Does the Welfare State Induce Risk Taking?

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Abstract: In cross-national data on individual and country-level characteristics, the variance of log annual income is shown to correlate positively with indicators of redistribution. The database comes from the Panel Comparability (PACO) project, affiliated with the Luxembourg Income Study (LIS), a first effort to provide comparable panel data across a broad range of countries. Countries in the sample include both eastern and western Europe, and the US. A random effects permanent income regression is used country-by-country to estimate individual-specific income variance. The variance estimates are then regressed on individual and country characteristics. The results indicate robustly that various measures of risk are higher in countries with a higher share of social spending in GDP. The evidence can be interpreted as support for the argument that the Welfare State encourages risk-taking and thereby economic growth.

"The data used in this study are from the public use version of the PACO datafiles, including data from the German Socio-Economic Panel, the British Household Panel Study, the Lorraine Panel Study, the Panel Study of Income Dynamics, the Luxembourg Household Panel Study, the Hungarian Household Panel Study, and the Polish Household Panel. The comparable variables in this datafile were created by the PACO project, coordinated through CEPS/INSTEAD in Luxembourg."

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I. Introduction

One of the central issues in the long-running debate about the Welfare State is its impact on individual behavior with regard to risk. Risk-taking is a wellspring of economic growth, and it has been argued in theory that risk taking can be encouraged by redistributive spending. Redistribution can act as a form of income insurance, reducing the downside potential of risky investments in physical and human capital. At the same time, the Welfare State distorts decisions and has well-known efficiency costs; it may displace various forms of private insurance and self-insurance, so that the net effect of redistribution on risk-taking, savings, and growth is theoretically ambiguous. Recent empirical evidence in fact suggests that there is no general empirical correlation between economic growth and the size of the Welfare State (Lindert, 1996; Persson and Tabellini, 1994). The deadweight losses of redistribution seem to be offset in practice by real benefits. The idea that the Welfare State has real economic benefits is not new, of course, but it is beginning to receive more practical research attention (e.g. Atkinson, 1995, ch. 6; Barr, 1993, p. 3; Sinn, 1996; Haveman, 1988, Chapter 6; Ringen, 1987). The object of this paper is to try to find evidence about the Welfare State's potential effect on growth through its encouragement of risk-taking, an effect that has been discussed before but never measured.

There is some indirect evidence on the issue. Individual pre-tax, pre-transfer income generally exhibits higher variance than post-tax, post-transfer income (Bird, 1995a). This implies that redistribution does seem to have a direct insuring effect on income. If an insuring effect exists, there is the possibility that it may induce agents to make their incomes more risky by undertake riskier activities. Evidence from simulations (Hubbard, Skinner, and Zeldes, 1995) and cross-section regressions (Bird and Hagstrom, 1997) suggest that redistribution does have some

affect on risk-taking behavior, by depressing savings. Individuals who make risky investments in human capital, say, may build up their savings to hedge their bets. Thus, again, redistribution may be providing a cushion that allows individuals to undertake larger economic gambles. If so, the Welfare State could be seen as an encouragment to economic growth.

Ultimately the only way to test whether redistribution affects risk-taking as part of an individual's whole income-generating portfolio is to measure the correlation between the individual's income risk and measures of redistribution policies where the individual lives.[1] We have no evidence on the issue now, because the necessary data are unusual. What is needed is the correlation between aggregate measures of Welfare State activity, on the one hand, and individual level measures of the variance of income, on the other. Measuring this correlation requires panel data, but in order to observe sufficient variation in Welfare State measures it also requires a dataset that crosses major jurisdictional boundaries, ideally countries. Until recently comparable cross-national panel data were limited to two-country pairs, but an ongoing project related to the Luxembourg Income Study (LIS) has generated a seven-country panel data set, the Panel Comparability Project (PACO). The paper uses PACO data to explore the level of income risk, pre- and post-transfer, in the seven countries, and to relate these to various country characteristics, including redistributive and all-governmental spending.

The method is straightforward. Each country's data provides an annual panel of individual incomes. A random effects income regression with robust standard errors ("robust RE regression") is used to estimate the individual component of annual income variance. This is done for pre-transfer income ("market income") and post-transfer income ("disposable income").[2] The difference between market and disposable income risk reveals the impact of transfers on income

risk, and is called the "insurance effect." All of these measures are done separately on each country's data, creating country-by-country cross-sections of risk measures and individual characteristics. These cross-sections are then combined into one cross-national data set, and regressions are run of the risk measures on individual and country characteristics. The country characteristics that can be included in a given regression are limited by the fact that there are only seven countries. Nonetheless the effect of national redistribution efforts can be captured in a number of different ways, and one can be reasonably confident of results that hold up regardless of how "Welfare State" effects are defined and tested.

Indeed the results have a very clear pattern: all else equal, income risk seems to be higher in countries with larger shares of social spending in GDP. This pattern persists despite significant variation in the empirical model. It holds up regardless of the definition of income risk, the exclusion of different countries in the sample (eastern Europe; Germany), the set of macroeconomic controls, whether the equation system is considered separate or simultaneous, and other changes as well. Such a finding is not inconsistent with evidence found by other researchers; for example, that income mobility seems to be no lower in countries with large Welfare States such as Germany as compared to those with small ones, like the U.S. (Burkhauser and Poupore, 1997).

Does this mean that the Welfare State *induces* risk taking? Not necessarily. Certainly the evidence is consistent with this interpretation, but it is also consistent with a competing interpretation, because the causation may run in the opposite direction. If voters in high-risk societies demand more social spending, in order to have more income insurance, then risks and social spending will be positively correlated. However, some of the results here seem to argue

against this interpretation. It turns out that the insuring effect of the Welfare State seems unaffected by its scale, because the gap between pre- and post-transfer risk does not depend on the share of social spending in GDP. Small Welfare States seem to offer just as much income insurance protection as big ones. The patterns of risk are that countries with large Welfare States have much higher risks in *pre-transfer* income, and all countries have about the same gap between pre- and post-transfer income. As a result, the large Welfare States have much higher risks in post-transfer income as well. The higher pre-transfer risk thus seems most likely to be a direct inducement effect of social spending.

The paper is organized as follows. Section II provides a model of risk-taking with main result that agents may respond to an increase in redistributive spending by increasing or decreasing the magnitude of the economic risks they face. Section III describes the methods and the data necessary to determine which of these two outcomes occurs in practice. Section IV presents results for a single-equation regression model of income risk. Section V presents results for a two-equation model of income risk and income mean. Section VI draws further implications.

II. A model of risk-taking

The model, derived from Sinn (1996), will be used to determine the response of risk-taking to changes in the scale of redistribution. It will become clear than even in a very simple model the theoretical relationship between these two is ambiguous. The basic structure is a one-period model with identical agents with preferences in mean-variance space. Sinn notes that μ-σ preferences apply to a wide range of problems; in particular it is not necessary to assume normal

distributions or quadratic preferences. If all distributions belong to the same linear distribution class (see Sinn, 1983, 1990), indifference curves in μ-σ space will be well-behaved with appropriate von Neumann-Morgenstern properties.

Each agent enjoys an income $W = m - e - L$, where m is certain income, L is a potential loss, and e is "effort" undertaken to reduce loss. Let $L = f(e)Z$, where Z is a random variable with mean EZ and standard deviation RZ. The function f(e) has $f'(e) < 0$ and $f''(e) \geq 0$. It is assumed that all loss-prevention efforts can be denominated in terms of cash - a minor simplification that avoids having to model labor choices and the value of time. In addition the variable Z is assumed independently and identically distributed across the population.

Sinn works entirely with a general function f(e) but the comparative static results here will be more intuitive if a functional form is assumed. For maximum clarity in the expressions I will assume a linear form: $f(e) = 1-\delta e$. It will be seen that the value of δ will have to be constrained if the line defining the agent's opportunity set is to have a sensible slope; for now, assume δ a small positive fraction.[3]

Redistribution occurs through proportional taxation. Market income is taxed at the rate τ and a lump-sum transfer t is given to all agents. Post-fisc income becomes $Y = W(1-\tau) + t$.[4] Taking means and variances, expected income is $\mu = (m - e - (1-\delta)EZ)(1 - \tau) + t$ and the standard deviation of income is $\sigma = (1-\tau)(1-\delta e)RZ$. Because the standard deviation of pre-fisc income is higher, $(1-\delta e)RZ$, the model ensures that redistribution lowers income risk (behavior held constant).

For an individual the choice of e affects both μ and σ according to the equations just given. By solving $\sigma(e)$ for e and inserting the result into $\mu(e)$, one can obtain the agent's

opportunity set μ(σ): the set of all combinations of μ and σ made possible by different choices of e. In this case the opportunity set is the curve:

$$OS: \quad \mu(\sigma) = ((m - \frac{1}{\delta})(1 - \tau) + t) + \frac{\sigma}{RZ}(\frac{1}{\delta} - EZ) \qquad \textbf{(1)}$$

It should be the case that higher levels of expected income can only be purchased by accepting higher levels of risk; hence the slope of μ(σ) should be positive; therefore assume $\delta < EZ^{-1}$. Figure 1 depicts the opportunity set, labeled OS. Increases in loss reduction effort are associated with movements downward and to the left - lower mean and lower variance - along the OS line. Preferences are indicated by indifference lines; given a certain placement of the opportunity set, each agent will choose the level of effort that yields a (μ,σ) pair such that the utility trade-off between expected income and income risk equals the rate of transformation of one to the other as effort increases along OS.

Now consider the tax rate τ fixed while t is increased and decreased (the balance of the government budget is irrelevant to the agent's choices). In Equation 1 an increase in t, all else equal, raises the intercept of the OS line. Figure 2 depicts a mapping of values of t ($t_1 < t_2 < t_3$) into opportunity sets OS_1 to OS_3, with a fixed value of τ. The sets differ only in the intercept, and increases in t simply shift the opportunity set upward. All else equal, greater transfers allow agents to choose bundles with higher expected incomes at no increase in risk. The bundles actually chosen will depend on preferences, in particular risk aversion. As transfers shift the opportunity set from OS_1 to OS_3, agents with high risk aversion will choose bundles along a negatively-sloped trajectory, labeled TEL_H to indicate "transfer expansion line, high risk aversion." The negative trajectory suggests a desire to match increases in expected income with

reductions in risk. Agents with low risk aversion (note they are not risk-preferring) will choose a path of bundles like that depicted in TEL_L, with a positive trajectory suggesting a willingness to accept higher risks in order to obtain higher expected income.[5]

The agents' TEL indicates the response of effort (and hence the response of expected income and income risk) to increases in transfers, holding taxes constant. For any value of τ, the government must take these responses into account in order to arrive at balanced budget. In other words, let τ indicate the government's dedication to redistribution; then a political-economic equilibrium requires that, given τ, the government sets a transfer level t that induces an amount of effort such that expected net transfers to each agent are zero. By the law of large numbers and the similarity of the agents (each choosing the same value of e), the government's budget will balance if and only if $t = (m - e - EZ)\tau$. Under this condition, each agent's expected income must be:

$$\mu_{bb} = (m - e - (1 - \delta e)EZ)(1 - \tau) + \tau(m - e - (1 - \delta e)EZ) \quad \textbf{(2)}$$

and the standard deviation of income must be:

$$\sigma_{bb} = (1 - \tau)(1 - \delta e)RZ \quad \textbf{(3)}$$

Thus the set of μ,σ pairs that guarantee a balanced budget will be constrained to lie along the set BB:

$$BB: \quad \mu_{bb}(\sigma_{bb}) = m - \frac{1}{\delta} + \frac{\sigma}{(1 - \tau)RZ}\left(\frac{1}{\delta} - EZ\right) \quad \textbf{(4)}$$

The balanced-budget set BB has a positive slope that is greater than the slope of a given OS set. Increases in redistribution, as measured by τ, cause the balanced budget set to rotate counter-clockwise about its intercept at $m - \delta^{-1}$. A politico-economic equilibrium is an intersection between the balanced-budget set and the associated TEL. As depicted in Figure 3, a fixed value of τ yields a fixed balanced budget set, labeled BB. With τ fixed, the mappings of opportunity sets and preferences (not shown) yield a series of desired μ-σ bundles along the TEL (here only the high risk-aversion TEL is shown). As the government changes t it will find that only one level of transfers balances the budget, namely the level that produces the opportunity set associated with the choice at point X where the TEL and the BB set intersect.

Within this BB-TEL framework, the impact of redistribution on risk-taking can be easily shown. See Figure 4. An increase in taxes τ rotates BB counterclockwise. From Equation 1 it can be seen that each opportunity set is shifted downward (assuming $m < \delta^{-1}$), with no impact on the points of tangency traced out by the TEL. If as with TEL_H agents are relatively risk-averse, the new equilibrium results in a lower value of σ; redistribution lowers income risks. If as with TEL_L the agents are relatively less risk-averse, the new equilibrium results in a higher value of σ; redistribution raises income risk. More properly, increased redistribution induces levels of pre-tax, pre-transfer income risk that are so high that, despite the risk-reducing effect of the redistribution, post-tax, post-transfer income risk has increased.

It is worth stressing that this simple model does not have a fully-specified social welfare function; there is no deadweight loss. Thus we cannot conclude that increases in redistribution improve or degrade social welfare. What can be shown definitively, however, is that *increases in the scale of redistribution may or may not lower post-tax, post-transfer income risk.* The welfare

state may indeed induce risk-taking (and perhaps thereby economic growth), as Sinn and others have argued. At the same time, individuals living in countries with large welfare states may not be economically less vulnerable than those living in countries with smaller ones. Indeed with market insurance mechanisms readily available in the richest countries, individuals in those countries will tend to have a status quo bundle with a high value of μ and a low value of σ. If absolute risk aversion declines with income, agents with such bundles would be relatively willing to accept increases in risk in order to obtain more expected income. Thus one might expect that people in the richest countries live in a world in which all feasible transfer expansion lines are positively-sloped. In that case the model would predict that increases in redistribution unambiguously increase income risk.

III. Method and Data

Determining the empirical effect of redistribution on risk-taking requires two steps. The first is to estimate risk, and the second is to relate the estimated risk to country-level measures of redistribution.

A. Measuring risk

Here *risk* will be defined as the standard deviation of shocks to yearly individual log income. Assume we have data from a single country on N individuals indexed i = 1,..., N, over T years, indexed t = 1,...,T. For each individual we have information on annual income $Y_{it,}$ and a vector of characteristics X_{it}. Log income is y_{it} and is assumed to be determined by the equation

$$y_{it} = \alpha + \beta X_{it} + \nu_i + \varepsilon_{it} \quad \textbf{(5)}$$

with parameters α and β, and error terms ν and ε independently normally distributed, uncorrelated with X, with zero means and variances σ^2_ν and σ^2_i respectively. In addition $E(\varepsilon_{it}\, \varepsilon_{is}) = 0$ if $t \neq s$. We approach $\alpha + \beta X_{it} + \nu_i$ as the individual's permanent income and ε_{it} as the deviation from permanent income in the current period; note that ε_{it} contains both permanent and transitory income shocks, but since the distinction between them is not particularly informative for the main question here (the relation of all risks, however structured, to redistribution), they will not be estimated separately.[6] The error term ν_i is the fixed portion of individual i's permanent income; it varies across the population but not across time periods. For purposes of estimation and interpretation one should assume that the individual knows the value of ν_i but the researcher does not; whereas ε is considered a random variable by both parties. The relevant concept of risk here involves the income deviations unanticipated by the individual (as opposed to the researcher); it depends only on the error term ε_{it}. Denoting the variance of that term σ_i emphasizes that the risks faced by different individuals will be different; it also implies heteroskedasticity (which will require modifications to standard error calculations - see below).

A random effects regression estimates the parameters α and β, as well as the individual-specific income effects ν_i. The residuals from the regression, $e_{it} = y_{it} - \hat{\alpha} - \beta X_{it} - \nu_i$, can be squared and then averaged over the T periods to obtain an estimate of the income variance faced by the individual: $\hat{\sigma}^2_i = \Sigma_T\, e^2_{it}/T$. The square root of the estimate yields $\hat{\sigma}_i$, the standard deviation of the unanticipated income shocks facing this individual, and will be the operational definition of income risk in what follows.

The end result of this step is a cross-section of income risk estimates from a single country. Let period s be a single year in that country's panel (ideally in the middle of the time series). Then the variables $\{X_{is}, \hat{\sigma}_i\}$ form a cross-section sample of individual characteristics matched with the individual estimates of income risk.

B. Relating risk to country characteristics

Repeating step A for several countries yields several cross-sections. In order to keep the risk estimates comparable across countries, of course, each country's panel should have comparable variables and the same length (T). Pooled, these cross-sections form a cross-national cross-section of individuals with matched risks and individual characteristics; weights can be used to ensure that the contribution of each country's sample is the same even if the number of observations differ across countries (see below). The risk estimates are always comparable across countries because, as shocks to log income, they measure relative percent changes.[7] This has two implications: the risk estimates are not denominated in terms of currency and will not be affected by exchange rates; but also, the risk estimates will not be affected by the fact that countries with higher standards of living will generally have higher *absolute* levels of risk.

In the pooled sample, regressions of risk on individual characteristics can also include country-level regressors. One approach would be to include country dummy variables, but it is also possible to include a limited number of country characteristics instead. Of course if there are C countries in the sample and D of them are indicated by a dummy variable in the regression, only C - D - 1 country characteristics variables are admissible; adding more results in a singular variance-covariance matrix. In practice it is good to keep the number of country characteristics

substantially less than C - D, since near-singularity makes all results sensitive to small changes in specification.

Assuming a reasonably robust specification, then, such regressions will indicate how an individual's income risk relates to her own characteristics as well as the characteristics of the country in which she resides:

$$\sigma_{ic} = \alpha + \beta X_{ic} + \gamma Z_c + \varepsilon_{ic} \qquad \textbf{(6)}$$

where the 's' subscript on individual characteristics has now been suppressed, and 'c' subscripts indicate country of residence. This is a simple cross-section and could be estimated by basic OLS. Because of the structure of the PACO sample, however, a large number of additional observations can be obtained if the assumptions of homoskedastic and independent errors is relaxed (see below). The equation will be estimated using weighted OLS with robust Huber-White ('sandwich') standard errors.[8]

The risk regressions are most informative if we know that the direction of causation in any model would be from individual and country characteristics to risks and not vice versa, but there are good reasons to suppose that causation is not in one direction. In particular, although we are interested in testing whether redistribution causes individuals to take on greater risks, citizens in a country where risks are high may demand more income-insuring redistribution measures. As a result a negative correlation between these two would be solid evidence that redistribution reduces risk-taking, but a positive correlation would not necessarily be evidence that it increases risk-taking. At best a positive correlation does not reject the possibility that redistribution enhances risk-taking and the results will be interpreted in this light.[9]

Secondly, the theoretical model in Section II indicates that both income risk and income mean are choice variables, jointly determined. Within the context of a two-equation regression system, the simple single-equation risk regression above is not identified. The regression can still be run, of course, but the results have to be interpreted as simple linear correlations in the data, not as the estimates of a structural model. Estimating the structural model is frustrated by the fact that identifying the equations is virtually impossible: it would require variables which affect income risk and not the income mean. The data are already somewhat limited in the number of variables, because of the need within the PACO project to ensure cross-country comparability. Within the data, there does not seem to be any way of making uncontroversial identifying assumptions. Nonetheless, Section V below will make some questionable assumptions just to identify a structural model and see whether the results differ significantly from the simple correlation model.

C. Data

The data are drawn from the Panel Comparability (PACO) database maintained by CEPS/Instead in Luxembourg.[10] The PACO project takes individual-household income panels from several countries and harmonizes data definitions to allow the fullest possible cross-national comparability. Such a project is obviously difficult, but despite the wide variety of approaches to data collection in the different countries it has been possible to build a joint dataset of remarkable breadth and depth. The PACO countries and years in the release used in this paper include France 1985-1990, Germany (the former west) 1984-1990, Hungary 1992-1994, Luxembourg 1985-1992, Poland 1987-1990, Great Britain 1991-1993, and the US 1983-1987.[11] The sample's great

cross-national variation with respect to social and political institutions is of course very useful for the present study. Within each sample are comparable indicators of household structure, individual employment and education, and income from various sources including transfers. There are, however, some important pieces of information that could not be obtained: in the German data for this release there are no education data, and tax information is not included in the research design. Nonetheless the PACO data provide sufficient information to obtain reasonably accurate estimates of an individual's yearly income variance, and to compare these estimates across significantly different socio-political institutions.

Some of the aspects of the PACO data will affect the practical estimation techniques in noteworthy ways. The smallest number of years in any panel is three, so for comparability each risk estimate must be based on T = 3. Because some countries have significantly more than three years in the panel, using T = 3 would throw away significant amounts of information. Instead the longer panels are broken into two non-overlapping three-year segments. The full set of three-year samples is: France A 1985-1987, France B 1988-1990, Germany A 1985-1987, Germany B 1988-1990, Hungary 1992-1994, Luxembourg A 1987-1989, Luxembourg B 1990-1992, Poland 1988-1990, Great Britain 1991-1993, and US 1985-1987. The 'country dummies' referred to above will in fact be sample dummies, separately identifying both the country and the year in which the observation appears. Of course since individuals can appear in more than one sample, they are not independent. And of course since they are drawn from different countries the errors will not be homoskedastic; hence the need for robust standard error methods.

There are a number of possible conceptual approaches to weighting the sample. Each country's panel contains individual probability weights, and in general these should be and are

applied to all the estimation steps. What is more open to debate in the pooled cross-national data is whether an individual from Luxembourg should have the same weight as one from the United States, or whether Luxembourg's sample as a whole should have the same weight as the US sample as a whole. For the research object here the latter weighting scheme seems more appropriate, since the correlations of most interest are between the levels of income risk in a given country and the approach to redistribution in that country. Luxembourg and the US are thus treated as two distinct and equal units, two observations in the space of Welfare State parameters. The individual-level samples are treated as the source of observations about risk in the two countries. The practical implication of this conceptual decision is that the sum of weights in the US sample equals the sum of weights in that from Great Britain; and, because the Luxembourg data contribute two samples, the sum of weights in both equals one-half of the sum of weights in the US sample.

The samples consist of all individuals over age 17 in all households present throughout all three years of the given sample.[12] Income is assigned to each individual in a household by pooling the household's total annual income from all sources and then dividing by an equivalence scale. The scale used is based roughly on that used by the German social assistance system: the first adult counts as one person, each additional adult counts as 0.8 persons, and each child counts as 0.65 persons. Comparisons using data from the Luxembourg Income Study (LIS, also administered by CEPS/Instead) indicate that variations in equivalence scales will affect measured inequality (and hence probably mobility and risk) within a country but will not affect qualitative comparisons across countries (Burkhauser, Smeeding, and Merz, 1996). The German scale was chosen simply for ease of comprehension: it is straightforward to understand and explain how the

scale translates household income to individual welfare.

Monetary income values in each country's sample were first updated to real 1992 currency using that country's consumer price index; these were then translated into US dollars using IMF purchasing power parity rates. For Poland and Hungary neither step can be done with same reliability as with the western countries in the sample, in Poland especially since the period 1988-1990 was one of extremely high inflation. One approach to these problems would be to consider these countries too 'different' to be included in the study, but alternatively their uniqueness gives the study's conclusions greater generality. In that sense it is valuable to have data from pre- and post-socialist societies, and from societies facing considerable economic stress. The benefit of giving the study this kind of breadth must be weighed against the cost of including data which have accuracy problems. In practice the importance of the East European data can be tested by removing Poland and Hungary from the data and comparing results.

These comments apply to the measures of country characteristics as well. These were taken from various sources, principally World Bank publications. For the East European countries the regular World Bank/IMF sources do not report values on key items, such as the share of social spending in GDP. Fortunately the Bank has conducted specific studies of social policy in both Poland and Hungary, and statistics reported in these studies can be reliably used instead (World Bank, 1993, 1995).

For each individual, several separate estimates of income risk are constructed. Three different estimation methods are applied to market and disposable income to produce a total of six estimates. The first estimation method is the RE permanent income method outlined in section III.A. above, and includes in the set of independent variables (to be described momentarily) the

individual's years of formal education. Since the German data do not include information on education, Version 1 income risk does not exist for Germany. Version 2 is like Version 1 except it does not make use of the education variable; Version 2 income risk thus exists for all countries, including Germany. Version 3 adopts a simplified approach to estimating risk. Rather than conduct a robust RE permanent income regression, the Version 3 method simply detrends the income path of each individual's three-year income time series and defines risk as the standard deviation of income around the trend.

These six measures of risk are used to construct three additional variables of interest, the insurance effect of transfers. Version 1 income insurance is the difference between Version 1 market income risk and Version 1 disposable income risk. Versions 2 and 3 income insurance are defined similarly.

The independent variables in random-effects permanent income estimation regressions have include measures of the individual's age, sex, work status and hours, industry of occupation (if any), household structure, number and age of children, marital status, and for regressions excluding Germany, years of formal education. Lastly the regressions include age-industry interactions with a quadratic in age. Outside the interaction terms, age squared generally is not significant in any of these regressions so results are reported from versions with age only entered linearly.

In the final regressions of risk measures on individual and country characteristics, the independent variables are roughly the same as in the permanent income regressions, except that each regression also includes the individual's market income (in the same version as the dependent variable) as well as its square, and the individual's transfer income. Of course the risk regressions

contain country- and sample-level regressors as well.

IV. Results for a single-equation model

A. Descriptive statistics

Table 1 presents medians of the six income risk versions and the derived income insurance measures by country. Version 1 risk is not systematically different from Version 2, suggesting that the omission of education variables is not significant. Version 3 risk is systematically about half as large as Version 1 or 2, indicating that if individual's form subjective expectations on the basis of their own income path alone, they will systematically expect their incomes to be much more stable than if they also pay attention to the experiences of others in society. Across countries the risk measures have a predictable pattern, with a startling exception. In general, risks are highest in the "duress" economies of Poland and Hungary, somewhat lower in the more stable but more free-market economies of the UK and US, and lowest in western Europe's more advanced Welfare States, except for Germany: German pre-transfer incomes exhibit about as much risk as US incomes. The same result was found in a previous study of risk in the two countries, using quite different methods (Bird, 1995a).

The German transfer system has a relatively low insurance effect, as does Luxembourg's; the French system seems to have a larger impact, and the Anglo-Saxon systems have a larger impact still. The Hungarian transfer system provides the highest level of insurance. Every system provides income insurance in some amount however, and this is a very robust results across the income versions. It confirms the basic proposition that redistribution does reduce the variance of individual incomes.

Table 2 presents these figures, using Version 2 risk, in the context of country characteristics as averaged over the length of the respective samples. The only conclusion that can be drawn is the absence of any obvious simple connection between country characteristics and income risk. On none of the dimensions can countries be ordered by pairs of risks and characteristics. The country with the highest social quota (share of social spending in GDP) is France, which has one of the lower levels of post-transfer risk. Yet Germany's Welfare State is just as large and it has the highest level of post-transfer risk.

Table 3 provides breakdowns of risk levels by individual characteristics, but excluding East European data. The table is meant to reveal the pattern of risks faced by typical individuals in relatively calm developed economies. (The social situation in Eastern European countries is substantially different from that in the west and its impact on risk patterns is worthy of a study of its own.) Recall these risk estimates are relative to income; thus it is interesting that this relative income risk follows an inverted-U shape across the income distribution. Insurance effects do not; the poor enjoy the greatest risk-reduction impact, although that of the rich is not zero. Again confirming earlier results (Bird, 1995b), the PACO data show that income insurance is distributed widely in the population, which may explain the breadth of political support for redistribution. The remaining patterns are intuitive: Women seem to face higher risks than men, and the old higher than the young; stable households and nuclear families face lower risks, as do working individuals as compared to the unemployed.

B. Risk regressions with sample dummies

Table 4 presents a base-case regression of disposable (post-transfer) income risk on

individual characteristics and sample dummies; the means and standard deviations of the variables are included to assist the substantive assessment of the coefficients. (The mean pre-transfer equivalent income of 1.804 translates to about $6,000 in 1992 US dollars.) A number of other regressors are not shown, including industry dummies and industry-age interactions. The income coefficients suggest that risk follows an inverted-U pattern, but with a negative slope throughout the range of observed log incomes. Thus risks fall with income but at a decreasing rate. The transfer income suggests comfortingly that the transfer system is itself not more capricious in providing income than the market. Most of the other variables follow intuitive patterns, although risks seem not to differ significantly by sex, once other variables are taken into account. Risk rises with age and falls with hours of employment; individuals in larger households, married households, and stable households (non-splitting) experience lower risks. Of these, the effect of not changing households is by far the greatest, indicating that a greater source of economic vulnerability is unstable family relations rather than employment or capital market changes.

The last part of the table gives the sample ID dummies, and reveal some counter-intuitive patterns. All of the coefficients express the risk level in the sample as compared to the US sample. First, as one would expect, the US is among the highest-risk economies, with most of the others having risks significantly lower. The mean of the dependent variable here is 0.193 (i.e. there is usually no more than a 40 percent income swing in a given year). The sample dummies indicate that the relative standard deviation of income shocks in the US is about 2 percentage points higher than in the UK, 7 points higher than in France, 9 points higher than in Luxembourg, 14 points higher than in Poland, and 26 points higher than in Hungary. Only in Germany are risks higher than the US, in one sample 3 points higher and in the other 9 points higher. In substantive

terms these effects are very large relative to individual characteristics; for example, a 20-year-old faces risks only about 1.2 percentage points lower than a 50-year-old, and increasing income from the mean by an entire standard deviation (translating from logs, it implies a tripling of income in levels) only lowers risk by 6.8 percentage points. The implication is that individual income risks are more powerfully shaped by socio-economic institutions than that by measurable individual characteristics.[13]

Table 5 explores the robustness of these patterns to variations in the approach to risk. Only a selection of the most important coefficients is shown. The first column uses Version 1 income risk, which includes data on education but excludes the German sample. Adding five years of formal education increases income risks by about 2.7 percentage points, so one implication of graduate school is a small but measurable increase in the riskiness of lifetime income. Otherwise the coefficients follow a very similar pattern to those in Table 3, indicating that the omission of education from the measure of Version 2 risk has little substantive impact. The second column tests the importance of omitting the German sample from column 1; it re-runs the base-case Version 2 regression without the German data, revealing very little substantive change in the patterns (with the possible exception of age, which become even less meaningful than before, and sex, which now shows a slightly higher but statistically insignificant risk for women). The third column in Table 5 runs the base regression on Version 3 income, with no difference in the patterns. The size of the coefficients is systematically different, of course, because the mean of the dependent variable is lower. The Version 3 regression has a substantially worse fit (the R-squared is .1079 as opposed to .1562 for the base case), no doubt a result of the its non-use of cross-sectional information in estimating risk.

Table 6 returns to Version 2 income. The third column simply repeats the base case regression from Table 3, while the first column shows a regression of pre-transfer risk, and the second shows a regression of the income insurance effect. The patterns are revealing of the targeting of income insurance. For example, we see that pre-transfer risk declines at a declining rate with respect to income, and it contributes this pattern to post-transfer risk. Yet the income insurance effect has an opposite pattern, rising at a decreasing rate across the income distribution, in effect amplifying the income-related decline in pre-transfer risk. Similarly, pre-transfer risk rises with age but the insurance effect falls with age, again amplifying rather than dampening the market's distribution of risk. Working in the other direction, the pre-transfer risks faced by women are higher than those faced by men, but the income insurance system wipes the difference out. Also, those receiving higher transfer incomes face significantly higher pre-transfer risks, but the transfers hedge so much of it that post-transfer risk falls with transfers. A neutral effect of the insurance system is found with respect to some variables; for example, changing households greatly increases pre-transfer risks but only slightly increases the insurance effect, so that post-transfer risk remains quite high.

In terms of country effects, Table 6 reveals that the cross-country pattern of post-transfer income risk is largely derived from the pattern of pre-transfer income risk; no country's income insurance system changes its standing in the world with respect to risk. The ordering, from highest risk to lowest, is Germany, US, UK, France, Luxembourg, Poland, Hungary. Except for Germany the ordering seems to suggest that the relatively smaller anglo-saxon Welfare States do the most to encourage risk, the continental welfare states less so, and socialist and post-socialist systems least of all. But of course there is no reason to assign the ordering to Welfare State

structure, since the countries differ on so many other dimensions. Nonetheless, except for Germany, this ordering seems to support the conventional wisdom that the relatively free-market Anglo-US system emphasizes risk-taking while the more protective continental system encourages security. There are three reasons, however, not to simply stop with this conclusion. First is the clear exception of Germany, with its high risks that have been corroborated elsewhere in the literature (e.g. Burkhauser and Poupore, 1997). Second is the fact that the US transfer system, limited though it may be, seems to offer the greatest insurance effect (column 2). Third is the possibility that this simple ordering is produced not by the Welfare State but by other facets of the countries: their size, per capita income, growth rate, etc.

C. Risk regressions with country characteristics

To expose the effect of specific aspects of the different countries, the regressions are run without sample dummies but with aggregate country characteristics. To obtain a reasonable fit on the country characteristics, the number of country variables in a regression will be limited to four.[14] The macro variables should measure the level of redistribution, the state of the business cycle, the wealth of the economy, and the dependence of the economy on world trade. The base-case measures of these four aspects are the social quota (share of social spending in GDP), the unemployment rate, real GDP per capita in US dollars, and real GDP in US dollars. The set of macro variables will be changed to test for the robustness of any conclusions.

Table 7 presents regressions of pre- and post-transfer risk, and the income insurance effect, on the individual-level variables contained in Table 6 but replacing the sample dummies with these four country characteristics. The results indicate that, all else equal, risks are higher in

countries with larger social quotas and in the larger economies; they are lower at the trough of the business cycle and in wealthier economies. The pattern of individual-level effects is largely unchanged. Using the mean country characteristics in Table 2 we can assess the substantive significance of these coefficients. A increasing the social quota from the US level to that of France/Germany would increase pre-transfer risk by about 50 percentage points, obviously a very large increase and much larger than any of the individual-level effects. Increasing the economy size from France to the US has a similarly-sized positive effect. Decreasing the unemployment rate from 9.9 in France to 7.4 in the US increases risk by only 5.6 percentage points, however, and increasing per capita income from the French level to the American reduces risks by only 6.2 percentage points. Thus the large effects in the sample dummies seem to have been produced primarily by the Welfare State on the one hand and the economy size on the other; wealth and the business cycle seem less important. Nonetheless the Welfare State effect is in the opposite direction as one would have concluded from the sample dummies: the larger welfare states in continental Europe seem to encourage risk.

It is worth noting also that these patterns of pre-transfer risk are translated almost directly into similar patterns of post-transfer risk; the insurance effect of transfers is not substantively significant. For example, pre-transfer risk rises with the social quota, but income insurance also rises with the social quota; therefore it is possible that the insurance effect might counteract the pre-transfer risk and leave post-transfer risk *lower* in countries with large social quotas. The results indicate, however, that the impact of larger social quotas on the insurance effect is quite small (.0023), less than one-tenth as large as their impact on pre-transfer risk (0.0341). Hence on net the social quotas increase post-transfer risk, indeed by an amount almost as large (0.0318) as

their effect on pre-transfer risk.[15]

Another surprising implication of the small social quota coefficient in the income insurance regression ($\beta = .0023$) is that the insuring effect of transfers does not seem to depend strongly on the size of the Welfare State. Of course, at some level there has to be an effect: going from having no Welfare State to having one at the smallest level (here, the US at 14 percent of GDP) must do something to create an insurance effect, since the insurance effect is present and positive throughout the sample of individuals. But it may be the case that once a Welfare State is established - a basic system of safety nets, means-tested benefits and social insurance programs - further increases in the scale of the programs has very little effect on the programs' income insuring effect.

The next three tables offer a series of tests of the robustness of these conclusions. Given that pre-transfer risk patterns generally translate strongly into post-transfer risk patterns, the focus for sensitivity will be on the post-transfer regressions. The first direction of sensitivity testing is to change the sample; column one in Table 8 repeats column 3 of Table 7 but leaves out Poland and Hungary, while column 2 switches to Version 1 income and drops the two German samples. In both cases the effect is to weaken the substantive impact of the social quota and transfer some of it to the other three variables. Nonetheless the patterns are the same: the positive effect of the Welfare State on risk levels is not an artifact of including eastern European countries in the sample, nor is it produced by the odd case of Germany, the continental welfare state with high levels of risk.

Next we explore the conjecture of Sinn (1996) that it is all governmental activity, and not the social spending per se, that is the relevant measure of redistribution at the national level.

Table 9 replaces the social quota variable with the share of government spending in GDP, with an opposite outcome. Column 1 repeats column 3 of Table 7; columns 2 and 3 repeat columns 1 and 2 of Table 8 respectively. In the whole sample (column 1), risks rise with the size of government, although more weakly than with social spending alone; this perhaps reflects the greater progressivity of social spending. The same pattern is observed when east European countries are removed (column 2), although when Germany is removed (column 3) the effect of government expenditure on risk is negative.

Finally Table 10 presents regressions with other sets of macroeconomic variables. The coefficient on the social quota is much smaller here but is still positive and statistically significant. The smallest coefficient ($\beta = .0014$) is in the regression in column 3, which uses GDP pre capita, the export share, and GDP growth as the controlling macroeconomic variables. It implies that moving from the US social quota to the French would raise risks by 1.9 percentage points.

To check macro-level robustness in an entirely atheoretical way, one can identify eight macro-level variables that could conceivably be considered as determinants of income risk and then regress Version 2 disposable risk on the social quota and all possible three-element combinations of these eight variables. The eight variables are the unemployment rate, the percentage of GDP received from exports, the inflations rate, the annual change in real GDP, the dependency ratio (the share in total population of the population age 18 and below or age 65 and above), real GDP, real GDP per capita, and the share of government spending in GDP. The permutations produce 56 regressions. All but thirteen of these (77 percent) produce positive and statistically significant coefficients on the social quota variable. Of the thirteen where social quota has a negative effect on risk, nine are regressions that also included the government GDP share; in

each of these cases the coefficient on the government share is positive and statistically significant. The finding that government activity does something to increase risk-taking thus seems very robust to variations in macro-level controls. The mean coefficient on the social quota is 0.007051, which implies that a ten-point increase in the social quota would produce a 37 percent increase in disposable income risk.

The same exercise offers strong evidence that this effect is causal. Running 56 regressions of the Version 2 Insurance Effect on the social quota and all possible permutations of the other macro variables strongly suggests that the insurance effect is not significantly related to the size of the Welfare State. In 34 of the regressions (61 percent), the coefficient on the social quota is negative: increasing the Welfare State *from its current scale among developed countries* produces less and not more income insurance *at the margin*. However, the average coefficient is -0.00014, with the result that a 10-point increase in the social quota would reduce the insurance effect of social spending by only 3 percent. One can conclude that Welfare States of the size range covered in this sample (14 - 28 percent of GDP), will not become *more effective* agents of income insurance simply by increasing scale. It follows that voters perceiving high pre-transfer risks would have little incentive to demand an increase in social spending from these levels; such added spending would not reduce their risks. Thus it is probably not the case that high risks have caused political pressures that lead to high spending; rather, it is more likely that high spending and the security it affords have led people to take more risks.

V. Simultaneous equation model of income mean and income variance

Next, consider a set of assumptions that identify a two-equation system of income mean

and income variance.[16] Let income risk be affected by all the variables included in the single-equation regressions above, but excluding: 1) transfer income and the square of pre-transfer income, and 2) industry dummies and age-industry interactions. The "income mean" is the value of permanent *post-transfer* income that has been estimated for the individual respondent. Let it be affected by all the variables in the single-equation risk regression, *including* income risk but *excluding:* 1) transfer income, pre-transfer income, and the square of pre-transfer income, and 2) children variables (number of kids, age of youngest and oldest). Thus risk is affected by the presence of children but not by the industry of employment, and mean is affected by industry but not the presence of children. It would be difficult to defend these assumptions on theoretical grounds, but they are probably the best available. Some such problematic assumptions are necessary simply to identify the two-equation model and test for its resemblance to single-equation results.

Table 11 shows in fact that there is very little difference in moving to a two-equation system. The first column shows the results for a single-equation risk regression including the industry dummies. Column 2 simply removes the industry dummies to show their impact on the other coefficients. Column 3 presents the results of the risk equation in the two-equation system. The column 3 coefficient on permanent post-transfer income is larger in absolute value than the others, indicating that the endogeneity of the average income level is substantively important. However, none of the other coefficients seem greatly affected. Note especially that the coefficient on social spending in GDP (SQUO) is virtually unchanged across the columns.

Thus while the single-equation results in Section IV cannot be viewed as identified parameters of a two-equation system, they do not seem to differ substantially from those

parameters - which we have identified, if only with rough assumptions. Unfortunately, for this kind of problem it seems unlikely that one could find identifying assumptions that are more acceptable. Thus there are two reasons to believe that the single-equation results provide virtually all the reliable information that can be gleaned from the data: 1) because they produce results similar to a two-equation system, and 2) because no two-equation system would be worthy of great confidence due to the questionable assumptions behind it.

VI. Summary and interpretation

In a cross-national data set of individual and country characteristics, the annual variance of log disposable income is positively correlated with the share of social spending in GDP. While it may be the case that individuals in high-risk countries exert more pressure to expand the level of social spending, the data also indicate that the insuring effect of social spending is not strongly related to changes in the amount of the spending within the scale of spending levels studied here. It seems more likely that the causation runs in the other direction: social spending induces behavior and encourages institutions that increase the level of economic risk in society.

Thus it seems that the Welfare State does induce risk-taking. The results have also shed light on the microeconomic mechanisms whereby this risk-taking might occur. For example, maintaining stable household relationships is second only to income among the important determinants of risk. Household structure is certainly endogenous, and risk is also shown to be affected by a number of other endogenous items: education, work hours, home ownership. It seems reasonable to suppose that the positive risk effects picked up by country-level variables are at least to some extent reflective of unmeasured individual decisions. If so, then the results

support the argument that the Welfare State, through its positive effect on economic stability, encourages risk-taking and thereby economic growth.

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Table 1. Median Levels of Income Risk by Country

Standard Deviation of Log Pre-Transfer Income:	France	Germany	Hungary	Luxem-bourg	Poland	UK	US
Version 1[a]	0.135	---	0.227	0.091	0.190	0.174	0.183
Version 2	0.133	0.190	0.225	0.091	0.189	0.174	0.188
Version 3	0.059	0.079	0.100	0.042	0.121	0.065	0.075
Standard Deviation of Log Post-Transfer Income:							
Version 1	0.111	---	0.151	0.079	0.175	0.142	0.151
Version 2	0.112	0.180	0.146	0.080	0.174	0.142	0.150
Version 3	0.052	0.076	0.076	0.039	0.114	0.058	0.067
Insurance Effect:[b]							
Version 1	0.024	---	0.076	0.012	0.015	0.032	0.032
Version 2	0.021	0.010	0.079	0.011	0.015	0.032	0.038
Version 3	0.007	0.003	0.024	0.003	0.007	0.007	0.008

Notes: Table reports medians of individual-level income risk measures within large national samples of individuals. Sample sizes vary by country and income definition and are weighted - see text.

a) “Version 1" defines income risk as the standard deviation of the residual from a random-effects regression of log income on household and individual characteristics, including education; the German data have no education information. “Version 2" is the same except that it excludes education. “Version 3" is the simple standard deviation of log income around its three-year time trend. “Income” here is the equivalent income per person in the household, in thousands of 1992 US dollars.
b) The “insurance effect” is the difference between the median standard deviation of pre-transfer income and the median standard deviation of post-transfer income.

Source: PACO

Table 2. Income Risks and Country Characteristics

	France	Germany	Hungary	Luxem-bourg	Poland	UK	US
Pre-Transfer Income Risk 2[a]	0.133	0.190	0.225	0.091	0.189	0.174	0.188
Post-Transfer Income Risk 2[a]	0.112	0.180	0.146	0.080	0.174	0.142	0.150
Insurance Effect 2[a]	0.021	0.010	0.079	0.011	0.015	0.032	0.038
Real GDP (1992 $US billions)	988	1,137	61	9	229	929	5,194
Real GDP per capita (1992 $US)	17,680	18,460	5,900	23,260	6,040	16,080	21,770
Annual GDP Growth Rate (%)	2.76	2.77	0.45	4.91	-0.30	0.30	3.80
Unemployment Rate (%)	9.9	6.3	11.6	1.9	0.9	9.9	7.4
Inflation Rate (%)	3.1	1.5	21.8	3.2	286.2	2.6	3.3
Share of GDP from Exports (%)	22.5	32.2	29.4	86.4	4.9	26.4	7.92
Social Quota[b] (%)	28.1	28.0	23.5	26.2	15.7	26.5	14.3
Government Expenditure Share in GDP	41.2	48.7	60.5	36.4	43.2	41.8	23.0
Time Period	85-90	84-90	91-94	85-92	87-90	91-93	83-87

a) Measures refer to income version 2; see Table 1.
b) Share of social spending in GDP.

Sources: World Bank; International Monetary Fund; PACO. Currency amounts converted to $US using IMF estimated purchasing power parities.

Table 3. Income Risk and Individual Characteristics
(Note: Does not include East European data)

Individual and Household Characteristics	Median Pre-Transfer Income Risk[a]	Median Post-Transfer Income Risk[a]	Insurance Effect[a]
All	0.149	0.126	0.023
Income:[b]			
Below ½ median	0.223	0.173	0.050
½ - 1.5 times median	0.146	0.122	0.024
1.5 - 3.0 times median	0.130	0.110	0.020
More than 3.0 times median	0.188	0.169	0.019
Sex:			
Men	0.142	0.123	0.019
Women	0.157	0.130	0.027
Education (no German data):			
8 years or less	0.126	0.100	0.026
9 to 12 years	0.146	0.120	0.026
More than 12 years	0.143	0.124	0.019
Age:			
18-25	0.148	0.126	0.022
26-35	0.125	0.113	0.012
36-55	0.129	0.116	0.013
56-75	0.217	0.164	0.053
76 and higher	0.264	0.165	0.099

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Table 3. (Continued) Income Risk and Individual Characteristics
(Note: Does not include East European data)

Individual and Household Characteristics	Median Pre-Transfer Income Risk[a]	Median Post-Transfer Income Risk[a]	Insurance Effect[a]
All	0.149	0.126	0.023
Household Stability:			
Stable Household	0.148	0.125	0.023
Household Split	0.266	0.222	0.044
Household Type:			
Single Person	0.199	0.156	0.043
Two Adults, No Kids	0.180	0.144	0.036
Two Adults, Kids	0.127	0.113	0.014
Lone Parent	0.208	0.155	0.053
Three-Generation	0.136	0.116	0.020
Work Status:			
Working Now	0.129	0.118	0.011
Unemployed	0.240	0.178	0.062

Observations: 44,147, including 14,220 Germans who are not included for education calculations. Results are weighted medians, using country-level weighting schemes; all weights are adjusted so that each country's sample has the same total weight.

a) Income risk measures are based on Version 2 - See table 1.
b) "Income" is permanent real income (1992 $US) in thousands per person in the individual's household, as adjusted by an equivalence scale.

Table 4. OLS Regression of Post-Transfer Income Risk on
Individual Characteristics and Sample Identifiers

Dependent variable is the standard deviation of the residual from random effects income estimation, with pre-transfer income version 2; sample mean is 0.193, sample s.d. is 0.195.

Variable	Sample Mean	Sample St. Dev.	Coefficient	Standard Error
Pre-transfer income	1.804	1.181	-.1277	*.0052
(Income^2)/1000	.005	.004	14.5768	*1.0073
Transfer income	.251	.422	-.1477	*.0052
Weekly work hours (I)	18.424	22.009	-.0003	*.0001
Work status = employed (I)	.630	.483	-.0107	*.0035
Work status = unemployed (I)	.040	.196	.0034	.0054
Age	42.707	16.527	.0004	*.0001
Sex = female	.517	.500	-.0004	.0026
Relation to Head (I): Head	.480	.500	.0217	*.0034
Spouse	.302	.459	.0161	*.0037
Cohabitor	.017	.130	.0177	*.0083
Family status (I): Married	.508	.500	-.0252	*.0031
Divorced	0.41	.199	-.0003	.0061
Did the respondent change households in past year = yes	.153	.360	.1107	*.0128
HH structure: Lone parent	.049	.217	.0217	*.0056
Three-generation	.058	.235	-.0157	*.0040
Two adults, children	.494	.500	-.0080	*.0031
Two adults, no children	.204	.403	.0137	*.0038
No. of children in household	.799	1.063	-.0097	*.0017
Age of youngest child	3.645	5.406	-.0010	*.0005
Age of oldest child	4.840	6.363	-.0003	.0005

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Table 4 Continued. OLS Regression of Post-Transfer Income Risk on Individual Characteristics and Sample Identifiers, continued

Variable	Sample Mean	Sample St. Dev.	Coefficient	Standard Error
Do the residents own the home? = yes	0.684	.465	.0154	*.0023
SAMPLE DUMMIES[a]				
France 1986	1/14	.258	-.0718	*.0053
France 1989	1/14	.258	-.0755	*.0057
Germany 1985	1/14	.258	.0874	*.0056
Germany 1989	1/14	.258	.0277	*.0052
Hungary 1992	1/7	.350	-.2619	*.0148
Luxembourg 1986	1/14	.258	-.0938	*.0039
Luxembourg 1991	1/14	.258	-.0859	*.0035
Poland 1989	1/7	.350	-.1376	*.0063
United Kingdom 1992	1/7	.350	-.0189	*.0035
Constant	1	--	.4416	*.0109

Source: PACO. N = 51,810, weighted to 70,000. R^2 = .1562.

Notes: Simple OLS regression with robust Huber-White ('sandwich') standard errors. A '*' indicates statistical significance at the .05 confidence level, two-tail test. The regression also includes industry dummies interacted with a quadratic in age. Where it is not clear from the variable name, an (I) indicates the variable is an individual-level variable (as opposed to household-level). All incomes are permanent log income per capita in the respondent's household, adjusted by an equivalence scale, in thousands of real 1992 US$. For "Relationship to Head" the omitted category is "other family members." For marital status, the omitted category is "single or widowed." For household structure, the omitted category is "single-person household." For sample dummies, the omitted category is "United States 1986."

a) Each country's weights are adjusted so that the country's samples contributes an equal share (1/7) of information to the estimates. When there are two separate samples from the same country (France, Germany, Luxembourg), each sample receives ½ of the country weight, i.e. 1/14.

Table 5. OLS Regressions of Different Versions of Post-Transfer Income Risk

Dependent variables are measures of income risk in terms of standard deviation of log income.

	Version 1: RE, no educ. or German data. Mean .178, sd .164		Version 2, but excludes German data. Mean .179, sd .169		Version 3: Deviations from trend. Mean .107, sd .134	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Pre-transfer income	-.1316	*.0060	-.1224	*.0057	-.0645	.0053
(Income^2)/1000	11.1307	*.9336	11.7349	*.9268	5.6778	1.0125
Transfer income	-.1556	*.0068	-.1423	*.0064	-.0721	.0053
Education (years)	.0053	*.0005	--	--	--	--
Age	.0001	.0001	-4.24e-5	9.92e-5	.0002	.0001
Sex = female	-.0005	.0026	-.0015	.0026	-.0017	.0024
Did the respondent change households in past year = yes	.0986	*.0128	.1019	*.0127	.0883	*.0119
SAMPLE DUMMIES						
France 1986	-.0754	*.0052	-.0811	*.0052	-.0199	*.0082
France 1989	-.0763	*.0058	.0795	*.0058	-.0567	*.0047
Germany 1985	--	--	--	--	.0287	*.0046
Germany 1989	--	--	--	--	.0104	*.0052
Hungary 1992	-.2691	*.0154	-.2646	*.0152	-.1677	*.0139
Luxembourg 1986	-.0933	*.0040	-.0983	*.0040	-.0603	*.0031
Luxembourg 1991	-.0794	*.0037	-.0883	*.0035	-.0471	*.0029
Poland 1989	-.1580	*.0074	-.1464	*.0073	-.0596	*.0057
United Kingdom 1992	-.0152	*.0036	-.0206	*.0035	-.0182	*.0030
R^2	.1393		.1322		.1079	

Notes: See previous tables for notes. Regressions also include information on: work status, industry (interacted with a quadratic in age), relationship to head, household structure, and children. Observations: Column 1: 37,008, Column 2: 37,590, Column 3: 32,812.

Table 6. Regressions of Risk and Insurance, With Sample Dummies

Variable	DV: Pre-Transfer Income Risk Mean .241 sd .239		DV: Income Insurance Mean .048 sd .145		DV: Post-Transfer Income Risk Mean .193 Sd .195	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Pre-transfer income	-.1017	*.0058	.0260	*.0044	-.1277	*.0052
(Income^2)/1000	11.2957	*1.1656	-3.2811	*.8972	14.5768	*1.0073
Transfer income	.0614	*.0080	.2092	*.0063	-.1477	*.0052
Weekly work hours	-.0004	*.0001	-.0001	5.38e-5	-.0003	*.0001
Work status = employed	-.0049	.0042	.0058	*.0026	-.0107	*.0035
Work status = unemployed	.0392	*.0078	.0357	*.0055	.0034	.0054
Age	.0002	*.0001	-.0003	*8.72e-5	.0004	*-.0001
Sex = female	.0022	.0032	.0026	.0022	-.0004	.0026
Relation to Head: Head	.0200	*.0045	-.0017	.0032	.0217	*.0034
Spouse	.0153	*.0049	-.0008	.0035	.0161	*.0037
Cohabitor	.0166	.0100	-.0011	.0057	.0177	*.0083
Family status: Married	-.0242	*.0040	.0011	.0027	-.0252	*.0031
Divorced	.0149	.0080	.0151	*.0054	-.0003	.0061
Did the respondent change households in past year = yes	.1352	*.0141	.0246	*.0094	.1111	*.0128

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Table 6. Regressions of Risk and Insurance, with Sample Dummies, continued

Variable	DV: Pre-Transfer Income Risk Mean .241 sd .239		DV: Income Insurance Mean .048 sd .145		DV: Post-Transfer Income Risk Mean .193 sd .195	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
HH structure: Lone parent	.0214	*.0068	-.0003	.0047	.0217	*.0056
Three-generation	-.0070	.0057	.0087	*.0043	-.0157	.0040
Two adults, children	.0022	.0040	.0102	*.0028	-.0080	*.0031
Two adults, 0 children	.0146	*.0049	.0010	.0032	.0137	*.0038
No. of children in household	-.0101	*.0022	-.0005	.0016	-.0097	*.0017
Age of youngest child	3.24e-5	.0006	.0010	*.0004	-.0010	*.0005
Age of oldest child	-.0011	.0007	-.0013	*.0004	-.0003	.0005
Do the residents own the home? = yes	.0098	*.0029	-.0056	*.0019	.0154	*.0023
SAMPLE DUMMIES						
France 1986	-.0959	*.0061	-.0241	*.0036	-.0718	*.0053
France 1989	-.0931	*.0071	-.0176	*.0049	-.0755	*.0057
Germany 1985	.0706	*.0063	-.0167	*.0029	.0874	*.0056
Germany 1989	.0135	*.0059	-.0142	*.0027	.0277	*.0052
Hungary 1992	-.2795	*.0165	-.0176	.0109	-.2619	*.0148
Luxembourg 1986	-.1359	*.0054	-.0421	*.0033	-.0938	*.0039
Luxembourg 1991	-.1225	*.0054	-.0366	*.0041	-.0859	*.0035
Poland 1989	-.1605	*.0072	-.0229	*.0042	-.1376	*.0063
United Kingdom 1992	-.0341	*.0047	-.0152	*.0028	-.0189	*.0035
R^2	.1854		.2971		.1562	

N: 51,810. Regressions based on income Version 2. See notes to previous tables.

Table 7. Regressions of Risk and Insurance, with Country Characteristics

	DV: Pre-Transfer Income Risk Mean .241, sd .239		DV: Income Insurance Mean .048, sd .145		DV: Post-Transfer Income Risk Mean .193, sd .195	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Pre-transfer income	-.0900	*.0057	.0264	*.0043	-.1164	*.0050
(Income^2)/1000	11.055	*1.1485	-3.2232	*.8839	14.2779	*.9907
Transfer income	.0713	*.0078	.2101	*.0062	-.1388	*.0051
Age	.0003	*.0001	-.0003	*8.69e-5	.0006	*.0001
Sex = female	.0033	.0032	.0025	.0022	.0007	.0026
Did the respondent change households in past year = yes	.1049	*.0080	.0293	*.0049	.0755	*.0070
HH structure: Lone parent	.0194	*.0069	-.0003	.0047	.0197	*.0056
Three-generation	-.0115	*.0057	.0084	.0043	-.0199	*.0040
Two adults, children	-.0027	.0040	.0101	*.0028	-.0128	*.0031
Two adults, 0 children	.0134	*.0049	.0009	.0032	.0125	*.0039
MACRO VARIABLES (Group A)						
Social Quota (%)	.0341	*.0010	.0023	*.0005	.0318	*.0009
Unemployment (%)	-.0222	*.0010	-.0009	.0005	-.0214	*.0009
Real GDP per capita (1992 $US thousands)	-.0151	*.0006	-.0020	*.0003	-.0131	*.0005
Real GDP (1992 $US trillions)	.1165	*.0032	.0126	*.0017	.1038	*.0028
R^2	.1736		.2968		.1390	

N: 51,810. Regressions based on income Version 2. Regressions also include information on: work status, industry (interacted with a quadratic in age), relationship to head, and children. See notes to previous tables.

Table 8. Short-Sample Regressions of Risk and Insurance, with Country Characteristics

	DV: Post-transfer Income Risk Mean .195, sd .216 Sample: No east European data		DV: Post-Transfer Income Risk Mean .178, sd .164 Sample: No German data, Version 1 income	
Variable	Coef.	S.E.	Coef.	S.E.
Pre-transfer income	-.1580	*.0077	-.1132	*.0058
(Income^2)/1000	21.6319	*1.5238	10.5110	*.9245
Transfer income	-.1486	*.0078	-.1358	*.0066
Education (years)	—	—	.0048	*.0005
Age	.0006	.0001	.0002	.0001
Sex = female	9.40e-6	.0035	-.0002	.0026
Did the respondent change households in past year = yes	.1193	*.0127	.0207	*.0096
HH structure: Lone parent	.0185	*.0063	-.0098	.0059
Three-generation	-.0156	*.0055	-.0133	*.0041
Two adults, children	-.0150	.0039	-.0174	*.0033
Two adults, 0 children	.0084	*.0047	.0057	.0041
MACRO VARIABLES				
Social Quota (%)	.0243	*.0009	.0190	*.0018
Unemployment (%)	-.0373	*.0013	-.0105	*.0015
Real GDP per capita (1992 $US thousands)	-.0332	*.0011	-.0061	*.0008
Real GDP (1992 $US trillions)	.0978	*.0030	.0655	*.0052
Observations	44,147		37,008	
R^2	.1781		.1205	

Regressions also include information on: work status, industry (interacted with a quadratic in age), relationship to head, and children. See notes to previous tables.

Table 9. Regressions of Risk on Government GDP Share

	DV: Post-Transfer Income Risk Mean .193, sd .195		DV: Post-Transfer Income Risk Mean .195, sd .216		DV: Post-Transfer Income Risk Mean .178, sd .164	
Sample	All countries		No east European countries		Excluding Germany	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Pre-transfer income	-.1132	*.0051	-.1565	*.0077	-.1165	*.0059
(Income^2)/1000	13.5185	*1.001	21.2582	*1.5226	10.9325	*.9308
Transfer income	-.1432	*.0052	-.1471	*.0059	-.1353	*.0066
Education (years)	—	—	—	—	.0049	*.0005
Age	.0005	.0001	.0006	*.0001	.0002	.0001
Sex = female	-.0002	.0026	.0001	.0034	2.6e-5	.0026
Did the respondent change households in past year = yes	-.1270	*.0059	.1197	*.0126	.0570	*.0122
HH structure: Lone parent	.0167	*.0057	.0180	*.0063	.0099	*.0058
Three-generation	.0191	*.0040	.0158	*.0055	-.0142	*.0041
Two adults, children	-.0154	.0032	-.0152	*.0039	-.0167	*.0033
Two adults, 0 children	.0167	*.0039	.0086	.0047	.0054	*.0041
MACRO VARIABLES						
Gov't share in GDP (%)	.0097	*.0004	.0102	*.0004	-.0162	*.0015
Unemployment (%)	-.0017	*.0004	-.0110	*.0010	.0164	*.0011
Real GDP per capita (1992 $US thousands)	.0077	*.0004	-.0046	*.0011	-.0065	*.0008
Real GDP (1992 $US trillions)	.0414	*.0014	.0507	*.0014	-.0407	*.0048
Observations	51,810		44,147		37,008	
R^2	.1304		.1800		.1227	

Regressions also include information on: work status, industry (interacted with a quadratic in age), relationship to head, and children. See notes to previous tables.

Table 10. Sensitivity of Risk and Insurance Effects to Macro Indicators

Dependent variable is Version 2 post-transfer income risk. Mean .193, sd .195

Macro Variables	Group A		Group B		Group C	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Social Quota (%)	.0057	*.0004	.0090	*.0007	.0014	*.0004
Unemployment Rate (%)	-.0029	*.0006	—	—	—	—
Real GDP per capita (1992 $US thousands)	.0072	*.0004	-.0031	*.0004	.0019	*.0008
Real GDP (1992 $US trillions)	—	—	.0337	*.0017	—	—
Share of Exports in GDP (%)	-.1847	*.0084	—	—	-.0996	*.0086
Annual Growth in Real GDP (%)	—	—	.2950	*.1192	.9602	*.1252

N: 51,810. The regressions from which these coefficients are derived include all the variables given in the regressions in the previous table. See notes to previous regression tables.

Table 11. Results from the Risk Equation in a Two-Equation System

	DV: Post-Transfer Income Risk Mean .193, sd .195					
	Single-equation regression, includes industry dummies		Single-equation regression, no industry dummies		Risk equation in a two-equation system	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Post-transfer income[a]	-.0595	*.0028	-.0599	*.0027	-.0706	*.0088
Age	.0002	*.0001	.0002	*.0001	.0002	*.0001
Sex = female	.0008	.0026	.0018	.0025	.0019	.0025
Did the respondent change households in past year = yes	.0951	*.0067	.0944	*.0067	.0913	*.0071
MACRO VARIABLES						
Social Quota (%)	.0372	*.0009	.0367	*.0009	.0373	*.0011
Unemployment (%)	-.0260	*.0008	-.0255	*.0008	-.0258	*.0009
Real GDP per capita (1992 $US thousands)	-.0169	*.0005	-.0165	*.0005	-.0160	*.0006
Real GDP (1992 $US trillions)	.1222	*.0028	.1208	*.0028	.1231	*.0034
R^2	.1195		.1167		.1157	

N: 51,810. Regressions based on income Version 2. Regressions also include information on: work status, household structure, relationship to head, and children. See notes to previous tables.

a) The standard single-equation risk regression breaks post-transfer income into pre-transfer income and transfer income, and also adds a squared term in pre-transfer income. All of these income variables would be endogenous in the multiple-equation setting, so they have been collapsed into the single post-transfer income variable. This allows for a simple two-equation system in income risk and permanent income (referred to as “income mean” in the text).

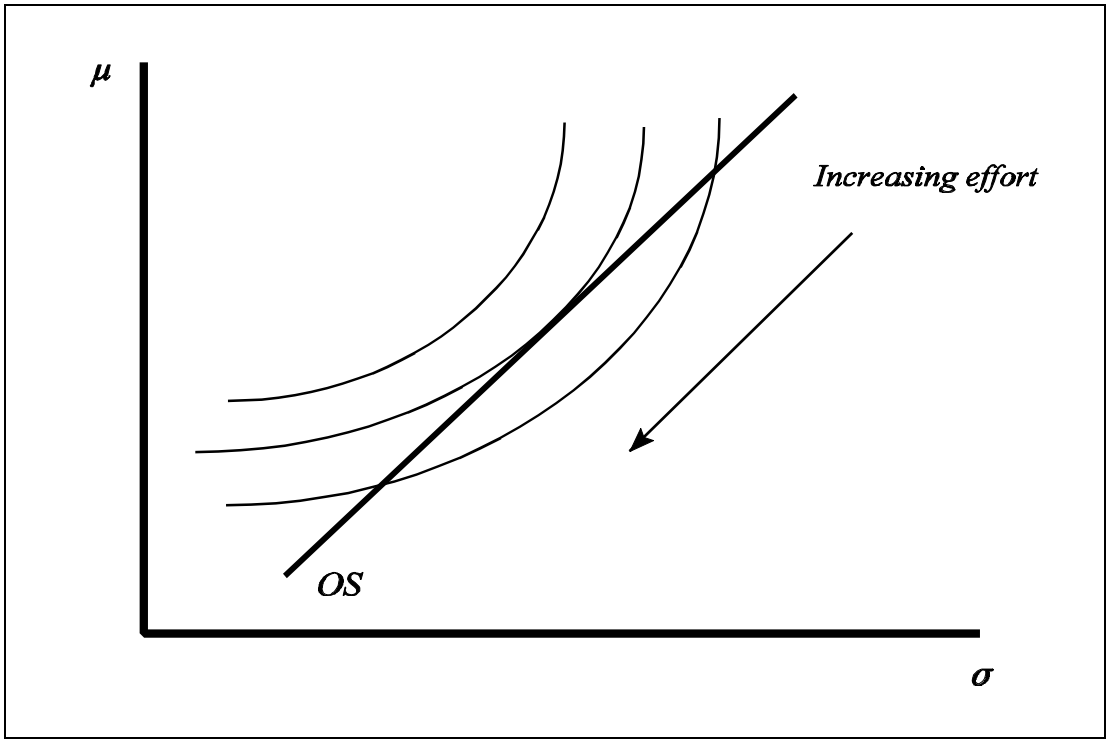

Figure 1. The Opportunity Set

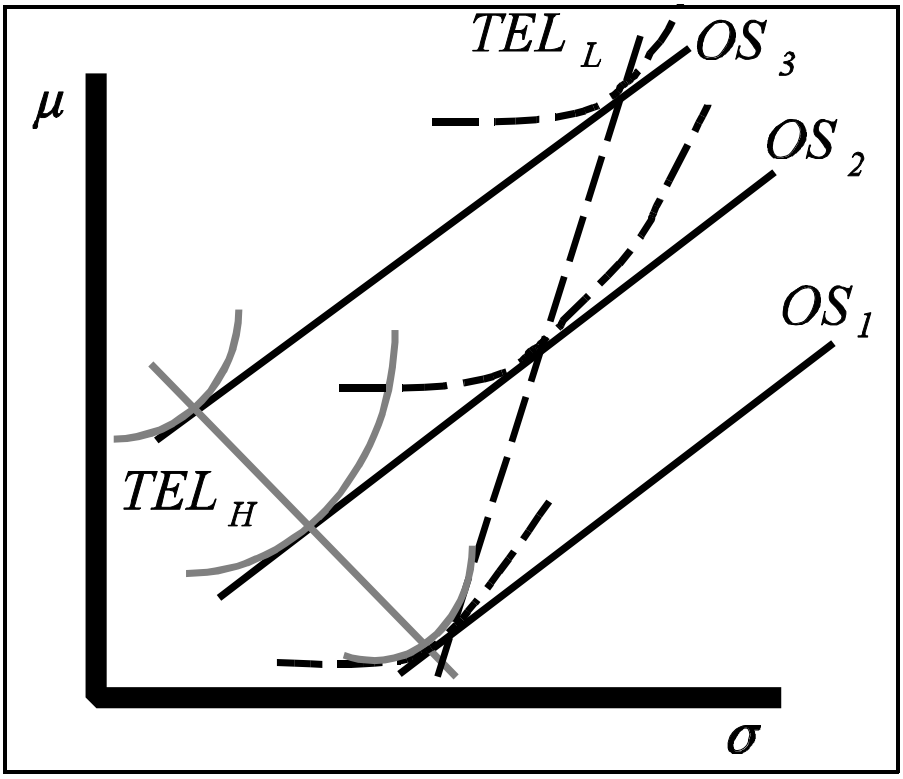

Figure 2. The Transfer Expansion Line

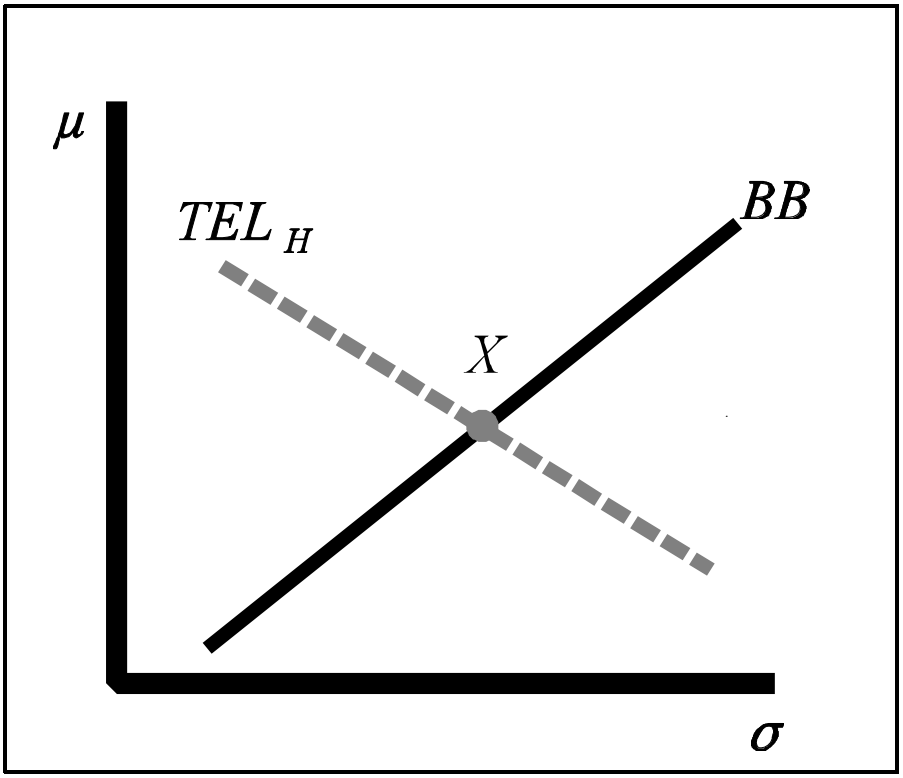

Figure 3. The Balanced Budget Line and Transfer Expansion Lines

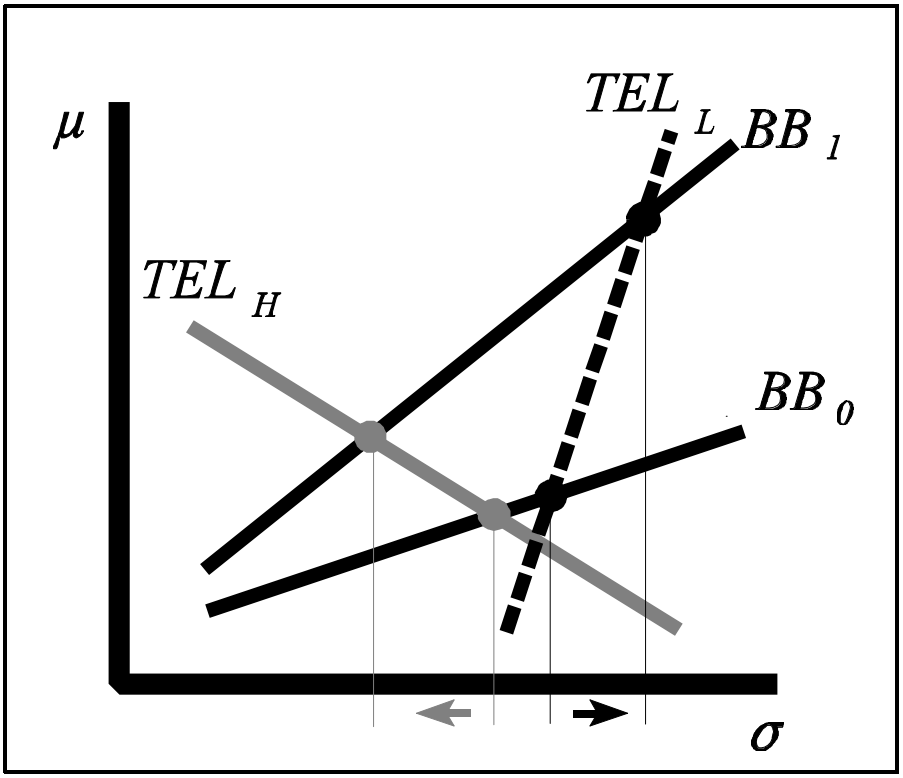

Figure 4. The Effect of Increasing Redistribution on Risk-Taking

Endnotes

1. In Bird (1995b) I compare two countries, Germany and the US, finding that pre-transfer risks are much higher in Germany than in the US. But the German welfare state had a much larger impact on these risks, so that post-transfer risks were remarkably similar in the two countries. Although it considers only two countries, the study is consistent with the idea that the Welfare State induces larger pre-transfer risks and then reduces them via the insurance effect, so that post-transfer risk may be higher or lower.

2. The data contain no information about tax payments. Pre-transfer income is income before taxes and transfers.

3. In the Sinn model, a nonlinear f(e) function allows the slope of the opportunity set to change. Given any reasonable preferences, however, the agent's choice will occur on the positively-sloped segment of the set. To make sure the comparative statics here refer only to choices on this part of the set, δ will be constrained to ensure a positive slope. In effect I am linearizing the feasible, positively-sloped segment of the opportunity set.

4. It is assumed that loss-reduction expenses e are taken from pre-tax income. Sinn motivates the 'loss-prevention' activity as the reallocation of time from market labor to the education of children. In any case the assumption is a simplification, not necessary for any of the results.

5. Declining absolute risk aversion would indicate a TEL whose slope becomes greater in expected value as μ rises.

6. Since we are not estimating the reaction of individuals to the risks they face, the distinction between permanent and transitory shocks is not particularly important. Both types of shocks contribute to income variance in a given period, and it is the combined variance that is of interest. It is not clear, for example, whether the risk-taking that the Welfare State may or may not induce will be more in the nature of shocks to permanent income (long-run risky investments) or to transitory income (one-shot gambles). Fortunately the distinction, which would in any case be difficult to model, is not central to the main questions about the relationship between the overall levels of income risk that people choose and the level of redistribution.

Also, the random effects method for estimating permanent income and total income risk is common; see for example Kazarosian (1997) or Carroll and Samwick (1995).

7. For example: A typical log income shock estimate might indicate a standard error of 0.15, meaning that in 95 percent of the years income does not change by more than 30 percent in either direction.

8. See Hsiao (1986), pp. 57-63.

9. Some of the results seem to suggest that reverse causation is not a severe problem; see below.

10. The datasets available in the PACO group are: the German Socio-Economic Panel, the British Household Panel Study, the Lorraine Panel Study, the Panel Study of Income Dynamics, the Luxembourg Household Panel Study, the Hungarian Household Panel Study, and the Polish Household Panel. Interested researchers can contact the Panel Comparability Project at http://www.ceps.lu.

11. Future releases will include Belgium, the Netherlands, Italy, Portugal, and Spain.

12. Limiting the sample to working-age people by removing the elderly had no significant impact on the results.

13. A competing hypothesis is that the PACO data are simply not well harmonized. One test would be to compare the dummies on the more troublesome eastern countries to those of the more easily harmonized western countries. The eastern dummies are indeed bigger in absolute value, but intuitively so; the eastern socialist economies were in some ways designed to minimize income risk. More importantly, the difference between, say, the Polish dummy and the Luxembourg dummies is smaller than that between the Luxembourg dummies and the UK dummy. That is, interpreting the evidence as indicative of harmonizing problems leads one to conclude that it was more difficult to harmonize the UK and Luxembourg than Poland and Luxembourg, which seems very unlikely. It seems comparatively more reasonable to believe that the dummies indicate real differences in the level of risk across these very diverse socio-economic systems.

14. With seven countries and ten samples, no more than nine country characteristics can be identified, and no more than seven can be identified robustly. When some countries are dropped from the analysis (to test for the sensitivity of results to their presence), the admissible number of country characteristics falls still more. In running various regressions, it was always the case that four country-level effects could be reliably estimated; with five or more, there were occasional problems (e.g. ridiculously large standard errors).

On a conceptual level, however, four country-level variables can control for the national aspects of greatest interest in determining risk. The main question of the paper is the risk effect of social spending, so the spending share in GDP is important to include always. The other three most important macro-level characteristics are not very controversial: one would want a measure of the economy's overall per capita wealth, a measure of its recent growth, and a measure of its susceptibility to external shocks. So a base-case regression might include the social quota, real GDP per capita, the unemployment rate, and aggregate real GDP.

15. It should be noted that the samples are taken at different time periods, so an omitted variable throughout the analysis is the state of the world economy at different times. Ideally to account for this effect one would want comparable cross-national panel data at the same time, but they are simply not available across a sufficiently large number of economies to allow identification of country-level effects.

16. A number of different identifying assumptions were tried without any substantive impact on the results.