Labor Market Shocks and Wealth Accumulation*

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Abstract

Separately exploiting exposure to plant closures and trade import competition in Sweden, we investigate how labor market shocks affect wealth accumulation and consumption in the short and long run. We find that: 1) exposure to acute labor market shocks leads to a significant decline in the value of total wealth that persists for a long time and is not explained by changes in earnings, 2) a large part of this decline is explained by the drop in (prospective) housing wealth as non-homeowners become less likely to enter the housing market and homeowners experience a decline in their housing wealth, 3) drop in financial assets contributes significantly, but to a lesser degree, to the decline in total wealth as those exposed substantially reduce their savings rate and decumulate both risky and safe financial assets, and 4) households significantly reduce their consumption in the aftermath of exposure. The effects are proportional to the size of the labor market shock. Our findings suggest that transitory labor market shocks could have long lasting effects on the wealth accumulation of those exposed.

JEL classifications: D14, F16, G11, G50, G51, J64, J65

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1 Introduction

Labor market shocks happen regularly and a large proportion of the working population face those in different forms and intensity during their lifetime.[1] While in some cases those exposed might lose their jobs, in others job security goes down and employment becomes more uncertain.

Because of its pervasiveness, and in some cases severity, the previous literature has tried to measure the welfare effects of exposure to (usually more severe) labor market shocks by documenting the earning effects for exposed workers and it has generally found significant and lasting effects. In a classic study, Ruhm (1991) finds that four years after displacement, while those who lose their jobs because of layoffs or plant closures are out of work only slightly more, they earn 10-13 percent less than their non-displaced counterparts. Jacobson et al. (1993a) and Couch and Placzek (2010) suggest that, six years after displacement, worker losses are between 13% and 25% of their pre-displacement earnings. Autor et al. (2014) show that individuals whose industries of employment experienced high import shocks generate lower cumulative earnings in subsequent years.[2] Using German data, Burdett et al. (2020) argue that the workers' major cost of job loss and the main reason driving lower earnings is foregone human capital accumulation while unemployed.

Unlike the effects of labor market shocks on employment and earnings, our knowledge of the potential impact of these shocks on wealth accumulation of individuals is much more limited. Wealth reflects the accumulation of advantage across time and has a unique role in smoothing consumption and providing a safety net to buffer shocks. It is also associated with important life and intergenerational outcomes net of other socioeconomic predictors (Charles and Hurst, 2003, Killewald et al., 2017, Black et al., 2020) and, therefore, is a better and more permanent indicator of well-being than income. Understanding the link between labor market shocks and wealth is important in trying to measure the magnitude of the long-run impact caused by such events.

Drops in earnings could lead to less (or even negative) savings that results in less accumulated wealth. However, it is important to note that wealth effects of labor market shocks cannot necessarily be backed out from earnings effects and potential changes in aggregate contributions to savings that follow. Exposure to labor market shocks could affect wealth accumulation through generating differential returns on investment and beyond its effects on earnings. This could happen because of at least two reasons. First is housing investment. Non-homeowners who would have entered the housing market

[1] Examples include recessions, plant closures, technology shocks, automation, import shocks, industry regulations, dissolution of labor unions, etc.

[2] Other research on the incidence of broadly defined labor market shocks and individual labor market outcomes include, but is not limited to, Topel (1990), Davis and Von Wachter (2011), Walker (2013), and Yagan (2019).

could drop out because of having less savings for down-payment or, generally, having more limited access to the credit market after losing their jobs, earning less, or having more uncertain employment. To a lesser extent, homeowners could be forced to sell their house or downsize their residence to smooth their consumption of other goods.[3] This is important because homeownership causes substantial wealth accumulation (Sodini et al., 2023).[4]

The second reason is that being exposed to labor market shocks could affect investment in risky financial assets. The previous literature has documented negative relationships between different measures of income risk (mostly variance) and equity holdings (Betermier et al., 2012, Fagereng et al., 2018, D'Astous and Shore, 2022). If those exposed reduce their holdings of risky assets, they could miss out on the equity premium in the long run and accumulate less financial wealth.

Because of its severity, and abrupt nature, plant closures provide a setting in which one can study the effect of labor market shocks. Using administrative data on the universe of plants in Sweden, we identify plant closures by observing workplaces that cease to exist from one year to another. By using matched workplace-employee data, we observe all workers who face such closures during our study period. To account for the non-random nature of the closures, we follow the plant closure literature and employ propensity score matching, where workers subject to a closing of their workplace are matched to very similar workers at similar workplaces who happen to not close down.[5] With our rich data, we can match on a large number conditioning variables, including workplace size, sector, location, and individuals characteristics such as pre-closure tenure, education, earnings, and detailed information about wealth and its different categories. The resulting data set is a panel of workers (and their counterparts in the control group) that we can follow across time and who faced similar trends in the outcomes before the plant closures took place.

Before analyzing wealth outcomes, we confirm and document the extent of labor market shocks realized through plant closures by investigating exposed workers' labor market outcomes, such as the incidence of unemployment and earnings in the labor market. Apart from setting up a first stage for the analysis of asset market, this would also help with comparing the labor market shocks in Sweden with those observed in other countries. This makes it easier to extend our findings to other settings.

We find those exposed to plant closures are 25 percentage points more likely to be unemployed the year after separating from their previous employers. This figure drops

[3] Homeowners could also refinance their mortgages, but that would not affect their total wealth.

[4] This, of course, depends on house price growth but, as shown in Sodini et al. (2023), price growth in our period of study was not unusual by international or historical standards.

[5] The literature on the effect of plant closures and mass layoffs on labor market outcomes have a long tradition in economics, see for instance Ruhm (1991), Jacobson et al. (1993b), Stevens (1997), Kletzer and Fairlie (2003), Eliason and Storrie (2006), Couch and Placzek (2010), Hijzen et al. (2010), Seim (2019)

continuously to only 2 percentage points after 10 years. On the other hand, their (non-conditional) labor earnings drop by 15 percent the year after and remain 4 percent lower 10 years after. One might argue that what matters most for investment and savings behavior is total earnings and not labor earnings, especially in a welfare economy like Sweden. Total earnings go down by around 10 percent the year after the shock and remain only 2.5 percent lower after 10 years. The findings indicate that despite the initial significant drop in earnings, they mostly recover in the longer term. It is noteworthy that, although significant, both the short and long term cost of losing a job in Sweden is lower than in many other countries. This is in line with the findings in Bertheau et al. (2023).

Due to the presence of wealth tax in Sweden, we have access to a full picture of households' balance sheets at the end of each year from 1999 to 2007 when the tax was repealed. This data includes information on the universe of households' portfolio holdings at the security level, as well as information about their debt obligations and real estate valuation. We use this data to analyze changes in individuals' asset holdings across years.

Total wealth declines continuously for the first few years and, compared to the control group, it stands 5.5 percentage points lower than its preperiod value for those exposed. Importantly, it does not recover in the long run - 10 years after exposure, total wealth is 4.5 percent lower for the treatment group.

Drop in the value of total assets could be because of decline in i) the value of financial assets, ii) (prospective) housing wealth, or iii) the value of other real assets. We find that financial wealth declines by around 8 percent after three years and remains 10 percent lower after 10 years. Given that in the preperiod financial wealth, on average, accounts for 22 percent of total wealth in our sample of analysis, this indicates changes in financial wealth explains slightly more than 30 percent of the drop in total wealth after three years.

A decline in financial assets could happen because of negative net savings and, potentially, decumulating risky assets that would lead to losing out on equity premium in the long term. savings rate out of household disposable income goes down significantly after exposure. More specifically, after three years, savings rate stand 3 percentage points lower compared to a mean of 10 percent (a 30 percent effect) in preperiod.[6] Given that total disposable income is also negatively affected, these findings indicate that households contribute much less in absolute values to their savings.[7] Additionally, we find that the

[6] We can measure active financial savings from one year to the next since we have information on individual assets merged with prices. In the data section, we will explain in detail how we measure savings.

[7] A related paper is Basten et al. (2016) that studies the financial decisions of workers around both expected and unexpected job loss. They find increases in savings in the years leading up to the job loss and a depletion of savings thereafter. Our paper asks different questions, focuses on, arguably, unexpected labor market shocks, and differs in how we set up our empirical design. While Basten et al. (2016) rely on an individual fixed effects design, which follows the financial decisions of workers before and after job loss, we follow the plant closure literature and carefully match workers facing a plant closure with similar workers who did not but who followed similar trends in their outcomes in the years leading up to the plant closure. Thus, apart from asking different questions on wealth

value of risky assets (stocks and mutual funds with risky components) goes down by around 10 percent after three years.

Next we investigate (prospective) housing wealth and find that those exposed to the shocks have around 20,000 SEK (3,100 USD at the time) less wealth three years after displacement. This accounts for more than 60 percent of the drop in total wealth. One important mechanism explaining this decline is that non-homeowners who are exposed become 10 percent less likely to become a homeowner. The reverse mechanism also works, but to a lesser extent. We find that 1 in 100 of exposed homeowners become renters after the shock. Additionally, we provide suggestive evidence that some homeowners relocate to less expensive housing with smaller mortgages. We rule out the possibility that housing value for exposed individuals decline because plant closures can act as labor market shocks and bring down home values.

The important role that housing wealth plays in explaining the drop in total wealth is also evident when we investigate the relative effect of the shock on homeowners and non-homeowners separately. While in the short term total wealth decreases by less than 4 percent for homeowners, it goes down by around 16 percent for non-homeowners. Although, by construction, financial wealth accounts for a far larger share of total wealth for non-homeowners in the base period, it declines similarly by around 8 percent for both groups, suggesting that the difficulty getting into the housing market is the main reason the (prospective) total wealth goes down relatively much more for non-homeowners.

To provide a more comprehensive picture of how labor market shocks affect welfare of exposed individuals, we conclude our analysis by investigating consumption at the household level. While wealth is generally considered an aggregate measure of welfare, it is still important to understand to what extent exposed individuals are able to smooth consumption.[8] We find that those exposed reduce their consumption by around 5 percent during the first three years compared to the control group. Interestingly, while homeowners reduce their consumption by only 3 percent, non-homeowners' consumption goes down by 10 percent.[9]

We complement our analysis of plant closure with investigating exposure to import

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outcomes, our paper relates more closely to the impact of unexpected labor market shocks. Also, consistent with evidence from many other developed economics, we show that the labor market effects of plant closures are not quickly reversible. This is unlike the evidence presented in Basten et al. (2016) where they show labor market outcomes start to improve after one year in Norway. It should be noted that, in a robustness check, they run their individual fixed effects regressions on a small sample of workers who became unemployed in association with a mass layoff and find large, but less precisely estimated, increases in savings in the years leading up to unemployment. The strong pre-trends in savings indicate that many workers in their sample were expecting unemployment.

[8] To measure consumption, we follow the residual approach proposed by Koijen et al. (2014) and implemented in Di Maggio et al. (2020) that imputes consumption as a residual of households' disposable income net of other transactions. We explain this in more detail in the data section.

[9] These are consistent with findings in Stephens Jr (2001) that uses data on food consumption from PSID and shows that job displacement leads to significant reduced consumption but the changes are less volatile than earnings and less severe than the initial drop in the head of the household's earnings.

shocks as an alternative source of labor market shock. The labor market effects of import shocks have been studied quite extensively across many countries. Most of this research relies on increases in exposure to the Chinese import in the aftermath of China joining the WTO in 2001, famously coined by Autor et al. (2016) as China Shock. In this study, we use different industries' exposure to import competition and investigate the effect of import shocks on wealth accumulation of workers exposed to different levels of the shock.

Similar to other developed economies, Sweden was exposed to increases in trade competition especially after 2001. However, we show that import competition in Sweden was less severe than what has been documented in the literature for the U.S. (e.g. Autor et al. (2014) and Pierce and Schott (2016)). Also, trade competition in Sweden was on average a much less severe shock compared to plant closures. This makes it an interesting shock to study and helps complementing our understating of how labor market shocks of different severity affect wealth accumulation.

We find that while, on average, exposure to import shocks does not increase the chance of being unemployed in the years that follow, relative to the base period, those who are exposed generate less labor earnings and total earnings. Specifically, exposure to a mean shock decreased relative accumulated labor earnings during 2002-2007 compared to the average earnings during 1999-2001 by more than 5 percent and total earnings by 1 percent. Mean Import shocks lowered relative total wealth in 2007 compared to average wealth during 1999-2001 by around 1 percent. Similar to the effect of plant closures, we find that homeowners are affected much less than renters. While total wealth goes down by just around 0.4 percent for homeowners, the drop is 1.8 percent for non-homeowners. We also show that most of this effect is driven by housing wealth. While the effect on relative financial wealth was small - on average it went down by around 0.5 percent and it was not different for homeowners and non-homeowners, a mean value of the import shock lowered the value of housing wealth in 2007 by around 2.1 percent for non-homeowners. The corresponding figure for homeowners is 0.5 percent.

A related paper to ours is the recent work by Gomes et al. (2023), who use data from Sweden and document negative effects of adopting industrial robots in workers' industry of activity on wealth accumulation. The main focus of the study is changes in financial portfolio composition of households that contributes to the negative wealth effects. The authors show that households rebalance their financial wealth away from the stock market in response to increased risk induced by pervasive use of industrial robots and, as a result, attain lower wealth levels. The findings on portfolio rebalancing of exposed households is consistent with what we find. In addition to investigating different labor market shocks, our study also differs in our heavier focus on other components of wealth and showing that, during the same period, changes in housing wealth contributed much more to negative wealth effects of labor market shocks and that homeowners and non-homeowners were affected differently.[10] Finally, in addition to different components wealth, we measure consumption at the household level and try to understand the explicit effects of labor market shocks on households' welfare by estimating the consumption effects.

Apart from documenting how labor market shocks affect wealth accumulation, our study contributes to the literature that tries to understand the sources behind the rise in wealth inequality within developed economies. These studies have shifted away from dispersion of returns in the labor market (Aiyagari, 1994, Castaneda et al., 2003) and focused more heavily on heterogeneity in returns to financial and physical capital (Benhabib et al., 2011, Benhabib and Bisin, 2018). The main reason is that heterogeneity in human capital does not seem to be successful in explaining the rapid changes in wealth inequality. The more recent empirical work has found evidence in favor of the role of returns to financial capital as the main driver of changes in wealth inequality. Using administrative data from Norway and Sweden correspondingly, Fagereng et al. (2020) and Bach et al. (2020) find that returns to financial wealth exhibit substantial heterogeneity across individuals. Furthermore, they find that heterogeneity in returns reflects the differences in portfolio allocations. In this paper, we argue that labor market shocks could affect the dynamics of wealth inequality by affecting the holdings and composition of assets, including housing and risky financial assets, and alter returns to investments that could in turn change the path of wealth accumulation between those exposed to shocks and others.

2 Data

Data used for our analysis in this paper is mainly constructed by combining several Swedish administrative registers. The starting point is a population-wide data set on all Swedish citizens born between 1932 and 1980 that includes basic information such as place of residence and other demographic information. We merge this with data from income and taxation register, the wealth register, the education register, and the workplace register. Below, we explain some of the main data sources that we use or construct.

2.1 Wealth Register

The key outcome variables in our empirical analyses are taken from the Swedish Wealth Register (Förmögenhetsregistret). The register includes data on all assets, except retire-

[10] Gomes et al. (2023) acknowledge that the effects of increased automation extend beyond financial assets to the real assets of households by showing that increased exposure to robots in the workplace increases (decreases) the probability of households selling (buying) a house, but do not focus on measuring the effect of changes in housing wealth.

ment accounts, for the years 1999 to 2007.[11] The register reports assets held at the end of a tax year, December 31st. Since the information is reported by public and private financial institutions, there is little measurement error in the data. In addition to reporting the value of total financial assets and total assets, the register reports categories of wealth, including value of bank accounts, mutual funds, stocks, options, bonds, housing wealth, other real assets, and capital endowment insurance. We also observe an end-of-the-year snapshot of each listed bond, stock, or mutual fund held by individuals, reported by their International Securities Identification Number (ISIN). It also reports data on total debt. Non financial assets are collected from the property tax assessments and valuations are based on market prices.

During the 1999 to 2005 period, banks were not required to report small bank accounts to the Swedish Tax Agency unless the account earned more than 100 SEK (about $11) in interest during the year. From 2006 onwards, all bank accounts above 10,000 SEK were reported. In our data, some people do not have a reported bank account. Since almost everybody has a bank account (in surveys, the fraction of Swedes aged 15 and above that have a bank account has consistently been 99 percent (Riksbanken, 2014), in reality the people who are measured as having zero financial wealth probably in fact have some small amount of financial wealth. We follow Calvet et al. (2007), Calvet and Sodini (2014), and Black et al. (2017) and impute bank account balances for persons without a bank account using the sub-sample of individuals for whom we observe their bank account balance even though the earned interest is less than 100 kronor.

2.2 Labor Market Outcomes

To measure unemployment, labor income, earnings, and disposable income we use data from the Swedish Income Register that is available from 1968. We define earnings as income from work including taxable benefits like unemployment insurance and pensions as well as capital income and realized capital gains. Labor income is defined as income from work, including self-employment and sickness benefits. Using data on the payment of unemployment benefits, we construct an indicator of unemployment.

2.3 Identifying plant closures

To identify plant closures, we rely on linked employer-employee data from the workplace register (RAMS). We define a workplace's final year of operation as the year in which it was last observed in the register. Since there can be several reasons why a workplace cease to exist in the register, such as mergers, change of ownership, reallocation of workers or data errors, we also use data on worker flows in order to exclude "false" closures. We

[11] The data were collected by the government's statistical agency, Statistics Sweden, for tax purposes between 1999 and 2007, at which point the wealth tax was abolished.

define a plant closure as false if one of the following conditions are met: (1) At least 50 % of the employees that work at a workplace in its last year of operation work together in *another* workplace the year after, and they correspond to at least 50 % of the workforce at this other workplace. (2) At least 50 % of the employees that are separated from a workplace in its final year, or the year before, are working for the same *organization* both in the year of separation and in the year after separation.

2.4 Savings and Consumption

We follow the approach proposed by Koijen et al. (2014) and implemented in Di Maggio et al. (2020) to impute consumption expenses. Specifically, we impute consumption expenditure from the household budget constraint by combining information from the Swedish registry data on income, detailed asset holdings, and asset returns that we collect from third-party sources. Intuitively, consumption is the difference between the households' after-tax labor and financial asset income (plus transfers plus rental income from renting out owned houses), and the payment on existing debt, financial and housing savings (which do not include capital gains) as well as pension contributions. We also take into account changes in the indebtedness level. This approach has the advantage of allowing us to build a panel of the consumption measure for each household. However, there are some limitations. For instance, stock holdings are observed at an annual frequency; this means that we have to ignore stock price changes and active portfolio rebalancing within a year, as well as gifts and transfers.[12]

As mentioned before, since data on asset holdings was collected for tax purposes, we observe an end-of-the-year snapshot of each listed bond, stock, or mutual fund held by individuals, reported by their International Securities Identification Number (ISIN). Using each security's ISIN, we collect data on the prices, dividends, and returns for each stock, coupons for each bond, and net asset values per share for each mutual fund in the database from a number of sources, including Datastream, Bloomberg, SIX Financial Information, Swedish House of Finance, and the Swedish Investment Fund Association (FondBolagens Förening). This additional information allows us to compute the total returns on each asset that is used to estimate active savings from one year to the next and, consumption, as a result.

2.5 Trade Data

In order to identify industry-specific trade shocks, we need data for trade between Sweden and China across different industries as well as industry production data. We get both

[12] As shown in Eika et al. (2017), taking into account stock transactions within each year does not add much to reducing measurement error.

sets of data from Statistics Sweden. We also use trade data between some other countries and China in order to construct our instrument explained in section 3.2. That data come from UN COMTRADE..[13]

3 Empirical strategy

We use two complementary empirical approaches to estimate the effect of labor market shocks on wealth accumulation. The first approach uses plant closures combined with detailed matching to find a control group for affected workers and the second exploits import competition with China as a labor market shock. Below, we describe these two approaches.

3.1 Plant Closures

3.1.1 Matching

In our analyses of short term impacts of plant closures, we focus on individuals who were exposed to plant closures between the years 2001 and 2004. This allows us to follow individuals in the wealth register for at least 2 years before the closure and up to 3 years after. We further restrict our sample to individuals of working age (25-60 years old), who had at least three years of tenure at the closing workplace, and who had a non-zero wage income in the three years leading up to the closure. Furthermore, we restrict our sample to workplaces with at least 20 employees and exclude individuals in the top and bottom one percent of the net wealth distribution and in the top one percent of the financial wealth distribution.

Due to the extended nature of a plant closure, which can span several years, solely considering employees who are separated from the workplace in the final year of operation may lead to an understatement of the total number of affected workers and introduce certain selection issues.[14] On the other hand, including individuals that were separated from the workplace several years before the final year of operation poses the risk of including voluntary resignations. At the very least, we want to include displacements that occur within one year prior to the closure. Due to the absence of precise information regarding the exact date of workplace closure, but knowledge of the year it took place, we define worker separations as those happening in the last year of operation and the preceding year. Consequently, we include all separations within a two-year time frame leading up to the closure.

[13] We use data reported by the importer and code missing values as zeros. This data has been cleaned according to the recommendations of Feenstra et al. (2005)

[14] The direction of the selection bias is not clear as the workers who remain with the employer until the closure can either be workers who have the most difficulty finding an alternative job or staff who are the most loyal to the firm (Seim, 2019).

We define our treatment group as individuals whose primary job is located at a closing workplace and who experience separation from that workplace within a two-year period preceding the closure. Within this sample, 63% are separated from their workplace during the final year of operation, while 37% experience separation in the year prior. We show that our findings remain the same if we only focus on workers who remain with the employer until the closure.

Because of a time-limit on the wealth register, the longest period of time that we can observe all individuals in our sample is three years. In a second set of analyses, we examine the long-run effects of plant closures on individuals who encountered a closure between 1995 and 1997. Since the wealth register commences in 1999, we are unable to follow wealth and financial outcomes for these workers in the years before the closure and in the immediate aftermath. Instead, we concentrate on long-run wealth and financial outcomes, measured from 1999 to 2007, capturing a consistent period spanning 4 to 10 years for all affected workers after the closure occurred. We impose the same set of restrictions for this sample as we did for the 2001-2004 sample.

In our plant closure analyses, we employ a combination of exact matching and propensity score matching techniques to construct a suitable control group for individuals who were affected by plant closure. For each year within the period of 2001-2004, we create a pool of potential control individuals. To ensure comparability with the treated sample, we impose similar restrictions on age, tenure, wealth distribution, and workplace size. Furthermore, we limit the pool of potential controls to individuals employed at workplaces that remain active throughout our observation period.[15]

To achieve exact matching on specific characteristics, we assign treated individuals and potential controls to cells based on attributes measured at $t = -2$.[16] The characteristics employed for exact matching include gender, attainment of at least 3 years of post-secondary education, homeownership, two-digit workplace sector, net wealth quartiles, financial assets quartiles, earned income quintiles, and three indicators of risky assets (zero risky assets and below/above the median of non-zero risky assets). Note that the distributions of all monetary variables used for exact matching are calculated *within* calendar year, gender and age. Within each cell, we perform matching based on propensity scores using nearest neighbor matching without replacement. The propensity score is estimated through a logit model, using characteristics such as age, years of schooling, marriage status, prior income, workplace tenure, workplace sector, workplace size, and wealth variables as covariates.[17] We repeat this procedure for each year between 2001 and 2004. Once a control has been matched, it is subsequently excluded from the pool

[15] In the robustness checks, we relax this restriction and include workplaces in the control group that close down in later periods.

[16] In one of our robustness analyses we show that the treatment and control groups are also balanced in $t = -3$, indicating that the two groups are on very similar paths before the shock happens.

[17] For a complete list of covariates used for estimating the propensity score, see Table A1 in Appendix.

of potential controls for the following years.[18]

The same matching approach is applied for the long-run sample that experienced a closure between 1995-1997, with the exception that we do not match on wealth variables in this particular sample since the wealth register only begins in 1999. However, we show that if we exclude wealth variables from the matching process in the sample that we use for our short-term analysis, none of the main findings change. This is because the list of non-wealth related variables we use is rich enough to encapsulate wealth outcomes. This makes us confident that our long-term analysis can be thought of as a continuation of what we show in the short run.

The restrictions we impose on our data lead to a sample size of 51,779 treated individuals. In Table A2, we compare the characteristics of our treated individuals, measured at t-2, with those of the general population of similarly aged workers who were not subject to a closure. On financial characteristics, the samples are remarkably similar in terms of stock market participation, risky shares, and financial wealth. They differ in terms of demographics, however, where treated individuals are more often males, are less often married, have fewer children, and have less education. They have higher earnings, likely reflecting the higher share of males.

Table 1 demonstrates that the matching process successfully achieves balance between the treatment and control groups. The only characteristics that exhibit statistically significant differences between the treatment and control groups are plant size and the fraction of Scandinavian workers. However, these differences are minuscule.[19]

3.1.2 Econometric specification: plant closures

Utilizing our matched sample for the period from 2001 to 2004, we estimate the following event study model:

$$y_{ict} = \alpha_i + \gamma_c + \theta_{ct} + \sum_{k \neq -2} \beta_k \mathbf{I}(t = k) \cdot D_i + \sum_{k \neq -2,-1} \delta_k \mathbf{I}(t = k) + \varepsilon_{ict} \quad (1)$$

Where y_{ict} is the outcome of individual i in calendar year $c \in [1999, 2007]$, at event time $t \in [-2, 3]$. Event time is measured as time since job separation. The model include fixed effects for individuals, α_i, calendar year, γ_c, and separation year, θ_{ct}, as well as event time indicators, $\mathbf{I}(t = k)$. D_i is a treatment indicator that takes the value 1 for those who are separated from a closing workplace, and 0 for the matched controls. The coefficients of interest are β_k, measuring the effect of job separation in relation to outcomes at t-2. Under the sample restrictions specified in the Data section, the treated individuals are

[18] All our findings go through if we exclude the three large cities of Sweden (Stockholm, Gothenburg, and Malmo)from the our matching process.

[19] Balancing is also observed in the matched samples for the 1995-1997 group.

defined as those whose primary job is located at a closing workplace and who experience separation from that workplace within a two-year time frame. In the robustness section, we assess the sensitivity of the results by narrowing the focus to individuals who are separated specifically in the year of the plant closure.

For the 1995-1997 sample, we estimate the following model:

$$y_{ict} = \gamma_c + \theta_{ct} + \sum_{k=4}^{10} \beta_k \mathbf{I}(t = k) \cdot D_i + \varepsilon_{ict} \tag{2}$$

In this specification, we compare the average outcomes at t+4,...t+10 for individuals who encountered a closure between the years 1995 and 1997 with those of the matched control group.

3.2 Trade Shocks

Similar to Autor et al. (2014), our baseline measure of trade exposure is the change in the import penetration ratio for a Swedish industry over the period 2000 to 2007, defined as

$$\Delta IP_{j,\tau} = 100 * \frac{\Delta M_{j,\tau}^{SweC}}{1/3 * (Y_{j,99-01} + M_{j,99-01} + E_{j,99-01})} \tag{3}$$

where for industry j in Sweden, $M_{j,\tau}^{SweC}$ is the change in imports from China over the period 2000 to 2007 and $1/3 * (Y_{j,99-01} + M_{j,99-01} + E_{j,99-01})$ represents the average initial absorption (measured as industry production, Y_j, plus industry imports, M_j, minus industry exports, E_j) between 1999-2001.[20] Swedish trade shocks are defined as the first difference in Swedish imports normalized by the industry size between 1999-2001.

It has been previously discussed in the literature that a concern with using import penetration as a measure of trade exposure is that observed changes in the penetration ratio may (partly) reflect domestic shocks to industries. Even if the factors driving China's export growth are internal supply shocks, industry import demand shocks in Sweden may still affect trade flows between the two countries.

To capture only the supply-driven component in the imports from China, we instrument for trade exposure in equation (3) with the following variable

[20] Alternatively, we could treat year 2000 as the sole initial year for measuring absorption. However, annual production and trade in a given a industry in small countries, such as Sweden, might suffer from large sudden movements. By taking a 3-year average, we try to capture a more realistic measure of absorption.

$$\Delta IPAS_{j,\tau} = 100 * \frac{\Delta M_{j,\tau}^{ASC}}{1/3 * (Y_{j,96-98} + M_{j,96-98} + E_{j,96-98})} \tag{4}$$

$M_{j,\tau}^{ASC}$ is the change in imports in industry j from China over the period 2000 to 2007 in four Anglo-Saxon countries - US, UK, Australia, and New Zealand. The motivation is choosing these four countries is that these high-income economies were similarly exposed to growth in Chinese imports, driven by supply shocks originating in China. The identifying assumption is that industry import demand shocks in are weakly correlated across high-income economies.[21] We measure absorption in industry j between 1996-1998, three years prior to the base years. This is to account for the possibility that absorption between 1999-2001 might have changed as a result or anticipation of increases in trade with China in the future.

We use data on trade flows from UN Comtrade, concorded from HS product codes to four-digit SNI manufacturing industries, provided by Statistics Sweden.

4 Results: Plant Closures

4.1 Unemployment and earnings

To show that the events we study qualify as labor market shocks and to understand the magnitude of the shocks, we start by measuring the effect of plant closures on unemployment and earnings, before turning to the implications for wealth-related outcomes. These exercises could be thought of as "first stage" effects.

The findings are presented in Table 2 and Figure 1. Panel (a) in Figure 1 demonstrates that plant closures lead to immediate and large effects on unemployment, defined as having received any unemployment benefits during the year. In the year following the separation, the treated groups is 24 percentage points more likely to be unemployed. The magnitude of the effect declines rapidly in subsequent years when, arguably, some unemployed workers find new jobs. Column (1) in Table 2 shows the estimates for each year after the shock, where the effect is to increase unemployment by 24 percentage points in the first year and by 18 and 13 percentage points in the second and third years, respectively.

Plant closures also lead to large and immediate negative effects on labor earnings, as illustrated in Panel (b) of Figure 1. The decline amounts to 15-20 percent during the first three years after the shock, corresponding to 45,000-50,000 SEK, as shown in

[21] The reason we do not include high-income European countries in our instrument is that, because of joint trade policies in the European Union and the closeness of economies in the block, demand shocks might be correlated.

Column (2) of Table 2. Interestingly, while Panel (a) of Figure 1 shows that the risk of unemployment declines quickly, labor earnings do not follow the same trend, suggesting that, in the short run, individuals who secure new employment may face a decrease in earnings compared to their previous job.

It is important to note that the effect on earnings may overstate the effects on disposable income as they do not account for unemployment benefits and other social benefits, which are not included in the labor earnings measure. In order to get a sense of changes in available resources, that might be more important for how individuals change their savings behavior and wealth accumulation as a result, we repeat the analysis but replace labor earnings with total earnings, defined as labor earnings and other social benefits. Panel (c), and estimates in column (3) of Table 2 show that the effects indeed get smaller, where the earnings losses amount to 6 to 10 percent, suggesting that unemployment benefits and social benefits compensate for the loss of labor earnings to some extent.[22] These earnings losses are in line with those observed in previous studies on the effects of plant closures and mass layoffs in Sweden, although the magnitude of the effects vary (Eliason and Storrie, 2006, Eliason et al., 2011, Seim, 2019). The losses are also comparable to those observed in Norway and Denmark (Bratberg et al., 2008, Rege et al., 2011, Huttunen et al., 2011, Browning and Heinesen, 2012).

Figure 2 shows how labor market outcomes develop in the long run. Unemployment rate continues to decline until it is only 2.5 percentage points higher for the treated group 10 years after separation form the old plant. Interestingly, relative total earnings also improve significantly - after 10 years total earnings for those exposed are only 2.5 percent lower than that of the control group. This suggests that, for those who find a new job, the initial disadvantage in earnings disappears in the long run.

4.2 Wealth outcomes

We next investigate how plant closures affect different wealth-related outcomes. We start by looking at total wealth and then try to understand how different components of wealth contribute to the observed changes and the mechanisms through which each component is affected.

4.2.1 Total Wealth

Figure 3 shows both the short-term and long-term development of total assets for the treated group compared to the baseline (and the control group). Panel (a) shows that total assets gradually go down and 3 years after exposure stay around 5.5 percent lower than its value in the baseline. The estimate in column (1) in Table 3 shows that 3 years

[22] Explicitly looking at total disposable income reveals that it goes down by around 7 percent after three years.

after exposure, the value of total wealth is 35,000 SEK (5,500 USD using exchange rates from 2007) lower. Importantly, the estimates in Panel (b) of Figure 3 show that, unlike earnings outcomes, the value of total assets hardly recovers even after 10 years where it stands 4.5 percent lower. While the drop in earnings seem to be transitory, decline in wealth seems to be more permanent.[23]

Next we try to understand what drives down the value of total assets by doing an accounting exercise. The drop in the value of total assets could be because i) drop in the value of financial assets, ii) decline in (prospective) housing wealth, iii) a drop in the value of other real assets.

4.2.2 Financial Wealth

Figure 4 shows the short-term and long-term changes in financial assets. Panel (a) shows that financial assets go down sharply and stay around 8 percent lower than its value in the baseline 3 years after exposure. The estimates in column (2) in Table 3 show that 3 years after exposure, the value of financial wealth is 9,500 SEK (1,500 USD) lower. Given that financial wealth counts for around 22 percent of total wealth in our sample before the shock happens, this decline explains around one-third of the drop in total wealth. The estimates in Panel (b) of Figure 4 show that the value of financial assets does not recover after 10 years, and it even declines further by standing more than 10 percent lower.

Decline in financial wealth could be the result of negative net financial savings. If, compared to the control group, households faced with labor market shocks draw down on their financial assets to smooth their consumption or reduce their savings, that would show up in lower values for financial wealth. In addition, whether the treated individuals reduce their holdings of safe or risky assets could have long term implications for wealth accumulation. Figure 5 shows how savings rate changes for those who are exposed to plant closures.[24] We estimate active financial savings using the approach by Koijen et al. (2014) explained in Section 2.4 by combining information from the Swedish registry data on detailed asset holdings, and asset returns that we collect from third-party sources.

The effects are both statistically and economically significant - three years after the shock, households affected reduce their savings rates by more than 3 percentage points from a base-period mean of 10 percent. One should note that these savings rates are calculated out of an already significantly reduced disposable income at the household level.[25] This indicates that the total amount of active financial savings significantly goes down after exposure and this potentially contributes to lower accumulated financial

[23] Net wealth shows a similar trend and 3 years after exposure stays around 4 percent lower than its value in the baseline.

[24] Since it is not quite meaningful to show savings rate at the individual level, we have computed it at the household level.

[25] Disposable income at the household level goes down by 5.5 percent 3 years after exposure.

wealth. This is, of course, not guaranteed if those exposed change the composition of their savings in a way that generates higher returns, although that outcome would be unexpected since there is no good reason why they should not have formed higher earning portfolios before they are affected. Also, interestingly, the saving rates seem to be trending down as time passes. This is despite the fact that unemployment incidence goes down gradually after the first year, as shown in Figure 1.

Financial assets studied above include both safe and risky assets. One could argue that as long as all the drop in financial wealth comes from drawing down on safe assets, this might have less long-term impacts, since treated individuals would not miss on the equity premium. The implications for the long term wealth accumulation could be quite different based on what kind of assets exposed workers reduce the most when faced with higher risks in the labor market and the prospect of declines in labor earnings. Next, we investigate to what extent this is true by looking how likely equity market participants are to exit following the labor market shock and how the value of risky financial assets change in response to the shock. The findings are represented in Figure 6.

Panel (a) shows that, relative to the control group and a baseline of 56 percent, exposed workers are only one percentage point less likely to be in the market three years after exposure. While we find statistically significant negative effects, this is an economically negligible. Given the very small effect on market participation, in Panel (b) we look at the (unconditional) value of risky assets, defined as total value of directly held stocks plus mutual funds that include equity components. We find that after three years of exposure, treated individuals reduce their portfolio of risky financial assets by 10 percent. In Panel (c), we show that while the portfolio volatility of risky assets goes down in the aftermath of the shock, the magnitude is small, as it goes down by less than 0.01 from a pre-shock mean of 0.25.[26] Findings in Panel (a) indicate that the observed decline in the value of risky assets in Panel (b) does not reflect exposed workers' decision to leave the equity market altogether, and is the outcome of making adjustments to their portfolios. On the other hand, small magnitudes of the estimates in Panel (c) indicate that exposed individuals hardly reduce the riskiness of their portfolio of risky assets. Overall, we find that the effect of plant closures on changes in holdings of risky financial assets are mainly driven through the intensive margin and reflects sizing down of portfolios, and that individuals lower their exposure to financial risk mainly through decumulating risky assets.

Findings represented in Figures 4 and 6 suggest that, in aggregate, individuals change their portfolios along both safe and risky assets and that the relative changes in the value of risky assets is slightly larger than the corresponding changes in total financial wealth.

[26] We explain how we compute the portfolio volatility of risky assets in the Appendix.

4.2.3 Housing Wealth

Next we study housing wealth and how exposure to a severe labor market shock could affect that. Figure 7 shows how housing wealth for those exposed develops compared to the control group across time. Since all individuals, regardless of their homeownership status in the baseline are represented in the analysis, we show the results in monetary values and not relative changes to the baseline value of housing wealth. This shows that housing wealth steadily goes down during the first few years and exposed individuals end up with more than 19,000 SEK lower wealth after 3 years. The contribution of decline in housing wealth to the changes in total wealth is almost twice as large as that of financial wealth. Adding this to the associated decline in financial wealth, it covers close to 90 percent of drop in total wealth observed in Figure 3, leaving a small room for other real wealth.

There could be different reasons why housing wealth declines in response to exposure to labor market shocks. One is that treated workers who are non-homeowners in the baseline might become more likely to remain a renter or to buy less expensive houses, conditional on becoming a homeowner. Panel (a) in Figure 8 shows the likelihood of becoming a homeowner for those who are non-homeowners in the baseline. This likelihood drops slightly more than 2 percentage points in the aftermath of the shock. Since less than 25 percent of non-homeowners in the control group become homeowners by $t = 3$, this effect represents almost a 10 percent decline in homeownership for the treated group compared to those in the control group.

Since it is evident from estimates in Panel (a) that the likelihood of ownership is an outcome, we cannot evaluate if housing wealth also goes down conditional on ownership, but in Panel (b) we show the unconditional value of housing as the outcome goes down by about 20,000 SEK three years after exposure. However, we observe that, conditional on becoming owners, the average housing value in $t = 3$ is practically the same for individuals in the treated group and control group.[27] This suggests that the main mechanism is the extensive channel.

The other reason why housing wealth declines in response to exposure to labor market shocks could be that local labor market shocks might bring down home values. In Figure 9 we show how the average price of houses change in the municipality and parish of residence for homeowners in the treated group versus those in the control group. If anything, it seems there is a very small increase (around 1 percent after three years) in the price of housing in areas that the treated individuals live.[28]

Finally, homeowners might become more likely to liquidate their housing and become

[27] It is 981,237 SEK for the treated and 984,795 SEK for the control

[28] While it is likely that both a treated individual and her associated control live in the same municipality, in which case the graph represented in Panel (a) might become complicated to interpret, it is much less likely that they live in the same parish that consists of around 3,000 individuals on average.

renters or downsize and relocate to less valuable housing. Panel (a) in Figure 10 shows that, relative to the control group, around 1 percent of homeowners end up being renters. Given that 10 percent of homeowners in the control group become non-homeowner in $t = 3$, in relative terms, the effect size is similar to renters' likelihood to become homeowners observed in Figure 8. Looking at the unconditional changes in housing wealth in Panel (b) of Figure 10, we see that it goes down by less than 20,000 SEK that is very much in the vicinity of what we observed for non-homeowners in Panel (b) in Figure 8.

Another mechanism through which homeowners lose housing wealth might be moving to less pricey houses. While our data does not allow us to explicitly check this mechanism, we evaluate the amount of total debt that homeowners carry to shed light on this.[29] The hypothesis is that moving to less expensive housing would bring total debt down. Figure 11 shows the effect of plant closures on debt level both in percentage of change relative to the baseline period and in monetary values. The findings show that debt goes down by around 6 percent or 21,000 SEK after three years. This could be the result of exposed individuals' less access to the credit market and not being able to take as much loan. However, while this does not conclusively show that some homeowners move to less pricey housing, combined with our finding on lower housing wealth in Figure 10 it is consistent with that possibility.

4.3 Consumption

A drop in savings does not necessarily mean a decline in consumption and households might using their savings (housing or financial) to smooth consumption. While wealth is generally considered an aggregate measure of welfare, it is still important to understand to what extent exposed individuals are able to smooth consumption. This would provide a more comprehensive picture of how labor market shocks affect welfare of exposed individuals. Using a panel of consumption at the household level, constructed using the methodology proposed and used in Koijen et al. (2014) and Di Maggio et al. (2020), we investigate how plant closures affect consumption. The findings are represented in Figure 12. This indicates that the decline in savings rates observed in Figure 5 doesn't help households keep their consumption levels intact and consumption goes down by around 5 percent in the aftermath of the shock.

4.4 Heterogeneous Effects

Whether affected workers behave similarly across different socioeconomic backgrounds could have further implications for how labor market shocks affect the trajectory of wealth accumulation and potential diversion. Since changes in (prospective) housing wealth

[29] We do not have data on mortgages and only know total debt.

seems to explain the majority of observed decline in total wealth, a natural analysis is to see if homeowners and non-homeowners are affected differently. Figure 13 shows the effect of plant closures on the relative decline in the two groups' total assets. While homeowners' wealth goes does by less than 4 percent, that of non-homeowners decline by more than 16 percent.

The reason we observe such stark differences between the two groups is not because of differential changes in the absolute value of decline in wealth but that non-homeowners have much less wealth in the baseline. As shown in Figures 8 and 10, both groups have a decline of around 20,000 SEK in housing wealth. In Figure 14, we observe that both groups have a similar relative decline in financial wealth. In the Baseline period homeowners and non-homeowners have around 148,000 and 106,000 SEK in financial wealth, respectively. This means that they both experience a drop in financial wealth of close to 10,000 SEK relative to the control group. However, non-homeowners have much less wealth to begin and a similar amount of absolute drop in wealth constitute a much larger share of initial wealth.[30] The main point is that non-homeowners who are exposed to labor market shocks end up accumulating much less wealth than their counterparts who are not exposed.

Plant closures also make non-homeowners to reduce their consumption much more intensely than homeowners. Although not always statistically significant, the estimates shown in Figure 15 indicate that while homeowners' consumption at the household level goes down by around 4 percent after three years, non-homeowners experience around 10 percent decline during the same period.

Given that non-homeowners are more likely to be younger, one would expect to see heterogeneous effects based on age. Figure 16 confirms this. While the effect of shocks on total wealth for individuals 45 and older is around 4 percent, it is more than 7 percent for the younger group (Panel a). This is despite the facts that younger workers recover from unemployment earlier (Panel b), lose less labor earnings (Panel c), and both groups lose around 10 percent of their total earnings in the short run (Panel d).[31]

The findings above indicate that adjustment to labor market shocks happen on more than one margin. Not only affected workers accumulate relatively less wealth, non-homeowners and younger workers are affected disproportionately.

[30] Total wealth in $t = -2$ is 869,299 SEK for homeowners and 219,887 SEK for non-homeowners.

[31] We also observe that drop in (prospective) housing wealth for the younger individuals is about twice the size of the drop for older people.

4.5 Robustness checks

4.5.1 Existence of pre-trend

Since we match treated individuals with those in the control group in $t = -2$, by construction, the two groups look similar in that time. However, a concern might be that workers in treated and control groups are already on different trends before we match them and in $t = -2$ we match exposed workers to those who would not have been their counterparts before that. To investigate this we reproduce the three main graphs showcasing the effect of plant closures on labor market outcomes as well as total assets, where we extend the pre-period to three years while we still use the same sample that had been matched in $t = -2$. Figure 17 shows the results. As is evident, those exposed and the associated controls look very similar in $t = -3$, indicating that it is very unlikely that the two groups were on different paths before being matched.[32]

4.5.2 Different timing of separation

As described in Section 2, in our analysis so far, we have included those who separate from the closing plants either during the year the plan ceases to exist or the year before. A concern might be that those who separate the year before might be systematically different from others. It is, of course, not clear in which direction a potential bias would go. One can imagine those who are more competitive on the market leave a sinking ship earlier, but it is also possible that a struggling business might let go of less productive employees first.

We redo some of our main analyses using only the sample of workers who leave the closing plants during their last year of existence, and their matches in the control group. Estimates in Figure 18 suggest that the results using this sub-sample of workers are very similar to those found using the main sample.

4.5.3 Household-level outcomes

Most of the outcome variables we have studied, except for consumption and savings behavior, have been analyzed at the individual level. It can be argued that what matters most is (potential) drops in wealth at the household level, since household members might insure each other against labor market risk (Fadlon and Nielsen, 2021), although given that consumption at the household level drops significantly in response to plant closures, it is unlikely that other household members can fully insure the exposed individuals.

In a sub-sample of our study in which the exposed individual is married, we analyze the spouses' labor market behavior. Figure 19 shows the findings. The estimates indicate

[32] Since we add one year to the pre-period in this analysis, we can only show two periods after the shocks is realized.

that spouses don't seem to insure against the loss of income for exposed workers in the labor market. In fact, labor earnings go slightly down and total earnings do not change.

Figure 20 shows the wealth effect of plant closures at the household level. Panel (a) shows that the magnitude of drop in total wealth after three years is just slightly lower compared to individual level effects. The reason is that while, as shown in Panel (b), financial wealth goes down less compared to individual level effects, housing wealth goes down more in monetary value. This is most probably because housing is not divisible.

5 Trade shocks

5.1 Unemployment and earnings

Similar to the analysis of plant closures, we start by looking at the effect of trade shocks on unemployment and individual earnings. It has been shown before that import competition from China accumulated over years, mainly after China joined the WTO in 2001 (Autor et al., 2016). The steepest increase in Chinese imports into developed economies occurred just after China's accession to the WTO in 2001; China's share of world manufacturing exports surged from 4.8 percent in 2000 to 15.1 percent in 2010, before reaching 18.3 in 2014. The timing of this shock matches perfectly the data on Swedish individuals' asset holding described before and allows us to investigate the effects of labor market shocks caused by import competition.

The results for labor market outcomes are in Table 4. The dependent variable in column (1) is the number of years between 2002 and 2007 an individual was unemployed. Given the cumulative nature of the shock, in columns (2) and (3), we follow the structure of analysis presented in Autor et al. (2014) and investigate the effect of exposure to import competition from China on the cumulative income of individuals over 2002-2007 period normalized by their average annual income over the base period of 1999-2001. As we did in the analysis of plant closures, we investigate labor earnings in column (2) and all earnings in column (3). All regressions control for gender, year of birth dummies, if individuals are born in Sweden, risky market participation in the base period, and total earnings in the base period.

The coefficient estimate in column (1) is not statistically significant, indicating that on average, exposure to trade shocks in Sweden did not result in higher likelihood of unemployment. This is different from finding in many other countries, especially the U.S (Autor et al., 2014) and indicates the magnitude and effectiveness of the labor market shock caused by import competition in Sweden might have been smaller. This could also be the relative ease of switching to other jobs in Sweden. However, the estimates in the following columns clearly show that it reduced labor earnings and total earnings and that import shocks indeed affected labor market outcomes of those exposed. A mean value of the shock (0.005) reduces the relative labor earnings by around 5.4 percent (0.004*152/11.16) of its mean value and the relative total earnings by around 1 percent.

This findings suggest that, import competition in Sweden is an opportunity to study the effects of labor market shocks on wealth accumulation when those exposed experience a less severe labor market shock where, unlike what we observed with plant closures, don't on average get unemployed but their earnings slightly go down and, most probably, face worsening conditions on the market.

5.2 Wealth accumulation

Next, we investigate the effect of this labor market shock on wealth and its components. Table 5 shows the results. In Panel A, we include all individuals and, in line with the analysis for plant closures, we divide the sample into homeowners and non-homeowners, in Panels B and C. In Column (1) the outcome is the total wealth of an individual in 2007 relative to her average wealth in the base-period of 1999-2007.[33] This indicates that the average shock reduces the relative wealth by around 1 percent (0.004*13.95/5.45) compared to its mean value. Homeowners lose only around 0.4 percent while the drop is around 1.8 percent for non-homeowners. Consistent with the findings in the previous section, financial wealth drops almost uniformly for homeowners and non-homeowners (around 0.4 percent). The results are shown in the second column. This means that housing value is probably the main reason why non-homeowners lose a lot more in terms of relative wealth. The coefficient estimates in column (3) confirm that. While homeowners only lose 0.5 percent on average in housing wealth, non-homeowners lose around 2.2 percent in prospective housing wealth. These results are very much consistent with the findings for plant closures and indicate that decline in wealth is proportional to the severity of the labor market shock.

6 Conclusions

In this paper, we investigate the effect of two different labor market shocks on wealth accumulation of those exposed. Unlike the effects of labor market shocks on employment and earnings, our knowledge of the potential impact of these shocks on wealth accumulation of individuals is much more limited. This is important because wealth is a better and more permanent indicator of well-being than income - it reflects the accumulation of advantage across time, has a unique role in smoothing consumption and providing a safety net to buffer shocks, and is also associated with important life and intergenerational outcomes net of other socioeconomic predictors. It is also important to note that

[33] Since wealth is an accumulative variable by itself, we only show the results for the end year.

wealth effects of labor market shocks cannot necessarily be backed out from earnings effects and potential changes in aggregate contributions to savings that follow.

Using data from Sweden, we find that exposure to plant closures results in a considerable decline in total wealth in the short run but, importantly, it doesn't recover even after 10 years. We show that a decline in financial wealth, brought about by saving much less out of an already declined disposable income and investing less in equities, explains about one-third of the drop in total wealth. Importantly, we find that it is housing wealth that drives the majority of total decline. This is driven by different mechanisms. One important mechanism is that non-homeowners who are exposed to closures become significantly less likely to become a homeowner and lose on housing wealth accumulation. The reverse mechanism also works. While some exposed homeowners become renters after the shock, we also provide suggestive evidence that some others relocate to less expensive housing with smaller mortgages. We rule out the possibility that housing value for exposed individuals decline because plant closures can act as labor market shocks and bring down home values.

The important role that housing wealth plays in explaining drop in total wealth is also evident when we investigate the relative effect of the shock on homeowners and non-homeowners separately. While in the short run, and compared to their counterparts who are not exposed to labor market shocks, total wealth decreases by less than 4 percent for homeowners, it goes down by by around 16 percent for non-homeowners. We show that the difficulty getting into the housing market is the main reason the (prospective) total wealth goes down relatively much more for non-homeowners.

To provide a more comprehensive picture of how labor market shocks affect welfare of exposed individuals, we also investigate consumption at the household level. While wealth is generally considered an aggregate measure of welfare, it is still important to understand to what extent exposed individuals are able to smooth consumption. We find that those exposed reduce their consumption by around 5 percent during the first three years compared to the control group. Interestingly, while homeowners reduce their consumption by only 3 percent, non-homeowners' consumption goes down by 10 percent.

We complement our analysis of plant closure with investigating exposure to import shocks as an alternative source of labor market shock. We show that import competition in Sweden was on average a much less severe labor market shock compared to plant closures. That makes it an interesting shock to study and complements our understating of how labor market shocks of different severity affect wealth accumulation. We find that, while the negative effects of import competition are smaller in magnitude compared to plant closures, they follow the same pattern - homeowners lose relatively much less than non-homeowners and housing wealth explains the majority of the decline.

These findings could have important implications for accumulation of wealth among different socio-economic groups and the dynamics of wealth inequality in general - workers who are exposed to labor market shocks lose on accumulating housing wealth which is the main driver of wealth accumulation for a large part of the economy. This effect is much larger for younger workers. In addition, they accumulate less financial wealth since they save much less and, importantly, reduce the size of their portfolio of risky assets and miss out on equity premium. These imply that affected workers not only suffer through potentially lower earnings in the short run, they accumulate less wealth in the long run.

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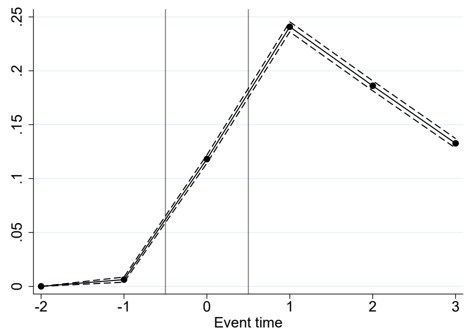
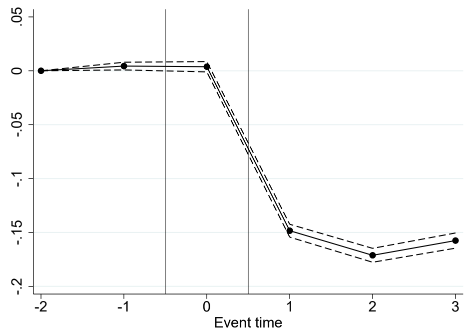
Figure 1: Labor Market Outcomes - Short Run

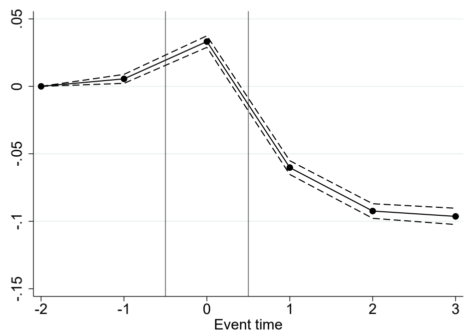
(a) Unemployment



(b) Labor earnings



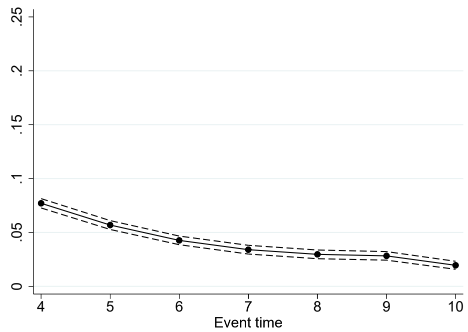
(c) Total earnings



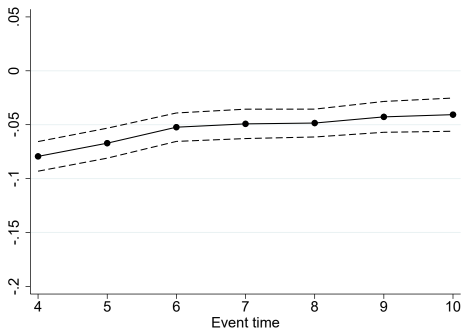
Notes: The figures display the effect of plant closure on various labor market outcomes, estimated using equation (4). For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 2: Labor Market Outcomes - Long Run

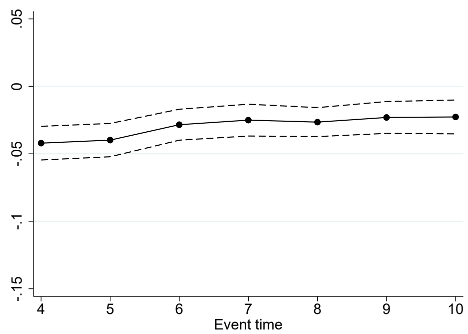
(a) Unemployment



(b) Labor earnings



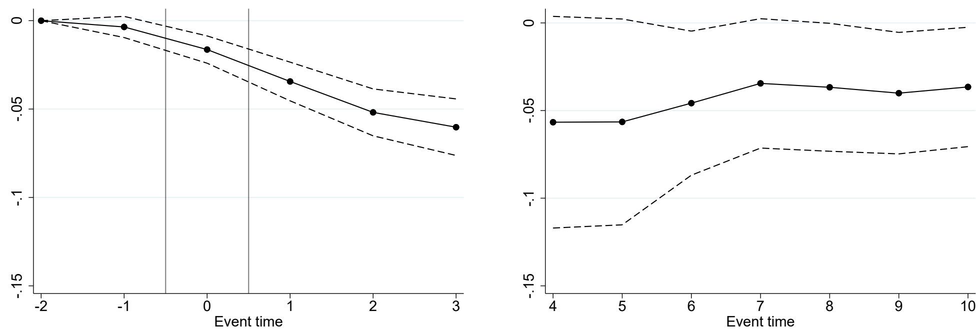
(c) Total earnings



Notes: The figures display the effect of plant closure on various labor market outcomes in the long run, estimated using equation (2). For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 3: Total Assets in the Short and Long Run

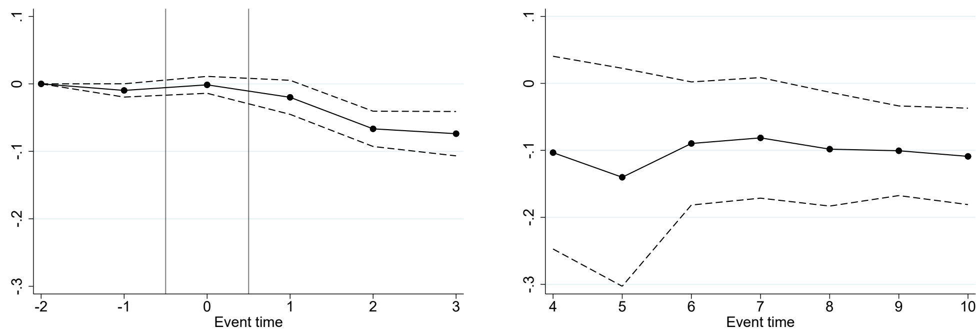
(a) Short run (b) Long run



Notes: The figures display the effect of plant closure on the changes in the value of total assets, estimated using equation (4). The coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

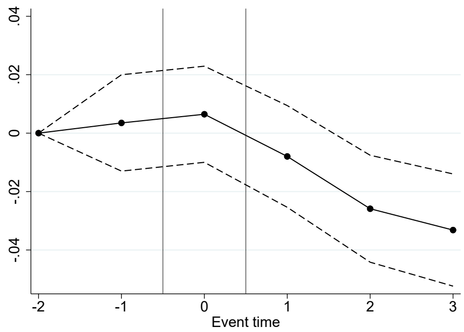
Figure 4: Financial Assets in the Short and Long Run

(a) Short run (b) Long run



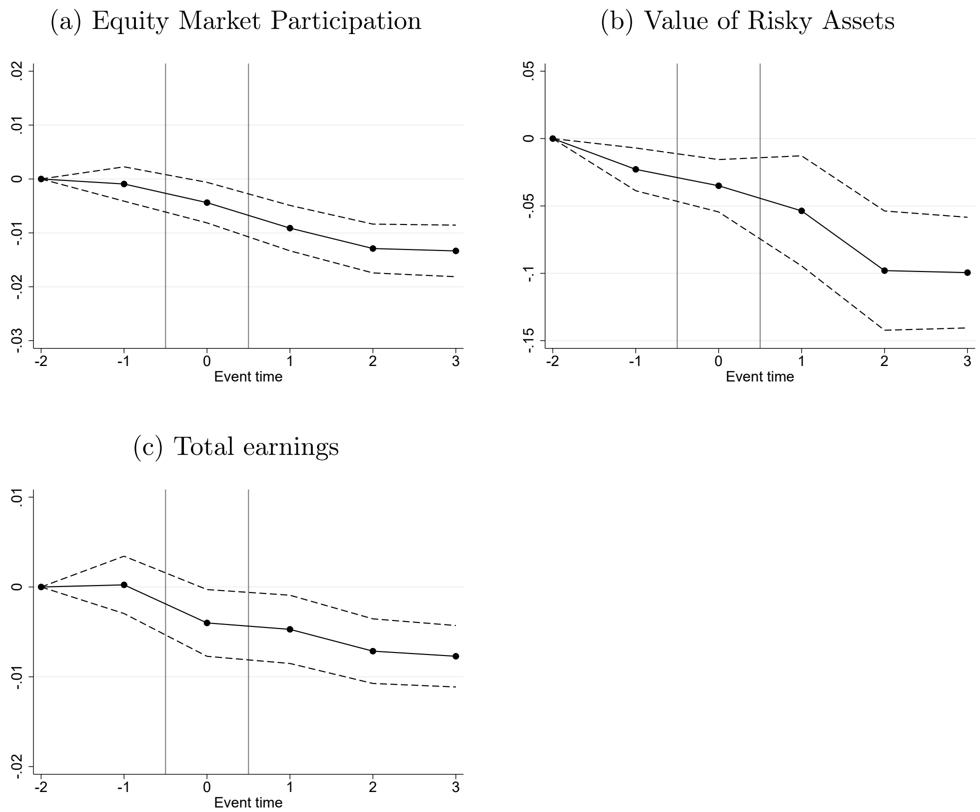
Notes: The figures display the effect of plant closure on the changes in the value of financial assets, estimated using equation (4). The coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 5: Savings Rate out of Household Disposable Income



Notes: The figure displays the effect of plant closure on active financial savings rate at the household level, estimated using equation (4). Dashed lines represent 95 percent CI's. Returns on assets used to estimate active financial savings are winsorized at 1 percent level.

Figure 6: Plant Closures and Risky Assets

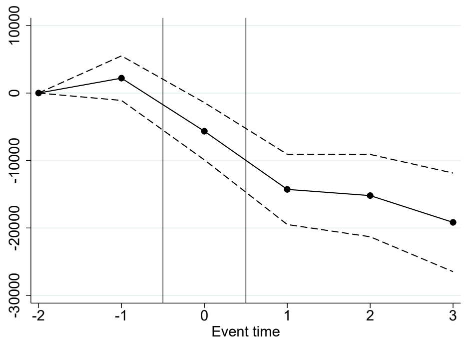

(a) Equity Market Participation

(b) Value of Risky Assets

(c) Total earnings

Notes: The figures display the effect of plant closure on the likelihood of exiting the equity market (in percentages out of 56 percent of participants in the base period), unconditional changes in the value of risky financial assets as percent of outcome mean at $t = -2$, and conditional changes in the portfolio volatility of risky assets, estimated using equation (4). Dashed lines represent 95 percent CI's.

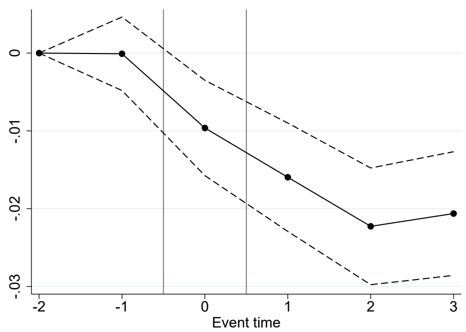
Figure 7: Housing Wealth



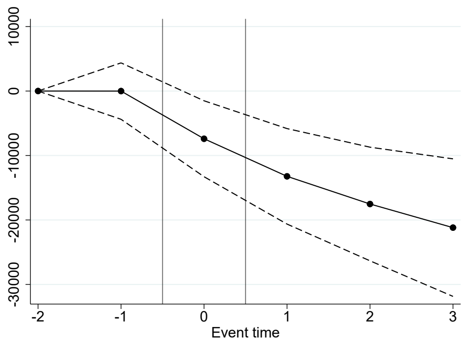
Notes: The figure displays the effect of plant closure on housing wealth in monetary value, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 8: Non-homeowners' Housing Status

(a) Homeownership



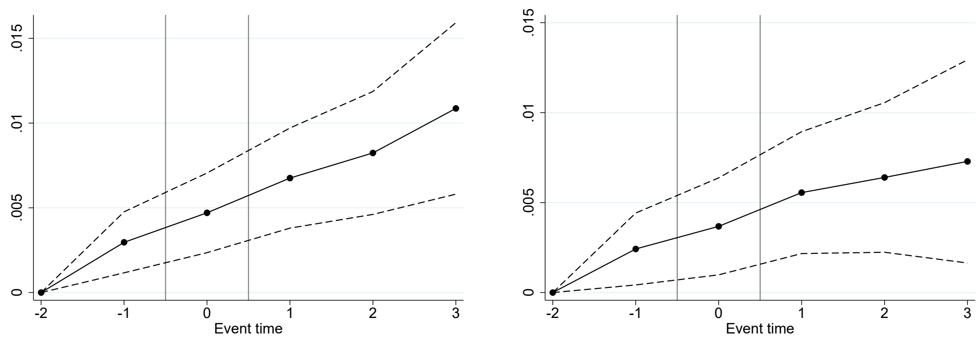
(b) Housing Value



Notes: The figures display the effect of plant closure on the likelihood of becoming a homeowner in percentages and (unconditional) changes in the value of housing wealth in SEK for non-homeowners, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 9: Plant Closure and The Price of Housing

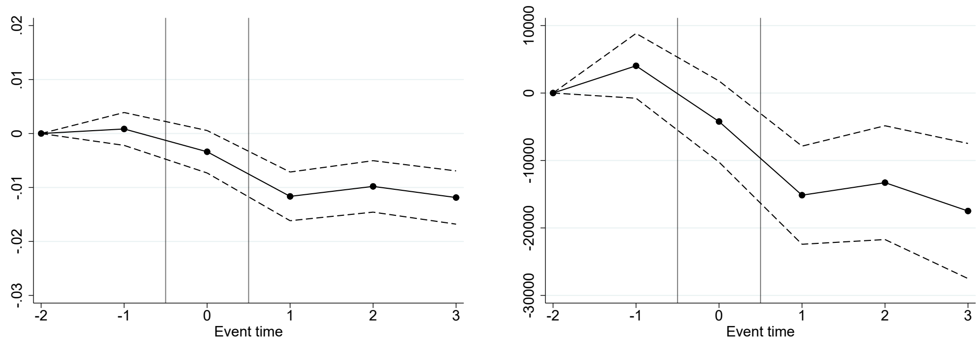
(a) Municipalities (b) Parishes



Notes: The figures display the effect of plant closure on the changes in the price of housing between the municipality (parish) of residence for the treatment versus control groups, estimated using equation (4). The coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 10: Homeowners' Housing Status

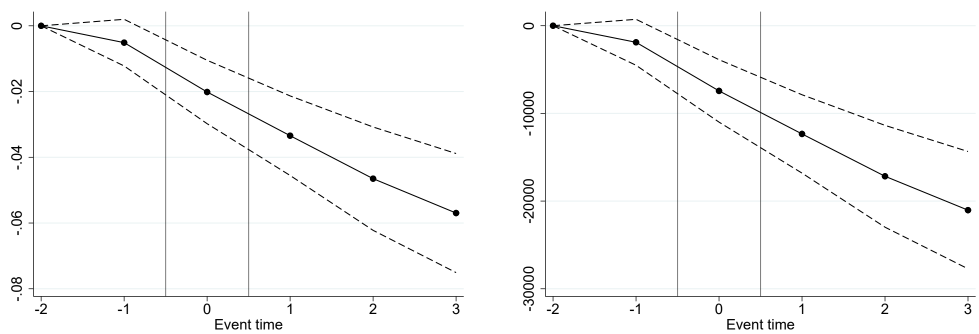
(a) Homeownership (b) Housing Value



Notes: The figures display the effect of plant closure on the likelihood of becoming a renter in percentages and (unconditional) changes in the value of housing wealth in SEK for homeowners, estimated using equation (4). Dashed lines represent 95 percent CI's.

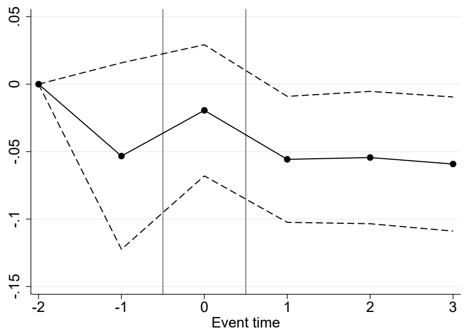
Figure 11: Homeowners' Total Debt

(a) Percentage (b) Monetary Value in SEK



Notes: The figures display the effect of plant closure on changes in the total amount of debt, estimated using equation (4). Dashed lines represent 95 percent CI's.

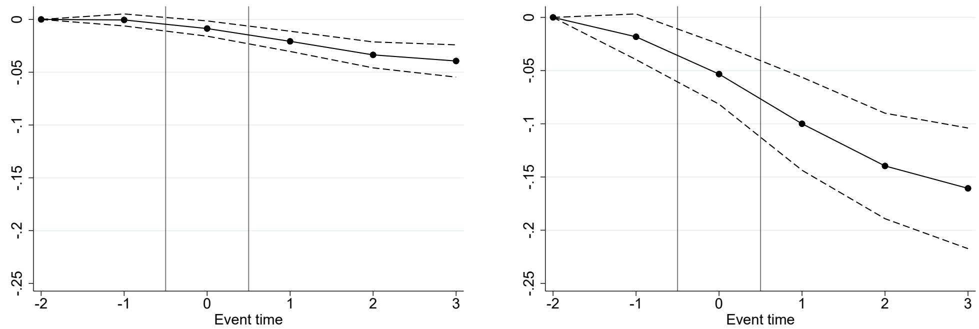
Figure 12: Plant Closures and Households' Consumption



Notes: The figure displays the effect of plant closure on changes in consumption at the household level, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 13: Decline in Total Wealth - Homeowners and Non-homeowners

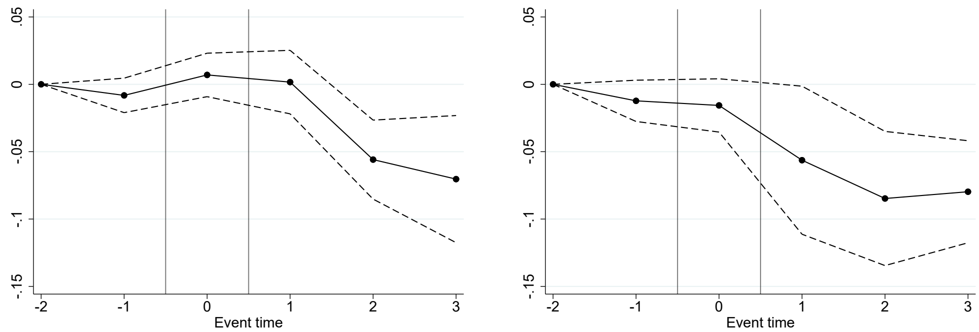
(a) Homeowners (b) Non-homeowners



Notes: The figures display the effect of plant closure on the changes in the value of total wealth for homeowners and non-homeowners, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 14: Decline in Financial Wealth - Homeowners and Non-homeowners

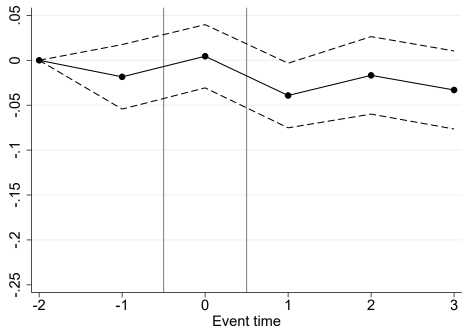
(a) Homeowners (b) Non-homeowners



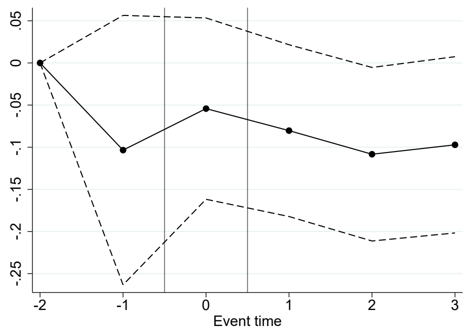
Notes: The figures display the effect of plant closure on the changes in the value of financial wealth for homeowners and non-homeowners, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 15: Plant Closures and Consumption - Homeowners and Non-homeowners

(a) Homeowners



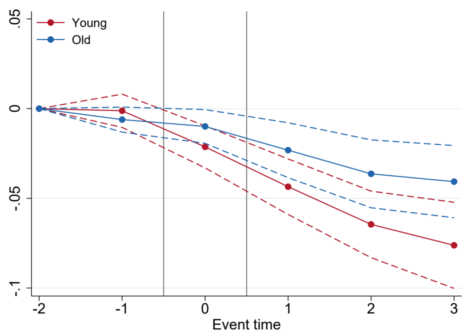
(b) Non-homeowners



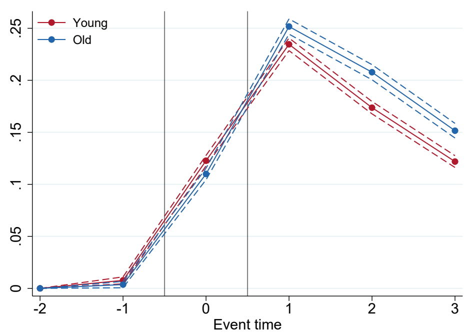
Notes: The figures display the effect of plant closure on the changes in consumption at the household level for homeowners and non-homeowners, estimated using equation (4). Dashed lines represent 95 percent CI's.

Figure 16: Heterogeneous Effects of Plant Closures by Age

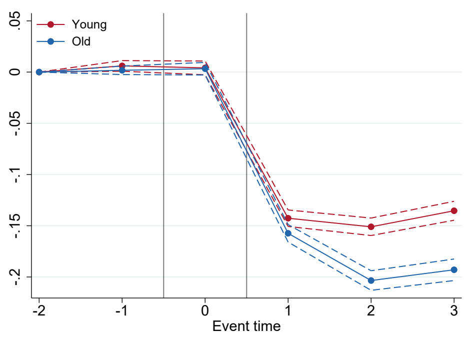
(a) Total wealth



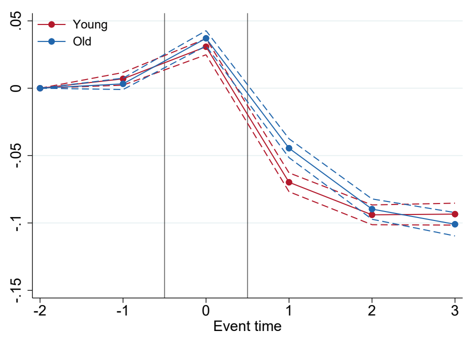
(b) Unemployment



(c) Labor earnings



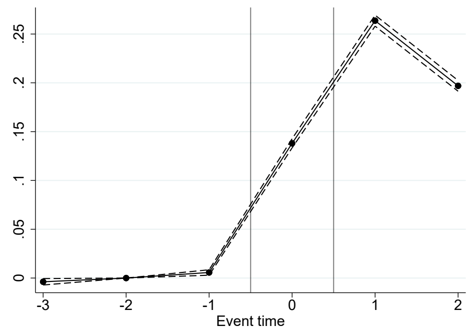
(d) Total earnings



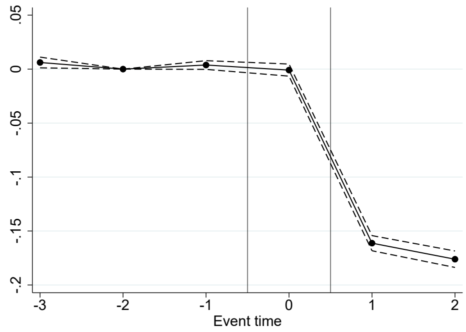
Notes: The figures display the effect of plant closure on wealth labor market outcomes for 45 and older workers versus younger workers, estimated using equation (4). For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 17: Differential Trends during the pre-period

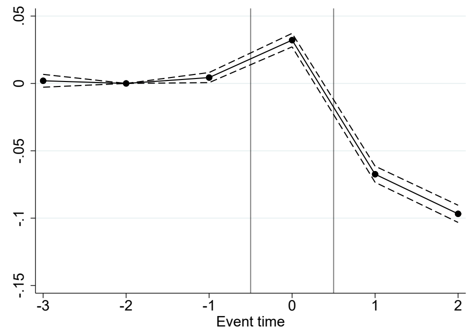
(a) Unemployment



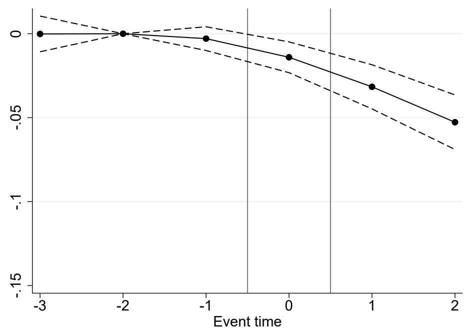
(b) Labor earnings



(c) Total earnings



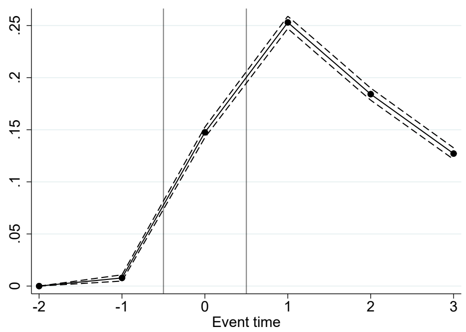
(d) Total wealth



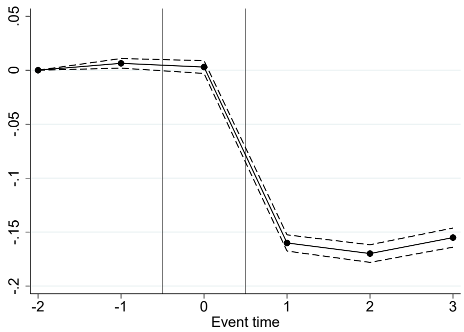
Notes: The figures displays the how treatment and control groups fare in $t = -3$, one year before being matched. For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 18: Sub-sample of Those Who Leave during The Last Year

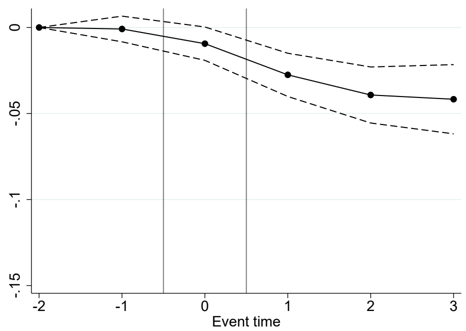
(a) Unemployment



(b) Labor earnings



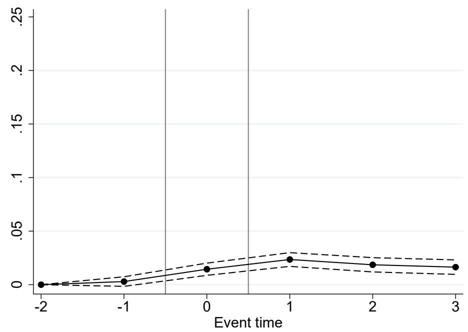
(c) Total Wealth



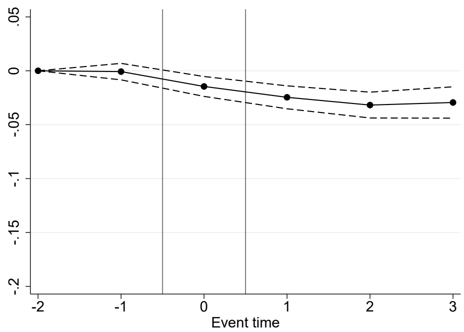
Notes: The figures displays the labor market effects and total wealth effect for a sample of treated individuals who leave the closing plants during the last year that the plant exists. For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 19: Labor Market Outcomes for Spouses of Exposed Individuals

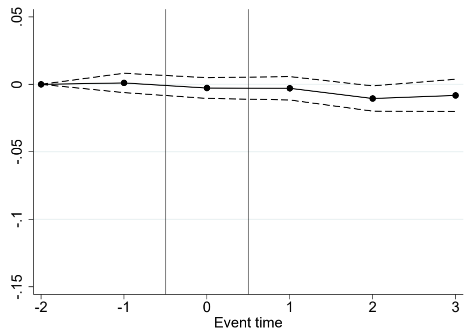
(a) Unemployment



(b) Labor earnings



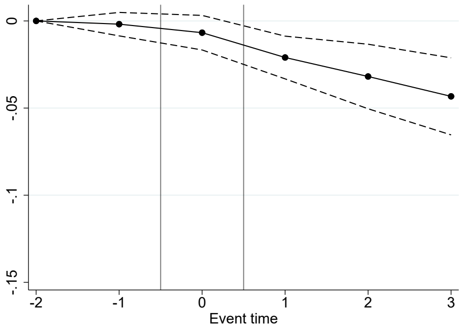
(c) Total earnings



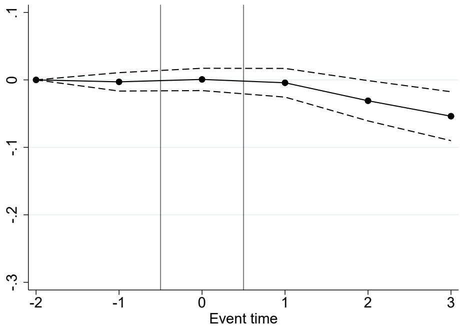
Notes: The figures display the effect of plant closure on various labor market outcomes for the spouses of exposed workers, estimated using equation (4). For monetary outcomes, the coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Figure 20: Plant Closures and Wealth at the Household Level

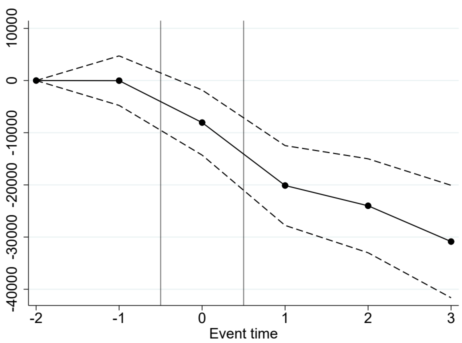
(a) Total Wealth



(b) Financial Wealth



(c) Housing Wealth



Notes: The figures display the effect of plant closure on the changes in the value of total wealth and its main components at the household level, estimated using equation (4). The coefficients are expressed as percent of outcome mean at $t = -2$. Dashed lines represent 95 percent CI's.

Table 1: Balance of covariates

	Means		t-test
	Controls	Treated	p-value
Female	0.36	0.36	1.00
Age	42.23	42.25	0.71
Years of schooling	11.66	11.67	0.60
Scandinavian	0.89	0.88	0.00
Married	0.47	0.47	0.69
No. of children	1.21	1.21	0.66
Earned income $t = -2$	307285	307013	0.79
Earned income $t = -1$	318963	319159	0.86
Years of tenure	6.85	6.81	0.09
No. of employees	142.75	146.08	0.00
Net wealth $t = -2$	321959	322252	0.93
Net wealth $t = -1$	352542	350609	0.60
Market participation $t = -2$	0.56	0.56	1.00
Market participation $t = -1$	0.59	0.59	0.64
Risky share $t = -2$	0.24	0.24	0.59
Risky share $t = -1$	0.25	0.25	0.47
Stock market participation $t = -2$	0.30	0.30	0.73
Financial assets $t = -2$	129712	129418	0.84
Obs.	51779	51779	

Table 2: Short-term Effect of Plant Closures on Labor Market Outcomes

	Labor market outcomes		
	Unemployment	Labor earnings	Total earnings
β_1	0.241***	-44.0***	-18.5***
	(0.001)	(0.903)	(0.799)
β_2	0.186***	-50.8***	-28.4***
	(0.001)	(0.977)	(0.845)
β_3	0.133***	-46.7***	-29.6***
	(0.001)	(1.067)	(0.948)
Obs.	620,518	620,518	620,518
Mean $t = -2$	0.054	296.6	307.4

Notes: The table shows the effect of plant closures on various labor market outcomes, using propensity score matching (nearest neighbor without replacement). Monetary values are presented in 1000 SEK. Standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: The Effect of Plant Closures on Wealth Outcomes

	Wealth outcomes			
	Total assets	Financial assets	Home value	Other assets
β_1	-19.8***	-2.6	-14.3***	-4.0**
	(3.216)	(1.661)	(2.658)	(1.589)
β_2	-29.9***	-8.6***	-15.2***	-6.7***
	(3.900)	(1.721)	(3.114)	(2.210)
β_3	-34.7***	-9.5***	-19.2***	-6.3**
	(4.702)	(2.164)	(3.729)	(2.584)
Obs.	619,130	619,130	620,514	619,128
Mean $t = -2$	576.2	129.0	368.1	79.1

Notes: The table shows the effect of plant closures on various wealth outcomes, using propensity score matching (nearest neighbor without replacement). Monetary values are presented in 1000 SEK. Standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: The Effect of Trade Shocks on Labor Market Outcomes

Dependent Variable:	Unemployment	Relative labor earnings	Relative total earnings
Import Shocks	0.282	-152.660**	-17.998***
	(0.582)	(75.974)	(4.675)
Obs.	1,782,441	1,782,441	1,782,441
Mean outcome	0.29	11.16	8.15
Birth year dummies	Y	Y	Y
Gender	Y	Y	Y
Sweden Born	Y	Y	Y
College Education	Y	Y	Y
Risky Market Participation in the Base Period	Y	Y	Y
Base period (99-01) earnings	Y	Y	Y

Notes: The table shows the effect of import competition from China on labor market outcomes. The mean level of import shock is 0.004. The min and max are -.004 and 0.310. Standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: The Effect of Trade Shocks on Wealth Outcomes in 2007

Dependent Variable:	Total wealth	Financial wealth	Housing wealth
			(mil SEK)
	Panel A: All Individuals		
Import Shocks	-13.95***	-2.00	
	(5.01)	(1.23)	
Obs.	1,782,441	1,172,996	
Mean outcome	5.45	2.44	
	Panel B: Homeowners		
Import Shocks	-2.18***	-2.35*	-1.41***
	(0.84)	(1.32)	(0.496)
Obs.	1,077,441	1,077,441	1,077,441
Mean outcome	2.25	2.50	1.06
	Panel C: Non-homeowners		
Import Shocks	-45.03***	-1.98	-1.94***
	(10.70)	(1.26)	(0.471)
Obs.	704,774	704,774	704,774
Mean outcome	10.24	2.34	0.354
Birth year dummies	Y	Y	Y
Gender	Y	Y	Y
Sweden Born	Y	Y	Y
College Education	Y	Y	Y
Risky Market Participation in the Base Period	Y	Y	Y
Base period (99-01) earnings	Y	Y	Y

Notes: The table shows the effect of import competition from China on wealth outcomes. The mean level of import shock is 0.004. The min and max are -.004 and 0.310. Standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix

Constructing the Measure of Portfolio Volatility

The portfolio variance is estimated using a two-step procedure. First, the portfolio covariance matrix is estimated using data on monthly returns. Our data collection covers the period from January 1999 to December 2007, but a full history is not available for all securities for various reasons. To handle differences in the length of the series of monthly returns, the covariance matrix is populated element by element. The covariance between any pair of securities is estimated using all available information (Stambaugh, 1997, Page, 2013). For two assets I and J, where I and J have series of historical returns of length L and S, respectively, and $L > S$ the covariance over the longer period is estimated as:

$$\hat{\sigma}_{IJ,L} = \hat{\sigma}_{IJ,S} + \frac{\hat{\sigma}_{IJ,S}}{\hat{\sigma}^2_{I,S}} \left(\hat{\sigma}^2_{I,L} - \hat{\sigma}^2_{I,S}\right),$$

where $\hat{\sigma}_{IJ,S}$ is the sample covariance during the period of overlapping historical returns and $\hat{\sigma}^2_I$ denotes the sample variance of I. The variance ($I = J$) of securities with less than full histories is estimated over the full period by adjusting for differences in the market volatility between the full and the short period.

$$\hat{\sigma}^2_{J,L} = \hat{\sigma}^2_{J,S} + \left(\frac{\hat{\sigma}^2_{MJ,S}}{\hat{\sigma}^2_{M,S}}\right)^2 \left(\hat{\sigma}^2_{M,L} - \hat{\sigma}^2_{M,S}\right)$$

where terms indexed M denote the (co)variance of market returns.[34]

In the second step, the portfolio variance is calculated as the inner product of the estimated covariance matrix ($\hat{\Sigma}$) and the portfolio value weights (ω):

$$\hat{\sigma}^2_P = \omega' \hat{\Sigma} \omega$$

For our analysis, we transform the resulting portfolio variance into the annualized portfolio standard deviation.[35]

[34] We use OMXSPI as a proxy for the market index, a value-weighted index covering all stocks listed on the Stockholm exchange.

[35] $\hat{\sigma}_{P,\text{ annual}} = \sqrt{\hat{\sigma}^2_P} \times \sqrt{12}$

Table A1: Covariates used in propensity score

Characteristics	**Description of variables(s)**
Female	Equals 1 if female, 0 if male
Age	Age in years, and age in years squared
Scandinavian	Equals 1 if individual is born in Scandinavia, 0 otherwise
Education	Years of schooling, and dummy variable which equals 1 if individual obtained at least 3 years of post-secondary education at university or university collage, 0 otherwise
Married	Equals 1 if individual is married, 0 otherwise
Number of children	Dummies for 0, 1, 2, 3 and 4 or more number of children
Earned income	Earned income in $t = -4$, $t = -3$ and $t = -2$, and dummies for quintiles of earned income in $t = -2$ computed within age, gender and calendar year
Financial assets	Financial assets in $t = -2$, and dummies for quartile of financial assets in $t = -2$ computed within age, gender and calendar year
Risky financial assets	Risky financial assets in $t = -2$, and dummy for any risky financial assets in $t = -2$, and dummy for above median risky financial assets in $t = -2$ computed within age, gender and calendar year
Stock market participation	Equals 1 if individual owns any stocks in $t = -2$, 0 otherwise
Homeownership	Equals 1 if individual owns any housing wealth in $t = -2$, 0 otherwise
Net wealth	Net wealth (total assets minus debt) in $t = -2$, and dummies for quartile of net wealth in $t = -2$ computed within age, gender and calendar year
Tenure	Years of tenure at workplace at $t = 0$, and dummies for 3, 4, 5 and 6 or more years of tenure at workplace in $t = 0$
Working sector	Dummies for workplace sector (14 sectors), examples: "Manufacturing", "Real estate, renting and other business activities" and "Transport, storage and communication"
Workplace size	Number of employees at workplace in $t = -2$, number of employees at workplace in $t = -2$ squared, and dummies for small plant (less than 50 employees) and medium plant (between 50 and 250 employees)

Note: Monetary values are expressed in 2007 year price level.

Table A2: Comparison with population in year 1999

	Population		Matched sample	
	Mean	SD	Mean	SD
Female	0.49	0.50	0.35	0.48
Age	39.99	10.65	39.32	9.98
Scandinavian	0.92	0.28	0.89	0.31
Married	0.48	0.50	0.44	0.50
No. of children	1.31	1.30	1.20	1.26
Years of schooling	11.81	2.36	11.50	2.26
High education	0.16	0.36	0.12	0.32
Wage	238256	142902	279655	152795
Earned income	253906	136140	288906	148601
Net wealth	302147	579845	286271	531266
Financial assets	129627	243552	129722	238769
Risky value	63858	176028	62382	172979
Risky share	0.24	0.32	0.23	0.32
Market participation	0.51	0.50	0.50	0.50
Stock market participation	0.22	0.42	0.23	0.42
Financial assets rank	0.50	0.29	0.50	0.29
Risky value rank	0.50	0.27	0.50	0.27
Net wealth rank	0.50	0.29	0.51	0.28
Obs.	3,001,829		93,161	

Note: The population is restricted to non-zero wage earners of age 25-60 who are not in top or bottom one percent of the net wealth distribution or top one percent in financial assets distribution. Ranks are calculated within age and gender.