Health Endowments and Unemployment during Macroeconomic Crises

Prashant Bharadwaj, Petter Lundborg and Dan-Olof Rooth*

March 2014

Abstract

This paper shows that health endowments at birth can have important repercussions for labor market outcomes during large financial crises. Using data on adult males during Sweden's severe economic crisis in the early 1990's, we show that adults who were born with lower birth weight were much more likely to go on unemployment insurance and stay on it for years after the crisis. The returns to birth weight in the labor market also increase after the crisis. These results hold while controlling for individual education and occupational sorting prior to the crisis, and for controlling for maternal inputs by using a twins fixed effect. We conclude that health at birth is a potentially important indicator of vulnerability during macroeconomic shocks.

*Bharadwaj: UC San Diego (prbharadwaj@ucsd.edu), Lundborg: Lund University, Rooth: Linneaus University. Much thanks to Julie Cullen, Bhash Mazumder, Karthik Muralidharan and Petra Persson for comments.

1 Introduction

A large literature in Economics has examined the causes and consequences of macroeconomic fluctuations. Given the importance of health human capital for labor market outcomes, an important facet of the literature on consequences of economic fluctuations has examined whether and how events like recessions, job displacements and business cycles affect health outcomes (Sullivan and Von Wachter 2009, Ruhm 2000, Currie and Tekin 2011, Stillman and Thomas 2008). Some of this work has focussed on how such events affect early childhood health or even health at birth (see for example Paxson and Schady (2005), Chay and Greenstone (2003) and Dehejia and Lleras-Muney (2004)); this research is especially important given the research highlighting the long term economic implications of health in utero and during infancy (Almond and Currie 2011, Heckman 2007).

While examining the consequences of macroeconomic shocks on health is extremely important, it is also critical to understand whether people with poorer health *ex ante* are more vulnerable to job loss during a crisis. The research in this area has largely examined how business cycles affect labor market outcomes across a wide range of demographic characteristics such as age, gender, sex, race and education (Engemann and Wall 2009, Cho and Newhouse 2012, Hoynes, Miller, and Schaller 2012). However, despite the large body of important work in this area, there appears to be a dearth of studies examining whether predetermined health dictates the degree to which one is affected during economic downturns. In this paper we build on the literature documenting the long term consequences of early childhood health and on the literature examining who is affected during a crisis to show that *pre-determined health endowments*, such as health at birth, are an important marker for labor market vulnerability during economic downturns.

We study the economic crisis in Sweden in the early 1990's when unemployment went from less than 2% to around 8% in 2 years. This crisis is referred to as one of the "Big Five" downturns along with that of Spain, Norway, Finland and Japan according to Reinhart and

Rogoff (2008). Many observers of the Great Recession in 2008 compared it to the Swedish crash of the 1990s, and especially noted the ways in which Sweden recovered from the crisis (New York Times, September 22, 2008; Time, September 24, 2008). While much has been written about the causes and consequences of the crisis in the Nordic countries during the early 1990's (Gorodnichenko, Mendoza, and Tesar 2012, Englund 1999, Jonung, Kiander, and Vartia 2009), the main import from these studies appears to be that the crisis was a result of a combination of various factors including monetary policies in the 1980's, budget deficits, financial deregulation and collapse of trade.

Using birth weight as an indicator of health at infancy,[1] we examine how adults who were born with lower birth weight fare during the Swedish crisis. We find that adults who were born with poorer health at birth were much more likely to face job loss and go on unemployment insurance during the crisis. Importantly, we find that these adults tended to stay on UI for a while after the crisis indicating a persistent impact on their labor market outcomes. Lower birth weight adults also appear to dip into their pensions earlier after the crisis, although this result is not statistically significant. Recognizing that birth weight likely represents nutritional inputs and other attributes of the mother that might confound such long term analysis, we examine plausibly exogenous variation in birth weight within twin pairs similar to prior studies (Black, Devereux, and Salvanes 2007, Almond, Chay, and Lee 2005, Royer 2009).

While there is debate regarding the generalizability of twins based studies, some studies have shown that using twins fixed effects to identify the effect of birth weight on various short, medium and long run outcomes is comparable to using sibling fixed effects (Oreopoulos, Stabile, Walld, and Roos 2008, Bharadwaj and Neilson 2014). Twins studies examining the role of birth weight typically also rely on the idea that parental investments or behaviors do not react to birth weight differences. However, we need even *weaker* assumptions about the role of parental investments compared to prior settings since we examine twin pairs

[1] In this we follow prior studies like Almond, Chay, and Lee (2005) among many others.

before and after the crisis and use panel data on twin pairs (Bharadwaj, Eberhard, and Neilson 2011, Figlio, Guryan, Karbownik, and Roth 2013). Under the assumption that all birth weight specific investments are made prior to the crisis, our estimates would effectively hold these differential investments constant. The fact that OLS results are small and largely insignificant underscores the need for controlling for unobserved characteristics that might otherwise be correlated with birth weight and labor market outcomes.

Importantly, we find that the relationship between health at birth and UI take up during the crisis is not entirely determined by intermediating factors like educational attainment or pre-crisis selection into certain occupations. For example, since the private sector and manufacturing industry was hit extensively by the crisis, one hypothesis might be that lower birth weight twins select into sectors and occupations that just happened to be hit harder by the crisis. While birth weight determines occupational sorting to some degree (lower birth weight individuals are more likely to enter the public sector for example), our results hold even when we examine twin pairs who worked in the *same* sector, 3 digit or 5 digit occupation code (while magnitudes are similar for all three, we lose statistical significance due to smaller samples when restricting the data to same occupation codes). While job tenure is an important determinant of hiring/firing decisions in the Swedish context, we unfortunately do not observe job tenure in the data.

Examining this relationship requires rather unique data. Most electronic birth records even in countries known for their excellent administrative records (for example Norway) start in the late 1960's. For this reason, examining how pre determined health endowments affect job attachment during major crises has been under-explored since subjects for whom we have reliable birth data are generally too young to be observed for a substantial period in the labor market before and after the crisis. In the case of Sweden, we use a unique source of twin birth records collected for nearly the entire population of births between 1929-1956. Hence, most of our sample is observed while they were active in the labor market for ten

years before and after the crisis. These unique birth records are then matched to individual yearly income (including income from sources such as unemployment insurance, disability, sickness etc) records from 1981-2005.

Recent work has shown the importance of social assistance programs in improving early childhood health, as well as long run effects of early exposure to social safety nets (Bitler and Currie 2005, Hoynes, Schanzenbach, and Almond 2012). Our paper adds to this literature by showing that better health at infancy can be particularly protective during periods of economic fluctuations. Hence, we add another dimension by which early childhood health related spillovers of safety net programs become important in that children born with better health as a result of these programs are themselves *less* likely to take up social assistance later in life. Finally, this study is also important for highlighting the role of social assistance during a crisis. One of the fundamental questions about the design of optimal insurance policy is the extent to which it can mitigate morally arbitrary misfortunes of nature. By exploiting random variation in birth weight, we are able to show that social assistance, at least in the case of Sweden, appears to come to aid of those who were born at a health disadvantage.

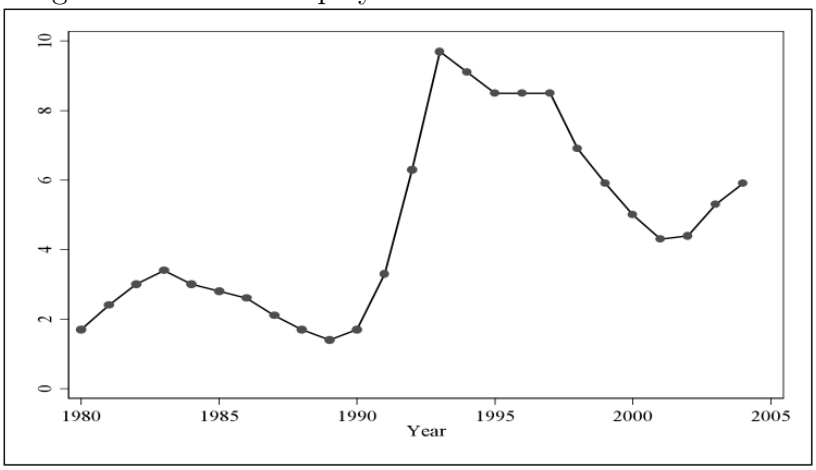
2 Background

2.1 The 1990s crisis in Sweden

Unlike most European countries, unemployment in Sweden remained low during the 1980s and fluctuated between 2 to 4 percent. In the later part of the decade the Swedish economy experienced a boom which pushed unemployment further down to a low of 1.5 percent in 1989. This exceptionally good period in the Swedish labour market was followed by the worst recession since the 1930s. The sharp rise in unemployment began in 1990 as unemployment for men increased from 1.7 percent in 1990 to 9.7 percent in 1993, see Figure 1. The open

unemployment rate then remained at about 8 percent until it started to fall in 1997. The crisis also caused a severe decrease in employment. In 1990, total employment for men stood at 85.2 percent, and then began its fall to 73.0 percent in 1993. The decrease in employment occurred in both the private and the public sector (Lundborg, 2000).

Figure 1: Male Unemployment 1980-2004. Stats Sweden



The current US labor market crisis in many ways resembles the Swedish crisis in the 1990s, with its rapid increase in the unemployment rate. In 2010, the US unemployment rate was 9.6 percent, where close to 30 percent had been unemployed for more than one year (OECD, 2011). This fraction of long-term unemployment was more than two and a half times higher than the one in 2008. Moreover, in both the Swedish and US crises, debts in the real estate sector played an important role.

In describing the roots of the Swedish crisis, we rely heavily on Englund (1999) and Holmlund (2011). At the beginning of the 1980s the Swedish economy was characterized by a regulated credit market, a fixed exchange rate, and fiscal policies that aimed at full employment. Inflation, to a large extent driven by rapidly increasing wages, was consistently higher compared to the neighboring economies and reached a high of over 10 percent in 1990 (Holmlund 2011). In order to protect its export industry from increasing costs, Sweden devalued the Swedish krona on six occasions between 1973 and 1982.

Despite high inflation, the real interest rate was extremely low, and sometimes even negative,

as a result of a tax system with high marginal tax rates combined with generous opportunities for interest deductions. The Swedish credit market had been tightly regulated since WWII, but during the first half of the 1980s the credit market was deregulated. The increased ability to borrow, combined with a tax system that made loans cheap, created a price bubble in real estate. Further, and as discussed earlier, unemployment was low throughout the decade, and extremely low in the second half, and probably lower than equilibrium level of unemployment (Holmlund 2011). Overall, these circumstances led to sharp increases in prices and wages in the Swedish market in the late 80s.

Then a series of factors - mostly policy-driven - interacted to create a sharp contraction of the Swedish economy. We make no statement about which factors were most important and only aim to describe them. First, in 1991 a new tax system with lower marginal tax rates and reduced opportunities for interest deductions was introduced. This implied an increase in real interest rates, resulting in a sharp fall in property prices. In downtown Stockholm, the price of real estate decreased by 35 percent in 1991 (Englund, 1999, pp. 90). Between 1988 and 1992 household savings increased by 12 percentage points, which constituted an important reason for the sharp decline in domestic demand between 1990 and 1993 (Holmlund, 2011, pp. 4).

Second, the central bank decided to defend a fixed exchange rate. This implied that devaluations of the Swedish currency were no longer going to be used to compensate for the negative effect of wage inflation on the competitiveness of the export industry. In the end of the 80s, production and employment in the export industry started to fall rapidly. The central bank defended the fixed exchange rate until November 1992 when they finally decided the Swedish Krona to float, which in practice led to a devaluation of the currency. The defense of the fixed exchange rate also led to increased interest rates, but internationally higher interest rates as a result of the German unification and the introduction of the new tax system also played a role in this increase (Englund, 1999, pp. 89).

Third, the crises coincided with a dramatic reduction in labor demand in the public sector. This was caused by large deficits in public finances during this period, leading to cuts in public spending. Instead of compensating for the fall in private section labour demand, as was often done in the past, the reduction in public employment instead contributed to the fall in overall employment during the crisis.

The crisis lasted until the late 1990s. The reason for this prolonged period of the crisis was a desire to keep restrictive fiscal and monetary policies. Monetary policy had to be restrictive in order to create credibility for the new low-inflation regime, while fiscal policy had to deal with the budget deficit by increasing taxes and cutting costs. During the late 90's both fiscal and monetary policy became less restrictive, while at the same time the international economy improved.

2.2 The UI System in Sweden

The Swedish public unemployment insurance system dates back to 1935, when a state-sponsored, voluntary, unemployment insurance was introduced. Prior to 1935, existing unemployment funds were independently and privately organized by different trade unions but their finances were typically weak and the benefit levels low. Under the new system, the unemployment funds were still to be organized by the unions but a number of requirements were introduced in order for the funds to be part of the state-sponsored unemployment insurance. The latter essentially meant that the unemployment funds were no longer dependent on their members contribution but also received funding from the state in order to finance their payment of unemployment benefits to their members.

The basic rules that regulate the right to reimbursement from the unemployment funds have in large been the same since the 1930s. Then, it was required that one was at least 16 years of age, able to work, and had reported as seeking a job at the Swedish Public Employment Service. Moreover, the membership and employment requirements were introduced, which

are still in place today although in a different version. Between 1973 and 1994, the former requirement meant that in order to receive compensation, one needed to have been a paying member of the unemployment fund for at least 12 months before becoming unemployed.[2] The employment requirement meant that one needed to have worked a certain number of days during a certain period. The exact number of days and the period has varied somewhat over time; between 1989 and 1994 the requirement was for instance that one needed to have been working at least 75 days within any four month period during those last 12 months before becoming unemployed. Note that the benefit levels and the eligibility criteria are set by the government and the task of the funds is simply to evaluate if a person applying for unemployment benefits fulfill the criteria. For full compensation, it has also been required that the reason for unemployment is due to involuntary unemployment. Unemployment benefits could still be paid to workers who quit their job and become unemployed or to workers who get fired due to misbehavior, but the rules then become less generous.[3]

The government subsidies to the unemployment funds are substantial; in the early 1990s, the subsidies covered about 95 percent of all unemployment benefits paid out (Carling et al. 2001). The monthly membership fees, which are typically small, thus cover only a small part of the benefits paid out. During the same period, about 80 percent of the recorded unemployed workers were members of an unemployment fund. Unemployed non-members could between 1976 and 1997 receive so called cash assistance (Kontant Arbetsmarknadsstd, KAS) from the government but the benefits paid out was much lower than those of the unemployment funds and the entitlement period substantially shorter.

By international standards, the replacement rate in the Swedish unemployment insurance has historically been generous. Whereas the 80s and early 90s saw replacement rates of about 90 percent of earnings one needs to take into consideration that there was a ceiling on the benefit level. This means that the actual replace rate may be much lower than 90 percent

[2]Between 1976 and 1989, the requirement was 75 days during a 5-month period.

[3]In such cases, the rules allow the unemployment funds to subtract days of compensation to the person. In 2007, for instance, a worker who voluntarily quit his job, lost 45 days of unemployment benefits.

and especially so for high-earning workers. In 1996, it was for instance estimated that 75 percent of employees had monthly earnings exceeding the ceiling (SOU, 1996, p. 51). From 1974 and onwards, unemployed workers could receive unemployment benefits for a total of 300 days. Workers aged 55 and above could receive benefits for 450 days.

The unemployment insurance system became somewhat less generous in 1993. On July 1st, 1993, the replacement rate was first reduced to 80 percent and then further reduced to 75% in 1996 but then increased to 80 percent again in 1997 (Carling et al, 2001). In 1994 the working requirement was also changed such that one needed to have worked for at least 75 hours per month during a five month period, or alternatively, for 65 hours per month during a 10 month period. This had the effect that part time workers and youths found it more difficult to qualify for unemployment benefits. The duration of unemployment benefit payments was, however, not changed.

3 Data and Econometric Specification

3.1 Data

The data used for this paper has been described in greater detail in Bharadwaj, Lundborg and Rooth (2013) and hence, we only provide a brief summary here. We use data from a subset of the historical register of nearly all Swedish twins born between 1926-1958. This twin registry was put together by collecting information from local delivery archives around Sweden. The records contain information on date and location of birth, birth weight, sex and year of death, among other variables. A large survey of twins from the universe of this twin registry was conducted in 1972. Our data consists of all twins that were interviewed as of 1972; hence, there is some degree to which we selectively observe only those twin pairs born between 1926-1958 who survive till 1972.

The data on birth records thus obtained was matched with yearly labor market data, with individual records starting in 1968. Starting in 1974, these income and earnings records show the individual source of income (labor market earnings, self employment earnings, income from welfare etc). Specifically, unemployment insurance as a category of earnings first appears in 1978, and is reported consistently ever since.[4] It is important to note that these income records are reported by the employer on tax forms and are not self reports. Hence, we consider this data to be rather accurate. All income related variables are adjusted using the 2007 CPI. Finally, information on individual years of schooling are obtained from the education register (utbildningsregistret, UREG) from 1990 or 2007, where years of schooling has been imputed based on obtained degree. For the overwhelming majority of people, we thus have register-based information on schooling.

We obtained occupation data for the years 1985 and 1990 from Statistics Sweden which were then matched with the twins records. These data contain detailed codes on occupation and sector of employment. We classify "white collar" jobs as those that take the single digit code of 1, 2 or 3 according to the Swedish Standard Classification of Occupations (SSYK). These broad codes are categories for "legislators, senior officials and managers", "professionals" and "technicians and associate professionals" respectively. While we use the finer classifications of occupations as controls, we only use the broad categories to define occupational categories like "white collar".

3.2 Econometric Specification

We follow other papers that have used twins fixed effects as the basis for our empirical specification. For a given outcome Y (say take up of unemployment insurance) for person i

[4]Welfare earnings appear in 1974 and sickness benefits appear in 1981, although a major change in the definition of sickness benefits occurred in 1992.

belonging to family j in year t, we estimate the following relationship:

$$Y_{ijt} = \beta_t BW_{ijt} + \gamma_t X_{ijt} + \eta_j + \epsilon_{ijt} \tag{1}$$

In this equation BW is log birth weight measured in grams or a measure of low birth weight (less than 2500 grams for example, or less than some specific threshold) and X's are individual specific controls, which in our case amounts to years of education (since we do not have other characteristics that might vary at the individual level), and importantly η_j is the twin or family fixed effect. In other words, β_t can be interpreted as the coefficient on the difference in birth weight within twins in a given calendar year t. We estimate equation 1 for years before and after the crisis for the regression tables and for each year for the graphs. The coefficient of interest is β_t. We cluster standard errors at the family level and restrict the sample to people who were younger than 65 years of age (retirement age in Sweden) between 1993 and 1998. The average person in our sample is 43 years old in 1990.

Traditional twins based estimates do not use repeat observations on twin pairs, and the classical interpretation of a twins fixed effect model in the context of birth weight requires the assumption that post birth investments within twin pairs are not correlated to birth weight. While this might be true in some contexts as in Bharadwaj, Eberhard and Neilson (2013), this might not apply more generally. However, in our case, because we are examining how the birth weight effect varies in years leading up to and right after the crisis, the assumptions needed are weaker. To the extent that all post birth differential investments are captured in years leading up to the crisis, a comparison of post and pre crisis birth weight effect would net out any differential investments (we can think of this design as essentially being a difference in differences design). Given that the economic downturn in Sweden was unexpected and exogenous to individual level birth weight, it is difficult to imagine a case where investments or actions specific to birth weight occurred right around the crisis, and that also affected labor market outcomes.

4 Results

4.1 Unemployment

We begin by examining the relationship between unemployment insurance take up and birth weight in the years leading up to and after the crisis. Figure 2 shows the twins fixed effects estimates of estimating equation 1 for each year between 1980 and 2005. The independent variable in this case is the natural log of birth weight, although other related variables are examined in a later table (for example indicators for being less than 2000 grams, less than 1500 grams etc). The dependent variable is a binary variable which takes on the value of 1 if a person is observed to have income from unemployment insurance in that year. Given the description of UI in Sweden in the previous section, UI is a good indicator of job loss in this context.

Figure 2:

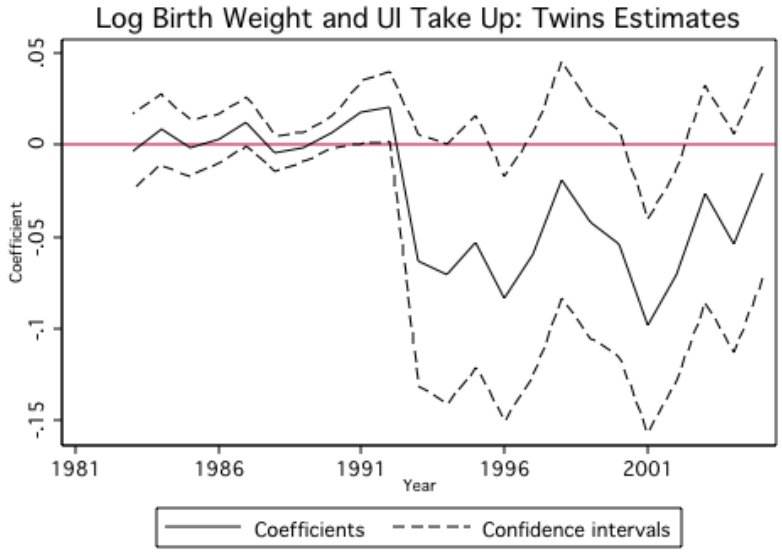


Figure 2 very clearly shows the main point of this paper: adults who were relatively higher birth weight than their twin counterparts are less likely to go on UI after the crisis. Figure 2 also shows that the birth weight-UI relationship is persistent after the crisis. Those that

happened to go on UI after the crisis appear to stay on it for many years hence. While the standard errors in this figure seem large, pooling pre and post crisis years improves precision. The estimates in Table 1 show this relationship by combining a few years before the crisis (1985-1990) and few years after the crisis (1993-1998).[5] The dependent variable in the top panel of Table 1 is a binary variable that takes on the value of 1 if a person is ever observed as being on UI during each of the periods (pre-crisis mean is 0.01 and post crisis mean is 0.2). The dependent variable for the bottom panel is the length of time a person receives UI payments measured in years (pre crisis mean is 0.013 and post crisis mean is 0.67). Unfortunately, we do not have data on precise months of UI support received; hence, any year in which a person has some income from UI is counted as a year spent on UI. The years 1991 and 1992 are transitionary years before the full effect of the crisis hit, and while all the figures include it, we omit them in the regressions as it is unclear whether they should be included in the pre or post crisis years. Including them in either category however, makes little difference to the overall results.

Table 1 shows in regressions that birth weight matters significantly for UI take up after the crisis. Before the crisis, the average length of time spent on UI was extremely low and it is therefore not surprising to find no relationship with birth weight. Between 1993-1998 (post crisis years) a 10% increase in birth weight (approximately 260 grams) results in a 0.008 percentage point lower probability of being on unemployment insurance. This is a 4% effect over the mean (the average probability of being unemployed is 0.2). The effect is slightly larger for discordant twins (twins whose birth weight differs by more than 10%).

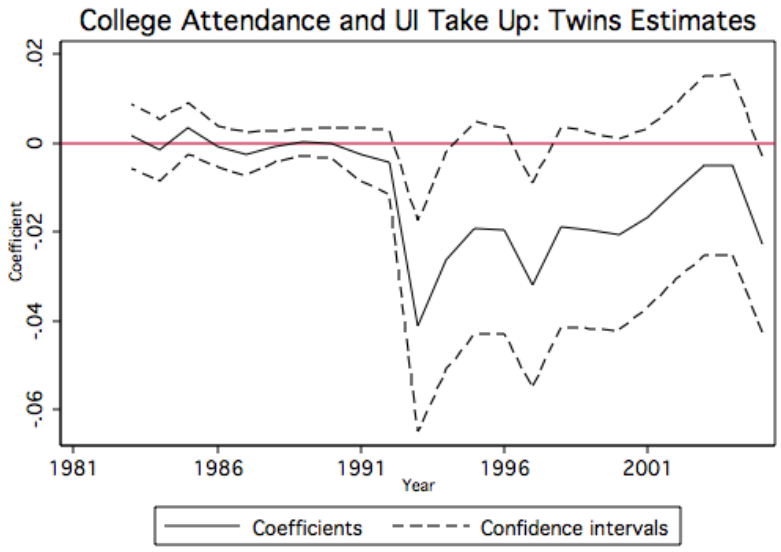
Examining the bottom panel of Table 1, birth weight also plays a significant role in the time spent on UI. A 10% increase in birth weight is associated with a 0.035 years (a little less than half a month) decrease in time spent on UI. Relative to the mean, this is a 5%

[5]Since UI is only available to people who were previously employed, we condition the "pre" years on being employed in 1985 and the "post" years on being employed in 1990. Note that we only have direct employment and occupational data from 1985 and 1990. Occupational data come from the census which were conducted at 5 year intervals until 1990 in Sweden. Moreover, Table 1 uses all the available data; for results using a balanced panel of twins see Appendix Table 1. The results are qualitatively the same.

effect. Examining the coefficient on the dummy variable indicating college degrees in the lower panel allows us to place the magnitude of the birth weight effect in context. The effect of having gone to college reduces the time spent on UI by 20% over the post crisis mean. Hence, the birth weight effect is about a quarter of the effect of having gone to college. The last two columns show the OLS coefficients, and the post crisis OLS coefficient is small and statistically insignificant. This indicates a large role for unobservables that might be at play in determining UI take up after the crisis which are controlled for in the twins analysis. Table 2 supports the findings of Figure 2 in that lower birth weight adults are significantly more likely to stay on UI even between 1999-2005.

Appendix Table 2 examines results by zygosity. In the immediate post crisis years, birth weight among monozygotic (MZ) twins does not predict unemployment status; however, lower birth weight does predict unemployment between 1999-2005. Note that among MZ twins. even in the pre-crisis years, lower birth weight adults are more likely to be on UI. The birth weight effect in 1999-2005 is nearly four times the effect seen in the pre crisis years. Among dizygotic twins, the effect of birth weight on UI take up is largely concentrated in 1993-1998. with a smaller and statistically insignificant effect in 1999-2005.

Figure 3:



Appendix Table 3 examines whether there is any non linearity in the birth weight-UI relationship (we examine length of time spent on UI) before and after the crisis. While most of the coefficients are not significant at the conventional levels, the magnitudes indicate some strong non linearities in this relationship. Most of the effects appear concentrated in the below 2000 gram range and these non linearities are different based on discordancy. For example, being less than 2000 grams increases the likelihood of ever being on UI after the crisis by around 4 percentage points among all twins and among discordant twins, while being less than 1500 grams has a similar effect among the group of all twins, but the effect is nearly double when examining discordant twins. Comparatively, the effects are quite a bit lower for individuals who were less than 2500 grams, the threshold for a low birth weight classification. It is important to note that while being less than 2500 grams is considered low when compared to the overall population, among twins, the average twin weighs around 2600 grams.

4.2 The Role of Occupational choice

Table 3 examines in finer detail whether occupational sorting in the pre crisis years is a potential mechanism for the results in Table 1. Columns 2-4 control for various aspects of occupational choice such as sector of employment (this was included in Table 1, hence the estimates are same as in Table 1), skills required at the job (white collar) and detailed 5 digit occupation codes. The results are quite stable across these difference specifications; hence, it does not appear that birth weight specific occupational sorting explains much of the results seen in Table 1, although adding occupation controls makes the results more precise. Appendix Table 3 examines directly whether birth weight is a determinant of occupational sorting. The results show that birth weight is a determinant of sorting into white collar jobs and public sector employment. A 10% increase in birth weight is associated with a 0.01 percentage point (or 5% over the mean) decrease in the probability of being employed in the

public sector. Higher birth weight also predicts a greater likelihood of entering white collar jobs. To examine this idea further columns 5-7 in Table 3 restrict the sample to twins who share the same sector, 3 digit or 5 digit employment code. Restricting the sample to twins in the same sector results in larger magnitudes; for twins in the same 5 digit occupation code, the birth weight effect is quite large. A 10% increase in birth weight results in a 0.02 percentage point decrease in unemployment, which is a 10% effect over the mean. Hence, even when twins share detailed occupation codes, the effects of birth weight appear to be large and statistically significant.

4.3 Other sources of income

Table 4 examines other sources of income before and after the crisis in a similar fashion. Both birth weight and having attended college appear more important in the post crisis years for determining labor income. Birth weight is almost twice as important (even though it was significantly important in the pre crisis years) in determining labor income after the crisis. However, birth weight does not seem to have a differential effect before and after the crisis on withdrawing an early pension or going on welfare. The figures below show this graphically.

5 Conclusion

A growing literature has shown the deleterious effects of major financial crises on health. However, very few have examined whether pre-existing health is a determinant of who is affected during large recessions. This paper shows that health at birth as proxied by birth weight is an important source of vulnerability during macro economic crisis and is a predictor of job loss during a large financial crisis. Using data on male Swedish twins to control for maternal inputs that might affect both health at birth and subsequent job attachment, we

Figure 4:

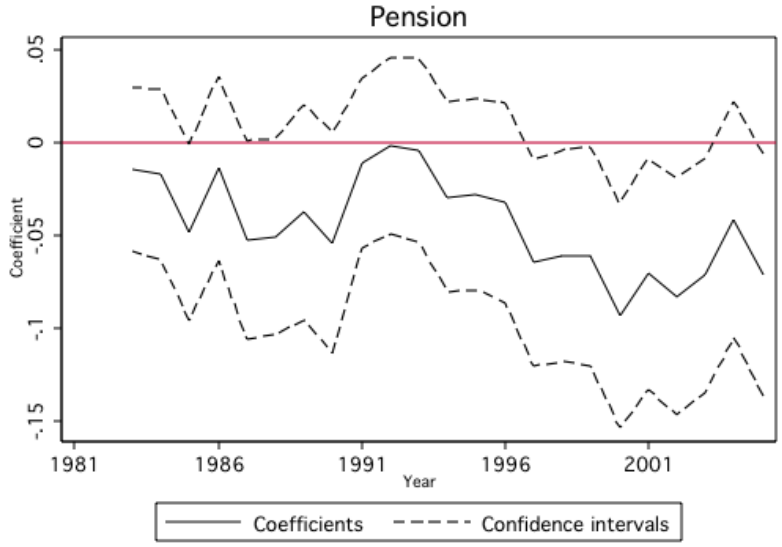
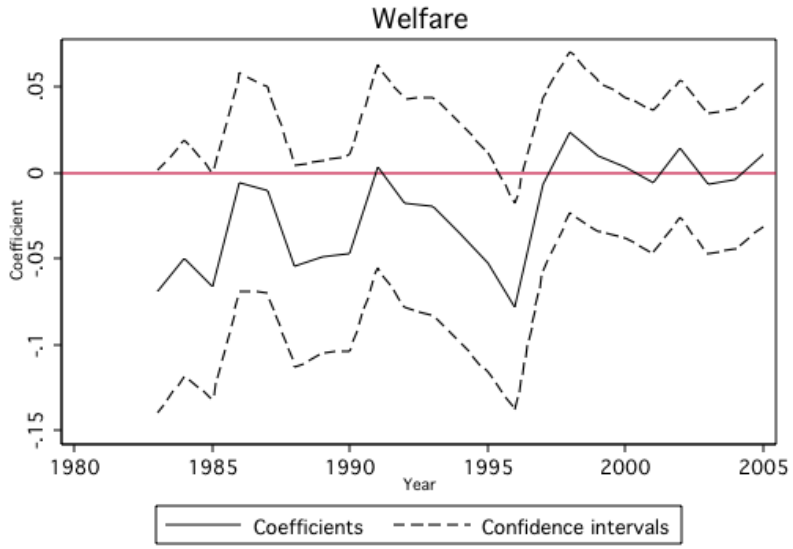


Figure 5:



find that lower birth weight twins not only become unemployed when the crisis hits, but that lower birth weight twins tend to remain unemployed for many years after the crisis. While education and occupational sorting are factors behind who becomes unemployed, these factors do not explain all of the birth weight effect.

References

Almond, D., K. Chay, and D. Lee (2005): "The Costs of Low Birth Weight," *The Quarterly Journal of Economics*, 120(3), 1031–1083.

Almond, D., and J. Currie (2011): "Killing me softly: The fetal origins hypothesis," *The Journal of Economic Perspectives*, 25(3), 153–172.

Bharadwaj, P., J. Eberhard, and C. Neilson (2011): "Do Initial Endowments Matter only Initially? Birth Weight, Parental Investments and Academic Achievement," *Working Paper, University of California, San Diego*.

Bharadwaj, P., and C. Neilson (2014): "Birth Weight and Mortality: A Note on Twins and Sibling Fixed Effects," *Working Paper*.

Bitler, M. P., and J. Currie (2005): "Does WIC work? The effects of WIC on pregnancy and birth outcomes," *Journal of Policy Analysis and Management*, 24(1), 73–91.

Black, S., P. Devereux, and K. Salvanes (2007): "From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes*," *The Quarterly Journal of Economics*, 122(1), 409–439.

Carling, K., B. Holmlund, and A. Vejsiu (2001): "Do benefit cuts boost job finding? Swedish evidence from the 1990s," *The Economic Journal*, 111(474), 766–790.

Chay, K. Y., and M. Greenstone (2003): "The impact of air pollution on infant mortality: evidence from geographic variation in pollution shocks induced by a recession," *The quarterly journal of economics*, 118(3), 1121–1167.

Cho, Y., and D. Newhouse (2012): "How did the great recession affect different types of workers? Evidence from 17 middle-income countries," *World Development*.

Currie, J., and E. Tekin (2011): "Is the foreclosure crisis making us sick?," *NBER Working Paper Series*, 17310.

Dehejia, R., and A. Lleras-Muney (2004): "Booms, busts, and babies' health," *The Quarterly Journal of Economics*, 119(3), 1091–1130.

Engemann, K. M., and H. J. Wall (2009): "The effects of recessions across demographic groups," *Federal Reserve Bank of St. Louis Working Paper Series*.

Englund, P. (1999): "The Swedish banking crisis: roots and consequences," *Oxford review of economic policy*, 15(3), 80–97.

Figlio, D. N., J. Guryan, K. Karbownik, and J. Roth (2013): "The Effects of Poor Neonatal Health on Children's Cognitive Development," Discussion paper, National Bureau of Economic Research.

Gorodnichenko, Y., E. G. Mendoza, and L. L. Tesar (2012): "The finnish great depression: From russia with love," *The American Economic Review*, 102(4), 1619–1643.

Heckman, J. (2007): "The economics, technology, and neuroscience of human capability formation," *Proceedings of the National Academy of Sciences*, 104(33), 13250–13255.

Hoynes, H. W., D. L. Miller, and J. Schaller (2012): "Who suffers during recessions?," Discussion paper, National Bureau of Economic Research.

Hoynes, H. W., D. W. Schanzenbach, and D. Almond (2012): "Long run impacts of childhood access to the safety net," Discussion paper, National Bureau of Economic Research.

Jonung, L., J. Kiander, and P. Vartia (2009): *The great financial crisis in Finland and Sweden: the Nordic experience of financial liberalization*. Edward Elgar Publishing.

Oreopoulos, P., M. Stabile, R. Walld, and L. Roos (2008): "Short-, Medium-, and Long-Term Consequences of Poor Infant Health An Analysis Using Siblings and Twins," *Journal of Human Resources*, 43(1), 88–138.

Paxson, C., and N. Schady (2005): "Child health and economic crisis in Peru," *The World Bank Economic Review*, 19(2), 203–223.

Reinhart, C. M., and K. S. Rogoff (2008): "Is the 2007 US sub-prime financial crisis so different? An international historical comparison," Discussion paper, National Bureau of Economic Research.

Royer, H. (2009): "Separated at girth: Estimating the long-run and intergenerational Effects of Birthweight using Twins," *American Economic Journal - Applied Economics*.

Ruhm, C. J. (2000): "Are recessions good for your health?," *The Quarterly Journal of Economics*, 115(2), 617–650.

Stillman, S., and D. Thomas (2008): "Nutritional Status During an Economic Crisis: Evidence from Russia*," *The Economic Journal*, 118(531), 1385–1417.

Sullivan, D., and T. Von Wachter (2009): "Job displacement and mortality: An analysis using administrative data," *The Quarterly Journal of Economics*, 124(3), 1265–1306.

Table 1: Birth Weight and UI

Ever take up UI	All Twins		Discordant Twins		OLS	
	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)
Log Birth Weight	0.00454	-0.0812*	0.00499	-0.0968**	0.00274	-0.0287
	(0.0126)	(0.0439)	(0.0128)	(0.0450)	(0.00542)	(0.0217)
College	0.00654	-0.0270	0.00581	0.0114	0.00202	-0.0780***
	(0.00480)	(0.0166)	(0.00664)	(0.0226)	(0.00299)	(0.00932)
Number of Twin Pairs/Obs in OLS	5186	5077	2759	2693	10352	10143

Number of Years with some UI take up	All Twins		Discordant Twins		OLS	
	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)
Log Birth Weight	0.0128	-0.352**	0.0134	-0.402**	0.00200	-0.103
	(0.0193)	(0.164)	(0.0195)	(0.168)	(0.00869)	(0.0839)
College	0.00812	-0.110*	0.00767	0.0359	0.00396	-0.306***
	(0.00660)	(0.0617)	(0.00847)	(0.0821)	(0.00431)	(0.0347)
Number of Twin Pairs/Obs in OLS	5186	5077	2759	2693	10352	10143

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Average take of UI post (pre) crisis is 0.2 (0.01) and the average length is 0.67 (0.01). Conditional on some UI take up, the average number of years with some UI take up is 3.25. All specifications control for sector of employment in 1990.

Table 2: Birth Weight and UI Take up 1999-2005

	Ever on UI			Years on UI		
	All twins	Discordant twins	OLS	All twins	Discordant twins	OLS
Log Birth Weight	-0.0984**	-0.120**	-0.0247	-0.391**	-0.465**	-0.163**
	(0.0471)	(0.0484)	(0.0213)	(0.177)	(0.182)	(0.0793)
College Education	-0.00993	0.0222	-0.0664***	-0.0427	0.0343	-0.247***
	(0.0173)	(0.0239)	(0.00907)	(0.0604)	(0.0841)	(0.0313)
Number of twin pairs/obs	5,040	2,672	9,573	5,040	2,672	9,573
Mean of dependent variable	0.188	0.191	0.188	0.561	0.575	0.561

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Birth Weight and UI Post Crisis

Ever take up UI 1993-1998	1	2	3	4	5	6	7
Log Birth Weight	-0.0647	-0.0812*	-0.0755	-0.0748*	-0.0821	-0.189*	-0.238**
	(0.0441)	(0.0439)	(0.0479)	(0.0446)	(0.0605)	(0.102)	(0.116)
College	-0.0519***	-0.0270	-0.0136	-0.0426**	-0.0427	-0.0902*	-0.102
	(0.0160)	(0.0166)	(0.0190)	(0.0186)	(0.0269)	(0.0523)	(0.0699)
Mean of dependent variable	0.209	0.209	0.208	0.209	0.225	0.232	0.218
Number of Years with some UI take up 1993-1998							
Log Birth Weight	-0.297*	-0.352**	-0.376**	-0.293*	-0.395*	-0.499	-0.396
	(0.165)	(0.164)	(0.181)	(0.163)	(0.222)	(0.306)	(0.335)
College	-0.188***	-0.110*	-0.0730	-0.127*	-0.107	-0.167	-0.271
	(0.0593)	(0.0617)	(0.0691)	(0.0691)	(0.0981)	(0.197)	(0.273)
Other controls	none	Sector of employment	2+white collar job	5 digit occupation code	Both twins in same sector	Both twins in same 3 digit occupation	Both twins in same 5 digit occupation
Mean of dependent variable	0.682	0.682	0.678	0.682	0.729	0.786	0.720
Number of twin pairs		5,076	4,998	5,077	2,717	848	645

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Birth Weight and Other Income Sources

	Log Labor Income		Years with some pension take		Years with some welfare take	
	Pre-Crisis	Post Crisis	Pre-Crisis	Post Crisis	Pre-Crisis	Post Crisis
Log Birth Weight	0.106**	0.173**	-0.0187	-0.0191	-0.0329	-0.0233
	(0.0413)	(0.0748)	(0.0179)	(0.0238)	(0.0244)	(0.0243)
College Education	0.123***	0.237***	0.0187**	-0.0128*	-0.0323***	-0.0293***
	(0.0160)	(0.0261)	(0.00744)	(0.00773)	(0.00868)	(0.00815)
Number of twin pairs	5,186	5,077	5,186	5,077	5,186	5,077
Mean of dependent variable	12.34	12.37	0.0651	0.113	0.0914	0.0800

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 1: Birth Weight and UI - Balanced Panel

	All Twins		Discordant Twins		OLS	
Ever take up UI	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)
Log Birth Weight	0.00454	-0.0589	0.00499	-0.0750	0.00172	-0.0241
	(0.0126)	(0.0446)	(0.0128)	(0.0457)	(0.00543)	(0.0221)
College	0.00654	-0.0223	0.00581	0.0141	0.00211	-0.0715***
	(0.00480)	(0.0169)	(0.00664)	(0.0228)	(0.00306)	(0.00941)
Number of Twin Pairs/Obs in OLS	4,760	4,760	2,528	2,528	9,499	9,499

	All Twins		Discordant Twins		OLS	
Number of Years with some UI take up	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)
Log Birth Weight	0.0128	-0.238	0.0134	-0.294*	0.000568	-0.0988
	(0.0193)	(0.164)	(0.0195)	(0.168)	(0.00884)	(0.0844)
College	0.00812	-0.107*	0.00767	0.0401	0.00424	-0.278***
	(0.00660)	(0.0627)	(0.00847)	(0.0821)	(0.00445)	(0.0345)
Number of Twin Pairs/Obs in OLS	4,760	4,760	2,528	2,528	9,499	9,499

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Average take of UI post (pre) crisis is 0.2 (0.01) and the average length is 0.67 (0.01). Conditional on some UI take up, the average number of years with some UI take up is 3.25. All specifications control for sector of employment in 1990.

Appendix Table 2: Birth Weight and UI Take up by Zygosity

	Monozygotic Twins			Dizygotic Twins		
Ever take up UI	1985-1990	1993-1998	1999-2005	1985-1990	1993-1998	1999-2005
Log Birth Weight	-0.0323**	-0.00933	-0.129*	0.0161	-0.112**	-0.0734
	(0.0150)	(0.0682)	(0.0694)	(0.0164)	(0.0556)	(0.0559)
College Education	0.00264	0.0241	0.0287	0.00816	-0.0520***	-0.0268
	(0.00817)	(0.0299)	(0.0295)	(0.00584)	(0.0198)	(0.0197)
Number of twin pairs/obs	2,057	1,951	2,077	3,292	3,110	3,402
Mean of dependent variable	0.00948	0.208	0.168	0.0101	0.206	0.173

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 3: Birth Weight and Time on UI - Non Linearities

	All Twins		Discordant Twins		OLS	
	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)	Pre Crisis (1985-1990)	Post Crisis (1993-1998)
Less than 1500 grams	-0.0163	0.0409	-0.0181	0.0836	-0.00971***	0.0666
	(0.0179)	(0.0701)	(0.0200)	(0.0765)	(0.00116)	(0.0513)
Less than 2000 grams	0.00691	0.0429*	0.00834	0.0414	0.00457	0.0374**
	(0.00830)	(0.0244)	(0.00928)	(0.0261)	(0.00445)	(0.0168)
Less than 2500 grams	-0.00180	0.00783	-0.000888	0.0219	-0.00178	0.00626
	(0.00385)	(0.0145)	(0.00420)	(0.0161)	(0.00210)	(0.00872)
Less than 3000 grams	-0.00509	0.00745	-0.00413	0.0135	-0.00384	0.00111
	(0.00355)	(0.0152)	(0.00379)	(0.0170)	(0.00247)	(0.00888)
Number of Twin Pairs/Obs in OLS	5186	5077	2759	2693	10352	10143

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4: Occupational choice and Birth Weight

	Employed (1990)	White collar job	Professional skills job	Public sector job
Log Birth Weight	0.0288	0.0797*	0.0145	-0.109**
	(0.0225)	(0.0458)	(0.0406)	(0.0456)
College	0.0138	0.386***	0.292***	0.284***
	(0.00841)	(0.0204)	(0.0207)	(0.0191)
Mean of dependent variable	0.957	0.399	0.188	0.212
Number of twin pairs	5,338	5,169	5,169	5,293

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1