

Did Unexpectedly Strong Economic Growth Cause the Oil Price Shock of 2003-2008?

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Abstract: Recently developed structural models of the global crude oil market imply that the surge in the real price of oil between mid-2003 and mid-2008 was driven by repeated positive shocks to the demand for all industrial commodities, reflecting unexpectedly high growth mainly in emerging Asia. This note evaluates this proposition using an alternative data source and a different econometric methodology. Rather than inferring demand shocks from an econometric model, we utilize a direct measure of global demand shocks based on revisions of professional real GDP growth forecasts. We show that recent forecast surprises were associated primarily with unexpected growth in emerging economies (and to a lesser extent in Japan), that markets were repeatedly surprised by the strength of this growth, that these surprises were associated with a hump-shaped response of the real price of oil that reaches its peak after 12 to 16 months, and that news about global growth predict much of the surge in the real price of oil from mid-2003 until mid-2008 and much of its subsequent decline.

Key words: Oil price; Global Real Activity; Demand; News; Shocks; Forecast Revisions; EIU.

JEL: C42, C53, Q43

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1. Introduction

A central question for macroeconomists and financial analysts alike is what caused the dramatic surge in the real price of oil between 2003 and mid-2008. The structural VAR model of Kilian (2009a) implies that this surge was driven by repeated positive shocks to the demand for industrial commodities including crude oil.¹ This model relies on the use of a proxy for fluctuations in global real economic activity based on dry cargo ocean shipping freight rates. Further analysis in Kilian (2009a) based on a linearly detrended index of OECD industrial production as an alternative proxy for global real economic activity suggests that the unexpected increase in the demand for oil after 2002 was not driven primarily by unexpectedly high growth in the OECD, but by unexpected growth from countries outside of the OECD. This finding is consistent with the widespread perception that much of the recent boom in industrial commodity markets was driven by the economic transformation of countries in emerging Asia such as China and India.

At first sight it may strain credulity that markets would have been repeatedly surprised by high growth in emerging Asia, as suggested by the econometric model, rather than adjusting their expectations early on when it became apparent that the emerging Asian economies were booming. In this paper, we show that this central implication of the model is consistent with independent evidence based on professional forecasts for real economic growth in China and other countries.

Based on the data provided by the Economist Intelligence Unit we first document that, starting in mid-2003, forecasters were repeatedly surprised by high economic growth in emerging economies. In contrast, forecast errors for OECD real economic growth were much

¹ This type of a model has been employed in a variety of contexts to study the effect of oil demand and oil supply shocks on macroeconomic aggregates and financial markets (see, e.g., Alquist and Kilian 2008; Kilian 2008; Kilian 2009b; Kilian and Park 2008; Kilian, Rebucci and Spatafora 2009).

less biased. Second, we construct estimates of the response of the real price of crude oil to weighted errors in professional real GDP forecasts. We exploit the fact that suitably weighted real GDP forecast errors can be treated as exogenous demand shocks for the global crude oil market.² We show that the response of the real price of oil to such news shocks is similar to the response estimates generated by the structural VAR model of Kilian (2009a). Unexpected growth in China, for example, is associated with a large hump shaped response that builds slowly and peaks after about one year. The same regressions for an aggregate of the United States, Germany and Japan yield an increase in the real price of oil that peaks after 16 months. Third, a historical decomposition shows that unexpected growth in emerging economies as well as advanced economies jointly explains much of the rise and decline of the real price of oil between 2000.12 and 2008.12, underscoring the importance of fluctuations in global real economic activity for the real price of oil.

We conclude that unexpected growth in emerging economies played a central role in driving up the real price of oil until mid-2008, but that it was aided by unexpectedly high growth in some OECD economies, most notably Japan. Likewise, much of the decline in the real price of oil is explained by large negative growth shocks since mid-2008 both in emerging and in advanced economies. The remainder of the paper is organized as follows. Section 2 discusses the data on real GDP forecast surprises and the evolution of the real GDP weights. Section 3 presents the econometric methodology and impulse response estimates. Section 4 contains the concluding remarks.

² The link between innovations to global real GDP and the real price of oil is discussed, for example, in Barsky and Kilian (2002). Our econometric methodology is based on the work of Andersen, Bollerslev, Diebold, and Vega (2007) and Faust, Rogers, Wang, and Wright (2007), for example. Kilian and Vega (2008) conduct a similar analysis using high frequency U.S. macroeconomic news measures. For a related analysis of oil inventory surprises see Arsenau, Beechey, and Vigfusson (2008).

2. Forecast Surprises

2.1. Data Construction

We construct measures of exogenous shocks to real activity based on forecasts of real activity provided by the Economist Intelligence Unit (EIU).³ The EIU is one of the leading providers of such forecasts. Country-specific forecasts of annual real GDP growth for the current and future years are available every month. The sample period is 2000.11-2008.12.⁴ We define revisions of forecasts of real GDP growth as a forecast surprise or news shock.⁵ Let $F_{i,t}$ denote the EIU forecast of annual real GDP growth for the current year or the next year. We focus on the one-year forecast horizon because one-year forecasts are more reliable and watched more closely by market participants and because there is much less variability in forecast revisions at longer horizons. We follow the EIU in treating current annual growth as unknown for January through September of that calendar year. Starting in October of every year, we follow the EIU in focusing on forecasts for the following calendar year. A news shock then can be defined as the forecast revision:

$$N_{i,t} = F_{i,t} - F_{i,t-1},$$

where i denotes the country and t denotes the current month. Since the news shocks already are expressed in annualized percent growth rates we do not standardize them. However, a given country's news shock is weighted by the time-varying share $\omega_{i,t}$ of the country's purchasing-power adjusted real GDP in purchasing power adjusted world real GDP:

$$S_{i,t} = N_{i,t}\omega_{i,t}$$

³ The data are proprietary and available from the EIU at www.eiu.com

⁴ No monthly data are available prior to this date.

⁵ An alternative approach would be to compare forecast to ex post realizations of ex post revised data. Since the lags with which such data are available are long and variable, since the quality of the final data for China and India is questionable, and since we are interested in measuring the news component of forecast announcements in real time, defining news in terms of forecast revisions is more natural.

This approach helps us capture the growing importance of economies such as China in the world economy over our sample period. The share data are constructed from purchasing power adjusted real GDP data in the Penn World Table 6.2.⁶ Since the table ends in 2003, we extrapolate the shares for 2004 through 2009 from the average growth rate of each country's share over 1996-2003.⁷ Given the approximate linearity of the time path of the shares, this approach should provide a good approximation. Since the Penn World Table is annual, we linearly interpolate the shares to obtain the monthly weights used in constructing $S_{i,t}$. Similarly, in constructing aggregates of news shocks across countries we use country weights reflecting purchasing-power adjusted real GDP estimates:

$$S_{i \in I, t} = \sum_{i \in I} N_{i,t} \omega_{i,t},$$

where I denotes a set of countries.

2.2. Data Analysis

A testable implication of the Kilian (2009) analysis is that real GDP forecast surprises in emerging Asia should be positive on average and should be much higher than in OECD economies starting in 2003. Table 1 supports that view. We focus on the four largest emerging economies (Brazil, Russia, India and China), often collectively referred to as the BRIC countries, and the three largest OECD economies (the United States, Germany and Japan). Table 1 shows that of these economies only Russia exhibited strong unexpected growth in 2000.12-2003.5. All other economies experienced (often large) negative growth shocks. In contrast, between 2003.6 and 2008.6, the world economy accelerated unexpectedly and – with the exception of Germany –

⁶ These data are available from the Center for International Comparisons at the University of Pennsylvania at pwt.econ.upenn.edu.

⁷ Although the Penn World Table 6.2 includes some data for 2004, there are no real GDP data for the world as a whole.

across the board. The largest growth shocks were recorded in China, Russia, and Japan. In addition, India, Brazil, and the United States experienced smaller positive growth shocks. After 2008.6, growth collapsed unexpectedly in all countries with the exception of Brazil, as did the real price of oil. The largest forecast revisions occurred in Germany, Japan and Russia (in that order), but even China, and India experienced large negative forecast surprises. This evidence is consistent with the view that the oil price shock of 2003-2008 was driven at least in part by an unexpected acceleration and deceleration of world economic activity.

Table 1 shows that unexpected growth in emerging economies played an important role in this event, but not at the complete exclusion of growth shocks in advanced economies. Japan's unexpected recovery starting in mid-2003 certainly was a factor. More generally, the relative importance of different countries evolved over time. For example, growth shocks in emerging economies such as China were dominant between mid-2003 and mid-2008, whereas the decline in the real price of oil since mid-2008 was associated as much with negative growth shocks in OECD economies as in emerging Asia.

Many of the forecast surprises during 2003.6-2008.5 were quite sizable. For example, the average monthly forecast surprise about Chinese GDP growth was +0.12 percentage points of annual growth. While a shock of this magnitude may seem modest by itself, successive shocks of this magnitude over several years have the potential to trigger large adjustments in the demand for industrial commodities in general and crude oil in particular. Economic theory suggests that unexpectedly high economic growth without a commensurate increase in global oil supplies should be associated with increases in the real price of oil, as global demand for crude oil grows (see, e.g., Barsky and Kilian 2002).

3. Estimating the Effect of Forecast Surprises on the Real Price of Crude Oil

A natural question is how much of the observed movements in the real price of oil are explained by the forecast surprises documented in section 2. Since response estimates for individual countries can be erratic and since there is reason to believe that emerging economies have a larger industrial sector than advanced economies, we focus on two broad aggregates of countries. The emerging economy aggregate includes China and India, which jointly account for 23.1% of world GDP in 2008 (see Table 2). It may have seemed natural to include the remaining BRIC countries as well. We exclude Russia from the set of emerging economies because it is unclear whether Russian growth shocks are exogenous with respect to the real price of oil, given the dependence of the Russian economy on foreign exchange earnings from oil and gas exports. We exclude Brazil because that economy is effectively decoupled from global crude oil markets to the extent that much of its energy needs are satisfied by domestic ethanol production. We note, however, that the estimated responses for the aggregate for China and India shown below would be very similar, if we included Brazil and Russia among the emerging economies. The aggregate of the advanced economies consists of the United States, Germany and Japan and accounts for 28.3% of world GDP in 2008.

While instructive, the forecast surprises shown in section 2 do not account for the increasing weight of China and India in the world economy in recent years, and the declining weight of OECD economies. Table 2 shows that the combined weight of the United States, Germany and Japan has declined from 33.6% in 1996 to 28.3% in 2009. The weight of all OECD economies has fallen from 58.4% to 51.0%. At the same time, the combined weight of China and India has risen from 14.4% to 23.1%, with China alone accounting for almost 16% of the world economy in 2009. In assessing the impact the forecast errors had on the crude oil market, it is

important that we control for the increasing weight of China and India in the world economy in recent years. Figure 1 plots the weighted forecast errors, $S_{i \in I, t}$, since 2001 for China and India combined and for the aggregate of the United States, Germany and Japan. The correlation of $S_{China+India, t}$ with $S_{US+Germany+Japan, t}$ is 0.29. We treat these series as measures of exogenous shocks to global real economic activity.

Data for the real price of oil are obtained by deflating the U.S. refiners' acquisition cost of imported crude oil by the U.S. consumer price index for all urban consumers.⁸ We relate the percent change in the real price of oil to current and lagged news shocks:

$$\Delta rpoil_t = \alpha_{i \in I} + \sum_{j=0}^{18} \beta_{j, i \in I} S_{i \in I, t-j} + \varepsilon_{i \in I, t}, \quad (1)$$

where $\varepsilon_{i \in I, t}$ is possibly serially correlated. Following the literature on news regressions, the baseline regression estimates are based only on dates t on which a nonzero forecast surprise occurred. The parameter $\beta_{j, i \in I}$ measures the response of $\Delta rpoil_{t+h}$, $h = 0, 1, 2, \dots$, to a unit news shock at date t in the set of countries I . An estimate of $\beta_{j, i \in I} = 0.1$, for example, would imply that a forecast revision of one percentage point would cause an increase in the real price of oil by 0.1%. Since actual forecast surprises are much smaller, we scale all responses to represent the effects of a +0.1 percentage point shock in N_{it} . In practice, we report the cumulative responses with one standard error bands obtained by the block bootstrap method (see, e.g., Berkowitz, Birgean, and Kilian 1999).⁹

The two panels of Figure 2a show the dynamic response of the price of oil to the news shocks $S_{China+India, t}$ and $S_{US+Germany+Japan, t}$. In the first panel, a revision of annual real GDP growth

⁸ The oil price data were obtained from the *Monthly Energy Review* of the Energy Information Administration at <http://www.eia.doe.gov>. The CPI data are from the FRED database.

⁹ Results shown are for a block size of 8. Almost identical results are obtained with block sizes of 4 and 12.

forecasts for China and India by 0.1 percentage points raises the real price of oil by about five percent. The response is hump shaped with a peak after 10 months. The price response is quite persistent and most statistically significant in months 9 through 15.¹⁰ The same type of shock in the second panel induces a price increase of almost the same magnitude, with a peak after 16 months, but the hump shape is less pronounced and the response is barely statistically significant in months 8 through 13. The qualitative features of both responses in Figure 2a are consistent with economic theory.¹¹ Figure 2b shows that similar results are obtained even if we include periods of zero forecast surprises in the regressions. The main difference is that the peak response to $S_{China+India,t}$ occurs after 14 rather than 10 months.

The upper panel of Figure 2c shows for comparison the response to a positive shock to global demand for all industrial commodities estimated from the Kilian (2009a) structural VAR model. This VAR response is the direct analogue of the response shown in the lower panel of Figure 2c, which is based on regression model (1) applied to a suitably weighted aggregate of the three OECD economies, China and India. Although by construction the magnitude of the shock is not the same, the overall pattern of the impulse response is quite similar. The responses are weakly hump shaped and persistent. They build slowly with a peak after 12 or 13 months for the VAR estimate and somewhere between 10 and 16 months for the news regression estimate. These aggregate results, of course, ignore inherent differences between shocks originating in emerging economies and in OECD economies.

One immediate implication of our analysis is that for the same shock $S_{i \in I,t}$ the response

¹⁰ Similar results hold for regressions on China shocks alone. The response to $S_{China,t}$ is slightly larger than the response to $S_{China+India,t}$, but otherwise similar.

¹¹ Regressions for broader forecast aggregates including all OECD economies yield a similar hump shaped response with a peak after 11 months, but the response is very imprecisely estimated. This result may reflect the lower quality of forecasts (and real GDP weights) for many smaller OECD economies as well as a preoccupation of markets with the real GDP forecasts for the major economies. We therefore concentrate on the three largest OECD economies.

to $S_{US+Germany+Japan,t}$ would be somewhat smaller in magnitude than the response to $S_{China+India,t}$.

This result is expected. Since much of the world's industrial production has moved to emerging Asia, a given surprise about real GDP growth all else equal is associated with a larger increase in the demand for industrial commodities, if the shock emanates from that region. This difference is compensated for in Figures 2a and 2b by the smaller weight in world GDP associated with China and India.

Finally, we assess the overall importance of news about real economic activity for the real price of oil based on the fitted value of the regression (1). We construct a historical decomposition by extrapolating the real price of oil from 2001.5 on the basis of the observed forecast surprises. All regressions are based on the full sample. The first panel of Figure 3 shows that $S_{China+India,t}$ cumulatively explains a substantial part of the increase in the real price of oil starting in mid-2004. It is not the only explanation, however. The upward pressure on the price is reinforced by the cumulative effect of $S_{US+Germany+Japan,t}$ starting in early 2004. Although these two news shocks are not uncorrelated, their correlation is fairly low. Thus, to a first approximation, we can add the two fitted values to obtain a crude estimate of the combined effect of global demand pressures on the real price of oil. The third panel shows that $S_{China+India,t}$ and $S_{US+Germany+Japan,t}$ jointly explain the bulk of the increase and decline of the real price of oil between 2002.1 and 2008.12, underscoring the explanatory power of demand shifts for the real price of oil.

4. Conclusion

Many explanations have been proposed for the surge in the real price of crude oil after 2003 including speculation in oil futures and spot markets, adverse oil supply shocks, deliberate

restrictions on OPEC crude oil production, and shifts in global real economic activity.

Understanding the causes of that increase is important for understanding the macroeconomic effects of oil price shocks and for the design of policy responses (see, e.g., Kilian 2008). This paper added to a growing body of evidence that the latest surge in the real price of oil is explained primarily by rising global demand for industrial commodities driven by unexpected economic growth. Our analysis differed from earlier work in that we utilized a direct measure of demand shocks (based on revisions of professional real GDP growth forecasts) rather than inferring demand shocks from an econometric model. We showed (1) that recent forecast surprises were associated primarily with unexpected growth in emerging economies (and to a lesser extent in Japan), (2) that markets were repeatedly surprised by the strength of this growth, (3) that these surprises were associated with a hump-shaped response of the real price of oil which reaches its peak after 12-16 months, and (4) that news about global growth predict much of the surge in the real price of oil from mid-2003 until mid-2008 and much of its subsequent decline.

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Table 1: Average Forecast Surprises (Percentage Points)

	2000.12-2003.5	2003.6-2008.6	2008.7-2008.12
USA	-0.05	0.02	-0.08
Germany	-0.12	0.00	-0.33
Japan	-0.10	0.08	-0.27
Brazil	-0.10	0.03	0.07
Russia	0.06	0.12	-0.42
India	-0.06	0.03	-0.17
China	-0.04	0.12	-0.17

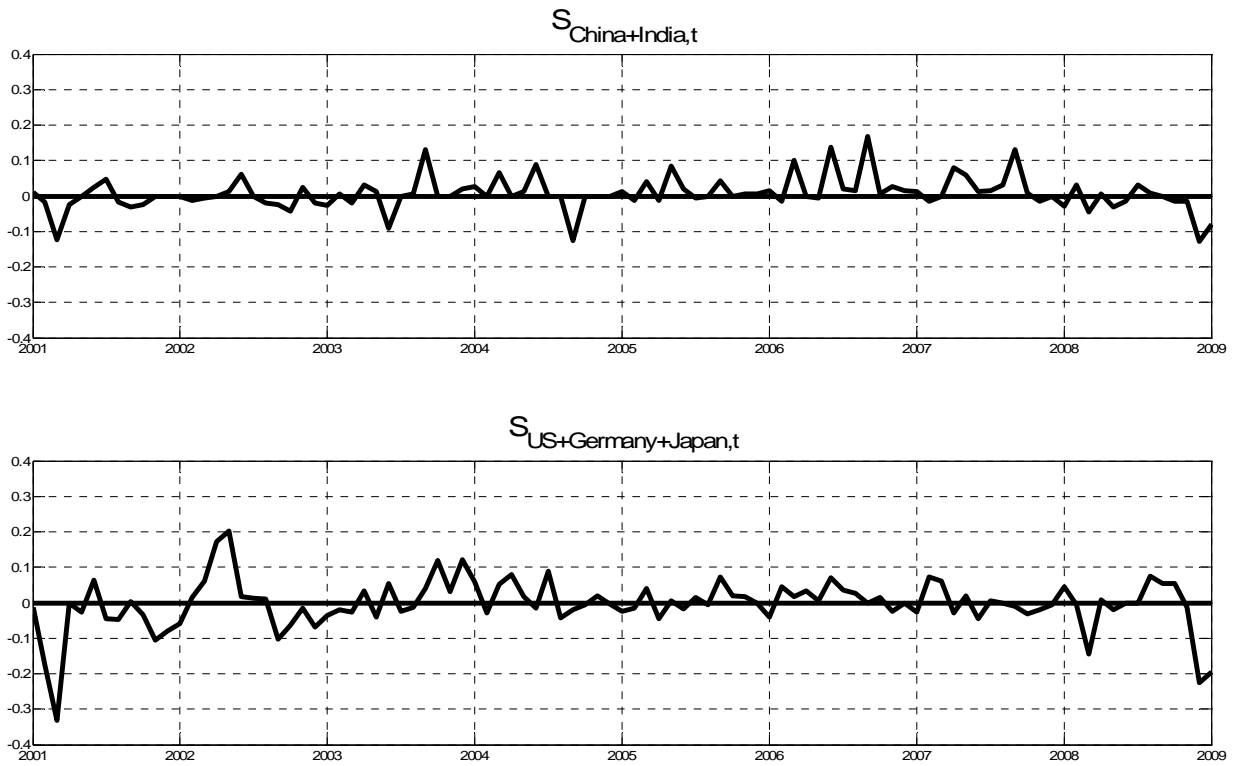
SOURCE: Computations of the authors based on successive annual forecasts of real GDP growth reported by the *Economist Intelligence Unit*.

Table 2: Shares in World Real GDP (Percent)

	1996	2002	2009
USA	21.1	20.7	19.9
Germany	4.9	4.3	3.6
Japan	7.6	6.4	4.9
USA+Germany+Japan	33.6	32.2	28.3
OECD	58.4	55.4	51.0
Brazil	3.0	2.6	2.3
Russia	3.0	3.3	3.8
India	5.3	6.1	7.2
China	9.2	12.3	15.9
China+India	14.4	18.4	23.1

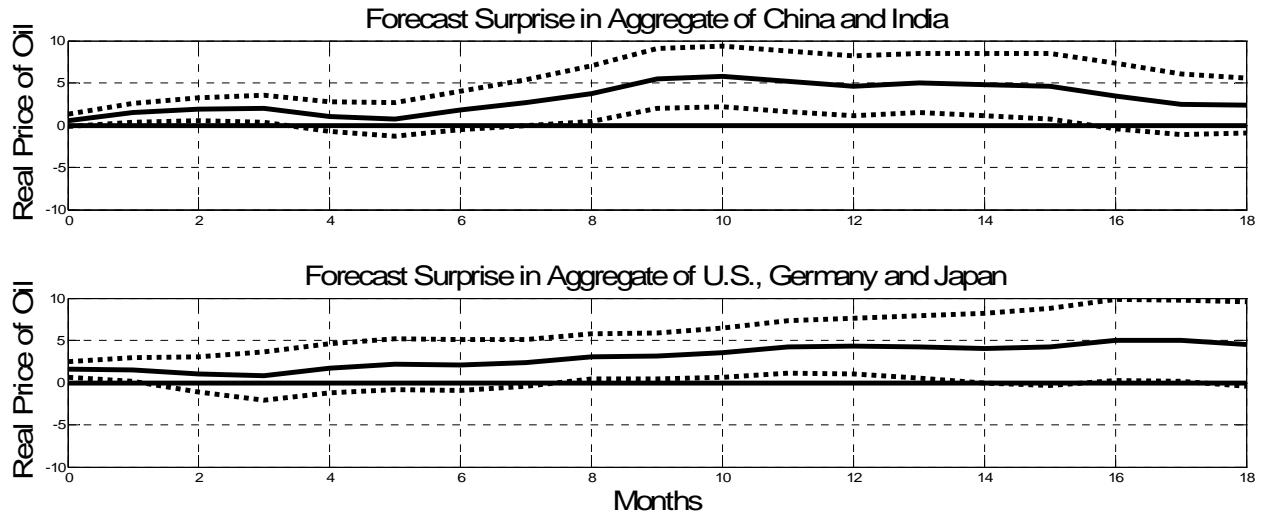
SOURCE: Computations of the authors based on the purchasing power adjusted real GDP data in the Penn World Table 6.2. The shares for 2009 have been obtained by linear extrapolation.

Figure 1: Weighted Real GDP Growth Forecast Surprises: 2000.12-2008.12



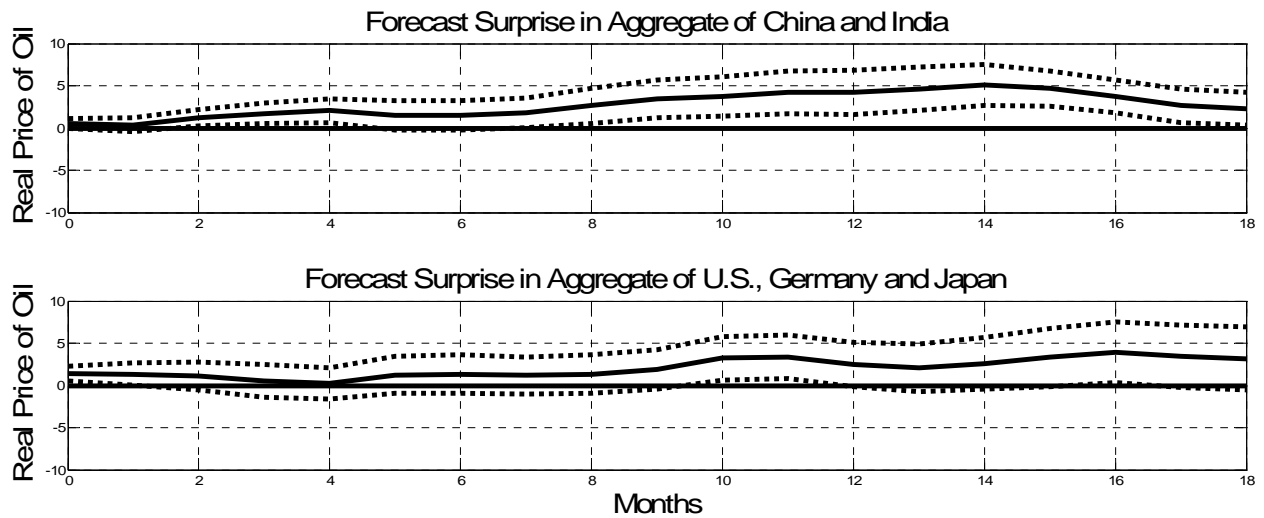
SOURCE: EIU revisions of annual real GDP growth forecasts for each country, constructed by the authors as described in the text and weighted by each country's share in purchasing power adjusted world real GDP, computed from data in the Penn World Table.

**Figure 2a: Responses of the Real Price of Oil to Real GDP Forecast Surprises
Sample Restricted to Months with Nonzero Forecast Surprises**



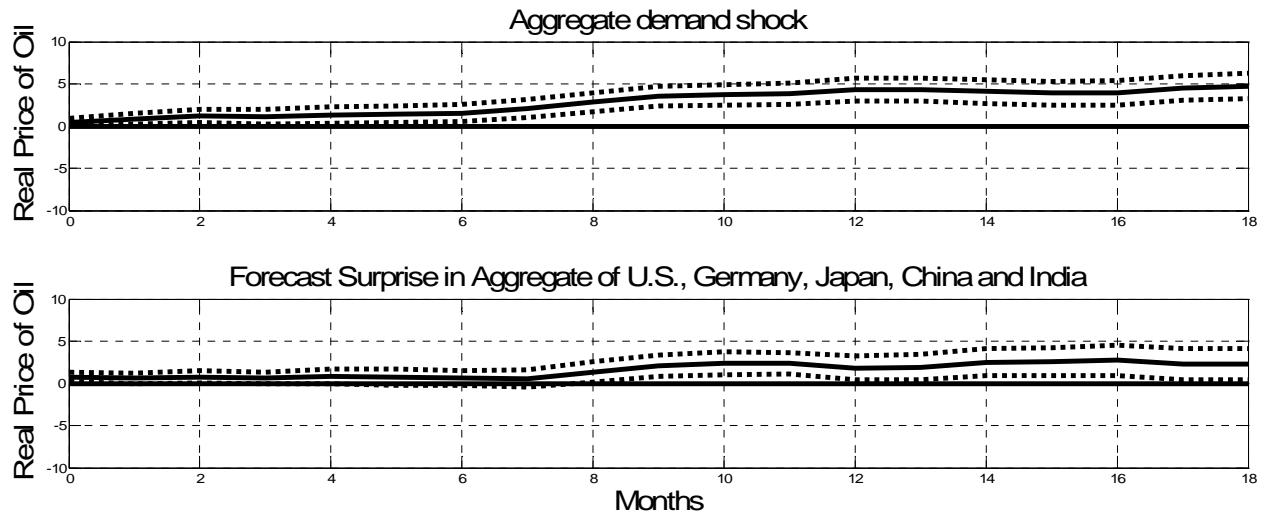
Source: Estimates based on regression model (1).

Figure 2b: Responses of the Real Price of Oil to Real GDP Forecast Surprises: Full Sample



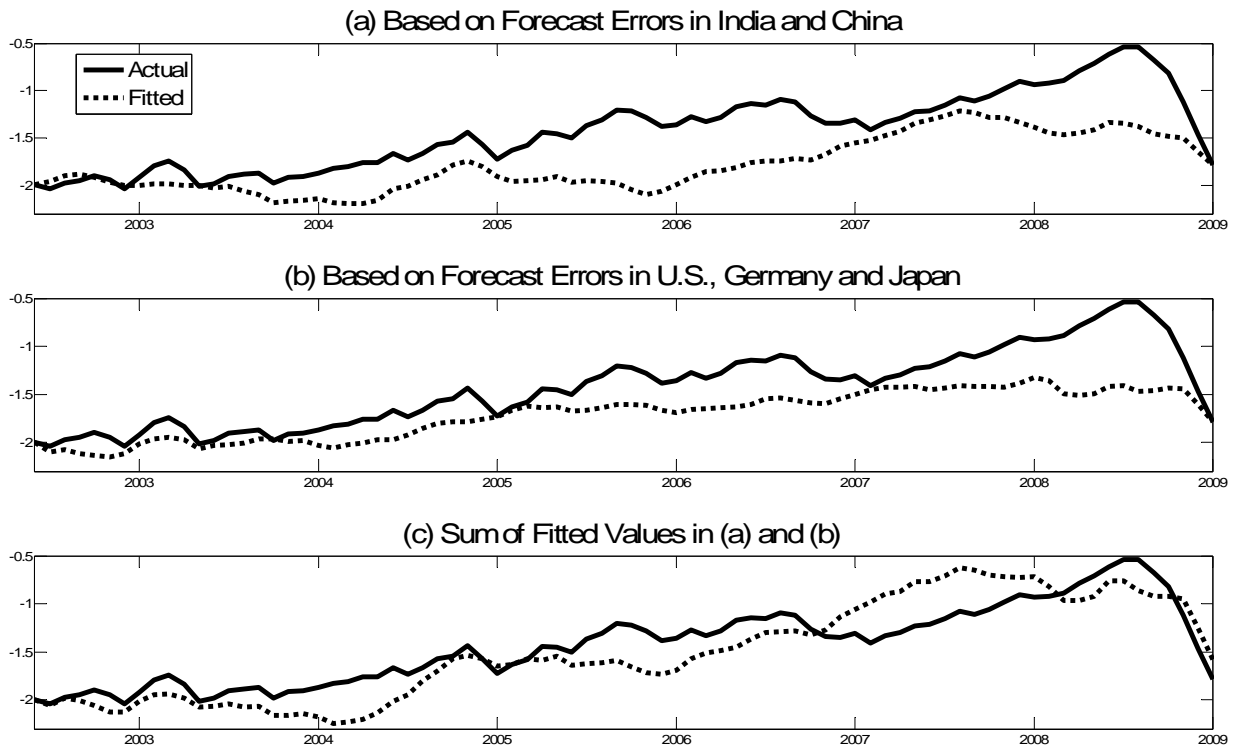
Source: Estimates based on regression model (1).

Figure 2c: VAR Response to Global Aggregate Demand Shock



Source: Estimates based on regression model (1) and the VAR model in Kilian (2008, 2009).

Figure 3: Fitted Value of the Real Price of Oil



NOTES: Fitted values based on regression model (1) including periods in which forecast errors are zero. Projection of the real price of oil conditional on its value in 2001.5.

Parenting Styles and Financial Security: How are children impacted?

Bruce Hicks*

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Abstract

This paper looks at the correlative effect between Primary Care Giver behavior in 1997 Panel Study of Income Dynamics core data and the Child Data Supplement and Transition to Adulthood outcomes of their children in 2005. It uses a model based on four primary parenting styles commonly defined in psychology literature as Authoritarian, Authoritative, Passive and Uninvolved. Covariates within the Panel Study of Income Dynamics and Child Data Supplement serve as proxies for the different parenting styles. Certain behaviors are common to more than one parenting style; thus interaction variables stand in for the various combinations of behaviors within each parenting style. This allows better modeling of the defined parenting styles. The paper began with the simple question: “What outcomes are more prevalent based on parenting behaviors in 1997?” It captured this question by considering whether the subject has completed high school or obtained their GED, whether he/she is employed and/or in college from age 18 to age 21, using multinomial logit model and maximum likelihood estimators. The models have been run on progressively larger sets of explanatory variables, starting with the parenting measures and adding a standard list of covariates consisting of highly significant economic predictors of high school completion, college attendance and employment for young adults. The results support the hypothesis that parenting styles or the behaviors that define them have an impact on whether a child will attend college and work at the same time. Applying the restrictions in age –18 and up– to the entire Panel Study of Income Dynamics data-set limited the sample size to 672 data points, a reasonable distribution of both working and non-working students remained along with a group of young people that had no high school diploma or GED and were either working or unemployed. The initial outcome measure has been defined as four categories based on whether or not the subject was an employed student, only a part time student enrolled in a two year college and not working, an employed young adult with or without a high school diploma or GED, or a non-working young adult with or without a high school diploma or GED.

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1 Introduction:

This paper broaches the idea that employability is an acquired characteristic inherent in the personality of an individual that is statistically correlated with one's upbringing. One's care givers have a profound impact on them and it is believed that this set of interactions will lead to a predictable set of outcomes in any given child's life. With these dynamics in mind, this paper is a thought experiment devoted to asking what makes some people apparently more 'employable' than others. Employability is particularly important within the growing service sector of today's economies. To be a human resource manager, a position where one would have the opportunity to read many applications and make decisions on whether an applicant is the one whom he/she had 'thought' was the correct applicant would instead likely vet applicants based on their personality, whether intentionally or unintentionally, all other criteria being approximately equal. It does not seem hard to believe that an HR manager would be drawn to those whom he/she felt comfortable with or subconsciously felt a sense of good communication towards. As human resource managers are the first who vet applicants for positions within a company, they surely come into contact with a diverse sample of personality types, finding that some applicants are difficult to handle, whether during screening for a job or after being hired for a position. The fact that after being hired, the applicants may themselves find that meeting the requirements of a highly structured job are too burdensome, thus being dismissed or quitting, this inability to adapt to working conditions can further aggravate the attempts that one might have in trying to become gainfully employed. Furthermore, once employed, it is not uncommon to observe that some highly skilled applicants are particularly difficult for their coworkers to relate to and communicate with. As nature and genetics are the common basis for analyzing such negative behavioral outcomes, this paper focuses on analyzing one part of an individual's development, the growth that occurs in one's later formative years, ages 12 to 18. Also, this analysis incorporates not just those raised by the biological parents but also those raised by relatives or people from outside the family circle.

A primary idea that is postulated by this work is that parenting measures have an effect on coping mechanisms that children will use to navigate difficult situations socially. Just what type of parenting characteristics are associated with those who are well adjusted? Does some correlation exist between parenting styles and a personality that others would describe as flexible, defining flexibility as having a good set of coping mechanisms, mechanisms that help people navigate the sometimes socially awkward moments that can occur in day to day interactions with co-workers and senior employees. What are the interactions amongst parenting behaviors that define the larger construct of a Parenting Styles, and can they be broken down and critical interactions be spotlighted? The Panel Study of Income Dynamics, Child Data Supplement and Transition to Adulthood, see Panel Study (2009), database has a large set of well defined parenting measures that should aid in this analysis.

One might ask why they should concern themselves with the differences amongst others personalities, by working one can witness the importance of personality in the workplace, as

one characteristic of personality can be described by a sense of consideration. It is the level of ‘considerate’ interaction amongst co-workers that occurs usually when responsibilities interact or overlap, and it can have an impact on the level of effort within a workplace. A reasonable level of ‘consideration’ or ‘flexibility’ is a characteristic that any rational employer would prefer given the choice. Employers would likely list flexibility as a fundamental predictor of success at work and one’s ability to maintain a productive relationship with their respective co-workers. Since one’s personality has become a criteria in hiring and a determinant of who will be retained and promoted in the long run, society must be cognoscente of the consequences that result from variances within parenting behaviors. Otherwise, any nation with a modern economy risks their place in the global competition for economic growth due to lost opportunities in building their human capital. Flexibility has been used here as an illustrative example of how one interacts with others and it plays an important role in the future success of those who plan to be providers within a family unit or for oneself, but it is neither a specific outcome nor the only dynamic within one’s personality that is of concern to this research.

Below is an abridged listing of the basic four parenting styles commonly referred to within the field of modern psychology. This is followed by the distribution of subjects analyzed within this paper. The subjects were chosen based on their age, 18 and older, their employment or student status –either working, looking for work, or laid off during 2005– and whether they are a student. All possible combinations of these restrictions were considered. The oldest age included in this analysis is 21. This is due to the composition of the Child Data Supplement data, this limitation will be overcome in subsequent years as the cohort of children from the core move into the realm of the Transition to Adulthood data tables by responding to the separate Transition to Adulthood survey. As of March 2009 there have been only two data waves from the Child Data Supplement that have made this transition. Thus, the extent of the time horizon is limited when considering the long term implications of parenting behaviors upon the set of subjects contained within the TA¹ data set.

Parenting Styles			
Authoritative	Authoritarian	Passive	Uninvolved
●Warmth in interaction	●Large Quantity of Rules	●Few Rules	●Lack of Attention
●Sufficient Interaction	●Rigid Application of Rules	●Ill Managed Expectations	●Lack of Empathy
●Clearly Defined Rules	●Low Empathy	●Inconsistency in Discipline	●Lack of Care
●Managed Expectations			

Berk (2008)

¹The Panel Study of Income Dynamics, Child Data Supplement and Transition to Adulthood will be referred to as PSID, CDS and TA respectively from this point forward.

2 Motivation

When in the process of considering a child's well-being, one fundamental dynamic that will have a lasting impact on the rest of a their life is whether that child has learned effective coping mechanisms. When one lives in a society that survives through open market economics, one needs to be able to fend for him/herself, which coping mechanisms for tough social interactions and outcomes aid in. This ability can be dramatically impacted by one's upbringing, entailing their environment and nurturing. The nurturing component is the primary question considered within this research. What are the real reasons why so many live below their potential? Do people simply live out the view of a world that was given to them by their nurturer, a view that can be thought of as a 'filter' that the outside world must pass through? A filter that creates a lack of awareness to certain social conditions that causes people to unnecessarily live in fear and can create social misunderstandings. This issue directly relates to the group that this research focuses upon, who due to these problems may be living below their true potential.

In looking at this sample group it is important to identify the quality of their care givers. The purpose of this study is to identify the effects of certain parenting behaviors and their correlation to later outcomes, which directly effect the ability of a person to compete in an open market economy. Thus established, this work can begin to outline a tangible construct with which primary care givers can be educated. Allowing PCGs² to begin to direct their attention in ways that reduce their parenting efforts –or increase depending on parenting behavior– and maximize their return, measured by the independence of their children as adults. The ability to construct a realistic marginal benefit analysis of applied quality care to future outcomes will be a useful resource. It is assumed by this research that many primary care givers seriously miscalculate the impact that their parenting behaviors have on their children, and that a significant amount of future 'economic' suffering is caused by those behaviors that are negatively correlated to preferred outcomes. It is also asserted that the impact parenting behaviors have on a child's sense of emotional stability and the development of coping mechanisms that a child should take into their young adult life are significantly degraded.

It is reasonable to believe that the economic well being of a child's adult life is impacted by the various characteristics of their primary care giver's nurturing style, specifically, the belief that the interactions amongst groups of parenting behaviors that define the commonly identified parenting styles are good predictors of economic well being. It is not believed that any one parenting behavior is key *ceteris paribus* but that dynamics between certain combinations can be strong, and either detrimental or inspirational to a child. The center of the source of one's will to put forth effort comes from the belief in oneself and their parents, who are postulated to be the protectors of the spark in a child's creativity and motivation.

The subsequent discussion of this topic will proceed as follows: the methods section will explain the variables' construction and descriptions of the model used will be examined, along with the data source, followed by some hypotheses that will be posited about the validity of the

²Primary care givers will be abbreviated as PCGs.

assumptions and arguments, concluded with what sort of results will be necessary to confirm them or deny them; next, the Results’ section details assumptions and calculations and provides the tangible results; then, after the results have been examined, a conclusion; then, some limitations will be discussed; and finally, a section on possible thoughts for future analysis will conclude. At the end of this paper is the customary reference section, followed by the appendix of tables where there is a complete table of variable names and definitions for both the model that was constructed and the PSID variables used. This should allow for any replication that might be considered. Also, part of the appendix lists the tables of results from the ‘Proposed’, ‘Benchmark’ and ‘Encompassing’ models. The tables contain the estimators, robust standard errors and significance levels.

3 Methods

The primary question of this paper is, “Whether a particular parenting style, or any specific characteristic that describes the behavior of the primary care giver within the framework of ‘parenting styles’, has an impact on the likelihood that a young adult would be actively engaged in life?”. For this analysis a multinomial logit model has been used under I.I.D. and random walk assumptions. Following is the mathematical representation of the model that is used, beginning with the hypothesized parenting model, which consists of binary proxies and interaction variables which help define the intended parenting measures within the ‘encompassing’ model³. Within these models there have been assumptions made to correlate the data available to known definitions of parenting styles, ‘Berk’ (2008). Some of the variables within the models measure beliefs, such as whether one believes that the first four years of a child’s life have a profound impact on that child’s lifelong development. Other variables measure whether or not concrete actions have occurred or whether there are certain conditions within the household environment.

The entire data set used for this analysis comes from the PSID, CDS and TA database. The PSID is a nationally representative longitudinal database of families across the United States. The broad sample of the data can be seen within distribution tables in the appendix. The sample was drawn from all three data sets, PSID, CDS and TA, and was filtered by the age of the young adults –18 and older– which are codified within the database as children, stepchildren, grandchildren, nieces, and nephews. Some of the young adults within the sample are codified as the ‘Head of Household’, or ‘Wife’. The former designation is due to children within the CDS growing up and moving out of the PCG’s home into their own, where they can continue to be surveyed through the TA. The range of age available within the young adults that were living with a family in 1997 and subsequently 18 or older in 2005 captured a sample with ages ranging from 18 to 21 years. The parenting measure and inputs are from 1997 and the outcomes are measured during 2005 from a balanced panel, the income measures are from 1997 and 2005. These young adults represent the oldest CDS subjects that have transitioned and continued

³The benchmark model of income and parents education plus the proposed parenting measures model.

to report via the TA survey. The other filter that was used to identify the sample within the database was based on TA050127: "E1 EMPLOYMENT STATUS 1ST MENTION". All records were kept, except those who were listed as permanently or temporarily disabled within the 2005 survey.

A model containing the multinomial outcome, called empst, which is an ordinal dependent variable with outcomes zero, one, two, or three, has been estimated using the multinomial logit model with MLE approximation techniques. The first of the four categorical outcomes denote whether the subject young adult does or does not have a high school diploma or a GED and is not working nor is he/she enrolled in school in 2005. This is denoted by outcome 'zero' with a quantity of 140 observations. Whether the subject does or does not have a high school diploma or a GED and is working but not enrolled in school in 2005 is denoted by outcome 'one' with a quantity of 193 observations. Whether the subject has their two year degree or is enrolled in a 2 year college but is not working is denoted by outcome 'two' with a quantity of 197 observations. Last, whether they have Bachelors degree and some level of graduate study or if he/she is a full or part time student and is working, is denoted by outcome 'three' and has a quantity of 142 observations. In the total sample there are 672 observations which were used to calculate the estimators⁴. A detailed discussion of the calculations necessary to compute the best approximations of the marginal effects has also been performed using the multinomial logit model with MLE estimators; refer to the results section for details. The ensuing section will elucidate the proposed model in mathematical notation, starting with the model as defined strictly by parenting measures then broken down into proxies that describe the parenting behaviors that comprise the key aspects of these parenting styles. Choices for proxies were limited to the available parenting measures within the PSID core, but those listed here are only a very small sample of what is available for such an analysis. There are many more choices within the PSID that can be drawn on to answer the same question asked within this work or an entirely different questions that would rely on a similar style of data set. Thus, the quantity of explanatory parenting proxies used here is a choice made by the author mainly to *begin* an exploration into the dynamic effects believed to influence children.

Initial Model explored:

Independent Economic Well Being_i=

$$\beta_0 + \beta_1 \text{Authoritative}_i + \beta_2 \text{Authoritarian}_i + \beta_3 \text{Passive}_i + \beta_4 \text{Uninvolved}_i + \varepsilon_i$$

Where:

$$\text{Authoritative}_i = \delta_0 + \delta_1 \text{Rules}_i + \delta_2 \text{Enforcement}_i + \delta_3 \text{Empathy}_i + \delta_4 \text{Warmth}_i + \delta_5 \text{Involvement}_i + \delta_6 (\text{Rules}_i * \text{Enforcement}_i)^\dagger + \delta_7 (\text{Rules}_i * \text{Enforcement}_i) * (\text{Warmth}_i)^\ddagger + \varepsilon_i^{AE}$$

⁴Tables of the estimators and their associated standard deviations can be found in the appendix

[†]A variable that captures the interaction between the Quantity of rules and a Measure of the consistency to which they are enforced

[‡]A variable that captures the interaction between the consistency and amount of discipline and the level of warmth

$$Authoritarian_i = \alpha_0 + \alpha_1 Rules_i + \alpha_2 Enforcement_i + \alpha_3 Empathy_i + \alpha_4 Warmth_i + \alpha_5 Involvement_i + \alpha_6 (Rules_i * Enforcement_i) + \alpha_7 (Rules_i * Enforcement_i) * (Warmth_i) + \varepsilon_i^{AN}$$

$$Passive_i = \gamma_0 + \gamma_1 Rules_i + \gamma_2 Enforcement_i + \gamma_3 Empathy_i + \gamma_4 Warmth_i + \gamma_5 Involvement_i + \gamma_6 (Rules_i * Enforcement_i) + \gamma_7 (Rules_i * Enforcement_i) * (Warmth_i) + \varepsilon_i^P$$

$$Uninvolved_i = \phi_0 + \phi_1 Rules_i + \phi_2 Enforcement_i + \phi_3 Empathy_i + \phi_4 Warmth_i + \phi_5 Involvement_i + \phi_6 (Rules_i * Enforcement_i) + \phi_7 (Rules_i * Enforcement_i) * (Warmth_i) + \varepsilon_i^U$$

And Where: (each regressor is a function of categorical variables)

$$Rules_i = \tau_0 + \tau_1 Qty_i + \tau_2 Quality_i + \varepsilon_i^R$$

$$Enforcement_i = \theta_0 + \theta_1 Strict_i + \theta_2 Eat\ with\ Parents\ regulary_i + \theta_3 Spank_i + \theta_4 WhoDisp_i + \theta_5 No\ TV\ while\ Eating_i + \theta_6 Limits\ on\ TV\ viewing_i + \varepsilon_i^E$$

$$Empathy_i = \theta_0 + \theta_1 Shown\ Affection_i^5 + \theta_2 Men\ have\ difficulty\ Expressing\ their\ emotions_i + \varepsilon_i^y$$

$$Involvement_i =$$

$$\omega_0 + \omega_1 Reading\ to\ child_i + \omega_2 Showing\ Affection_i + \omega_3 Who\ Disciplines\ the\ child(consistency)_i + \omega_4 Who\ Bathes\ children_i + \omega_5 Who\ drives\ the\ child\ to\ Activities_i + \omega_6 Playing\ with\ child_i + \omega_7 Beliefs\ about\ Dad's\ Interaction\ with\ child_i + \varepsilon_i^I$$

$$Warmth_i = \psi_1 + \psi_1 Showing\ Affection_i + \psi_3 Bathing_i + \psi_3 Men\ Expressing\ feelings_i + \psi_4 Developmental\ Importance\ of\ First\ 4\ yrs_i + \varepsilon_i^W$$

Finally Where:

$$Quality_i = \phi_0 + \phi_1 Men\ Expressing\ Feelings_i + \phi_2 Beliefs\ on\ Men's\ Involvement_i + \varepsilon_i^Q$$

$$\varepsilon_i = \xi_1 Subject\ Child\ has\ a\ Dependent_i + \xi_2 Ability_i + \xi_3 BusClimate2005_i$$

$$Ability_i = \rho_0 + \rho_1 WoodJohn_i + \rho_2 ACT.SAT_i + \varepsilon_i^{abl}$$

Actual Model Explored using data from PSID and CDS: Multinomial Model: Engagement in School and Work given Wealth, Familial Education and Parenting

$$empst_i = \beta_0 + \beta_1 own_i + \beta_{3,4} wealth_99_23, 4_i + \beta_{5,6,7} nhome_99_2q, 3q, 4q_i + \beta_{8,9} wealth_05_23, 4_i + \beta_{10,11,12} nhome_05_2q, 3q, 4q_i + \beta_{13} male_i + \beta_{14} single_i + \beta_{15} married_i + \beta_{16,17,18} age19, 20, 21_i + \beta_{19} cmpedh_c_i + \beta_{20} cmpedh_gr_i + \beta_{21} cmpedf_c_i + \beta_{22} cmpedf_gr_i + \beta_{23,24} drive1, 2_i + \beta_{25} play_i + \beta_{26} limtvself_i + \beta_{27} limtvoftr_i + \beta_{28} mealtv_i + \beta_{29} dadint_i + \beta_{30} menexpagr_i + \beta_{31} menexpdis_i + \beta_{32} erlydeva_i + \beta_{33} dinwpar_i + \beta_{34} bath_i + \beta_{35} discp_i + \beta_{36} spank_i + \beta_{37} intrulenf_i + \beta_{38} intrulesm_i + \beta_{39} intrulesf_i + \beta_{40} father_97_i + \varepsilon_i$$

that a child receives

⁵The data provided is unusable due to the distribution amongst respondents, Please see Figure 16, although it may be an accurate measure it provides little information as a proxy for warmth of interaction between the PCG and child in 1997. The proportion the PCGs who reported showing physical affection toward the child zero times was 96.83%. This seems unreasonably high or low depending on how one measures this behavior, the author has little explanation for the observed distribution of respondents who answered zero. Perhaps the distribution was an unfortunate consequence of the horizon chosen by the survey designer, "...within the last week.", many reasons can exist for no contact with the child within the last week. Although, the quantity of respondents choosing zero is extreme.

There is a set of well established predictive regressors that are typically associated with the working and education activities of a young adult; within this paper this group will be referred to as the ‘benchmark’ model. This model contains direct measures and proxies of wealth, parents’ education, age of the young adult, gender of the young adult, and parents’ marital status (Please see Figure 2). Among the possible measures within the PSID core database are a set of wealth variables that measure liquid assets, such as checking and savings deposit accounts, also measures for the amount of money a family has invested, equity held in real estate other than the family’s primary residence, a measure of the equity in one’s primary residence, and business cash and equity assets belonging to the family. These measures are adjusted for each family’s non-collateralized and collateralized debt obligations to accurately account for their available resources. The use of these measures has been chosen to minimize the effects of over-fitting that would occur due to correlation of annual income earned by the ‘head’ and/or ‘wife’ to their respective education level and subsequent cash flow account balances. By measuring the balance sheet of the family these collinearities are reduced⁶. A measure for the ability of the head or child is not included within the benchmark model although the Woodcock Johnson scores are available; however, part of the thrust of this research is to estimate the effect that parenting measures have on the abilities of a child and how those effects impact their future economic prospects. Thus, it is believed that the Woodcock Johnson test scores are correlated to parenting behaviors. The line between what is genetic and environmental within the concept of ability is part of what is in question. Thus, including the ability measures would lead to collinearities (See table 1). Seeking the effects that parenting behaviors have on the engagement of a child in their academic career has an important role in conducting this exploration. So the meaning would be somewhat unclear in this context if an ability measure was included, although it is a critical determinant in the future education and lifelong earning potential of any person.

Table 1: **Correlation between Strict/Quantity of rules and Woodcock Johnson Scores**

	Q24LWSS ^a	Q24BRSS ^b	Q24APSS ^c	Q24DSTO ^d
Not Strict/ Many Rules	-0.0377	-0.0383	-0.0230	-0.0170
Strict/ Few Rules	0.1304	0.1402	-0.0054	0.0978
Strict/ Many Rules	-0.0466	-0.0705	0.0033	-0.0247
Not Strict/ Few Rules	-0.0331	-0.0181	0.0125	-0.0398

^aQ24LWSS: Letter Word Standardized Score 02

^bQ24BRSS: Broad Reading Summation Standardized Score 02

^cQ24APSS: Applied Problems Standardized Score 02

^dQ24DSTO: Digit Span Total Raw Score 02

These variables have been derived from responses to questions within the PSID Core, CDS and TA Surveys. In general, and with respect to a normative opinion, the categorical answers

⁶Correlation between heads education measured in years and total income from 1996 is 7.5% and in 2004 is 4.1% whereas the wealth measure (PSID ER417, S717, see appendix) and the heads education correlation is 0.62% in 1996 and 1.14% in 2004.

Table 2: **Standard Measures: Proxies for wealth, family income, primary care givers education, ability, gender and PCG Marital Status**

2005	S705	Value of cash assets, Checking account, Savings account and CDs
2005	S707	Non-collateralized debt –Credit cards–
2005	S711	Value of investments –Stocks and Bonds–
2005	S716	2005 measure of equity excluding house equity value from the primary residence –illiquid assets–
2005	S717	2005 measure of total equity including house of primary residence – illiquid assets–
1997	ER12222	Head’s Completed Education Level
1997	ER12223	‘Wife’s’ Completed Education Level
2005	ER25023	A3. Are you (HEAD) married, widowed, divorced, separated, or have you never been married?
	ER32000	Gender of Child
2005	ER33804	Age of child 2005

from the survey questions are split apart into binary variables that are arranged ordinally from the least favorable outcome to most favorable outcome; this has been done for ease of interpretation only. This means that a value of 1 in the *dinwp1* binary variable is less favorable to a value of 0 for *dinwp1*⁷. The presumption that the parenting measures add predictive capabilities to the ‘encompassing’ model that contains the ‘benchmark’ model implies that the variables within the parenting measures model remain significant within the estimation of the encompassing model. This is the case and can be evidenced within the results of the unrestricted or ‘encompassing’ model, the restricted or ‘benchmark’ model, and the ‘proposed’ or parenting measures model. A further discussion of the results will occur in the Results section. Other expected results and implications of adding meaningful regressors to the set of benchmark regressors would be increases in the R^2 of the encompassing model, and reductions in significance of some of the variables contained within the restricted model once the results are obtained from the encompassing model. Any increase in the R^2 would have to be checked against the null hypothesis of no change. This has been completed and the results are given in the results section (see table 6). A comparative analysis via the log likelihood ratio test will be done to answer the question of whether the change in R^2 is significant, and comparisons of any significant results will be reported within the results section along with the β_i ’s from both the restricted (benchmark and proposed models) and unrestricted (encompassing model, as referred to within this paper) models. The LR statistic and log likelihood test is used for testing significance of independent covariates within the encompassing model by dropping individual covariates from the encompassing model and checking for any significant change in the R^2 .

Many variables had to be carefully constructed in order to provide meaningful inference and sound analysis, one key consideration within the explanatory variables that needed to be accounted for was the fact that not all households had a ‘Wife’. This presented the need to

⁷See Tables section in Appendix for the table of variable categorizations, and the subsequent section for a detailed explanation of how the re-categorizing was produced

adjust the variable measuring the years of education for the ‘wife’ within the household. Within the PSID the quantity in years of education is captured by variable ER12223 which records a 0 when there is no ‘Wife’ in a family unit. Within the PSID data sample there should be a one to one match for no ‘father’, because the PSID classifies a female head of house as ‘Head’ and the ‘Wife’ record is filled in accordingly to alert those who use the data that there is no non-head of household partner within the family unit. This implies that any mate who is not the head of the household of either gender would be categorized as a ‘wife’ within the PSID family unit. There are 199 families that have no wife recorded as part of the family unit. There are 161 families that have no father figure, not the same as head, as listed within the family unit. The gap between the ‘wife’ and ‘father’ was dealt with by adding the father_97 variable to the models to account for the fathers absence and by setting the erroneous quantitative values of ‘wife’s’ education to the mean, thus when they are categorized binomially they fall into the group of college graduates. The mean of ER12223 measured in years was derived by adjusting the arithmetic mean of the raw data, by scaling a factor of $\frac{672}{473}$, this adjusts for the down-weighted mean, which is calculated erroneously due to the added observations that are 0 and create too large a sample size within the denominator of the mean estimator. The adjusted mean was then assigned to ER12223 where ER10011 –“Age of Wife”– indicates that there is no wife within the family unit.

Examples of discrete PSID/CDS variable re-categorizations⁸

The variables that were used to conduct inference within the models are binary. This necessitated re-categorizations that separated the non ordinal responses within the survey questions into binary variables. In typical practice a single category of every explanatory measure’s effect was left within the intercept. Some illustrative examples are MenExp –which represents how strongly the PCG agrees with the statement: Men find it difficult to express their feelings. The PSID variable that contains the responses has been re-categorized into five binary variables using a scheme that can be related to vectorizing each parenting measure. The vector response is [menexpagr menexpdis], for agree and disagree respectively, thus we have [0 0] if $Q2A37W \notin \{1, 2, 3, 4\}$, [1 0] if $Q2A37W = 1$ or $Q2A37W = 2$, and [0 1] if $Q2A37W = 3$ or $Q2A37W = 4$. There are two binary categorizations of *MenExp*. Although there are three possible responses to the survey question within the re-categorizations, one is left out to avoid any linear dependence among the categories.

⁸See the variable definitions: Section 9.2 for specific definitions of all the variables used

4 Results

Among the sample of 672 college age subjects, 18 to 21 years of age, there were some particularly interesting distributions from families where the primary care-givers reported combinations of parenting styles that would be categorized under various headings within the definitions given. In particular, if one looks at the number of primary care givers that reported being ‘strict’ and ‘having many rules’, we find that the size of this group in relation to the entire sample is 186, or 27.68% of our sample, while the portion of our sampled PCG’s reporting few rules that are strictly enforced is 97, or 14.43%. Furthermore, one interesting group reported having many rules but not strictly enforcing them. An implication that might be drawn here is that the children might be subjected to inconsistent disciplining behaviors by the parents which would lead to less consistent outcomes if the children within this group did not develop coping mechanisms to handle the uncertainty of whether or not they would bear the consequences of their actions. Though, one must admit the PCGs could have reported this combination for various reasons, perhaps inferring that there was no need to strictly enforce the rules because their children’s behavior had not warranted it. The wording for the question is “Are your rules strictly enforced, or not very strictly enforced?” This paper will not debate this but further analysis may sway one’s inference as to the appropriate context of the question. The proportion of the group of PCGs that reported having many rules but not strictly enforcing them was 6.84%, or 46 of the 672 from the total sample. In order to complete the cases within this sample and inference about the various parenting styles we include the proportion of PCGs reporting few rules and little enforcement of 51.04%, or 343 out of 672.

Looking at the distribution of outcomes within these four groups one can see that three of the four interactions between enforcement and quantity of rules appear to have little effect on the whether the outcome of the child is below our hypothetical midpoint in outcomes. In the strict/many interaction 49.46% of the young adults have at least a two-year college degree. In the not strict/many rules category there is an even distribution of 50% of the subjects at least in a two-year college, and in the not strict/ few rules group there are 48.69% of the subjects in at least a two-year college. The previous hypothesis –that there exists an important interaction between the quantity of rules and how strictly those rules are enforced– plays an important role in the development of important coping mechanisms of a child and is not overturned by the previous results, but the group that reported strictly enforcing a few rules has 58.76% of the subjects in at least a two-year college. Also, noticeably different within this group is the difference in proportion of individuals that are not in the bottom group, maybe having a high school diploma or GED but not working. The proportion within the group is 15.46% as compared to the smallest proportion within the not strict and many rules group of 19.56%. With little difference between the remaining two groups, strict/many rules proportion is 23.11%, and the not strict/few rules proportion is 21.28%. This points to a critical relationship between the quantity as reported by PCGs and the self-reported strictness.

Within the parenting measures multinomial logit estimation (see table 5) of the encompassing

model, several parenting measures remained significant (see table 3). Among them are intrulenf, intrulesf and inrulesm, one category was omitted. In the common practice of explanatory binary dummy variables it was dropped; if it was to be added, omitting one of the other categories it would be called intrulenl. These variable names represent 'Interaction between the quantity of rules and the strictness with which they are enforced'. The last two letters specify the interactions as binary groups, nf, nm, sf, and sm, which represent 'not strict and few rules', 'not strict and many rules', 'strict and few rules', and 'strict and many rules' respectively. The variable that was hypothesized to be of considerable importance here is the interaction of 'strict and few rules'; the hypothesis is that this interaction represents a consistent and clearly defined structure for the child to live within, a set of well-managed expectations for the child to learn, comparably easier than a lengthier 'list'. This can enable the child to practice and develop a routine that allows them to move into a framework that will be quite comparable to any future workplace more easily than if they did not have such structure. As children are curious, they need the freedom to experiment and ponder why the world around them behaves in the way that it does. Thus, if a child has few rules they may feel a greater sense of freedom to experiment. This combined with a consistent expectation for being disciplined if a rule is broken, teaches a child that their choices come with consequences. Thus, if they are to consider a risky venture they do it knowing that consequences are sure to follow. This perhaps promotes critical thinking and careful consideration between alternatives, skills that will prepare children for college and work, and foster a sense of responsibility.

Analyzing the multinomial logit results, the previous interactions can be seen in the significance of the interaction covariates within the individual outcomes, respectively:

Table 3: **Estimators of Interaction between Strict & Many Rules**

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
Estimators from Encompassing Model, Wealth, Parental Educ. and Parenting			
	$\frac{\hat{\beta}}{\text{RobustSE}}$	$\frac{\hat{\beta}}{\text{RobustSE}}$	$\frac{\hat{\beta}}{\text{RobustSE}}$
Not Strict/ Few Rules	0.224	-1.198***	0.739
intrulenf	(0.55)	(0.57)	(0.70)
Strict/ Many Rules	-0.307	-1.032**	0.098
intrulesm	(0.53)	(0.54)	(0.69)
Strict/ Few Rules	-0.019	-0.413	0.553
intrulesf	(0.59)	(0.59)	(0.74)
Estimators from Proposed model plus Parental Educ, no Wealth.			
Not Strict/ Few Rules	0.242	-1.045**	1.133*
intrulenf	(0.54)	(0.56)	(0.71)
Strict/ Many Rules	-0.318	-0.893**	0.494
intrulesm	(0.51)	(0.52)	(0.69)
Strict/ Few Rules	0.010	-0.306	0.818
intrulesf	(0.58)	(0.58)	(0.75)
Estimators from Proposed model, no Wealth nor Parental Educ.			
Not Strict/ Few Rules	0.103	-0.332	1.462***
intrulenf	(0.52)	(0.52)	(0.71)
Strict/ Many Rules	-0.331	-0.444	0.724
intrulesm	(0.50)	(0.48)	(0.70)
Strict/ Few Rules	-0.009	0.197	1.047
intrulesf	(0.56)	(0.53)	(0.74)
Base outcome: Educ. \leq (HS or GED)& Not Working			

Note: wealth measures used are unique to PSID, CDS, and TA database (See table 12 for LR Tests)

* represents significance at the 15% level

** represents significance at the 10% level

***represents significance at the 5% level

Inference from the estimators of the encompassing model (see table 11) is not clear, given that the explanatory data is binary and comes from a multinomial logit model. Normally this could be accomplished using a scalar multiplier of each β_i to determine its marginal effect. However, calculating the scalar $g(\hat{\beta}_0 + \bar{x}\hat{\beta})$ would not make intuitive sense, because there is no average gender as an example, ‘Cox’ (1989), ‘Wooldridge’ (2002). Thus, the following will be used:

$$n^{-1} \sum_{i=1}^n \left(G \left(\hat{\beta}_0 + \hat{\beta}_1 x_{i,1} + \dots + \hat{\beta}_{k-1} x_{i,k-1} + \hat{\beta}_k (c_k + 1) \right) - G \left(\hat{\beta}_0 + \hat{\beta}_1 x_{i,1} + \dots + \hat{\beta}_{k-1} x_{i,k-1} + \hat{\beta}_k c_k \right) \right)^\dagger$$

which is the **average partial effect**, and $c_k=0$ for the analysis of the binary partial effects. Provided in table 4 are the calculations for the interactions between the strictness and quantity of rules; the survey asked this via two basic quantities “Some families have many rules and other families don’t have very many rules. Which kind of family do you have, one with ‘lots of rules’, or ‘not very many rules’?”, ‘Panel Study of Income Dynamics’ (1997).

[†]where $G(z) = \frac{\exp(z)}{1+\exp(z)}$ is the CDF from the logistic function.

Table 4: **Estimates of Average Partial Effects Interaction between Strict & Many Rules**

		Avg. Partial Effect: $\Delta x_i = 1$			
		$\widehat{\beta}_{irnrf}$	$\widehat{\beta}_{irsm}$	$P(0 x_{irnrf} = 1)$	$P(0 x_{irsm} = 1)$
Empst:	Educ. \leq (HS or GED) & Working	0.224	-0.307	.0655922	-.0070857
	2 Year Degree & Not Working	-1.198***	-1.032**	-.250023	-.1425305
	2 or 4 Year Degree & Working	0.739	0.098	.1660145	.0879747

Note: irnf: (Not Strict/ Few Rules) & irsm: (Strict/ Many Rules)

From table 4, the probability of falling into the group with or without a high-school equivalent education that is not working increases *ceteris paribus* given a parenting behavior of not being strict or failing to follow through on what would be predefined punishment when a rule has been violated by 25 percent and likewise given the parenting behavior of strict discipline combined with many rules will increase the probability of falling into the group with or without a high-school diploma and not working by 14.25 percent. The degree of both statistical and practical significance are high amongst these covariates. Other covariates that have high degrees of correlation between various outcomes are noted in the table 11. The above listed scalars can be used to calculate the marginal importance of any explanatory variable. The analysis of every covariate within the framework of its marginal effect is beyond the scope of this research but has some interesting ramifications that Primary Care Givers may benefit from. A few key parental behavior regressors are located within table 5 on the following page.

Table 5: **Multinomial Logit: Estimators from Proposed Model**

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>
play	-0.043 (0.51)	-0.896** (0.52)	-0.167 (0.56)
mealtv	0.597** (0.35)	0.305 (0.36)	0.600* (0.37)
dadint	1.185* (0.73)	1.032 (0.77)	0.426 (0.73)
father_97	-0.434 (0.66)	-1.249* (0.77)	-0.137 (0.66)
menexpagr	-1.426* (0.93)	-1.342 (0.97)	-0.734 (1.01)
menexpdis	-1.539* (0.94)	-1.134 (0.97)	-0.890 (1.02)
discp	0.563** (0.34)	0.007 (0.38)	0.528 (0.37)
intrulenf	0.224 (0.55)	-1.196*** (0.58)	0.741 (0.71)
intrulesm	-0.304 (0.53)	-1.013** (0.55)	0.089 (0.69)

Base outcome: Educ. \leq (HS or GED) & Not Working

* represents significance at the 15% level
 ** represents significance at the 10% level
 *** represents significance at the 5% level

To further define these groups, the research sought an instrumental variable to measure parental warmth; ideally the variable would be a direct measure of how much a child is comforted and reassured by the parents. Unfortunately the author was unable to ascertain such information with the proxy for warmth, PSID variable Q1E9F. The PSID variable added little information because of the 672 respondent PCGs within this sample, 661 chose to answer the question with “0 Times OR Inapplicable within the last week”. The question was: “How many times in the last week had you shown (CHILD) physical affection (kiss, hug, stroke hair, etc.)?”. Perhaps the distribution was an unfortunate consequence of the horizon chosen by the survey designer, “...within the last week.”; however, many reasons can exist for no contact with a child in a one-week historical period, although the quantity of respondents choosing zero is extreme. A proxy for ‘warmth’ with wider distribution across the proposed outcomes is needed to test if such an interaction between a child and their PCG can have an impact on their future level of engagement for productive undertakings that will move them towards independence. A more robustly distributed measure, similar to ‘physical affection’, would be critical in showing whether such parenting behaviors have tangible effects on development. Also, important is whether ‘parental warmth’ will build independent coping skills that a child can later transfer and use in relationships with school or work mates, and how these skills help garner a productive future.

Table 6: **Multinomial Logit: Comparison of Unrestricted, Restricted, Base Parenting Measures**

Encompassing	Benchmark	Proposed
Wald $\chi^2(114) = 227.81$	Wald $\chi^2(63) = 148.77$	Wald $\chi^2(54) = 79.67$
Prob $> \chi^2 = 0.0000$	Prob $> \chi^2 = 0.0000$	Prob $> \chi^2 = 0.0131$
LogPsL = -791.31817	LogPsL = -820.80832	LogPsL = -880.6249
Pseudo $R^2 = 0.1425$	Pseudo $R^2 = 0.1106$	Pseudo $R^2 = 0.0458$
672 Observations		

Table 6 lists the associated statistics for each of the multinomial logit models that were estimated. From the Pseudo Log Likelihoods within these tables, significance of the parenting measure model has been tested using the likelihood ratio statistic.

$$LR = 2(\mathcal{L}_{ur} - \mathcal{L}_r).$$

Using the the LR statistic which is distributed χ_{18}^2 and the calculation of $LR = 54.7562 > \chi_{18}^2$ produces a test result that is statistically convincing at any level of significance chosen. Thus, it is reasonable to conclude significant evidence exists inferring that this set of parenting measures adds some ability to the explanation of variations that are observed between the different outcomes.

Testing whether the individual parenting measures improve the goodness of fit within the encompassing model will be done as follows: use the encompassing model log likelihood MLE estimate and compare it to the restricted model under $H_0: \beta_i = 0$, this will then be compared to

the LR statistic by following the common LR test. Table 7 contains the results for any parenting measure that was found significant up to the 15% level within the encompassing model.

Table 7: **Multinomial Logit: Likelihood Ratio Tests with respect to Encompassing Model**

$x_{i,j}$	LR_i	$2(\mathcal{L}_{ur} - \mathcal{L}_r)$	Result
play	-795.501	8.365	Fail to Reject
mealtv	-795.345	8.053	Fail to Reject
dadint	-795.367	8.098	Fail to Reject
father_97	-795.443	8.250	Fail to Reject
menexpagr	-794.929	7.222	Fail to Reject
menexpdis	-794.839	7.042	Fail to Reject
discp	-793.848	5.061	Fail to Reject
intrulenf	-797.673	12.708	Fail to Reject
intrulesm	-794.011	5.386	Fail to Reject
LogPsL = -791.31817			
$\chi^2_1 = 2.71$ at the 10% significance level			

5 Conclusion

The significance of the interaction terms is the strongest evidence that there exists some sort of dynamic between parenting behaviors and later economic engagement. This correlation warrants further and more detailed investigation, and perhaps experimental evidence that could help determine causation can be attained in the future. Although the direction of causation remains ambiguous the significance of these results warrants well thought out experiments to assist in determining the causation that is at work. This work serves to create a discussion of how one could define non-cognitive skills that are applicable to one's life, although the author had originally hoped to cover the longer horizon of one's lifetime. This work has shown that parenting behaviors exhibited in 1997 have a significant impact on whether or not a child as a young adult will be engaged in a productive endeavor in 2005. Further research will need to be done using similar measures to explore if parenting styles have a lasting impact on the wealth and education of children. As this paper is completed another wave of data from the PSID, CDS, and TA are being readied for release, this extra data will add two to three more years on to the horizon of similar research. Thus, as the children in the CDS grow into young adults and some choose to stay within the PSID family of surveyed individuals, the TA data will become a richer source for thought experiments of this type.

6 Limitations

As interesting as the author has tried to make this work for the reader, it must be mentioned that there are limitations that should be recognized. In the interest of full disclosure some important facts should be plainly stated. Heteroscedasticity, the variance, is correlated to changes within

the families income level. It is not difficult to argue that the variability in whether or not a prospective student will attend college is a function of their family's wealth; because of a lower wealth, a family's financial constraints will decrease the variability at the low end of the wealth scale as compared to the high end of the wealth scale. No test was run to confirm this, but robust standard errors have been used for the computation of all the test statistics.

Another limitation of the initial analysis stems from some missing regressors that lead to what could be considered correlation between the error term in the primary equation and within the observed outcomes. In particular, the following condition exists within our primary model:

$$\varepsilon_i = \xi_1 \textit{Subject Child has a Dependent}_i + \xi_4 \textit{BusClimate2005}_i$$

This problem is evident since it can be argued that whether a young adult has a dependent (child or adult) is deterministic, considered together or separately, of their having a job and being in school. The relationship here between the probability of finding work, given the requisite skills of the individual and the broadly measured business climate during 2005, are also controls needed within the primary model. This analysis could be done using Real US GDP as a determinate to allow for the difficulty of finding a job given the current economic climate, although the economic growth for 2005 was rather strong.

The analysis ultimately suffers from one critical factor that severely hampers the ability to infer causation: endogeneity of the explanatory variables. It is not hard to understand that a behavior can certainly cause a rational care-giver to modify their given approach to nurturing. This very causal relationship erodes the foundation of the direction of influence that be ascertained. If there were some measures of whether any significant events caused a change in the attitude of the Primary Care Giver, or perhaps a random change of heart possibly based on a recent event changing the PCG's outlook on life, the true effect of parenting behaviors could be ascertained. Providing any one of the aforementioned circumstances is a source of exogenous change within care giving behaviors. Widely publicized events from the news may cause some introspection, or an event that happened personally to the PCG independent of any behavior exhibited by the child. One could look for events that are job related, such as the loss of a job or a layoff and check for changes in responses on subsequent surveys. A layoff would arguably be a better source of exogenous shock to the PCG's outlook than the simple loss of their job as it could easily be argued that their outlook effected their employability, specifically within an economic downturn that occurs at a national level, provided the downturn is mild. The current national crisis –the recession of 2008-09– though very bad, may create the 'shock' that researchers would need to clarify the source of correlation described within this paper. Of course, some data-sets one never seeks.

7 Future Analysis

Upon reflection of the queried results from the model when regressed against the data and the assumptions that has been made, the research could have more quickly arrived at the core of

the issue in consideration by comparing the outcome of the Woodcock Johnson scores versus the parenting measures. The PSID and CDS have school district measures that could be included to control for any variances within the many factors that differ across the subjects surveyed. Marrying this with the CDS data to analyze characteristics of Parenting Styles and their subsequent influence upon the financial viability of the child's adult life seems a good basis for analysis. Remembering that the endogeneity between the parenting style and the behavior exists, this analysis would provide a more interesting and believable set of marginal effects that could be analyzed and perhaps add another dimension to any future data gathering surveys. This analysis would help define a set of measures with which future analysis of parenting interactions might be quantified or analyzed.

8 References

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9 Appendix: Tables

9.1 Multinomial Logit

Table 8: Parenting Measures, Proposed Model

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>
drive1	0.549 (0.48)	0.806* (0.52)	1.444*** (0.59)
drive2	0.426 (0.75)	0.090 (0.84)	1.294* (0.89)
play	-0.083 (0.53)	-0.853** (0.50)	-0.378 (0.52)
limtvself	-0.428 (0.46)	0.123 (0.52)	-0.723* (0.49)
limtvoftn	-0.414 (0.49)	0.559 (0.54)	-0.710 (0.52)
mealtv	0.618** (0.33)	0.274 (0.32)	0.593** (0.35)
dadint	1.263** (0.69)	0.942 (0.73)	0.437 (0.72)
father_97	-0.514 (0.64)	-0.349 (0.68)	0.301 (0.61)
menexpagr	-1.304 (0.91)	-2.188*** (0.94)	-1.136 (0.96)
menexpdis	-1.572** (0.94)	-1.671** (0.92)	-1.222 (0.96)
erlydeva	0.212 (0.50)	0.617 (0.49)	0.400 (0.55)
dinwpar	0.234 (0.63)	0.806 (0.65)	-0.339 (0.59)
bath	-0.304 (0.30)	0.215 (0.32)	-0.101 (0.33)
discp	0.435 (0.32)	0.236 (0.32)	0.550* (0.34)
spank	0.279 (0.33)	-0.153 (0.31)	0.184 (0.33)
intrulenf	0.055 (0.52)	-0.434 (0.52)	1.336** (0.69)
intrulesm	-0.368 (0.50)	-0.512 (0.48)	0.624 (0.68)
intrulesf	-0.052 (0.56)	0.103 (0.54)	0.946 (0.73)
_cons	0.094 (0.67)	0.240 (0.66)	-1.549** (0.81)

empst= 0 if subject child has no HS diploma nor a GED and are not working,
 1 if subject child has no HS diploma nor a GED and but they are working,
 2 if subject child is enrolled in a 2 year college but is not working,
 3 if subject child is a full time student, or a part time student and working,
 See Table 4 on Tables section

* represents significance at the 15% level

** represents significance at the 10% level

***represents significance at the 5% level

Table 9: Parenting Measures, Including Parental Education Model

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>
male	0.229 (0.23)	-0.415** (0.25)	-0.261 (0.25)
single	0.399 (0.34)	-1.251*** (0.42)	-0.253 (0.38)
married	-0.093 (0.34)	0.133 (0.35)	0.196 (0.36)
age19	-0.036 (0.30)	-0.175 (0.30)	0.119 (0.32)
age20	-0.114 (0.30)	-0.187 (0.30)	0.176 (0.31)
age21	0.193 (0.56)	0.826 (0.60)	0.401 (0.63)
cmpedh_c	0.035 (0.28)	0.546*** (0.27)	0.202 (0.30)
cmpedh_gr	-0.887 (0.73)	1.037** (0.54)	0.402 (0.58)
cmpedf_c	-0.295 (0.32)	0.734*** (0.31)	0.406 (0.33)
cmpedf_gr	-1.586 (1.14)	1.376*** (0.64)	0.498 (0.68)
drive1	0.742* (0.49)	0.272 (0.54)	1.189*** (0.58)
drive2	0.676 (0.80)	-0.432 (1.07)	1.151 (0.91)
play	-0.026 (0.52)	-0.936** (0.53)	-0.395 (0.53)
limtvself	-0.409 (0.47)	0.069 (0.53)	-0.707 (0.50)
limtvoftn	-0.327 (0.48)	0.412 (0.55)	-0.722 (0.53)
mealtv	0.550** (0.33)	0.285 (0.34)	0.591** (0.35)
dadint	1.283** (0.72)	1.148* (0.78)	0.509 (0.75)
father_97	-0.269 (0.65)	-0.979 (0.70)	0.091 (0.64)
menexpagr	-1.632** (0.94)	-1.509* (0.97)	-0.883 (0.99)
menexpdis	-1.802** (0.96)	-1.331 (0.97)	-1.050 (0.99)
erlydeva	0.319 (0.50)	0.623 (0.47)	0.332 (0.53)
dinwpar	0.255 (0.64)	0.621 (0.67)	-0.476 (0.60)
bath	-0.261 (0.30)	0.095 (0.33)	-0.118 (0.34)
discp	0.478* (0.33)	-0.023 (0.36)	0.455 (0.35)
spank	0.288 (0.33)	-0.099 (0.33)	0.161 (0.34)
intrulenf	0.242 (0.54)	-1.045** (0.56)	1.133* (0.71)
intrulesm	-0.318 (0.51)	-0.893** (0.52)	0.494 (0.69)
intrulesf	0.010 (0.58)	-0.306 (0.58)	0.818 (0.75)
_cons	-0.377 (0.78)	1.206* (0.77)	-1.312 (0.92)

empst= 0 if subject child has a HS diploma, a GED or not, and are not working,
1 if subject child has a HS diploma, a GED or not, but they are working,
2 if subject child is enrolled in a 2 year college but is not working,
3 if subject child is a full time student, or a part time student and working,
See Table 4 on Tables section

* represents significance at the 15% level

** represents significance at the 10% level

***represents significance at the 5% level

Table 10: No parenting Measures, Benchmark Model

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>
own	0.135 (0.27)	-0.033 (0.30)	0.275 (0.34)
wealth_99_23q	0.118 (0.29)	0.012 (0.32)	0.107 (0.35)
wealth_99_4q	0.717 (0.60)	0.059 (0.58)	0.577 (0.65)
nhome_99_2q	0.828*** (0.36)	0.373 (0.38)	0.672** (0.40)
nhome_99_3q	1.025*** (0.49)	1.206*** (0.43)	1.261*** (0.47)
nhome_99_4q	0.184 (0.63)	0.656 (0.56)	0.452 (0.62)
nhome_05_2q	0.387 (0.35)	0.272 (0.38)	0.782** (0.42)
nhome_05_3q	-0.581* (0.37)	0.035 (0.36)	0.795*** (0.39)
nhome_05_4q	-0.863** (0.46)	-0.234 (0.40)	0.545 (0.42)
wealth_05_23q	0.448* (0.27)	0.191 (0.30)	-0.099 (0.30)
wealth_05_4q	0.643 (0.49)	0.677 (0.49)	0.120 (0.48)
male	0.174 (0.23)	-0.392* (0.24)	-0.386* (0.26)
single	0.514* (0.33)	-0.967*** (0.42)	0.046 (0.40)
married	0.046 (0.32)	0.028 (0.31)	-0.132 (0.34)
age19	-0.233 (0.30)	-0.185 (0.30)	0.002 (0.33)
age20	-0.161 (0.29)	-0.228 (0.30)	0.202 (0.31)
age21	0.179 (0.56)	0.715 (0.57)	0.454 (0.62)
cmpedh_c	-0.152 (0.27)	0.410* (0.27)	-0.141 (0.29)
cmpedh_gr	-1.089 (0.77)	0.814* (0.54)	-0.114 (0.61)
cmpedf_c	-0.315 (0.33)	0.497** (0.30)	0.201 (0.32)
cmpedf_gr	-1.556 (1.10)	1.078** (0.61)	0.381 (0.67)
_cons	-0.400 (0.42)	-0.250 (0.42)	-0.914** (0.48)

empst= 0 if subject child has a HS diploma, a GED or not, and are not working,
1 if subject child has a HS diploma, a GED or not, but they are working,
2 if subject child is enrolled in a 2 year college but is not working,
3 if subject child is a full time student, or a part time student and working,
See Table 4 on Tables section

* represents significance at the 15% level

** represents significance at the 10% level

*** represents significance at the 5% level

Table 11: Parenting Measures, Encompassing Model

Empst	Educ. \leq (HS or GED) & Working	2 Year Degree & Not Working	2 or 4 Year Degree & Working
	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>	$\hat{\beta}$ <i>RobustSE</i>
own	0.155 (0.29)	0.037 (0.33)	0.375 (0.35)
wealth_99_23q	0.097 (0.31)	-0.003 (0.33)	0.136 (0.37)
wealth_99_4q	0.671 (0.62)	0.066 (0.61)	0.623 (0.65)
nhome_99_2q	0.729** (0.38)	0.397 (0.41)	0.563 (0.41)
nhome_99_3q	0.976** (0.50)	1.227*** (0.44)	1.339*** (0.49)
nhome_99_4q	0.200 (0.63)	0.702 (0.57)	0.404 (0.64)
nhome_05_2q	0.414 (0.37)	0.348 (0.41)	0.660* (0.43)
nhome_05_3q	-0.561* (0.38)	0.091 (0.38)	0.751** (0.41)
nhome_05_4q	-0.879** (0.46)	-0.203 (0.40)	0.441 (0.43)
wealth_05_23q	0.420* (0.28)	0.044 (0.31)	-0.101 (0.31)
wealth_05_4q	0.574 (0.49)	0.559 (0.50)	0.107 (0.49)
male	0.155 (0.24)	-0.517*** (0.25)	-0.403* (0.27)
single	0.421 (0.35)	-1.110*** (0.42)	0.023 (0.40)
married	-0.108 (0.35)	0.066 (0.35)	-0.047 (0.37)
age19	-0.130 (0.31)	-0.140 (0.31)	0.115 (0.34)
age20	-0.189 (0.30)	-0.221 (0.31)	0.127 (0.32)
age21	0.161 (0.57)	0.888* (0.60)	0.493 (0.62)
cmpedh_c	-0.127 (0.29)	0.366 (0.29)	-0.141 (0.32)
cmpedh_gr	-1.182* (0.77)	0.644 (0.55)	-0.244 (0.63)
cmpedf_c	-0.386 (0.34)	0.594** (0.32)	0.281 (0.34)
cmpedf_gr	-1.643 (1.16)	1.262** (0.67)	0.429 (0.69)
drive1	0.409 (0.53)	0.028 (0.56)	0.795 (0.63)
drive2	0.496 (0.80)	-0.403 (1.10)	1.057 (0.98)
play	-0.043 (0.51)	-0.896** (0.52)	-0.167 (0.56)
limtvself	-0.321 (0.50)	0.092 (0.55)	-0.688 (0.54)
limtvofn	-0.253 (0.51)	0.369 (0.56)	-0.716 (0.56)
mealtv	0.597** (0.35)	0.305 (0.36)	0.600* (0.37)
dadint	1.185* (0.73)	1.032 (0.77)	0.426 (0.73)
father_97	-0.434 (0.66)	-1.249* (0.77)	-0.137 (0.66)
menexpagr	-1.426* (0.93)	-1.342 (0.97)	-0.734 (1.01)
menexpdis	-1.539* (0.94)	-1.134 (0.97)	-0.890 (1.02)
erlydeva	0.270 (0.51)	0.578 (0.49)	0.176 (0.55)
dinwpar	0.236 (0.63)	0.726 (0.73)	-0.581 (0.62)
bath	-0.239 (0.31)	0.093 (0.34)	-0.132 (0.36)
discp	0.563** (0.34)	0.007 (0.38)	0.528 (0.37)
spank	0.334 (0.34)	0.011 (0.34)	0.252 (0.35)
intrulenf	0.224 (0.55)	-1.196*** (0.58)	0.741 (0.71)
intrulesm	-0.304 (0.53)	-1.013** (0.55)	0.089 (0.69)
intrulesf	-0.007 (0.59)	-0.371 (0.59)	0.515 (0.74)
_cons	-0.752 (0.82)	1.146 (0.82)	-1.435* (0.98)

empst= 0 if subject child has a HS diploma, a GED or not, and are not working,
1 if subject child has a HS diploma, a GED or not, but they are working,
2 if subject child is enrolled in a 2 year college but is not working,
3 if subject child is a full time student, or a part time student and working,
See Table 4 on Tables section

* represents significance at the 15% level
** represents significance at the 10% level
*** represents significance at the 5% level

Table 12: **Multinomial Logit: Likelihood Ratio Tests with respect to Encompassing Model**

$x_{i,j}$	LR_i	$2(\mathcal{L}_{ur} - \mathcal{L}_r)$	Result
Whether the ‘Head’ owns their home/mobile 1999	-792.00416	1.37192	Reject
2 nd &3 rd qrtle Balance of wealth 1999	-791.4364	0.2364	Reject
4 th qrtle Balance of wealth 1999	-792.50907	2.38174	Reject at 10%
2 nd qrtle Net Home Equity 1999	-793.35849	4.08058	Fail to Reject
3 rd qrtle Net Home Equity 1999	-796.63964	10.6429	Fail to Reject
4 th qrtle Net Home Equity 1999	-792.15328	1.67016	Reject
2 nd qrtle Net Home Equity 2005	-792.61231	2.58822	Reject at 10%
3 rd qrtle Net Home Equity 2005	-797.20081	11.7652	Fail to Reject
4 th qrtle Net Home Equity 2005	-795.77592	8.91544	Fail to Reject
2 nd &3 rd qrtle Balance of wealth 2005	-793.16412	3.69184	Fail to Reject
4 th qrtle Balance of wealth 2005	-792.50769	2.37898	Reject at 10%
LogPsL = -791.3182			
$\chi^2_1 = 2.71$ at the 10% significance level $\Rightarrow LR < -792.673$			
See table 9.2 for variable definitions			

9.2 Variable Definitions

emp	TA050127	emp=1 if TA050127=1 or TA050127=2
empst	ER33816	empst= 0 if not working nor employed, 1 if not working and full part time student, 3 working and full or part time student, 2 if working and not in school
Proposed Model Covariates		
spank	Q1B13	Reported “Yes” to having spanked the child
erlydeva	Q2A37AA	“Agree”, “Strongly Agree” ...The way a parent treats a child in the first four years will have important life-long effects
dinwpar	Q1B15	Child eats a meal with both the mother and father few times per month to at least once per day
rdfreq1	Q1B14	They read to child several times a year to several times per month
rdfreq2		They read to child about once per week to every day
bath	Q2A21I	...Bathing children, changing diapers is a shared responsibility vs. “other”, “just him/herself” or “someone else”
discp	Q2A21J	Whether they “Shared” disciplining the child vs. “other”, “just him/herself” or “someone else”
drive1	Q2A21M	If “Other Household Member” drives children to activities
drive2		If PCG her/himself drives or “Shared” driving children to activities
play	Q2A21P	0 if other household member plays with children, 1 if respondent plays with children
manyrule	Q2A24	0 if Not Very Many Rules, 1 if Lots of Rules
strict	Q2A25	0 if rules “Not very strictly enforced”, 1 if rules “Strictly enforced”
intrulesm		Interaction of quantity and enforcement of rules - “Strictly Enforced” and “Many rules”
intrulesf		Interaction of quantity and enforcement of rules - “Strictly Enforced” and “Few Rules”
intrulenm		Interaction of quantity and enforcement of rules - “Not very strictly enforced” and “Many Rules”

intrulenf		Interaction of quantity and enforcement of rules -“Not very strictly enforced” and “Few Rules”
discp		PCG respondent shares in the discipline, 0 represents either Only the PCG, Other household member or someone else
limtvself	Q21A31A	Seldom,Sometimes put limits on tv -Never is in intercept-
limtvoftn	Q21A31A	“Often”, “Very Often” put limits on tv
mealtv	Q21A31C	“Sometimes”, “Seldom”, “Never” ...Permit TV watching during the evening meal
dadint	Q2A37V	“Agree”, “Strongly Agree” that it is essential for the child’s well being that fathers spend time interacting and playing with their children
menexpagr	Q2A37W	“Agree”, “Strongly Agree” that it is difficult for men to express their feelings
menexpdis	Q2A37W	“Disagree”, “Strongly Disagree” that it is difficult for men to express their feelings
father_97	Q1B2	If the child has a father figure living in the home
Benchmark Model Covariates		
own	ER10035	Whether the ‘Head of Household’ owns their home/mobile home, 1997
nhome_99_3q	ER416,ER417	Is equal to $ER416 - ER417$; Third quartile of net home equity, 1999
nhome_99_4q	ER416,ER417	Is equal to $ER416 - ER417$; Fourth quartile of net home equity, 1999
wealth_99_23q	ER417	Second and Third quartiles of Balance of wealth “equity” not including net home equity, 1999
wealth_99_4q	ER417	Fourth quartile of Balance of wealth “equity” not including net home equity, 1999
nhome_05_3q	S716,S717	Is equal to $S716 - S717$; Third quartile of net home equity, 2005
nhome_05_4q	S716,S717	Is equal to $S716 - S717$; Fourth quartile of net home equity, 2005
wealth_05_23q	S717	Second and Third quartiles of Balance of wealth “equity” not including net home equity, 2005
wealth_05_4q	S717	Fourth quartile of Balance of wealth “equity” not including net home equity, 2005
cmpedh_c	ER12222	‘Head’ completed college
cmpedh_gr	ER12222	‘Head’ completed at least some graduate school
cmpedf_c	ER12223	‘Wife’ completed college
cmpedf_gr	ER12223	‘Wife’ completed at least some graduate school
single	ER25023	2005, PCG “Never Married”, “Widowed”
married	ER25023	2005, PCG “Married”
male	ER32000	Gender of child is male
age19	ER33804	
age20	ER33804	
age21	ER33804	

PSID, CDS, Variable Definitions

	ER32000	Sex of Individual
1997	ER33403	1997 Relationship to Head
1997	ER12079	Total Family Money Income in 1996
1997	ER416	“WEALTH199 (1999 NO MAIN HOME EQUITY)”
1997	ER417	“WEALTH299 (1999 MAIN HOME EQUITY INCL)”
1997	ER25028	“A19 OWN/RENT OR WHAT”
1997	ER12222	Head’s Completed Education Level

continued on the next page

1997	ER12223	Wife's/"Wife's" Completed Education Level
2005	ER26533	W1. Do you (or your family living there) have any real estate other than your main home, such as a second home, land, rental real estate, or money owed to you on a land contract?
2005	ER26607	W43. Since January 2003, did you (or your family living there) put aside money in any private annuities or IRAs?
2005	ER28037	Total 2004 Family Money Income
2005	S708	W1. Do you (or your family living here) have any real estate other than your main home, such as a second home, land, rental real estate, or money owed to you on a land contract?
2005	S716	"WEALTH105 (2005\$ NO MAIN HOME EQUITY)"
2005	S717	"WEALTH205 (2005\$ MAIN HOME EQUITY INCL)"
2005	ER33813	B1. We would like to know about what you do—are you (HEAD) working now, looking for work, retired, keeping house, a student, or what?king for work, retired, a student, keeping house, or what?
2005	ER25023	A3. Are you (HEAD) married, widowed, divorced, separated, or have you never been married?
2005	ER33804	Age at the Time of the 2005 Interview
2005	ER33803	2005 Relationship to Head
1997	Q1B5	How often does (CHILD) eat a meal with both mother and (father/stepfather/adoptive father/father-figure)?
1997	Q1B13	Have you ever spanked (CHILD)?
1997	Q1B14	How often do you read to (CHILD)?
1997	Q1E9F	...shown (CHILD) physical affection (kiss, hug, stroke hair, etc.)?
1997	Q2A21I	...Bathing children, changing diapers
1997	Q2A21J	...Disciplining children
1997	Q2A21M	...Driving children to activities
1997	Q2A24	Some families have many rules and other families don't have very many rules. Which kind of family do you have, one with lots of rules, or not very many rules?
1997	Q2A25	Are your rules strictly enforced, or not very strictly enforced?
1997	Q2A31A	For the next questions. please indicate how often you do the following. ...Set limits on how much time your child(ren) can watch TV in a day?
1997	Q2A31C	...Permit TV watching during the evening meal?
1997	Q2A37V	...It is essential for the child's well being that fathers spend time interacting and playing with their children
1997	Q2A37W	...It is difficult for men to express tender and affectionate feelings toward children
1997	Q2A37AA	...The way a parent treats a child in the first four years has important life-long effects
1997	ER33414	G89. Was (he/she) enrolled as a full-time or part-time student?
2005	TA050931	Financial Responsibility
2005	ER33816	"WHETHER STUDENT 05"
2005	TA050596	"G12 WHETHER FULL OR PART TIME STUDENT"
2005	TA050130	"E3 WHETHER WORKING FOR MONEY NOW"
2005	TA050946	"ENROLLMENT STATUS"
2005	TA050044	Measure of personal responsibility
2005	TA050127	E1. We would like to know about what you do – are you working now, looking for work, keeping house, a student, or what?–1ST MENTION
2005	ER33816	G89. Was (he/she) enrolled as a full-time or part-time student?

Table 13: **Descriptive Statistics for wealth variables**

Variable	Obs	Mean	Std. Dev.	Min	Max
nhome_99	662	42732.74	86152.23	0	1096072
nhome_05	672	81780.5	146831.1	0	2000000
wealth_99	662	132263.6	800988.4	-898150	1.78e+07
wealth_05	672	194641.8	1520061	-138000	3.71e+07

Table 14: **Age Distribution of Young Adults, 2005**

	Freq.	Percent	Cum.
18	217	32.29	32.29
19	193	28.72	61.01
20	225	33.48	94.49
21	37	5.51	100
Total	672	100	

Table 15: **Distribution of Young Adults**

empst	Freq.	Percent	
≤ GED or HS Diploma & Not Working	0	140	20.83
≤ GED or HS Diploma & Working	1	193	28.72
2 year College and Not Working	2	197	29.32
2,4 Year College or Grad student and working	3	142	21.13
Total	672	100	

Table 16: **Distribution ...Shown Child Physical Affection?,1997**

	Freq.	Percent	Cum.	
	0	661	96.83	96.83
	3	1	0.15	98.51
	7	6	1.36	98.19
Times/Week	10	1	0.45	98.64
	20	1	0.45	99.1
	100	1	0.45	99.55
Total	672	99.55		

Table 17: **Empst given Freq. Shown Child Physical Affection,1997**

	Empst=	Freq.	Percent
≤ GED or HS Diploma & Not Working	0	1	10.00
≤ GED or HS Diploma & Working	1	2	20.00
2 year College and Not Working	2	3	30.00
2,4 Year College or Grad student and working	3	4	40.00
Total		10	100

Table 18: **Distribution Student Status vs. Work Status, 2005**

	Employed	Not Employed	Total
Full Time	110	205	315
Part Time	28	15	43
Total	138	220	358

Table 19: **Distribution Parent's Education**

	Freq.	Percent
'Head' No HS Diploma/GED	135	20.00
'Head' High School	219	32.59
'Head' College/Some or 2 Year Degree	157	23.36
'Head' College Grad	82	12.2
'Head' Grad School	57	8.48
Total	650	96.63
	Freq.	Percent
'Wife' No HS Diploma/GED	275	40.92
'Wife' High School	150	22.32
'Wife' College/Some or 2 Year Degree	119	17.71
'Wife' College Grad	65	9.67
'Wife' Grad School	44	6.55
Total	653	97.17

Table 20: **Distribution of Sample Subjects enrolled below grade 10, 2002**

Variable	Obs	Mean	Std. Dev.	Min	Max
ER33804	22	18.77273	.869144	18	20

2005 Sample of subjects 18 to 21, one sample subject in grade 1
 21 in sample in grade 9 2002 which implies older than average age for grade

Table 21: **Distribution of Strict Many-Rules**

	Many-Rule			
	0	1	Total	
Strict	0	343	46	389
	1	97	186	283
Total	440	232	672	

Table 22: **Empst given Strict and Few Rules**

	Play		No Play		
	Freq.	Percent	Freq.	Percent	
	Empst=	0	13	14.13	2
	1	24	26.09	1	20.00
	2	37	40.22	2	40.00
	3	18	19.57	0	0.0
Total	92	100.00	5	100.00	

Table 23: **Empst given Strict and Many Rules**

	Play		No Play		
	Freq.	Percent	Freq.	Percent	
	Empst=	0	39	23.21	4
	1	43	25.60	8	44.44
	2	53	31.55	4	22.22
	3	33	19.64	2	11.11
Total	168	100.00	18	100.00	

Table 24: **Empst given Not Strict and Few Rules**

	Play		No Play		
	Freq.	Percent	Freq.	Percent	
	Empst=	0	19	17.76	54
	1	37	34.58	66	27.97
	2	23	21.50	59	25.00
	3	28	26.17	57	24.15
Total	107	100.00	236	100.00	

Table 25: **Empst given Not Strict and Many Rules**

	Play		No Play		
	Freq.	Percent	Freq.	Percent	
	Empst=	0	9	23.68	0
	1	12	31.58	2	25.00
	2	14	36.84	5	62.50
	3	3	7.89	1	12.50
Total	38	100.00	8	100.00	