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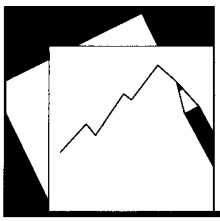

IMF Working Paper

Does Spousal Labor Smooth Fluctuations in Husbands' Earnings? The Role of Liquidity Constraints

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INTERNATIONAL MONETARY FUND

 WP/04/20

IMF Working Paper

European Department

Does Spousal Labor Smooth Fluctuations in Husbands' Earnings? The Role of Liquidity Constraints

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February 2004

Abstract

This paper theoretically and empirically investigates the role of spousal labor in buffering transitory shocks to husbands' earnings. To measure the amount of the shock that spousal labor absorbs, an instrumented cross-sectional variance decomposition is developed. Using data from the Panel Study of Income Dynamics, the paper finds that the smoothing resulting from the wives' labor response (both labor force participation and hours of work) is larger for households with limited access to credit. This finding, which is consistent with the model's prediction, indicates that because of the presence of liquidity constraints, the temporal change in family income (exclusive of wives' earnings) reinforces the substitution effect in explaining the effect of shocks to the husbands' earnings on spousal labor.

JEL Classification Numbers: D1, D91, J21, J22

Keywords: female labor supply, spousal labor participation, consumption smoothing, liquidity constraints

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[1] I have benefited from discussions with Gary Becker, Pierre-Andre Chiappori, Kevin Murphy and Robert Townsend. I also thank Michael Greenstone, Annamaria Lusardi, Lior Menzly, Casey Mulligan, Derek Neal, and Oved Yosha for their helpful comments and suggestions. Any remaining errors are mine. I am also grateful to La Caixa and the Margaret G. Reid Fund for financial support. This paper is a revised version of my University of Chicago Ph.D. dissertation.

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I. INTRODUCTION

To frame the key questions this paper addresses, it is useful to mention the lack of consensus regarding the "added worker effect" (AWE). The literature defines AWE as the temporary change in wives' labor supply (hours worked or participation) in response to transitory shocks in husbands' earnings. First, the existence of the AWE is questioned (see Section II for a review on the mixed empirical results). Further, there is a debate regarding the driving force of this behavioral effect: (i) some papers rationalize the AWE on the basis of substitutability between husbands' and wives' leisure; (ii) others suggest the AWE arises via an income effect.

In an industrial country like the United States where the gender gap in labor participation is relatively small (in the 1980s, 75 percent of married women between the ages 25 and 55 participated in the labor force) should we expect transitory shocks of husbands' earnings to have an impact on spousal labor participation?[2] Is there a cross effect on the wives' hours of work? And returning to the debate on the causality, does the AWE represent an income and/or a substitution effect?

The goal of this paper is to investigate the AWE theoretically and empirically. The methodology used differs from the previous literature: instead of analyzing the direct effect of the husband's earnings shock on the wife's labor supply, this study measures the fraction of the shock absorbed via changes in her labor supply.

In addition, the paper examines if this behavioral effect is driven by either a substitution or an income effect. The approach followed focuses on liquidity constraints to differentiate both effects. In a life cycle setting, a household with credit access will be able to smooth a transitory change in the husband's income over time; consequently, the temporary change in the wife's labor supply, if any, will represent just a substitution effect. On the contrary, for a household with limited access to credit, an income effect will reinforce the substitution effect in driving the spousal labor response.

Using 1980s' U.S. data, this paper finds that adjustments in spousal labor supply (participation and hours change) absorb a fraction of the shock to the husband's earnings. Further, the results show that the smoothing contribution through the wives' labor response is larger for households with limited access to credit. In other words, the existence of a substitution effect is not ruled out, but the temporal change in family income (exclusive of wives' earnings and triggered by the liquidity constraints) dominates the spousal labor response. Thus, this paper offers new evidence regarding the existence of the AWE, and supports the view that liquidity constraints play a major role in explaining the cross effect of transitory shocks in husbands' earnings on spousal labor.

A brief review on the AWE literature is offered in the next section. Section III presents a dynamic model of spousal labor force participation and savings decisions under borrowing constraints and uncertain husbands' earnings. The setting examines the effect of the resources available to the household on spousal labor when the husband suffers a transitory earnings shock. A

[2] Author's calculations using 1975–91 PSID data.

numerical solution of the model reveals that because of borrowing constraints, spousal labor of households with low assets smoothes the fluctuations in income associated with shocks.[3] Although the model only considers spousal labor decisions at the extensive margin, changes at the intensive margin (that is, hours of work) can be easily incorporated into the analysis.

Section IV focuses on the methodology this paper uses to measure the amount of the shock absorbed via spousal labor supply. This framework builds on the cross-sectional variance decomposition method developed in Asdrubali, Sorensen, and Yosha (1996),[4] but it is generalized here to its application to household data—with the explicit incorporation of spousal labor supply as an income smoothing mechanism.

The empirical section, Section V, starts by describing the household data drawn from the Panel Study of Income Dynamics (PSID). Next, the measurement framework is modified for its implementation to the data. In particular, the smoothing contribution of the wife's labor supply is split into the own-wage effect, the cross effect (of the husband's earnings) at the intensive margin, and the cross effect (of the husband's earnings) at the extensive margin. Further, instrumental variables are incorporated in the decomposition. Instruments enable focus on specific shocks to earnings, like unemployment and illness, and guarantee the exogeneity of the change in the husband's earnings, which is a concern when working with household data. Using this framework, cross-sectional covariance decomposition (that is, an instrumented cross-sectional variance decomposition), the paper tests for differences in the degree of income smoothing achieved via adjustments in spousal labor supply (participation and hours change) between families with access to credit and those with limited credit access. Lacking a tangible measure of credit accessibility, this paper uses net wealth and the husband's years of schooling as proxies.

Section VI presents the empirical estimates. The results, which are consistent with the predictions of the model, show that the fraction of the husband's earning shock that is smoothed via spousal labor supply (labor force participation and hours worked) is significantly larger for the group of households with limited access to credit. Section VII reports additional tests that demonstrate the robustness of the results. Several implications of the paper are discussed. Section VIII concludes.

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[3] If the shock is more persistent, smoothing via spousal labor also takes place for households with larger amount of assets.

[4] Asdrubali, Sorensen, and Yosha (1996) decompose the cross-sectional variance in gross state product into several components yielding a relation of the type, $1=\beta_K + \beta_F + \beta_C + \beta_U$, where β_K, β_F, and β_C are the fractions of the shocks to gross state product smoothed via capital markets, by the federal fiscal system, and via credit markets, and β_U is the fraction not smoothed. These authors find that in the federal system of the United States 23 percent of shocks are smoothed by credit markets (adjustments in asset portfolio), 39 percent are smoothed by capital markets (cross-ownership of productive assets), 13 percent are smoothed by the federal government (the tax-transfer system), and 25 percent are not smoothed.

II. ADDED WORKER EFFECT LITERATURE

The "added worker effect" (AWE) refers, as noted above, to the temporary change in the wife's labor supply (hours worked or participation) in response to transitory shocks in household income exclusive of the wife's earnings. Most papers focus on the event of the husband's unemployment, and estimate the wife's employment or the wife's hours worked as a function of the husband's labor status together with other covariates like labor market characteristics and household fixed effects; exceptions are Lundberg (1985) and Tano (1993), who use a framework of wives' labor market transition rates.

To date, as mentioned in the introduction, the results obtained in the AWE literature are mixed. The rejection of the AWE is rationalized on the basis of complementarity between the leisure of husbands and wives (Maloney (1991));[5] and the existence of perfect capital markets operating in an environment of perfect certainty (Heckman and MaCurdy (1980)).[6] Similarly, several arguments have been advanced in support of the AWE: the substitutability of leisure of wives and husbands in home goods production (Ashenfelter (1980), Maloney (1987));[7] an income effect (Pietro-Rodríguez and Rodríguez-Gutiérrez (2000), Maloney (1987));[8] and the presence of liquidity constraints (Mincer (1962), Lundberg (1985), Cullen and Gruber (2000), Finegan and Margo (1994)).

The papers suggesting that the AWE arises from credit market constraints build their argument on Mincer (1962):

> "[…] if assets are low or not liquid, and access to the capital market costly or nonexistent, it might be preferable to make the adjustment to a drop in family income on the money income side rather than on the money expenditure side" (Mincer (1962, p.75)).

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[5] Maloney (1991) finds no evidence of the AWE, and concludes that either the AWE and complementarity offset one another, or that in the absence of any complementarity the AWE is nonexistent.

[6] Heckman and MaCurdy (1980) find no response of female labor supply to transitory income fluctuations holding lifetime wealth constant; this result is reversed in Heckman and MaCurdy (1982).

Other explanations for the lack of AWE are sociological factors like the behavior of women who do not want to work or the behavior of their husbands who do not allow them to do so (Pietro-Rodríguez and Rodríguez-Gutiérrez (2000)).

[7] According to Ashenfelter (1980), a constraint on the head of the household's labor supply (like unemployment) leads the wife to seek more employment in the labor market via a pure substitution effect between the nonmarket time of the husband and the nonmarket time of the wife; he also states that rationalizing the AWE through a substitution effect requires one to determine empirically the degree of substitutability or complementarity that actually exists between the head of the household's leisure and the spouse's leisure.

[8] If leisure is a normal good, a decrease in wife's nonlabor income leads to a decrease in the demand for woman's nonmarket time.

> "Cyclical and random variations in […] income and employment of other family members, particularly of the head, are […] likely to induce temporal variations in the allocation of time between home, market and leisure. It is not surprising, therefore, that over short periods of observation, variation in labor force participation, or turnover, is the outstanding characteristic of labor force behavior of married women" (Mincer (1962, p.68)).

Two recent empirical works present some results on the relationship between the smoothing role of the spousal labor and liquidity constraints, but their findings are not conclusive, indicating that this issue is not completely settled.

First, using data from the Survey of Income and Program Participation, Cullen and Gruber (2000) observe a crowding out effect of unemployment insurance on the wife's labor supply in the event of the husband's unemployment. To test if this effect arises from liquidity constraints, they split the sample of couples with unemployment spells into two groups according to two different criteria. The two criteria are age and likelihood of unemployment. They expect to obtain a larger income effect of unemployment insurance on the wife's labor for couples that are liquidity constrained. But the results between age groups, or between groups characterized by different unemployment risks, are not statistically different.

Second, Dynarski and Gruber (1997) use data from the PSID and Consumer Expenditure Survey (CEX) to investigate the amount of the head of the household's unemployment-induced earnings variation buffered through the wife's labor. They divide the sample by educational attainment and find that in the sample drawn from the PSID the response of spousal labor supply is insignificant. However, in the CEX sample her labor response is not significant for high school dropouts, while significant for high school graduates and college graduates, and even larger for the higher educated groups. This finding seems to contradict the liquidity constraints story.

The empirical ambiguity in Cullen and Gruber (2000) and Dynarski and Gruber (1997), as well as the mixed results on the existence of the AWE, can stem from factors obscuring the spousal behavioral response. Five of these factors are first, that the wife's employment prospects or desired hours of work are affected by the factors causing husband's unemployment (known as the "discouraged worker effect") (Maloney (1987), Lundberg (1985)); second, assortative mating in tastes for work among spouses (Lundberg (1985)); third, a crowding out effect from social insurance programs like unemployment insurance or work relief programs (Tano (1993), Cullen and Gruber (2000), Finegan and Margo (1994)); fourth, that the value of the unemployment benefit received by the husband is linked to the wage received by the spouse (Garcia (1991)); and last, different measurement approaches used in the assessment of the AWE (Lundberg (1985)).

This paper offers new evidence regarding the existence of the AWE, and tests the role of liquidity constraints in explaining this behavioral effect. The approach used differs from the previous literature. In particular, instead of analyzing the direct effect of the husband's current employment status or earnings shock on the wife's labor supply, this study measures, using instrumented cross-sectional variance decomposition, the fraction of the shock absorbed via changes in her labor supply.

III. THE MODEL

This section outlines a dynamic model of spousal labor force participation and saving decisions under borrowing constraints and uncertain husband's earnings. Then the implications of the amount of resources available to the household to the wife's labor responsiveness to the husband's shocks are discussed. While throughout the text, the husband is assumed to be the head of household or breadwinner, future work will analyze the cross effect of the shock to the wife's earnings on the husband's labor supply.

A. The Setup

Consider an economy with a large number of households, the decision units, which are *ex ante* identical but *ex post* heterogeneous (they differ in their histories). Households receive uninsured idiosyncratic shocks to the earnings of the head of household and have access to two alternative mechanisms for insulating consumption from idiosyncratic fluctuations. The two mechanisms are spousal labor supply and self-insurance (accumulation and depletion of a stock of a single asset).

Households make decisions regarding spousal labor and adjust their holdings of a single tradable and interest-bearing asset to maximize the expected value of the discounted sum of one-period utilities in an environment characterized by borrowing constraints, unchanging aggregate variables and uncertainty over the earnings of the head of household. For clarity, the setting abstracts from modeling the influence of consumption insurance devices (like government insurance programs) on these two private mechanisms. Nevertheless, a control for the effect of these mechanisms is incorporated in the empirical section.

At time k, a household indexed by i, with initial assets $a_k^i \geq 0$ and labor income of the head of household ${y^H}_k^i$, chooses a policy for consumption of market goods, $\{c_t^i\}_{t=k}^{\infty}$, and wife's leisure, $\{l_t^{Wi}\}_{t=k}^{\infty}$, to maximize expected lifetime utility conditional on information available at time k,

$$E_k\left(\sum_{t=k}^{\infty}\beta^{t-k}U(c_t^i, l_t^{Wi})\right) \tag{1a}$$

subject to

$$c_t^i + a_{t+1}^i = a_t^i(1+r) + {y^H}_t^i + (1-l_t^{Wi})w, \tag{1b}$$

$$l_t^{Wi} \in \{1, \bar{l}\}, \tag{1c}$$

$$c_t^i \geq 0, \tag{1d}$$

$$a_{t+1}^i \geq 0, \tag{1e}$$

where $\beta \in (0,1)$ is the discount factor; r is rate of return on the asset which satisfies to be less than the rate of time preference;[9] and w is the earning power of the wife.[10]

Head of household's labor supply is considered to be inelastic and separable from the instantaneous utility, U. On the contrary, the household derives utility from wife's leisure through the direct consumption of leisure and through the consumption of home produced goods and services. Unlike the head of household's labor supply, wife's leisure is a decision variable, which can take either value: 1 if the wife does not participate in the labor market, or $\bar{l}$ when the wife works. Hence, only the spousal labor supply decisions at the extensive margin are modeled. Despite this limitation, changes at the intensive margin can be easily incorporated in the analysis.

The support for the head's earnings, $y^{H^i}_t$, is bounded and given by $[\, y^H_{\min}, y^H_{\max}\,]$ with $y^H_{\min}>0$. The log of head's labor income, $\ln(y^{H^i}_t)$, is assumed to be governed by an i.i.d. process.

Next, the superscript i is omitted. The household's Bellman equation is

$$V(a_t; y^H_t) = \max_{\substack{a_{t+1} \\ l^W_t \in \{1,\bar{l}\}}} \left\{ U(c_t, l^W_t) + \beta E_t \left[V(a_{t+1}; y^H_{t+1}) \right] \right\} \tag{2a}$$

subject to

$$c_t = -a_{t+1} + a_t(1+r) + y^H_t + (1 - l^W_t)w, \tag{2b}$$

$$c_t \geq 0, \tag{2c}$$

$$a_{t+1} \geq 0. \tag{2d}$$

The solution to the Bellman equation is characterized by two policy functions: $a_{t+1} = A(a_t; y^H_t)$ and $l^W_t = L(a_t; y^H_t)$. The first maps this period's asset holdings and head's earnings into an optimal choice of assets to carry into next period, while the second yields the optimal current spousal leisure given the pair $(a_t; y^H_t)$. Alternatively, the policy functions can the expressed as $a_{t+1} = \tilde{A}(z_t)$ and $l^W_t = \tilde{L}(z_t)$, where $z_t \equiv a_t(1+r) + y^H_t$. In words, z_t can be thought as the household's current resources exclusive of wife's earnings.

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[9] Without aggregate uncertainty but with uninsured idiosyncratic risk and limited borrowing, consumption, c_t, and asset holdings, a_t, must converge to ∞ a.s. if $\beta(1+r) \geq 1$ (Ljungqvist and Sargent (2000)). In other words, the precautionary savings motive leads to an interest rate lower than the rate of time preference which chokes the desire to accumulate an infinite amount of assets (Aiyagari (1994)).

[10] The model presented in this paper is one of partial equilibrium; in particular, I made no attempt to model the determinants of the interest rate or the wife's earning power, which are assumed to be exogenous and constant.

B. Policy Functions

Ignore, for a moment, the choice of spousal participation so that the problem collapses to the standard savings-consumption problem with an instantaneous utility function $U(c_t, l_t^W) = u(c_t)$, which is increasing, strictly concave, and differentiable. Then, under the appropriate conditions, as shown by Aiyagari (1994) and Deaton (1991), there exists an asset demand function $a_{t+1} = \widetilde{A}(z_t)$ where $z_t \equiv a_t(1+r) + y_t^H$, which is continuous, and has a unique kink at $x^* > y_{\min}^H$, satisfying that whenever $z_t \leq x^*$, it would be optimal to consume all current resources (i.e., set $c_t = z_t$) and set $a_{t+1} = 0$; while for $z_t \geq x^*$, both c_t and a_{t+1} are strictly increasing in z_t with slope less than unity.[11]

In addition to savings consider, as in the model in this paper, that the household can rely on the spousal labor participation to smooth fluctuations in head of household's earnings but at the cost of household utility. Also assume that the instantaneous utility function is separable within period for consumption and spousal leisure, that is, $U(c_t, l_t^W) = u(c_t) - v(1-l_t^W)$, with $u(c_t)$ increasing, strictly concave, and differentiable, and with $v(1-l_t^W)$ satisfying $v(0) = 0$ and increasing in $(1-l_t^W)$. Since the leisure choice is restricted to the set $\{1, \bar{l}\}$, the instantaneous utility function may take only two forms that are increasing, strictly concave and differentiable in consumption: $U(c_t, 1) = u(c_t)$ if the wife does not work at date t, and $U(c_t, \bar{l}) = u(c_t) - \kappa$, where $\kappa = v(1-\bar{l})$, if she works.

Then, the Bellman equation can be rewritten as

$$V(z_t) = \max\left\{ V^1(z_t), V^2(z_t) \right\} \tag{3}$$

where

$$V^1(z_t) = \max_{a_{t+1}} \left\{ u(-a_{t+1} + z_t) + \beta E_t\left[V(z_{t+1})\right] \right\} \tag{4a}$$

subject to $z_t = a_t(1+r) + y_t^H$, $c_t \geq 0$, $a_{t+1} \geq 0$, $c_t = -a_{t+1} + z_t$ (4b)

and

$$V^2(z_t) = \max_{a_{t+1}} \left\{ u(-a_{t+1} + z_t + (1-\bar{l})w) - \kappa + \beta E_t\left[V(z_{t+1})\right] \right\} \tag{5a}$$

subject to $z_t = a_t(1+r) + y_t^H$, $c_t \geq 0$, $a_{t+1} \geq 0$, $c_t = -a_{t+1} + z_t + (1-\bar{l})w$ (5b)

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[11] The conditions are $r < (1-\beta)/\beta$ together with some additional assumptions on $u(c_t)$ in order to guarantee that asset holdings do not converge to infinity a.s. The key assumption on $u(c_t)$ is the bounded relative risk aversion coefficient, which the negative exponential utility function violates; if the utility does not satisfy this condition, for $r < (1-\beta)/\beta$, asset holdings converge to infinity a.s. (Aiyagari (1994), Deaton (1991), Schechtman and Escudero (1977)).

Let Z denote the level of current resources exclusive of the wife's earnings at which the V^1 and V^2 are equal. If $z_t \leq Z$, the optimal strategy is that the wife works at t, while if $z_t \geq Z$, it is optimal that the wife does not work. [12]

C. Parameterization and Numerical Computation of the Model Solution

Figure 1 illustrates the asset, spousal labor participation and consumption rules as a function of z_t, the household's total resources exclusive of wife's earnings at date t. The numerical solution is computed assuming the functional forms of $u(c_t)$ and $v(1-l_t^W)$ are given by

$$u(c_t) = \frac{\left(c_t\right)^{1-\alpha}}{1-\alpha}, \qquad \text{and} \qquad v\left(1-l_t^W\right) = \frac{\left(1-l_t^W\right)^{1+\upsilon}}{1+\upsilon}, \qquad (6)$$

with parameters values $\alpha = 3$, $\upsilon = 0.3$, $\beta = 0.95$, $(1+r) = 1.02$, $\bar{l} = 0$ and $w = 0.24$. The i.i.d. earnings stochastic process is approximated with a 5-state Markov chain with the variance of log earnings innovations, σ^2, set equal 0.16.[13,14]

The asset decision rule exhibits a flat region, where the borrowing constraint is binding. For this region, all current resources are being consumed and no assets are being carried into next period; thus, the consumption function follows the 45-degree line. For the area where households are not bound by the borrowing constraint, both the asset function and the consumption function are increasing in z_t, but with slope less than unity. Z is the level of current resources below which the optimal strategy is that the wife participates in the labor market.

Figure 2 shows a 100 period simulation for a household in the economy described above. The objective of this exercise is to highlight that both asset holdings and spousal labor are smoothing devices; that is, both mechanisms absorb a fraction of the variability of husband's earnings yielding a consumption path smoother than earnings.

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[12] It might be the case that the functions V^1 and V^2 do not cross. Then, the strategy is for the wife to never work if V^1 exceeds V^2, while the optimal decision is to always participate in the market if V^2 exceeds V^1. The sufficient condition for the existence of Z is that at the lowest permissible value of current resources, which is $z_t = y_{\min}^H$ (i.e. $a_t = 0$ and the worst draw on earnings), $V^2(0;\ y_{\min}^H) > V^1(0;\ y_{\min}^H)$, while for the maximum value current resources may take (which corresponds to the best draw on earnings and a large a_t), $V^2(a_t; y_{\max}^H) < V^1(a_t; y_{\max}^H)$. If this condition is satisfied, the wife will change her participation decision in order to smooth the fluctuations in the head of the household's earnings.

[13] I follow the procedure described in Tauchen's (1986) and Deaton (1991) to replace the continuous stochastic earnings process of the head of the household by a discrete-state Markov chain approximation.

[14] This value for σ fall in the range of those reported in Abowd and Card (1987, 1989) and Heaton and Lucas (1993).

The figure also illustrates the model implication that the amounts of the husband's earnings shock that the wife's labor supply smoothes away is a function of the amount of current resources (exclusive of the wife's earnings). In particular, because the wife's labor force participation is costly to the household in terms of forgone utility, the optimal decision to buffer a transitory drop in earnings is to deplete asset holdings unless the amount of current resources is low.

IV. SMOOTHING MEASUREMENT FRAMEWORK

This section outlines a framework that enables us to measure the amount of the shock to the head of the household's earnings absorbed via changes in spousal labor. The framework builds on the cross-sectional variance decomposition method developed in Asdrubali, Sorensen, and Yosha (1996), and it is generalized here to its application to household data—with the incorporation of spousal labor as a smoothing device. Section V further modifies the measurement framework for its implementation to the data drawn from the PSID.

Consider the identity,

$$y^{H^i}_t = \left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t} \right) \left(\frac{y^{H^i}_t + y^{W^i}_t}{y^{H^i}_t + y^{W^i}_t + m^i_t} \right) c^i_t, \tag{7}$$

where the subscript t indexes time; the superscript i indexes households; y^H is labor income of the husband; y^W denotes the labor income of the wife; and m is the income adjustment via saving and dissaving so that the summation $\left(y^H + y^W + m\right)$ equals total household consumption, c. Remember borrowing is precluded in the model.

Taking logs and differences, we get

$$\Delta \ln y^{H^i}_t = \Delta \ln \left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t} \right) + \Delta \ln \left(\frac{y^{H^i}_t + y^{W^i}_t}{y^{H^i}_t + y^{W^i}_t + m^i_t} \right) + \Delta \ln c^i_t . \tag{8}$$

Then, multiplying both sides of Equation (8) by the left hand side, $\Delta \ln y^{H^i}_t$, subtracting the square of the mean of $\Delta \ln y^{H^i}_t$, and taking expectations yields the following cross-sectional variance decomposition of the shock to head's earnings:

$$Var\left(\Delta \ln y^{H^i}_t \right) = Cov\left(\Delta \ln y^{H^i}_t, \Delta \ln \left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t} \right) \right) + Cov\left(\Delta \ln y^{H^i}_t, \Delta \ln \left(\frac{y^{H^i}_t + y^{W^i}_t}{y^{H^i}_t + y^{W^i}_t + m^i_t} \right) \right) +$$
$$+ Cov\left(\Delta \ln y^{H^i}_t, \Delta \ln c^i_t \right) \tag{9}$$

Dividing Equation (9) by $Var\left(\Delta \ln y^{H^i}_t\right)$, we get $1 = \beta^1 + \beta^2 + \beta^U$. The interpretation of the beta coefficients is as follows: β^1 and β^2 are, respectively, the incremental percentages of the husband's earning shock smoothed via the wife's labor participation and the accumulation/decumulation of assets. β^U is the percentage of the shock non-smoothed, measured in terms of household consumption.

V. EMPIRICAL SECTION

This section generalizes the measurement framework for its application to the household data drawn from the PSID. First, the data are described.

A. Data

The data used are drawn from the PSID survey years 1975-1991. The PSID is an annual panel survey interviewing U.S. individuals and the households in which they reside. The PSID provides detailed information on annual income, labor force participation, and demographic characteristics for each household member.

Unlike income and labor market information, consumption is recorded for households, which are, not broken down by household members. Moreover, consumption is limited to food expenditures both at home and away from home, and it is missing for years 1988 and 1989.[15] Further, while earnings and labor market information refer to the year preceding the survey, the timing of the consumption questions is not exactly clear. Some authors like Hall and Mishkin (1982) and Dynarski and Gruber (1997) have interpreted that expenditures refer to the previous year and therefore coincide with the timing of the income information, and others like Zeldes (1989) have argued that consumption refers to the current consumption flow at the time of the interview. Because of the limitations regarding the PSID consumption data (limited to food consumption, the timing issue, and missing data for the years 1988 and 1989), this paper measures the unsmoothed fraction of the shock in terms of household disposable income rather than in terms of household consumption.

The smoothing measurement framework requires information on changes to the relevant variables. I choose a three-year interval period in the analysis rather than a growth period of one or two years. One reason is that the wife's labor supply is expected to be less responsive to husbands' earnings shocks over a small differencing interval because first, changing the labor force status requires spending some time searching for a job, and second, hours worked are more flexible in the medium than in the short run. Another reason is that longer periods might be associated with changes in living standards and in the need for the wife's labor at home; then, it would be argued that the spousal labor force supply changes are driven by household changes rather than by sudden shocks to husbands' earnings.

[15] The PSID reports housing information for several survey years.

Sample selection

This paper focuses on a sample of continuously married couples (with or without children and with or without other adult members in the household) with non zero earnings for the husband either at the beginning and/or at the end of the three-year interval and with neither spouse younger than 25 or older than 54 at the time of the interview.[16] After the sample selection issues and elimination of outliers, as explained in detail in the Appendix, the panel sample consists of 7,587 observations on 2,288 households, spread over the years 1978-90.[17]

One concern is that by restricting the sample to observations for households continuously married, the results are affected by a selection bias. Indeed, divorce/separation can be thought as an alternative smoothing device for the wife when the husband suffers a disappointing earning shock. Table 1 stratifies observations based on the magnitude of the shock to husband's earnings, and shows the distribution of the sample according to the marital status change. The event of continuing to remain married does not appear to be related to the size of the earnings shock. This result suggests that the empirical estimates reported in Section VI are not seriously affected by the selection of the population.

Access to credit? criteria for splitting the sample

Testing the model implications requires classifying household observations according to the level of resources available to the household, which in turns depends on credit accessibility. Unfortunately, an accurate measure of access to credit is not available. For this reason, the sample is split on the basis of two criteria.

First, I use the measure of net wealth reported in the PSID as a proxy for accessibility to credit. The PSID computes net wealth by summing the market value of house (main home), other real estate, vehicles, farm or business, stocks, cash accounts, and other assets, and by subtracting remaining mortgage principal (main home) and other debts. Based on this measure of net wealth, observations were split into "limited credit access" and "access to credit" groups. According to the reported net wealth at the beginning of the three-year interval period, I placed a household observation in the "limited access to credit" group if the net wealth recorded was less than \$18,900 (the 40^{th} percentile of the distribution), or in the "access to credit" group if the answer exceeded \$39,700 (the 60^{th} percentile of the distribution).[18] Using this criterion on net wealth, the resulting sub-sample consists of 1,485 observations corresponding to 793 households.

[16] Wife refers to a female partner not necessarily married to the head of the household.

[17] I indexed the growth variables to the end of the three-year timing interval, for example, 1978 was the time index corresponding to the change from 1975 to 1978.

[18] This information was collected in the 1984 survey. Therefore, it corresponds to the three-year interval 1984–87. By exploiting the panel structure, I also assigned the reported net wealth by a household to its entries over the periods 1985–88 and 1983–86.

The robustness of the results is evaluated using a different variable to proxy for access to credit, which is the education of the husband.[19] Households were included in the group with low access to credit if the husband's education was less than 12 years of schooling (1,267 observations corresponding to 434 households), or in the group with access to credit if the education was at least 16 years (1,814 observations corresponding to 536 households).

Descriptive statistics and definition of variables

Panel A of Table 2 illustrates the demographic characteristics of the total sample (Column (1)), and of the households split up into "limited access to credit" and "access to credit" groups based on the PSID net wealth measure (Columns (2) and (3), and Columns (3) and (5), respectively). Columns (2) and (4) correspond to those household observations with a positive shock to husbands' earnings, and Columns (3) and (5) to the observations with a bad shock. First, the "limited access to credit" group has a larger family size, and is slightly younger and less well educated than the "access to credit" group. In fact, husbands with 16 or more years of education are scarce in the group with limited access to credit, while those with less than 12 years of schooling are rare in the group with credit accessibility. This illustrates that classifying household observations according to the education of the husband is an alternative criterion for capturing accessibility to credit. Within each net wealth group, households receiving a positive earnings shock are somewhat more educated than those affected by a negative shock as the literature has described: Katz and Murphy (1992) show that during the 1980s, education-based wage differentials increased, with a particularly sharp rise in the relative earnings of college graduates.

The descriptive statistics of the key variables used in the analysis are reported in Panel B of Table 2. These variables are annual labor income for the husband, y^H;[20] annual labor income for the wife, y^W; wife's annual average hourly earnings, w^W; wife's actual annual hours worked for money, h^W; annual household labor earnings, (y^H+y^W); and annual total family disposable income, y^d.[21] All income responses have been deflated using the implicit price deflator for personal consumption expenditures from the National Income and Product Accounts.

[19] Unlike the net wealth measure provided by the PSID, education does not inform about mortgages or other debt commitments.

[20] Labor income is measured as the sum of wages and salaries, bonuses, commissions and overtime, and income from business, professional practice or trade.

[21] Household disposable income was constructed by subtracting total federal income taxes paid from total pretax household money income. Total pretax household income is reported by the PSID, and includes total taxable income of head and wife (labor income, interests, dividends, alimony income, asset part income of farm income, roomers and market gardening), and total transfers of the household (ADC/AFDC, Supplemental Security Income, Social Security, retirement pensions and annuities, unemployment compensation, child support, help received from relatives, and other transfer income).

Using three different values for the wife's own labor elasticity chosen accordingly to those found in the literature, θ={-0.17, 0.25, 1.64}, I computed $\hat{h}_t^{\theta,W}$.[22,23] The variable $\hat{h}_t^{\theta,W}$ stands for the hours of work that we expect to observe for the wife at time *t* as a result of the change in her hourly earnings between *t-1* and *t*, if her husband's earnings remain constant.

Regression analysis is necessary to establish a causal relationship between the husband's shock and the spousal labor supply response, and to further examine the effect of credit accessibility on this relationship. Next, the estimation equations are presented, and Section VI contains the empirical results.

B. Cross-Sectional Covariance Decomposition

In what follows, the measurement framework outlined in Section IV is modified by (i) splitting the contribution of spousal labor supply into her own wage effect, the cross effect (of the husband's earnings) at the intensive margin, and the cross effect (of the husband's earnings) at the extensive margin; and (ii) by incorporating instrumental variables in the decomposition. The objective of instrumenting is to focus on specific shocks to husband's earnings, such as shocks due to illness, or shocks due to unemployment. In addition, the instrumented decomposition guarantees the exogeneity of the head of the household's earnings shock, which is a concern when working with household data.

A decomposition of the first term in Equation (8), the term that captures the buffering of the husband's shock via the wife's labor supply, is proposed. Let d_1 and d_0 be dummy variables defined as d_1^i=1 if the wife is working at both *t-1* and *t*; 0 otherwise; and d_0^i=1-d_1^i. So for household *i*, $\left(d_1^i + d_0^i\right)$ equal 1.

$$\Delta \ln y^{H^i}_t = d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t}\right) + d_0^i \cdot \Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t}\right) + \Delta \ln\left(\frac{y^{H^i}_t + y^{W^i}_t}{y^{H^i}_t + y^{W^i}_t + m_t^i}\right) + \Delta \ln y^{d^i}_t \tag{10}$$

[22] These elasticities agree with those found in the literature for female labor supply elasticities, but are conservative; Heckman and Killingsworth (1986) report compensated wage elasticities as high as 15.

[23] Using a broad range of labor supply elasticities, θ={-0.17, 0.25, 1.64}, I estimated three values for $\hat{h}_t^{\theta,W}$, the wife's annual hours of work corresponding to her own wage change.

$$\hat{h}_t^{\theta,W} = h_{t-1}^W\left(1 + \theta\frac{w_t^W - w_{t-1}^W}{w_{t-1}^W}\right)$$

As indicated above, because of the limited information on expenditures provided by the PSID, the unsmoothed fraction of the shock is measured in terms of household disposable income, y^d, rather than in terms of household consumption. Therefore, income adjustments via credit market do not enter in m; instead, m consists of income from capital market participation, transfers to the household, and taxes. The theoretical model presented in Section III ignored these other insurance devices.

Several transformations of the first term in Equation (10) are implemented. First, note that if the income contribution of the wife's labor income is different from zero, and its value does not move with the shock to the husband's earnings, it will still smooth the shock. For example, suppose the earnings of the husband decrease 50 percent between time *t-1* and *t*; if the wife's labor income remained constant between both periods and equaled the earnings of the husband at *t-1*, then the decrease of the household labor income would be 25 percent, and not 50 percent. To disentangle the *active* smoothing of wife's labor supply from its *passive* component, the following decomposition is used:[24]

$$d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_t}\right) = d_1^i \cdot \left[\Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_{t-1}}\right) + \Delta \ln\left(\frac{y^{H^i}_t + y^{W^i}_{t-1}}{y^{H^i}_t + y^{W^i}_t}\right)\right], \qquad (11)$$

where the first term in brackets captures the smoothing contribution of the wife's labor supply if her earnings remained fixed between *t-1* and *t*. The second term measures the *active* smoothing of the wife's labor supply due to the changes at the intensive margin between *t-1* and *t*.

The expression above can be rewritten as

$$d_1^i\left[\Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_{t-1}}\right) + \Delta \ln\left(\frac{y^{H^i}_t + y^{W^i}_{t-1}}{y^{H^i}_t + y^{W^i}_t}\right)\right] =$$

$$= d_1^i\left[\Delta \ln\left(\frac{y^{H^i}_t}{y^{H^i}_t + y^{W^i}_{t-1}}\right) + \Delta \ln\left(\frac{y^{H^i}_t + y^{W^i}_{t-1}}{y^{H^i}_t + w^{W^i}_t h^{W^i}_{t-1}}\right) + \Delta \ln\left(\frac{y^{H^i}_t + w^{W^i}_t h^{W^i}_{t-1}}{y^{H^i}_t + w^{W^i}_t \hat{h}^{\theta,W^i}_t}\right) + \Delta \ln\left(\frac{y^{H^i}_t + w^{W^i}_t \hat{h}^{\theta,W^i}_t}{y^{H^i}_t + w^{W^i}_t h^{W^i}_t}\right)\right] \qquad (12)$$

where the second term corresponds to the smoothing contribution of exogenous changes in the wife's wage; the third captures the response of the wife's hours to her own wage shock; and the fourth term measures the movement in hours not explained by her wage change.

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[24] $\Delta \ln\left(y^{H^i}_t + y^{W^i}_{t-1}\right) = \ln\left(\left(y^{H^i}_t + y^{W^i}_{t-1}\right) \Big/ \left(y^{H^i}_{t-1} + y^{W^i}_{t-1}\right)\right)$

After these transformations to the first term in Equation (10), multiply both sides of the equation by Q_t^i, subtract the mean of $\Delta \ln y^{H^i}{}_t$ times the mean of Q_t^i, and take expectations. The following cross-sectional covariance decomposition (expression analogous to the cross sectional variance decomposition in Equation (9)) is obtained:

$$
\begin{aligned}
Cov\left(Q_t^i, \Delta \ln y^{H^i}{}_t\right) = {} & Cov\left(Q_t^i, d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}{}_t}{y^{H^i}{}_t + y^{W^i}{}_{t-1}}\right)\right) + Cov\left(Q_t^i, d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}{}_t + y^{W^i}{}_{t-1}}{y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_{t-1}}\right)\right) + \\
& + Cov\left(Q_t^i, d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_{t-1}}{y^{H^i}{}_t + w^{W^i}{}_t \hat{h}^{\theta, W^i}{}_t}\right)\right) + + Cov\left(Q_t^i, d_1^i \cdot \Delta \ln\left(\frac{y^{H^i}{}_t + w^{W^i}{}_t \hat{h}^{\theta, W^i}{}_t}{y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_t}\right)\right) + \\
& + Cov\left(Q_t^i, d_0^i \cdot \Delta \ln\left(\frac{y^{H^i}{}_t}{y^{H^i}{}_t + y^{W^i}{}_t}\right)\right) + Cov\left(Q_t^i, \Delta \ln\left(\frac{y^{H^i}{}_t + y^{W^i}{}_t}{y^{d^i}{}_t}\right)\right) + \\
& + Cov\left(Q_t^i, \Delta \ln y^{d^i}{}_t\right) \qquad (13)
\end{aligned}
$$

Dividing Equation (13) by the left hand side, $Cov\left(Q_t^i, \Delta \ln y^{H^i}{}_t\right)$, yields the beta relationship $1 = \beta^{1,pass} + \beta^{1,w} + \beta^{1,\hat{h}} + \beta^{1,h} + \beta^{1,partic} + \beta^2 + \beta^U$, where the beta coefficients are the instrumental variable estimates in the following system of equations, with the right hand side, $\Delta \ln y^{H^i}{}_t$, being instrumented with Q_t^i.[25]

$$d_1^i\left[\Delta \ln y^{H^i}{}_t - \Delta \ln\left(y^{H^i}{}_t + y^{W^i}{}_{t-1}\right)\right] = \gamma_0^{1,pass} + \alpha_t^{1,pass} + \beta^{1,pass} \Delta \ln y^{H^i}{}_t + \varepsilon_t^{1,pass,i} \qquad (14a)$$

$$d_1^i\left[\Delta \ln\left(y^{H^i}{}_t + y^{W^i}{}_{t-1}\right) - \Delta \ln\left(y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_{t-1}\right)\right] = \gamma_0^{1,w} + \alpha_t^{1,w} + \beta^{1,w} \Delta \ln y^{H^i}{}_t + \varepsilon_t^{1,w,i} \qquad (14b)$$

$$d_1^i\left[\Delta \ln\left(y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_{t-1}\right) - \Delta \ln\left(y^{H^i}{}_t + w^{W^i}{}_t \hat{h}^{\theta, W^i}{}_t\right)\right] = \gamma_0^{1,\hat{h}} + \alpha_t^{1,\hat{h}} + \beta^{1,\hat{h}} \Delta \ln y^{H^i}{}_t + \varepsilon_t^{1,\hat{h},i} \qquad (14c)$$

$$d_1^i\left[\Delta \ln\left(y^{H^i}{}_t + w^{W^i}{}_t \hat{h}^{\theta, W^i}{}_t\right) - \Delta \ln\left(y^{H^i}{}_t + w^{W^i}{}_t h^{W^i}{}_t\right)\right] = \gamma_0^{1,h} + \alpha_t^{1,h} + \beta^{1,h} \Delta \ln y^{H^i}{}_t + \varepsilon_t^{1,h,i} \qquad (14d)$$

$$d_0^i\left[\Delta \ln y^{H^i}{}_t - \Delta \ln\left(y^{H^i}{}_t + y^{W^i}{}_t\right)\right] = \gamma_0^{1,partic} + \alpha_t^{1,partic} + \beta^{1,partic} \Delta \ln y^{H^i}{}_t + \varepsilon_t^{1,partic,i} \qquad (14e)$$

$$\Delta \ln\left(y^{H^i}{}_t + y^{W^i}{}_t\right) - \Delta \ln y^{d^i}{}_t = \gamma_0^2 + \alpha_t^2 + \beta^2 \Delta \ln y^{H^i}{}_t + \varepsilon_t^{2,i} \qquad (14f)$$

$$\Delta \ln y^{d^i}{}_t = \gamma_0^U + \alpha_t^U + \beta^U \Delta \ln y^{H^i}{}_t + \varepsilon_t^{U,i} \qquad (14g)$$

[25] α_t are time-fixed effects controlling for aggregate fluctuations in the economy, that is, uninsurable shocks.

By using the instrument, Q_t^i, we keep only the variation of the husband's earning shock, $\Delta \ln y^{H^i}{}_t$, that co-varies with the instrumental variable. Two different instruments, designated $Q_t^{i,unemp}$ and $Q_t^{i,sick}$ are used in Section VI. The first one, $Q_t^{i,unemp}$, is defined as the change in the husband's annual hours of work lost due to unemployment; then, it picks the variation of the head of the household's earnings due to unemployment. The second instrument enables focus on fluctuations in earnings driven by health related shocks. $Q_t^{i,sick}$ is constructed as the change in the head of the household's annual hours of work lost because of illness. Note that unemployment and sickness are shocks to hours worked, which are more transitory than changes in wages.

The beta coefficients, $\beta^{1,pass}$, $\beta^{1,w}$, $\beta^{1,\hat{h}}$, $\beta^{1,h}$, and $\beta^{1,partic}$, measure, respectively, the incremental percentages of the instrumented shock to the husband's labor income smoothed via the *passive* mechanism; the change in the wife's wages; the change in hours worked due to the own wage effect; the cross effect (of the husband's earnings) at the intensive margin; and the cross effect (of the husband's earnings) at the extensive margin. The beta coefficients are not constrained to lie between 0 and 1; therefore, negative coefficients are possible and represent dissmoothing. β^U is the percentage of the instrumented shock that is non-smoothed, measured in terms of disposable income.

Other smoothing channels, such as transfers, the capital market, and taxation, can be easily incorporated into the analysis. However, the advantage of this methodology is that the contribution of these other channels is absorbed by β^2 (the term prior to β^U). So the combined contribution of these other mechanisms is still measurable.[26]

VI. Empirical Results

This section presents the main results of the cross sectional covariance decomposition. All the equations in the system of equations numbered (14) are estimated using the full sample. Next, the paper tests for differences in the degree of income smoothing achieved via adjustments in the spousal labor force (participation and hours change) between households with and without access to credit.

[26] As mentioned in the main text, because of data limitations, the analysis concentrates on how disposable income is buffered from shocks to the labor income of the household head. Further smoothing of the earnings shock is possible via the credit market (borrowing and lending) and via adjustments in durables holdings, so the percentage change of non-durable consumption due to an earnings shock will be smaller than the percentage effect of the shock on disposable income.

A. Estimates of the Smoothing Role of the Wife's Labor—Full Sample

Smoothing of the total shock, $\Delta \ln y^H$

Table 3 shows the estimates corresponding to the decomposition of the total shock to the head's labor earnings, $\Delta \ln y^H$. Year dummies were included to control for aggregate shocks. Panel A reports the estimates for the full sample, whereas the sample used in Panel B excludes observations with zero husband's earnings at *t-1* and *t*. Hence, estimates in Panel B are free from the weight of these influential though very informative observations. Columns (1-10) measure the incremental fractions of the shock to the husband's earnings absorbed by each of the following levels of smoothing: *passive* mechanism of the wife's labor income, $\beta^{l,pass}$; the change in the wife's wages, $\beta^{l,w}$; the change in hours worked due to the own wage effect, $\beta^{1,\hat{h}}$; the cross effect (of husband's earnings) at the intensive margin, $\beta^{l,h}$; the cross effect (of husband's earnings) at the extensive margin, $\beta^{l,partic}$; and other income sources β^2. The beta estimate in Column (11), β^U, measures in terms of disposable income the incremental fraction of the shock not smoothed. Columns (3-8) differ in the elasticity, θ, used to split up the smoothing contribution of the change in the wife's hours of work into the parts explained and unexplained by her own wage change.

As expected, the wife's response at the extensive margin is especially responsive to zero earnings. Column (9) in Panel A shows that a considerable part of the shock to head's labor earning, 9.7 percent, is absorbed through spousal participation.

Panel B tells that 36.1 percent of the shock is buffered through the passive component of the wife's labor supply (Column (1)). Changes in the wife's wages are correlated with the husband's shock, as the negative sign of the estimate in Column (2) illustrates. Changes at the intensive margin not explained by the wife's wage change (see Columns (4), (6), (8)) also smooth a small fraction of the head's earnings shock. The remaining smoothed part of the shock, 20.9 percent, is absorbed via other pretax income mechanisms (like transfers and taxation).

Smoothing of diverse components of the shock, $\Delta \ln y^H$: instrumented decomposition

The analysis here explores two sources of variation in earnings: unemployment and sickness. The use of instruments is motivated by the concern on endogeneity. It is plausible that the estimates in Table 4 are driven by changes in preferences, rather than by exogenous shocks to earnings. In other words, the husband's labor income could be a decision variable, and consequently, the change in earnings, $\Delta \ln y^H$, could be correlated with changes in preferences. Still, results obtained in the previous section are robust to some preference shifts like household composition changes because of the sample selection process described above.

Table 4 presents the 2SLS of the wife's response at the extensive margin, $\beta^{l,partic}$, while Table 5 shows the 2SLS of the wife's response at the intensive margin not driven by her own wage change, $\beta^{l,h}$.

Panel A in Table 4 includes all the observations in the sample, while Panel B excludes those with zero earnings for the husband at *t* or *t-1*. Regardless of the instrument used, the estimates of $\beta^{l,partic}$ in Panel A are statistically significant, and similar to the coefficient obtained using the total shock to the husband's earnings (Column (1)). Therefore, it appears that both sources of variation in the husband's earnings exert a similar effect on the wife's labor participation.

When the influential observations are excluded (Panel B), the spousal labor participation still responds to the hours lost due to unemployment. But, the response to hours of work lost due to illness vanishes (Column (3) of Panel B). In fact, the estimate turns negative but insignificant. The interpretation is that when the sickness shock leads to zero earnings for a whole year, the wife enters the labor market and smoothes the household income loss. However, when the magnitude of the shock is not so pervasive, as is the case in Panel B, the need of the wife to possibly take care of the sick husband prevents her from entering the labor market.

Table 5 reports the instrumental estimates of the spousal response at the intensive margin, $\beta^{l,h}$. Panels A, B and C correspond to the different values for the spousal own labor supply elasticity, θ={-0.17, 0.25, 1.64}. The sample used excludes the household observations that report zero earnings either at the beginning or at the end of the three-year period. Results imply that the earnings loss driven by unemployment leads to a change in the number of hours worked by the spouse. Similar to the response observed at the extensive margin in Table 5, the coefficient for $\beta^{l,h}$ is negative, though not significant, when the shock is instrumented with Q^{sick}.

The conclusion of the estimates reported in Tables 3, 4, and 5 is that during the 1980s, for the overall U.S. population, the shock to the husbands' earnings had an effect on the spousal labor supply at the extensive and at the intensive margins. In other words, the results support the existence of the AWE. As a result of this cross effect, the wives' labor contributed to smoothing a fraction of the husbands' shocks.

B. The Effect of Credit Accessibility on the Smoothing Role of the Wife's Labor

The natural question to ask is what the cause of the cross effect of the husband's earnings shock on the spousal labor is. Is it driven by the substitutability between the leisure of the husband and the wife, or by the temporal drop in family income because of the presence of liquidity constraints?

To determine the causality of the AWE, this section disentangles the spouse's response in those households with limited access to credit from the response of households with credit accessibility. To separate these responses, a dummy *b* equal to one for households with access to credit is incorporated in the equations that estimate the wife's response at the intensive and extensive margins (Equations (14d) and (14e)) as an intercept and also interacted with the husband's earnings shock. The Equation (14e), for example, takes the form,

$$d_0^i\left[\Delta \ln y^{H^i}{}_t - \Delta \ln\left(y^{H^i}{}_t + y^{W^i}{}_t\right)\right] =$$

$$= \gamma_{0N}^{1,partic} + (\gamma_{0H}^{1,partic} - \gamma_{0L}^{1,partic})b + \alpha_t^{1,partic} + \beta_L^{1,partic}\Delta \ln y^{H^i}{}_t + \left(\beta_H^{1,partic} - \beta_L^{1,partic}\right)\Delta \ln y^{H^i}{}_t \cdot b + \varepsilon_t^{1,partic,i} \quad (15)$$

where the subscript *L* indexes households with limited access to credit, and *H* stands for households with credit access. Therefore, $\beta_L^{1,partic}$ measures the incremental fraction of the shock smoothed via the wife's labor participation in households with limited credit access, whereas $\beta_H^{1,partic}$ refers to households with credit access.

If the ability to smooth the husband's income shock via the credit market matters for the spouse's labor, her response (labor participation and hours worked), if any, will be smaller for households with access to credit than for households with limited credit access. The results are presented in what follows.

By credit accessibility: smoothing via spousal labor participation, $\beta^{1,partic}$

As mentioned in Section V, this paper uses two different criteria to proxy for access to credit: the PSID net wealth measure and the husband's education. Panel I in Table 6 shows the empirical estimates for the wife's response at the extensive margin using the first criteria, while Panel II presents the estimates obtained using the second.

The estimates corresponding to the cross-sectional variance decomposition of the total husband's shock show that the amount of the shock smoothed via labor participation for the households facing borrowing constraints exceeds that for households with credit access (Panels A and C). This result is robust after excluding observations with zero earnings for the husband (Panels B and D). Further, the estimate for $\beta^{1,partic}$ is significant for the group with credit accessibility (Columns (4), (6), and (8)); this finding may be attributed to the existence of a substitution effect between the leisure of the husband and the wife, or to a misclassification of some households.

The sensitivity of the relationship between credit accessibility and spousal labor participation response to different sources of variation in earnings is also examined. Specifically, the instruments used are $Q_t^{i,unemp}$ and $Q_t^{i,sick}$, already defined above.

The results of the cross-sectional variance decomposition with $Q_t^{i,sick}$ as instrumental variable confirm that the smoothing contribution of the wife's participation is larger for the group of households with limited access to credit, while absent for households not facing liquidity constraints (Panels A and C). However, when the influential observations are excluded, the spousal response to the illness shock disappears (Columns (3) and (7)). As stated above, this outcome may be explained by the need for the wife to remain at home to take care of the husband. Hence, an illness shock to the husband prevents her from entering the labor market unless the shock leads to a great loss in earnings.

The wife's labor contributes to smoothing the unemployment shock, but there are no significant differences in the response based on credit access (Panels C and D). It is possible that because of assortative mating among spouses, the factors driving the husband's unemployment affect the wife's employment prospects. Therefore, the observed wife's labor participation departs from the desired employment response.

By credit accessibility: smoothing via spousal labor changes at the intensive margin, $\beta^{1,h}$

The role of credit accessibility for the wife's response at the intensive margin (change in hours worked not explained by her own wage shock) is examined in Table 7. The estimates correspond to the cross sectional variance decomposition of the total shock to the head of the household's earnings, and to the instrumented decomposition with the instruments $Q_t^{i,unemp}$ and $Q_t^{i,sick}$. Panels I and II correspond to each criterion used to split the sample based on credit accessibility. Results for the three values of the wife's own labor supply elasticity, θ={-0.17, 0.25, 1.64}, are presented. The sample excludes the influential observations.

In general, the results support the hypothesis that the temporal drop in income, due to credit constraints, is a major factor driving the wife's labor response to the husband's shock.

An interesting finding is that an illness shock can cause a decline in the hours worked by the wife, which may be explained with the reason indicated above (Columns (7) and (11)). It is also worth noting that in contrast with the finding in Table 6, Table 7 shows that wives in households facing credit constraints change their hours worked in response to an unemployment shock to husbands' earnings (Columns (1), (7), (9) and (11)), while no response is observed for the households with access to credit. Indeed, if the wife's labor market is affected by the same factors driving the husband's unemployment, it might be easier for the spouse to adjust her desired hours worked if she already works than becoming employed if she is not a labor market participant.

VII. Robustness and Extensions

Section VI has tested the sensitivity of the results to the following sample changes: the two criteria used as proxies for access to credit, and the exclusion of the influential observations (those with zero earnings). The results of additional robustness checks are presented below.

A. Robustness to Income Transfers

Here the paper explores if transfer income may explain the difference in the estimates for the spousal response between households with and without credit access.

One of the roles of public and private transfers is to buffer shocks to household income; therefore, well-targeted transfers are expected to offset, at least partially, via the income effect, the spouse's response to the husband's earnings shock.

The concern is whether households with limited credit access are on average less protected from shocks than households with credit access. Some welfare programs are designed to protect lower-income households; on the other hand, these households are likely to work in the informal sector, which excludes them from many of the social protection programs like unemployment insurance and severance payments.

To verify the robustness of the results to this alternative explanation, the sample is restricted to households that did not experience a change in the transfers received over the three-year interval period.[27] Panel I in Table 8 presents the estimates of $\beta^{l,partic}$, the cross effect (of husband's earnings) at the extensive margin, and Panel II shows the estimates of $\beta^{l,h}$, the cross effect (of husband's earnings) at the intensive margin. Since the number of observations is reduced, only the second criterion—that is, the education of the husband—is used to split households according to credit accessibility. The sample used excludes observations with zero earnings for the husband at t or $t-1$.

In contrast to the results presented in Table 6, Table 8 shows an increase in the point estimates for the smoothing contribution via spousal labor participation, $\beta^{l,partic}$, for the group of households with limited credit access. Still, the estimate for the smoothing of the component of the shock attributed to illness is not significant.

Compared to Table 7, several estimates of $\beta^{l,h}$ corresponding to households with limited access to credit increase or turn significant. In particular, the estimate for $\beta^{l,h}$ becomes significant for θ=0.25, and increases in absolute value for θ=-0.17. The estimates of the cross-sectional covariance decomposition using Q^{unemp} as instrument rise for the elasticities θ=0.25 and θ=-0.17. Further, the estimates for the illness shock are still negative for θ=0.25 and θ=-0.17, but no longer significant, implying that in absence of an income compensation mechanism, the need of the wife to enter the labor market is strengthened.

To summarize, the results obtained when controlling for transfers indicate that the larger spousal labor response observed for households with limited credit access is not driven by a specific lack of access to transfer benefits for this group of households. Further, some point estimates for the wife's labor rise or become significant, which implies that transfers partially offset her labor response. This evidence supports the income effect story as the major driving force of the AWE.

B. Robustness: Downward Versus Upward Shock

A question to ask is if the households constrained to borrow differ from other households in their preferences, or in the home production technique of goods and services, in such a way that their substitution effect surpasses the substitution effect of households with access to credit. In other

[27] Transfer income consists of ADC/AFDC, supplemental security income, social security, retirement pensions and annuities, unemployment pay including strike benefits, child support, help received from relatives, and other transfer income.

words, is the income effect driving the response of households with limited borrowing ability, or are these households characterized by a larger substitution effect?

To explore this possibility, the paper tests for differences in the smoothing contribution of spousal labor between downward and upward shocks. To separate these responses, a dummy equal to one for downward shocks is incorporated in Equations (14d) and (14e) (the equations that estimate the wife's response at the intensive and extensive margins) as an intercept and also interacted with the husband's earnings shock. If the cross effect of the husband's shock on the spouse's labor is mainly driven by an income effect, the response to a downward shock should exceed the response to an upward shock. On the other hand, if households facing limited access to credit exhibit a larger substitution effect, the estimates for an upward and downward shock will not differ.

Table 9 presents the results of the smoothing of the shock through the change in the wife's labor participation. The top panel corresponds to the households with limited credit access, while the lower panel to those with access to credit. Both criteria, net wealth and husband's education, are used as proxies for credit access. Table 9 also includes the estimates corresponding to the sample that controls for transfer income. Specifically, the sample excludes households that experience a change in the transfers received over the three-year period. The purpose is to remove the doubt on the possible claim that households experiencing a downward shock might be less protected via transfers.

For households with limited credit access, the estimates for the negative earnings shock are significantly larger than for the positive shock. The exclusion of the observations with zero earnings for the husband either at t or $t-1$ does not change the results. In contrast, the estimates for the positive and negative shock do not differ from each other for the group of households with access to credit (Column (9) is the exception).

In addition, for either group of households, several estimates corresponding to the positive shock are positive and significant. Hence, the existence of a substitution effect is not ruled out, although the findings mentioned in the previous paragraph disregard it as the cause of the different spousal labor response among households that differ in their access to credit. In other words, results do not rule out a substitution effect between the leisure of the husband and wife, but the temporal family income change (exclusive of wife's earnings and triggered by borrowing constraints) seems to dominate the cross effect of the husband's earnings shocks on the wife's labor.

The test was repeated for the smoothing of the shock via the cross effect (of husband's earnings) at the intensive margin and each of the three values of the wife's own labor supply elasticity, $\theta=\{-0.17, 0.25, 1.64\}$. The results do not alter the previous conclusion.

C. Robustness: Alternative Definition of Downward and Upward Shocks

As an additional check on the estimation results presented in Table 9, an alternative definition of downward and upward shocks is used. The purpose of this alternative criterion is to discriminate between shocks to the head of the household's earnings and the recovery from those variations in earnings.

In particular, rather than modeling all the positive three-year differences in the head of the household's earnings as positive shocks, here instead, a positive shock equals the positive change in the earnings only if the corresponding earnings level at the end of the three-year interval exceeds by at least one standard deviation the head of the household's average earnings. Likewise, the negative shock is the observed negative change in earnings if the earnings level at the end of the differencing interval falls below the average earnings in at least one standard deviation.

Note that this approach suffers from restricting the sample size. For this reason, Table 10 only shows the estimates corresponding to the use of the education criteria as proxy for access to credit. Column (1) corresponds to the group of households with limited credit access, whereas Column (2) shows the results of the group with access to credit.

Like in Table 9, the smoothing contribution of the spousal labor participation is significantly larger for downward shocks. Further, the spousal labor participation also buffers the negative shocks for households with credit access, but the point estimates are smaller than those observed for the households with limited credit access. Last, in contrast to the estimates in Table 9, no buffering response is observed for the positive variations in the head of the household's earnings, which questions the substitution effect as an important factor in explaining the added worker effect.

Thus, regardless of the definition of shocks used, the results show that especially for the group of households with limited credit access, the sensitivity of the wife's response to negative shocks exceeds that for positive shocks.

D. Implications

Several implications can be drawn from the analysis presented in this paper.

First, we might expect a larger smoothing contribution via spousal labor participation in countries where the gender gap in labor participation is larger than in the United States. A decline in the gender gap implies that the number of potential entrants declines, but also that the group of wives out of the labor force is highly selected (and probably less responsive).

The flexibility of the labor market is expected to influence the size of the estimates. Note that the U.S. labor market is more flexible than the markets of other industrial countries such as those in Europe.

The combined smoothing contribution of the wife's response, even for households facing credit constraints, is small relative to the contribution of other income sources like transfers, capital market income, and taxes. Therefore, we would expect a higher spousal labor response in economies where salaries are the main source of household income, and where the tax and transfer systems are less reliable as distributive income mechanisms, holding constant the cultural factors which might affect the wife's labor supply.

The development of the domestic financial system and, in particular, the access to private credit, determines the overall sensitivity of spousal labor to a temporary drop in husband's earnings or to the main source of household income. Hence, if access to credit differs across geographical regions, for example rural and urban areas, the smoothing role of the wife will differ.

VIII. CONCLUSION

This paper has investigated the responsiveness of the labor supply of wives (participation and hours of work) to transitory shocks in husbands' earnings. The hypothesis that limited access to credit drives this response has been tested.

The analysis consisted of measuring the extent to which the wife's labor smoothes the fluctuation in husband's earnings. For this purpose, a cross-sectional variance decomposition framework that enables to split the contribution of the spousal labor supply into her own wage effect, the cross effect (of the husband's earnings) at the intensive margin, and the cross effect (of the husband's earnings) at the extensive margin was developed. In addition, the concern regarding the endogeneity of the husband's shock, together with an interest to investigate different components of the shock, led to the inclusion of instrumental variables in the cross-sectional decomposition.

The results suggest that wives' labor sensitivity, both at the extensive and intensive margins, to changes in husbands' earnings is dominated by the effect of family income changes (exclusive of wives' earnings). In other words, credit access plays a major role in explaining the cross effect of husbands' earnings shocks on spousal labor. Section VII.D has outlined several implications of this relationship.

SAMPLE SELECTION

After selecting the sample of continuously married couples with neither spouse younger than 25 or older than 54 at the time of the interview, and with nonzero earnings for the husband either at the beginning and/or at the end of the three-year interval period, the following observations were excluded.

I excluded households living outside the United States or with missing information on U.S. region of residence or U.S. state; with the wife as head of household; with missing education for the husband; and with other adults, excluding the husband and wife, working. Further, households with family size changes over the differencing period were dropped. The reason is that composition changes shift households' preferences; controlling for changes in family size by excluding households with composition changes reduces this bias.

In order to eliminate outliers, observations with male or female working more than 4,160 hours per year (52 weeks at 80 hours per week) were dropped. I also excluded observations with positive annual work hours for the wife but zero female labor income or vice versa since these cases are due to reporting or coding errors. To be precise, in this paper a woman is defined as participating in the market if reported labor income is greater than zero and reported annual hours worked exceed 300; on the contrary, a woman is defined to be out of the labor market during a year if both her reported labor income is zero and her reported annual hours are less than 80.

As noted in the main text, the sample selection led to the panel consisting of 7,587 observations on 2,288 households, spread over the years 1978–90.

Table 1. Changes in Household Marital Status by Changes in Husband's Earnings

	Change in Husband's Earnings					
	Non-zero earnings at *t-1* Zero earnings at *t*	Non-zero earnings at *t-1* Non-zero earnings at *t*				Zero earnings at *t-1* Non-zero earnings at *t*
		Decline in earnings (percentage change)		Increase in earnings (percentage change)		
		>50	0-50	0-50	>50	
Couple at *t-1*, splits at *t*	6.19	5.3	4.62	3.5	4.59	9.09
Couple at *t-1*, couple at *t*	93.81	94.7	95.38	96.5	95.41	90.91

Source: Panel Study of Income Dynamics 1975–91.

Percentage of the sample in each category.

Table 2. Summary Statistics[a]

		"Limited access to credit" proxied by low net wealth		"Access to credit" proxied by high net wealth	
		Change in husband's earnings			
		>0	<0	>0	<0
	(1)	(2)	(3)	(4)	(5)
A. Demographic Characteristics					
Family size	3.60	3.63	3.90	3.37	3.43
	(1.21)	(1.18)	(1.22)	(1.10)	(1.09)
Number of children	1.57	1.59	1.85	1.35	1.40
	(1.20)	(1.17)	(1.20)	(1.11)	(1.09)
Age of husband	37.15	35.21	35.61	39.57	40.21
	(6.44)	(5.04)	(5.43)	(5.92)	(6.49)
Age of wife	34.96	33.36	33.60	37.16	37.25
	(5.99)	(4.47)	(4.70)	(5.70)	(5.85)
Educational attainment of husband[b]					
less than 12	16.70	16.48	24.75	3.61	8.15
exactly 12	39.61	40.31	44.07	28.87	38.15
more than 12 but fewer than 16	19.78	23.39	21.69	23.14	25.19
16 or more	23.91	19.82	9.49	44.37	28.52
B. Labor and Income Variables					
Annual labor earnings of husband, y^H	23,553	18,231		29,810	
	(15,730)	(13,528)		(19,693)	
If working, annual labor earnings of wife, y^W	12,443	10,477		16,355	
	(8,475)	(6,872)		(10,664)	
If working, wife's annual hourly earnings, y^W	7.39	6.02		9.49	
	(4.65)	(3.56)		(6.51)	
Wife's hours worked, h^W	1,662	1,711		1,717	
	(570)	(582)		(560)	
Annual household labor earnings, y^H+y^W	33,245	26,751		43,009	
	(18,960)	(15,796)		(23,622)	
Annual disposable income, y^d	31,194	25,095		40,932	
	(15,893)	(12,492)		(19,705)	
Number of observations	7,587	449	295	471	270

Source: Panel Study of Income Dynamics 1975–91.

Notes: All the income figures are expressed in real annual amounts (1982 dollars); in each year, income numbers were deflated using the implicit price deflator for personal consumption expenditures from the National Income and Product Accounts.

a. Means; standard deviations in parenthesis.
b. Percentage of the sample in each category.

Table 3. Smoothing Estimates

Independent Variable: Total Shock to Earnings, $\Delta \ln y^H$

			$\theta = 0.25$		$\theta = -0.17$		$\theta = 1.64$				
	$\beta^{l,pass}$	$\beta^{l,w}$	$\beta^{1,\hat{h}}$	$\beta^{l,h}$	$\beta^{1,\hat{h}}$	$\beta^{l,h}$	$\beta^{1,\hat{h}}$	$\beta^{l,h}$	$\beta^{l,partic}$	β^{2}	β^{U}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Full sample											
	0.566	0.003	0.001	0.001	-0.001	0.003	-0.001	0.002	0.097	0.245	0.084
	(0.005)**	(0.001)**	(0.000)*	(0.001)	(0.000)*	(0.001)**	(0.002)	(0.002)	(0.004)**	(0.004)**	(0.002)**
Observations	7,587	7,587	7,587	7,587	7,587	7,587	7,587	7,587	7,587	7,587	7,587
Number of households	2,288	2,288	2,288	2,288	2,288	2,288	2,288	2,288	2,288	2,288	2,288
B. Sample excludes observations with zero husband's earnings at *t* or *t-1*											
	0.361	-0.006	-0.001	0.007	0.0004	0.005	-0.015	0.021	0.062	0.209	0.367
	(0.004)**	(0.002)**	(0.001)	(0.003)**	(0.001)	(0.002)*	(0.004)**	(0.005)**	(0.004)**	(0.004)**	(0.005)**
Observations	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354
Number of households	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242

Source: Panel Study of Income Dynamics 1975–91

Notes: GLS random effects estimates. Standard errors in parenthesis. * significant at 5 percent; ** significant at 1percent

Columns (1-10): Incremental fractions of shock to head's earnings absorbed by each level of smoothing: *passive* mechanism of the wife's labor income, $\beta^{l,pass}$; the change in the wife's wages, $\beta^{l,w}$; the change in hours worked due to the own wage effect, $\beta^{1,\hat{h}}$; the cross effect (of husband's earnings) at the intensive margin, $\beta^{l,h}$; cross effect (of husband's earnings) at the extensive margin, $\beta^{l,partic}$; and other income sources β^{2}. Other income sources include transfers, capital market, and taxes.

Columns (11): β^{U} incremental fraction of the shock not smoothed measured in terms of disposable income.

Table 4. Spousal Labor Participation—Income Smoothing Estimates
Independent Variable—Total Shock to Earnings, $\Delta \ln y^H$—Instrumented

	Instruments		
	Q^{total}	Q^{unemp}	Q^{sick}
	(1)	(2)	(3)
A. Full sample			
$\beta^{l,partic}$	0.097	0.084	0.092
	(0.004)**	(0.007)**	(0.011)**
Observations	7,587	7,587	7,587
Number of households	2,288	2,288	2,288
B. Sample excludes observations with zero husband's earnings at *t* or *t-1*			
$\beta^{l,partic}$	0.062	0.070	-0.016
	(0.004)**	(0.008)**	(0.025)
Observations	7,354	7,354	7,354
Number of households	2,242	2,242	2,242

Source: Panel Study of Income Dynamics 1975–91

Notes: Two-stages least squares random-effects estimates.

Standard errors in parenthesis. * significant at 5 percent; ** significant at 1 percent

The instrumental variables are defined as:

Q^{total}: total shock to earnings, that is, $\Delta \ln y^H$;
Q^{unemp}: change in head's annual hours of work due to unemployment;
Q^{sick}: change in the head's annual hours of work due to illness.

Table 5. Effect of Husband's Earnings on Spousal Labor at the Intensive Margin—Income Smoothing Estimates Independent Variable—Total Shock to Earnings, $\Delta \ln y^H$—Instrumented

	A. $\theta = 0.25$			B. $\theta = -0.17$			*C.* $\theta = 1.64$		
	Instruments			Instruments			Instruments		
	Q^{total}	Q^{unemp}	Q^{sick}	Q^{total}	Q^{unemp}	Q^{sick}	Q^{total}	Q^{unemp}	Q^{sick}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\beta^{l,h}$	0.007	0.015	-0.037	0.005	0.002	-0.030	0.021	0.035	-0.064
	(0.003)**	(0.006)*	(0.019)	(0.002)*	(0.006)	(0.018)	(0.005)**	(0.012)**	(0.038)
Observations	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354	7,354
Households	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242

Source: Panel Study of Income Dynamics 1975–91

See notes to Table 4 for instrumental variables definition.

Sample: excluded observations with zero husband's earnings at *t* or *t-1*.

Notes: Two-stages least squares random-effects estimates.

Standard errors in parenthesis. * significant at 5 percent; ** significant at 1 percent.

Table 6. By Access to Credit: Spousal Labor Participation—Income Smoothing Estimates
Independent Variable—Total Shock to Earnings, $\Delta \ln y^H$—Instrumented

Criterion:	I. NET WEALTH						II. HUSBAND'S EDUCATION					
	A. Full sample			B. Excludes observations with zero husband's earnings at *t* or *t-1*			C. Full sample			D. Excludes observations with zero husband's earnings at *t* or *t-1*		
	Limited credit access	Access to credit	Test (β_H-β_L)=0	Limited credit access	Access to credit	Test (β_H-β_L)=0	Limited credit access	Access to credit	Test (β_H-β_L)=0	Limited credit access	Access to credit	Test (β_H-β_L)=0
Instruments	(1)	(2)	Prob>chi2	(3)	(4)	Prob>chi2	(5)	(6)	Prob>chi2	(7)	(8)	Prob>chi2
Q^{total}	0.150	0.003	0.000	0.052	0.037	0.381	0.113	0.066	0.000	0.096	0.070	0.031
	(0.010)**	(0.015)		(0.011)**	(0.013)**		(0.007)**	(0.010)**		(0.008)**	(0.009)**	
Q^{unemp}	0.049	0.012	0.508	0.009	0.036	0.597	0.078	0.118	0.137	0.118	0.077	0.259
	(0.017)**	(0.054)		(0.026)	(0.043)		(0.014)**	(0.023)**		(0.013)**	(0.034)*	
Q^{sick}	0.242	-0.006	0.000	-0.0003	0.018	0.864	0.131	0.005	0.006	0.014	-0.076	0.502
	(0.025)**	(0.028)		(0.073)	(0.082)		(0.019)**	(0.042)		(0.034)	(0.129)	
Observations			1,485			1,432			3,081			3,006
Households			793			774			970			954

Source: Panel Study of Income Dynamics 1975–91. See notes to Table 4 for instrumental variables definition.

Sample selection criteria: According to the net wealth criterion explained in the data section, a household belongs to the "Limited credit access" group if reports <18,900, and to the "Access to credit" group if reports >39,700. The second criterion classifies a household in the group with "Limited credit access" if the husband's education was less than 12 years of schooling, while in the group with "Access to credit" if the education was at least 16 years.

The subscript *L* indexes households with limited access to credit, and *H* stands for households with credit access.

Notes: Two-stages least squares random-effects estimates.

Standard errors in parenthesis. * significant at 5 percent; ** significant at 1 percent

Table 7. By Access to Credit: Effect of Husband's Earnings on Spousal Labor at the Intensive Margin—Income Smoothing Estimates
Independent Variable—Total Shock to Earnings, $\Delta \ln y^H$—Instrumented

Criterion:	I. NET WEALTH								
	A. $\theta = 0.25$			B. $\theta = -0.17$			C. $\theta = 1.64$		
	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$
Instruments	(1)	(2)	Prob>chi2	(3)	(4)	Prob>chi2	(5)	(6)	Prob>chi2
Q^{total}	0.024	0.002	0.080	0.025	-0.020	0.001	0.040	0.107	0.015
	(0.008)**	(0.010)		(0.009)**	(0.011)		(0.018)*	(0.021)**	
Q^{unemp}	0.043	-0.011	0.144	0.007	-0.007	0.717	0.051	-0.004	0.497
	(0.019)*	(0.032)		(0.021)	(0.034)		(0.042)	(0.070)	
Q^{sick}	0.084	0.045	0.648	0.039	-0.011	0.563	0.098	0.176	0.655
	(0.058)	(0.064)		(0.058)	(0.065)		(0.116)	(0.130)	
Observations			1,432			1,432			1,432
Households			774			774			774

Criterion:	II. HUSBAND'S EDUCATION								
	D. $\theta = 0.25$			E. $\theta = -0.17$			F. $\theta = 1.64$		
	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$	Limited credit access	Access to credit	Test $(\beta_H - \beta_L)=0$
Instruments	(7)	(8)	Prob>chi2	(9)	(10)	Prob>chi2	(11)	(12)	Prob>chi2
Q^{total}	0.008	0.007	0.923	0.011	-0.001	0.085	0.017	0.011	0.741
	(0.005)	(0.006)		(0.004)*	(0.005)		(0.011)	(0.013)	
Q^{unemp}	0.035	-0.010	0.064	0.026	-0.035	0.004	0.066	-0.011	0.125
	(0.009)**	(0.023)		(0.008)**	(0.020)		(0.019)**	(0.047)	
Q^{sick}	-0.060	-0.031	0.758	-0.039	-0.042	0.971	-0.104	-0.017	0.649
	(0.024)*	(0.092)		(0.020)	(0.077)		(0.049)*	(0.185)	
Observations			3,006			3,006			3,006
Households			954			954			954

Source: Panel Study of Income Dynamics 1975–91. See notes to Table 4 for instrumental variables definition.

Sample: excluded observations with zero husband's earnings at *t* or *t-1*

The subscript *L* indexes households with limited access to credit, and *H* stands for households with credit access.

See notes to Table 6 for sample selection criteria into "Limited credit access" and "Access to credit" groups.

Notes: Two-stages least squares random-effects estimates.

Standard errors in parenthesis. * significant at 5 percent; ** significant at 1percent.

Table 8. Robustness to Transfers
By Access to Credit: Spousal Labor—Income Smoothing Estimates
Independent Variable—Total Shock to Earnings, $\Delta \ln y^H$—Instrumented

I. Spousal labor participation, $\beta^{l,partic}$

Instruments	Limited credit access (1)	Access to credit (2)	Test $(\beta_H-\beta_L)=0$ Prob>chi2
Q^{total}	0.108	0.048	0.000
	(0.009)**	(0.011)**	
Q^{unemp}	0.130	0.051	0.181
	(0.015)**	(0.057)	
Q^{sick}	0.067	0.004	0.818
	(0.082)	(0.264)	
Observations			2,018
Households			740

II. Spousal labor at the intensive margin, $\beta^{l,h}$

	A. $\theta = 0.25$			B. $\theta = -0.17$			D. $\theta = 1.64$		
Instruments	Limited credit access (3)	Access to credit (4)	Test $(\beta_H-\beta_L)=0$ Prob>chi2	Limited credit access (5)	Access to credit (6)	Test $(\beta_H-\beta_L)=0$ Prob>chi2	Limited credit access (7)	Access to credit (8)	Test $(\beta_H-\beta_L)=0$ Prob>chi2
Q^{total}	0.020	0.006	0.207	0.029	0.006	0.015	0.017	0.008	0.691
	(0.007)**	(0.009)		(0.006)**	(0.007)		(0.015)	(0.018)	
Q^{unemp}	0.058	-0.040	0.012	0.066	-0.022	0.010	0.054	-0.020	0.354
	(0.012)**	(0.037)		(0.010)**	(0.033)		(0.023)*	(0.076)	
Q^{sick}	-0.034	-0.222	0.690	-0.051	-0.392	0.594	0.012	-0.039	0.762
	(0.074)	(0.466)		(0.087)	(0.631)		(0.129)	(0.320)	
Observations			2,018			2,018			2,018
Households			740			740			740

Source: Panel Study of Income Dynamics 1975–91. See notes to Table 4 for instrumental variables definition.

Sample: excluded observations with zero husband's earnings at *t* or *t-1*. The sample is restricted to households that did not experience a change in the transfers received over the three year interval period.

The subscript *L* indexes households with limited access to credit, and *H* stands for households with credit access.

Access to credit is proxied with husband's education.

Notes: Two-stages least squares random-effects estimates.

Standard errors in parenthesis. * significant at 5 percent; ** significant at 1percent.

Table 9: Robustness: Downward Versus Upward Shocks
Smoothing of the Shock Through the Spousal Labor Participation

$$d_0^i\left[\Delta \ln y^{H\,i}_t - \Delta \ln\left(y^{H\,i}_t + y^{W\,i}_t\right)\right] = \gamma_{0U}^{1,p} + \left(\gamma_{0D}^{1,p} - \gamma_{0U}^{1,p}\right)\cdot a + \alpha_t^{1,partic} + \beta_U^{\,1,partic}\Delta \ln y^{H\,i}_t + \left(\beta_D^{\,1,partic} - \beta_U^{\,1,partic}\right)\Delta \ln y^{H\,i}_t \cdot a + \varepsilon_t^{1,partic,i}$$

Criterion:	I. NET WEALTH				II. HUSBAND'S EDUCATION							
					Total sample				Sample with transfers at *t-1* = transfers at *t*			
	A. Full sample		B. Excludes zero husband's earnings at *t* or *t-1*		C. Full sample		D. Excludes zero husband's earnings at *t* or *t-1*		E. Full sample		F. Excludes zero husband's earnings at *t* or *t-1*	
Limited credit access	(1)	Prob>chi2	(2)	Prob>chi2	(3)	Prob>chi2	(4)	Prob>chi2	(5)	Prob>chi2	(6)	Prob>chi2
$\beta_U^{1,partic}$	0.077		0.104		0.074		0.006		-0.007		-0.033	
	(0.024)**		(0.023)**		(0.024)**		(0.021)		(0.020)		(0.029)	
$(\beta_D^{1,partic} - \beta_U^{1,partic})$	0.127	0.000	-0.062	0.061	0.060	0.030	0.163	0.000	0.123	0.000	0.274	0.000
	(0.031)**		(0.033)		(0.027)*		(0.027)**		(0.026)**		(0.040)**	
$\gamma_U^{1,partic}$	-0.014		-0.050		0.042		-0.001		-0.069		-0.019	
	(0.057)		(0.018)**		(0.081)		(0.027)		(0.053)		(0.040)	
$(\gamma_D^{1,partic} - \gamma_U^{1,partic})$	0.066	0.298	0.046	0.026	0.037	0.369	0.035	0.030	0.013	0.558	0.047	0.022
	(0.063)		(0.020)*		(0.041)		(0.016)*		(0.022)		(0.021)*	
Observations	744		705		1,267		1,211		677		669	
Households	393		377		434		419		292		290	
Credit access	(7)		(8)		(9)		(10)		(11)		(12)	
$\beta_U^{1,partic}$	0.009		0.033		0.011		0.067		0.006		0.035	
	(0.009)		(0.017)		(0.007)		(0.010)**		(0.004)		(0.012)**	
$(\beta_D^{1,partic} - \beta_U^{1,partic})$	-0.014	0.173	-0.013	0.621	0.147	0.000	-0.005	0.809	-0.0003	0.963	0.025	0.247
	(0.010)		(0.026)		(0.012)**		(0.019)		(0.008)		(0.022)	
$\gamma_U^{1,partic}$	-0.0001		-0.005		-0.022		-0.038		-0.034		-0.042	
	(0.010)		(0.011)		(0.024)		(0.015)*		(0.013)*		(0.014)**	
$(\gamma_D^{1,partic} - \gamma_U^{1,partic})$	-0.023	0.050	-0.008	0.558	0.022	0.086	0.011	0.228	-0.021	0.002	-0.002	0.834
	(0.012)		(0.014)		(0.013)		(0.009)		(0.007)**		(0.008)	
Observations	741		727		1,814		1,795		1,359		1,349	
Households	400		397		536		535		452		450	

Source: Panel Study of Income Dynamics 1975-1991.

See notes to Table 6 for sample selection criteria into "Limited credit access" and "Access to credit" groups.

Notes: GLS random effects estimates. Standard errors in parenthesis. * significant at 5%; ** significant at 1%

Cross sectional variance decomposition.

The dummy variable *a* equals one for downward shocks; and the subscript *U* indexes upward shocks, and *D* stands for downward shocks.
Prob>chi2 of the Test $(\beta_D^{1,partic} - \beta_U^{1,partic})$or $(\gamma_D^{1,partic} - \gamma_U^{1,partic})=0$

Table 10. Robustness: Alternative Definition of Downward and Upward Shocks Smoothing of the Shock Through the Spousal Labor Participation

	Limited credit access		Credit access	
	(1)	Prob>chi2	(2)	Prob>chi2
$\beta_U^{1,partic}$	-0.046		0.006	
	(0.071)		(0.020)	
$(\beta_D^{1,partic} - \beta_U^{1,partic})$	0.230	0.002	0.057	0.039
	(0.076)**		(0.028)*	
$\gamma_U^{1,partic}$	0.145		-0.006	
	(0.083)		(0.032)	
$(\gamma_D^{1,partic} - \gamma_U^{1,partic})$	0.090	0.054	0.020	0.351
	(0.047)		(0.022)	
Observations	327		397	
Households	225		257	

See notes to Table 9.

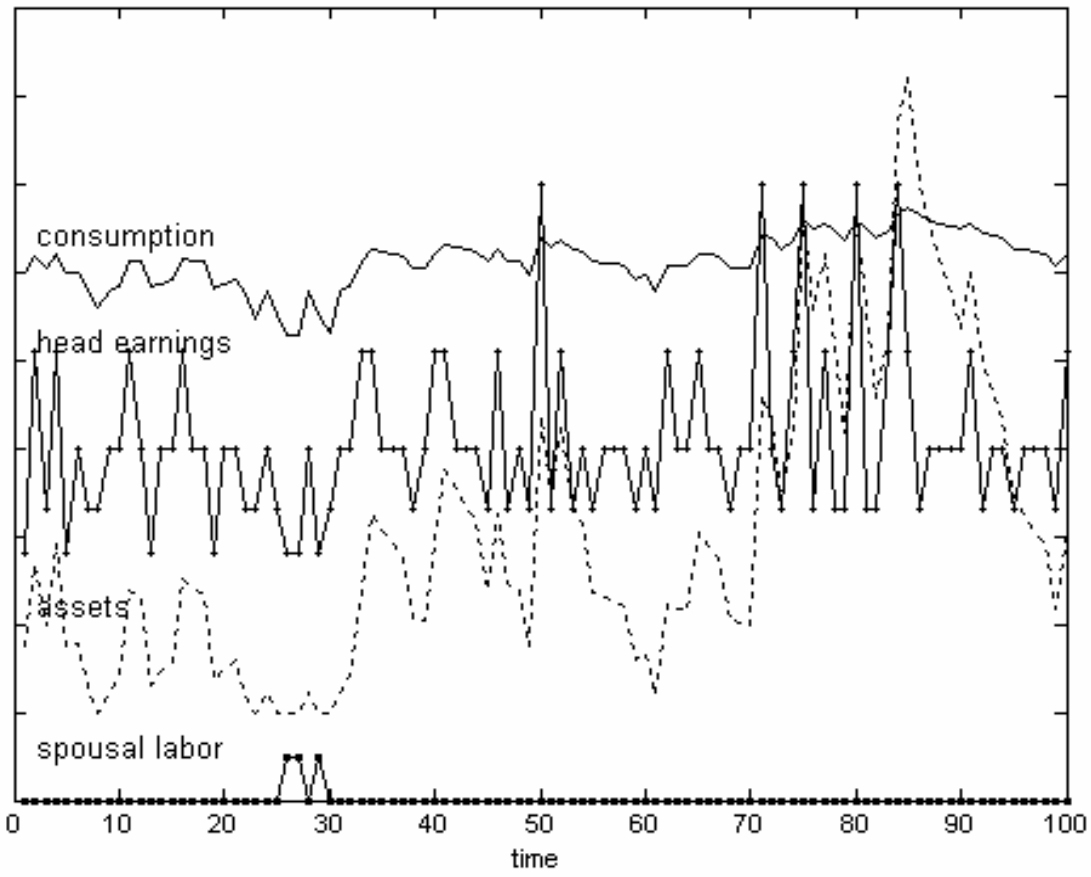
Sample: excluded observations with zero husband's earnings at *t* or *t-1*.

A positive shock equals the positive change in the earnings only if the corresponding earnings level at the end of the three-year interval exceeds by at least one standard deviation the head of the household's average earnings. A negative shock is the negative change in earnings if the earnings level at the end of the differencing interval falls below the average earnings in at least one standard deviation

Figure 1. Decision Rules

Note: The graph shows the asset, spousal labor participation and consumption decision rules when the parameters values used are $\alpha = 3$, $\upsilon = 0.3$, $\beta = 0.95$, $(1+r) = 1.02$, $\underline{l} = 0$ and $w = 0.24$, and when the i.i.d. earnings stochastic process with variance $\sigma^2 = 0.16$ is approximated with a 5-state Markov chain.
The borrowing constraint is binding for $z_t \leq x^*$.
Z is the level of current resources below which the optimal strategy is that the wife works.

Figure 2. Simulation of a Time Path for a Household



Note: See note to Figure 1.

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