Born to be Unemployed:
Unemployment and Wages Over the Business Cycle∗

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Abstract

This work studies the evolution of wages and unemployment over the business cycle by disaggregating the population with respect to individuals’ education and their parents’ education. Using the PSID data on white males, for the period between 1968 to 1992, we find the following facts: (a) The higher the education the less cyclical unemployment, employment, and wages are. (b) Within education categories, the higher parents education the less cyclical unemployment, employment, and wage are. Moreover, (c) college graduates with educated parents face a-cyclical unemployment and their wages increase in absolute terms during recessions. (d) the less educated with less educated parents take most of the burden of recessions, both their wages and their employment are highly pro-cyclical. Thus, the a-cyclicallity of the aggregate wage is not only a statistical issue. To a large extent, the rise in inequality during recessions reflects the failure of the representative agent model to account for important components of cyclical dynamics. We interpret these findings to imply that general skills are more on demand during recessions.

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1 Introduction

The last three decades had shown drastic changes in unemployment worldwide. In the US unemployment was low till the early 1970s, it has increased dramatically during the early 1980s, and, more recently, has gone down back almost to the level of the 1960s. This low frequency pendulum is the cradle of a faster moving swing - the business cycle. Business cycles, of course, are not a new phenomenon and not specific to the US. Whether measured by unemployment, employment, output, or by more complex measures, they are present at least throughout the documented economic history of the last century.

This work documents a new set of evidence on cyclical unemployment, employment, and on the cyclicallity of wages, and provides a simple interpretation for these facts. While this work shed new light on the role of education over business cycles the new set of evidence is mainly concerned with the direct effect of parents’ education on the cyclicallity of wages and unemployment within each education group. The main findings we provide about the role of parents education are:

1. Unemployment: (a) For every level of education and age group, average unemployment is higher among those with less educated parents. (b) Within each education group, the gap between the rate of unemployment of those with less educated parents and those with more educated parents increases during recessions. (c) College graduates with educated parents (2/3 of the college graduate group) face no cyclical unemployment (and counter cyclicallity in the incidence of not-working). All results hold true when we control for individual heterogeneity as well as for individuals’ past performance in the labor market.

2. Wages: (a) During recessions, within education group, the wage of those with less educated parents decreases by more than the wage of those with more educated parents. (b) The wage of college graduates with more educated parents increases in absolute terms during recessions. (c) The wage of less educated with less educated parents is highly pro-cyclical.

Needless to say, education is a very important determinant of wages. Perhaps less emphasized but still not all surprising is the fact that education is a shelter against unemployment; individuals with more education earn more and are more employed on average. However, controlling out parents’ education, the cyclical component of both the individual wage and his (un)employment status are not correlated with his education. Relative to himself and control-
ling for the choice the individual made (occupation, industry, residence and the like) ones own education has little effect on his cyclical experience (if at all) while parents’ education has a strong and robust cyclical effect.

A possible explanation that may come to mind is that of a social network. For reasons to be explained below we tend to rule out this explanation. Our interpretation of these results is therefore different and is based on the hypothesis that human capital is made of two components: The first component is knowledge, that is made of education, experience, etc.. The second component is the human capital experiential part that is made of some components of the cognition, some aspects personality, aspirations, and other general skills which are essential for coping with or adjusting to changes.\textsuperscript{1} The study uses parents’ education as a proxy for the inherited, instilled, or bequeathed general skills of the child. Parents take decisions for their heirs, serve as role models, nurture their children and transfer intelligence, temperament, values, working habits, and a long list of other personal characteristics.\textsuperscript{2} As a result, parents’ education affects child’s own level of education, as well as his general skills. Thus, controlling for one’s own education, experience and many other measures for knowledge, we can associate the net effect of parents’ education on child’s labor market outcomes with the role of these general skills parents provide.

Assuming parents’ education stands for general skills, interpreting the results is simple, and is composed of three building blocks. The first block is that recessions are times of change. The idea that recessions are time of change was recently used by Ricardo J. Caballero and Mohamad L. Hammour (1993) who build on Joseph A. Schumpeter, as well as by Robert E. Hall (1999).\textsuperscript{3} The second building block is our hypothesis from the previous paragraph: It is that the experiential component in human capital, which is made of general skills, is needed more at times of change. This component of human capital, being less specific than education,

\textsuperscript{1}This decomposition was put forward by Theodore W. Shultz (1975) in the context of economic development and is transferred in this work to allow for a better understanding of the evolution of the return to human capital over the business cycle.

\textsuperscript{2}The positive correlation between parents’ and child’s education (and income) is a well known fact. Gary s. Becker and Nigel Tomes (1979, 1986) showed the effect of family background on the child’s accumulated human capital. See Solon (1999) for an excellent survey on Inter-generational Mobility.

\textsuperscript{3}The theoretical literature on creative destruction as a source for unemployment exists also in the context of long run unemployment (e.g., Philippe Aghion and Peter Howitt, 1994; Dale T. Mortensen and Christopher A. Pissaridis 1994).
gains importance at times when new situations are encountered and new tasks or new procedures are to be met. Obviously, both general skills and education are essential. Nevertheless, since education is more specific, we argue that the relative role of general skills increases during times of change.\textsuperscript{4} The third building block is that these general skills are not fully contractible, i.e., individuals’ wages are not fully adjusted to compensate for a change in the price of these skills.\textsuperscript{5} Given that recessions are times of change, if demand for general skills rises during times of changes, and if general skills are not fully contractible, than during recessions the productivity of individuals who are less endowed with general skills decreases relatively to the productivity of the more endowed ones. Thus, during recessions, within each education group: (a) wages of highly endowed individuals should increase relative to wages of less endowed individuals, (b) the likelihood to be unemployed should increase more for the less endowed individuals too.\textsuperscript{6} Our interpretation of the evidence follow directly from this logic.\textsuperscript{7}

These findings bring the study close to the debate about the degree of wage cyclicallity. The discussion of wage cyclicallity is usually cast in aggregate time series. Recently, Garry Solon, Robert Barsky, and Jonathan Parker 1995 (hereafter SBP), used data at the individual level to demonstrate that wages are indeed pro-cyclical.\textsuperscript{8} While all earlier work we know focused on the composition of human capital in the labor force, our focus is on the composition of human capital \textit{within} the individual as well as on its composition \textit{across} individuals, a novel aspect that complements the previous one. While the previous line of research showed that once one corrects for heterogeneity across individuals wages are pro-cyclical, we let some individuals to

\textsuperscript{4}This view about the role of ability is consistent with findings about individuals’ performance during the process of growth (Theodore W. Shultz, 1975; Yona Rubinstein and Daniel Tsiddon, 1998) as well as with modern theories of intelligence (Robert J. Sternberg, 1985).

\textsuperscript{5}Labor contracts are not the only way to explain unemployment. When we detail our argument we show that other theories of employment can fit well our analysis. The literature on labor contract incompleteness is vast and is clearly beyond the scope of this work.

\textsuperscript{6}Note that we make no statement on the source for the recession. It can be either a technology shock or demand shock as well as any other reason. In all cases a recession is time when production is low and so is the demand for labor.

\textsuperscript{7}A related evidence is found in the literature on technical change. That literature has already documented the fact that human capital exists in firms \textit{before} investment in new equipment is done (e.g., Doms, Dunne and Troske, 1997). Since investment is strongly procyclical the two observations are not unrelated.

have *pro-cyclical* wages while others have *counter-cyclical* wages. Sorting individuals on the human capital line according to education and parents' education resolves both the inconclusive results at the aggregate level and the weak pro-cyclicallity at the individual level and shows that the previous, widely held, assumption that recessions are a loose-loose situation hide important differences. For example individuals with high education and high parents’ education see *counter* cyclical wages.

Obviously, there are other channels through which parents can affect their child’s labor market outcomes. For example, more educated parents usually have higher income and better social contacts, which may also affect labor market outcomes. At the end of the day, the distinction between these alternative explanations is an empirical issue. Focusing on individuals with a long experience on the labor market, controlling out the effect of individual history as well as the effect of choices he made (occupation, residency, etc.), and conducting some further tests leave us with the conclusion that this explanation does not fit the data and that the results we present in this study are not in line with the social network hypothesis. In the experiment we conduct, parents’ education captures some general skills *the individual obtains* and not skills *his parents have*. Nonetheless, since the effect of parents’ education is not only exogenous to the individual but also permanent to him, understanding wage cyclicallity by parents’ education goes beyond portraying business cycles, and may obtain important welfare implications.

The paper is organized as follows: First, the data is briefly described. Than the new stylized facts are presented. The third section presents the argument and the methodology more formally. The forth tests our hypothesis on unemployment, the fifth tests our hypothesis on the cyclicallity of wages. We than expand on our interpretation and show why it does more justice to the data than alternative explanations. Conclusions are last.

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9 We would like to point out to difference between “income effect” and the “social contacts” arguments. The first one suggests that the parent’s education capture the quality of child’s education, while the second one hints to an active role of parents in child’s labor market performance. The two play very different roles along the career path of their children.
2 The data

2.1 Data set

Throughout this paper we use the Panel Study of Income Dynamics (PSID), a national longitudinal survey. Since the PSID is well known, we only say that it is a panel data set on members of the same families since 1968. As far as we know, the PSID is the only American panel data which follows more then one cohort from the late 1960s and includes information on education, labor market outcomes and family background. In particular the PSID contains information on parents’ education which we are using as a proxy for child’s general skills. This makes the PSID superior to other data sets for our study.

In order to restrict attention to the main points we want to document, we include only white males, born in the USA, aged 22 to 65, with non-missing data on schooling. When we discuss wage data we take the usual route and exclude self employed, exclude reported wage of less than 2 ($1993) or more than 300 ($1993), and focus on full time workers who are defined to be those who work more than 34 hours a week for at least 13 weeks a year.

We decompose the sample by individuals’ own education. Within each education category, we decompose the sample by the education of the parents. For education we divide the data into three subgroups: (i) high-school dropouts (HSD) who are those with less than 12 years of schooling (22 percent of our sample); (ii) high school graduates (HSG) who are those with 12 to 16 years of schooling (approximately 59 percent of our sample); (iii) college graduates (CG) who are those that obtain 16 and above years of schooling (19 percent of our sample). For parents education we divide our sample into two: (i) individuals with high parents’ education (hereafter: HPE) are those whose both parents graduated at least high school (41 percent of our sample). (ii) individuals with low parents’ education (hereafter: LPE) are those whose one of the parents did not finish high school. We do not use more narrow definitions of either education or parents’

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10 For more detailed information about the PSID look at http://www.isr.umich.edu/src/psid/.

11 Within education groups the picture is of-course not constant. Among HSD only 10 percent are HPE, among HSG 45 percent are HPE and among CG 65 percent are HPE. Looking by mothers or fathers education does not change the picture a lot. More Fathers graduated college but more mothers graduated either high school or college. Marriage is assortive so out of the 48 percent fathers that had at least high school 41 percent are married to mothers that had at least high school education as well. Thus in the context of this work above 80 percent marry “their own kind”.

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education since we divide each education group into sub groups according to parents education. Further details of each variable show up in the notes to each of the tables.

2.2 Indicators for business cycles

Business cycles are a well documented phenomenon over the last decades. We make no attempt to change the convention with respect to its dates and use two commonly used indicators for the Business Cycle. First, we use the nation-wide yearly aggregate unemployment rate (hereafter: YARU). Second, we use a binary measure - the NBER business-cycle dates. The NBER dates recessions by year and month. Since earnings and employment in the PSID data are given on yearly basis, we define each year with 6 or more month of recession as a recessionary year. For example, we define 1980 as a recessionary year although according to the NBER definitions the recession took place from January to July.

Furthermore, the NBER defines recession dates by rising unemployment. For that reason, 1983, the year with the second highest unemployment rate between 1950 and 2000 is not defined as a recessionary year. Thus, we add the next year to each NBER-defined recession. Results are qualitatively the same if one uses the exact NBER dates. The recessionary years in our sample are: 1974-1976, 1980-1983 and 1990-1993.

In the stylized facts’ section, where we focus on recessions vs. booms we use the NBER dates for recessions. In the quantitative analysis we use both.

3 Unemployment and wages over the cycle: some stylized facts

With aggregate data there are two well known stylized facts: employment is pro-cyclical and wages are non-cyclical. In order to compare this study to the literature, we “preview” our micro-data analysis with presenting some stylized facts on unemployment and wages over the business cycle using the PSID data. We find that: (a) The rise in unemployment during recession is mostly a phenomenon of less educated persons with less educated parents. (b) Moreover, unemployment of college graduates born to educated parents is cyclical. (c) The non-cyclicality of aggregate wages over the cycle is a composition of two different phenomena: (i) real wages of less educated persons born to LPE are highly pro-cyclical; (ii) real wages of college graduates

\footnote{see: http://www.nber.org/cycles.html}
with educated parents are *counter-cyclical*.

*Figure 1* documents the first evidence. We focus on white males, 22 to 65 years old, during the years 1968-1993. We split our sample by education into three groups: individuals with less than 12 years of schooling ("high school dropouts", hereafter HSD), individuals with at least 12 years of schooling and with less than 16 years of schooling ("high school graduates," hereafter HSG), and individuals that graduated at least college ("college graduates", hereafter CG). For each group we plot the average rate of not-working out of the total population. We split each education group into two: (i) those whose parents are both at least high school graduates (HPE), and (ii) those for whom at least one of the parents did not graduate high school (LPE).\(^{13}\) The figure provides a clear picture: For each level of education, non-employment among children of parents with less education, is about 20 percent higher than in the other group. While education is clearly a shelter against non-employment, parents’ education is important as well.\(^{14}\) *Figure 1* shows that parents’ education affects offsprings labor market performance above and beyond its effect on the child level of education.

Figure 2 presents evidence about the cyclicallity of not-working in the labor force within each education group and each parents’ education group. Here we use the NBER recession dates to split our data into two groups of years: All years of recession are in one group and all other, non-recession, years are in the other group. We use first the proportion of not-working men in the workforce. This figure presents the evidence within the group of high school graduates (*Panel a*), and within the group of college graduates (*Panel b*). For these two groups, that together consist of over three quarters of the individuals, a clear picture emerges. Not only unemployment is higher on average among the individuals born to LPE but it is much more cyclical as well. In fact the aggregate view shows very little difference, if at all, in the proportion of non-working men among the educated HPE white men. *Panels c - d* present the results for unemployment. These results are very much the same. At the level of college graduates practically all the additional burden of unemployment during recessions falls on the pool of those with less educated parents. In fact, those with less educated parents see about the same

\(^{13}\)In this figure we define the workforce at a given year as the population between 22 to 65 that are not in school for that year. We exclude students from this group. Counter-cyclically education attainment is a well documented issue which we do not make an attempt to re-report.

\(^{14}\)Juhn Murphy and Topel (1991) and Topel (1994) already had noticed that unemployment is “mainly a low-skilled phenomenon”.

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rate of unemployment as their HPE counterparts during booms and are more unemployed on average mainly because they are less employed in bad years. Figure 2 points out the first new observation; parents’ education has an important role in determining unemployment over the business cycle.

One can immediately questions whether all business cycle are alike or, if put differently, is it possible that the results are all driven by one cycle? The last two panels of Figure 2 show clearly that the results are NOT derived from one cycle. Panel e plots the rate of unemployment among high school graduates with less educated parents over the yearly aggregate rate of unemployment (YARU). The positive correlation is evident and need no further comments. Panel f plots the rate of unemployment among the college graduates with educated parents on the YARU. The correlation is zero if not slightly negative. College grads. with educated parents face no cyclical unemployment. This is true throughout the sample and not only during one year or one cycle. The results, therefore, are not derived from one observation or another.

Figures 3 and 4 present the ratio of the average wages of those who work during recessions over the average wages of those who work during booms, by education and parents’ education. In Figure 3 we use weekly wages and in Figure 4 we repeat the exercise using hourly wages. A word of caution: In these figures we do not control for any other source of heterogeneity but education and parents’ education. Therefore, these figures serve as a preview and should not be interpreted as the effect of recessions on wages.

Figure 3.a splits the data into education groups. The left column shows that our data is not unique; the aggregate wage is indeed a-cyclical. The rest of the columns show that this a-cyclicallity is no more than a fallacy of aggregation. Disaggregating wage change data into education groups shows a clear difference across them. Wages of HSD are strongly pro-cyclical, wages of HSG are a-cyclical, and wages of college graduates are counter-cyclical. The second panel of Figure 3 disaggregates the data one step further. Here we split each education group into two sub-groups: HPE and LPE. Disaggregating each education group according to parents’ education shows that much of the variation in the response of education groups to recessions is originated in or conditioned upon parents’ education. In particular college graduates with low educated parents have a pro-cyclical wage while college graduates with educated parents observe a counter-cyclical wage. This picture repeat itself within each education group. The left-most column show that the effect of parents’ education is robust to aggregation. Even if one splits
the data according to parents’ education only, and one does not split the data by education
groups, the picture that emerges is striking: wage a-cyclicallity does not exist within groups
defined according to parents’ education. While the wage of the LPE (from all education groups
together) is pro-cyclical, the wage of the HPE (again, from all education groups together) is
counter-cyclical.

Figure 4 repeats the above described disaggregation with hourly wage data. The picture that
emerge is robust to this modification. Aggregate wages are a-cyclical in our sample. Nevertheless
they are highly pro-cyclical in the group of sons of LPE and are strongly counter cyclical for
college graduates who are sons of HPE.

Merging the unemployment figures with the wage-change data provide a clear picture: During
recessions, both employment rates and real wages of less educated individuals with less educated
parents decline, while real wages of educated individuals sons to educated parents rise and their
unemployment remains intact. Hence, disaggregation by education and parents’ education seems
important in this context. The next sections explore further that idea.

4 The empirical framework

We test our hypothesis by comparing change over the business cycle in both the real wage and
the likelihood to work, by education and parents’ education categories.

4.1 Statistical model of wages over the business cycle

Let $W_{it}$ be the log hourly wage of individual $i$ at time $t$, then, adopting linear random coefficient
earnings specification. For the sake of simplicity we assume that the parameters are a linear
function of the aggregate economic activity. Thus, we can write the panel data estimators as:

$$ W_{i,t} = \lambda + \Delta \lambda BC_t + Z_i A + X_{i,t} B + Z_i \alpha BC_t + X_{i,t} \beta BC_t + \varepsilon_{it} $$

(1)

15 Implicitly, we assume that wages ($WG_{i,t}$) are determined by individuals’ human capital in the following
form: $WG_{i,t} = \Lambda t H_{i,t}$, where $\Lambda$ is the price of an efficiency unit of human capital ($H$). Human capital is a
composition of different skills/traits/abilities. For the sake of simplicity let’s assume the following form: $H_{i,t} = 
\exp \left \{ Z_i A_i (BC_t) + X_{i,t} B_i (BC_t) + \mu_{i,t} \right \}$. Note that $\Lambda$, the price of an efficiency unit of $H$, is the wage of individuals
with $Z = X = 0$. 

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where $\varepsilon_{it}$, the error term is:

$$
\varepsilon_{it} = Z_i (A_i - A) + X_{i,t} (B_i - B) + Z_i (\alpha_i - \alpha) BC_t + X_{i,t} (\beta_i - \beta) BC_t + \mu_{it}
$$

$T$ is the length of the panel and $N$ is the number of subjects in it. $Z_i$ is a vector of dummy variables representing time-invariant characteristics, pre-determined to labor market experience such as education and parents’ education. $X_{i,t}$ is a vector of worker’s characteristics which vary over time, such as experience, occupation, industry, region of residence etc., as of year $t$.

$\lambda$, the intercept, is the “price” of unskilled labor - i.e., the wage of workers with no $Z$ or $X$. $A_i$ and $B_i$, stand for the effect of person $i$ observed characteristics on wages. We do not restrict for fixed coefficients. In other words, we allow for heterogeneity in the levels ($A_i$) and in the slopes ($B_i$). $BC_t$ is an indicator of the state of the economy measured by the aggregate economic activity in period $t$. Both the intercept and the slopes may vary over the cycle, thus, in this specification the effect of business cycles may vary with skills. $\Delta \lambda, \alpha, \text{ and } \beta$ stand for the change in $\lambda, A, \text{ and } B$ caused by a change in the state of aggregate economic activity. $(A_i - A), (B_i - B) (\alpha_i - \alpha)$ and $(\beta_i - \beta)$ are the deviations of the random coefficients $A_i, B_i, \alpha_i \text{ and } \beta_i$ from the average coefficients evaluated in the population of workers during booms. $\mu_{it}$ is a vector of unobserved skills/traits/abilities:

$$
\mu_{it} = F_i + f_i BC_t + \nu_{it}
$$

where $F_i$ stands for the product of unobserved invariant characteristics and their price. $f_i$ is the deviation in the effect of unobservable characteristics on real wages over the business cycles. If the effect of aggregate economic activity does not vary with education, parents education, or other invariant characteristics, then $\alpha = \beta = f_i = 0$.

$\varepsilon_{it}$, the error term is a composition of unobservable characteristics and unobserved prices:

$$
\varepsilon_{it} = Z_i (A_i - A) + X_{i,t} (B_i - B) + Z_i (\alpha_i - \alpha) BC_t + X_{i,t} (\beta_i - \beta) BC_t + F_i + f_i BC_t + \nu_{it}
$$

This paper focuses on the effect of recessions on workers real wages by education and parents education categories. As such, the parameters of interest, in terms of Equation (??), are the average effect of recessions on the wages of unskilled workers $\Delta \lambda$ and the average effect of recessions on the price of human capital $\alpha$. 


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4.1.1 The average treatment effect of the business cycle on real wages

For notational convince let’s assume that the aggregate economic activity, $BC_t$, may have two states only: booms and recessions, i.e., $BC_t \in (0, 1)$  

Using this simplification, the effect of a change in economic activity on the real wages of a random sample of the population, conditional on observed characteristics, i.e. the average treatment effect ($ATE$), is:\(^\text{17}\)

$$ATE \mid Z, X = \Delta \lambda^* = \Delta \lambda + Z\alpha + X\beta$$  \hspace{1cm} (5)

We observe strictly positive wages for a non-random sample of the population of boom’s workers. Let $\tilde{A}$ denote the difference between recession workers’ $A$ from the average $A$ of all workers.\(^\text{18}\) If (i) skills affect the likelihood to work over the cycle or (ii) the likelihood to work during recessions depends on the wage shock $(\alpha_i, \beta_i, f_i)$, then the Ordinary Least Square estimators generate a bias estimate of the average treatment effect:

$$ATE_{\text{OLS}} \mid Z, X = \Delta \lambda^* + Z\tilde{A} + X\tilde{B} + Z\tilde{\alpha} + X\tilde{\beta} + \tilde{F} + \tilde{f}$$  \hspace{1cm} (6)

If those who work during both booms and recession are (i) more able than the average worker - $\tilde{A} > 0$, $\tilde{B} > 0$, $\tilde{F} > 0$, or (ii) those who suffered less from recessions $\tilde{\alpha}, \tilde{\beta}, \tilde{f} > 0$ then the OLS understates the $ATE$.

**Previous studies:** Previous studies by Bils (1985) and by Solon Barsky and Parker (1993), which aimed at estimating the average treatment effect of recessions on real wages, pointed out to the role of the change in the composition of unobserved skills in explaining the weak cyclicallity of the average real wages. Yet, both studies assumed that the effect of business-cycles on real wages does not vary within groups - i.e. common coefficient model.

Bils (1985) aimed to control for the change in unobserved invariant heterogeneity $\tilde{F}$ by differencing out individuals’ “fixed effects”.\(^\text{19}\)

$$ATE_{\text{FE}} = \Delta \lambda^* + \Delta X\tilde{B} + Z\tilde{\alpha} + \Delta X\tilde{\beta} + \tilde{F}$$  \hspace{1cm} (7)
As Equation (7) makes clear, by differencing out individuals’ fixed effects we partially control for the change in the composition of skills over the cycle. Hence, implicitly Bils assumes, in addition to the common effect assumption, no heterogeneity in the slopes - i.e., $B_i = B$. Solon Barsky and Parker (1994) challenged Bils’ assumption. They offered to eliminate this skills’ selection bias by using a “balanced sample” - i.e., a sub-sample of individuals who report wages for every year over the cycle. Indeed, as long as the effect of business cycles on wages does not vary within skills’ categories the SBP method generates an unbiased estimate of the average treatment effect. However, if the effect of an aggregate shock on real wages and employment varies within skills categories then the SBP estimator is biased:

$$ATE_{FE,BS} = \Delta \lambda^* + Z \tilde{\alpha} + \Delta X \tilde{\beta} + \tilde{f}$$ (8)

As Equation (8) makes clear, if the likelihood to work depends on the effect of business cycles on individuals’ productivity then the balanced sample does not fully control for selection bias. For instance, if $\tilde{\alpha} > 0$ or $\tilde{\beta} > 0$ then the SBP estimate $(ATE_{FE,BS})$ understate the effect of recessions on real wages.

4.1.2 The effect of recessions on the price of skills

We estimate the effect of recessions on the real wages of workers by education and parents education categories using a balanced sample of workers.

We start with the simplest case, the change in the price of unskilled labor $\Delta \lambda$. Let $l$ denote the balanced sample estimator of $\Delta \lambda$. Obviously, $l$ is an upper bound of the change in wages of unskilled workers ($Z = 0, X = 0$):

$$l = (ATE_{FE,BS} \mid Z = 0, X = 0) = \Delta \lambda + \tilde{f} > \Delta \lambda$$

As for the change in the price of invariant human capital observed characteristics. Section II shows that employment is less cyclical the higher are one’s own education and parents’ education. Based on that, it is fair to assume that selection bias decreases with human capital characteristics ($Z$), that is$^{20}$:

$$\tilde{\alpha} \mid Z_H \leq \tilde{\alpha} \mid Z_L \text{ for all } Z_H > Z_L$$ (A.1)

$^{20}$for all $z_{k+1} > z_k$
At first glance it might seems that we obtain a lower bound of the change in the price of \( Z \) over the cycle by differencing out the common effect. However, this is slightly more complicated. For instance, consider the case where \( Z \in \{ Z_L, Z_H \} \). Let \( \Delta Z = Z (Z_H) - Z (Z_L) \) and \( \Delta \hat{\alpha} = \hat{\alpha} (Z_H) - \hat{\alpha} (Z_L) \). The difference between the average change in real wages among a balanced sample of workers with \( Z = Z_H \) and the average change in wages among a balanced sample of workers with \( Z = Z_L \) is:

\[
\Delta Z \alpha + \Delta \hat{f} + Z_H \Delta \hat{\alpha} + \Delta Z \hat{\alpha} (Z_H)
\]

(9)

where the first term is the change in the price of skills evaluated in the skills gap (\( \Delta Z \)) and the second term is the selection gap \( \Delta \hat{f} = \hat{f} (Z = 1) - \hat{f} (Z = 0) \), which by assumption is negative \( \Delta \hat{f} \leq 0 \). As this Equation (9) makes clear, this dif. by dif. estimator does not provides a lower bound for the change in the price of skills. Indeed by assumption \( Z_H \Delta \hat{\alpha} < 0 \), yet \( \Delta Z \hat{\alpha} (Z_H) > 0 \). We can identify \( \Delta Z \alpha \) using the variation among individuals with high \( Z \). Assuming no ("little") cyclical employment among individuals with high levels of \( Z \) Equation (9) equals to:

\[
\Delta Z \alpha
\]

### 4.2 Unemployment over the cycle

We assume that individuals choose to work if (and only if) the wage they are being offered \( W_{i,t}^0 \) exceeds their reservation wage \( W_{i,t}^R \):

\[
W_{i,t}^* = W_{i,t}^0 - W_{i,t}^R
\]

(10)

\[
U_{i,t} = 1 \quad if \quad W_{i,t}^* \leq 0
\]

\[
U_{i,t} = 0 \quad if \quad W_{i,t}^* > 0
\]

where \( W_{i,t}^* \) is the net benefit from working at time \( t \). \( U_{i,t} \) is a binary variable which equals one if individual \( i \) did not work at time \( t \). Wage offers and reservation wages reflected in \( W_{i,t}^* \) are determined by individuals’ characteristics. Let \( W_{i,t}^* \) be a linear function of individual’s characteristics:

\[
W_{i,t}^* = \mu_i + \Delta \mu_i BC_t + Z_i \delta + Z_i \Delta \delta BC_t + X_{i,t} \eta Z + X_{i,t} \Delta \eta Z BC_t + \varphi_{it} \quad i = 1, ..., N; \; t = 1, ..., T
\]

(11)
where:
\[ \varphi_{i,t} = F_i \pi + F_i \Delta \pi BC_t + \phi_{it} \] (12)

Thus, individuals’ characteristics and aggregate economic activity determine agents’ likelihood to work:
\[ \Pr(U_{i,t} = 1) = F^i W_{i,t}^\pi \] (13)

This study focuses on the change in the likelihood to work over the business-cycle. Therefore the parameters of interest are: \( \Delta \mu, \Delta \delta \) and \( \Delta \eta_Z \). \( \Delta \mu \) measures the effect of a marginal change in aggregate economic activity on the likelihood of an unskilled individual to work evaluated in the probability distribution. \( \Delta \delta \) measures the effect of invariant observed skills on likelihood to work over the cycle evaluated in the probability distribution. If changes in aggregate economic activity have the same effect on unskilled and skilled individuals likelihood to work then \( \Delta \delta \) should be equal zero. \( \Delta \eta_Z \) measures the change the effect variant skills, such as experience, on the likelihood to work over the cycle.

We estimate the parameters of interest using both normal probability distribution (Probit) and the logistic probability distribution. We estimate the model twice: (i) assuming the effect of invariant unobserved heterogeneity does not vary over the cycle, (ii) conditional on unobserved invariant heterogeneity. We control for unobserved invariant heterogeneity using two methods: (i) we instrument individuals’ invariant heterogeneity using their employment history in periods with (approximately) no change in economic activity, (ii) we instrument individuals’ fixed effect using wage data (see previous sub-section).

4.3 Testing the hypothesis

Once the effects of business cycles on wages and unemployment were estimated, we are able to merge prices with quantities. We argue that:

1. the demand for unskilled labor is pro-cyclical.

2. the demand for general skills we associate with \( Z \) is counter-cyclical.

Therefore the null hypothesis to reject are:

\[ H_A : \Delta \lambda > 0, \Delta \mu < 0 \]
\[ H_B : \Delta \alpha \leq 0, \Delta \delta > 0 \]
The first, $H_A$, is quite trivial. A labor supply shock only cannot generate lower real wages and higher unemployment rate. The second, $H_B$ refers to the relative wages and to the relative change in the likelihood to work. If wages reflect other things than the marginal productivity of labor, then rejecting $H_B$ is necessary, but not sufficient condition. For instance, if low skill workers’ wages reflect their contemporaneous marginal productivity, while high educated workers’ wages reflect their average marginal productivity, then changes in relative wages over the cycle do no necessarily reflect changes in the marginal productivity gap.

Moreover, in this study we focus on the effect of parents’ education on real wages and unemployment over the business cycle. We believe that the net effect of parents’ education on individuals’ wages reflect individuals unmeasured skills associate with parents’ education. If so, the change in the effect of parents’ education over the cycle reflects the change in the price of those unmeasured skills. Yet, by studying relative wages only we cannot rule out alternative explanations as the “network” effects. Offspring to high educated parents may have better connections than others. If labor markets discriminate during “bad times”, then connection may serve as a channel. In this case an increase in the relative wage of those with high educated parents during recessions might reflect network effects rather then productivity effect.

Therefore we should study the change in real wages as well. We find it hard to ascribe an increase in individual’s real and relative wages during recessions to discrimination effect. Hence, in order to be able to distinguish between our argument and alternative explanations we would like to like to reject, at least for high levels of $Z_i$, the following hypothesis:

$$H_C : \Delta \lambda + Z_i \Delta \alpha > 0, \Delta \mu + Z_i \Delta \delta > 0$$

5  The effect of education and parents’ education on unemployment over the cycle

This section presents estimates for the effect of education and parents’ education on the change in the probability to be unemployed over the business cycle.

There are two main findings: First, the higher the level of education the less cyclical is unemployment. Second, within education categories, unemployment of those with educated parents (HPE) is less cyclical than the unemployment of those with same education but with less educated parents (LPE). It turns out that the likelihood of less educated people to be
employed decreases sharply during recessions while college graduates with educated parents face NO increase in the likelihood to be unemployed during recessions.

Table 1 presents Probit analysis for both the probability of the incidence of being not-working (1a) and for the probability of being unemployed (1b). The independent variables of interest are only one’s own education and his parents’ education. Each of the independent variables appears once by itself and once while interacted with the state of the economy. We present results either when the state of economic activity takes a binary value of recessions and booms or when the state of the economy is given by the continuous measure - the Yearly Average Rate of Unemployment. For every year-individual pair, the dependent variable gets the value of 0 if the individual works during that year and 1 otherwise. In their binary measure, recessions are represented by a dummy variable that gets the value of 1 during recession and 0 otherwise where the dates of recessions are the NBER dates (see Section 2.2). For parsimony, the table shows only some of the results; the probability for being not working is shown with the binary measure of economic activity, and the probability for being unemployed is shown with the continuous measure of economic activity. Beyond the variables of interest the regressions in Table 1 control only for age (and age$^2$).

Column 1 in panel 1a shows that the individual’s incidence of not working in the PSID is positively correlated with the incidence of recession as defined by the NBER; in our data the employment rate during recessions is on average 2 percent lower than during booms. Column 2 in panel 1a shows that the average likelihood to be not working is negatively correlated with ones own education. Column 3 to 5 are the heart of this table. In these columns we find that the likelihood to be employed over the cycle varies both with ones own education as well as with his parents’ education. In Column 3 we allow to the employment rate over the cycle to vary with ones own education only. We find that the employment rate of high school dropouts is on average 3.5 percentage points lower during recessions than during booms. This does not hold for other education groups. For instance, the employment rate of college graduates is a-cyclical (-0.035+0.04) and its $F-test$ is not statistically different from zero. Column 4 shows that employment over the cycle of individuals with educated parents is different from the employment of their counterparts with less educated parents. Individuals with educated

\footnote{Note that this is different from what figure 1 shows. This is due to the effect age on the likelihood to be employed (negative) which is not controlled out in figure 1.
parents are on average more likely to be employed during recessions than their counterparts do (they are more probable to work by 1.3 percentage point with $STD = 0.58$). Moreover, the employment rate of college graduates with educated parents is counter-cyclical. On average, in our sample, their employment rate is 1.1 percentage point higher during recessionary years than during booms (different from zero with Prob. of 0.6). Column 5 omits HSD. This reduces our population by approximately 20 Percent and allow the focus to be on the educated. It shows that the results for parents’ education are even stronger among this group.

In Panel b of Table 1 we repeat this exercise with two modifications: (i) we use the aggregate unemployment rate (YARU) as the indicator for the state of economic activity (ii) we restrict the sample to those who choose to participate in the labor market - i.e., those who either work or are looking for a job. As this panel makes clear, individuals with higher level of education and with educated parents are less likely to be unemployed during recessions than their counterparts do. The only difference that comes when comparing the two panels is that while we find employment to be counter-cyclical for college graduates with educated parents we find their unemployment to be a-cyclical.

Table 1 shows that education and parents’ education are positively correlated with employment over the cycle. Needless to say, Table 1 falls short of clarifying what education and especially parents’ education stands for. For example, the negative correlation between education and unemployment over the cycle could have emerged from the fact that educated workers work in less cyclical industries or occupations, and not from the relative rise of the demand for human capital during recessions. Moreover, the fact that children of less educated parents are more unemployed (less working) during recession could have reflected the effect of a social network or liquidity constraints. For these reasons, in Table 2 we introduce a long list of controllers and conduct some further test.

We add a number of groups of controllers. One group of regressors controls out the effect of industry and occupation by decomposing industry into durable and non-durable and occupation into blue and white collar. Another group of regressors controls out the individual’s work history. Farber (1996), Aguirregabiria (1998), among others have documented the fact that wage history and pre-displacement wage dynamics are important characteristics of the individual current employment. To net out these effects we include average past wage as well as last year wage. To control for individual employment history (hysteresis) we control for the average time of being
not working (or unemployed, respectively) and for last year employment status (unemployment status).\textsuperscript{22} Parents’ education could have also worked by relaxing liquidity constraints. To control for such an effect we include a binary measure of parents’ income as a regressor. As in table 1 we allow age to matter as well.

It could be the case that educated parents can place their offspring in a job that is less cyclical even for a given wage, education, industry and the like. However, if social networks exist and are affected by parents, it is only reasonable to assume these networks are more effective among young and less experienced workers. If so, we can test the social network hypothesis by comparing the effect of parents’ education on the likelihood to be unemployed over the cycle across age and experience groups. If, indeed parents’ education reflects social networks we should expect the regression coefficient of unemployment on the interaction between recession and parents’ education to be higher among the young and less experienced workers. Thus, we split our sample into five experience/age subgroups, and estimate the effect of parents education on the likelihood to unemployed over the cycle separately for each of them.

Tables 2a and 2b present the results when the dependent variable is, again, either the state of being not-working or the state of being unemployed. To avoid repetitions we present results with the continuous measure of economic activity (the YARU) only. To avoid unnecessary controllers we focus in this table on men at their prime working years (age 25 to 54). As is made clear by Table 2, the fact that individuals with educated parents are less likely to be unemployed during recessions cannot be attributed to social networks, parents’ income, labor market history, occupation, industry, demographic changes, residence or the like. The effect of parents’ education on the likelihood to be less employed during recession is strong and significant. Perhaps surprising is the fact that the same does NOT hold true for one’s own education. The effect of one’s own education on cyclical unemployment becomes small or nil when one controls for the above list of variables.\textsuperscript{23}

Consider Table 2a. This table presents the results for not working. The first column presents the result for the entire sample. Columns 2-6 present the results by experience and age sub-

\textsuperscript{22}We introduce also cohort dummies due to, among other issues, the increase in education over the years. As typically done we also introduce dummies for marital status, residency, urban vs. non-urban and the like.

\textsuperscript{23}We are not saying that the level of employment is the same across education group. This, of-course, is wrong. Educated people work on average more and are less unemployed on average. The point we are making is about the response of each group level of (un)employment to the stage of the business cycle.
groups. Since our focus is on the change of employment over the cycle we do not report variables that are expected to be correlated with the level of employment.

The first row brings the cyclical effect on the likelihood to be not employed. Variables grouped below the first row are variables which are expected to interact with recession. For example, the first column of the table uses the entire sample to reveal the following facts: An increase of 1 percentage point of the nation-wide rate of unemployment (YARU) increases the likelihood to be not working of a High School Dropout (HSD) white male (age 25 to 54) by .638 of a percentage point. If this man is a blue collar worker in the durable-goods industry his likelihood to be not working increases by approximately 1.4 percentage points when the YARU increases by 1 percentage point (.638 + .235 + .483 = 1.356). However, for the same 1 percentage point increase in the YARU, a College Graduate (CG) sees only a rise of .3 of a percentage point in the likelihood to be not working (.638 − .305 = .333). If this CG comes from a family with educated parents (and he is neither blue collar nor in the durable-goods industries) his likelihood to be not working is a-cyclical (.638 − .305 − .313 ≈ 0). Furthermore, the fact his parents were rich or poor made no difference to the likelihood to be more/less employed during recessions.

The second group of variables presented in the Table 2a is that employment history. If one was not working last year, the likelihood he is not working this year is 0.2 of a percentage point higher than if he was working last year. Also, if one had not been working for longer than the average man throughout his entire past he is more likely to be not working at any point in time. Last but not least, better workers work! An individual with a high average hourly wage throughout his past worklife is more likely to be working than those who earn less on average.24 Note however that the incorporation of employment history in these regressions may have more than one interpretation. While it may reflect hysteresis, it may reflect unobserved heterogeneity as well. In this work we do not make an attempt to draw a line between the two. For our purpose, employment history is one way to control for variables we do not observe but we think might be correlated with our variables of interest. For example, if parents’ education was standing only for the push parents give to their hires at the entry level, the inclusion of variables that report past performance in the labor market should have made the direct effect of parents’ education nil. The fact that parents’ education affects the employment response to recession even when

\[24\text{The average is calculated on the individual actual experience.}\]
employment history is included rules out a number of non-market explanations. Obviously, employment history stands for unobserved heterogeneity of many kinds of which hysteresis is only one. Therefore, even if one is less willing to consider non-market mechanisms, the fact that the effect of parents’ education on the likelihood to be employed survives these controllers for unobserved heterogeneity is reassuring.25

Consider Columns 2-4 in Table 2a. In these columns we split our sample by the past actual experience one has on the labor market.26 The main reason behind this split is the desire to make a clear distinction of the effect parents’ education has on individuals from the effect educated parents may have on their children. Our hypothesis claims for the former while the social network approach vows for latter. Clearly, the use of parents’ education as a proxy for some general skills tends to raise an immediate doubt. Perhaps this variable captures the effect of positive discrimination and not that of ‘skills’, and the only reason it is captured by parents’ education and not by parents’ wealth is because wealth, being reported by the child, is measured with an error? While we provide direct evidence against this hypothesis elsewhere (RT, 1999), Columns 2-4 clearly show that a social network, if it exists, is unlikely to be the explanation for the phenomena we document.27 Column 2 brings only those individuals with relatively short experience (less than 10 years). Columns 3 and 4 bring different experience groups (5 to 30 and 10 to 30 respectively). If parents’ education stood for a social network, parents should have had a stronger impact on the younger and less experienced: It is hard to imagine that after more than 10 years of active participation in the work force, parents can still provide social contacts the child has not been able to establish for himself (Column 4). A brief look in the 4th row in Table 2a reveals, however, that parents’ education is as important hedge against unemployment during recessions for individuals with long work experience as for those who obtain a relatively short work experience. Moreover, parents’ education is insignificant in the regression of less experienced individuals (Column 2) and has negative and significant effect on unemployment in

25 An inspection of the variables under the “Individual History” reveals a phenomenon described in the work on the “displaced worker premia” (Henry S. Farber, 1996). Wages go down for two years in a row before an individual becomes unemployed. As was noticed by Farber, this implies that the displaced worker premia, if measured properly, must take this decline into account. For our purpose it is important to note that wages do go down significantly and persistently (for two years in a row!) before an individual becomes unemployed.
26 By “actual” we mean that we count the years the individual is working. A year one does not work is not a year of experience.
27 Note, however, that this work is not desigend and cannot rule out social networks.
all other regressions. During the early years, working in the “wrong” industry (durable-goods) makes most of the explanation. While the probability of the less experienced to be unemployed in bad years is much higher than that probability among the more experienced, parents’ education does not help. The fact parents’ education is important when work experience is at least 10 years is compatible with our interpretation of this variable as something that exists in the child and not as something that exists in the parents. I.e., it favors the general skills or ability hypothesis over the social network one.

*Columns 5-6* split the data once again by experience. However, here we report the results for individuals who are at least 35 years old (and not older than 54). One way to think about these columns is that the average parent in this sample has already retired from work. The result within this group are even stronger. For an individual with educated parents who is a working college graduate, older than 34 and younger than 54, with experience of at least 10 years of work (Column 6), the likelihood to become not working when the YARU increases by 1 percentage point is actually *decreasing* by approximately half a percentage point (\(0.781 - 0.748 - 0.509 = -0.476\) with an *F test Prob.* = .103). The strong effect of parents’ education that almost offsets by itself the cyclicallity of employment that exists also when individuals are at their best and their parents are retired or about to retire makes our point clear.

*Table 2b* conducts the same experiments with the same cuts on experience groups and age groups. The dependent variable here is the probability to be unemployed. There is not even one qualitative difference between the evidence of interest in the table for unemployment as for the table for the incidence of not working that was discussed above.

This pattern, that parents’ education prevents cyclical unemployment during recessions, repeats itself in all the regressions of unemployment for men under 60 years old. In the regressions for not-working the “critical age” seems a bit lower - around 55. For individuals above the prime working age this effect tends to vanish. One possible interpretation is based on human capital theory in conjunction with our hypothesis that parents’ education is a proxy for the ‘general skills’ of the child. If, during recessions, these ‘general skills’ are jointly used with other resources to produce new human capital, then it should affect older men to a lesser extent. Controlling for the level of general skills, the fact that work-life is finite makes the older worker to invest less than a younger one.28

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28 A second interpretation is technical. It may be the case that over time the history of the individual makes
Recently Edmund Phelps (1997), while re-assessing his natural rate hypothesis, conjectured (as he did long ago) that higher levels of wealth increase the tendency to stay unemployed. In his theory he nominates both personal wealth and public (aggregate) wealth as the reasons behind the increase in the natural rate. The data seems not to fit the first part of that hypothesis. Parents’ poverty seems to shrink employment opportunities more than it increases the incentive to work.

Tables 1-2 provide evidence that employment of HPE individuals is less cyclical. Specifically, employment of CG with educated parents is \emph{a-cyclical}. This is true even when one controls for individual heterogeneity, past experience, parents’ income as well as many other variables.\footnote{Parents’ income (a dummy variable for poverty) does come out significant in some Logit regressions of the same type. We do not exclude the possibility that parents’ income has an effect on the average probability to be unemployed. \textbf{Never}, however, do we find an evidence for the effect of parents’ income of the cyclicallity of either wages or employment.} Moreover, the results are stronger for individuals at prime age. In the next sections we explore the differential movement of wages over the cycle across individuals with the same level of education but different parents’ education.

## 6 Wages over the business cycle

In this section we estimate the effects of parents’ education on the evolution of wages over the business cycle. Since we have intensively explored the effect of parents’ education on wages elsewhere (RT, 1999), the focus in this section is on the way wages are \emph{changed} over the cycle. We estimate this effect in a number of ways. In all estimation procedures the qualitative results are the same: \textit{(i)} Individuals with low level of education and less educated parents have \emph{pro-cyclical} wages. \textit{(ii)} Individual with educated parents see less of a decline in their wage during each recession. Moreover, \textit{(iii)} there exists a well defined group of men, the group of college graduates with educated parents (this group consists of about 10 percent of our sample), for whom wages are \emph{counter-cyclical}. I.e., the wage of college graduates with educated parents increases at times of recession.

\[ \text{him converge to his true type (true general skill or ability) and that therefore these general skills or ability become more and more correlated with both employment and wage history of the individual. In general the explanatory power of these variables indeed rise with age but as employment history is highly relevant even at young age it is hard to conclude that this is the explanation.} \]
6.1 Estimating the model using “fixed effects”

Table 3 reports estimates of the effect of parents’ education on wage cyclicallity using simple fixed effect wage regressions. This method assumes $E[a_i \mid BC_t = \text{boom}] = E[a_i \mid BC_t = \text{recession}]$. Due to the well known “composition effect”, this estimation should be interpreted with care. One benefit of this test is, however, that it allows a maximal use of the data and is the natural counterpart of the estimation we conducted on unemployment. Note also, that the all the literature we are aware of claim that composition effects bias the results in favor of the null we want to reject. Thus, if in spite of the composition effect we find evidence against the null, these evidence are still interpretable.

The dependent variable in Table 3 is the log hourly wage. The cycle is defined by a dummy variable according to the NBER dates (see Section 2.2). Variables of interest are: recession, the interactions of one’s own level of education with recession, and the interaction of one’s parents’ education with recession. Other explanatory variables include actual experience, i.e., experience accumulated while working full time, and a set of conventional dummies. Other explanatory variables which are interacted with the state of the cycle are parents’ income, occupation (blue collar), and industry (durable-goods). Regressions reported in Columns 1,3,5... are run for the entire population while Columns 2,4,6... report results for high school graduates and above.

During recessions, the wage of high school dropouts (HSD) with less educated parents is on average 2.5 percentage lower than during booms. This number is significant and robust; in the regressions reported it hovers between 2.4 and 3 percentage points. This number is however only part of the picture. Educated parents cut the decline by almost a half. Thus, during recessions, wages of the less educated individuals (HSD) with educated parents decline by only 1 to 1.5 of a percentage points. The results about high school graduates (HSG) are just close. It seems that while graduating high school provides a wage, it does not provide a significant insurance against recessions.\(^30\) The picture that emerges for college graduates is surprising. By itself the college degree insures almost fully against a wage decline during recessions $-2.6 + 2.2^{(0.5)} + 2.2^{(0.7)}$. If the individual is a college graduate whose both parents graduated at least high school, his wage during recession goes up by 0.7 of a percentage point (Equation 1).\(^31\) This evidence is robust. In general all equations yield the same picture about the lower and the upper ends of...

\(^{30}\) The interaction of HSG with recession always gets the expected sign but is always not statistically insignificant.

\(^{31}\) About 65 percent of college graduates in our sample belong to this group.
our decomposition. At the lower end, the $HSD+LPE$, the wage is **pro-cyclical**, at the high end, the $CG+HPE$, the wage is **mildly counter-cyclical**. This holds true even before we treat the composition effect, i.e., the fact that during booms the average quality of those segments of the workforce that get to be more unemployed during the recession goes down.

Columns 3-4 add interactions of recession with a proxies for parents’ wealth. Columns 5-6 add interactions of recession with being a blue-collar worker and with working in the more cyclical industries (manufacturing and construction). Columns 7-8 bring these 4 interactions together. In all these estimations the effect of parents’ education on the cyclicality of wages is not altered. The last two columns present results where actual experience is interacted with parents’ education as well. We have shown elsewhere (RT, 1999) that this interaction is important when trying to understand long run wage dynamics during the 1970s and the 1980s. For the purpose of our analysis here it enough to report that such a modification does not alter our results either.

All 10 tests reported in Table 3 clearly show the following three facts: (1) High parents’ education reduces the decline of the wage during a recession. (2) Wages of college graduates with educated parents are **counter-cyclical**. (3) Within the group of men that graduated at least high school, parents’ education provide a shelter of the same order of magnitude as does college education against the decline of the wage during recession; The reaction of the wage in the incidence of a recession of a high school graduate with educated parents ($HSG$ with $PE=1$) is similar to that of a college graduate with less educated parents ($CG$ with $PE=0$). Note that this two groups are not small. It is about 45 percent of the HSG group and about 35 percent of the CG group.

### 6.2 Estimating the model using a balanced panel

As noted earlier, the fixed effect model is correct under the assumption that the mix of the working group is not different across recessions and booms. If firms tend to keep individuals of higher ability during recessions then the wage change we observe in our fixed effect equations is lower than the actual wage change. One way to clarify the importance is the composition effect is to restrict our sample by selecting individuals that are working during recessions. Solon, Barsky, and Parker (SBP) shows that the composition effect provides an important upward bias of the wage-changes during recession; it seems to be the case that during booms low human
capital individuals are employed more so they press the average wage down.\textsuperscript{32,33} To avoid this problem they suggest the use of a balanced panel, i.e., to follow the same individuals all period long. We follow their solution to the problem and focus on individuals that are in the data for all the period.

As a benchmark for our analysis we repeat the SBP estimation with minor modifications. We estimate three different specifications. In the first two, we do not allow to the price of experience to vary over the business cycle. In the second and the third, we allow for autoregressive process of a second order in wages. In all the specifications presented, the dependent variable is the first difference of the log hourly wage. The explanatory variable in focus is the change in the average yearly rate of unemployment. The modifications do not alter the SBP result in any significant way and they are meant only to bridge between this work and their study.\textsuperscript{34} We estimate these specifications for all white males and for individuals who are high school graduates and above (HSG and above). Since the PSID runs now for more years, we repeat the experiment for all the period. Since holding everybody from 1967 to 1992 leaves us with just a handful of observations, we run our experiment twice; once for the period 1967-1987 (same as in SBP) and once for the period 1972-1992. We also let the change in the annual worked hours to have a coefficient different from one, by running the differences of log wages also on hours, while SBP used average hourly wage on the LHS. We run these regressions with and without time square and experience square. The results are reported in Table 4. The result reported in SBP is that a 1 percent rise in aggregate unemployment decreases wages by 1.5 percents. We get the same estimators when we explore the period of time they used (1967-1987) and a slightly lower number for a later period.\textsuperscript{35}

Equipped with SBP methodology and results we can now explore whether heterogeneity in the response of wages by parents’ education has a significant effect. We does so by double-

\textsuperscript{32}Note however, that the composition effect exists only if employment is pro-cyclical. In the previous section we have already documented the evidence that for CG who are HPE unemployment is a-cyclical. Thus for that group composition effect need not exist.

\textsuperscript{33}Another reason that generate bias in the same direction is that people move across jobs more often during booms. To the extent that there is some temporary loss of specific human capital or other displacement costs, wages in booms are lower than their shadow price.

\textsuperscript{34}Unlike SBP we use a sub-sample of White males only.

\textsuperscript{35}We split our sample into shorter periods an, obviously got larger samples. The results we report here and in the next table are independent of the exact period we select (as long as the period contains at least one recession).
spliting the data. We split all individuals that graduated at least high school (HSG and above) into two groups by their education (high school graduates and college graduates), and split each group of education into individuals with educated parents and individual with less educated parents. As a result we have four groups that make a ladder with four slangs: the lowest slang is made of high school graduates with less educated parents, second lowest slang is HSG with educated parents, third slang is CG with less educated parents, and at the top we have CG with educated parents. We redo the log-wage-differences with the balanced sample within each group. Table 5 reports the results of estimating the model separately for each group, using the specifications that were used in Table 4. Within each model, the first row is the focus of our investigation. Table 5 presents two main findings:

(i) When aggregate unemployment increases, the wage-change across education groups is very different [columns (I) and (IV)]. While HSG’s wages decline sharply with an increase in the aggregate unemployment rate, wages of CG are a-cyclical. A white male HSG who did not stop working all these years loses more than one percent of his wage for an increase in one percent point in aggregate unemployment (the coefficient hovers between 0.8 and 2.6 percentage points, according to the specification used). At the same time, a change in aggregate rate of unemployment is uncorrelated with a change in white male CG wages.

(ii) The coefficient on the change in the aggregate rate of unemployment increases as we move from left to right (as we climb the ‘human capital ladder’ [Columns 2,3,5,6]). For the HSG-LPE group, wages are strongly pro-cyclical. In the first two models, a cut of one percent in the aggregate rate of unemployment leads to a cut of 1 percent in the wage ($-0.9$, std. $= 0.4$) and ($-1.1$, std. $= 0.4$). In the third specification, in which we interact the change in unemployment with the change in experience (square), we receive stronger pro-cyclicallity of wages ($-3.1$), which mildly decline with experience. At the high end of the ‘ladder’, at the CG-HPE group, the picture is reversed; a 1 percent rise in the aggregate rate of unemployment increases wages by 1.3 percent (1.4 and 1.2). Including an interaction with experience boosts this variable to 2.9 percents.\footnote{The price of the stock of experience declines for this group during recessions. Yet, for a college graduate with HPE and fifteen years of experience, the elasticity of wages with respect to unemployment equals 1.} Wages of individuals at the top of the ladder are counter-cyclical; they go up during recessions. While wage change in most groups is pro-cyclical or a-cyclical, the top of the ladder is strongly counter-cyclical.
The result that, during recessions, some individuals do actually better seems counter intuitive. Let us therefore review briefly what we already know about recessions. The non-cyclicallity of aggregate wages is our starting point. This is true for all wages and it is true specifically for CG wages. Economists documented before that cyclical unemployment is very low (or nil) among college graduates. Thus, when the literature explained aggregate a-cyclicallity with arguments as “composition” and “selection” effects, both due to the exit into unemployment, it was implicitly talking about individuals with education lower than college. If college graduates do not face higher unemployment rates during recessions, non of the explanations that are based on higher exit to unemployment can do for the fact their wages are a-cyclical. Since CG wages and employment are a-cyclical, there are only three alternatives: (i) CG’s wages do not change during recessions, (ii) CG’s wages move randomly during recession, yet the average does not change, (iii) CG’s wages change systematically - for a well specified sub-group among CG wages increase, while others face an opposite experience. The results presented above fit the third alternative; we are able to show that for the group of college graduates with less educated parents wages decline during recession, while for the group of CG with educated parents wages rise during recessions. This result is not at all at odds with the evidence in the literature. To the contrary, conditioning on parents’ education helps us understanding a-cyclicallity of wages among those for whom unemployment is not cyclical at all.

When we put the evidence of the balanced sample together with the fixed effect results, as well as with the results on unemployment provided in the previous section, it is hard to reject the hypothesis that recessions are times of an increase in demand for the general skills provided by those with educated parents. Not only parents’ education is a crucial factor in explaining the cyclical behavior of both prices (wages) and quantities (unemployment), but, when it comes together with one’s own education (college) its price goes up during recessions.

Table 6 shows that these results are robust to changes in annual worked hours. It shows the same model estimated using annual wages instead of hourly wages. One immediately notices that the results are qualitatively similar to those obtained in Table 5.

One may doubt these results on the basis of the small sample that we are left with in each cell. A simple robustness test is to repeat the experiment for different sub-periods. This is useful since it let us see whether the results are driven by a sub-period or by outliers in the small sample. To avoid repetitions we present the results with sub-samples in Figure 5. The
horizontal axe in this figure is the ‘ladder’. The vertical axe is the degree of response of the wage to a one percent rise in aggregate unemployment. The fact that the lines are all upward sloping reflect the robustness of our finding. The lowest group always has a significant pro-cyclical wage with around one percent decline in wage when aggregate unemployment increases by one percent (these coefficients are always statistically significant). The group at the top (the right-most one) has a counter-cyclical wage. Their wage increases by slightly more than 1 percent when aggregate unemployment goes up by one percent.

Table 7 provides another robustness test. Here we focus on the sub-sample of individuals born after WWII. The idea is that within such a more homogeneous group variables like education or experience are more comparable across individuals: A year of schooling in the 1970s is closer in type to a year of schooling in the 1960s than to a year in school in 1940. Thus we can compromise and run within each category of education-parents’ education a wage difference model with all the sample and by using a balanced sample. Needless to say, this also increase the size of each sub-group quite a bit. The results speak for themselves. The human capital ladder is evident here as well and college graduates with educated parents see a counter-cyclical wage.

7 Interpretation: the use of parents’ education as a proxy for instilled ability and the demand for ability during recessions

In the Labor Economics literature ‘ability’ is generally perceive as either the ability to learn (Becker 1967, Ben-Porath 1968), or the ability to earn. Our use of the concept ability is slightly different from each.\textsuperscript{37} For that reason, we bring up a short discussion on the role of general skills or ability in coping with changes, as well as the use of parents’ education as a proxy for these types of skills.

\textsuperscript{37}Juhn, Murphy and Pierce (1993) pointed out the “ability to earn” in their discussion on inequality: “...we interpret the dispersion in wages, after controlling for observable skill determinants, as a distribution of unobservable ability in the population in conjunction with a current market value of this unobservable ability.” [page 411]. David Card (1995) discuss the effect of the “ability” (to learn) in the context of estimating the return to education.
7.1 Our concept of ability

In this study ‘ability’ or general skills are everything that characterizes the individuals’ capacity to cope with changes and thus stay on the job and earn (more) income, yet is exogenous to him and cannot be purchased on the market.\(^3\) We draw a clear distinction between ‘ability’ and knowledge (education, experience, etc.). This distinction is two dimensional: (a) Ability is a more general input; One can think of education as the stock of knowledge or as a long list of instructions to perform certain tasks and procedures, and of ‘ability’ as the necessary input for acquiring new knowledge. (b) Ability is composed of those components of the individual that are in him and are not purchasable on the market, while knowledge (education, experience) are those components that are bought on the market. For the purpose of this work the first distinction between ‘ability’ and education (between general skills and knowledge) is the important one.

The role of ‘ability’ as an important input in the capacity to adjust to changes is central in modern psychology.\(^3\) Robert Sternberg (1985) writes: “Intelligence is not so much a person’s ability to learn or think within conceptual systems that the person has already become familiar with as it is his or her ability to learn and think within new conceptual systems, which can then be brought to bear upon already existing knowledge structures” [page 69].

Our concept of ‘ability’ falls very close to the concept of intelligence in Sternberg (1985).\(^4\) It is also closely related to the concept of ‘ability’ that was used by Theodore W. Shultz, (1975). Of course, both ‘ability’ and education contribute to earnings as well as to the probability to be employed. Complementarity between education and ‘ability’ is indeed old news in economics.\(^5\) While this work took this observation as a starting point, the focus here is on the differences between the two. This work points to the advantage of general skills or ‘ability’ over education in adapting to changes.

\(^3\) A term that can replace ability is the Beckerian term *endowment*. Since we want to distinguish between wealth and human endowments and focus on the later, we find the term ability wins on a narrow margin.

\(^4\) See Cattell 1971; Horn 1968; Kaufman & Kaufman 1983; Raashein 1974. Popular psychology make use of the (less precisely defined) concept of “EQ”. Emotional quality also falls within the boundaries of our definition of ability.

\(^5\) Within his “Triarchic Theory” in “Beyond IQ” our use of ability falls within the boundaries of his “experiential intelligence”.

7.2 Parents’ education and child’s ‘ability’

From the above discussion it is clear we are looking for a broad definition of ‘ability’; a definition that goes far beyond that of innate ‘ability’. We are looking for variables that capture everything that contribute to the general skill to cope with changes, a skill we name ‘ability’ only due to the lack of a better term. For that reason, this work focus on parents’ education as a proxy of child ‘ability’. Parents transmit many qualities through many channels to their children. There is genetic transmission, there is instilling of values, of work ethics, of perceptions and of ways of coping with hardship as well as with the good. Clearly some of the channels are decisions taken for the child by his parents. Such decisions include the choice of neighborhood, the choice of language spoken at home etc. As long parents’ transmission, choices, or instilling contribute directly to the ‘ability’ of the individual to cope with changes in his workplace beyond what they contribute to the child choices about his own education, occupation etc., these effects fit into our, broadly defined, concept of ‘ability’. We therefore find parents’ education a good candidate to serve as a proxy for the above discussed notion of ‘ability’.42

This work lacks an explicit discussion of the linkages from parents’ education to parents’ income to business cycle characteristics. In previous work (RT, 1999) we have shown that parents’ education is a good proxy for that component of ‘ability’ that makes the individual capable of coping with technological changes. Moreover, we have shown that this is true whether we condition it or we do not condition it on the exact level of parent’s income.43 Thus, we devote only little attention to parents’ income in this work.

The use of parents’ education as a proxy for our concept of ‘ability’ raises the immediate question of how can one distinguish between parents’ contribution to the formation of their child and their contribution to the formation of the match between the child and his job (social

42Recently, Heckman, Hsee and Rubinstein (2000) used the NLSY to find that parents’ education (as well as the incidence of broken marriage) is an important determinant for the AFQT scores after conditioning on IQ scores at age 13. They also show that parents’ income is irrelevant in this context. As the AFQT is designed to check fitness for the army, these evidence support the use of parents’ education as a proxy for child’s ability.

43In (RT 1999) we used a sub-sample of the PSID where we had the actual data of parents’ income (as reported by parents themselves), as well as the child’s income to show that parents’ education serves a very different role from parents’ income in the formation of the child’s earning. In fact comparing the 1970s with the 1980s reveal that their effects are changing in opposite ways.

31
networks etc.). We find the fact the group at the top of the ladder gains during recession is incompatible with the social network hypothesis. Moreover, the fact that parents’ education has a long lasting effect, even on those who have been working for at least 10 years, seems at odds with the social network hypothesis.

7.3 The demand for ability (general skills) over the cycle

Given the above, the interpretation of our findings is simple and can be built upon three well known building blocks. The first block is that recessions are times of change. The idea that recessions are time of change was recently used by Ricardo J. Caballero and Mohamad L. Hammour (1993) who build on Joseph A. Schumpeter, as well as by Robert E. Hall (1999). The second building block was already noted. It is that the experiential component in human capital, which is made of cognition, aspiration, and other general skills, is needed more at times of change (Shultz, 1975; Sternberg, 1985). This component of human capital, being less specific than education, gains importance at times when new situations are encountered and new tasks or new procedures are to be met. Obviously, in the process of learning, both general skills and education are essential. Nevertheless, since education is more specific, we argue that the relative role of general skills increases during changes. The third building block is that these general skills are not fully contractible; individuals’ wages are not fully adjusted to compensate for a change in the price of these skills. Given that parents’ education is a reasonable proxy for child’s ability, that recessions are times of change, that demand for general skills rises during times of changes, and if general skills are not fully contractible, then, during recessions, the productivity of individuals who are less endowed with general skills decreases relatively to the productivity of the more endowed ones. Thus, during recessions, within each education group: (a) wages of highly endowed individuals should increase relative to wages of less endowed individuals, (b) the likelihood to be unemployed should increase more for the less endowed individuals.  

44 The theoretical literature on creative destruction as a source for unemployment exists also in the context of long run unemployment (e.g., Philippe Aghion and Peter Howitt, 1994; Dale T. Mortensen and Christopher A. Pissaridis 1994).
45 Labor contracts are not the only way to explain unemployment in this context.
46 Note that we make no statement on the source for the recession. It can be either a technology shock or demand shock as well as any other reason. In all cases a recession is time when production is low and so is the demand for labor.
interpretation of the evidence is based on this simple logic.

One question remains however open. To what extent is our distinction of two inputs into the making of the human capital output important? Couldn’t we satisfy ourselves in the interpretation by saying human capital is one but is measured better by bringing in parents’ education as well? We think the answer is that our finding point out for a clear difference between the two components. Obviously, as mentioned many times in the analysis, the two components: education and parents’ education are complements. However the two are different. An easy way to see the difference is to do a back of the envelope calculation with the results we had in Table 3. We see that in that table the price of college education and the price of parents’ high school education increases from recessions to booms by the same number - about 1.5 percent (Table 3, Equation 2). Are the two a better measure for one? The return to college education in this equation is about 30 percent, the rise of the price of college education is therefore about 5 percents. The return to the fact both parents graduated high school in this equation is about 7 percents. A 1.5 increase in this case is a 20 percent increase in the price! The right way to think about the two is indeed that of two inputs; one price goes up by 5 percent at the same time the other price goes up by 20 percent. The time they both go up is the time of recession. Since the two prices always move together we are once again reassured that they are complements.

8 Conclusions

This work documents a new set of evidence on cyclical unemployment, employment, and on the cyclicallity of wages, and provides a simple interpretation for these facts. While this work shed new light on the role of education over business cycles the new set of evidence is mainly concerned with the direct effect of parents’ education on the cyclicallity of wages and unemployment within each education group. The main findings are: (i) Education is a shelter against unemployment. On average, individuals with more education not only earn more but are more employed (less unemployed) as well. However, (ii) Controlling out parents’ education, the cyclical component of both the individual wage and his (un)employment status are not correlated with his own education. Relative to himself and controlling for the choice the individual made (occupation, industry, residence, etc.) ones own education has little effect on his cyclical experience while parents’ education has a strong and robust cyclical effect. The effect of parents’ education is
best summarized while split into quantities and prices.

**Quantities:** (i) For every level of education and age group, average unemployment is higher among those with less educated parents. (ii) Within each education group, the gap between the rate of either employment or unemployment of those with less educated parents and those with more educated parents *increases* during recessions. (iii) College graduates with educated parents face *no* cyclical unemployment (and perhaps slightly *counter* cyclical chance of being not-working). All results hold true when we control for individual heterogeneity as well as for individuals’ past performance in the labor market.

**Prices:** (i) During recessions, and within education group, wages of those with less educated parents decrease *more* than wages of those with educated parents. (ii) Wages of college graduates with educated parents *increase in absolute terms* during recessions. (iii) The wage of less educated with less educated parents is highly pro-cyclical.

These new evidence take us into two complementary roads. First, the evidence make clear that treating human capital as a uniform input is not informative enough. Decomposing human capital into at least two components seems to be essential not only for research but for policy oriented discussions as well. Second, recessions are not good times, we do not try to turn the bowl on its head. However, recessions affect different individuals differently. Individuals with low ability pay a lot to keep their job: their wages decline dramatically while their likelihood to be unemployed rises sharply. However, recessions, during the second half of the 20th century, were not bad times for individuals at the top slang of the human capital ladder; these individuals are more on demand during recessions. Thus their level of unemployment is stable (and very low) while their wages increase.

This work does not propose, however, a unified concept of the business cycle. In some sense the evidence send us back to the “drawing table” to write down formal models of the business cycle that provides these implications.
References


Figure 1:
Not-Working in the Labor Market by Education and Parents' Education
White Males, USA: 1970-1993
Figure 2.b:
Not-working in the Labor Market During Business Cycles by Parents' Education
White Males, College Graduates, USA: 1970-1993

At least one of the parents is HSD
Both parents are at least HSG

Booms  Recession
Figure 2.c:
Unemployment During Business Cycles by Parents' Education
White Males, High school Graduates, USA: 1970-1993
Figure 2.d: Unemployment During Business Cycles by Parents' Education
White Males, College Graduates, USA: 1970-1993

- At least one of the parents is HSD
- Both parents are at least HSG

[Diagram showing unemployment rates during booms and recessions for different education levels of parents.]
Figure 2.e:
The Change in the Unemployment Rates over the Cycle
White Males, High School Graduates Born to Less Educated Parents
Figure 2.f:
The Change in the Unemployment Rates over the Cycle
White Males, College Graduates Born to Educated Parents
Figure 3.a:
Weekly wages During Recessions Relative to Booms by Education,
Full time workers - White Males (born in the USA)
Figure 3.b:
Weekly wages During Recessions Relative to Booms,
by Education and Parents’ Education (PSID data)
Full time workers - White Males (born in the USA)

*Recessions & Booms according to the NBER definition
Figure 4.a:
Hourly wages During Recessions Relative to Booms, by Education and Parents' Education*
Full time workers White Males (born in the USA)

*Selection: Individuals with at least one observation at each state
Recessions & Booms according to the NBER definition
Figure 4.b:
Hourly wages During Recessions Relative to Booms
by Education, and Parents’ Education*
HSG and above, Full time workers White Males (born in the USA)

{Hourly wage on recession/Hourly wage on Booms} - 1
Percentage points

All sub-sample
At least one of the parents is a high school dropout
Both parents at least high school graduates

*Selection: Individuals with at least one observation at each state
Recessions & Booms according to the NBER definition
Figure 5: 
The Change in Wages When Aggregate Unemployment Rate Increases by 1 Percentage Point
Figure 6:  
Wages and Unemployment over the Business Cycle  
White Males, Born in the US

The change in the probability to be unemployed when agg. unemployment rate increases by 1 pct.  

The change in real hourly wage when agg. unemployment rate increases by 1 pct.
Table 1a:
Unemployment Over the Business Cycle by Education and Parents’ Education
Business Cycles Measured by NBER Definitions

A Probit model (dF/dx) - percentage points

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<th>II</th>
<th>IV</th>
<th>V*</th>
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**F-Test**

Rec + Rec*CG                               | 0.002 |
Prb=0                                     | {0.706} |
Rec + Rec*CG + Rec*PE                     | -0.011 | -0.012 |
Prb=0                                     | {0.023} | {0.034} |

Observations: 55429 55429 55429 44020
Pseudo R-square: 0.128 0.142 0.143 0.126

Notes to table 1:
Based on the PSID 1968-1993.
Sub-sample of (1) 1970-1993 (2) White males born in the US (3) Age 22-65
Sub-sample excludes those living in Alaska/Hawaii
* Sub-sample excludes high school dropouts.
**Parents’ education is a binary variable. It =1 if both parents at least high school graduates (else =0).
*** Recession =1 according to the NBER business cycle data. To each recession we add the following year.
Table 1b: 
Unemployment Over the Business Cycle by Education and Parents’ Education 
Business Cycles Measured by National Unemployment Rate

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Notes to table 1:
Based on the PSID 1968-1993.
Sub-sample of (1) 1970-1993 (2) White males born in the US (3) Age 22-65
Sub-sample excludes those living in Alaska/Hawaii
* Sub-sample excludes high school dropouts.
**Parents’ education is a binary variable. It =1 if both parents at least high school graduates (else =0).
<table>
<thead>
<tr>
<th>Variables</th>
<th>All</th>
<th>Past experience in the labor market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0-9</td>
</tr>
<tr>
<td><strong>The State of the Business Cycle:</strong></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Yearly Aggregate Rate of Unemployment</td>
<td>0.638</td>
<td>(0.245)</td>
</tr>
<tr>
<td><strong>Interactions of YARU with:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.007</td>
<td>(0.166)</td>
</tr>
<tr>
<td>College graduate</td>
<td>-0.305</td>
<td>(0.251)</td>
</tr>
<tr>
<td>Parents’ education*</td>
<td>-0.313</td>
<td>(0.157)</td>
</tr>
<tr>
<td>Poor parents</td>
<td>0.017</td>
<td>(0.159)</td>
</tr>
<tr>
<td>Rich parents</td>
<td>-0.054</td>
<td>(0.175)</td>
</tr>
<tr>
<td>Blue collar</td>
<td>0.235</td>
<td>(0.175)</td>
</tr>
<tr>
<td>Durable goods**</td>
<td>0.483</td>
<td>(0.150)</td>
</tr>
<tr>
<td><strong>Labor Market Past Outcomes:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not working during last year***</td>
<td>0.223</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Avg. non-working until last year***</td>
<td>0.104</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Log avg. hourly wage until last year</td>
<td>-0.019</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>43570</td>
<td></td>
</tr>
<tr>
<td><strong>Individuals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pseudo R-square</strong></td>
<td>0.239</td>
<td></td>
</tr>
<tr>
<td><strong>F-test:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YARU+CG+PE&gt;0</td>
<td>0.020</td>
<td>(0.925)</td>
</tr>
</tbody>
</table>

*Notes to table 2.a: See next page*
### Table 2.b:
Determinants of Employment Over the Business Cycle
Dependent variable: Unemployed
White Males, Aged 25 to 54, PSID

<table>
<thead>
<tr>
<th>Variables</th>
<th>All</th>
<th>Past experience in the labor market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0-9</td>
</tr>
<tr>
<td>The State of the Business Cycle:</td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Yearly Aggregate Rate of Unemployment</td>
<td>0.494</td>
<td>0.696</td>
</tr>
<tr>
<td></td>
<td>(0.197)</td>
<td>(0.463)</td>
</tr>
<tr>
<td>Interactions of YARU with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>0.119</td>
<td>0.298</td>
</tr>
<tr>
<td></td>
<td>(0.132)</td>
<td>(0.315)</td>
</tr>
<tr>
<td>College graduate</td>
<td>-0.220</td>
<td>-0.479</td>
</tr>
<tr>
<td></td>
<td>(0.207)</td>
<td>(0.462)</td>
</tr>
<tr>
<td>Parents’ education*</td>
<td>-0.322</td>
<td>-0.077</td>
</tr>
<tr>
<td></td>
<td>(0.127)</td>
<td>(0.254)</td>
</tr>
<tr>
<td>Poor parents</td>
<td>0.192</td>
<td>0.508</td>
</tr>
<tr>
<td></td>
<td>(0.128)</td>
<td>(0.324)</td>
</tr>
<tr>
<td>Rich parents</td>
<td>0.024</td>
<td>-0.087</td>
</tr>
<tr>
<td></td>
<td>(0.143)</td>
<td>(0.284)</td>
</tr>
<tr>
<td>Blue collar</td>
<td>0.195</td>
<td>-0.479</td>
</tr>
<tr>
<td></td>
<td>(0.145)</td>
<td>(0.380)</td>
</tr>
<tr>
<td>Durable goods**</td>
<td>0.317</td>
<td>1.007</td>
</tr>
<tr>
<td></td>
<td>(0.115)</td>
<td>(0.258)</td>
</tr>
<tr>
<td>Labor Market Past Outcomes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed during last year</td>
<td>0.075</td>
<td>0.058</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Avg. unemployment until last year</td>
<td>0.105</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Log avg. hourly wage until last year</td>
<td>-0.012</td>
<td>-0.019</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Observations</td>
<td>42365</td>
<td>9047</td>
</tr>
<tr>
<td>Individuals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudo R-square</td>
<td>0.164</td>
<td>0.192</td>
</tr>
<tr>
<td>F-test:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YARU+CG+PE&gt;0</td>
<td>-0.048</td>
<td>0.139</td>
</tr>
<tr>
<td></td>
<td>(0.770)</td>
<td>(0.695)</td>
</tr>
</tbody>
</table>

Notes to Table 2.b: See next page
Notes to table 2b (continued from last page):
Based on the PSID 1968-1993. The sample selection rule is:
(1) White males age 25 to 54 born in the U.S.A.
(2) Already observed in the data at least one year before.
(3) Belong to the labor force: = work or unemployed
(4) Excluding those who live in Alaska or Hawaii.
  * Parents’ education =1 if both parents are at least high school graduates.
  ** Durable goods are construction and manufacturing
  *** Not-working at t-1 and the average number of years being not-working
  ^ Selection is age 35 to 54
Other Variables that were included and for luck of space are not reported here are:
Age, AgeSQR, cohort dummies for born during the 1910s, 1920s, ..., 1950s.
Dummies for living in urban areas, Dummies for US regions, Dummy for marital status
All variables that are presented when interacted with YARU are also independently in the regressions
Notes to table 2a (continued from last page):

Based on the PSID 1968-1993. The sample selection rule is:

1. White males age 25 to 54 born in the U.S.A.
2. Already observed in the data at least one year before.
3. Belong to the labor force: work or unemployed
4. Excluding those who live in Alaska or Hawaii.

* Parents' education =1 if both parents are at least high school graduates.
** Durable goods are construction and manufacturing
*** Not-working at t-1 and the average number of years being not-working

^ Selection is age 35 to 54

Other Variables that were included and for luck of space are not reported here are:

Age, AgeSQR, cohort dummies for born during the 1910s, 1920s, ..., 1950s.
Dummies for living in urban areas, Dummies for US regions, Dummy for marital status
All variables that are presented when interacted with YARU are also independently in the regressions
Table 3: Hourly Wages Over the Business-Cycle by Education, Occupation, Industry and Parents’ Education

<table>
<thead>
<tr>
<th>Variables</th>
<th>Fixed Effect Model</th>
<th>Dependent variable: Log hourly wage ($93)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II*</td>
</tr>
<tr>
<td>Experience**</td>
<td>0.022</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Experience*2</td>
<td>-0.0004</td>
<td>-0.0004</td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>Experience * Parents’ education***</td>
<td>0.017</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>

**Business Cycle variables**

| Recession (Rec)****               | -0.026             | -0.020                                 | -0.024 | -0.013 | -0.030 | -0.022 | -0.028 | -0.015 | -0.029 | -0.021 |
|                                   | (0.005)            | (0.003)                                | (0.006) | (0.004) | (0.007) | (0.005) | (0.008) | (0.006) | (0.007) | (0.005) |
| Rec * High school graduate        | 0.008              | 0.008                                  | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
|                                   | (0.006)            | (0.006)                                | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) |
| Rec * College graduate            | 0.022              | 0.014                                  | 0.023 | 0.014 | 0.026 | 0.017 | 0.026 | 0.017 | 0.026 | 0.017 |
|                                   | (0.007)            | (0.005)                                | (0.007) | (0.005) | (0.006) | (0.006) | (0.008) | (0.006) | (0.008) | (0.006) |
| Rec * Parents’ education          | 0.011              | 0.013                                  | 0.013 | 0.013 | 0.013 | 0.015 | 0.014 | 0.014 | 0.007 | 0.010 |
|                                   | (0.004)            | (0.005)                                | (0.005) | (0.005) | (0.004) | (0.005) | (0.005) | (0.005) | (0.004) | (0.005) |
| Rec * Parents’ poor               | -0.001             | -0.013                                 | -0.001 | -0.013 | -0.001 | -0.013 | -0.001 | -0.013 | -0.001 | -0.013 |
|                                   | (0.005)            | (0.006)                                | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) |
| Rec * Parents’ rich               | -0.012             | -0.016                                 | -0.012 | -0.017 | -0.012 | -0.017 | -0.012 | -0.017 | -0.012 | -0.017 |
|                                   | (0.005)            | (0.006)                                | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) |

| Rec * Blue collar                 |                       |                                       |       |       |       |       |       |       |       |       |
|                                   |                       |                                       |       |       |       |       |       |       |       |       |
|                                   |                       |                                       |       |       |       |       |       |       |       |       |
|                                   |                       |                                       |       |       |       |       |       |       |       |       |
| Rec * Durable goods sector        | -0.007              | -0.009                                 | -0.007 | -0.010 | -0.007 | -0.009 | -0.007 | -0.009 | -0.007 | -0.009 |
|                                   | (0.004)             | (0.005)                               | (0.004) | (0.005) | (0.004) | (0.005) | (0.004) | (0.005) | (0.004) | (0.005) |

| Observations                      | 47823              | 38910                                  | 47823 | 38910 | 47823 | 38910 | 47823 | 38910 | 47823 | 38910 |
| Individuals                       | 4130              | 3293                                  | 4130 | 3293 | 4130 | 3293 | 4130 | 3293 | 4130 | 3293 |
| Overall R-square                  | 0.645              | 0.623                                  | 0.645 | 0.623 | 0.656 | 0.636 | 0.656 | 0.636 | 0.661 | 0.641 |

**Notes to table 3:** Based on the PSID 1968-93. Data selection: (1) White males born in the US. (2) Age: 22-65. (3) Excluding residents Alaska/Hawaii (4) Full-time workers: worked more than 34 hours a week and more than 13 weeks a year. (5) hourly wage ($93) 2-300*... is the actual experience and NOT (age-6-school years). *** Parents’ education = 1 if both parents at least HSG. 
****According to the NBER business-cycle data + one year to each recession. ^^^Durable good = Construction and Manufacturing.

All specifications include lagged hourly wage, dummy variables for region, married and union membership. ( ) Standard errors in parenthesis.
### Table 4: The Change in Real Wages - Variations on SBP

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dep. Variable: The Change in Log Hourly Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1967-87 (SBP)*</td>
</tr>
<tr>
<td></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
</tr>
<tr>
<td>DW</td>
<td>1.982</td>
</tr>
<tr>
<td>Adj.R-square</td>
<td>0.307</td>
</tr>
</tbody>
</table>

(1) Model 1: Without time/experience square effect in the wage equation

| Unemployment | -0.016 | -0.015 | -0.010 | -0.008 |
|              | (0.003) | (0.003) | (0.002) | (0.003) |
| DW          | 1.969 | 2.021 | 1.969 | 2.033 |
| Adj.R-square | 0.312 | 0.327 | 0.276 | 0.284 |

(2) Model 2: With time square in the wage equation

| Unemployment | -0.014 | -0.013 | -0.009 | -0.008 |
|              | (0.002) | (0.003) | (0.002) | (0.003) |
| DW          | 1.999 | 1.965 | 1.949 | 1.933 |
| Adj.R-square | 0.314 | 0.329 | 0.281 | 0.290 |

(3) Model 3: With experience (square) in the wage equation model

| Observations | 4848 | 3787 | 7385 | 6264 |

**Notes:**
The data selection is:
(1) Working all the years during the period (2) white males, born in the US, age: 22 - 65.
(6) Experience is the observed experience and NOT (age-6-school years).

Unemployment = The change in the Yearly Aggregate Rate of Unemployment unemp.(t)-unemp.(t-1)

Full time workers are working more than 13 weeks a year and more than 34 hours a week.

Parents’ education (PE) = 1 if both parents are at least high school graduates.

* As in Solon, Barsky and Parker (QJE 1994), with minor modifications and using our selection rules.

() Standard errors in parenthesis.
### Table 5: The Price of Parents’ Education Over the Business-Cycle

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent Variable: The Change in Log Hourly Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High School Graduates</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.008</td>
</tr>
<tr>
<td>DW</td>
<td>1.973</td>
</tr>
<tr>
<td>Adj.R-square</td>
<td>0.226</td>
</tr>
</tbody>
</table>

(1) Model 1: Without Lags

| Unemployment | -0.011 | -0.011 | -0.012 | 0.003 | -0.007 | 0.012 |
| DW | 1.937 | 1.947 | 1.908 | 1.956 | 2.003 | 1.864 |
| Adj.R-square | 0.297 | 0.327 | 0.258 | 0.261 | 0.270 | 0.256 |

(2) Model 2: With Lags

| Unemployment | -0.026 | -0.031 | -0.023 | 0.019 | 0.001 | 0.029 |
| U * experience^2 | 0.0003 | 0.0004 | 0.0002 | -0.0005 | -0.0003 | -0.0007 |
| DW | 1.993 | 1.969 | 1.860 | 2.065 | 1.959 | 2.033 |
| Adj.R-square | 0.305 | 0.333 | 0.268 | 0.284 | 0.280 | 0.294 |

(3) Model 3: With Lags and Different Price for Experience Over the Cycle

| Unemployment | -0.026 | -0.031 | -0.023 | 0.019 | 0.001 | 0.029 |
| U * experience^2 | 0.0003 | 0.0004 | 0.0002 | -0.0005 | -0.0003 | -0.0007 |
| DW | 1.993 | 1.969 | 1.860 | 2.065 | 1.959 | 2.033 |
| Adj.R-square | 0.305 | 0.333 | 0.268 | 0.284 | 0.280 | 0.294 |

**Observations:**

| 4124 | 2830 | 1294 | 2140 | 1014 | 1126 |

**Notes:**


The data selection is: (1) Working all the years during the period (2) white males, born in the US, age: 22 - 65. (3) Working full-time (4) 2<hourly wage ($93)<300 (5) Excluding self-employed, agriculture and Alaska-Hawaii. (6) Experience is the observed experience and NOT (age-6-school years).

Unemployment = The change in the (YARU) Yearly Aggregate Rate of Unemployment

Full time workers are defined "as usual", i.e.-working more than 13 weeks a year and more than 34 hours a week. Parents’ education (PE) = 1 if both parents are at least high school graduates.

( ) Standard errors in parenthesis.
### Table 6: The Price of Parents’ Education Over the Business-Cycle

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent Variable: The Change in Log Yearly Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High School Graduates</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
</tr>
<tr>
<td></td>
<td>PE=0</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td>(1) Model 1: Without Lags</td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.009</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
</tr>
<tr>
<td>DW</td>
<td>2.017</td>
</tr>
<tr>
<td>Adj.R-square</td>
<td>0.198</td>
</tr>
<tr>
<td>(2) Model 2: With Different Price for Experience Over the Cycle</td>
<td></td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.024</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
</tr>
<tr>
<td>U * experience^2</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>(0.0002)</td>
</tr>
<tr>
<td>DW</td>
<td>2.021</td>
</tr>
<tr>
<td>Adj.R-square</td>
<td>0.204</td>
</tr>
<tr>
<td>Observations</td>
<td>3611</td>
</tr>
</tbody>
</table>

Notes:
- The data selection is: (1) Working all the years during the period (2) white males, born in the US, age: 22 - 65. (3) Working full-time.
- (4) 2-hourly wage ($93)<300 (5) Excluding self-employed, agriculture and Alaska-Hawaii.
- (6) Experience is the observed experience and NOT (age-6-school years).
- Unemployment = The change in the (YARU) Yearly Aggregate Rate of Unemployment
- Full time workers are defined “as usual”, i.e.-working more than 13 weeks a year and more than 34 hours a week.
- Parents’ education (PE) = 1 if both parents are at least high school graduates.
- ( ) Standard errors in parenthesis.
### Table 7: White males born in the U.S after 1945
The Effect of Recessions on Real Wages

<table>
<thead>
<tr>
<th>Variables</th>
<th>All</th>
<th>High School Graduates</th>
<th>College Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PE=0</td>
<td>PE=1</td>
</tr>
<tr>
<td>The change in agg. unemployment</td>
<td>-0.008</td>
<td>-0.014</td>
<td>-0.020</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Observations</td>
<td>17065</td>
<td>12162</td>
<td>5791</td>
</tr>
<tr>
<td>Individuals</td>
<td>2129</td>
<td>1633</td>
<td>721</td>
</tr>
<tr>
<td>Adj. R-square</td>
<td>0.169</td>
<td>0.186</td>
<td>0.215</td>
</tr>
</tbody>
</table>

**Notes to Table X:**
Unemployment = The change in the (YARU) Yearly Aggregate Rate of Unemployment
Full time workers: working more than 13 weeks a year and more than 34 hours a week.
Parents’ education (PE) = 1 if both parents are at least HSG
( ) Standard errors in parenthesis.