p))B$, is an increasing function of total transfers to the unemployed (up to full insurance), and a decreasing function of unemployment.

shows how total transfers vary with public transfers, for weak families. When the State provides zero transfers, the maximum level that can be enforced by families is b_2^{FAM}. Any increase in public transfers has the double effect of collapsing family transfers and of increasing the unemployment rate. Hence the State must increase public transfers beyond b_2^{FAM} if it is to compensate for the higher unemployment rate and increase social welfare.

The State maximizes social welfare at point O, which has more generous transfers, but higher unemployment than if families set transfers at b_2^{FAM}.[25] Social welfare decreases when public provision exceeds b^{PUB} because the gains from being better insured are more than offset by the losses due to higher unemployment.

The scenario where the State maximizes social welfare by taking over the provision of insurance becomes more likely the less severe the trade-off between unemployment and benefits facing the State (i.e. if $U_{bp} > 0$ is small, then it is more likely that $S^{PUB} > S^{FAM}$: see Proposition 6).

III. Discussion, Extensions and Direct Evidence

III. A. Religion, Divorce and Birth Control

The rate of time preference is an economical way of modelling a number of factors that may affect families and the design of the optimal Welfare State. For example, the model can be used to study the effect on the family of factors such as the decline in the role of religion in society, the increase in divorce rates and the introduction of birth control methods (e.g. the pill). In terms of this model, these social trends affect family strength through the enforceability constraint (equation (12)), changing the level of unemployment benefits for which that equation binds. When a certain minimum level is reached, it may become optimal for the State to intervene and take over the responsibility for the provision of social insurance from the family. This provides

[25] The welfare-maximising level of public transfers, b^{PUB}, must be strictly greater than b_2^{FAM}, in this case. If it were not, then welfare could be increased, since at least the same total level of transfers could be provided by the families, but with lower unemployment.

a microeconomic rationale for the birth of the Welfare State.[26]

The introduction of birth control methods affects the design of the optimal Welfare State in at least two ways. First, it may imply that the number of children which a couple decides to have is lower than the optimal number from the point of view of the extended family. There may be a positive externality to other family members from one's child, at least in terms of risk-pooling. With less people to pool risk there are less advantages to staying with the extended family so the level of transfers to the unemployed must be reduced (again from equation (12)), otherwise defection from the family is not so bad an option. A second effect from a more widespread use of birth control methods (and the changed role of women in society) is the increase in the proportion of working mothers. This increases the number of wage earners in the family with which members can pool income risk, something that may strengthen families in our simple model.

The model can also be used to study the effect is the sharp rise in divorce rates in some Western countries on the design of the optimal Welfare State. This rise may partly be due to a reduced role of religion or less social rejection of divorced individuals, two factors that may be linked to a person's willingness to remain in an unhappy marriage. By itself, this would reduce the number of people with whom to pool income risk, again reducing the level of benefits for which the enforceability constraint binds. Religion, of course, may affect families through different channels from the propensity to divorce. It may, for example, increase the sense of solidarity towards other family members, increasing informal transfers as defection from the family becomes morally more costly. This would be characterized by an extra negative term (a moral cost from defection) in equation (12). This would increase the level of informal transfers for which it binds.

If these conjectures are true, the model predicts that at some point in time when family transfers fall below a crucial level, an unemployment benefit program would be established by the State. The time-series profile of public transfers to the unemployed would show a discrete positive jump rather than a gradual increase. Thus, the existence of countries which have both a generous Welfare State and weak families may be explained - in terms of the model - by the underlying

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[26] Traditionally, the birth of the Welfare State has been explained either in political terms or as an instance of Keynesian counter-cyclical (macroeconomic) policy.

strength of families. The optimal response of the State in such a case is to have generous social insurance and to weaken family ties further. On the other hand, if strong family ties exist naturally, the State's optimal response is to retain these ties (with the associated gains from peer monitoring) and opt out of welfare provision altogether.

To the extent that different social groups have different characteristics (rates of time preference, divorce rates, role of religion, etc) the model may justify different public transfers to the rich and poor, or to whites and blacks, based on insurance motives.[27]

III. B. Single Mothers

The model could be extended to study the interaction of public assistance and other important contemporary social problems. Assume that each period, each member of the family faces a number of different risks which have in common that in the event of the bad state occurring the family member will require assistance. Three examples could be young married family members who may have a child needing day-care while they work, young single women who may become pregnant and unable to work, and adult members who may have health problems requiring assistance. An informal insurance arrangement stipulates that each member must contribute in direct proportion to the probability and cost of the risk which the individual faces. This would imply that a young teenage girl in a country where becoming a single mother is very costly would be asked to help a lot with an older family member who happens to be sick. In particular, she would be expected to help more than a brother of the same age group to the extent that men are able to get away with not providing for their offspring more often than women.[28] ***As time passes and risks change, we would expect to see family roles change as well. When the State decides to increase assistance to single mothers, families will endogenously ask less help from teenage girls.***

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[27] Traditionally, different treatment of these groups by the Welfare State has been justified mainly on redistribution grounds. In practice, however, it may be difficult to implement different welfare programs to Catholics and Protestants, or to blacks and whites.

[28] Of course it is not ruled out that this distribution of work occurs because women are discriminated against in this country.

The case of single mothers introduces the interesting possibility that the cost of risk involves an indivisibility. That is, if a pregnancy occurs the single mother would require a high minimum transfer (below which transfers are not valued by the recipient). It is possible that the amount of money/help that the teenage girl will need as a single mother (in terms of lodging, food and clothing, for example) is so high that becoming a single mother is not an insurable risk with the contract technology available to the family. Technically, transfers are not self-enforceable as equation (12) cannot hold to cover the high minimum transfers required in the case of the bad event occurring (i.e. pregnancy). However, one could imagine that if the State provides some help to single mothers it makes the risk insurable. Hence, just below that crucial level, increases in the generosity of the Welfare State increases informal transfers and strengthens the family.

III. C. Politics

This paper may provide a natural interpretation for the different attitudes of political parties towards the Welfare State. As pointed out in the introduction, it seems that parties which emphasize the role of families in society also have a preference for low spending on welfare programs. On the other hand, political preferences for high welfare spending sometimes go together with weak concerns for "strengthening" family ties. Two examples of this could be the different political preferences of the Republicans and Democrats in the USA, or the Conservatives and the Labour Party in Britain.[29] In terms of the model, a political party that supports a generous Welfare State and also supports policies that favour strong families would be perceived by the electorate to be inefficient, in the sense that it attempts to provide too much insurance. On the other hand, if a party that supports a small Welfare State also supports policies that are seen to go against the family, it would be perceived by the electorate as too mean in the sense that society ends up with too little social insurance.

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[29] The debate in Britain is particularly informative. The Conservatives explicitly say that the Welfare State has weakened the family, while the Labour Party emphasize that because families are now weaker the Welfare State should be made more generous. Note that as long as there has been an exogenous force weakening families (such as an increase in the divorce rates, etc), both statements could be true in our simple model.

The paper may also help explain why political parties treat the Welfare State as a whole - that is, in general, why parties that wish to cut welfare assistance to single mothers also support cuts in unemployment insurance.[30] In terms of our model, all such considerations are driven by the perceived strength of families. Incidentally, we would expect that such parties would be pushing legislation to reverse increases in the divorce rate (as well as the use of birth control methods) as much as such policies are feasible.

III. D. Direct Evidence

Some people seem to accept that the Welfare State displaces some of the functions of the family (see, for example, the recent empirical work on army pensions by Costa (1997)).[31] Perhaps more difficult, however, is to accept that in practice the design of the Welfare State already takes into account the natural strength of family networks, as suggested by our model. Although a formal statistical test is difficult to construct, it would be important to show that something consistent with the mechanisms presented in our model actually takes place in reality.

We believe that the standard descriptions of unemployment benefit programs (e.g. the OECD Jobs Study (1994)) provide such information. The basic fact we use is that unemployment benefit replacement rates depend on family circumstances. Thus, we observe in Australia in 1991, during the first year in unemployment, a single person would receive 28% of his or her previous earnings whereas a person with an employed spouse would receive 0% (a person with a dependent spouse would receive 50% of his or her previous earnings, but this is probably an income effect). A spouse is a very narrow definition of a network, but is probably the only verifiable measure of

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[30] The Conservative Party launched a campaign in 1994 called 'back to basics', appealing for a return to traditional family values, combined with reductions in the State's role as a provider of social insurance on most fronts. See *The Economist*, January 31, 1998.

[31] This does not imply, however, that it is accepted that exchange (i.e. not altruistic) motives are at play. In an earlier version of this paper, we found some evidence that residents of U.S. states with less generous unemployment benefits more often turned for help, in times of need, to their families rather than to the bank and other financial institutions compared to residents of states with relatively more generous benefit programs. However, the data from the G.S.S. on family networks was only available for one year, 1986, and did not allow us to control for fixed effects.

the individual's ability to rely on informal insurance (making State benefits dependent on the unemployment status of a sibling may cause difficulties since an individual may be able to credibly claim that their brother or sister is not willing to help).

The OECD Jobs Study provides information on unemployment benefit replacement rates - not just for Australia - but for 21 countries, in each of the first 3 years of unemployment. In the first year, single individuals receive more State help than married individuals with a spouse in work in 7 of the 21 countries. During the second year, single unemployed individuals receive more help from the State in 12 out of 18 countries (in the remaining 3 countries, the State provides zero benefits in both cases). During the third year, the same is true in 13 out of 14 cases (in the remaining 7 countries, the State provides zero benefits in both cases). Overall, for 32 out of 53 cases (or 60%) in which the State provides unemployment benefits, single people receive more State help than married individuals with working spouses. In every case, single people receive no less help than married individuals with a working spouse.

Furthermore, perhaps the most extreme feature of our model is the absence, in many cases, of solutions where both the State and the family should provide a positive level of benefits. In other words, the State should either opt out completely from the provision of social insurance, or provide such a generous amount that insurance no longer becomes a motive for intra-family transfers. In 21 out of the 32 cases where there is less State help for individuals who can rely on their spouses, the State opts out completely from the provision of social insurance (i.e. the unemployment benefit replacement rate for married individuals is zero).

IV. Concluding Remarks

In the absence of the Welfare State families provide a lot of the social insurance available to an individual. Thus, in order to design the optimal Welfare State, we must first know the effect of public transfers on intra-family insurance. In this paper we use the exchange model of the family (i.e. one that is based on non-altruistic preferences) to study unemployment insurance. Thus, all transfers within families occur because members expect, and receive, reciprocity when

circumstances change. In the benchmark case, public transfers crowd out family insurance transfers one-for-one, so the existence of family insurance is irrelevant for the design of the optimal Welfare State.

The model is then extended to capture the idea that family contracts are informal and not legally enforceable, whereas the State can simply use the power to tax the employed to support individuals on unemployment benefits. When families can only use self-enforcing contracts, an increase in the level of public transfers crowds out family transfers by more than one-for-one. By changing the penalty for defection from the family network, increases in public transfers reduce the set of self-enforceable contracts available to the family. In other words, total transfers to an unemployed individual fall as the generosity of the Welfare State increases. This provides a dramatic departure from the predictions of traditional models.

A direct application of the model lies in designing the optimal size of the Welfare State (in our case, of unemployment benefit programs) when families also provide unemployment insurance (informally). There are two possibilities, depending on the natural strength of families. If families are naturally weak, in the sense that they cannot by themselves provide their members with a generous level of insurance (maybe due to a high rate of time preference, or a difficulty in ostracizing members), the State should intervene and provide all the insurance available to individuals. If families are strong enough to be able to fully insure their members without State support, then the State should either stay out and provide no unemployment insurance, or intervene and become the sole-provider of social insurance.

We consider the possibility that our results are driven by modelling families as inherently weak (they are inferior to the State in terms of contract technology). In the second section of the paper, we assume that families are better than the State at monitoring the activities of family members. This has been called the "peer monitoring view" (Arnott and Stiglitz (1991)). We assume that families can perfectly monitor the search activities of unemployed members while the State does not have this capacity, and hence cannot make unemployment insurance payments contingent

on the amount of search undertaken.[32] Again we find that public transfers crowd out family insurance transfers more than one-for-one. However the implications for the theory of the optimal size of unemployment benefit programs are now somewhat different.

A simple message of this paper is that even if total insurance transfers available to an individual fall as the State increases the generosity of its welfare program (the more than one-for-one crowding out result), it does not mean that the State should not intervene in the provision of social insurance. The paper allows for a number of interesting extensions. We discuss some of these, such as how the rise in divorce rates or the introduction of the pill may be expected to affect the design of the Welfare State; how the model can be used to study welfare programs that assist single mothers; how the different attitudes of political parties towards the family and the Welfare State can be explained; and why a cursory look at the direct evidence available is consistent with the model. It would be incorrect to argue that the huge complexities of the topics covered in the paper can be completely captured in just one simple model. Nevertheless, we believe that the model shows a potentially fruitful way in which we can incorporate families into discussions about the optimal Welfare State.

[32] The model could also be applied to study adverse selection problems, where the family has superior knowledge on individual characteristics vis-a-vis the State.

Appendix I

Remark: (i) The level of family transfers decreases with the rate of time preference when family contracts are non-enforceable, and the enforceability constraint binds. (ii) For a sufficiently low rate of time preference, families are able to enforce full insurance on their own.

Proof: (i) When the enforceability constraint binds, $F(b^f,b^p,u,U) = 0$ and $\delta F/\delta b^f < 0$. Using the implicit function theorem yields

$$sgn(\frac{\partial b^f}{\partial r}) = sgn(-\frac{\partial F}{\partial r}/\frac{\partial F}{\partial b^f}) \qquad \textbf{(A1)}$$

which equals $sgn(\delta F/\delta r)$. When $u = U$ (for identical families), $\delta F/\delta r = z[w-U(b^f + b^p)/(1-U)]-z[w-Ub^p/(1-U)] < 0$. Hence, the level of family transfers decreases with the rate of time preference. (ii) When the rate of time preference is sufficiently low, families alone are able to enforce their own full insurance: for example, when $r = 0$ and $b^p = 0$, full insurance (which occurs when $W = w-Ub^f/(1-U) = b^f$) is enforceable because the net benefit from not cheating, from (12), is positive. It is given by

$$B = \frac{(1-U)t}{U}(z(w-\frac{Ub^f}{1-U}) - z(w)) + t(z(b^f) - z(0)) \qquad \textbf{(A2)}$$

Since $z(w-Ub^f/(1-U))-z(w) > -Ub^f/(1-U)z_w(w-Ub^f/(1-U))$ and $z(b^f)-z(0) > b^f z_{b^f}(b^f)$ (due to diminishing marginal utility, where $z_w(.)$ represents the derivative of $z(.)$ with respect to net wages), these two inequalities imply that $B > -tb^f z_w(w-Ub^f/(1-U)) + tb^f z_{b^f}(b^f) = 0$. Hence B, the net benefit from not cheating, is positive and the enforceability constraint is satisfied when $W = w-Ub^f/(1-U) = b^f$. #

Proposition 3 (More than One-for-One Crowding Out, Part I): When there are no moral hazard problems, and family contracts are non-enforceable, increases in the level of public transfers crowd out family transfers by more than one-for-one.

Proof: Proceed by proof by contradiction to show $\delta b^f/\delta b^p < -1$. That is, assume initially $\delta b^f/\delta b^p \geq -1$. When the enforceability constraint binds, $F(b^f,b^p,u,U) = 0$ and $\delta F/\delta b^f < 0$. Using the implicit function theorem, $-(\delta F/\delta b^p)/(\delta F/\delta b^f) \geq -1$, which implies that $\delta F/\delta b^p \geq \delta F/\delta b^f$. For identical families, $u = U$. Then, from equation (12)

$$\frac{\partial F}{\partial b^p} = t(z_b(b^f + b^p) - z_{b^p}(b^p)) - (j+r)[z_W(w-\frac{U(b^f + b^p)}{1-U})\frac{U}{1-U} -$$

$$z_{W^p}(w-\frac{Ub^p}{1-U})\frac{U}{1-U}] \qquad \textbf{(A3)}$$

and

$$\frac{\partial F}{\partial b^f} = t z_b(b^f + b^p) - (j + r) z_w(w - \frac{U(b^f + b^p)}{1 - U}) \frac{U}{1 - U} \qquad \textbf{(A4)}$$

where z_w(.) represents the derivative of z(.) with respect to wages net of total transfer premiums (w-U($b^f + b^p$)/(1-U)) and z_{w^p}(.) represents the derivative of z(.) with respect to wages net of public transfer premiums (w-Ub^p/(1-U)).

Then $\delta F/\delta b^p \geq \delta F/\delta b^f$ ***implies***

$$-t z_{b^p}(b^p) + \frac{U}{1 - U} z_{w^p}(w - \frac{U b^p}{1 - U})(j + r) \geq 0 \qquad \textbf{(A5)}$$

or

$$\frac{\frac{U}{1-U} z_{w^p}(w - \frac{U b^p}{1-U})}{z_{b^p}(b^p)} \geq \frac{t}{j + r} \qquad \textbf{(A6)}$$

But the binding enforceability constraint implies that

$$\frac{z(w - \frac{U b^p}{1 - U}) - z(w - \frac{U(b^f + b^p)}{1 - U})}{z(b^f + b^p) - z(b^p)} = \frac{t}{j + r} \qquad \textbf{(A7)}$$

Substituting (A7) for the right hand side of the inequality in (A6) implies that

$$\frac{U}{1-U} \geq \frac{z(w - \frac{U b^p}{1 - U}) - z(w - \frac{U(b^f + b^p)}{1 - U})}{z_{w^p}(w - \frac{U b^p}{1-U})} \frac{z_{b^p}(b^p)}{z(b^f + b^p) - z(b^p)} \qquad \textbf{(A8)}$$

Furthermore, diminishing marginal utility means that the following inequalities must hold: [z(w-Ub^p/(1-U))-z(w-U($b^f + b^p$)/(1-U))] / z_{w^p}(w-Ub^p/(1-U)) > Ub^f/(1-U) and z_{b^p}(b^p) > [z($b^f + b^p$)-z(b^p)]/b^f.

Substituting these inequalities into (A8) yields U/(1-U) > U/(1-U), which is the contradiction which we sought. Hence

$$\frac{\partial b^f}{\partial b^p} < -1 \qquad \textbf{(A9)}$$

#

Proposition 4 (Optimal Size of the Welfare State, Part I): When there are no moral hazard problems, and family contracts are non-enforceable, the social welfare maximizing level of public transfers depends on the natural strength of families. If families can enforce full insurance on their own, there exist at least two levels of public transfers which yield a social welfare optimum. Otherwise, there exists a unique level of public transfers maximizing social welfare.

Proof: If families are able to enforce their own full insurance, then $\lambda = 0$ and $F(b^f, b^p, u, U) > 0$ when $b^p = 0$ (from (15)). Hence $M_{bf} = 0$ (from (14)), which implies full insurance: $W = w - Ub^f/(1-U) = b^f$ (from (7)). In the State's problem, this corresponds to families setting $b^f = (1-U)w$ when $b^p = 0$ (see constraint (ii) of problem (16)). Consequently, when the State sets public transfers equal to zero, a social welfare optimum obtains. However, another social welfare optimum also occurs when the State fully insures family members, whose own transfers then equal zero, in which case $W = w - Ub^p/(1-U) = b^p \Rightarrow b^p = (1-U)w$. If families cannot enforce their own full insurance, then $b^p = (1-U)w$ is the unique level of public transfers which maximizes welfare, since no other level of public transfers results in full insurance. #

Proposition 5 (More than One-for-One Crowding Out, Part II): When there are moral hazard problems arising from the provision of public transfers which increase unemployment, and family contracts are non-enforceable, increases in the level of public transfers crowd out family transfers by more than one-for-one.

Proof: Proceed by proof by contradiction to show $\delta b^f/\delta b^p < -1$. That is, assume initially $\delta b^f/\delta b^p \geq -1$. When the enforceability constraint binds, $F(b^f, b^p, u(e(b^p)), U) = 0$ and $\delta F/\delta b^f < 0$. Using the implicit function theorem, $-(\delta F/\delta b^p)/(\delta F/\delta b^f) \geq -1$, which implies that $\delta F/\delta b^p \geq \delta F/\delta b^f$. When family unemployment is a function of public transfers ($u(e(b^p))$), and noting that $u(e(b^p)) = U(b^p) = U$ for identical families in equilibrium, equation (12) implies

$$\frac{\partial F}{\partial b^p} = t(z_b(b^f + b^p) - z_{b^p}(b^p)) - (j+r)[z_W(w - \frac{U(b^f + b^p)}{1-U})(\frac{U}{1-U} +$$

$$(\frac{U}{1-U})_{b^p}(b^f + b^p)) - z_{W^p}(w - \frac{Ub^p}{1-U})(\frac{U}{1-U} + (\frac{U}{1-U})_{b^p} b^p)] +$$

$$(\frac{1-U}{U})_{b^p}[z(w - \frac{U(b^f + b^p)}{1-U}) - z(w - \frac{Ub^p}{1-U})]t \qquad \textbf{(A10)}$$

and

$$\frac{\partial F}{\partial b^f} = tz_b(b^f + b^p) - (j+r)z_W(w - \frac{U(b^f + b^p)}{1-U})\frac{U}{1-U} \qquad \textbf{(A11)}$$

Then $\delta F/\delta b^p \geq \delta F/\delta b^f$ ***implies***

$$-tz_{b^p}(b^p) + (j+r)\frac{U}{1-U}z_{W^p}(w - \frac{Ub^p}{1-U}) - \qquad \textbf{(A12a)}$$

$$(j+r)(\frac{U}{1-U})_{b^p}[z_W(w - \frac{U(b^f + b^p)}{1-U})(b^f + b^p) - z_{W^p}(w - \frac{Ub^p}{1-U})b^p] + \qquad \textbf{(A12b)}$$

$$(\frac{1-U}{U})_{b^p}[z(w - \frac{U(b^f + b^p)}{1-U}) - z(w - \frac{Ub^p}{1-U})]t \geq 0 \qquad \textbf{(A12c)}$$

We now show that it is not possible for this expression to be greater than, or equal to, zero. First, (A12a) is negative from the proof of Proposition 2.

Second, the terms in b^p ***in (A12b) must also be negative, since diminishing marginal utility implies*** $-(j+r)(U/(1-U))_{b^p}[z_W(w-U(b^f+b^p)/(1-U)) - z_{W^p}(w-Ub^p/(1-U))]b^p < 0$.

Third, it is not possible for the remaining part of equation (A12) to be greater than, or equal to, zero. If these terms are non-negative then

$$-(j+r)(\frac{U}{1-U})_{b^p}z_W(w - \frac{U(b^f+b^p)}{1-U})b^f + (\frac{1-U}{U})_{b^p}[z(w - \frac{U(b^f+b^p)}{1-U}) - z(w - \frac{Ub^p}{1-U})]t \geq 0 \qquad \textbf{(A13)}$$

Hence

$$(\frac{j+r}{t})(\frac{U}{1-U})_{b^p}b^f \leq -(\frac{1-U}{U})_{b^p}\frac{z(w - \frac{Ub^p}{1-U}) - z(w - \frac{U(b^f+b^p)}{1-U})}{z_W(w - \frac{U(b^f+b^p)}{1-U})} \qquad \textbf{(A14)}$$

Since $[z(w-Ub^p/(1-U))-z(w-U(b^f+b^p)/(1-U))]/z_W(w-U(b^f+b^p)/(1-U)) < Ub^f/(1-U)$, ***due to diminishing marginal utility, this implies***

$$(\frac{j+r}{t})(\frac{U}{1-U})_{b^p} < -(\frac{1-U}{U})_{b^p}\frac{U}{1-U} \qquad \textbf{(A15)}$$

where $(U/(1-U))_{b^p} = U_{b^p}/(1-U)^2$, $((1-U)/U)_{b^p} = -U_{b^p}/U^2$ and $j = (1-U)t/U$. Substituting for these expressions leads to the contradiction

$$\frac{1}{U} + \frac{r}{t(1-U)} \leq \frac{1}{U} \qquad \textbf{(A16)}$$

The inequality in (A16) is not satisfied: the left-hand side is greater than the right-hand side. Combining these three results implies

$$\frac{\partial b^f}{\partial b^p} < -1 \qquad \textbf{(A17)}$$

#

Proposition 6 (Optimal Size of the Welfare State, Part II): If $S^{PUB} < S^{FAM}$, the social welfare optimum occurs when families are the sole providers of transfers. If $S^{PUB} > S^{FAM}$, the social welfare optimum occurs when the State is the sole provider of transfers.

Proof: When the State provides zero transfers, families can enforce their highest level of transfers (see Proposition 5). Social welfare, $U(b^p)A + (1-U(b^p))B$, is greater at this point than at any positive level of both public and family transfers, since total transfers are higher and unemployment is lower.[33] Thus, if families provide positive transfers in the social welfare optimum, they must be the sole provider of transfers, in which case social welfare equals S^{FAM}.

If $S^{PUB} < S^{FAM}$, families achieve a higher level of welfare by providing transfers for their members than the State achieves alone. Hence, at the welfare optimum, families are the sole providers of transfers.

If $S^{PUB} > S^{FAM}$, the State achieves a higher level of welfare by being the sole-provider of transfers than when both positive family and public transfers exist (since S^{FAM} is the highest level of welfare attainable when family transfers are positive). Hence, at the welfare optimum, the State is the sole provider of transfers. #

[33] Social welfare increases with total transfers to the unemployed (up to full insurance) and decreases with unemployment.

Appendix II

***Figure 1:** Total Transfers and Social Welfare, as a function of Public Transfers, when Family Contracts are Non-enforceable and there exist no Moral Hazard Problems.*

***Figure 2:** Total Transfers and Social Welfare, as a function of Public Transfers, when Family Contracts are Non-enforceable and there exist Moral Hazard Problems for the State.*

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