Insuring Labor Income Shocks: The Role of the Dynasty*

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Abstract

We provide empirical evidence on the importance of a relatively understudied channel of insurance against labor income shocks: transfers from (cash-rich) parents to (cash-short) children when the latter experience negative labor income shocks. Matching population data for Norway across two generations, we establish several results. First, parents make a transfer—i.e., decumulate liquid assets—when adult children experience negative labor income shocks. Consistent with dynastic insurance, we observe no transfer when income shocks are positive. Second, parents' responses depend on the nature of the shock. If the income drop is temporary, parents dissave; if the shock is persistent, parents save in order to make future transfers. Parental transfers are substantial, covering 45% of temporary income losses and 28% of persistent ones. Third, there is less parental insurance provision if children can smooth income losses through alternative mechanisms, such as spousal labor supply. Fourth, parents offer more insurance in response to shocks hitting their own child than their child's spouse; i.e.,"blood matters". Moreover, there is more insurance provision if the offspring's household can count on the transfers from another set of parents (the spouse's), suggestive of "competition for attention". Finally, insurance provision is unilateral: there is no evidence that children insure their parents against income shocks.

Keywords: Income shocks, Insurance, Financial wealth, Intergenerational transfers.

JEL codes: D31, E21, E24, G11

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1 Introduction

Relying on formal credit and insurance markets to cope with labor income shocks is notoriously difficult. This has led people and societies to resort to other mechanisms to smooth labor market adversities. A whole strand of research has studied the role of such arrangements, focusing on progressive taxation, government transfers, reliance on own savings, as well as risk sharing among spouses (see Blundell, Pistaferri, and Preston 2008; Guler, Guvenen, and Violante 2012; Ortigueira and Siassi 2013; Heathcote, Storesletten, and Violante 2014; Blundell, Pistaferri, and Saporta-Eksten 2016). All these channels have been shown to help workers smooth consumption, though to different degrees. With a few notable exceptions, there is limited evidence on what, for most young workers, may be the most obvious source of insurance: help from parents.[1]

In this paper, we study whether transfers from parents are an effective source of insurance against their children's labor income shocks. Parents' help is the most natural source of insurance against income shocks for one key reason: when children are in the early years of their working careers they typically have limited assets to buffer shocks, while parents on the other hand are in a phase of their life cycle where they have accumulated considerably more wealth. Their accumulated assets can be used as an effective mechanism for smoothing children's income shocks. Our paper is one of the few in the literature to shift the focus from the actions and decisions of the children (i.e., how they respond to intergenerational transfers) to those of the parents.

To study dynastic insurance against labor income shocks, we use individual-level administrative data covering the entire Norwegian population. These data allow us to link parents and children and, crucially, to observe parents' and children's assets as well as their incomes. For married children, we observe the parents of *both* spouses and can thus study which set of parents reacts to which spouse's income shock. We present a simple model of parental insurance to help guide our empirical analysis. A central feature of the model is that children have limited access to financial markets. Our model implies that altruistically motivated parents transfer resources to their child when the child faces an income realization below a certain threshold. Under plausible assumptions, this threshold is negative. Accordingly,

[1] There is a vast literature on the importance of intergenerational transfers and intergenerational family linkages (see e.g., Altonji et al. 1997 and Waldkirch et al. 2004). However, this literature is primarily concerned with identifying the nature of the linkages (e.g., whether motivated by altruism as in Altonji et al. 1997 or by features such as cognitive abilities and preferences that are common to parents and their offsprings, as in Waldkirch et al. 2004). This literature does not study the impact of children's income shocks on the asset accumulation/decumulation decision of parents, the focus of this paper.

our theory predicts that parental transfers only occur when the child faces an income *drop*. Importantly, upon observing the shock to their child, the parent's response depends on the nature of the shock. Large, persistent shocks trigger transfers not only in the present but also the expectation of more transfers in the future; transitory shocks do so only in the present. We do not observe parents' transfers directly. However, we do observe changes to wealth. We can thus study whether changes in parents' wealth are correlated with shocks to the children's income.[2] A current transfer implies that, *ceteris paribus*, the pace of parents' wealth accumulation slows down or even declines following a shock to their child's income —i.e., parents dissave to finance the transfer. A future transfer implies that parents must accumulate more assets to be able to make it. The model thus generates two key predictions: (*i*) a negative change in parents' (liquid) wealth in response to a transitory drop in the child's labor income; (*ii*) a positive change in wealth in response to the persistent component of the drop in child's income, increasing in the degree of persistence.

We find strong evidence for parental insurance. First, consistent with our model, we find that parents' wealth only changes when shocks to children's income are negative. The relation between positive income shocks and parents' change in financial wealth is flat. Second, parents decumulate financial wealth in response to transitory negative shocks to their children's income, and accumulate assets in response to persistent shocks. This is consistent with consumption-smoothing agents wishing to front-load the adverse effects of anticipated future transfers on their own consumption.[3]

Interpreting the response of parents' saving decisions to income drops experienced by their children as "insurance" requires that we identify income changes that are exogenous and unanticipated. For example, parents may be willing to insure children against an unexpected layoff (a "shock"), but may be reluctant to do so if the child loses employment due to poor effort on the job (a "choice") or if the exit from the labor force is a planned event (due to e.g., (paid) maternity leave). In this paper, we use firm shocks as the "primitive" behind drops in income experienced by workers. This approach follows a well established and still growing literature on the importance of pass-through of firm productivity shocks onto wages in the presence of labor market frictions. Moreover, since our altruism model predicts starkly different responses of parents' saving decisions in response to children's tem-

[2]Of course, an alternative way for parents to "finance" a transfer to their children would be to cut their own consumption. However, short of non-standard preference considerations (such as mental accounting, etc.), this is clearly a sub-optimal response when parents have savings to draw from. In our regression we control for parents' initial wealth.

[3]This is also consistent with immediate, positive effects on saving behavior from higher long-term wealth tax exposure as in Ring (2019).

porary vs. persistent shocks, we rely on the empirical evidence firstly established by Guiso, Pistaferri, and Schivardi (2005) and replicated for Norway by Fagereng, Guiso, and Pistaferri (2018).[4] In these papers, firms fully shelter workers from transitory shocks to firm output but partially pass through permanent shocks to workers' pay. Hence, negative shocks to value added translate into negative long lasting shocks to workers' earnings. A formal IV strategy is a simple way of implementing this idea: by instrumenting income changes with firm value-added shocks, we obtain estimates of how parental saving responds to persistent income shocks experienced by their child. This IV strategy also takes care of potential reverse causality problems, i.e., children reducing their work effort after receiving a transfer from their parents. Combining OLS with IV estimates allows identification of parent responses to the child's transitory income shocks.

We estimate an elasticity of parents' financial wealth to a persistent negative shock to their child's labor earnings of about -0.26 (i.e. parents save). For transitory shocks, we estimate a positive elasticity of around 0.41 (i.e., parents dissave). At the sample means of parents' wealth and children's labor earnings (which are roughly of the same order of magnitude), these estimated elasticities imply a coverage (size of transfer divided by size of income loss) of a transitory earnings shock of about 45% and that of a permanent shock (size of saving for the future transfer/size of the shock) of around 25%, suggesting that parents play quite a relevant role in offering protection against their children's adverse labor market outcomes.

Having established a significant role for parents' insurance, we next explore potential sources of heterogeneity. An important one is whether insurance (altruism) is towards the child or towards the household unit she becomes part of after marriage. In other words, does "blood matter"? Since we can match spouses to their parents, our data allow us to study whether parents tend to offer insurance primarily to their own offspring or whether they also activate transfers in response to drops in the income of their offspring's spouse.[5] We find that, when shocks are transitory, insurance is activated independently of whom, in the child's household, receives the shock; however, there is a stronger insurance elasticity when the shock hits the own child: "blood matters". Moreover, when shocks are permanent, "blood matters" even more: parents save if the shock affects their own offspring's income but the response is absent or much weaker if the shock affects their offspring's spouse. We present

[4]See Guiso and Pistaferri (2020) for a survey covering evidence for other countries.

[5]If couples follow a collective utility model and drops in income lead to a reallocation of consumption within the household, parents can decide to offer insurance to their child in order to redress the increase in intra-household inequality.

evidence consistent with divorce risk reducing parents' incentive to insure against shocks to the child's spouse.

Other sources of heterogeneity may derive from different access to alternative mechanisms for smoothing shocks. For example, marriage may provide risk sharing opportunities, and especially so if the spouse works. We thus test whether parents' savings tend to respond less when children are married rather than single and, among married children, if the spouse is employed. Second, we show that marriage, besides opening up risk sharing possibilities among spouses, also increases the overall supply of dynastic insurance as it expands the number of parents that can activate transfers if shocks occur. Interestingly, in this context, there is little evidence of one set of parents "free riding" on the other; in fact, we find the opposite: parents provide more insurance when another set is present, perhaps due to "competition for attention". Finally, we show that while parents insure their children *vis-à-vis* labor income shocks, the reverse is not true. This finding lends support to the logic of dynastic insurance which requires that a transfer occurs only when the agent making the transfer has enough assets compared to the agent experiencing a drop in income. The different asset position over the life cycle of parents and children implies that this condition tends to be met by parents but not by children, at least on average.

Relation to the literature. Our paper is related to two strands of literature. The first studies the mechanisms that allow households to buffer labor income shocks and attempts to provide a quantitative assessment of their importance (Blundell, Pistaferri, and Preston 2008; Guler, Guvenen, and Violante 2012; Ortigueira and Siassi 2013; Heathcote, Storesletten, and Violante 2014; Blundell, Pistaferri, and Saporta-Eksten 2016). We contribute to this literature in a relatively understudied direction—namely, insurance-motivated transfers from parents—and establish the quantitative relevance of this channel. The only other papers we are aware of that emphasize parents' role in insuring children's labor income shocks are Kaplan (2012) and more recently Boar (2021) and Andersen et al. (2020).[6]

Kaplan (2012) uses high-frequency US panel data to document the "boomerang" effect, i.e., children returning to the parental home following job loss. Using a calibrated model of parent-child living arrangements, he shows that the option to return to the parental home in-

[6] A number of papers in the literature have looked at how altruistic behavior is affected by the child's income and probability of being liquidity constrained. Guiso and Jappelli (1991) and McGarry (1999) show that *inter vivos* transfers are related to the extent of liquidity constraints faced by adult children, while bequests depend on the level of permanent income; Altonji, Hayashi and Kotlikoff (1997) show that, when the child's income is uncertain, parents may prefer to defer *inter vivos* transfers unless the child is currently liquidity constrained.

creases children's welfare considerably, reduces their precautionary savings and consumption response to shocks, and induces riskier occupational choices. While Kaplan (2012) focuses on a form of in-kind insurance, our focus is on monetary transfers; moreover, in our case, the shock that may trigger insurance is not only a job loss but also, possibly, long-lasting income losses that children cannot buffer otherwise. Our finding that children's access to other sources of insurance of labor income losses affects parents' willingness to make a transfer parallels Kaplan's result that the option to count on parents affects children's risk-taking behavior. Boar (2021) relies on matched parent-child pairs in the PSID to show that parents' consumption correlates negatively with variation in permanent income risk across children's age and occupation groups. This is consistent with parents exhibiting a precautionary saving motive in response to their children's income risk. Unlike Boar (2021), we focus on *ex-post* transfers (after shocks occur) and relate them to the *size* and *nature* of the income loss. Importantly, while parental accumulation of precautionary savings in response to their children's income uncertainty requires parents to have a precautionary motive—i.e., to have preferences exhibiting convex marginal utility—the transfer motive that we study *does not* require a precautionary motive: it only requires that utility is concave and that children suffer a sufficiently large income loss to activate the transfer. This is important because it implies that, provided parents have enough accumulated assets, an insurance channel may be operational even if those assets were accumulated for reasons other than to set up a buffer *vis-à-vis* children's labor income risk, as in Boar (2021). Because *ex-post* transfers occur when income losses are sufficiently large, our paper, like Kaplan (2012), highlights the fact that parents appear to act as insurance providers of last resort. Finally, and similarly to us, Andersen et al. (2020) study post-shock transfers using administrative data from Denmark. They observe money transfers sent between accounts of a large national bank. If the sender of the transfer has an account in the same bank, they can use administrative data to discern family ties. This means that they can obtain a direct measure of monetary transfers from *own* parents, and look at how parental transfers respond to changes in children's income and other adverse occurrences (such as unemployment, divorces, and expenditure shocks). Andersen et al. (2020) document that monetary transfers from parents are related to drops in the income position of the child as well as other adverse shocks, consistent with the insurance role of the dynasty.[7] However, they find that the replacement rate—the share of

[7]Andersen et al. (2020) also establish that the most relevant money transfers originate from parents; transfers from other members of the individual's social network (siblings, co-workers, school friends) are negligible. This highlights the unique role of parents as supplier of insurance, most likely because, unlike school friends or siblings (who tend to be of similar age as the child), parents are on average at the peak of their wealth accumulation trajectory.

the child's income loss that is covered by the parental transfer—is quite small, around 7%. While our results and those in Andersen et al. (2020) are qualitatively similar, they differ in various respects. First, we estimate a significantly higher replacement rate (not too far from half of transitory income losses). One potential reason for this difference is that parental transfers are unobserved in Andersen et al. (2020) if they are given as cash in order to avoid *inter-vivos* inheritance taxation. Another reason is that Andersen et al. (2020) do not observe if parents *pay directly* for some of the children expenses. The understatement of the insurance coverage could be substantial if direct payments involve bulky expenses, such as the child's home rent, mortgage payments, or utility bills. Our methodology is free from these problems. We observe the parental linkages of both spouses and the parents' wealth changes, hence capturing *all* parents' transfer sources. Furthermore, because we observe all parents we can study whether parents care only about shocks to their own children or also about shocks to their child's spouse and how the supply of insurance varies when the parents of one spouse are missing. Third, we devise a specific strategy to identify parents' response to transitory and permanent income shocks. On the other hand, we have to assume that a reduction in parental savings is causally related to the child's income shock; we do so by identifying truly idiosyncratic shocks to the child's income (i.e., dismissing concerns related to facing common shocks), and using exogenous variation stemming from firm shocks passing through the child's earnings.

Our paper also relates to a recent strand of macroeconomics research that studies the aggregate implications of idiosyncratic labor income shocks. For example, Bayer et al. (2019) study the aggregate implications of microeconomic uncertainty shocks through accumulation of liquid precautionary assets (see also Basu and Bundick 2017 and Leduc and Liu 2016); Schaab (2020) allows also for time variation in fundamental aggregate risk and for correlation between the latter and the micro uncertainty that individuals experience, emphasizing the tail-risk nature of microeconomic labor income shocks during recessions (as in Guvenen et al., 2014). However, in these papers the only insurance mechanism is precautionary savings. One exception is Bardoczy, 2020, who builds a macroeconomic model with incomplete markets and heterogeneous agents facing idiosyncratic and cyclical labor income risk but allows insurance among spouses, both because marriage offers unemployment risk diversification and because a spouse can increase his/her labor supply to absorb the shock to the family income. However, none of these papers allow for parental insurance. As ours and Kaplan's (2012) findings suggest, parental insurance activates precisely in response to the type of shocks to labor income - large and possibly persistent - that children find hardest to self insure and because of this may cause the strongest consumption response. Accordingly, ignoring parents' insurance role can significantly overstate the importance of microeconomic labor income shocks for macroeconomic fluctuations. In general, our evidence suggests that a full understanding of the macroeconomic implications of microeconomic labor income risk would require modeling households not as isolated entities but as dynastically connected through transfers from one generation to the next.

The rest of the paper proceeds as follows. In Section 2, we outline a simple model and describe its basic predictions. In Section 3 we lay down our empirical strategy and discuss identification of parents' savings response to transitory and permanent shocks to their children labor income. In Section 4 we introduce the data and discuss how we measure shocks to labor income and to firm performance. We present our main results in Section 5, while in Section 6 we show evidence of heterogeneity in parents response to children income shocks and discuss extensions. In Section 7 we put the results in perspective and conclude.

2 A basic framework

In this section, we set up a simple model of dynastic relations between parents and children (similar to Altonji et al., 1997) to isolate the main forces that induce parents to offer insurance to children experiencing labor income losses. The model provides a set of predictions that guides our empirical analysis.

Parents live for three periods and interact with children in periods 1 and 2. In the initial period (period 0) parents obtain income y_0^P and save w_0^P. In period 1 they receive income $y_1^P = y_0^P$, can count on previous period savings w_0^p and save w_1^P to finance spending in the last period; they make an *inter vivos* transfer τ_1 to their child after observing the *level* and *nature* - transitory or persistent - of the shock faced by the child. In period 2 they spend w_1^P after making another transfer τ_2 to the child. In both periods children are endowed with the same flow of income/cash-on-hand, a^K, which is subject in period 1 to a shock ϵ_1, and in period 2 to a shock ϵ_2, observed by both parent and child. We assume no lifetime uncertainty. Parents draw utility from helping their children when alive, but no utility from leaving bequests, which are therefore absent.

To consider a stark case for insurance, assume that children have no access to formal insurance or credit markets. This assumption captures the idea that there are financial market frictions to which parents are not subject because, being older, they have accumulated enough assets when children start facing labor market shocks. Accordingly, they can use these assets to time transfers to their children to help them smoothing consumption.[8]

We focus on the parents' optimization problem once children are born, i.e., focus on choices made in periods 1 and 2. Assuming for simplicity no discounting and zero return on savings, parents choose their current savings and transfers in the two periods to maximize expected utility, subject to the constraint that they cannot make negative transfers:

$$Max_{w_1^P,\tau_1,\tau_2} : u(y_0^P + w_0^p - w_1^P - \tau_1) + Eu(w_1^P - \tau_2) + \alpha[u(a^K + \epsilon_1 + \tau_1) + Eu(a^K + \epsilon_2 + \tau_2)]$$

$$s.t.\tau_1 \geq 0; \tau_2 \geq 0$$

where period utility $u(.)$ is increasing and concave. The parameter $0 \leq \alpha \leq 1$ measures the degree of parental altruism. As for the shock to the child's income, we assume that it follows an AR(1) process:

$$\epsilon_2 = \rho\epsilon_1 + \theta\eta$$

The period 1 shock ϵ_1 is a symmetrically distributed, zero mean error with variance σ^2; η is a zero mean, i.i.d. innovation with variance σ_η^2; and $\theta \geq 0$ marks the importance of this innovation for the second period shock ϵ_2. The parameter ρ measures the degree of persistence of the income shock; we assume $0 \leq \rho \leq 1$. From the parents' period 1 viewpoint, ϵ_1 is known and so is the persistent component of ϵ_2, i.e., $\rho\epsilon_1$, whereas the innovation η is not. To focus on the role of persistence and obtain a closed form solution to the parent's transfer policy, we assume for simplicity $\theta = 0$. This amounts to ignore a precautionary savings channel (and thus dropping the expectations operator from the above problem) against children's labor income shocks when parents plan their saving and transfer policy for period 2. This channel is the focus of Boar (2021).[9]

[8]A less extreme assumption is that parents can invest their savings at a higher rate than children, for instance because the scale of their wealth allows to reap a higher risk-free return. If children could borrow but the borrowing rate exceeded the risk free rate, parents could profitably lend money to them.

[9]An alternative equivalent assumption is to assume quadratic utility, and thus the absence of a precautionary saving motive.

2.1 Optimal transfers

The following proposition establishes the conditions under which the transfers are operative so that shocks to the child's consumption may affect parents' savings flows.

Proposition 1

In the spirit of the role of insurance, assume that in the absence of shocks, i.e., when $\epsilon_1 = 0$, parents make no transfers, that is $u'\left(\frac{y_0^P+w_0^p}{2}\right) \geq \alpha u'(a^K)$. Under the assumption $0 \leq \alpha \leq 1$, this condition holds if the child's endowment is at least a certain share of the parents' endowment. *A fortiori*, parents make no transfers when the shock is positive. Let $\bar{\epsilon} \leq 0$ denote a threshold value for the first period shock and τ_1^* and τ_2^* the optimal transfers. Hence, assuming $0 \leq \rho \leq 1$:

- The size of transfers depend on the realization of the shocks affecting the child's income: $\tau_1^* > 0$ and $\tau_2^* > 0$ if $\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$; $\tau_1^* > 0$ and $\tau_2^* = 0$ if $\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}$; and $\tau_1^* = \tau_2^* = 0$ if $\epsilon_1 \geq \bar{\epsilon}$.

- The threshold $\bar{\epsilon}$, defined implicitly by: $u'(\frac{y_0^P+w_0^P}{2}) = \alpha u'(a^K + \bar{\epsilon})$, is decreasing in children's cash on hand, a^K, and increasing in parents' period 1 endowment, $y_0^P + w_0^P$, and degree of altruism α.

- When both transfers are positive, their level equalizes children's marginal utility of consumption in the two periods. This requires $\tau_2^* = \tau_1^* + \epsilon_1 - \epsilon_2$. If only the first period transfer is active, its optimal level equalizes parents' period 1 marginal utility to the parents' perception of children's period 1 marginal utility.

- If the shock is purely transitory ($\rho \to 0$), there is no transfer in the second period, and in the first period a transfer is only observed if $\epsilon_1 < \bar{\epsilon}$; if the shock is purely permanent ($\rho \to 1$), transfers are either zero in both periods (if $\epsilon_1 \geq \bar{\epsilon}$) or positive in both periods (if $\epsilon_1 < \bar{\epsilon}$).

Proof: In the Appendix.

The proposition implies that, provided parents have large enough accumulated savings and care about their children (so that they internalize the child's budget constraint), they are ready to help financially constrained children smooth current consumption when children suffer a sufficiently large income loss in the current period.

In addition, if the shock is large enough (in absolute value), parents plan to transfer cash also in the next period; this requires compressing their current consumption to make sure that enough resources are available in period 2 to sustain their own consumption and finance the transfer to the child. Assuming both transfers are operative, their size will be increasing in the value of parents endowment and degree of altruism, decreasing in the child's endowment, and will be larger the more negative the shock. Second period transfers will be larger the higher the degree of persistence ρ.

2.2 Parents' wealth dynamics

In the data we do not observe *inter vivos* cash transfers; however, parental transfers triggered by shocks to the child's income do affect the dynamics of parents' wealth, establishing a link between observable shocks to children's labor income and changes in their parents' wealth.[10] From the first order condition for savings w_1^P in the parents' maximization problem above, the parents' flow of savings is:

$$\Delta w_1^P = w_1^P - w_0^P = \frac{1}{2}(y_0^P + \tau_2^* - \tau_1^*) - \frac{1}{2}w_0^P$$

If a current transfer τ_1^* takes place, parents' savings fall, whereas they rise if, *ceteris paribus*, parents plan a transfer τ_2^* for the future period. Because optimal transfers depend on the income loss experienced by the child, the existence of an insurance motive can be inferred from the response of parents wealth changes to the children's observable labor income shocks. To obtain closed form solutions to the optimal transfers and thus to parents' wealth change, assume period utility is CRRA $u(x) = \frac{x^{1-\gamma}}{1-\gamma}$ with relative risk aversion parameter $\gamma > 0$.

We summarize the link between parents' wealth changes and income shocks in the following proposition.

[10] *Inter vivos* transfers are typically unobservable, particularly at high frequency. When information on *inter vivos* transfers is available, it is often either about transfers made by the donor or those received by the recipient, but rarely do researchers observe both sides of the exchange. Andersen et al. (2020) is an exception as they observe transfers made by parents to children who have checking accounts in the same bank. However, even in this case, it is unlikely that all transfers are captured. Apart from direct cash transfers that do not go through the bank account, parents can support their offspring by paying directly some of their expenses, such as rent, mortgage, or utility bills. These transfers are not observed but they affect parents' wealth dynamics. If wealth dynamics is well measured, as is in our data, it captures in principle all type of transfers that affect parental savings.

Proposition 2

If period utility is $u(x) = \frac{x^{1-\gamma}}{1-\gamma}$, the condition for no transfer when $\epsilon_1 = 0$ is $a^K \geq \mu\frac{(y_0^P + w_0^P)}{2}$, where $\mu = \alpha^{1/\gamma}$ satisfies $0 \leq \mu \leq 1$ and is increasing in risk aversion. The shock threshold for the first period transfer to be operative is $\bar{\epsilon} = \left(\mu\left(\frac{y_0^P + w_0}{2}\right) - a^K\right) < 0$, and the condition for transfers to be operative in both periods is $\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$. The solution for the optimal transfers and for the dynamics of parents wealth depends then on the realized value of ϵ_1 and is given by the following:

Case	τ_1^*	τ_2^*	Parents' current savings Δw_1^P
$\epsilon_1 \geq \bar{\epsilon}$	$\tau_1^* = 0$	$\tau_2^* = 0$	$\Delta w_1^P = \frac{y_0^P}{2} - \frac{w_0^P}{2}$
$\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}$	$\tau_1^* > 0$	$\tau_2^* = 0$	$\Delta w_1^P = \frac{y_0^P}{2+\mu} - \frac{w_0^P}{2+\mu} + \frac{1}{2+\mu}\left(a^K + \epsilon_1\right)$
$\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$	$\tau_1^* > 0$	$\tau_2^* > 0$	$\Delta w_1^P = \frac{y_0^P}{2} - \frac{w_0^P}{2} + \frac{(1-\rho)}{2}\epsilon_1$

Proof: In the Appendix.

Letting $I^+ = I\{\epsilon_1 \geq \bar{\epsilon}\}$, $I^- = I\left\{\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}\right\}$ and $I^{--} = I\left\{\epsilon_1 < \frac{\bar{\epsilon}}{\rho}\right\}$ be indicator functions for the three intervals the shock can take (positive or very mildly negative, negative, and strongly negative), the dynamics of parents' wealth can be written as:

$$\Delta w_1^P = \frac{1}{2}\left(y_0^P - w_0^P\right) I^+ + \frac{1}{2+\mu}\left(y_0^P - w_0^P + a^K + \epsilon_1\right) I^- + \frac{1}{2}\left(y_0^P - w_0^P + (1-\rho)\,\epsilon_1\right) I^{--}$$

Parents' wealth dynamics is invariant to the shocks to child's income when the latter are positive ($\epsilon_1 \geq \bar{\epsilon}$), in which case it is purely determined by the need to smooth their own consumption between period 1 and 2. When children suffer a moderate income loss in period 1 (i.e., when $I^- = 1$), parents make a positive transfer $\tau_1^* = \frac{2}{2+\mu}(\bar{\epsilon} - \epsilon_1)$ and save less than in the first case, $\Delta w_1^P = \frac{y_0^P - w_0^P}{2} - \frac{\tau_1^*}{2}$. Since $0 < \mu < 1$, the parents offer only partial insurance against the child's shock. The transfer is increasing in the size of the shock, the degree of altruism, the child's endowment, and decreasing in the parent's endowment. Finally, when the child receives a large negative shock, ($\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$) parents make transfers in both periods, and the change in wealth is $\Delta w_1^P = \frac{1}{2}\left(y_0^P - w_0^P + (1-\rho)\,\epsilon_1\right)$. Accordingly, parents current dissaving increases with the size of the child's income loss, the less so the more persistent is the shock.[11]

[11]When making transfers in both periods is optimal, one important question is why parents do not choose to make a single transfer in period 1. In our simple model, this is because children have no access to financial

Figure 1 shows graphically the relation between change in parental wealth and the period 1 shock to children's labor income under different assumptions about the degree of persistence. Two things emerge from this picture. First, the amount of resources that parents carry to the next period (savings) decreases with the (absolute value) size of the child's shock, since insurance requires a larger transfer from the parent to the child. Second, savings increase with the degree of persistence of the shock, since parents balance the insurance against current shock vs. the expectation of having to make a transfer in the second period as well. In fact, one can break the saving response to the shock into two components: the current "insurance" component (the effect of ϵ_1 in the purely transitory case, or $\rho = 0$) and the "child's rainy day" component (which comes from the fact that, with $\rho > 0$, parents expect to make a transfer in the second period if the shock is large enough in absolute value). The latter is plotted in Panel B.

In the next section we present the empirical strategy that we use to test these basic implications of the parental insurance model and discuss how we can identify parents responses to transitory and permanent shocks.

3 The empirical model

An empirical specification that captures the key implications of the model of Section 2 is the following:

$$\Delta w_t^P = \alpha_{Trans} \Delta y_{Trans,t}^{-K} + \alpha_{Pers} \Delta y_{Pers,t}^{-K} + \gamma \Delta y_t^{+K} + \beta_1 w_{t-1}^P + \beta_2 y_{t-1}^P + \beta_3 a_{t-1}^K + \eta_t^P, \quad (1)$$

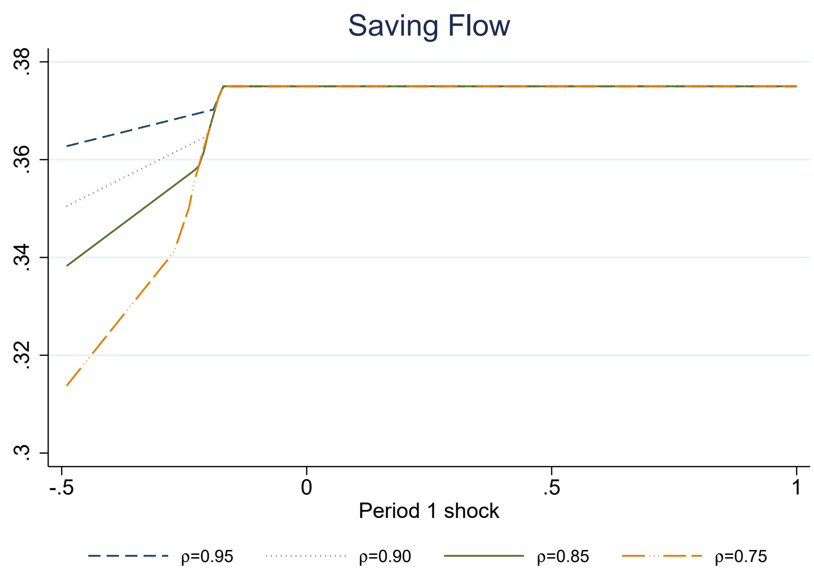
where Δw_t^P is the log-change in parents' liquid wealth in year t, $\Delta y_{Trans,t}^{-K}$ and $\Delta y_{Pers,t}^{-K}$ denote transitory and persistent drops in the child's labor income, Δy_t^{+K} is a positive income shock, and w_{t-1}^P is beginning-of-period parent wealth. We also control for parental income, y_{t-1}^P , and the child's liquid resources (i.e., cash on hand, measured as after-tax income plus financial wealth), a_{t-1}^K, both measured a full calendar year earlier.[12] This specification captures both the asymmetric response to positive vs. negative income changes as well as the distinction

markets (including access to a saving technology). In less simple settings, this may still be optimal if the child's income in the second period is uncertain, if parents have higher returns on financial wealth due to scale effects, or if there are moral hazard considerations.

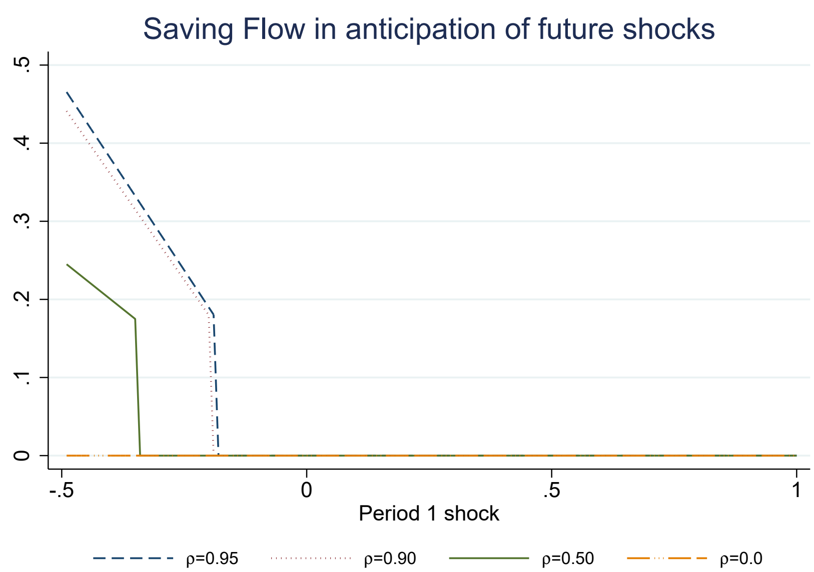
[12] Because the left hand side of equation (1) is the first difference in parents' wealth between t and t-1, to avoid attenuation bias due to measurement error in parents' liquid assets, the control for parents' lagged liquid assets on the right-hand side of equation (1) is dated t-2. Our findings are robust to changing the length of these lags.

Figure 1: The relation between parents savings and children labor income shocks

Panel A: Parents savings and current shock



Panel B: Parents savings and persistent shock



Notes: Panel A shows the relation between the change in parents wealth and the current shock to children labor income; Panel B shows the relation between parents savings and the persistent component of the current shock to children labor income. The graphs are generated under the (illustrative numerical) assumptions: $\alpha = 0.66, \gamma = 3, y_0^P = 0.75, a^K = 0.5$.

between temporary vs. more persistent shocks.

The theoretical model implies that parents make a transfer, and thus dissave, when their child face a transitory drop in income (or $\alpha_{Trans} > 0$), and that they save in anticipation of having to make future transfers in the future when the shock is persistent (or $\alpha_{Pers} < 0$). Finally, no response should be observed when children experience positive income shocks - that is, $\gamma = 0$. The theoretical model also delivers implications for the sign of parents' initial wealth ($\beta_1 < 0$) and children's cash on hand ($\beta_3 > 0$). Note that to interpret α_{Trans} and α_{Pers} as "insurance" parameters, one needs to identify genuine shocks to the child's income as opposed to anticipated or endogenous changes. The clearest example is one of reverse causality: a decline in parents' wealth may induce a labor supply response (and hence an increase in earnings) by the child if it signals lower bequests or *inter vivos* transfers in the future. Below, we discuss how we can use shocks to the firm where the child is employed as instruments for explaining exogenous changes in the child's income.

One key issue in estimating (1) is that we do not observe transitory and persistent income shocks separately. Furthermore, we cannot separate negative from positive (persistent or transitory) shocks, as we only observe the convolution of the two. Consider making no distinction between the two shocks and simply regressing Δw_t^P on Δy_t^{-K}:

$$\Delta w_t^P = \alpha \Delta y_t^{-K} + \gamma \Delta y_t^{+K} + \beta_1 w_{t-1}^P + \beta_2 y_{t-1}^P + \beta_3 a_{t-1}^K + \eta_t^P. \tag{2}$$

In this case, the parameter α measures the combined response of parental saving to a drop in the child's income. Assuming that the child's labor income shock at time t is orthogonal to lagged values of his cash-on-hand and the parents' income and wealth, the OLS estimate of α is a linear combination of the two responses α_{Trans} and α_{Pers}:

$$plim \hat{\alpha}^{OLS} = \omega_{Trans} \alpha_{Trans} + (1 - \omega_{Trans}) \alpha_{Pers}, \tag{3}$$

where $\omega_{Trans} = \frac{2\sigma^2_{Trans}}{2\sigma^2_{Trans} + \sigma^2_{Pers}}$ and $1 - \omega_{Trans}$ are the shares of total income variance that is due to transitory and persistent shocks, and σ^2_{Trans} and σ^2_{Pers} are the variance of transitory and persistent shocks to labor income, respectively. Since the model predicts $\alpha_{Trans} > 0$ and $\alpha_{Pers} < 0$, it is quite possible that $\hat{\alpha}^{OLS}$ is small even if both α_{Trans} and α_{Pers} are large. Below we discuss how we can identify α_{Pers} and use the above expression to retrieve an estimate of α_{Trans}.

3.1 Identifying parents' saving response to child persistent labor income drops

To identify parents' saving response to the persistent component of the shock (the parameter α_{Pers}) we rely on an instrumental variable strategy. Several papers in the rent sharing literature have found strong and consistent evidence for firms fully insuring workers' wages against transitory shocks to firm output while passing through permanent output shocks to workers' wages.[13] Let ΔVA_t^{-K} denote negative shocks to the performance of the firm where the child is employed (measured for instance by value added). Then, a regression of $\Delta y_t^{-K} = (\Delta y_{Trans,t}^{-K} + \Delta y_{Pers,t}^{-K})$ on ΔVA_t^{-K} isolates permanent drops in child labor income caused by drops in his/her firm valued added. As we show more formally in the Appendix OA.2, this implies that using ΔVA_t^{-K} as an instrument in an IV regression of (2) identifies α_{Pers}. Call this estimate $\hat{\alpha}^{IV}$. We can then use equation (3) to back out the parents' savings response to transitory child income shocks as:

$$\hat{\alpha}_{Trans} = \frac{1}{\hat{\omega}_{Trans}} \hat{\alpha}^{OLS} - \frac{(1 - \hat{\omega}_{Trans})}{\hat{\omega}_{Trans}} \hat{\alpha}^{IV},$$

where the variances of the transitory and persistent income shocks are (as discussed in Section 5.2 below) estimated as $\hat{\sigma}^2_{Trans} = -E[\Delta y_{t-1}^K \Delta y_t^K]$ and $\hat{\sigma}^2_{Pers} = E[(\Delta y_t^K)^2] + 2E[\Delta y_{t-1}^K \Delta y_t^K]$, respectively. Under our maintained assumptions, $plim \hat{\alpha}^{IV} = \alpha_{Pers}$ and $plim \hat{\alpha}_{Trans} = \alpha_{Trans}$.[14]

A few points need remarking. First, firm value added shocks induce persistent changes in workers' earnings under two assumptions: (a) firms pass-through onto wages mostly persistent shocks to their performance (an assumption validated by several empirical studies); and (b) workers cannot avoid such pass-through, which is the case when labor markets are characterized by frictions, a hard-to-dispute feature of most labor markets and an assumption that can be easily tested by looking at the power of the instrument. Second, several papers in the consumption insurance literature (Blundell et al. 2008; Kaplan 2012; to cite a few) use

[13] This was first established by Guiso, Pistaferri and Schivardi (2005) with Italian data and replicated by Fagereng, Guiso and Pistaferri (2018) with Norwegian data. The finding has been replicated for other countries (see Guiso and Pistaferri (2020) for a survey) and extended to other contexts. For example, Ring (2020) finds that a harshening of financial frictions leads to a reduction in hiring rather than displacement of existing workers during the crisis of 2008–09.

[14] See Appendix OA.2. Note that in estimating the variances of permanent and transitory shocks we do not need to distinguish between positive and negative shocks to labor income and can thus use all the variation in the data. A possible concern would be if the variance of shocks differs conditioning on positive vs. negative shocks. However, as we shall see, the distribution of residualized log income changes is fairly symmetric around the mean.

the covariance restriction that the model imposes on the joint behavior of consumption (or saving) and income at different leads and lags to identify the effect of transitory and more persistent shocks on behavior. We cannot use this popular strategy here because the altruism model of Section 2 draws a net distinction between the impact of negative-transitory, negative-persistent, and positive shocks, which are not separately identified by covariance restrictions. Combining OLS and IV estimates (along with the dynamics of the worker's income process to pin down $\hat{\omega}_{Trans}$) is a transparent way of solving the problem of identifying two parameters ($\hat{\alpha}_{Pers}$ and $\hat{\alpha}_{Trans}$) using two data "moments".

4 Data and variables construction

In this section, we discuss our data sources, the criteria for selecting the sample we focus on, and how we measure income shocks.

4.1 The Norwegian population data

We use population data for Norway and match through family identifiers every parent to all sons and daughters (we refer to them as children), either single or married, who live in an independent domicile. We link parents and children identifiers with several administrative registries: (a) tax records containing detailed information about the individual's sources of income as well as asset holdings and liabilities; (b) balance sheet data for the private businesses owned by the individual; (c) a housing transaction registry; (d) balance sheet information for all firms individuals work for. The value of asset holdings and liabilities is measured as of December 31. While tax records typically include information about income, they rarely (if ever) contain exhaustive information about wealth. In Norway, this happens because of a wealth tax that requires taxpayers to report their asset holdings in their tax filings. From the tax records we observe labor income as well as any other income component, including income from capital and from transfers. From the same source we have information on the assets and liability holdings of each taxpayer. Assets values are reported separately for each of the classes (deposits, bonds, mutual funds, listed stocks, non-listed stocks, real estate and private business wealth) and three liability types (mortgages, consumer loans and student loans).[15] Financial assets are reported at market value directly to the tax authority

[15] Data on private pension wealth and other (minor) wealth components are absent. However individual pension (i.e., the equivalent of IRA accounts in the US) are quantitatively negligible (less than 1% of aggregate household gross wealth). Furthermore, liquidation of these assets is typically costly as they entail

by the intermediary where the asset is held (e.g. a bank or mutual fund); similarly, labor income is reported directly by the employer to the tax agency. Finally, wealth in private business is obtained as the product of the equity share held in the firm (available from the shareholder registry) and the fiscally-relevant "assessed value" of the firm. The latter is the value reported by the private business to the tax authority to comply with the wealth tax requirements. See Fagereng et al. (2020) and Ring (2019) for more details about the wealth data.

The data we assemble have several, distinguishing useful features for the purpose of this study. First, our income and wealth data cover all individuals in the population, including people at the bottom as well as at the very top of the wealth distribution. This is important since whether the parents insurance channel is active or not depends on their wealth holdings relative to those of their children. Furthermore population coverage allows to span both sources of parents transfers for married couples, transfers from the parents of the husband and from those of the wife (if alive).

Second, in our data set, most components of income and wealth are reported by a third party (e.g., employers, banks, and financial intermediaries) and recorded without any top- or bottom coding. Thus, the data do not suffer from the standard measurement errors that plague household surveys, where individuals self-report income and asset components and confidentiality considerations lead to censorship of asset holdings and top incomes. Third, the Norwegian data have a long panel dimension, which allows to observe interactions between parents and children over several periods where negative income shocks have a chance to materialize and insurance-motivated transfers to be observed. Because the data cover the whole relevant population, they are free from attrition, except the unavoidable ones arising from mortality and emigration, implying that parents-children interactions are rarely interrupted and can be followed also in case of divorce of either the young or old member of the dynasty.

Next, we discuss how we measure shocks to children's labor income and to their firms' value added, parents' savings and endowments as well as our sample selection.

early withdrawal penalties as well as the loss of tax subsidies. Hence, they are unlikely to be relied upon to fund a transfer to own children. The other component of wealth that is missed is assets held abroad not reported to the tax authority. However, this is unlikely to matter for our results. Alstadsæter et al. (2018) find that only a fraction of people in the top 1% of the distribution of wealth holds assets offshore. This people are not only a few but also so wealthy that missing their assets abroad does not affect their ability to transfer money in case their children are confronted with a shock.

4.2 Measuring income shocks and financial holdings

We restrict the analyses to children aged 25 to 55 to focus on people who have completed their education and are not yet retired.[16] To obtain an exogenous earnings shock measure, we focus on children employed in the private sector where we have a meaningful definition of firm value added. We drop observations where parents and children work in the same industry, and children whose lagged earnings is below a threshold of approximately \$10,000 ("basic income" level in Norwegian Social Security). These selections leave us with a sample of 3 million child-parent pairs observed during the 1997–2014 time period, providing a total of more than 13 million observations, of which about 9.7 million from matches with married children.

Shocks to the firm's performance. Following Guiso et al. (2005), we measure firm performance with its value added, defined as total revenues net of operating costs, excluding depreciation and labor cost. We use value added as it is the relevant flow to remunerate labor and capital. We set value added to zero whenever it is missing during or following a bankruptcy or large collective dismissal event.[17] In order to accommodate (near-) zeros in value added when taking logs, we shift the observed measure by NOK 10,000 (in 2011 NOKs, around \$1,000). To obtain a measure of shocks to value added we purge the observed value added data (Ψ_{jt}) of the non-idiosyncratic component in firm j in year t by estimating the following process:

$$\ln \Psi_{jt} = X'_{jt}\phi + VA_{jt},$$

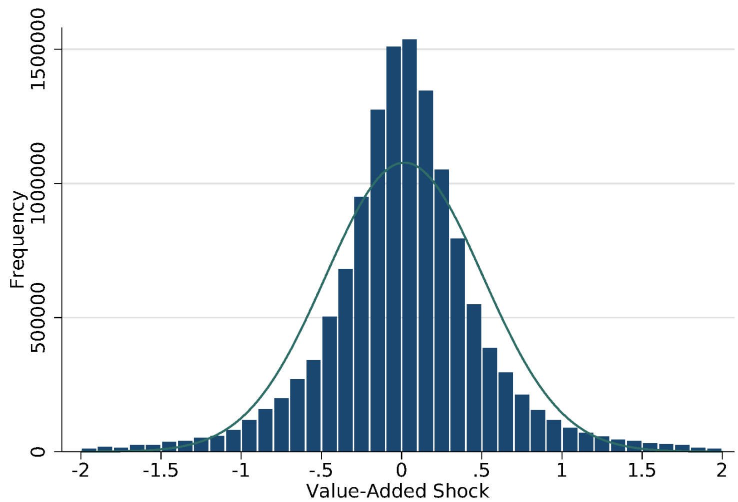
where X_{jt} is a vector of observables that captures the predictable component of firm's performance and ϕ the corresponding vector of coefficients. The shock component is the residual VA_{jt}. The vector X_{jt} includes firm fixed effects, 2-digit NACE-code industry fixed effects at the county-year level, more granular 3-digit NACE-code fixed effects at the year level, as well as the latter fixed effects interacted with lagged log revenues. Our measure of shocks to the firm value added are the first-differenced residuals from this regression after we censor/winsorize them at +/- 1.5 (approximately bottom and top 2.5%). The resulting variable is denoted ΔVA. Figure 1, Panel A shows the histogram of its uncensored values, benchmarked against the normal distribution (green line).

[16] AppendixOA.4, Table OA.1 shows that our results are invariant to reducing the age interval to 25–45.

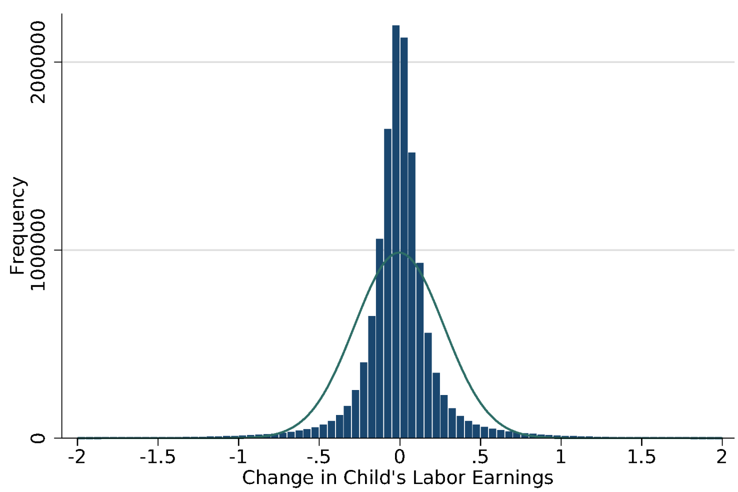
[17] We define a large collective dismissal event as one in which at least 10 employees or 10% of the firm's work force receive unemployment insurance. This addresses potential missing tax filings in the presence of large employment-relevant shocks to these firms.

Figure 2: Distribution of Value-Added Shocks and Changes in Child Labor Earnings

Panel A: Value-Added Shocks



Panel B: Log-Differenced Child Labor Earnings



Notes: Panel A shows the distribution of the estimated first differenced value-added shocks to the child's firm employer; Panel B that of the estimated shocks to child labor earnings. The bin size is 0.1 (measured in log-differenced values). Values outside [-2,2] are omitted for readability. The continuous line is a fitted normal distribution.

Shocks to labor income. We model the log of labor earnings Y_{it} of worker i in year t , in a similar vein, as a linear function of a predictable component that depends on a vector of workers observed characteristics, Z_{it} and an idiosyncratic, unpredictable component Δy_{it}:

$$\Delta \ln Y_{it} = Z_{it}' \gamma_t + \Delta y_{it}.$$

We take out predictable time-invariant components of earnings by taking first differences. Z_{it} includes a third-order polynomial in age, year-specific fixed-effects interacted with (i) family size $\times$ marital status, (ii) year-specific county$\times$field of education$\times$education level bins , and (iii) municipality of residence. Controls (ii) and (iii) non-parametrically remove region- and occupation-related shocks or trends that could be correlated with firm performance shocks. Similarly to the value added shocks, outliers are accommodated by censoring the estimated residual Δy_{it} at +/- 1.5. Figure 2, Panel B shows the histogram of the un-censored individual labor income shocks; the green line is the normal distribution. Compared to the distribution of the value added shocks, labor income shocks are much less spread out, as one would expect; both distributions appear fairly symmetric and reveal excess kurtosis, which is more marked for labor income shocks .

Changes in Financial Wealth. We follow a similar route to obtain a measure of residualized parental net saving that we use to infer their insurance role. For this we use log-differenced parental financial wealth, residualized with the same variables used to model children's income growth. We also include year-specific coefficients on the lagged stock market share in parents' financial wealth to avoid potential confounding from differences in stock market exposure. We use financial wealth to focus on a measure of wealth that can be readily made available for insurance purposes. We use residuals to insulate changes that cannot be attributed to predictable shifts in portfolio composition, taxation, and the like.

Table 1 shows summary statistics for parents and children. We also present separate statistics for the subsample of children that are married. The last three rows present statistics for the main variables of interest: residualized changes to parents' financial wealth as well as children's labor earnings and firm value added shocks. Since the distribution is symmetric (Figure 2), approximately half of the sample experience some unexplained drop in earnings. The average age gap between parents and children is 27 years. As expected, parents have much more liquid wealth than their children (twice as much at the mean) but children have relatively more labor earnings, which is consistent with parents and children being in different phases of their life cycles.

Table 1: Summary Statistics

	N	Mean	SD	p25	p50	p75
Parents						
Financial Wealth	13,102,370	465,172	2,061,713	47,682	183,550	507,449
Total Labor Income	13,102,370	432,032	347,092	214,434	350,643	551,909
Labor Earnings	13,102,370	227,775	374,789	0	22,161	374,397
Age	13,102,370	66	10	58	65	74
Children						
Financial Wealth	13,102,361	248,700	1,673,580	27,440	87,704	238,771
Total Hh. Labor Income	13,102,370	702,415	428,876	436,080	630,246	872,948
Cash-on-hand	13,102,361	791,764	1,941,981	402,379	605,885	902,554
Labor Earnings	13,102,370	428,096	290,773	273,541	376,242	516,150
Age	13,102,370	39	8	32	38	45
Married	13,102,370	0.72	0.45	0.00	1.00	1.00
Married Children						
Spouse Works	9,652,202	0.93	0.26	1.00	1.00	1.00
Spouse's Parents Present	9,205,583	0.90	0.30	1.00	1.00	1.00
Parent of Spouse	9,652,202	0.49	0.50	0.00	0.00	1.00
Not divorced $(t, ..., t+3)$	8,427,600	0.87	0.34	1.00	1.00	1.00
Share of Hh. Labor Earnings	9,652,202	0.60	0.21	0.46	0.59	0.72
Residuals						
Parents' FW, Δw^P	13,102,370	0.00	0.79	-0.24	-0.03	0.19
Child's Labor Earnings, Δy^K	13,102,370	0.01	0.32	-0.09	-0.00	0.09
Value-Added Shocks, ΔVA^K	13,102,370	0.02	0.53	-0.24	0.02	0.27

Notes: Total labor income includes labor earnings as well as pensions and labor-related public transfers. Cash-on-hand is the sum of after-tax total income and financial wealth. "Married children" is the subset of children for whom we observe a legally married spouse. The Spouse Works dummy indicates that the spouse has non-zero labor earnings. Spouse's Parents Present indicates whether the spouse's parents are alive. Parent of Spouse indicates that the child-parent relationship goes through the spouse (i.e., child-in laws). Share of Hh. Labor Earnings is the ratio of the child's own labor earnings to their household's total labor earnings, which includes any spousal earnings.

5 Results

Before showing regression results of our empirical model (1), we provide some visual evidence regarding the key property of the insurance model: transfers from parents should only be active when children experience a drop in income and parents should not respond to positive shocks to children income, as illustrated in Figure 1. Figure 3 plots the log change in parents' residualized liquid assets against shocks to the child's labor earnings using a kernel-weighted local polynomial regression. The continuous line runs the local polynomial regression over the whole range of the distribution of the shock to the child's labor earnings. There is a strong and clear positive relation between changes in parents' liquid wealth and children's labor income shock over the negative domain of the shock: as the latter becomes increasingly more negative, parents decumulate (or slow down accumulation of) financial assets. Over the positive domain of the shock the relation is essentially flat —that is, movements in parents' liquid savings are unrelated to the child's labor income innovations. The asymmetry in parents behavior is confirmed when running separate polynomial regressions for negative and positive values of the shock (the dotted line). The non-parametric empirical relation between parents' net saving behavior and children's labor income shocks tracks closely the theoretical one of Figure 1 and lends some *prima facie* support to the role of parents as insurance providers against labor income shocks affecting the younger members of the dynasty.[18] In fact, since we are using residuals that eliminate the influence of "common shocks" that may create spurious co-movements between labor earnings of children and wealth changes of parents (such as economy-wide or geographically-concentrated effects), it would be hard to rationalize the relationship that we find - and its asymmetry - absent some form of insurance or altruistic behavior from parents to children.

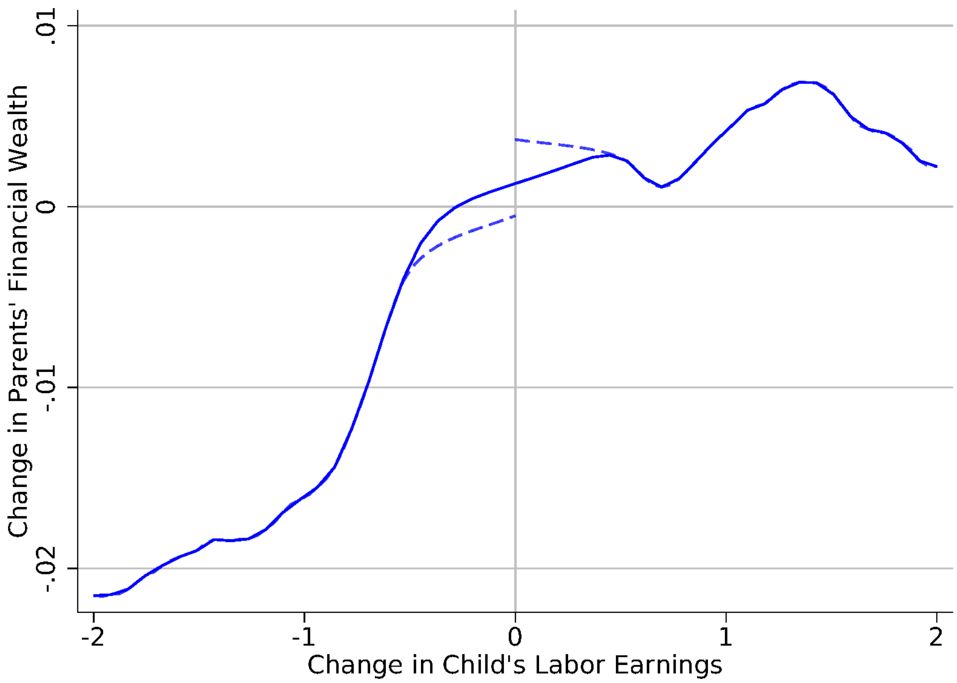
Table 2 shows OLS-estimated coefficients of our model 1. Controls include the parents' lagged financial wealth and income (both in logs) as well as children's lagged (log) cash on hand (the sum of financial wealth and after-tax income) to capture the volume of resources that children can count on to smooth earnings shocks. Consistent with the model predictions, the initial stock of parents' financial wealth is negatively correlated with parents' current savings while the latter are positively correlated with the children's cash-on-hand; both are highly statistically significant.[19]

In column (1), no distinction is made between positive and negative values of the shock to children labor income. The estimated parameter is positive with a point estimate of 0.011 and is highly statistically significant (p-value 0.001). This implies that parents dissave in response

[18]Notice that in Figure 3 the relation flattens when the drop in child income is large, a feature predicted by the model (see Figure 1). This happens because when the drop in income is large parents plans to make also a transfer in the future and this requires some extra savings. The latter comes partly from lowering current transfers, which flattens the curve.

[19]It is worth noticing that the positive correlation between parents savings and children cash on hand arises if parents are altruistically linked to their children and when the transfer motive is active: transfers are of smaller size (i.e. parents dissave less) when children cash on hand are larger, giving rise to the correlation.

Figure 3: Parental Saving and Changes to Children's Labor Earnings



Notes: The figure shows the relationship between (residualized) changes in parents' financial wealth and changes in the child's labor earnings. The solid line is a local polynomial fit (bandwidth=0.25), excluding values exceeding 2 in absolute value. The dashed lines perform the local polynomial fit separately for negative and positive changes in earnings.

to their children facing negative income shocks. The second column separates positive and negative unanticipated changes in children labor income. The estimate of parameter α in equation (2), which measures the effect on parents' savings of *drops* in the child's income, is 0.0252 and highly significant (p-value of 0.0013). In contrast, the estimate of parents' savings response to positive innovations in children's income (γ in equation 2) is virtually zero, implying that, economically, over the positive range of variation of children income shocks parents' savings are insensitive to the shocks, as already shown in Figure 2.

Table 2: Baseline OLS Regressions: Saving responses to total shocks

	(1)	(2)
Δy^K	0.0106***	
	(0.0007)	
$\Delta y^{K,-}$		0.0252***
		(0.0013)
$\Delta y^{K,+}$		-0.0001
		(0.0011)
log(parents' FW)$_{t-2}$	-0.0440***	-0.0440***
	(0.0002)	(0.0002)
log(parents' income)$_{t-1}$	0.0250***	0.0254***
	(0.0003)	(0.0003)
log(child's cash-on-hand)$_{t-1}$	0.0300***	0.0291***
	(0.0003)	(0.0003)
R^2	0.01	0.01
N	13,550,903	13,550,903

Notes: The table shows the main OLS estimates of model (2). Column 1 regresses log-differenced parent financial wealth on log-differenced child labor earnings. In column 2, the log-differenced earnings residuals are decomposed into two terms, one containing negative changes and the other containing positive changes. Standard errors are reported in brackets.

5.1 Parents' savings response to permanent shocks

As argued in Section 3, the OLS estimate combines the responses to transitory and persistent shocks to children's income. Yet the model suggests that parents' savings are affected differently by transitory drops in children income and by persistent drops: faced with a persistent children income drop, parents should save more in order to be able to make transfers to their children also in the future. Since the model predicts that the two coefficients are of opposite sign, a small OLS estimate may hide larger responses to the two type of shocks.

To identify the effect of persistent shocks, we follow the IV strategy discussed in Section 3. Our first step is to establish the power of the instrument (first stage of the regression), i.e., to show that shocks to the value added of the firm predict shocks to children labor income. In particular, we want to establish that negative shocks to the performance of the firm cause negative changes in children's labor income, which is what triggers parental transfers. Secondly, we want to establish that persistent shocks to firms performance are the drivers of the correlation between parents savings and children labor income drops.

Table 3 shows several specifications documenting the transmission of value added shocks onto earnings. The first column regresses our measure of shocks to children labor income on the shock to the firm value added (controlling for parent and child endowments). The effect is positive and statistically highly different from zero (p-value 0.0007). Moreover, our specification includes additional economic controls that may reduce pass-through. For example, workers with more accumulated assets may more easily finance consumption while seeking alternative employment; this makes them less likely to be the target of pass-through of firm shocks. The second column focuses on negative shocks to children labor income and shows that they are only predicted by negative shocks to the firm value added; positive value added shocks have no power for predicting drops in children income. Accordingly, in the third column, we drop positive shocks to value added from the specification: this estimate represents the first stage in our main IV estimate of parents savings response to children negative income shocks (discussed later). Finally, the last column replaces the left hand side with a three-year (forward) moving sum of negative changes in children income as a way of isolating the persistent component of the shock. It shows that the effect of negative shocks to value added is of the same order of magnitude as in the third column . We interpret this result as evidence that firms pass over to workers' wages only permanent shocks to their performance, as previously established by Guiso et al. (2005) and Fagereng et al. (2018) using a somewhat different methodology. In Appendix OA.3 we show formally that under the null that only persistent shocks to the firm performance are passed over to workers wages, the estimates in the third and fourth column are equal, a null that is not rejected by the formal test at the bottom of the Table..

Table 3: Transmission of Value-Added Shocks

Dependent Variable	Δy_t^K	Δy_t^K $\times 1[\Delta y_t^K < 0]$	Δy_t^K $\times 1[\Delta y_t^K < 0]$	$(\Delta y_t^K + ... + \Delta y_{t+2}^K)$ $\times 1[\Delta y_t^K < 0]$
	(1)	(2)	(3)	(4)
ΔVA	0.0066***			
	(0.0007)			
ΔVA^-		0.0079***	0.0078***	0.0068***
		(0.0010)	(0.0008)	(0.0010)
ΔVA^+		-0.0005		
		(0.0008)		
ΔVA^-: (3)-(4)			0.0010	
(se)			(0.0010)	
R^2	0.0151	0.0048	0.0048	0.0039
N	13,079,809	13,079,809	13,079,809	9,972,267

Notes: The table shows how value-added shocks are transmitted to labor earnings. Column (1) is a simplified first-stage that does not distinguish between the sign of the shock or the sign of the change in labor earnings. Column (2) provides first-stage results when distinguishing between positive and negative value-added shocks, and only considers the effect on negative labor earnings changes. Column (3) is the first-stage regression corresponding to our main IV estimates in Table 4, which assumes that the pass-through coefficient of zero of positive shocks to negative labor earnings changes. Column (4) shows evidence that only persistent shocks are transmitted; the left hand side isolates the persistent component of labor income shocks by summing three years of (forward) income growth rates. Under that null hypothesis that only persistent shocks to VA are transmitted the estimated coefficient should be equal to that in column (3), see Appendix OA.3. All regressions include lagged parent financial wealth, income, and the child's cash-on-hand as control variables. Standard errors are reported in brackets.

Figure 4, Panel A shows the "first stage" visually by reporting the kernel-weighted local polynomial regression of negative shocks to children labor income (vertical axes) against the entire support of shocks to the firm's value added; clearly, only negative shocks to firm performance predict negative shocks to labor income. Panel B plots a non-parametric version of the reduced form evidence. It shows the local polynomial regression of the change in parents liquid assets (vertical axes) against the shocks to the value added of the child's employer. As in Figure 1, the solid line is the local polynomial fit on the entire support of value added shocks while the dotted line shows the relation separately for positive and negative shocks. Positive shocks to the firm's value added (say, increase in productivity due to the adoption of new technologies) result in positive shocks to children's labor income and, as predicted by the insurance model, have no effect on parents transfers and savings. Negative value added shocks are passed over to children's earnings only to the extent that they are permanent (say, fundamental scaling down of the firm's operations in foreign markets). The model predicts that parents save (or dissave less) when confronted with larger drops in children's earnings as they anticipate more transfers are needed in the future to sustain children consumption. Empirically (Panel B), this prediction is borne out by the negative correlation when value added shocks are negative.

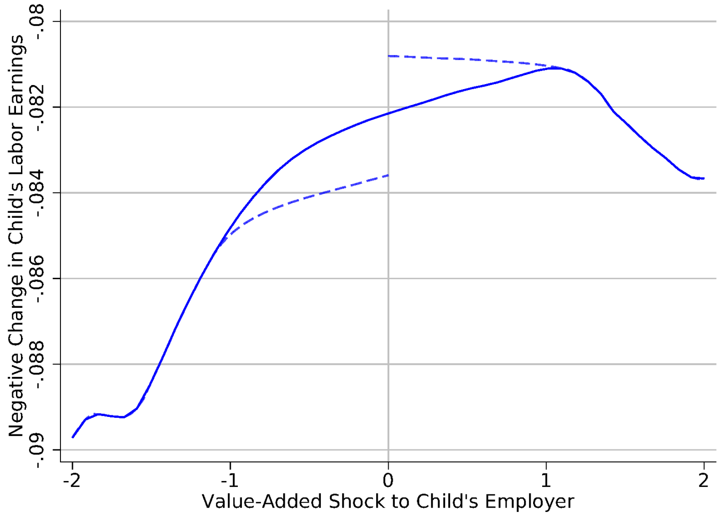
Given the evidence supporting the instruments' power, Table 4 shows the IV estimates. In column (1), we estimate the effect of both negative and positive shocks to children income on parents change in financial wealth by using two instruments: negative and positive shocks to the value added of the child's employer. Because individuals in our sample may share an employer, we cluster standard errors at the child's firm level. As the visual evidence above suggested, the instruments are statistically powerful with a first stage F-statistic of 68.5. Negative, persistent shocks to the child's earnings, as pinned down by the IV strategy, correlate negatively and significantly with parents' savings (coefficient -0.4, p-value = 0.042). In contrast, parents' savings are unresponsive to positive, persistent surprise increases in children's labor income. The point estimate of the coefficient on positive earnings changes is positive, 5.5 times smaller in absolute value than the savings response to negative changes, and not statistically different from zero. Hence, consistent with the insurance model predictions, parents react only to permanent negative shocks to their children labor income by saving more in anticipation of the transfers they plan to make in future years, when children will continue to need their support. .

In the second column we impose the restriction that parents' savings are independent of persistent *positive* shocks to the child's earnings. In this case we use only negative shocks to value added as an instrument for negative changes in labor income (consistent with Table 3, columns (2) and (3)). We find that the first stage remains strong (the F-value 96.14) and that the point estimate on negative income shocks is -0.26, only slightly different from that in column (1) but more accurately estimated. The estimated value of the parameter implies a parents savings elasticity to children labor income persistent losses of 1/4. These findings confirm the visual reduced-form evidence shown in the bottom panel of Figure 4

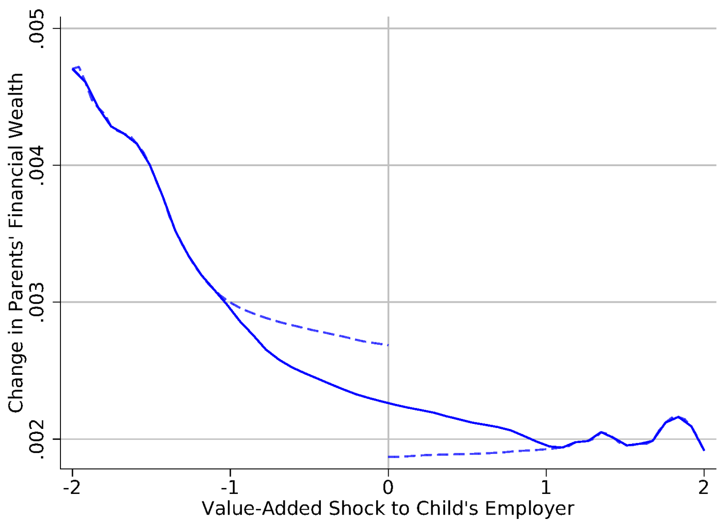
All in all, the evidence thus far lends strong support to the dynastic channel for insuring labor income shocks.

Figure 4: The Relationship Between Value-Added Shocks, Child Earnings, and Parental Saving

Panel A: First Stage



Panel B: Reduced-form Relationship



Notes: Panel A shows the first-stage relationship between negative changes in the child's labor earnings (Δy^{-K}) and value-added shocks experienced by the child's employer. Panel B shows the reduced-form relationship between changes in parents' financial wealth and the child's firm value-added shocks. The solid line is a local polynomial fit (bandwidth=0.5), excluding values exceeding 2 in absolute value. The dashed lines perform the local polynomial fit separately for negative and positive value-added shocks.

Table 4: Parents response to children persistent income drops: IV Estimates

	(1)	(2)
$\widehat{\Delta y^{K,-}}$	-0.2375**	-0.2585***
	(0.1012)	(0.0968)
$\widehat{\Delta y^{K,+}}$	0.0440	
	(0.0583)	
log(parent FW)$_{t-2}$	-0.0431***	-0.0429***
	(0.0004)	(0.0003)
log(parent income)$_{t-1}$	0.0214***	0.0217***
	(0.0012)	(0.0012)
log(child cash-on-hand)$_{t-1}$	0.0355***	0.0326***
	(0.0040)	(0.0012)
First-stage F-statistic	68.58	96.14
R^2	0.0083	0.0075
N	12,993,332	12,993,332

Notes: In column 1, positive and negative income changes are instrumented for with positive and negative value-added shocks. In column 2, negative income shocks are instrumented for with negative value-added shocks. Standard errors (in brackets) are clustered at the level of the child's employer.

5.2 Tracing the parents' response to the child's transitory income shocks

Ceteris paribus, the model predicts that temporary setbacks in earnings should be insured by positive transfers from the parents, which would induce them to dissave some of their liquid wealth. We now use the strategy discussed in Section 3.1 to back out parents' savings response to transitory shocks. In particular, we have shown that this response can be identified by combining OLS and IV estimates with an estimate of the share of total income variation explained by transitory shocks:

$$\hat{\alpha}_{Trans} = \frac{1}{\hat{\omega}_{Trans}}\hat{\alpha}^{OLS} - \frac{(1-\hat{\omega}_{Trans})}{\hat{\omega}_{Trans}}\hat{\alpha}^{IV}.$$

For this exercise we use the OLS estimate reported in Table 2 (second column) and the IV estimate reported in Table 4 (second column). To estimate the variances of transitory and permanent earnings shocks (and hence compute the weight $\hat{\omega}_{Trans} = \frac{2\hat{\sigma}^2_{Trans}}{2\hat{\sigma}^2_{Trans}+\hat{\sigma}^2_{Pers}}$), we assume that labor income follows a stochastic process given by the sum of an i.i.d. transitory shock and a random walk with (orthogonal) i.i.d. innovations. With these assumptions, one can use the variance and the first-order auto-covariance of income changes to obtain the estimates of the variances of the two shocks: $\hat{\sigma}^2_{Trans} = -E[\Delta y^K_{t-1}\Delta y^K_t]$ and $\hat{\sigma}^2_{Pers} = E[(\Delta y^K_t)^2] + 2E[\Delta y^K_{t-1}\Delta y^K_t]$ (see Guiso et al. (2005)). Table 5 shows the results of this exercise, with standard errors computed using a bootstrap procedure with 200-replications. The variance of transitory shocks to children labor income is 0.0386, smaller than that of permanent shocks, estimated at 0.105. Using these parameter estimates, parents' savings elasticity to negative transitory shocks to children's labor income is 0.41 and highly statistically significant (standard error 0.11). Faced with a 10% transitory drop in children's income, parents respond with transfers that lower their liquid assets by 4.1%. At the sample mean of children's labor income, the 10% shock amounts to an income loss of NOK 42,801 (about USD 7,000). At the sample mean of parents' liquid assets, our estimates imply a transfer-induced reduction in parents' liquid assets of NOK 19,065.. Thus parents insurance can cover approximately 45% of the child's transitory income loss:

$$\frac{\hat{\alpha}_{Trans} \times \text{mean parent financial wealth}}{\text{mean child labor earnings}} = \frac{0.4104 \times 465,172}{428,096} = 44.5\%.$$

Similarly, parental insurance covers about one quarter of persistent shocks in children's labor earnings:

$$\frac{\hat{\alpha}_{Pers} \times \text{mean parent financial wealth}}{\text{mean child labor earnings}} = 28\%.$$

These are non-negligible effects. Since the means are susceptible to outliers, we also do these back-of-the-envelope calculations at the medians. This produces a coverage ratio of transitory shocks of 20%, and a coverage ratio of persistent shocks of about 13%. These numbers are also substantial, leaving us to conclude that parents provide a meaningful source of insurance even in the presence of formal insurance mechanisms (e.g., unemployment insurance).

Table 5: Parents savings elasticity to transitory & persistent income drops

Income Variance Decomposition		Elasticities from Regressions	
$\hat{\sigma}^2_{Pers}$	0.1049	$\hat{\alpha}^{OLS}$	0.0252^{***}
			(0.0013)
$\hat{\sigma}^2_{Trans}$	0.0386		
		$\hat{\alpha}^{IV}$	-0.2585^{***}
$\hat{\omega}_{Trans}$	0.4241		(0.0821)
		Implied Elasticities to Shocks	
		$\hat{\alpha}_{Pers}$	-0.2585^{***}
			(0.0821)
		$\hat{\alpha}_{Trans}$	0.4104^{***}
			(0.1124)

Notes: The variance of transitory shocks is computed as $\hat{\sigma}^2_{Trans} = -E[\Delta y^K_{t-1}\Delta y^K_t]$; that of permanent shocks as $\hat{\sigma}^2_{Pers} = E[(\Delta y^K_t)^2] + 2E[\Delta y^K_{t-1}\Delta y^K_t]$ (see Guiso et al. (2005)). Moments are calculated using uncensored residuals. The decomposition of the OLS coefficient estimate, $\hat{\alpha}^{OLS} = \omega_{Trans}\alpha_{Trans} + (1 - \omega_{Trans})\alpha_{Pers}$, is used to calculate the implied $\hat{\alpha}_{Trans}$ under the assumption that $\hat{\alpha}^{IV}_1 = \hat{\alpha}_{Pers}$. Standard errors (in brackets) are computed using a bootstrap procedure with 200 replications.

5.3 Your parents or my parents? Checking insurance providers

In married couples that pool resources, it is immaterial which spouse suffers the adverse income shock: a dollar lost by one spouse is a dollar lost by all. In the previous sections, we have shown that an income loss induces parents to step up and insure such loss (by dissaving when the shock is temporary and by saving when it is persistent). In principle, in married couples with both sets of parents alive, the potential for insurance could be wider and hence shocks smoothed to a larger extent (see Laferrère and Wolff 2006 for a discussion). In practice, this need not be so. First, there could be free riding: each parent set may insure less waiting for the other to activate transfers. Second, there could be a violation of the equivalence of income pooling: a dollar lost by a daughter could be treated differently (for insurance purposes) than a dollar lost by a son-in-law.[20] Third, there may be "competition

[20]This may interact with violation of income pooling at the household level. If a dollar lost by a daughter weakens her bargaining position inside the marriage, her parent may want to provide insurance so as to

for attention" between the two sets of parents: a set may transfer money not to be outdone by the other set, losing part of the attention of the children. Finally, even if it exists, insurance of the child-in-law's income shocks could be contingent on the expectation that the marriage continues in the future. These are complex issues that we do not attempt to resolve here. Rather, we provide evidence on how the insurance mechanisms studied in the previous section change when the child is married and his or her spouse's parents are alive. We are able to study these issues thanks to the richness of our data, which allow us to link each spouse to his or her parents and provide us with information about the wealth of each set of parents.

We focus on a sample of couples where both spouses' parents are present. We regress the change in financial wealth of the parent set i, Δw_{it}^P, on two key covariates: Δy_{it}^{-K} (the negative shock suffered by their child), and Δy_{jt}^{K-} (the negative shock suffered by their child-in-law). We thus estimate the following variant of model (2):

$$\Delta w_{it}^P = \alpha_i \Delta y_{it}^{-K} + \alpha_j \Delta y_{jt}^{-K} + \beta_1 w_{i,t-1}^P + \beta_2 y_{i,t-1}^P + \beta_3 a_{it-1}^K + \eta_{it}^P.$$

If parents respond equally to a negative shock hitting their own child or his/her spouse, then $\alpha_i = \alpha_j$.

Table 6, Panel A, shows the results of OLS estimates. The first column reproduces the OLS estimate of Table 2 (column 2) in the restricted sample of households where both spouses' parents are present (0.0211 with a standard error of 0.0018). The second column distinguishes between negative shocks hitting the parents' own child and negative shocks hitting the child-in-law. Parents decumulate wealth in both cases; however, the response to shocks hitting their own child is 32% larger (0.0248 versus 0.018) and the difference is statistically significant (t-statistic on the difference 5.8). Panel B reports the IV regressions. The first column shows that in the sample of married children the parents' savings response is is similar in magnitude to that in the sample that includes both married and single children (see Table 4). The second column shows that the parents' save only if it is their own child that is hit by a negative, persistent shock (the estimated coefficient is -0.36 with s.e. of 0.18, significant at the 5% level). If the shock hits the child's spouse, the point estimate drops halves while the standard error is unchanged, so no statistically significant response is recorded (coefficient is -0.198, s.e. is 0.19). The third column drops from the sample all

reduce intra-household consumption reallocations. But if the same dollar is lost by the daughter's spouse and hence her bargaining position inside the marriage improves, her parent may not need to intervene since she's already better off (net of income effects).

children families that divorce at some point in the near future (5 years or less). Interestingly, while the parents' size response to a permanent drop in their own child's income is only slightly affected , the point estimate response to a shock to their child's spouse becomes as large (-0.35, significant at the 10%). While the estimate remains imprecise , its value is consistent with the idea that parents may be willing to provide insurance to children-in-law's persistent shocks only insofar as they believe their children's marriage is relatively stable. This interpretation is further supported by the OLS estimates in the third column of Panel A, showing little difference in response to the current shock when future divorcees are dropped from the sample, and by the implied response to transitory shocks computed in Panel C, which shows that divorce risk mostly affects the response to permanent shocks.

5.4 Robustness

We perform a number of robustness tests. First, we repeat our main estimates when limiting the sample to children aged 25–45 instead of our baseline range of 25–55. Results are qualitatively the same (see Appendix OA.4, Table OA.1). The same holds true if we retain only parents aged less than 75, to take care of two concerns: old parents may have already decumulated their assets to finance old age consumption; they may me mentally un-healthy and unable to make discretionary transfer decisions.[21] The OLS estimate is unaffected while the estimated elasticity to both transitory and persistent shock have the predicted sign, are precisely estimated but a little smaller in size than in the larger sample. Second, to ensure that our findings aren't driven by selection into firms after value-added shocks are realized, we limit the sample to children who were employed at their employer at the beginning of year t (i.e. January). Results are qualitatively and quantitatively similar (Appendix OA.4, Table OA.2 Panel A). Third, we run the estimates including government transfers in our measure of child income growth. . Naturally, this reduces the first-stage coefficient of value-added shocks on the child's labor income growth (as we account for some government-provided insurance, e.g., unemployment insurance) and thus modestly increases our estimate of how parents respond to permanent income shocks. But otherwise results are similar (Appendix OA.4, Table OA.2 Panel B). Finally, we run our main regressions when limiting the sample to child-parent pairs who reside in the same county(Appendix OA.4, Table OA.3) . This reduces the permanent pass-through by about 1/2 likely because parents

[21] In this case the estimated OLS parameter is 0.0234 and the elasticity to persistent and transitory income drops -0.26 and 0.39, respectively. They are all precisely measures and not different from those in the whole sample.

Table 6: Heterogeneity in response by type of parent

	(1)	(2)	(3)
		Sample	
Married	Yes	Yes	Yes
Other Parent Set Present	Yes	Yes	Yes
No Divorce within 5 years			Yes
		Panel A: OLS Regressions	
Δy_i^{-K}	0.0211***	0.0240***	0.0243***
	(0.0018)	(0.0025)	(0.0025)
Δy_j^{-K}		0.0182***	0.0192***
		(0.0026)	(0.0026)
Int. term controls	Y	Y	Y
Income, wealth controls	Y	Y	Y
N	8,195,987	8,195,987	7,150,886
		Panel B: IV Regressions	
$\alpha_{Perm,i}$	-0.2798***	-0.3617**	-0.3250*
	(0.1340)	(0.1813)	(0.1962)
$\alpha_{Perm,j}$		-0.1982	-0.3541*
		(0.1930)	(0.1898)
Int. term controls	Y	Y	Y
Income, wealth controls	Y	Y	Y
N	8,195,987	8,195,987	7,150,886
		Panel C: Implied Effect of Transitory Shocks	
$\alpha_{Trans,i}$	0.4600**	0.5867**	0.5454*
	(0.1962)	(0.2643)	(0.2936)
$\alpha_{Trans,j}$		0.3339	0.5760*
		(0.2825)	(0.2830)

Notes: Divorce Within 5 Yrs is an indicator variable that takes the value 1 when we observe the child divorcing his/her spouse within the next 5 years. All regressions consider the subsample of married children whose spouse's parents are still alive. Standard errors are reported in brackets.

anticipate being able to provide more assistance in-kind at a low cost (e.g., allowing children to move back home as in Kaplan 2012).

6 Extensions

In this section we consider some additional, intuitive implications of dynastic insurance. We first consider how parents' insurance supply changes when children have access to alternative forms of insurance. Next, we study *reverse* insurance, namely monetary transfers from children to parents.

6.1 Heterogeneity in responses

It stands to reason that the insurance role of parents should be less relevant when the child has access to alternative forms of insurance. In Norway, social insurance is very generous but there is no variation that would allow us to test whether parents provide less insurance when the child has access to the state's safety net. In contrast, we can use demographic variation (whether a child is married or not), as well as variation within married couples (whether the child's spouse has an independent source of income), to test whether parents' need to intervene with cash transfers depends on the ability of the child to absorb earnings shocks through alternative insurance channels. Marriage can mitigate the effect of income shocks suffered by one spouse either because the other spouse can enter the labor market (added worker effect), can work more (if already working), or because it expands the pool of potential insurance channels, i.e., the possibility of transfers from the spouse's parents. In Appendix Table OA.4 we run OLS and IV estimates of our main specification to capture the effects of marriage, number of parents sets and working status of spouse so as to test for these intuitive implications.

We summarize the effect of being married and also having a working spouse in Table 7 which shows the estimated effects for different subsamples: single children (column 1), married children (column 2), married with working and non working spouse (columns 3 and 4, respectively) and married with only one set or two set of parents (columns 5 and 6, respectively). The first row provides the estimated OLS coefficients. The second row shows the responses to persistent shocks, estimated using the IV approach. The third row records the implied response to purely transitory shocks.

Comparing column (1) and column (3) - i.e. single and married with one set of parents - reveals that parents tends to offer more insurance to single kids suggesting that marriage per se allows couples to handle income drops somewhat better. Point estimates of the elasticity to transitory income losses are 0.34 for singles compared to 0.22 for married, and that to persistent losses -0.19 compared to -0.13. While differences in point estimates are economically relevant standard errors large. This is partly because of the smaller sample size of single families and families with one set of parents compared to the whole sample (see Table 1). Comparing married with one set of parents and married with two sets - i.e. columns 3 and 4 - shows clearly that expanding the set of parents raises considerably dynastic insurance coverage vis a vis transitory income losses (elasticity 0.38, compared to 0.22) as well as persistent ones (elasticity -0.25 compared to -0.13).. Note that this is inconsistent with "free riding". We find that when parents in-law are present, parents provide *more* insurance, not less. One way to interpret this result is that it captures "competition for attention": parents offer more insurance in an attempt to sway the child's (or the couple's) attention towards them. The competition for attention interpretation is clearly supported when comparing singles with married with two parents sets (column 1 and column 4). While singles receive more parental insurance than married with one set of parents (as discussed above), they receive *less* than married with two sets - despite marriage per sÃš allows to manage shocks better.

Moving from married children with non-working spouse to married with a working spouse (columns 5 and 6) shows a quite dramatic drop in parents insurance provision. When spouse does not work the elasticity of parents savings to a transitory income drop is 1.23 (significantly different from zero at 10%) ;[22] when spouse works it falls to 0.32 (significant at 10%). Similarly, the elasticity to persistent income losses fall (in absolute value) from -0.88 (significant at 10%) to -0.20 (significant at 10%). This strongly suggests that marriage is a particularly effective way of buffering shocks when both spouses work. It is only than that parents can significantly limit their role of insurance providers vis as vis their children labor market adversities.

[22] At sample means of parents financial assets and children earnings the elasticity point estimate of 1.2 implies insurance coverage greter than 1 (computed as $((\hat{\alpha}_{Trans} \times$Parents financial wealth)/(Children earnings)); but we cannot reject that the elasticity equals the value (around 0.92) that at sample means just guarantees full coverage).

Table 7: Heterogeneity: marriage and spouse parents

	(1)	(2)	(3)	(4)	(5)	(6)
Child's marital status	Single	Married	Married	Married	Married	Married
Sets of parents			One	Two		
Working spouse					No	Yes
OLS estimate	0.0363***	0.0207***	0.0159	0.0211***	0.0187**	0.0208***
	(0.0021)	(0.0016)	(0.0051)	(0.0017)	(0.0078)	(0.0016)
$\hat{\alpha}_{Pers}$	-0.1890	-0.2393**	-0.1318	-0.2464**	-0.8793*	-0.2023*
	(0.1907	(0.1049)	(0.2751)	(0.1089)	(0.4813)	(0.1056)
$\hat{\alpha}_{Trans}$	0.3413	0.3737***	0.2164	0.3844***	1.2381*	0.3244**
	(0.2548	(0.1408)	(0.3685)	(0.1459)	(0.6450)	(0.1415)

Note: The table shows the estimated heterogeneity in parental saving responses to income shocks. Calculations are based on the parameter estimates in Table OA.4 in Appendix OA.4, the first row using Panel A, the second row using Panel B and the third row using Panel C. The calculations account for the fact that the empirical propensities to have two sets of parents may differ with respect to whether the spouse works, and vice versa. The delta-method is used on bootstrapped standard errors to calculate the standard errors on the coefficients shown in the table.

6.2 Reverse Insurance: Do Children Insure Parents?

Dynastic insurance arises from cash-rich parents transferring resources to cash-constrained children when markets for smoothing income shocks are incomplete. One implication of dynastic insurance is that it is likely to be unilateral: even if children are as altruistic towards their parents as their parents are towards them, they typically do not have enough assets to activate transfers to their parents in case the latter are hit by adverse shocks to income. [23] We can test this distinct implication of the dynastic model by reversing our empirical model. We estimate a specification equivalent to (2), but with the change in the child's liquid assets on the left hand side and the shocks to parents' income on the right hand side.

If children insure parents we would expect a positive correlation between unexpected drops in parents' earnings and the child's change in liquid assets, and no relation if parents

[23] In our sample, the mean amount of financial wealth held by children is only 53% of the mean amount held by parents. Even the median parent has twice the amount of financial wealth of the median child. children financial wealth in on average 53% of that of their parents. Children could still provide assistance in kind. Unfortunately, we do not observe these; moreover, we are interested in cases in which parents' shocks are of monetary nature, not health shocks that may lead to the need for physical assistance.

experience positive shocks. Following the same logic illustrated in Section 2, we would expect children to save more (or dissave less) when their parents face permanent income shocks (e.g- due to disability). That is, we should observe a negative relation between the change in children's liquid assets and persistent shocks to parents' income. Figure 5 is a graphical test of the hypothesis of reverse labor income insurance that parallels the evidence of Figure 3 and Figure 4 (panel B). Panel A of Figure 5 plots a local polynomial regression of children's change in financial assets against shocks to parental income. Panel B plots the local polynomial regression of changes in children's financial asset against changes in (residual) value added of parents' firms (i.e., the reduced form evidence of the response to permanent earnings shocks). One caveat is that by requiring parents to be employed (so that instruments are well defined), we are implicitly focusing on relatively younger children-parent sets. This implies that children are less likely to have accumulated assets and hence less able to provide reverse insurance.[24]

Panel A of Figure 5 documents that children do not dissave when parents suffer a drop in income. The relation continues to be flat over small and medium-sized positive shocks to parents income. The relation turns positive - that is, children pile up more assets - when parents experience large positive income unexpected changes. This is suggestive of parents sharing with their children large income windfalls, which children partly save. Panel B of Figure 5 reveals no evidence that can support the reverse insurance from children to parents: contrary to what reverse insurance would imply (a negative relation between permanent drops in parents' income and children's savings), we see a flat or even mildly positive relation.

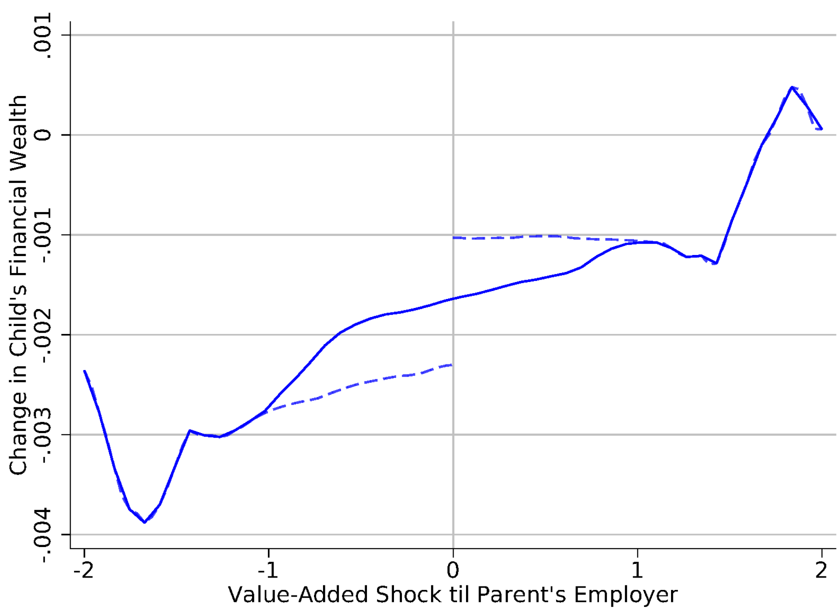
Table 8 provides the estimated (reverse) insurance parameters. In contrast to what reverse insurance predicts, the implied effect of transitory income shocks to parents on children financial saving is economically and statistically zero, as opposed to a positive effect implied by reverse insurance . From IV regressions, we estimate $\hat{\alpha}_{Pers}$ to be positive instead on negative but statistically highly insignificant This lack of evidence for children offering insurance to their parents is consistent with the story that dynastic insurance of income shocks runs mostly from parents to children, as only the former are in a position to absorb children's labor income shocks. Our findings complement Boar (2021), who shows that while parents

[24]In the reverse-insurance subsample, the mean (median) child age is 32.15 (31) years, which contrasts with our main analysis sample where the mean (median) is 39 (38). Child household financial wealth in the subsample has a mean (median) of NOK 161,969 (65,411), which is about 35% (25%) less than in the main sample. On the other hand, parents are also slightly less wealthy in this sample, which may partially offset the fact that children have less assets: Parental financial wealth is 441,714 (149,162), which is 5% (17%) lower than in the main sample.

Figure 5: Insurance provision from children to Parents? Graphical evidence

Panel A: Parent Income Changes and Child's Financial Wealth

Panel B: Parent Value-Added Shocks and Child's Financial Wealth



Notes: Panel A considers the relationship between children's household-level financial wealth (w^c) and changes in parental income (y^P) and . Parental income includes transfers and pensions, but the sample restrictions require that the main parent-household earner is not receiving any pension income. Panel B shows the relationship between value-added shocks to the parent's employer and their child's household-level financial wealth. The solid blue lines provide a local polynomial fit on the interval [-2,2], while the dashed blue lines provide separate local polynomial fits on the [-2,0) and [0,2] intervals.

consumption responds to the variance of children's labor income, the reverse is not true: children reduce consumption in response to their own income risk but not that of their parents. Our results are also qualitatively consistent with Gale and Scholz (1994), according to whom inter vivos transfers from parents to children are about ten times larger than those from children to parents.

Table 8: Reverse Insurance

	Estimate
OLS	0.0009
	(0.0028)
$\hat{\alpha}_{Perm}$	0.1289
	(0.2920)
$\hat{\alpha}_{Trans}$	-0.1730
	(0.3842)
N	4,573,028

Notes: This table considers the relationship between negative changes in parental income (Δy^{-P}) and the change in children household-level financial wealth . Parental income includes transfers and pensions, but the sample restrictions require that the main parent-household earner is not receiving any pension income. To identify $\hat{\alpha}_{Perm}$, we use value-added shocks to the parent's employer as an instrument for income changes. In a separate regression, we obtain OLS estimates by regressing changes in the child's household financial wealth on Δy^{-P}. To identify $\hat{\alpha}_{Trans}$, we combine the OLS and $\hat{\alpha}_{Perm}$ estimates as described in Section 3.1, where the weight on transitory shocks is recalculated for parents to be 0.31. Standard errors (in brackets) are obtained from a 200-repetition bootstrap procedure.

7 Conclusions

Our paper presents new evidence that parents serve a key role in insuring their adult children's income shocks. We find that parents deplete their savings when children experience large, negative income shocks. This relationship does not hold for positive shocks, consistent with the insurance motive for parents transfers. Importantly, we find that current transfers compete with expected future transfers. Shocks that are primarily permanent in nature trigger savings-accumulation responses. This implies that a small relationship between overall shocks (including both transitory and permanent elements) may mask more substantial but offsetting responses as permanent shocks cause additional saving but transitory shocks cause parents to deplete their assets. Our methodology allows to separate the two responses and identify parents savings elasticity to transitory and permanents drops in children income. They are both substantial, covering 1/4 of permanent and almost half of transitory negative shocks to children income. Furthermore, parents activate insurance-motivated transfers only when income losses are large enough and increase transfers when the size of the loss is larger. Because of this dynastic insurance is an effective way to attenuate the adverse effects on workers consumption of fat negative tails in the distribution of labor income growth during recessions, first documented by Guvenen et al. (2014). Hence, dynastic insurance can greatly mitigate the macroeconomic effects of idiosyncratic shocks.

We further find important heterogeneous effects. Parental insurance is not unconditional: it activates when children lack alternative ways of smoothing labor income shocks, particularly through marriage and access to transfers from in-laws. Furthermore, parents' willingness to supply insurance is affected by the stability of their offspring family: our evidence implies that if parents anticipate a divorce, they become less sensitive to permanent shocks to their child-in-law. Thus, divorce may not only destroy risk pooling opportunities among spouses—it also weakens dynastic insurance.

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Online Appendix for "Insuring Labor Income Shocks: The Role of the Dynasty"

by Andreas Fagereng, Luigi Guiso, Luigi Pistaferri and Marius A.K. Ring

In this Online Appendix we provide supplementary material to the article.

OA.1 Proof of Propositions

Proof of proposition 1

Under the assumption $\theta = 0$,the parents' problem consists of:

$Max_{w_1^P,\tau_1,\tau_2} : u(y_0^P + w_0^P - w_1^P - \tau_1) + u(w_1^P - \tau_2) + \alpha[u(a^K + \tau_1 + \epsilon_1) + u(a^K + \tau_2 + \epsilon_2)]$
s.t. $\tau_1 \geq 0; \tau_2 \geq 0$

We have three first order conditions (FOC):

FOC1 (optimal parent savings): $u'(y_0^P + w_0^P - w_1^P - \tau_1) = u'(w_1^P - \tau_2)$

FOC2 (optimal first period transfer): $u'(y_0^P + w_0^P - w_1^P - \tau_1) = \alpha u'(a^K + \tau_1 + \epsilon_1) + \lambda_1$

FOC3 (optimal second period transfer): $u'(w_1^P - \tau_2) = \alpha u'(a^K + \tau_2 + \epsilon_2) + \lambda_2$

and the complementary slackness conditions:

(CSC): $\lambda_1 \geq 0$ $(\lambda_1\tau_1 = 0)$; $\lambda_2 \geq 0$ $(\lambda_2\tau_2 = 0)$

where λ_1 and λ_2 are the Karush–Kuhn–Tucker multipliers associated to the non-negativity constraints on the two transfers.

From FOC1 we get $w_1^P = \frac{1}{2}(y_0^P + w_0^P + \tau_2 - \tau_1)$, and thus an expression for saving in period 1:

$$\Delta w_1^P = w_1^P - w_0^P = \frac{1}{2}(y_0^P - w_0^P + \tau_2 - \tau_1)$$

First, we want to determine under what conditions it is optimal for parents to transfer resources to their children. There are three cases of interest: (a) $\tau_1^* = \tau_2^* = 0$; (b) $\tau_1^* > 0, \tau_2^* = 0$; and (c) $\tau_1^* > 0, \tau_2^* > 0$.

From the complementary slackness conditions, the constraint on parental transfers are binding $(\tau_1^* = \tau_2^* = 0)$ whenever $\lambda_1 \geq 0$ and $\lambda_2 \geq 0$, which require that $u'(\frac{y_0^P + w_0^P}{2}) \geq$

$\alpha u^{'}(a^K + \epsilon_t)$ (for $t = \{1, 2\}$). Given concavity of marginal utility, there exists a threshold value of ϵ_t (say, $\bar{\epsilon}$), such that $u'\left(\frac{y^P + w_0^P}{2}\right) = \alpha u'\left(a^K + \epsilon_t\right)$, so that $\lambda_t = 0$. Hence, it is optimal to set transfers to zero whenever $\epsilon_t \geq \bar{\epsilon}$, i.e., if the shock is sufficiently large. In the spirit of the role of insurance, assume that in the absence of shocks, i.e., when $\epsilon_t = 0$, parents make no transfers, implying $u'\left(\frac{y_0^P + w_0^P}{2}\right) \geq \alpha u'\left(a^K\right)$. Assuming $\alpha < 1$, this condition holds if the the child's endowment is at least a certain share of the parents' endowment. If parents make no transfers when the shock is zero, *a fortiori*, they will not do so when the shock is positive. Hence, $\bar{\epsilon} \leq 0$. Totally differentiating the condition $u'\left(\frac{y_0^P + w_0^P}{2}\right) = \alpha u'\left(a^K + \bar{\epsilon}\right)$, and using concavity of $u(.)$ shows that the threshold $\bar{\epsilon}$ is decreasing in the child's endowment a^K and increasing in parents' income endowment y_0^P , initial wealth w_0 and degree of altruism α. Note also that, since $\epsilon_2 = \rho\epsilon_1$, the constraint on second-period transfers is binding ($\tau_2^* = 0$) when $\epsilon_1 \geq \frac{\bar{\epsilon}}{\rho}$.

The second case of interest ($\tau_1^* > 0, \tau_2^* = 0$) arises when the shock is negative but not large enough in absolute value, i.e., $\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}$. In this case the first period transfer is positive and determined by :

$$u'\left(\frac{y_0^P + w_0^P - \tau_1^*}{2}\right) = \alpha u^{'}(a^K + \tau_1^* + \epsilon_1),$$

which is increasing in parents' endowment, initial wealth, altruism and income loss and decreasing in children's cash on hand.

The final case of interest ($\tau_1^* > 0, \tau_2^* > 0$) occurs when the shock is large and negative ($\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$). In this case both transfers are operative, and their optimal value is determined by:

$$u'\left(\frac{y_0^P + w_0^P - (\tau_1^* + \tau_2^*)}{2}\right) = \alpha u^{'}(a^K + \tau_1^* + \epsilon_1)$$

$$u'\left(\frac{y_0^P + w_0^P - (\tau_1^* + \tau_2^*)}{2}\right) = \alpha u^{'}(a^K + \tau_2^* + \epsilon_2)$$

implying that parents make transfers to equalize the marginal utility of children's consumption across the two periods. This implies that $\tau_2^* = \tau_1^* + \epsilon_1 - \epsilon_2$. Using this, total differentiation of the first order conditions shows that first period transfer increases with parents' endowment, degree of altruism α, and the size of first period income loss; it decreases with children's cash on hand and the size of second period income loss, i.e., the degree of persistence. Following the same logic, the second period transfer increases with parents endowment and altruism and the degree of persistence of the shock; it decreases with the child's endowment. $\therefore$

Proof of proposition 2

Recall from FOC1 that the change in wealth in period 1 (the saving flow) is

$$\Delta w_1^P = \frac{1}{2}(y_0^P + w_0^P + \tau_2 - \tau_1)$$

Let $u(x) = \frac{x^{1-\gamma}}{1-\gamma}$. Then the condition for no transfer in the absence of a shock $u'(\frac{1}{2}(y_0^P + w_0^P)) \geq \alpha u^{'}(a^K)$ is

$$a^K \geq \mu \frac{y_0^P + w_0^P}{2}$$

where $\mu = \alpha^{1/\gamma} < 1$ if the risk aversion parameter is positive and finite.

The threshold for the income shocks that defines whether the transfers are active is (under the maintained assumptions):

$$\bar{\epsilon} = \mu \frac{y_0^P + w_0^P}{2} - a^K \leq 0$$

Parents' response to the shocks varies depending on which transfer is active. Consider again the three relevant cases: (a) $\tau_1^* = \tau_2^* = 0$ (which occurs when $\epsilon_1 \geq \bar{\epsilon}$); (b) $\tau_1^* > 0, \tau_2^* = 0$ ($\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}$); and (c) $\tau_1^* > 0, \tau_2^* > 0$ ($\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$).

Transfers not active: $\epsilon_1 \geq \bar{\epsilon}$

Setting transfers to zero in the general expression for parents wealth dynamics we have :

$$\Delta w_1^P = \frac{y_0^P - w_0^P}{2}$$

Transfers active in period 1 only: $\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon}$

The optimal first period transfer is determined from the FOC2 in Proposition 1 after substituting for w_1^P from FOC1:

$$u'\left(\frac{y_0^P + w_0^P - \tau_1^*}{2}\right) = \alpha u'(a^K + \tau_1^* + \epsilon_1)$$

Using the CRRA utility assumption yields

$$\tau_1^* = \frac{2}{2+\mu}\left(\mu \frac{y_0^P + w_0^P}{2} - a^K - \epsilon_1\right) = \frac{2}{2+\mu}(\bar{\epsilon} - \epsilon_1)$$

Using this expression and and setting $\tau_2^*=0$, parents wealth dynamics among those with an active transfer in period 1 is

$$\Delta w_1^P = \frac{1}{2+\mu}y_0^P - \frac{1+\mu}{2+\mu}w_0^P + \frac{1}{2+\mu}\left(a^K+\epsilon_1\right).$$

Transfers active in both periods: $\epsilon_1 < \frac{\bar{\epsilon}}{\rho}$.

From the proof of proposition 1, the optimal transfers in this case are determined by the first order conditions

$$u'\left(\frac{y_0^P + w_0^P - (\tau_1^* + \tau_2^*)}{2}\right) = \alpha u'(a^K + \tau_1^* + \epsilon_1)$$

$$u'\left(\frac{y_0^P + w_0^P - (\tau_1^* + \tau_2^*)}{2}\right) = \alpha u'(a^K + \tau_2^* + \epsilon_2)$$

Using the CRRA utility and solving for τ_1 and τ_2 yields:

$$\tau_1^* = \frac{1}{1+\mu}\left(\mu\frac{y_0^P + w_0^P}{2} - a^K\right) - \frac{2+\mu}{2(1+\mu)}\epsilon_1 + \frac{\mu}{2(1+\mu)}\epsilon_2$$

$$\tau_2^* = \frac{1}{1+\mu}\left(\mu\frac{y_0^P + w_0^P}{2} - a^K\right) + \frac{\mu}{2(1+\mu)}\epsilon_1 - \frac{2+\mu}{2(1+\mu)}\epsilon_2$$

Using these expressions, parents wealth dynamics is

$$\Delta w_1^P = \frac{y_0^P - w_0^P}{2} + \frac{(\epsilon_1-\epsilon_2)}{2} = \frac{y_0^P - w_0^P}{2} + \frac{(1-\rho)}{2}\epsilon_1$$

Putting together the three cases the change in parents wealth is:

$$\Delta w_1^P = \left(\frac{y_0^P - w_0^P}{2}\right) I^+ + \left(\frac{1}{2+\mu}y_0^P - \frac{1+\mu}{2+\mu}w_0^P + \frac{1}{2+\mu}\left(a^K+\epsilon_1\right)\right) I^- + \left(\frac{y_0^P - w_0^P}{2} + \frac{(1-\rho)}{2}\epsilon_1\right) I^{--}$$

where $I^+ = I(\epsilon_1 \geq \bar{\epsilon})$, $I^- = I(\frac{\bar{\epsilon}}{\rho} \leq \epsilon_1 < \bar{\epsilon})$ and $I^{--} = I(\epsilon_1 < \frac{\bar{\epsilon}}{\rho})$ are indicator functions for the three intervals the shock can take.

OA.2 Identification of the effect of persistent income drops

Suppose that unexpected drops (i.e., negative changes) in the child's labor income can be transitory or persistent:

$$\Delta y_{it}^{-K} = \Delta y_{it,Pers}^{-K} + \Delta y_{it,Trans}^{-K}$$

and that there is a similar decomposition for negative shocks to the firm's value added:

$$\Delta VA_{jt}^{-} = \Delta VA_{jt,Pers}^{-} + \Delta VA_{jt,Trans}^{-}$$

Assume that persistent drops in workers' earnings are partly induced by pass-through of persistent drops in the firm's value added:

$$\Delta y_{it,Pers}^{-K} = \gamma_{Pers} \Delta VA_{jt,Pers}^{-} + \nu_{it,Pers}^{-}$$

where γ_{Pers} measure the extent of pass-through of persistent value added shocks onto wages and $\nu_{it,Pers}^{-}$ are other persistent drops in labor income that do no depend on the firm's productivity changes. The final assumption we make (corroborated by previous evidence and also present in our data) is that workers transitory labor income declines are independent of the firm's fortune, but reflect instead temporary changes in labor supply, etc., i.e., $\Delta y_{it,Trans}^{-K} = \nu_{it,Trans}^{-}$, with $\nu_{it,Trans}^{-}$ orthogonal to (transitory or permanent) declines in the firm value added.

Under these assumptions, it follows that the IV estimate of a regression of Δw_{it}^{P} onto Δy_{it}^{-K} using negative shocks to value added as instruments (ΔVA_{jt}^{-}) has probability limit:

$$\begin{aligned}
p\lim \widehat{\alpha}_{IV} &= p\lim \frac{cov\left(\Delta w_{it}^{P}, \Delta VA_{jt}^{-}\right)}{cov\left(\Delta y_{it}^{-K}, \Delta VA_{jt}^{-}\right)} \\
&= p\lim \frac{cov\left(\alpha_{Pers} \Delta y_{it,Pers}^{-K} + \alpha_{Trans} \Delta y_{it,Trans}^{-K} + ..., \Delta VA_{jt}^{-}\right)}{cov\left(\Delta y_{it,Pers}^{-K} + \Delta y_{it,Trans}^{-K}, \Delta VA_{jt}^{-}\right)} \\
&= p\lim \frac{\alpha_{Pers} cov\left(\Delta y_{it,Pers}^{-K}, \Delta VA_{jt}^{-}\right) + \alpha_{Trans} cov\left(\Delta y_{it,Trans}^{-K}, \Delta VA_{jt}^{-}\right)}{cov\left(\Delta y_{it,Pers}^{-K}, \Delta VA_{jt}^{-}\right) + cov\left(\Delta y_{it,Trans}^{-K}, \Delta VA_{jt}^{-}\right)} \\
&= p\lim \frac{\alpha_{Pers} cov\left(\Delta y_{it,Pers}^{-K}, \Delta VA_{jt,Pers}^{-} + \Delta VA_{jt,Trans}^{-}\right)}{cov\left(\Delta y_{it,Pers}^{-K}, \Delta VA_{jt,Pers}^{-} + \Delta VA_{jt,Trans}^{-}\right)} \\
&= \alpha_{Pers}
\end{aligned}$$

OA.3 Testing for pass-through of transitory shocks

In this Appendix we discuss the test that we present at the bottom of Table 3. Suppose that the permanent component of the firm's value added follows a random walk process, so that:

$$\Delta VA_{jt,Pers} = \eta_{jt}$$

and the transitory component is i.i.d., $VA_{jt,Trans} = \varepsilon_{jt}$, so that $\Delta VA_{jt} = \eta_{jt} + \Delta\varepsilon_{jt}$.

Consider a more general case in which transitory shocks to value added may potentially also pass through onto wages, i.e..

$$\begin{aligned}
\Delta y_{it}^{K} &= \Delta y_{it,Pers}^{K} + \Delta y_{it,Trans}^{K} \\
&= \gamma_{Pers}\Delta VA_{jt,Pers} + \gamma_{Trans}\Delta VA_{jt,Trans} + \nu_{it,Pers} + \nu_{it,Trans} \\
&= \gamma_{Pers}\eta_{jt} + \gamma_{Trans}\Delta\varepsilon_{jt,Trans} + \nu_{it}
\end{aligned}$$

Under this more general model:

$$\Delta y_{it}^{K}+\Delta y_{it+1}^{K}+\Delta y_{it+2}^{K} = \gamma_{Pers}(\eta_{jt}+\eta_{jt+1}+\eta_{jt+2})+\gamma_{Trans}(\Delta\varepsilon_{jt}+\Delta\varepsilon_{jt+1}+\Delta\varepsilon_{jt+2})+(\nu_{it}+\nu_{it+1}+\nu_{it+2})$$

with $\gamma_{Pers} > 0, \gamma_{Trans} = 0$ if only firm persistent shocks are passed over to workers.

In Table 3, column 3, we run an OLS regression of Δy_{it}^{K} onto ΔVA_{jt} . Under the maintained assumptions, the OLS estimate has probability limit:

$$\begin{aligned}
p\lim \widehat{\beta}_1 &= p\lim \frac{cov\left(\Delta y_{it}^{K}, \Delta VA_{jt}\right)}{var\left(\Delta VA_{jt}\right)} \\
&= p\lim \frac{cov\left(\gamma_{Pers}\eta_{jt} + \gamma_{Trans}\Delta\varepsilon_{jt} + \nu_{it}, \eta_{jt} + \Delta\varepsilon_{jt}\right)}{cov\left(\eta_{jt} + \Delta\varepsilon_{jt}\right)} \\
&= \frac{\gamma_{Pers}\sigma_{\eta}^{2} + 2\gamma_{Trans}\sigma_{\varepsilon}^{2}}{\sigma_{\eta}^{2} + 2\sigma_{\varepsilon}^{2}}
\end{aligned}$$

In Table 3, column 4, we run instead an OLS regression of $\left(\Delta y_{it}^{K} + \Delta y_{it+1}^{K} + \Delta y_{it+2}^{K}\right)$ onto ΔVA_{jt}. Under the maintained assumptions, the OLS estimate has probability limit:

$$
\begin{aligned}
p\lim \widehat{\beta}_2 &= p\lim \frac{cov\left(\Delta y_{it}^K + \Delta y_{it+1}^K + \Delta y_{it+2}^K, \Delta VA_{jt}\right)}{var\left(\Delta VA_{jt}\right)} \\
&= p\lim \frac{cov\left(\gamma_{Pers}\sum_{s=t}^{t+2}\eta_{js} + \gamma_{Trans}\sum_{s=t}^{t+2}\Delta\varepsilon_{js} + \sum_{s=t}^{t+2}\nu_{is}, \eta_{jt} + \Delta\varepsilon_{jt}\right)}{cov\left(\eta_{jt} + \Delta\varepsilon_{jt}\right)} \\
&= \frac{\gamma_{Pers}\sigma_\eta^2 + \gamma_{Trans}\sigma_\varepsilon^2}{\sigma_\eta^2 + 2\sigma_\varepsilon^2}
\end{aligned}
$$

Hence, if only permanent shocks are transmitted onto wages, $p\lim\hat{\beta}_1 = p\hat{\lim}\beta_2$. If also transitory shocks are transmitted, then $p\lim\hat{\beta}_1 > p\hat{\lim}\beta_2$. This is the test reported at the bottom of Table 3.

OA.4 Additional Tables and Figures

Table OA.1: Main estimates when omitting children > 45 years old

Note: This table provides the estimated (and implied) sensitivities of parent financial wealth to child income shocks. Standard errors are obtain via a 200-repetition bootstrap procedure.

	Estimate
OLS	0.0227***
	(0.0015)
$\hat{\alpha}_{Pers}$	-0.1956**
	(0.0943)
$\hat{\alpha}_{Trans}$	0.3126***
	(0.1262)
N	10,446,754

Table OA.2: Robustness: January Employment and Government Transfers

Notes: The first four columns repeats the OLS and IV regressions on the subsample who were employed with their main employer since January 1st of any given year. The last four columns include government transfers (incl. unemployment insurance and pensions) in the income measure, y. Column (1)-(4) provide the first-stage (FS), reduced-form (RF), instrumental variables (IV), and OLS estimates, respectively; and the same ordering applies for columns (5)-(8). Standard errors are reported in brackets.

	Robustness A: With same firm since Jan 1st.				Robustness B: Include transfers in y.			
	$\Delta y^{c,-}$	Δw^p	Δw^p	Δw^p	$\Delta y^{c,-}$	Δw^p	Δw^p	Δw^p
	(1) FS	(2) RF	(3) IV	(4) OLS	(5) FS	(6) RF	(7) IV	(8) OLS
$\Delta y^{c,-}$			-0.2154**	0.0244***			-0.3617**	0.0302***
			(0.0903)	(0.0014)			(0.1408)	(0.0017)
$\Delta VA^{c,-}$	0.0084***	-0.0018**			0.0053***	-0.0019***		
	(0.0008)	(0.0007)			(0.0005)	(0.0007)		
Int. term controls	Y	Y	Y	Y	Y	Y	Y	Y
Income, wealth controls	Y	Y	Y	Y	Y	Y	Y	Y
F-statistic			120.20				96.00	
N	11973148	11973148	11973148	12463568	12988560	12988560	12988560	13545888

Table OA.3: Main results when child and parent reside in same county

Notes: We repeat the main analyses for child-parent pairs that reside in the same county. Column (1)-(4) provide the first-stage (FS), reduced-form (RF), instrumental variables (IV), and OLS estimates, respectively; and the same ordering applies for columns (5)-(8).

	$\Delta y^{c,-}$ (1) FS	Δw^p (2) RF	Δw^p (3) IV	Δw^p (4) OLS
$\Delta y^{c,-}$			-0.1415	0.0269***
			(0.1033)	(0.0015)
$\Delta VA^{c,-}$	0.0082***	-0.0012		
	(0.0008)	(0.0008)		
Int. term controls	Y	Y	Y	Y
Income, wealth controls	Y	Y	Y	Y
F-statistic			102.83	
N	9451024	9451024	9451024	9846501

Table OA.4 shows evidence consistent with these intuitive implications; it reports OLS regressions (Panel A), IV estimates that identify responses to the permanent shocks (Panel B) and the calculation of the implied response to purely transitory shocks (Panel C), running estimates on the whole sample of married and single offspring matched with their parents. Standard errors are reported in brackets.

Table OA.4: Heterogeneous Effects by Marital Status

	(1)	(2)	(3)	(4)
		Panel A: OLS Regressions		
Δy^{-K}	0.0361***	0.0361***	0.0362***	0.0363***
	(0.0023)	(0.0023)	(0.0021)	(0.0021)
$\Delta y^{-K}\times$Married	-0.0146***	-0.0107	-0.0203***	-0.0222**
	(0.0029)	(0.0073)	(0.0057)	(0.0095)
$\Delta y^{-K}\times$Spouse Works		-0.0042		0.0019
		(0.0068)		(0.0077)
$\Delta y^{-K}\times$Spouse's P. Present			0.0052	0.0052
			(0.0052)	(0.0052)
		Panel B: IV Regressions		
α_{pers}	-0.1839	-0.1869	-0.1863	-0.1890
	(0.1699)	(0.1699)	(0.1907)	(0.1907)
$\alpha_{pers}\times$Married	-0.0378	-0.7300	0.0592	-0.5762
	(0.2026)	(0.4574)	(0.3384)	(0.5497)
$\alpha_{pers}\times$Spouse Works		0.7300*		0.6809
		(0.4366)		(0.4868)
$\alpha_{pers}\times$Spouse's P. Present			-0.1157	-0.1291
			(0.2849)	(0.2863)
		Panel C: Implied Effect of Transitory Shocks		
α_{trans}	0.3348	0.3389	0.3385	0.3421
	(0.2326)	(0.2326)	(0.2547)	(0.2548)
$\alpha_{trans}\times$Married	0.0170	0.9660	-0.1283	0.7301
	(0.2768)	(0.6238)	(0.4529)	(0.7375)
$\alpha_{trans}\times$Spouse Works		-1.0012*		-0.9201
		(0.5954)		(0.6518)
$\alpha_{trans}\times$Spouse's P. Present			0.1694	0.1876
			(0.3809)	(0.3827)
Int. term controls	Y	Y	Y	Y
Income, wealth controls	Y	Y	Y	Y
N	13,550,903	13,550,903	13,093,572	13,093,572

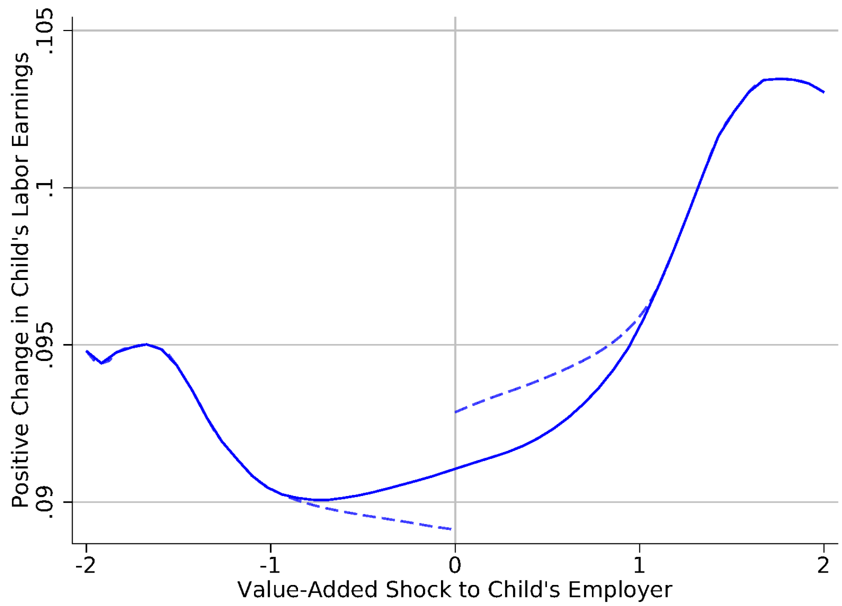
Notes: Married is a dummy for whether the child is married. Spouse Works is an indicator for whether the spouse has non-zero labor earnings during the year of the shock. Spouse's P. Present is a dummy variable indicating whether the other parent set (i.e. of the other spouse) is present, i.e., not deceased. This variable takes the value zero whenever the child is not married. Standard errors are reported in brackets; in Panels B and C are estimated with a 200-repetition bootstrap procedure.

The first column interacts negative unanticipated change in the child's income with a dummy for whether the child is married. In OLS regressions, the parent response is statistically and economically smaller (a 33% smaller coefficient) when the child is married compared to single, consistent with alternative insurance mechanisms for married households. The second column interacts the shock also with a dummy for whether the spouse works. This has a negligible effect, suggesting that what matters for the response to the current shocks is being married (labor force participation in Norway is high for both men and women, especially if young, reducing the potential importance of added worker effects). The third column interacts the shock with a dummy for whether the spouse's parents are present (i.e., still alive), capturing a potential additional source of dynastic insurance for married children. The effect is positive, implying that a young family that can count on two sets of parents is better equipped to smooth drops in labor income than families with just one set. Note that this is inconsistent with "free riding". We find that when in-laws are present, parents provide *more* insurance, not less. One way to interpret this result is that it captures "competition for attention": parents offer more insurance in an attempt to sway the child's (or the couple's) attention towards them. The last column estimates all interaction effects simultaneously and confirms the general pattern: marriage alone reduces the insurance provided by parents in response to a negative shock to a child's income but the presence of in-laws increases it.

Figure OA.1: The Relationship Between Value-Added Shocks and Positive as well as Over-all Changes in Child Labor Earnings

Notes: Panel A shows the first-stage relationship between positive changes in the child's labor earnings (Δy^{+K}) and value-added shocks experienced by the child's employer. Panel A shows the first-stage relationship between over-all changes in the child's labor earnings (Δy^{K}) and value-added shocks experienced by the child's employer. The solid line is a local polynomial fit (lpoly, bandwidth=0.5), excluding values exceeding 2 in absolute value. The dashed lines perform the local polynomial fit separately for negative and positive value-added shocks.

Panel A: Positive Changes in Earnings



Panel B: Over-all Change in Earnings