Recent research on labor supply: Implications for tax and transfer policy

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1. Introduction

- Recent work on labor supply has extended traditional labor supply models to account for investment in human capital over the life-cycle, which renders wages endogenous to the labor supply decision.
- It has also emphasized the important distinction between labor force participation and labor supply intensity (i.e., hours) decisions.
- This work suggests that labor supply elasticities may be significantly larger than has been assumed by the conventional wisdom of the economics profession (see Keane and Rogerson, 2012 , 2015).
- More generally, recent work on labor supply emphasizes how labor supply elasticities vary systematically over the life-cycle for individuals, as well as across demographic groups.

- Optimal tax theory suggests that labor supply elasticities are crucial inputs into the design of the tax and transfer system.
- But the implications of recent work on labor supply for the optimal design of the tax and transfer system has received limited attention.
- My goal here is to discuss the implications of recent labor supply modelling for the optimal design of the tax and transfer system, and to suggest important avenues for future research on this topic.
- As a by-product I update my survey in Keane (2011) to cover the past decade.

- Two key points are worth highlighting.

- First, there is a fairly broad consensus in the economics profession that low tax rates on capital in- come are desirable.

- However, we'll see how two results characteristic of recent labor supply modelling – the combination of elastic labor supply and elasticities that grow with age – imply that the optimal tax rate on capital income may be higher than previously supposed.

- Second, both elastic labor supply and endogenous wage formation (via human capi- tal formation) shift the optimal tax structure towards relatively structures with low top rates on labor income.

- It is interesting that these two implications push in opposite directions politically.

- The outline of the paper is as follows.
- First, I give some background on optimal tax theory and review some classic papers on optimal tax structure.
- Then I discuss more recent developments, focusing in particular on the work by Conesa, Kitao and Krueger (2009) that clarifies the role of labor supply elasticities in optimal tax calculations. Their paper shows how elastic labor supply and elasticities that increase with age both encourage a high tax rate on capital.
- Hence, I review in turn the evidence on elastic labor supply and the age pattern of elasticities, and argue it supports both claims.
- Next, I consider optimal tax calculations that explicitly account for endogenous human capital and/or participation.
- Finally, I turn to the topic of heterogeneity in labor supply elasticities across demographic groups, and show how the evidence on this topic argues for the efficiency of individual taxation.

- To conclude, I highlight some gaps in the existing literature.

- The empirical evidence on how labor supply elasticities differ by age is still rather limited, although the evidence that does exist suggest they are increasing.

- Given the importance of this issue for optimal tax structure, much more work on this topic is needed.

- Theoretically, the frontier in the optimal tax literature is to use dynamic stochastic general equilibrium models with overlapping generations of heterogeneous workers to study optimal tax structure –both income and capital tax – in models that include (i) Endogenous wages, (ii) Participation Decisions, (iii) Workers that differ by education, and (iv) both single workers and married couples.

- While existing papers tackle a subset of these problems no one has tackled all of them.

2. Background on the optimal tax literature

- The fundamental problem that motivates optimal tax theory is the fact that taxes generally create disincentives for work, investment and other productive economic activities.

- Thus, in simple terms, there is a trade-off between a desire to divide the economic pie more equitably, via increased government spending on social welfare, and a desire to minimize the shrinking of the economic pie induced by the taxes needed to pay for that social spending.

- The solution to this problem, as suggested by optimal tax theory, is that, in order to minimize distortions, government should focus taxation on factors of production that are inelastically supplied – meaning factors whose supply is not reduced much by taxation.

- Conversely, the government should avoid taxation of factors that are elastically supplied.

- Labor is obviously one of the most important factors of production, so the elasticity of labor supply with respect to the after-tax wage is a crucial ingredient in any optimal tax calculation.

- In particular, if labor supply elasticies are larger, then optimal tax rates on labor will tend to be lower.

- The theory also suggests that demographic groups with more elastic labor supply – such as married women or workers near retirement –should be taxed less.

- Unfortunately, however, prior work in optimal tax theory has mostly relied on very basic labor supply models that fail to incorporate insights from the modern labor supply literature.

3. Two classic papers

- To better understand how labor supply elasticities influence optimal tax calculations, it is useful to contrast the results from two classic papers, Mirrlees (1971) and Summers (1981) .

- In Mirrlees' model, total output depends on aggregate labor supply.

- A social planner, who cares about both total output and distributional equity, designs an optimal income tax/transfer system.

- In the simple model of labor supply that Mirrlees relies on, labor supply is very elastic. Hence, taxes on labor earnings lead to large reductions in work effort and output.

- Given Mirrlees' set up, it is not surprising he finds that the optimal income tax design is approximately a flat rate tax with a rather low top rate. In fact, the optimal top rate is only about 20%.

- Mirrlees' results also imply that transfers to low wage workers are modest.

- In Mirrlees' setup, the high elasticity of labor supply severely con- strains any attempt to use of the tax/transfer system to reduce in- equality.
- It is worth noting that Mirrlees assumes utility depends on log consumption – ruling out income effects – so compensated and uncompensated labor supply elasticities are equal.
- But later work by Hausman (1981) and Blomquist (1983) showed that labor supply may be greatly reduced by progressive taxation, even if the uncompensated elasticity is essentially zero, provided the income effect –and hence the compensated elasticity – is of reasonable size.

- Next we turn to Summers (1981).
- He considers a simple macro model with overlapping generations of homogenous consumers who supply labor inelastically.
- The life-cycle structure motivates savings in order to smooth consumption.
- Thus, saving and the capital stock are endogenous, and, as aggregate labor supply is fixed, output is determined solely by the capital stock.
- The government levies a tax on earnings, a capital income tax, and a sales tax. In contrast to Mirrlees, in Summer's simple model, labor supply is inelastic, so work effort is not affected by the income tax.
- On the other hand, savings is very elastically supplied.

- In Summers' model, a tax on capital, which reduces the aftertax rate of interest, greatly reduces savings and capital formation.
- This causes wages to fall substantially in the long-run, due to reduced labor productivity.
- The negative impact of capital taxes on the capital stock and wages in the long-run is so severe that workers are better off with an earnings tax.
- Given this set up, it is not surprising Summers finds the optimal policy is to not tax capital at all.
- Instead, it is optimal to finance government purely through earnings and/or sales taxes.

- There are also well-known theoretical results saying capital should not be taxed; see Judd (1985) and Chamley (1986).
- Judd (1999) gives a simple intuition: Consider an infinitely lived representative agent economy in continuous time.
- Let the agent's flow utility be given by $u(c_t, l_t)$, where c_t and l_t are consumption and leisure at time t.
- Let ρ and r denote the discount and interest rates, and let w_t denote the wage rate.
- The agent's marginal rate of substitution (MRS) between leisure in period t and consumption at time 0 is by definition $e^{-\rho}\ u_1/u_{c_0}$.
- The marginal rate of transformation (MRT) between leisure at time t and consumption at time 0 is $e^{-rt}w_t$ (i.e., sacrificing a unit of leisure at t would enable the agent to increase consumption by $e^{-rt}w_t$ units at time 0).

- If we apply a tax rate $\tau$to earnings then the agent's optimality condition is $\frac{e^{-\rho t}u_1}{u_{c_0}} = e^{-r}\ w_t(1-\tau)$.

- So an earnings tax generates a wedge between MRS and MRT equal to $(1-\tau)$ regardless of the time period t. Contrast this with the impact of a tax on interest.

- As the interest rate equals the marginal product of capital, the agent can obtain an extra unit of consumption at time t by giving up e^{-r} units of consumption at time 0.

- But the after-tax price of an extra unit of consumption at time t is $e^{-r(1-\tau)t}$.

- So the wedge between the MRT and the after-tax price is $e^{r\tau t}$.

- Thus, a capital tax creates a distortion that grows exponentially with time!

- In contrast, as we saw above, the income tax creates a distortion of fixed size.

4. More recent work on optimal taxes

- Work on optimal tax subsequent to the early work of Mirrlees and Summers has relied on increasingly sophisticated macro models.

- In particular, it has relied on dynamic stochastic general equilibrium models (DSGE) incorporating overlapping generations (OLG) of heterogeneous consumers.

- But the treatment of labor supply in these DSGE-OLG models has generally remained very simple.

- Conesa, Kitao and Krueger (2009) is a key recent paper in the DSGE- OLG heterogeneous agent framework.

- In their model labor supply is assumed to be rather elastic –i.e., the Frisch elasticity of labor supply with respect to anticipated wage changes is calibrated to be 1.0.

5. Assessing the magnitude of labor supply elasticities

- How elastic is labor supply?

- Until recently, there was a clear consensus in the economics profession that labor supply elasticities are small.

- At this point, it is useful to clarify some different elasticity concepts:
    - Frisch = response of hours to an anticipated wage or tax change. As the change is anticipated it has no wealth effect.
    - Frisch ≈ response of hours to a transitory wage or tax change. As the change is transitory, there is almost no wealth effect.
    - Hicks = response of hours to a permanent wage or tax change, compensated for the wealth or income effect (in order to isolate the substitution effect).
    - Marshall = response of hours to a permanent wage or tax change (uncompensated, so there is an income effect).

5.1. Human Capital and the Labor Supply Elasticities

- In order to understand why ignoring human capital would bias Frisch elasticity estimates towards zero, it is useful to consider a basic life-cycle model with exogenous wages.

- Let h t and A t denote hours of work and assets, let βdenote the discount factor, and let V and E t V denote the value function and the expected value function, with all other notation as in Section 3.

- Then the equations of the model are as follows:

  - Bellman equation:

$$V\left(c_t, h_t | A_t\right) = u\left(c_t, l_t\right) + \beta E_t V\left(A_{t+1}\right)$$

  - Law of motion for assets A_t (the only endogenous state variable):

$$A_{t+1} = (1+r)\left[A_t + w_t h_t - c_t\right]$$

- We consider three of the most influential papers, MaCurdy (1981), Browning et al. (1985), and Altonji (1986), each of which estimates the intertemporal elasticity of substitution, or Frisch elasticity.

- Details of their approaches differ, but all involve regressing changes in hours on changes in wages.

- For example, MaCurdy (1981) uses the basic model described above extended to allow for heterogeneity and uncertainty to derive the change in hours equation:

$$\Delta \log h_{it} = \gamma \Delta \log w_{it}(1 - \tau_{it}) - \gamma \log \beta(1 + r_t) + \alpha\gamma\Delta X_{it} + \gamma\xi_{it} + \gamma\Delta\varepsilon_{it}. \tag{10}$$

- First order conditions:

$$h_t : \quad \frac{\partial V_t}{\partial h_t} = -u_{l_t} + \beta(1+r)w_t \frac{\partial E_t V\left(A_{t+1}\right)}{\partial A_{t+1}} = 0$$

$$c_t : \quad \frac{\partial V_t}{\partial c_t} = u_{c_t} - \beta(1+r) \frac{\partial E_t V\left(A_{t+1}\right)}{\partial A_{t+1}} = 0$$

- Marginal Rate of Substitution (MRS) condition:

$$MRS_{c,l} = \frac{u_{l_t}}{u_{c_t}} = w_t \tag{1}$$

- Many papers have used this MRS condition to estimate the Frisch la- bor supply elasticity. To do so it is necessary to specify a utility function. For example, a common choice is:

$$u\left(c_t, l_t\right) = \sigma^{-1} c_t^{\sigma} - \alpha \gamma^{-1} h_t^{\gamma}, \gamma > 1, \sigma < 1$$

which generates the MRS condition:

$$MRS_{c,l} = \frac{u_{l_t}}{u_{c_t}} = \alpha h_t^{\gamma-1} / c_t^{\sigma-1} = w_t$$

- Rearranging we obtain the labor supply equation:

$$lnh_t = \frac{1}{\gamma - 1} lnw_t + \frac{\sigma - 1}{\gamma - 1} lnc_t - \frac{1}{\gamma - 1} ln\alpha \qquad (2)$$

- which is commonly made into an estimable equation by assuming the taste for leisure term $\alpha$is stochastic across consumers and over time.

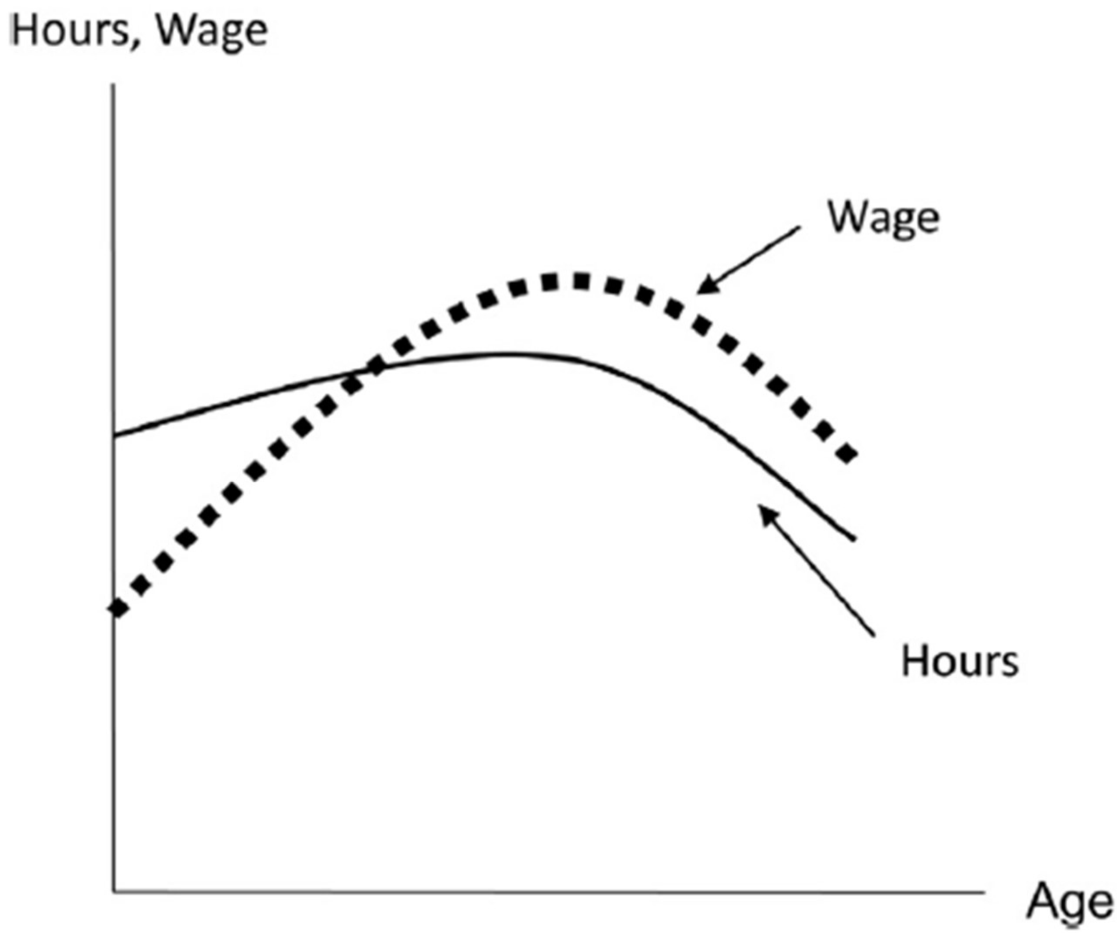
- In this simple life-cycle model, holding consumption fixed is equivalent to implementing compensation that holds lifetime wealth fixed.

- Hence, the Frisch elasticity is obtained by taking the derivative of log hours with respect to the log wage in (2), while holding consumption fixed:

$$Frischelasticity \equiv \left.\frac{\partial \ln h_t}{\partial \ln w_t}\right|_{c_t} = \frac{1}{\gamma - 1}$$

- Notice, therefore, that the Frisch elasticity is identical to the coefficient on the log wage in the log hours on log wage regression in (2).
- The classic papers cited above attempt to estimate the Frisch elasticity by estimating versions of Eq. (2).
- Fig. 1 plots typical paths of hours of work and wages over the lifecycle for men.
- The figure is meant to be a description of the typical pattern observed in data, rather than a plot of any particular data set.
- The key point is that wage paths tend to exhibit a clear hump shape over the life-cycle, while hours are relatively flat.
- People do not seem to work much higher hours at the ages when wages are highest, so the extent of intertemporal substitution in labor supply appears to be quite modest.

Fig. 1. Typical Patterns for Hours vs. Wages over the Life-Cycle (Men).



- Given this pattern, and assuming exogenous wages, the Frisch elasticity must be very small.

- Put another way, regressions of log hours on log wages –motivated by Eq. (2) – will inevitably yield a small coefficient on the log wage variable, and hence a small estimate of the Frisch elasticity, simply because wages vary much more than hours over the life-cycle.

- However, if we extend the life-cycle model to account for human capital, we see that regressions based on (2) are seriously mis-specified.

- To see this, let K t denote human capital, assume that work experience builds human capital (i.e., learning by doing) via a production function $f(K_t, h_t)$, and let the wage be given by $W_t = RK_t$ where R is the human capital rental rate.

- Then the equations of the model become:

- Bellman Equation:

$$V(c_t, h_t | A_t, K_t) = u(c_t, l_t) + \delta E_t V(A_{t+1}, K_{t+1})$$

- Laws of motion (Assets and Human Capital):

$$A_{t+1} = (1+r)[A_t + w_t h_t - c_t]$$

$$K_{t+1} = f(K_t, h_t)$$

- First order conditions:

$$h_t : \frac{\partial V_t}{\partial h_t} = -u_{l_t} + \beta(1+r)w_t \frac{\partial E_t V_{t+1}}{\partial A_{t+1}} + \beta \frac{\partial K_{t+1}}{\partial h_t} \frac{\partial E_t V_{t+1}}{\partial K_{t+1}} = 0$$

$$c_t : \frac{\partial V_t}{\partial c_t} = u_{c_t} - \beta(1+r)\frac{\partial E_t V_{t+1}}{\partial A_{t+1}} = 0$$

- Notice that the first order condition for hours now includes the additional term $\beta \frac{\partial K_{t+1}}{\partial h_t} \frac{\partial E_t V_{t+1}}{\partial K_{t+1}}$ which captures how additional hours of work at time t generate additional human capital at time $t+1$ (via the learning- by-doing mechanism), and how this in turn increases the value function at $t+1$ (via the positive effect of higher human capital on future earnings).

- Now take the ratio of the two first order conditions to obtain the MRS condition:

$$MRS_{c,l} = \frac{u_{l_t}}{u_{c_t}} = w_t + \frac{1}{1+r}\left[\frac{\partial K_{t+1}}{\partial h_t}\right] \frac{\partial E_t V_{t+1}/\partial K_{t+1}}{\partial E_t V_{t+1}/\partial A_{t+1}} \qquad (3)$$

- Contrast Eq. (3) with Eq. (1) for the model without human capital accumulation.
- In (1) the marginal rate of substitution between consumption and leisure is simply set equal to the wage rate, which is the opportunity cost of time.
- But notice that (3) includes an additional term: Once we introduce human capital, the return to a unit of work time is the wage plus the value of the human capital acquired through the additional work experience – see Shaw (1989).
- The “effective wage ”or “price of time ”is the sum of these two components.

- It is convenient to denote the additional term in (3) by $\mathrm{h}c_t = \frac{1}{1+r}\left[\frac{\partial K_{t+1}}{\partial h_t}\right]\frac{\partial E_t V_{t+1}/\partial K_{t+1}}{\partial E_t V_{t+1}/\partial A_{t+1}}$, which I will refer to as "the human capital re- turn. "We can then define the "effective wage "as $w_t + hc_t$, and write the MRS condition more compactly as:

$$MRS_{c,l} = \frac{u_{l_t}}{u_{c_t}} = w_t + hc_t$$

- Rearranging we obtain a labor supply equation that looks like this:

$$lnh_t = \frac{1}{\gamma - 1}\ln(w_t + hc_t) - \frac{\sigma - 1}{\gamma - 1}lnc_t - \frac{1}{\gamma - 1}ln\alpha \qquad (4)$$

- Comparing (4) with (2) we see that the sorts of labor supply equation estimated in the classic papers cited earlier are seriously mis-specified in the presence of human capital investment.

- That is, we ought to regress log hours on the log of the "*effective wage*" $w_t + h_{c_t}$ rather than on the wage itself.

- This point was originally made by Heckman (1976) , who also noted that, as h_{c_t} is not observed, this requires a structural approach.

- But this early observation seems to have had little impact on labor supply research until recently.

- Fig. 2 illustrates the simple intuition for why accounting for human capital changes the results in this way.

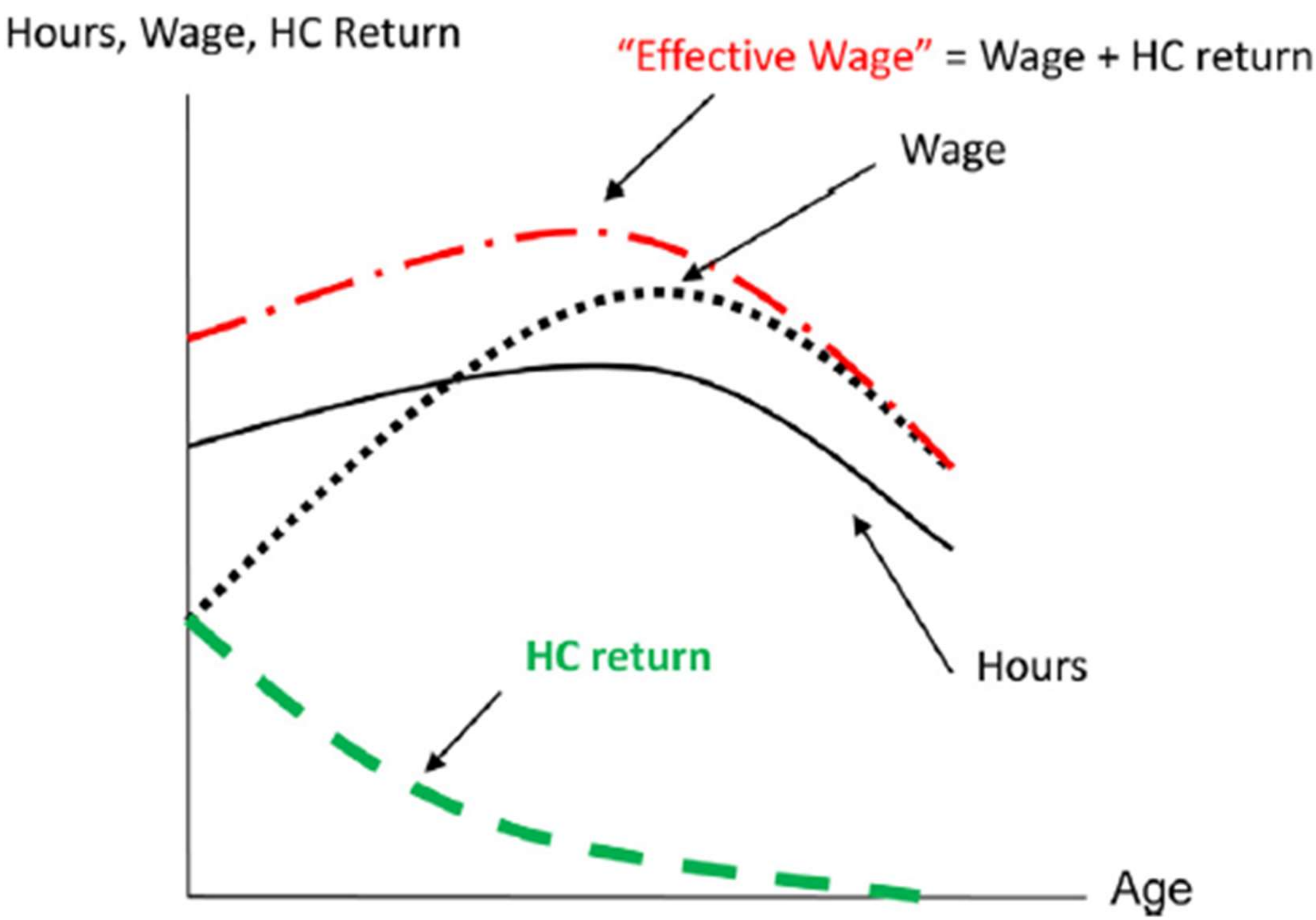
- The human capital return h_{c_t} is large when workers are young and declines as they grow older and approach retirement age – at which point the return to human capital investment drops to zero.

- Thus, as Fig. 2 illustrates, the effective wage rate $w_t + h_{c_t}$ is much greater than the observed wage rate when workers are young, but it converges to the observed wage rate as they age.

- As a result, the life-cycle path of the effective wage rate $w_t + h_{c_t}$ is much flatter than that of the wage rate itself.

- As Fig. 2 also illustrates, this means that hours actually track rather closely with the effective wage rate over the life-cycle, implying that labor supply is elastic with respect to the properly measured price of time. Hence the large Frisch elasticity.

Fig. 2. Typical Patterns for Hours, Wages, HC Return over the Life-Cycle (Men).



- The recent labor supply literature has placed a great deal of emphasis on the distinction between the participation (or employment) decision and the choice of hours of work conditional on participation – sometimes called the extensive vs. intensive margin distinction.

- The classic labor supply studies cited earlier focus on variation in hours conditional on employment for prime age men.

- But as Figs. 3 and 4 show, employment varies much more over the life-cycle for men than do hours conditional on employment.

- In fact, for prime age men hours conditional on employment are very flat over life-cycle.

- It has often been argued that this apparent lack of variability of hours conditional on employment can account for the very low Frisch elasticities obtained by the classic studies.

Fig. 3. Employment by Age and Education

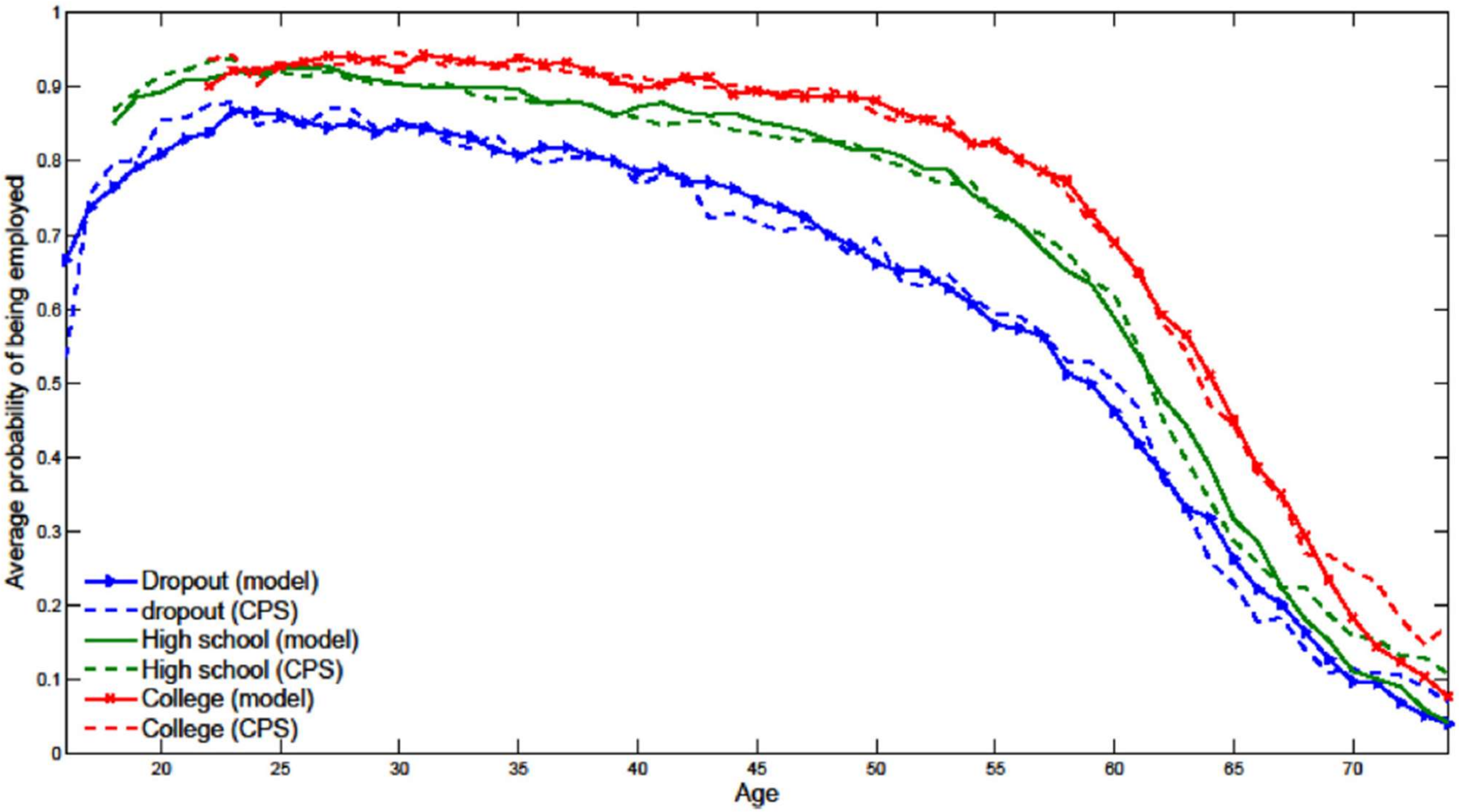
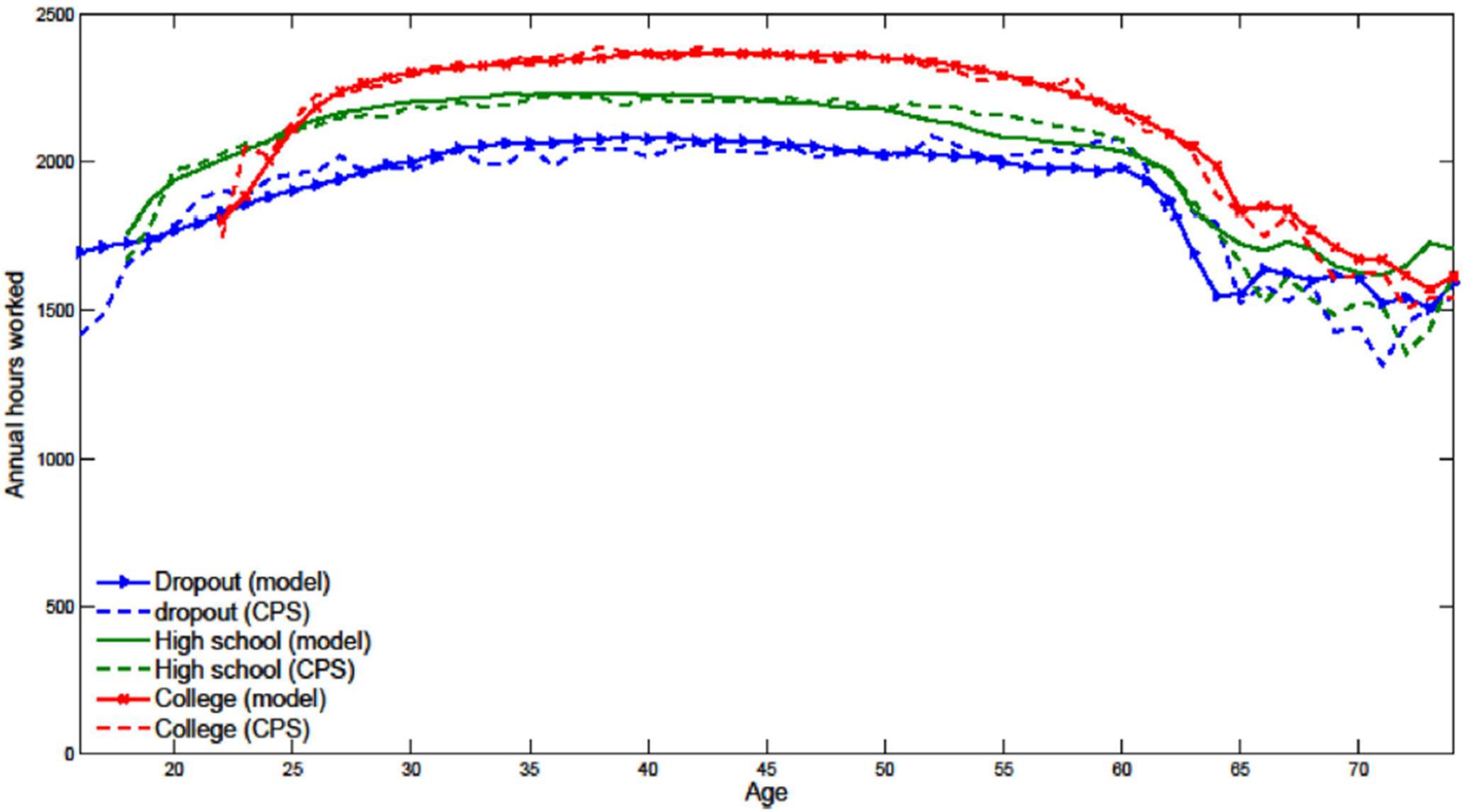


Fig. 4. Hours Conditional on Employment (by Age and Education)



- Papers that account for the participation margin of labor supply do tend to find large Frisch elasticities.
- Table 2 lists key papers that estimate labor supply elasticities for males incorporating the participation margin, along with their key results.
- In sharp contrast to the papers listed in Table 1 , these papers consistently find Frisch elasticities of employment near one.
- There is more disagreement on the elasticity of hours conditional on employment, but it is consistently much smaller.

Table 2
Frisch Elasticity – Papers with Participation Margin, Men.

	Notes	Employment	Hours	Total
Kimmel Kneisner (1998)	4 month period	0.86	0.39	1.25
French (2005)	60 year-old males	1.10	—	1.10
Chang and Kim (2006)	Inferred from reservation wages	≈0.90	—	≈0.90
Erosa Fuster Kambourov (2016)	Aggregate hours and employment	1.08	0.67	1.75
Keane Wasi (2016)	50 year-old males	—	—	0.73
Iskhakov Keane (2021)	60 year old males	1.3-1.6	0.15-0.20	1.5-1.8

Note: Figure for Keane and Wasi (2106) is from their Table 2, taking a weighted average over the three education groups.

5.3.
Summary

- In summary, I would argue there is plenty of evidence for elastic labor supply. Papers that account for human capital or the participation margin generally find Frisch elasticities in the vicinity of 1.0, if not greater.
- Thus, the Frisch elasticity of 1.0 assumed by Conesa, Kitao and Krueger (2009) does seem plausible.
- Recall they show that two main features of their model drive their 36% capital tax result: elastic labor supply and labor supply elasticities that grow with age.
- Next I turn to the question of how labor supply elasticities vary by age.

6. The age pattern of labor supply elasticities

6.1. Why do elasticities that grow with age favor a positive tax on capital?

- We can see the intuition for how a capital tax approximates an age-dependent tax on earnings using a simple two-period model with saving and taxes (and exogenous wages).

- Use the same notation as in Section 5 , but now introduce τ_K as the tax rate on interest income and τ_t as the age $t = 1{,}2$ tax on labor income. The first order conditions are:

$$u_{l_t}/u_{c_t} = w_t(1 - \tau_t),\ t = 1, 2$$

$$u_{c_1}/u_{c_2} = \beta(1 + r(1 - \tau_K))$$

which imply:

$$\frac{u_{l_1}}{u_{l_2}} = \frac{w_1(1 - \tau_1)}{w_2(1 - \tau_2)}\beta(1 + r(1 - \tau_K))$$

- From this equation we can see that the effect on intertemporal labor allocation of a tax rate on earnings that falls with age $\tau_2 < \tau_1$ can be mimicked by combining an age-invariant tax rate on earnings $\tau_2 = \tau_1$ with a positive tax rate on capital income $\tau_K > 0$.

- With many periods the capital tax can only approximate an age-dependent earnings tax, but Conesa et al. (2009) show the capital tax is still a valuable tool in that case.

6.2. Why might labor supply elasticities increase with age?

- There are strong theoretical reasons to expect labor supply elasticities to increase with age, due to endogenous human capital formation, an active participation margin, or both.

- For instance, returning to Fig. 2 , we see how the human capital model implies the market wage rate is a relatively small fraction of the "effective wage "for young workers – approximately 50% at ages 25-30 according to the Imai and Keane (2004) estimates.

- This is because the human capital return is substantial for the young.

- But for older workers the market wage is almost equal to the effective wage. This means that a transitory wage or tax change – which only impacts the current market wage – has a smaller impact on the effective wage at younger ages than at older ages.

- In other words, career concerns render young workers rather insensitive to transitory fluctuations in their current after-tax wage rate, as their incentive to work is derived more from the future payoffs (arising from career advancement) than from short-run payoffs.

- As a result, the Frisch elasticity grows with age. I derive this result mathematically in Keane (2016) .

6.2. Empirical evidence on age-varying labor supply elasticities

- Table 3 summarizes the evidence on how labor supply elasticities vary by age for males.
- All these studies find that elasticities increase strongly with age.
- For example, French and Jones (2012) find the Frisch elasticity increases from 0.36 at age 40 to 1.28 at age 60, and those figures are typical.
- The papers by Keane and Wasi (2016) , Erosa et al. (2016) and Iskhakov and Keane (2021) break this down by education, and find the increase with age is stronger for the more edu- cated.

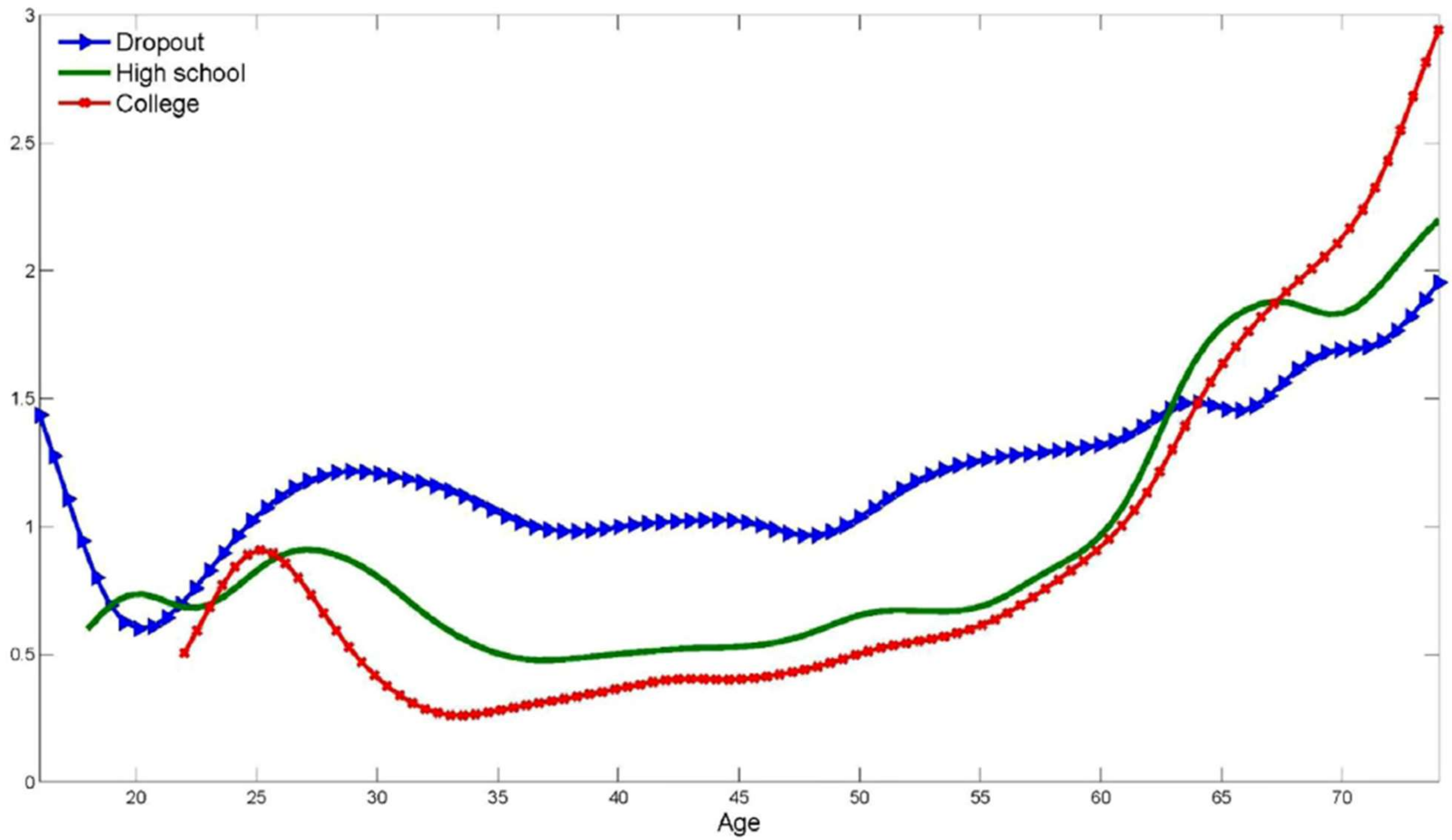
Table 3
Frisch Elasticity by Age – Papers with Human Capital and/or Participation, Men.

	Sample	Young (Age)	Age 60
Imai Keane (2004)	White Males 20 - 36	0.36 (25)	1.96
French (2005)	Males 30 - 75	0.30 (40)	1.10
French Jones (2012)	Males 59 - 75	0.36 (40)	1.28
Keane Wasi (2016)	College Men	0.29 (35)	0.96
	High School Men	0.46 (35)	0.94
	<HS Men	1.06 (35)	1.25
Erosa Fuster Kambourov (2016)	College Men	1.11 (35-44)	2.08
	Non-college Men	1.62 (35-44)	2.74
Iskhakov Keane (2021)	College Men	0.30 (30)	1.50
	High School Men	0.80 (30)	1.80
	<HS Men	0.80 (30)	1.80
Borella et al. (2021)	Married Men	0.30 (30)	1.10
	Single Men	0.60 (30)	1.80

Notes: Figures for Keane and Wasi (2016) are taken from their Table 2 . Results for Borella et al. (2021) are taken from their Table 4 . For Erosa at al. (2016) the age 60 figure is an average from age 55 to 61.

- Fig. 5 shows the age pattern of Frisch elasticities implied by our model.
- While there is some tendency for elasticities to be higher at young ages, the general trend is still increasing with age.
- For example, for college educated workers the Frisch elasticity increases from about 0.30 at age 35 to about 1.0 at age 60, and to about 2.0 at age 65.
- In contrast, for workers with less than a high school degree it increases very slightly from about 1.1 at age 35 to about 1.25 at age 60.
- The Frisch elasticity increases much more strongly with age for more educated workers because their return to human capital investment is much greater (reflected in their having wage profiles that rise more steeply with age).
- In other words, career concerns are more important for the more educated, rendering their labor supply less elastic at young ages.

Fig. 5. Frisch Elasticities by Age and Education, from Keane and Wasi (2016).



7. Optimal tax models with human capital and/or a participation

- In summary, accounting for endogenous wages via human capital formation has two key effects on optimal tax structure.
- First, it makes the optimal tax on labor income lower and less progressive. Intuitively, the incentive to invest in human capital is greatly reduced if higher wages push one into a higher tax bracket.
- Second, it makes it optimal to shift part of the tax burden off labor and onto capital.
- Taxes on physical capital are bad for growth as they reduce physical capital formation. But if labor taxes slow down human capital formation, the argument for taxing labor rather than capital is weakened.

8. Joint vs. individual taxation

- There is a broad consensus that labor supply elasticities are large for married women.
- The evidence is summarized in Table 4.
- As the literature is large, I have been very selective, with a bias towards classic papers and recent papers (see Keane (2011) Table 7 for additional cov- erage).
- In contrast to the tables for men, the papers in Table 4 present evidence on a range of elasticity concepts.
- The papers that report Frisch elasticities obtain values for married women ranging from 1.10 to 2.52, while Eissa (1996) estimates elasticities in the 1.25 to 1.6 range based on responses to the Economic Recovery Tax Act of 1981.

- The life-cycle elasticities reported in Table 4 range from 0.91 to 3.60.
- These magnitudes are strickingly large for Marshallian (uncompensated) elasticities.
- But in Keane (2016) I showed Marshallian elasticities with respect to permanent tax changes can exceed Frisch elasticities with respect to transitory changes if human capital is endogenous.

Table 4
Labor Supply Elasticities for Women.

	Sample	Elasticity Concept	Employment	Hours	Total
Heckman MaCurdy (1982)	Married Women 30-65	Frisch			2.35
Moffitt (1984b))	Married Women 16-31	Life-Cycle[a]	1.25		1.25
Eissa (1996)	Married Women	Tax Effect ERTA1981	0.65-1.00	0.60	1.25-1.60
Kimmel Kneisner (1998)	Married Women	Frisch	1.85	0.67	2.52
Van der Klaauw (1996)	All Women 14-36	Life-Cycle[a]			3.60
Keane and Wolpin (2010)	All Women 14-33	Life-Cycle[a]			2.80
Blundell, Pistaferri Saporta-Ekstein (2016)	Married Women, 30-57	Frisch		0.96	
Attanasio Levell Low	Married Women, 40-44	Frisch	0.56	≈0.80	1.37
Sanchez-Marcos (2018)	Married Women	Life-Cycle[a]	0.51	≈0.40	0.91
Eckstein Keane Lifshitz (2019)	Married Women, 35-44	Life-Cycle[a]			1.18
	Single Women, 35-44	"			0.17
Borella et al. (2021)	Married Women, Age 40	Frisch	0.70	0.40	1.10
	Single Women, Age 40	"	0.40	0.40	0.80

Note: Figures for Keane and Wasi (2016) are taken from their Table 2 . Results for Borella et al. (2021) are taken from their Table 4 . Figures from Eckstein et al (2019) are for the 1975 birth cohort. a The elasticity concept "Life-Cycle " means that, in a dynamic model, the wage rate is increased starting from the first period and the women is able to reoptimize her entire life-cycle path in response, possibly including changes in fertility, marriage, education and/or savings. None of the listed studies allows all four to be endogenous.

9.
Conclusion

- A central idea of optimal tax theory is that, to minimize distortions, taxes should be focused on activities that are inelastically supplied.
- For many years the conventional wisdom of the economics profession has been that labor supply elasticities are small, so that distortions from taxing labor income are minor.
- Inelastic labor supply also lends additional weight to arguments that capital income should be taxed lightly if at all.
- But recent work on labor supply that emphasizes human capital formation and the participation margin suggests that labor supply elasticities are significantly larger than the conventional wisdom suggests.
- This work also finds that labor supply elasticities grow with age, and that labor supply is highly elastic for older workers. Labor supply is also very elastic for married women, for whom the participation margin is very important.

- We’ve also seen how, in models that include married women with elastic labor supply, (i) optimal progressivity of the tax code is reduced, and (ii) a shift to individual taxation is desirable.

- With the exception of Freestone (2020) , there is almost no work that studies optimal tax structure more generally in such models.

- As a result, little is known about how accounting for marriage affects the optimal capital tax.

- The frontier is to study optimal tax structure – including the income, capital and consumption taxes – in models that include (i) endogenous wages, (ii) participation decisions, (iii) both single workers and married couples, and (iv) workers that differ by education and other key demographics.