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ABSTRACT

This paper uses two large datasets built from quarterly labor force surveys to provide a global perspective on labor market downturns. The distribution of the severity and duration of labor market downturns is strongly right skewed. The longest and most severe downturns are associated with crises, particularly financial crises, sudden stops, and house price busts. Manufacturing and construction are key sectors for propagation, as they account for more than half of the total decline in employment. Labor market downturns fall most on young and less-educated workers, who are less able to self-insure against idiosyncratic earnings risk.

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1 Introduction

A growing literature documents the existence and importance of rare, severe macroeconomic crises. Drawing on newly-assembled data spanning both a large number of countries and long periods of time, Barro (2006) and Barro and Ursúa (2008) document that substantial drops in per capita output and consumption (of at least 15 percent) happen with a frequency of roughly 1–2 percent per year. Such drops had been largely overlooked because they are absent from the U.S. postwar experience (Cogley, 1990). These estimates have been used to revive the insight of Rietz (1988) that rare but significant crises could help rationalize the equity premium. More generally, the literature has found that they have important implications for the behavior of a wide variety of financial markets as well as for our estimates of the welfare costs of business cycles.[1]

While this work has produced fundamental advances in our understanding of business cycles and financial markets, important limitations remain. A critical roadblock to progress is that crises are rare in most countries. For this reason, most research focuses on aggregate data spanning many countries, which permits a large sample of crises but limits the scope to answer questions about how crises propagate or their incidence. Research that uses microdata to address these questions generally studies a small number of events; for example, Guntin, Ottonello and Perez (2023) study household-level consumption responses to five crises.

This paper provides empirical estimates on the labor market responses to a large number of recessions and crises, including estimates that use microdata to trace the propagation and incidence of such crises. Our results draw on two different data sets, each built from quarterly labor force surveys. The first, aggregate data set collects the reported unemployment rate from each country that makes it available. The main advantage of this data set is its breadth: it spans 2,100 country-years and 311 recessions. We use the breadth of this data set to provide results on the behavior of labor market downturns that are comparable to those of output or consumption declines available for existing work. Our second, micro data set is built from harmonized versions of the underlying microdata covering one-half the countries and one-quarter of the recessions. We use this data set to provide an anatomy of labor markets during recessions and crises.

[1] See Barro (2006), Gabaix (2012), Nakamura et al. (2013), Farhi and Gabaix (2016), and Barro and Liao (2021) on the equity premium puzzle and other applications to finance. See Lucas (1987) for the classic calculation of the welfare cost of business cycles and Barro (2009) for the implications of crises for such calculations.

We make four main contributions to the literature. First, we use the breadth of the aggregate data set to document the distribution of how labor markets respond to recessions. We focus on the distribution of two key statistics: severity, which measures the cumulative rise in the unemployment rate from the onset of the recession until unemployment peaks; and duration, which measures how long it takes unemployment to peak. We show that the distribution of each of these statistics is right skewed, with a tail of downturns that are longer and more severe than any in the postwar United States. For example, the most severe decile of downturns have an empirical arrival rate of 1.4% per year and include unemployment rates that rise by 5–19 percentage points and last 16–33 quarters before unemployment begins to decline.

Second, we show that severe labor market downturns are associated with a few types of crises that have received attention in the literature, particularly financial crises, house price busts, and sudden stops (Reinhart and Rogoff, 2009). Here, too, breadth is key: each of these events is uncommon, which implies that the typical country has experienced few crises. Across the 2,100 country-years of data, we cover 43 financial crises and 52 house price busts. We show that nine of the ten most severe labor market downturns in our data set are associated with a crisis; seven are multi-dimensional crises, meaning that they are affected by multiple types of crises at once. We estimate that labor market downturns associated with a crisis have 1.2 – 1.9 percentage points larger rises in unemployment rates and last 0.5 – 3.6 quarters longer than those associated with non-crisis recessions. Effects cumulate for multi-dimensional crises.

In principle these effects could reflect that crises systematically strike different types of countries. We show that broadly similar results obtain if we control for country fixed effects, which is useful for controlling for a host of persistent country-level policies such as labor market institutions. We also explore controlling directly for policies or conditions that change over time, such as exchange rate policies, labor market policies, or debt levels. We find some policies and conditions that are correlated with longer or more severe labor market downturns, but controlling for them does not much diminish the importance of crises. While these estimates should not be viewed as causal evidence, they do suggest that the relationship between crises and severe labor market downturns does not proxy for differences in country policies or conditions.

Our remaining contributions deal with the anatomy of these shocks. We are motivated in part by a second literature that investigates the welfare cost of business cycles in models where households face uninsurable idiosyncratic risk in the form of unemployment and

possibly long-term unemployment risk (Atkeson and Phelan, 1994; Storesletten, Telmer and Yaron, 2001; Krusell et al., 2009). This literature also finds larger welfare costs of business cycles. Our goal is to understand how shocks propagate and particularly the incidence of idiosyncratic risk during crises.

Aggregate data are of little use in characterizing the moments of interest. Instead, we turn to a second data set consisting entirely of harmonized micro data from labor force surveys.[2] Although we can access micro data only for a subset of countries, the data set still spans 600 country-years and 86 recessions. In other ways it is much more detailed: it covers 73 million observations, where each observation is a person matched for two consecutive quarters. The short panel allows us to measure labor market flows, such as job-finding or separation rates. Additionally, we have harmonized a number of variables of interest, including hours worked, occupation, industry, education, and demographics.

Our third contribution is to study the propagation of shocks. We show that crises are reflected in all labor market outcomes that we can measure: not only does the unemployment rate rise, but employment-population ratios fall and hours worked per capita and per worker fall. Whereas long-term unemployment plays a negligible role for non-crisis recessions, it rises by 2–4 percentage points during crises. We decompose the rising unemployment rate into the underlying contribution of rising separation rates and falling job-finding rates and find that they each contribute roughly equally, building on recent work on the relative importance of these two margins for unemployment fluctuations (Hall, 2005; Fujita and Ramey, 2009; Shimer, 2012; Elsby, Hobijn and Şahin, 2013).

The data also permit us to study the sectoral propagation of crises. Manufacturing and construction account for more than half of the decline in the aggregate population-ratio, reflecting that they are large sectors and they shed a large share of employment: 10–15 percent for manufacturing and 10–35 percent for construction. The remaining sectors are either small or do not have large employment losses; several sectors show employment growth even after crises.

Our fourth and final contribution is to provide new evidence on the incidence of crises. We disaggregate results by age and education, which we view as proxies for the income and assets that might allow people to self-insure against idiosyncratic income risk. Younger and less educated workers experience a larger rise in unemployment and long-term unemployment in all recessions, but the gap between groups grows during crises.

[2]We previously built and used this data set to study differences in labor market outcomes across development levels in Donovan, Lu and Schoellman (2023).

In countries affected by multi-dimensional crises, the separation rate for less educated workers rises by 2 percentage points per quarter and the job-finding rate falls by 10 percentage points per quarter, which leads their unemployment rate to rise by 11 percentage points and their long-term unemployment rate to rise by 7 percentage points. Guntin, Ottonello and Perez (2023) find that high consumption-income elasticities are ubiquitous in the five crisis events for which they have access to microdata on consumption. If this finding applies more broadly, then the implication is that crises are episodes of substantial unemployment risk and that this risk is borne by the households least likely to be able to self-insure against such shocks.

In addition to the work cited so far, our findings also relate to two additional literatures. The welfare costs of crises is an important ingredient in cost-benefit calculations for policies that seek to mitigate or prevent crises, such as macroprodential or housing regulatory policy (Svensson, 2017; Allen and Greenwald, 2022). More speculatively, labor markets are a promising avenue for delivering much-needed amplification to allow models to generate long, slow recoveries. Recent work finds that the cyclical properties of labor markets may further help improve our understanding of the nature of shocks (Dupraz, Nakamura and Steinsson, 2021; Hall and Kudlyak, 2022).

2 Data

All of the data for our analysis comes from labor force surveys, meaning surveys of households that collect detailed information on each member's labor force status. Labor force surveys are the source of official labor market statistics such as the labor force participation rate or the unemployment rate. Countries differ in the regularity and frequency with which they collect such surveys, with some countries changing practices over time. We focus on countries and periods where data are collected at a quarterly frequency.

We construct two very different data sets from these surveys. The first is an aggregate data set that includes the quarterly unemployment rate derived from these surveys and published by national statistical agencies. The key advantage of this data set is its breadth of coverage. Breadth is useful for characterizing the full distribution of labor market responses to recessions. It is essential for studying uncommon events such as house price busts or financial crises, for comparing subsets of the data (comparing the Great Recession to other financial crises), or for controlling for possible confounding

factors (such as labor market policies). On the other hand this data set is shallow, in that it does not offer us any scope to characterize how macroeconomic crises propagate through labor markets or who they affect.

We complement the aggregate data set with a micro data set consisting of the harmonized microdata from labor force surveys with a rotating panel design for a subset of countries and years. This dataset is narrower than the first, but still covers nearly 100 recessions. At the same time, the fact that we have access to microdata allows us to study recessions and crises more deeply. We describe each data set in turn.

2.1 Aggregate Data Set

Our aggregate data set consists of the official quarterly series for the unemployment rate computed from labor force surveys for all countries and years for which we have been able to collect this data.[3] Most of our data are sourced from the Eurostat, OECD, and ILO databases on labor market statistics. We also supplement these sources with data from the respective countries' national statistical offices. See Appendix A for details on the sources and data availability by country.

We collect the aggregate unemployment rate from each source. The details of how this moment is constructed vary slightly by country. Some countries construct the unemployment rate for the entire labor force, whereas others (such as EU countries) focus on people age 15–74. Countries also differ slightly in how they define who is unemployed.[4] An important advantage of the micro data set is that we can harmonize the population of interest as well as how we measure unemployment. When comparing our harmonized measure to the aggregate reported statistics for the same country, we find these differences play a minor role in our findings. We use seasonally adjusted figures whenever they are available. When they are not, we adjust the series ourselves by estimating and removing proportional quarter-of-year fixed effects as in Donovan, Lu and Schoellman (2023).

We also collect data on quarterly real GDP or quarterly real GDP growth rates for all possible countries. Our sources include the Eurostat, OECD, and IMF databases

[3] We exclude data on registered unemployment, which is more sensitive to details of how the unemployment insurance system is structured.

[4] Hussmanns (2007) provides a useful overview of the common definitions of key labor market concepts and the conceptual and practical issues that lead countries to deviate from these definitions. As one example, some developing countries do not insist on the "search" criteria for people to be included among the unemployed.

on national accounts statistics. We again supplement these sources with data from the respective countries' national statistical offices. We convert all series to quarterly growth rates. We use seasonally adjusted figures whenever they are available. When they are not, we adjust the series ourselves by taking the fourth root of the year-over-year growth rate. This choice reflects a compromise: estimating and removing quarterly fixed effects (as we do with unemployment rates) performs well in countries with short time series but not in countries with long time series; more sophisticated methods work well with long time series but are not appropriate for countries with fewer than ten years of data.

Finally, we collect annual population data from World Bank (2023). We measure quarterly real GDP per capita growth rates by subtracting one-quarter of the annual population growth from the real GDP growth rate. This step is mostly useful for facilitating comparisons between countries with high and low rates of population growth, such as emerging versus developed economies.

We focus on countries for which we have overlapping series of quarterly unemployment and quarterly real GDP per capita growth rates with the unemployment data spanning at least six years. The resulting database is an unbalanced panel covering 83 countries. See Table A1 for countries and time periods covered. Throughout the paper we define a recession in a consistent way across all countries as any period of two or more consecutive quarters of negative real GDP per capita growth. This definition is consistent with the common rule of thumb suggested in textbooks and ensures that our measurement is consistent across countries. It produces some double-dip recessions; if two recessions are combined by only a single quarter of positive growth, we aggregate them into a single recession. Note that this definition differs from the officially defined recessions in the United States; for example, by our measure there was no recession in 2001.

The main advantage of this aggregate data set is its breadth. In total, it covers 311 recessions among the 83 countries (Table A1 shows the distribution of recessions across countries). The main disadvantage is that aggregate data do not offer much scope to understand how aggregate shocks are transmitted to individuals or who is affected. We complement our analysis with a micro data set that covers fewer countries and recessions but offers a wealth of details on workers' demographics, labor force status, and labor market dynamics.

2.2 Micro Data Set

Our second data set draws on our ongoing research project in which we collect and harmonize microdata from labor force surveys for a large number of countries worldwide. We focus on the subset of countries with quarterly labor force surveys that have three features. First, the country uses a rotating panel design, meaning that they track the same household for multiple periods. Second, this design allows households to be tracked across two consecutive quarters, which allows for the greatest comparable set of countries. Third, the country makes the data with the identifiers needed to match people consistently across sample waves available to researchers.

We use the identifiers in the data to match workers across consecutive quarters. We validate these matches using the standard best practice in the literature (Madrian and Lefgren, 2000). This allows us to study both labor market states and labor market flows in a consistent way for all workers and countries in the micro data set. We post-stratify the original weights so that the matched data and original unmatched samples have the same distribution across age, sex, education, and labor force status to help minimize the effect of attrition.

We previously used an earlier version of this micro data set to study how labor market dynamics, such as labor market flows or the functioning of the job ladder, vary with development (Donovan, Lu and Schoellman, 2023). In this paper we build on the subset of 37 countries with data spanning at least 24 quarters to study how labor markets respond to recessions and particularly to crises. A list of the countries and years included is available in Table A2.

We have harmonized a number of important variables to be consistent across countries. We overview these variables here; a more extensive description, analysis, and comparison to alternative sources is available in Donovan, Lu and Schoellman (2023) or at the companion website, `https://www.lfsdata.com/`. First, we harmonize a number of labor market outcomes, including employment, hours worked, unemployment, and long-term unemployment.[5] Second, we harmonize outcomes on the type of work, including notably occupation and industry. Finally, we harmonize a number of covariates of interest, including demographics and education. We discuss these variables further as they become relevant.

[5]The unemployed in each country are consistently defined as non-employed people who satisfy the standard three-part test: i) they want a job; ii) they have actively searched for a job in the last four weeks or month; and iii) they are available to start a job. Long-term unemployment includes those unemployed for a year or longer.

We focus throughout on the urban population aged 16–65. Some countries do not collect data on rural areas; we restrict attention to ages 16–65 to mitigate concerns about cross-country differences in labor market institutions such as child labor laws or retirement policies. In addition, some countries collect limited data on people over age 65.

We merge on the same measure of real GDP per capita and define recessions in the same way as we did for the aggregate data set. Doing so allows us to compare the behavior of labor markets in aggregate and micro data after the same recessions. More importantly, it means that we can study the anatomy of the same shocks in terms of labor market flows, sectoral changes, and types of workers affected. We begin our analysis with the aggregate data in the next section.

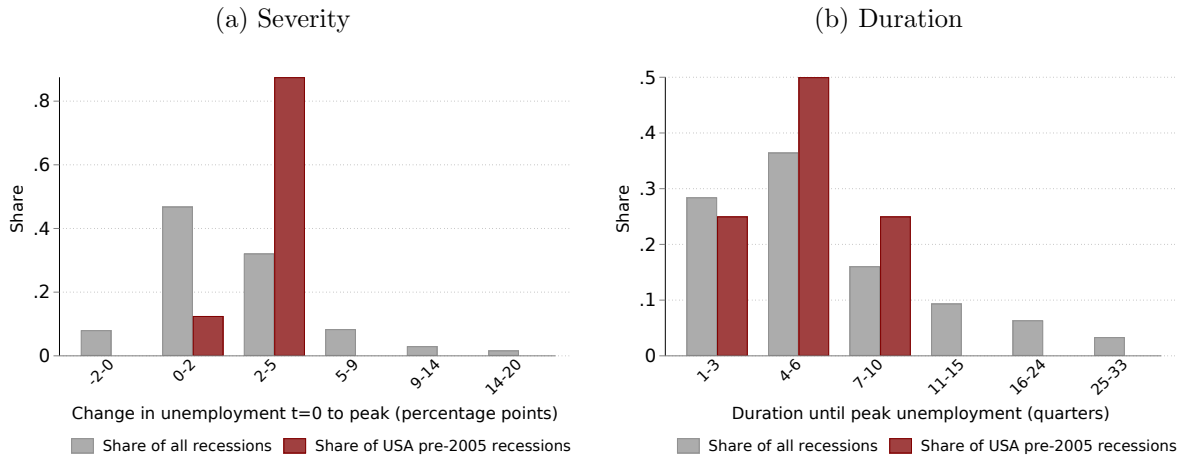
3 Recessions and Aggregate Labor Market Outcomes

Our first contribution is to use the aggregate data set to characterize how the reported unemployment rate changes during the 311 recessions for which we have data. For every recession covered by our data set, we set date $t = 0$ as the peak of the expansion and $t = 1$ as the onset of the recession, the first quarter of falling real GDP per capita. For much of our analysis we focus on two key summary statistics of the unemployment response to a recession. *Severity* measures the percentage point rise in the unemployment rate from $t = 0$ until its peak, the quarter before it begins to fall. *Duration* measures how many quarters it takes for unemployment to begin to recover.[6]

Our data set provides us with a large sample of labor market responses to recessions. Hence, we can characterize not just the average or median response of unemployment, but the distribution of responses along these two dimensions. Figure 1 provides a first look at our data in the form of a simple histogram of the severity and duration of labor market responses to recessions. The key finding is that the distribution of both severity and duration are strongly right-skewed. Most of the mass is on short, mild recessions: for almost half of the recessions the unemployment rate rises by 0–2 percentage points and for two-thirds the recovery begins within six quarters. However, the tail of the

[6]For a small number of recessions the unemployment rate does not rise. We code these recessions as having a duration of one quarter and the severity of the first quarter decline in unemployment. They play a small role in our analysis, which focuses on the other tail of the distribution. Duration and severity are set to missing for recessions where the unemployment rate does not recover during the period of data availability.

Figure 1: Distribution of Labor Market Responses to Recessions



distribution is long. For the most severe ten percent of recessions, the unemployment rate rises by 5 to as much as 19 percentage points, and it takes from 16 to 33 quarters for the unemployment rate to begin to fall. These findings closely parallel existing work that studies the distribution of changes in output or consumption (Barro, 2006; Barro and Ursúa, 2008; Barro and Jin, 2011).

Existing work that quantifies the importance of idiosyncratic risk for the welfare cost of business cycles uses unemployment data from the United States spanning roughly the years 1947–2005 (Storesletten, Telmer and Yaron, 2001; Krusell et al., 2009). It is well-known in the literature that the volatility of output was unusually low in the United States during this period as compared to samples that include more countries or longer spans of time (Cogley, 1990; Barro, 2009). A similar finding applies for labor market outcomes. To help see this fact, Figure 1 shows with red bars the distribution of severity and duration of labor market downturns that comes from the U.S. 1947–2005 data – that is, the portion studied in the previous literature. Labor market downturns in the United States were generally mild from World War II until the Great Recession, so studies that focus on this period miss the tail of extreme events. More recent U.S. recessions have been accompanied by more severe labor market downturns, but it is still the case that the United States does not account for any of the ten most severe downturns in the data set.

In what follows, we focus on the longest and most severe labor market downturns. In the next section, we use the aggregate data to characterize the macroeconomic conditions associated with severe downturns. We show that they are closely connected with several

well-known types of crises such as financial crises, house price busts, and sudden stops. In Section 5 we turn to the micro data set and characterize the anatomy of crises: how they propagate through the economy and what types of workers they affect most.

4 Characteristics of Severe Labor Market Downturns

In the last section we showed that the distribution of labor market outcomes during a recession is skewed. For example, the ten percent of most severe events are characterized by unemployment rates rising by at least 5 percentage points over at least 4 years before the labor market recovery begins. In this section we show that severe labor market downturns are associated with a small set of events and policies.

We emphasize that our results are descriptive rather than causal. We cannot estimate the effect of exogenously shocking an economy with, say, a financial crisis. We also acknowledge that the events we study are endogenous, in the sense that they arise in part as a consequence of broader macroeconomic conditions, world events, and policy choices. Nonetheless, we find these results useful because they show that there is a close correspondence between severe labor market downturns and a few types of crises, in the sense that these crises often cause severe downturns and most severe downturns can be linked to these crises. The size of our aggregate data set also makes it possible for us to control for confounding factors and estimate effects from subsets of the data, which allows us to show that this link is not due to a small number of events and is robust to controls.

4.1 Defining Crises

Recent work in macroeconomics and international economics identifies a number of candidate types of crises that may help explain severe labor market downturns. We cast a wide net in searching for possible types of crises. The main constraint to including additional types is that some candidates, such as conflict, turn out to be rare experiences among the set of countries in our database, e.g., those that have quarterly national accounts data and quarterly labor force surveys. To tie our hands, we use external data sets with the incidence of crises already defined when available. In the remaining cases we apply standardized rules to publicly available data.

Our starting point is the Global Crises Data by Country (GCDC) database.[7] The GCDC database contains data on the incidence of a number of possible types of crises at the country-year level. We focus in the text on three main types in their database. There are two forms of financial crises, where countries experience bank runs or bailouts of financial institutions. Systemic financial crises are severe cases where the crisis affects a large share of the banking sector; non-systemic crises are the less severe versions. We also study stock market crashes, which they define following Barro and Ursúa (2017) as "cumulated multi-year real returns of -25 percent or less." Their database also identifies the incidence of currency crises (depreciation of the currency by greater than 15 percent), which we find to play a minor role in the extent of a labor market downturn; and the incidence of (sovereign) debt defaults and inflation crises, which are too rare in our sample for us to provide reliable estimates.

The GCDC database identifies the incidence of crises at a country-year level. For each recession in our database, we consider the period $[-4, 8]$, that is, four quarters before to eight quarters after the onset of the recession. We consider a recession to be affected by a particular type of crisis if such a crisis happens within this period. Note that a recession can be accompanied by multiple, overlapping crises. Indeed, as we shall see shortly, such multi-dimensional crises are central to our analysis.

A second important type of crisis that has widespread attention in the literature is sudden stops. We classify sudden stops as cases when a country has a year-over-year change in its current account that is two standard deviations larger than the country-specific sample mean. We consider a recession to be affected by a sudden stop if there is one the year prior to, during, or after the recession. This combination of criteria is closely related to the work following from Calvo, Izquierdo and Meija (2004).

Finally, we consider a number of other types of crises that are inspired by the literature, but do not have a commonly agreed-upon definition. In these cases, we use a rule of looking for extreme swings as we did for sudden stops. The crisis that we highlight in the main text is house price busts. We use data from the Organisation for Economic Co-operation and Development (OECD) Analytical House Price Indicators.[8] We define a house price bust as when the 4-quarter log change in the house price index is below the 5th percentile of the overall distribution (-0.10, roughly a ten percent decline). We

[7] This database builds on the work of Carmen Reinhart and co-authors (e.g., Reinhart and Rogoff, 2009). Downloaded from https://www.hbs.edu/behavioral-finance-and-financial-stability/data/Pages/global.aspx on September 8, 2021.

[8] Available online at https://data.oecd.org/price/housing-prices.htm.

associate a recession with a house price bust if there was such a bust from one year before to two years after the start of the recession. We also explore large movements in commodity prices, where we study import and export commodity prices separately using data from Gruss and Kebhaj (2019). These results are reserved to Appendix B.1.

Table A3 shows the number of each type of crisis that is covered by our aggregate data set. It also shows the subset of those crises that are associated with recessions, and then the further subset that are also covered by our micro data set. An important lesson from this table is that it is essential to construct large data sets to study these shocks. Our aggregate data spans more than 2,100 country-years of data, yet it covers only 21 systemic financial crises, 22 non-systemic financial crises, and 52 house price busts. Data from a single country or even a single region would not given a sufficient sample of such events to provide reliable estimates of the typical path of labor market outcomes after they occur.

4.2 Severe Labor Market Downturns and Crises

Our second aggregate result is that severe labor market downturns are closely associated with a few types of crises. We show that this association runs in both directions. First, we focus on the worst labor market downturns in our data set, as measured by the severity (cumulative rise in the unemployment rate from onset of the recession to labor market recovery). Table 1 lists the country and dates of the ten worst downturns. All of these events involve rises in the unemployment rate of more than 10 percentage points, with the largest rise hitting nearly 19 percentage points.

Table 1: Severe Labor Market Downturns and Crises

Rank	Country	Dates	Severity	Types of Crises
1	Greece	2007q2–2013q1	18.97	Financial-systemic, Stock market, Sudden stop
2	Spain	2007q4–2013q1	18.07	Financial-nonsystemic, Stock market, Sudden stop
3	Belize	2019q4–2020q2	14.50	COVID
4	Finland	1990q1–1993q2	14.03	Financial-systemic, Stock market, House price
5	Lithuania	2008q2–2009q4	13.87	House price, Sudden stop
6	Latvia	2008q1–2010q2	13.80	House price, Sudden stop
7	Estonia	2007q3–2009q3	13.07	House price, Sudden stop
8	Costa Rica	2019q4–2020q2	11.80	Sudden stop, COVID
9	Ireland	2007q1–2010q2	11.23	Financial-systemic, Stock market, House price
10	South Africa	2019q4–2020q2	10.80	Sudden stop, COVID

Ranking in terms of size of cumulative rise in unemployment rate from onset of recession to peak unemployment. See text for definitions of crises.

The final column of this table lists the types of crises that are associated with each of these downturns. We focus on the five types of crises that we highlighted in the

last section (systemic and nonsystemic financial crises, stock market crashes, sudden stops, and house price busts). In total, nine of the ten worst macroeconomic crises are associated with at least one type of crisis. Further, seven of the crises are associated with multidimensional crises, meaning that they are affected by more than one type of crisis at the same time. Thus, while crises are generally rare, we see that they are ubiquitous during severe labor market downturns.

We have also noted in the table the three downturns that span early 2020 and hence are affected by the COVID pandemic. This pandemic represents a particularly special case in our analysis for two reasons. First, the pandemic disrupted data collection, with many countries reporting no labor force survey data for one or several quarters in 2020. Second, while COVID lowered hours worked in all countries where we can measure it, the effect on the measured unemployment rate turns out to be sensitive to the details of how governments structured their COVID relief policies during the pandemic; see Appendix B.3 for details. For this reason, our main analysis focuses on the other types of crises and we relegate the analysis of COVID to the appendix.

Table 1 shows that the most severe labor market downturns are strongly associated with a few types of crises. We now show that the same association holds in the other direction: those same types of crises are systematically associated with longer and more severe labor market downturns. To do so, we use regressions to estimate the factors that are correlated with the severity and duration of the labor market downturn during a recession. Our main factors of interest are whether a recession is affected by one or more of these types of crises. Most recessions are not crises. On the other hand, Table 1 shows that severe labor market downturns are often associated with multidimensional crises. We estimate the effects of the types of crises jointly to try to disentangle which one or ones might be most correlated with the extent of the labor market downturn.

Table 2 shows our results. Columns (1)–(3) show the correlates of the severity of a labor market downturn, while columns (4)–(6) show the correlates of the duration. Columns (1) and (4) show the simplest possible specification, which includes a constant term and indicators for whether the recession is associated with each of the five main types of crises. These are the only specifications with an interpretable constant, which tells us the effect of a non-crisis recession: the unemployment rate rises by 1.7 percentage points over the course of a little less than six quarters before the recovery begins. The coefficients for the crises reflect the additional effect on severity and duration of being in a recession that is also affected by the relevant type of crisis. For example, the coefficient

Table 2: Unemployment response to recessions: severity and duration

	Severity			Duration		
	(1)	(2)	(3)	(4)	(5)	(6)
Systemic financial crisis	1.836**	2.189***	1.741**	3.614**	1.905	0.178
	(0.753)	(0.804)	(0.749)	(1.549)	(1.762)	(1.567)
Non-systemic financial crisis	1.221	0.321	0.595	2.079	-0.562	0.067
	(0.813)	(0.863)	(0.801)	(1.672)	(1.891)	(1.668)
Stock market crash	0.161	1.004**	1.090**	2.425***	3.532***	1.715*
	(0.417)	(0.467)	(0.433)	(0.859)	(1.024)	(0.931)
House price bust	1.390***	1.520***	1.555***	2.725**	4.190***	2.138*
	(0.518)	(0.552)	(0.512)	(1.065)	(1.210)	(1.097)
Sudden stop	1.875***	2.223***	1.583***	0.531	0.116	-0.303
	(0.369)	(0.411)	(0.396)	(0.760)	(0.901)	(0.796)
Severity, GDP			0.154***			
			(0.026)			
Duration, GDP						0.869***
						(0.110)
Constant	1.704***	0.762	0.155	5.756***	2.000	-0.608
	(0.210)	(2.520)	(2.337)	(0.431)	(5.520)	(4.874)
R^2	0.160	0.490	0.564	0.124	0.397	0.534
N	299	299	299	299	299	299
Countries	81	81	81	81	81	81
Country FE	No	Yes	Yes	No	Yes	Yes

Severity, GDP measures the log difference in real GDP per capita between peak and trough. Duration, GDP measures the time (in quarters) between peak and trough.
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

on sudden stops indicates that unemployment rises by more than twice as much during such events (1.7+1.9=3.6 percentage points in total). Similarly, the coefficients in column (4) show that systemic financial crises last nearly a year longer than standard recessions, consistent with the overall findings of Reinhart and Rogoff (2014).

In columns (2) and (5) we repeat the same estimation with country fixed effects, which we think of as proxying for a large number of persistent differences in macroeconomic and labor market policies. In this specification, the correlation between the crises and severity and duration of the labor market downturn is estimated off of within-country, cross-recession variation. We see that this control does change some of the results. Non-systemic financial crises are more weakly correlated with severe labor market downturns, whereas stock market crashes are more strongly correlated. The remaining coefficients are broadly similar.

Finally, we explore controlling for the change in GDP during the recession. Specifically, in column (3) we estimate the effect of crises on the cumulative rise in the unemployment rate while controlling for the difference in log real GDP per capita between the peak and the trough, while in column (6) we estimate the duration of rising unemployment rates while controlling for the duration of falling real GDP per capita. These

estimates speak to the mechanism through which crises generate severe labor market downturns: do they simply depress production, or do they have an additional effect that would be missed by focusing on output? The estimates reveal that the change in GDP is a very strong and statistically significant predictor of the labor market downturn. They also admit a natural interpretation. The coefficient on severity implies that each additional one log point (one percent) decline in real GDP per capita is associated with 0.16 percentage points more unemployment. The coefficient on duration implies that each additional quarter of falling real GDP per capita is associated with 0.9 quarters of rising unemployment; we cannot reject that the coefficient is one.

Returning to the estimates for the crises, column (3) shows that many of the crises are estimated to have an additional effect on the severity of the labor market downturn even after controlling for the decline in real GDP per capita. Four of these effects are large and three are statistically significant. However, column (6) shows that the crises have a lesser effect on the duration of the labor market downturn, both in terms of economic magnitude and statistical significance. If we go further and re-estimate a specification similar to column (6) but with the coefficient on the duration of falling real GDP per capita restricted to be one, we find even smaller estimates for the crises. Thus, we conclude that these five types of crises contribute to the severity of the labor market downturn above and beyond their effect on declining real GDP per capita, but that they affect duration only by depressing the recovery in real GDP per capita for longer.

The size of our data set allows us to study subsets of events and test whether our results are driven by a few episodes. One particular case of interest is the Great Recession, which was a large financial crisis experienced across much of the world. In Appendix B.2 we show that the Great Recession lasted more than a year longer and involved a 2.1 percentage point larger rise in unemployment than a non-crisis recession. However, controlling separately for the Great Recession does not much alter the point estimates or statistical significance of the effect of financial crises or house price busts. Indeed, our estimates attribute much of the severity of the Great Recession to the fact that it was widely associated with systemic financial crises and house price busts. We conclude that our results are not special to the Great Recession.

We focus on five main types of crises. Table B1 shows the estimates when we control for all of the types of crises that we have explored simultaneously. One reason that we focus on these five types is that the remaining shocks have smaller and inconsistent estimated effects. Whereas the five main types of crises are strongly correlated with

severe labor market downturns, commodity shock prices, currency crises, and COVID are not. At an even more basic level, Table A3 shows that whereas most financial crises, house price busts, and sudden stops are associated with recessions, only about half of stock market crashes and currency crises are; most adverse commodity price swings are not associated with a recession at all.

Finally, the results in Table 2 suggest that different types of crises affect labor markets differently. For example, house price busts appear to be associated with more severe but not longer-lasting labor market downturns, whereas financial crises are less severe but are associated with longer downturns. To help visualize the full time path of the downturn and recovery, we estimate local projections following Jordà (2005). For each recession, we extract all available data in the window spanning up to $t \in [-8, 40]$, where again $t = 0$ corresponds to the peak of the previous cycle. We normalize all labor market outcomes by their value a year prior, $t = 0$, for the rest of the paper.

We use this data to estimate

$$\Delta y_{t+h} = \beta_h + \beta_{h,c} D_{t,c} + \epsilon.$$

Here, Δy_{t+h} is the cumulative change in the outcome of interest y after $h \in \{4, 8, 12, 16, 20, 24, 28, 32, 36, 40\}$ quarters for a recession that started in time t. On the right-hand side, $D_{t,c}$ is a dummy that takes the value of 1 if the recession at time t was accompanied by crisis type c. We pool together systemic and non-systemic financial crises and estimate the typical path for four types of crises. Then β_h captures the estimated time path of a non-crisis recession, while $\beta_{h,c}$ captures the estimated additional effect associated with a crisis of type c (so the total effect is $\beta_h + \beta_{h,c}$).

We start by showing the estimated time path of GDP per capita after each type of crisis in Figure 2 for context. The (common) blue line shows the estimated effect of a non-crisis recession. The red line in the figures shows the estimated path for output after a recession accompanied by a financial crisis, a house price bust, a stock market crash, and a sudden stop, respectively. Consistent with the findings in the literature, each type of crisis is associated with a more severe recession in terms of the decline in real output. The time path is different, however: house price busts are more severe initially but the recovery is also quicker, whereas financial crises in particular are associated with long, slow recoveries.

In Figure 3 we plot the corresponding local projection estimates for the path of

Figure 2: Local Projection Estimates of Effects of Shocks on GDP p.c.

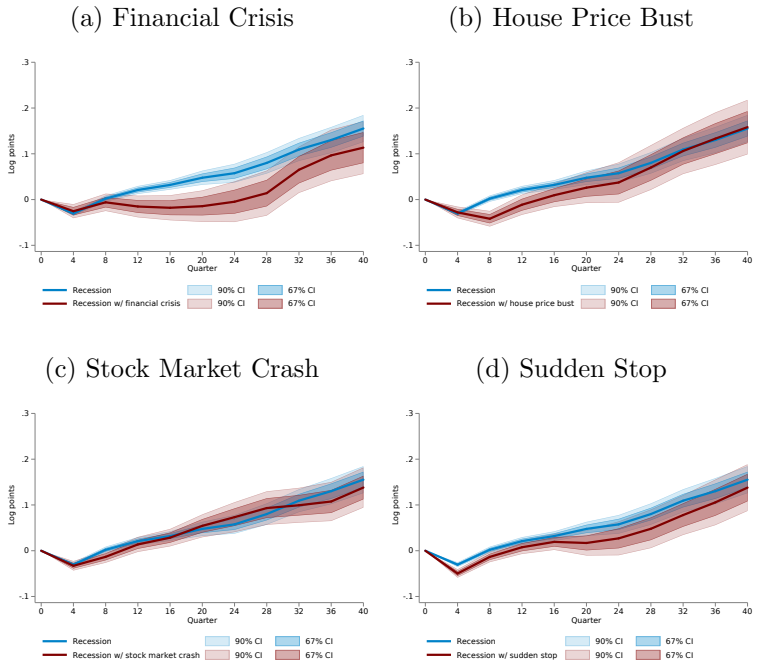
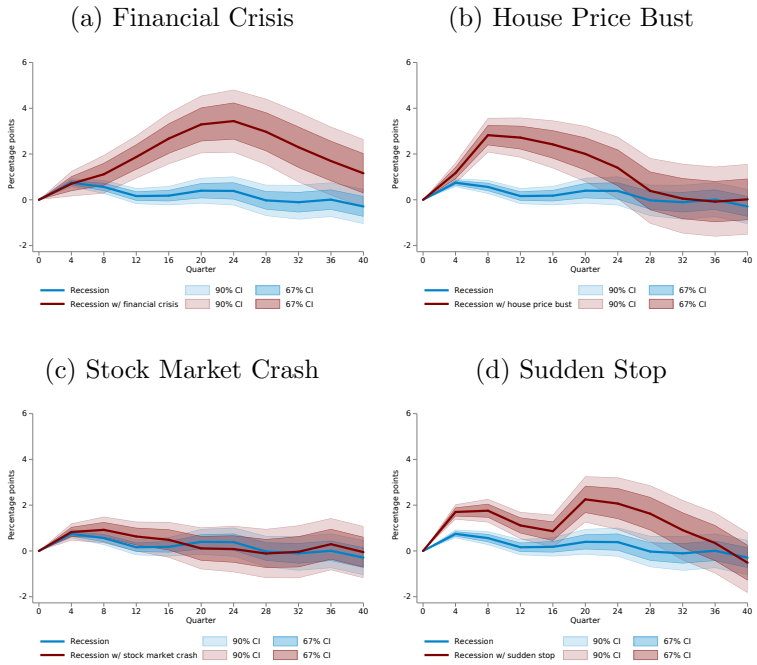


Figure 3: Local Projection Estimates of Effects of Shocks on Unemployment



unemployment. The results are consistent with the estimates in Table 2 and the path of GDP per capita in Figure 2. Each of the four types of crisis results in a time path for unemployment that is consistently higher than in a non-crisis recession. The difference is

smallest for stock market crashes and larger for the other three types. The shape of the path also differs. Financial crises and sudden stops are both more prolonged events than house price busts, which involve a more rapid deterioration of labor market conditions but also a more rapid turnaround.

4.3 Heterogeneity in Labor Market Downturns

In the last section we showed that there is a close correspondence between severe labor market downturns and a few types of crises including financial crises, stock market crashes, house price busts, and sudden stops. In this section we use the aggregate data to explore whether there is important heterogeneity in these impacts associated with a country's macroeconomic conditions or policy. Heterogeneity is useful for understanding which countries are most affected by crises and the mechanisms through which crises work.

We start with macroeconomic conditions prior to the onset of the shock. Among these, we find important heterogeneity between developed and emerging economies. We divide countries into two groups based on the S&P Dow Jones Indices' 2018 Country Classification. They distinguish between developed, emerging, and frontier economies; we group the last two together because there are few frontier economies with quarterly labor force surveys. We then estimate the relationship between crises and the severity and duration of the labor market downturn while allowing for interactions between developed/emerging status and shocks. Table 3 shows the results.

Columns (1) and (4) estimate the relationship between severity or duration and crises with country fixed effects but without any interaction between developed/emerging status. The estimates are the same as columns (2) and (5) of Table 2 and are included for reference. Columns (2) and (5) allow for a single interaction between a dummy for emerging markets and any type of crisis. The estimated interaction is positive but not statistically significant. Comparing the common coefficients in columns (1) and (2), or in columns (4) and (5), shows that allowing for this interaction also weakens the estimated effects on sudden stops. Columns (3) and (6) allow for a full set of interactions between emerging market status and each of the five types of crisis. Two main results obtain. First, there is some evidence that emerging markets are less affected by most crises: most of the interaction effects are negative, although not statistically significant. Second, much of the strong estimated effect of sudden stops is associated with emerging

Table 3: Unemployment Response to Recessions: Emerging Markets

	Severity			Duration		
	(1)	(2)	(3)	(4)	(5)	(6)
Systemic financial crisis	2.189***	2.239***	1.950*	1.905	2.039	2.044
	(0.804)	(0.805)	(1.039)	(1.762)	(1.761)	(2.292)
Non-systemic financial crisis	0.321	0.351	0.744	-0.562	-0.482	0.566
	(0.863)	(0.863)	(0.950)	(1.891)	(1.889)	(2.095)
Stock market crash	1.004**	0.829*	1.132*	3.532***	3.064***	3.455**
	(0.467)	(0.494)	(0.623)	(1.024)	(1.081)	(1.376)
House price bust	1.520***	1.406**	1.596**	4.190***	3.885***	3.842**
	(0.552)	(0.562)	(0.729)	(1.210)	(1.230)	(1.608)
Sudden stop	2.223***	1.945***	0.998*	0.116	-0.630	-2.226*
	(0.411)	(0.485)	(0.601)	(0.901)	(1.061)	(1.326)
Emerging market x any crisis		0.706			1.893	
		(0.653)			(1.428)	
Emerging market x systemic financial crisis			-0.346			-1.941
			(1.653)			(3.648)
Emerging market x non-systemic financial crisis			-3.371			-7.003
			(2.337)			(5.156)
Emerging market x stock market crash			-0.178			0.344
			(0.937)			(2.067)
Emerging market x housing price bust			-0.829			-0.418
			(1.115)			(2.459)
Emerging market x sudden stop			2.400***			4.498**
			(0.838)			(1.848)
Constant	0.762	0.762	0.762	2.000	2.000	2.000
	(2.520)	(2.518)	(2.484)	(5.520)	(5.510)	(5.481)
R^2	0.490	0.493	0.516	0.397	0.402	0.419
N	299	299	299	299	299	299
Countries	81	81	81	81	81	81
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

markets. The estimated marginal effect of a sudden stop in developed economies is a 1.0 percentage point larger rise in unemployment and a recovery that is 2.2 quarters *shorter* than a normal recession. For emerging markets, the effects are much larger: a 3.4 percentage point larger rise in unemployment and a recovery that is 2.3 quarters longer than a normal recession. This is consistent with the view that sudden stops are an important feature of emerging but not developed economies (Calvo, Izquierdo and Meija, 2004).

We also explore interactions between three other measures of macroeconomic conditions and the estimated effects of crises in a similar fashion. In the interest of space, we describe results here, with the full set of estimates shown in Table B2. We explore interactions between the unemployment response to crises and whether a country has a fixed or flexible exchange rate, but we do not find any clear results. We explore interactions with whether the country has a current account deficit at $t = 0$ and find that countries

with current account deficits have longer and more severe labor market downturns, both in non-crisis recessions and crises. Finally, we explore interactions with high debt levels measured as private debt to GDP ratios in excess of 2, again without any clear results. In all cases, controlling for these initial conditions does not much affect the estimates of the relationship between the various types of crises and the severity or duration of labor market downturns.

Table 4: Unemployment Response to Recessions and Labor Market Policies

	Severity				Duration			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Systemic financial crisis	2.189***	2.295*	0.103	0.261	1.905	3.844	2.724	-0.388
	(0.804)	(1.364)	(1.505)	(1.354)	(1.762)	(2.447)	(2.586)	(2.720)
Non-systemic financial crisis	0.321	1.144	-0.136	0.748	-0.562	3.923	-1.440	-1.106
	(0.863)	(1.890)	(1.871)	(1.471)	(1.891)	(3.390)	(3.215)	(2.957)
Stock market crash	1.004**	1.090	0.604	0.251	3.532***	3.751**	3.952**	4.737***
	(0.467)	(0.831)	(1.006)	(0.803)	(1.024)	(1.490)	(1.729)	(1.613)
House price bust	1.520***	1.292	1.079	2.341**	4.190***	3.917**	2.394	5.218***
	(0.552)	(0.979)	(1.172)	(0.956)	(1.210)	(1.756)	(2.013)	(1.920)
Sudden stop	2.223***	2.692***	3.415***	1.992***	0.116	0.912	1.799	-1.497
	(0.411)	(0.633)	(0.864)	(0.670)	(0.901)	(1.135)	(1.484)	(1.346)
Min. wage/GDP per worker		0.832				2.231		
		(0.763)				(1.369)		
Collective bargaining coverage			6.140***				6.217**	
			(1.584)				(2.721)	
Trade union density				0.733				4.064
				(1.489)				(2.993)
Constant	0.762	0.692	-0.111	1.159	2.000	1.812	1.117	2.829
	(2.520)	(2.828)	(2.609)	(1.467)	(5.520)	(5.072)	(4.483)	(2.947)
R^2	0.490	0.581	0.753	0.680	0.397	0.534	0.741	0.634
N	299	174	102	135	299	174	102	135
Countries	81	67	51	62	81	67	51	62
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Measures of labor market institutions are standard normalized.
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We also explore interactions between labor market institutions and the estimated effects of crises. We are motivated by the large literature that shows that labor market institutions affect the trend level of unemployment and the rate at which workers reallocate in response to shocks (Hopenhayn and Rogerson, 1993; Ljungqvist and Sargent, 1998; Jung and Kuhn, 2014). Labor market institutions also vary widely within our sample, for example between continental Europe and the United States or between developed and emerging economies.

We use data on labor market institutions from International Labour Organization (2024) and focus on three measures that are available for many of the countries in our sample: the statutory minimum wage, which we normalize by GDP per worker; the share of workers covered by collective bargaining; and the share of workers who are in a trade union. For comparability and interpretation, we standard normalize each of these variables.

Table 4 shows our results. Columns (1) and (5) again repeat the baseline specification for severity and duration. Columns (2)–(4) and (6)–(8) control for various measures of labor market institutions at $t = 0$ for each recession. Note that measures of labor market institutions are only available for about half of the recessions in our sample. Because of this, we do not try to estimate interactions between labor market institutions and types of crises.

The table contains two key findings. First, more restrictive labor market institutions – higher minimum wages and more collective bargaining – are associated with longer and more severe labor market downturns in response to recessions. All of the corresponding coefficients are positive and economically significant; the coefficients on collective bargaining coverage are also statistically significant. For example, a one standard deviation higher share of the labor force covered by collective bargaining is associated with a recession that lasts six quarters longer. Second, controlling for labor market institutions does not much change the estimated relationship between crises and the extent of the labor market downturn. The one possible exception is systemic financial crises; the point estimate for severity and duration are both smaller. However, we cannot reject that the coefficients are the same between specifications, so we view this result with some caution.

To summarize, this section uses the aggregate data set to document two main findings. First, there is a close correspondence between severe labor market downturns and a few types of crises. Nine of the ten worst labor market downturns are associated with at least one type of crisis. Regressing the severity or duration of the labor market downturn during a recession on the whether the recession was accompanied by a crisis reveals a consistent difference: financial crises, house price busts, and sudden stops in particular are associated with longer and more severe downturns (whereas currency crises or commodity price shocks, for example, are not). Second, we explore heterogeneity by country development level, pre-existing conditions, and labor market policies. There are important differences, but broadly the main finding that crises are associated with longer and more severe downturns persists.

5 Labor Market Anatomy of Crises

The breadth of the aggregate data set is useful for characterizing the distribution of labor market downturns and for showing the close connection between long, severe labor market downturns and a small set of crises. However, the aggregate data set contains

information on the aggregate unemployment rate, so it is not well-suited for more in-depth analysis. In this section we turn to the micro data set that contains harmonized data on workers matched across two consecutive quarters spanning 37 countries and 86 recessions. We use this information to provide a novel anatomy of the behavior of labor markets during crises. In particular, we focus on two questions: how do crises propagate through the economy, and who do they affect?

Since the micro data set covers fewer crises, we focus our attention on understanding the labor market response to non-crisis recessions, crises, and multi-dimensional crises, where crises includes recessions affected by only one type of crisis and multi-dimensional crises includes those affected by two or more types of crises. We also focus on the most severe crises as documented in the last section: financial crises (either systemic or non-systemic), sudden stops, and house price busts. Our smaller sample size and particularly the overlapping nature of the shocks implies that we cannot provide reliable estimates of the effect of the different types of crises in the microdata.

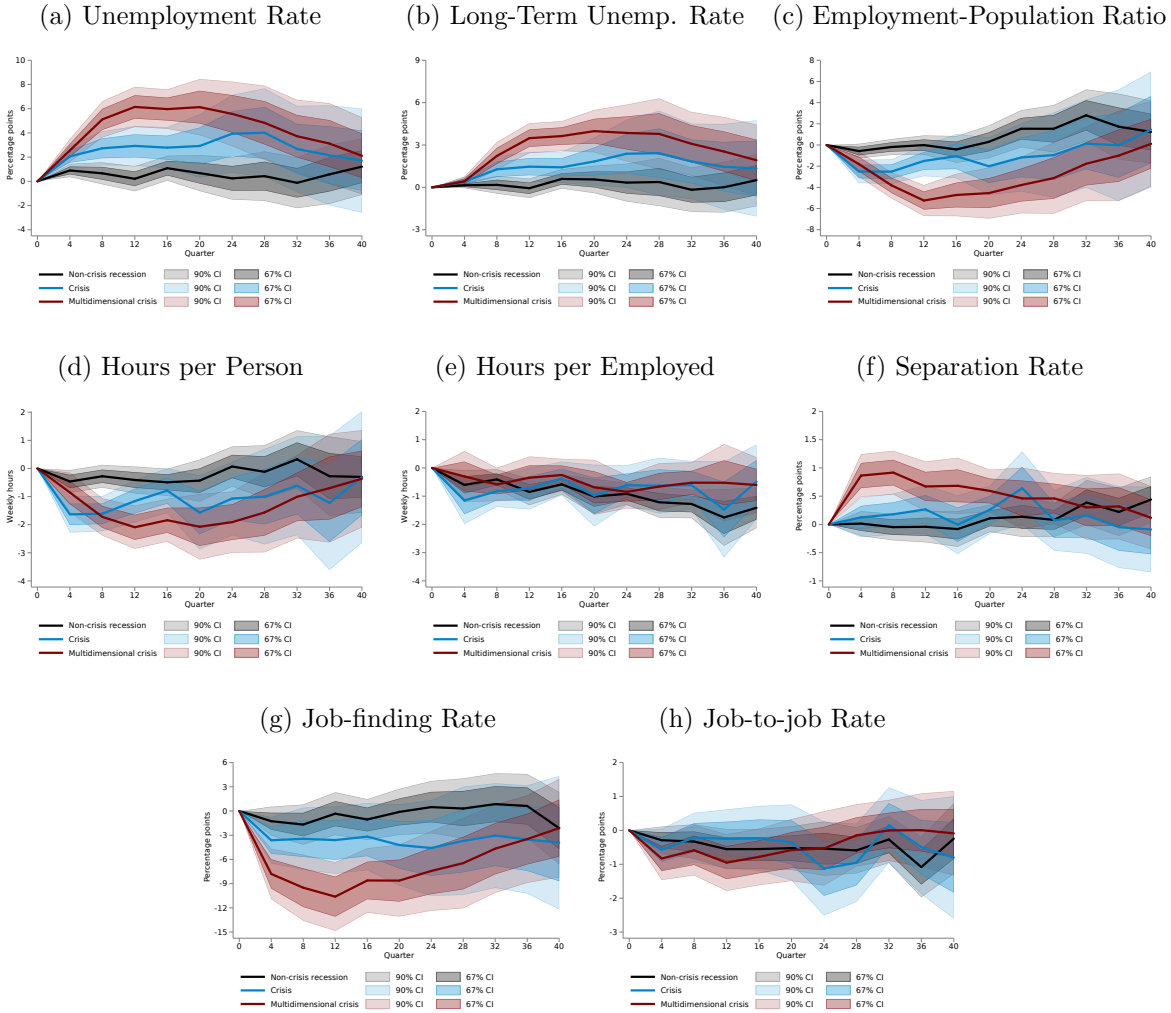
Recall that both the aggregate and the micro data sets build on quarterly labor force surveys. One simple check on the data sets is whether they imply the same results for the response of the aggregate unemployment rate. In principle this need not be the case, because the aggregate data set collects information reported by countries that use different definitions of unemployment and focus on different populations, whereas we standardize both dimensions. We show in Appendix B.4 that the local projections estimates are qualitatively similar when we use all recessions and quantitatively similar when we use the exact same set of recessions. This suggests to us that the differences in how countries define and construct these objects are not of first-order importance for researchers interested in cyclical labor market dynamics. We now turn our attention to how the micro data can enrich our understanding of crises.

5.1 Propagation through Labor Markets

We start our study of propagation by widening our analysis beyond the unemployment rate. Figure 4 shows the results from using local projections to estimate the time path of eight labor market outcomes that we have harmonized and measured in a standard way.

The first five panels show the behavior of labor market stocks. Panel (a) shows the behavior of the unemployment rate in the micro data. The estimates are broadly similar to those in the aggregate data set. As explained at the start of this section, the

Figure 4: Labor Market Outcomes During Recessions and Crises



differences are primarily due to the fact that the aggregate and micro data sets cover different recessions. The main novel information here is the comparison between non-crisis recessions, crises, and multidimensional crises. While unemployment rates rise by only one percentage point in a non-crisis recession, they rise by over three percentage points during a crisis, and more than six percentage points during multidimensional crises.

Panel (b) shows the long-term unemployment rate, which is the share of the labor force unemployed for a year or longer. This is a useful concept for measuring particularly severe income risk and evaluating the welfare costs of business cycles and crises. Long-term unemployment rates rise little in non-crisis recessions, less than half a percentage point. By contrast, long-term unemployment rates rise by 2–4 percentage points during

a crisis and the rate remains elevated even a decade after a multidimensional crisis.

Panel (c) shows the employment-population ratio. This statistic is useful for mitigating concerns about using unemployment as a measure of labor slack given, for example, large cross-country differences in unemployment insurance arrangements. The important finding here is that employment-population ratios mirror unemployment rates. It declines only modestly and quickly recovers during a non-crisis recession, but declines by 3–6 percentage points and takes nearly an entire decade to recover after a crisis.

Panels (d) and (e) plot the change in hours worked per person (age 16–65) and hours worked per employed person, respectively. Panel (e) shows that hours per worker decline by a similar amount, roughly one hour per week, after a non-crisis recession or a crisis. The larger overall decline in Figure (d), as well as the differences between non-crisis recessions and crises, can then be attributed to the fact that non-crisis recessions are estimated to have mild effects on employment, whereas crises have more severe effects.

We have also estimated changes in an extended measure of labor underutilization that combines unemployment and self-employment, motivated by the common finding in the literature that self-employment is closer to unemployment in developing countries (Donovan, Lu and Schoellman, 2023). In Appendix B.5, we show that this extended measure rises by about one percentage point more than the unemployment rate does in Latin America and other countries with high rates of self-employment. Elsewhere, this extended measure behaves similar to the conventional unemployment rate.

The remaining three panels show the behavior of labor market flows, which we measure using changes in labor force status for workers matched across two consecutive quarters. Panel (f) and (g) show the importance of rising separation rates and declining job-finding rates for the rise in unemployment. Both flows move in the expected direction, with a greater rise in separation rates and a greater decline in job-finding rates after crises and particularly after multidimensional crises.

One simple way to put these figures into context is to use the well-known fact that if we abstract from movements into and out of inactivity, the steady state unemployment rate implied by a given pair of flows is equal to separation rate/(separation rate + job finding rate). Donovan, Lu and Schoellman (2023) report the average quarterly separation rate and job-finding rate as roughly 2.5 and 30 percent, which implies a steady-state unemployment rate $2.5/(2.5+30) = 7.7$ percent. Panels (f) and (g) show that during multi-dimensional crises, the separation rate rises by 1 percentage point and the job-finding rate falls by 9 percentage points, which implies a new steady-state

unemployment rate of 3.5/(3.5+21) = 14.3 percent. This calculation is consistent with the fact that the unemployment rate is estimated to rise by more than 6 percentage points, as shown in Panel (a).

We can also use this calculation to provide a simple estimate of the contribution of each of these changes. Changing the separation rate alone leads to an implied unemployment rate of 10.6 percent, while changing the job-finding rate alone leads to an implied unemployment rate of 10.4 percent. From this calculation we conclude that the two contribute roughly equally to the overall rise in the unemployment rate during crises. This finding is in line with the more recent consensus that the job-finding rate and separation rate both play an important role in generating cyclicality in the unemployment rate, both in the United States (Hall, 2005; Fujita and Ramey, 2009; Shimer, 2012) and across OECD countries (Elsby, Hobijn and Şahin, 2013).

Finally, the job-job transition rate is plotted in Panel (h). This estimate speaks more to the effects of recessions and crises on the rate at which workers receive outside offers and climb the job ladder. The rates are estimated to decline after all events by 0.5–1 percentage points per quarter, with minor and statistically insignificant differences between the different types of events.

5.2 Sectoral Dimensions of Crises

Our micro data set also allows us to shed light on how shocks propagate through sectors. We harmonize the original industry codes in the micro data to 15 industry groups, building on the work of Minnesota Population Center (2019).[9] We focus our attention on changes in the ratio of sectoral employment to population.[10] This statistic makes it straightforward to decompose which sectors drive the aggregate decline in the employment-population ratio, which is simply the sum over sectors of the sectoral employment-population ratio. Note that the sectoral employment-population ratio weights sectors by their size; comparable results for log sectoral employment, which does not, are available in Appendix B.6.

We use local projections to estimate the path of sectoral employment to population

[9]We use the same classification as they do in their variable indgen. When possible, we also use their crosswalks from original country industry codes to broad industry groups.

[10]It is also possible to measure separation rates by sector or unemployment rates by previous sector of employment. However, each of these calculations cuts the data into small cells and the resulting series are measured with substantial noise.

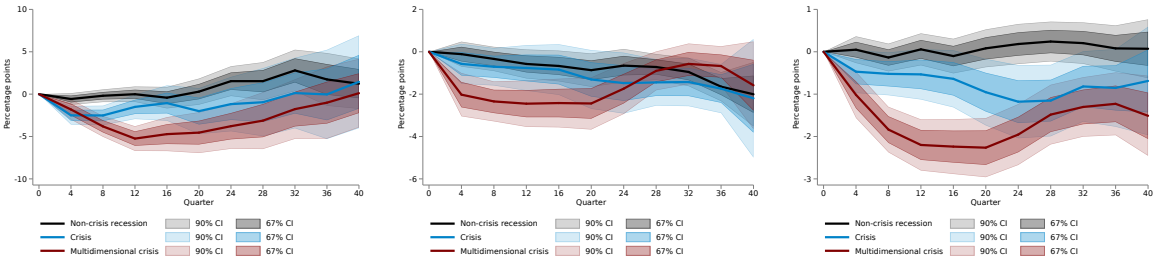
ratios for each sector j:

$$\Delta y_{j,t+h} = \beta_{j,h} + \beta_{j,h,c} D_{t,c} + \epsilon.$$

$y_{j,t+h}$ is now the change in outcomes (here, sectoral employment-population ratios) for group j. We allow both the estimated effect in a typical recession $\beta_{j,h}$ as well as the estimated effect of crisis type c, $\beta_{j,h,c}$, to vary by industry.

Figure 5: Sectoral Transmission of Crises: Employment-Population

(a) All sectors (b) Manufacturing (c) Construction



We again estimate the effect of a non-crisis recession, a crisis, and a multidimensional crisis. The main results of interest are shown in Figure 5. Figure 5a shows again the decline of the aggregate employment-population ratio for context. During a crisis, the aggregate employment-population ratio falls by three percentage points; during a multidimensional crisis, it falls by five percentage points.

The decline in employment is spread unevenly across sectors. Panels (b) and (c) show that two sectors – manufacturing and construction – account for the majority of the decline in employment. Manufacturing employment declines by a little less than one percentage point after a crisis and by two percentage points after a multidimensional crisis. Construction employment falls by one percentage point after a crisis and by two percentage points after a multidimensional crisis.

Overall, the majority of the peak decline in the employment-population ratio during a crisis is accounted for by employment losses in manufacturing and construction. These sectors are large and also have large declines in employment – 10–15 log points for manufacturing, 10–35 log points for construction (Figure B9). Perhaps surprisingly, the remaining sectors contribute little – or negatively – to the aggregate employment-population decline. For example, employment in education, transportation and storage, or hotels and restaurants rises after crises, while employment in private household services

or public administration and defense appear to be acyclical. See Figure B7 for results for all fifteen sectors.

There has been some uncertainty in the literature which sector or sectors might be most important for understanding how shocks such as sudden stops or financial crises spread through the economy. Our results suggest that when it comes to the labor market, the answer is clear: manufacturing and construction play the leading role in accounting for the aggregate declining employment-population ratios. Other sectors play a much more minor role or no role at all.

5.3 Distributional Consequences of Crises

Finally, we use the microdata to ask who is affected by crises. Here we build on a long tradition of research that studies heterogeneity in labor market outcomes (Altonji and Blank, 1999). More recent work has demonstrated that business cycles in the United States have systematically different effects on different types of workers (Cajner et al., 2017). We extend this analysis to show broad trends across a large number of countries and regions.

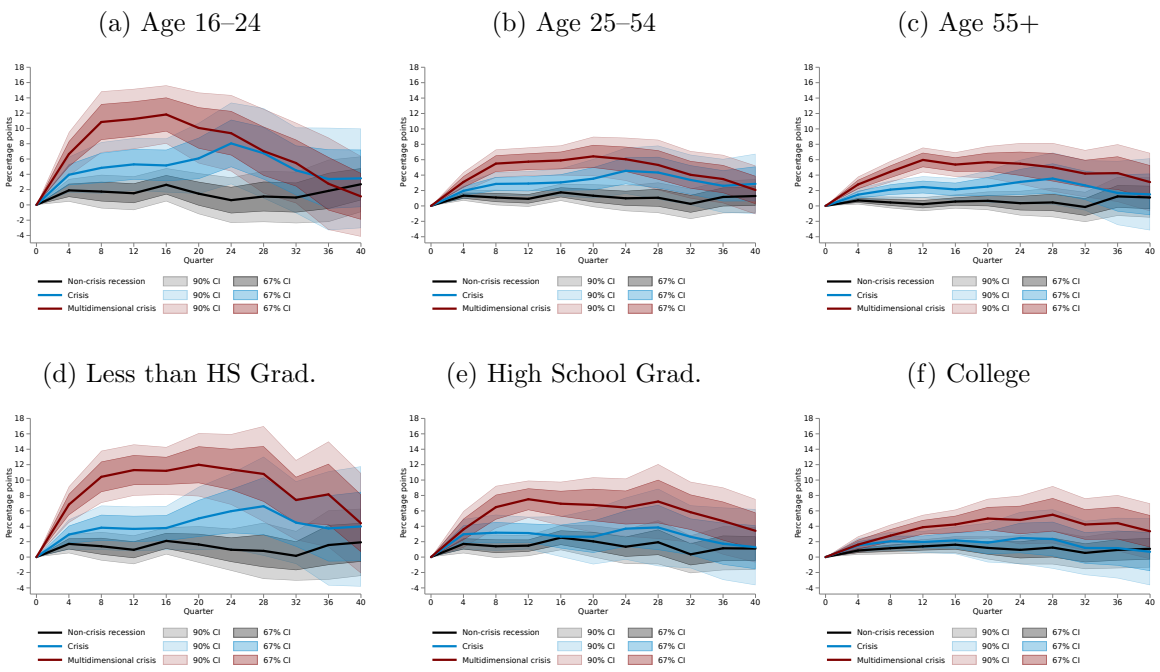
These results are informative about the welfare cost of business cycles. In models with uninsurable idiosyncratic risk, the consumption and welfare consequences of a given income shock depend on the household's insurance mechanisms, including notably self-insurance through savings. While we cannot observe assets directly, we can observe proxies such as age and education.[11] Young and less educated households are more likely to have both low income levels and low asset levels, implying that more of a given income shock will pass through to consumption and welfare.

We again use local projections to estimate group-specific responses to recessions and shocks. We distinguish three age groups: young (16–24 years old), middle age (25–54 years old) and old (55 years and older); and three education groups: less than high school completed, high school graduate, and college educated (including those who started college but did not finish). We have also explored gender, but the differences are smaller and less systematic than for age and education.

Figure 6 plots the estimated change in the unemployment rate by age group (first row) and education level (second row). We see again that crises are associated with larger rises in unemployment than non-crisis recessions. Unemployment rises by more (and the level

[11] Labor force surveys do not collect data on assets. Some countries do collect data on earnings, but not enough to allow us to analyze the incidence of shocks by earnings in a reliable fashion.

Figure 6: Changes in Unemployment by Demographic Groups



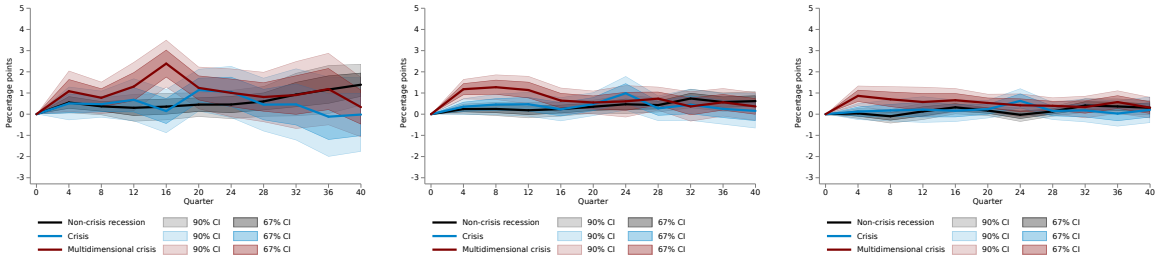
is also higher, not shown) for younger and less educated workers. Critically, these two effects interact in a quantitatively important fashion. For example, a multidimensional crisis raises the unemployment rate for middle-age or college-educated workers by 4–6 percentage points. During the same crises, the unemployment rate for the young and workers without a high school degree rises by 12 percentage points.

Figures 7 and 8 study the role of separation rates and job-finding rates in accounting for rising unemployment. The main finding is that heterogeneity in the response of separation rates accounts for most of the heterogeneity in the response of unemployment rates. Separation rates rise much more for younger and less educated workers than for other groups. By contrast, all of the groups except for the oldest workers experience similar paths for the job-finding rate. For example, after a multidimensional crisis, it falls by 10–15 percentage points over the first two to three years, then recovers slowly. Older workers have more muted responses of the job-finding rate, but this likely reflects selection in who continues to remain in the labor force during severe labor market downturns at high ages.

Figure 9 shows similar results for long-term unemployment, which the literature thinks of as a particularly severe form of income risk (Krusell et al., 2009). As we showed in Section 5.1, long and durable rises in long-term unemployment are an important feature

Figure 7: Changes in Separation Rate by Demographic Groups

(a) Age 16–24 (b) Age 25–54 (c) Age 55+



(d) Less than HS Grad. (e) High School Grad. (f) College

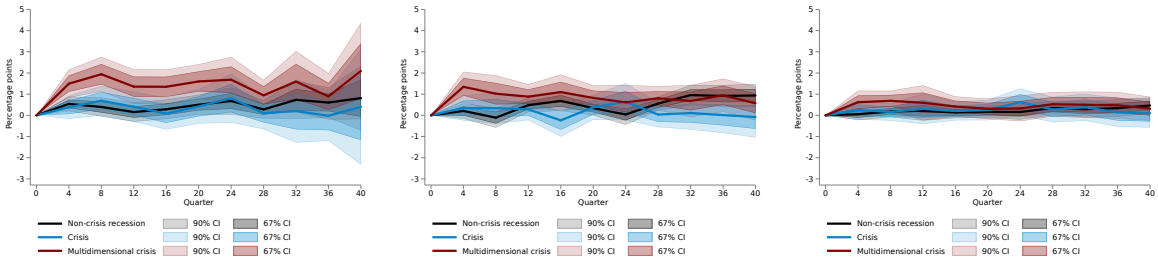
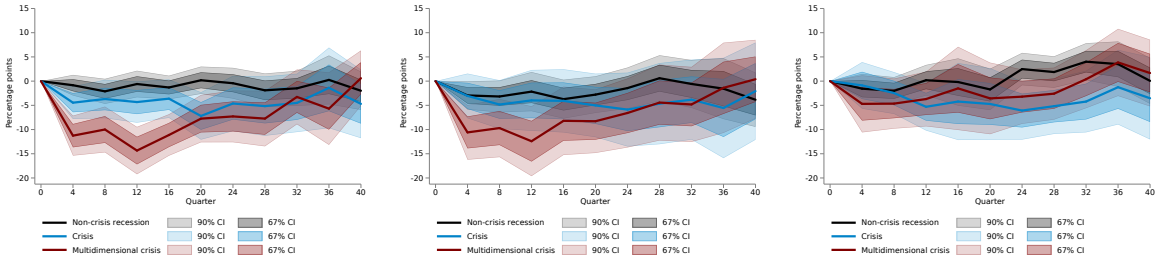
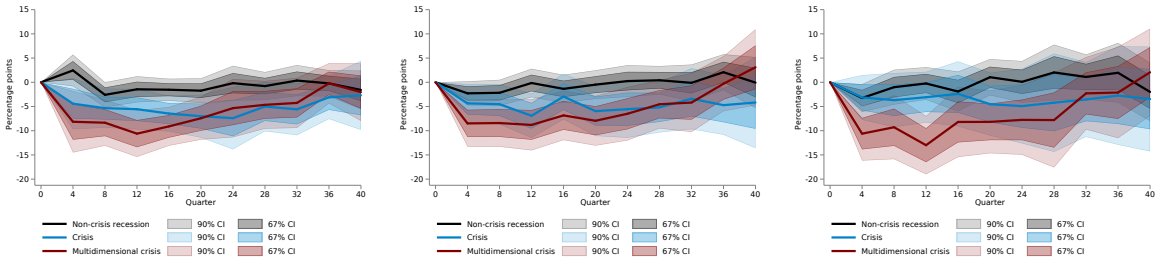


Figure 8: Changes in Job-Finding Rate by Demographic Groups

(a) Age 16–24 (b) Age 25–54 (c) Age 55+



(d) Less than HS Grad. (e) High School Grad. (f) College

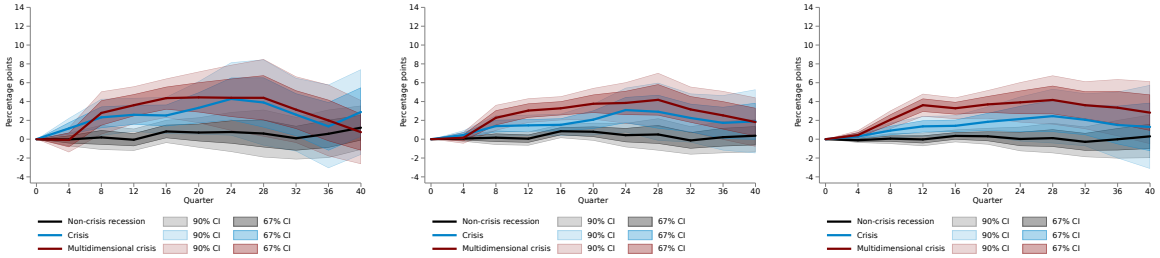


of crises. The main new finding in Figure 9 is that long-term unemployment also affects young and less educated workers more than older and college-educated ones. This is consistent with the existing evidence on the incidence of long-term unemployment in the

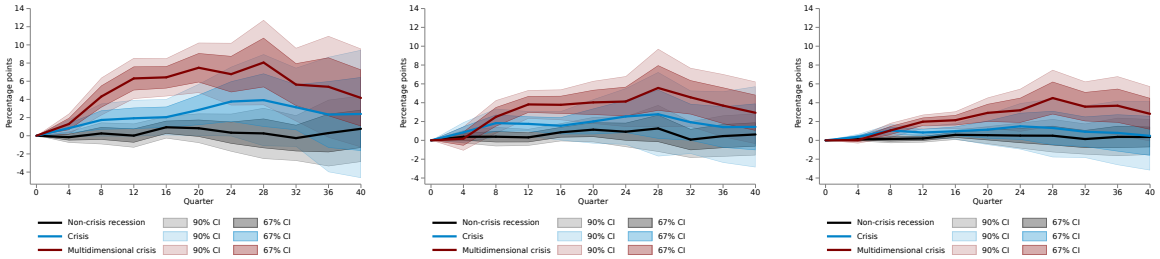
United States (Aaronson, Mazumder and Schechter, 2010). However, the magnitudes and duration of elevated long-term unemployment are much larger than what has been observed in the United States. For example, after crises with multiple shocks, workers without a college degree experience long-term unemployment rates of 6–8 percentage points, with the rate peaking 5–7 years after the onset of the crisis event.

Figure 9: Changes in Long-Term Unemployment by Demographic Groups

(a) Age 16–24 (b) Age 25–54 (c) Age 55+



(d) Less than HS Grad. (e) High School Grad. (f) College



To summarize, this section provides important evidence on the distributional consequences of the large labor market downturns associated with crises. We show that unemployment and long-term unemployment risk are borne more by the workers who are least likely to have the high income levels or wealth to self-insure. Young and less educated workers experience these risks at two to three times the rate of older and more educated workers. These findings add to the view that the welfare costs of business cycles are likely to be larger than the existing literature estimates.

6 Conclusion

Macroeconomic crises are fortunately rare, but they have important implications for financial markets and for the implied welfare costs of business cycles. In this paper we use the fact that a large number of countries worldwide have now collected quarterly labor

force surveys for a sufficiently long period to characterize how labor markets respond to recessions and crises. We use the aggregate unemployment rate that they report from such surveys as well as the underlying microdata to provide results that have both breadth and depth.

We provide four main results. First, the distribution of labor market downturns is right-skewed, with a long tail of significant downturns, similar to the distribution of consumption or output per capita declines. Second, the most significant events are closely associated with a few important types of crises, notably financial crises, house price busts, and sudden stops. Third, recessions and crises propagate roughly equally through rising separation rates and declining job-finding rates, but mostly affect the manufacturing and construction sectors. Fourth, the rise in unemployment and long-term unemployment during crises falls more on the youngest and least educated workers, who are precisely those that have the fewest mechanisms to self-insure against idiosyncratic income shocks.

Our work has important implications for a number of literatures. It brings together two literatures that argue separately for larger welfare costs of cycles – the literature on rare crises and the literature on uninsurable idiosyncratic income risk. It provides new insights on the propagation and costs of financial crises, house price busts, and sudden stops. These have implications for both how to model these shocks as well as the welfare gains from regulatory or prudential policies that seek to mitigate them. These are exciting avenues for future work.

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A Data Details

This appendix provides details on the source and coverage of our two data sets and our measures of crises.

A.1 Coverage by Country

Our aggregate data set consists of published data on the quarterly unemployment rate and quarterly real GDP per capita for all countries for which we can find the data spanning at least six years. Our basic procedure is to collect data on the unemployment rate and real GDP or real GDP growth rate directly from the major sources that aggregate such statistics:

- Seasonally adjusted real GDP growth rates and unemployment rates from Organization for Economic Co-operation and Development (2024) series "Quarterly real GDP growth - OECD countries" and "Monthly unemployment rates."
- Seasonally adjusted real GDP and unemployment rates from Eurostat (2024*a*) and Eurostat (2024*b*), series NAMQ_10_GDP and UNE_RT_Q;
- Seasonally adjusted and (for some countries) unadjusted unemployment rates from International Labour Organization (2024), series UNE_DEA1_SEX_AGE_RT_Q and UNE_DEAP_SEX_AGE_RT_Q;
- Seasonally adjusted and (for some countries) unadjusted quarterly real GDP data from International Monetary Fund (2024), series NGDP_R_SA_XDC and NGDP_R_NSA_XDC.

We augment these series with similar data from national statistical offices when it is available. This allows us to add or extend the unemployment series for seven countries and the GDP data for fourteen countries.

We convert all GDP data to quarterly growth rates. We use seasonally adjusted GDP growth rate and unemployment rate series whenever they are available. If only an unadjusted series is available, then we manually adjust it. For unemployment rates, we estimate the log unemployment rate as a function of quarter fixed effects for each country and use the regression to remove the proportional effect, as in Donovan, Lu and Schoellman (2023). Seasonal effects for GDP growth are much more pronounced and the adjustment much more important. We find taking the quartic root of the year-over-year growth rate gives the best performance because it works well for shorter samples as we

have in some countries but also allows for flexibility to fit countries whose seasonal cycles are changing over time. We merge on population growth rate data from World Bank (2023) and use it to convert real GDP growth rates to real GDP per capita growth rates under the assumption that population growth is constant across quarters within each country-year.

Table A1 gives the overview of our aggregate data set. It lists the countries covered; the time period covered for each country; and the number of recessions.

Our micro data set uses instead micro data from rotating panel labor force surveys from Donovan, Lu and Schoellman (2023). We use the same sources and procedures to merge on quarterly real GDP per capita as we did with the aggregate data set. Table A2 describes the data set. It lists the countries covered; the time period covered for each country; the number of observations (people matched for two consecutive quarters) in thousands; and the number of recessions.

Table A1: Coverage of Aggregate Data Set

Country	Quarters	Recessions
Albania	2012q1–2022q4	1
Argentina	2003q3–2023q4	7
Armenia	2014q1–2022q4	2
Australia	1966q3–2024q1	7
Austria	1993q1–2024q1	4
Belgium	1983q1–2024q1	3
Belize	2013q2–2020q3	4
Bolivia	2015q4–2023q4	1
Brazil	1996q1–2024q1	6
Bulgaria	2000q1–2024q1	3
Canada	1961q1–2024q1	9
Chile	1996q1–2024q1	5
Colombia	2001q3–2024q1	3
Costa Rica	2010q3–2024q1	2
Croatia	2002q1–2024q1	2
Cyprus	1999q2–2024q1	3
Czech Republic	1994q1–2024q1	5
Denmark	1983q1–2024q1	6
Dominican Republic	2000q2–2023q4	3
Ecuador	2003q4–2024q1	6
Egypt	2008q1–2022q4	2
Estonia	1997q1–2024q1	4
Finland	1988q1–2024q1	5
France	1983q1–2024q1	3
Germany	1983q2–2024q1	6
Greece	1987q2–2024q1	8
Guatemala	2013q4–2021q4	1
Hong Kong	1985q1–2024q1	9
Hungary	1996q1–2024q1	5
Iceland	1995q2–2024q1	4
India	2017q3–2023q4	1
Indonesia	2008q1–2023q3	1
Iran	2006q1–2022q4	6
Ireland	1995q1–2024q1	3
Israel	1995q1–2023q3	4
Italy	1983q1–2024q1	4
Jamaica	2008q1–2023q4	3
Japan	1960q1–2024q1	6
Jordan	2007q1–2024q1	3
Korea	1990q1–2024q1	2
Kosovo	2012q1–2021q4	1
Latvia	1998q2–2024q1	2
Lithuania	1998q2–2024q1	3
Luxembourg	1983q1–2024q1	9
Malta	2000q2–2024q1	5
Mauritius	2001q1–2022q4	3
Mexico	1987q1–2024q1	8
Mongolia	2010q1–2023q4	2
Montenegro	2011q1–2022q4	2
Netherlands	1983q1–2024q1	4
New Zealand	1987q2–2023q4	8
North Macedonia	2005q1–2023q4	2
Norway	1989q1–2024q1	4
Paraguay	2010q1–2023q4	4
Peru	2007q4–2023q4	2
Philippines	2001q1–2022q4	1
Poland	1997q1–2024q1	2
Portugal	1983q1–2024q1	6
Republic of Moldova	2010q1–2023q4	2
Romania	1997q2–2024q1	3
Russia	2010q1–2023q4	3
Saint Lucia	2011q3–2023q1	5
Saudi Arabia	2015q2–2023q4	3
Senegal	2016q2–2023q3	2
Serbia	2008q2–2023q4	4
Seychelles	2016q1–2023q2	1
Singapore	1992q1–2023q3	6
Slovak Republic	1998q1–2024q1	1
Slovenia	1996q1–2024q1	3
South Africa	2000q1–2024q1	4
Spain	1986q2–2024q1	3
Sri Lanka	2010q4–2022q4	3
Sweden	1983q1–2024q1	3
Switzerland	1996q2–2024q1	3
Taiwan	1982q1–2021q1	4
Thailand	2010q1–2024q1	1
Trinidad and Tobago	2012q4–2022q4	2
Turkey	2005q1–2023q4	3
Ukraine	2010q1–2021q4	2
United Kingdom	1980q1–2023q4	4
United States	1948q1–2024q1	10
Uruguay	1998q1–2023q4	2
West Bank and Gaza	2011q4–2023q4	4
Total: 83 countries	8,568 quarters	311 recessions

Quarters gives the range over which aggregate unemployment rate data is available for each country. Data may not be available for some quarters within the range. Recessions is the number of recessions the country has experienced during the period covered.

Table A2: Coverage of Micro Data Set

Country	Quarters	Observations (1000s)	Recessions
Argentina	2003q3–2022q2	941	6
Austria	2010q1–2020q3	743	2
Brazil	2002q2–2022q3	8163	4
Chile	1986q1–2022q3	7167	5
Costa Rica	2010q3–2022q3	275	2
Croatia	2010q1–2020q3	89	1
Cyprus	2005q1–2020q3	261	3
Czech Republic	2005q1–2010q3	591	1
Denmark	2007q1–2020q3	306	3
Ecuador	2007q2–2021q1	264	4
Egypt	2008q1–2012q3	84	1
Estonia	2005q1–2020q3	90	2
France	2003q1–2017q3	2378	1
Greece	2005q1–2018q3	1195	1
Hungary	2005q1–2020q3	1640	4
Iceland	2005q1–2020q3	67	3
Ireland	2007q1–2016q3	705	2
Italy	2005q1–2020q3	2019	3
Latvia	2007q1–2016q3	78	1
Lithuania	2005q1–2020q3	227	2
Malta	2009q1–2020q3	59	2
Mexico	1995q1–2022q3	19140	4
Paraguay	2010q1–2017q2	45	1
Peru	2003q1–2018q3	248	0
Philippines	1988q2–2003q1	1158	2
Poland	2010q1–2020q3	878	1
Portugal	2010q1–2020q3	544	2
Romania	2005q1–2020q3	929	2
Slovak Republic	2005q1–2020q3	639	1
Slovenia	2014q1–2020q3	116	1
South Africa	2008q1–2022q3	943	3
Spain	2000q1–2020q1	7197	2
Sweden	2006q1–2020q3	1631	3
Switzerland	2010q1–2019q3	289	0
United Kingdom	1997q1–2021q4	3946	2
United States	1976q1–2022q3	7768	5
West Bank and Gaza	2000q1–2021q3	383	4
Total: 37 countries	2,325 quarters	73,199 observations	86 recessions

Quarters gives the range over which matched labor force survey microdata are available for each country. Data may not be available for some quarters within the range. Observations is the number of people matched for two consecutive quarters, expressed in thousands. Recessions is the number of recessions the country has experienced during the period covered.

A.2 Coverage by Type of Crisis

Table A3 shows the distribution of different types of crises in our data sets. The column events shows the number of times each type of crisis occurs within the span of the aggregate data set. The column recessions shows the number of those events that are attached to a recession using the rules we describe in Section 4.1. For example, slightly more than half of the stock market crashes that occur within the span of our data are associated with recessions (77/143), while slightly less than half are not (66/143). Finally, the last column shows the number of recessions in the aggregate data set that are also covered in the micro data set.

Table A3: Crises, Recessions, and Data Coverage

	Aggregate data set		Micro data set
	Events	Recessions	Recessions
Systemic financial crises	21	17	9
Non-systemic financial crises	22	14	7
Stock market crashes	143	77	31
House price busts	52	37	13
Sudden stops	105	79	35
Commodity import price shocks	184	13	5
Commodity export price shocks	68	21	6
Currency crises	83	39	15

Events gives number of times each type of crisis occurs in a country during the period of data coverage as listed in Tables A1–A2. Recessions gives the number of events that are associated with a recession in the aggregate data set and the subset also covered in the micro data set.
See section 4.1 for definition of each type of crisis and the rule for assigning crises to recessions.

B Additional Results

This appendix provides additional results described or referred to in the text.

B.1 Results for Additional Types of Crises

The main results in the text focus on a few types of crises: financial crises (sometimes distinguishing systemic from non-systemic financial crises), stock market crashes, house price busts, and sudden stops. We have sufficient observations to estimate the effects of four additional types of crises that we find to be less associated with severe labor market downturns. We estimate the effect of both adverse import and export commodity price swings. We use data from Gruss and Kebhaj (2019). Their data provide the monthly average price of each country's imports and exports of 45 commodities weighted by the country's imports and exports of each commodity and then scaled relative to total GDP. We define an adverse commodity price shocks as when the 4-quarter log change in the import price index is above the 95th percentile of the overall distribution (0.03 log points) or when the change in the export price index is below the 5th percentile of the overall distribution (-0.05 log points). We associate a recession with a commodity price shock if there was such a movement in the year before the start of the recession. We also estimate the effect of currency crises, which we take from the GCDC database and which are measured as cases where a country's currency depreciates by more than 15 percent. Finally, we estimate the effect of COVID-19, which we consider to include any recession that reaches into the first half of 2020.

Table B1 shows results similar to Table 2, but with the extended set of crises. The COVID-19 recession is estimated to be unusually short – nearly a year shorter than the standard recession. Otherwise, the remaining estimates are both small and statistically insignificant.

We estimate the interactions of crises with the country's pre-existing macroeconomic environment. We focus on three variables. The first is its exchange rate policy at time $t = 0$, which we draw from Reinhart and Rogoff (2004), Ilzetzki, Reinhart and Rogoff (2019), and Ilzetzki, Reinhart and Rogoff (2022). They categorize each country-year into one of six exchange rate arrangements. To ensure sufficient sample size for comparison we aggregate these into two groups that approximate the classic fixed and floating exchange rate regimes.[12] We also split countries based on whether they have a current account

[12]Fixed includes peg and crawling peg; floating includes managed float, free float, and free fall, in

Table B1: Unemployment Response to Recessions: Additional Shocks

	Severity			Duration		
	(1)	(2)	(3)	(4)	(5)	(6)
Systemic financial crisis	1.828**	2.271***	1.675**	3.149**	1.369	-0.209
	(0.761)	(0.819)	(0.763)	(1.517)	(1.724)	(1.545)
Non-systemic financial crisis	1.282	0.328	0.666	1.999	-0.516	0.174
	(0.820)	(0.873)	(0.809)	(1.634)	(1.837)	(1.635)
Stock market crash	0.179	1.123**	0.823*	1.640*	2.397**	0.957
	(0.467)	(0.520)	(0.483)	(0.930)	(1.095)	(0.991)
House price bust	1.425***	1.638***	1.362**	2.172**	3.194***	1.591
	(0.528)	(0.571)	(0.529)	(1.052)	(1.201)	(1.088)
Sudden stop	1.782***	2.185***	1.585***	0.906	0.476	-0.179
	(0.380)	(0.425)	(0.405)	(0.756)	(0.894)	(0.799)
Commodity import price shock	0.824	-0.199	0.026	2.338	1.512	3.172*
	(0.803)	(0.868)	(0.803)	(1.600)	(1.827)	(1.638)
Commodity export price shock	-0.125	0.241	-0.057	-1.949	-2.349	-2.642*
	(0.707)	(0.846)	(0.784)	(1.409)	(1.781)	(1.583)
Currency crisis	0.142	0.061	0.294	-0.421	0.343	0.561
	(0.528)	(0.579)	(0.536)	(1.053)	(1.218)	(1.082)
COVID-19	0.316	0.415	-0.592	-3.017***	-3.182***	-1.660*
	(0.415)	(0.444)	(0.443)	(0.826)	(0.935)	(0.855)
Severity, GDP			0.172***			
			(0.028)			
Duration, GDP						0.839***
						(0.111)
Constant	1.594***	0.347	0.677	6.745***	5.182	1.143
	(0.248)	(2.574)	(2.380)	(0.494)	(5.418)	(4.843)
R^2	0.165	0.493	0.569	0.183	0.447	0.565
N	299	299	299	299	299	299
Countries	81	81	81	81	81	81
Country FE	No	Yes	Yes	No	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

deficit or surplus at $t = 0$ using data from Lane and Milesi-Ferretti (2018) and Milesi-Ferretti (2022). Finally, we divide them on whether they have a high private debt level, measured as private debt to GDP ratio in excess of two using data from International Monetary Fund (2023).

Table B2 shows the results when we interact recessions and crises with these initial policy variables one at a time. The effects for severity are all small and statistically insignificant. For duration, the estimates indicate that a fixed exchange rate is associated with a longer period of rising unemployment in the case of a crisis but not a recession. Current account deficits are associated with substantially longer periods of rising unemployment in response to both recessions and crises, although the latter estimate is statistically insignificant.

their terminology.

Table B2: Unemployment Response to Recessions: Country Characteristics

	Severity				Duration			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Systemic financial crisis	2.189***	2.155**	2.071**	2.440***	1.905	1.787	1.115	2.446
	(0.804)	(0.850)	(0.817)	(0.825)	(1.762)	(1.860)	(1.767)	(1.857)
Non-systemic financial crisis	0.321	0.200	-0.175	0.400	-0.562	-1.186	-1.820	-0.503
	(0.863)	(0.917)	(0.902)	(0.867)	(1.891)	(2.006)	(1.951)	(1.951)
Stock market crash	1.004**	0.464	0.740	0.850*	3.532***	2.048	3.325***	3.343***
	(0.467)	(0.572)	(0.520)	(0.486)	(1.024)	(1.251)	(1.125)	(1.095)
House price bust	1.520***	1.628**	0.933	1.515***	4.190***	4.125***	2.592**	4.170***
	(0.552)	(0.654)	(0.604)	(0.559)	(1.210)	(1.431)	(1.306)	(1.259)
Sudden stop	2.223***	1.935***	1.776***	2.311***	0.116	-0.970	-0.695	0.709
	(0.411)	(0.523)	(0.502)	(0.452)	(0.901)	(1.144)	(1.085)	(1.018)
Fixed exchange rate		-0.463				-1.686		
		(0.722)				(1.580)		
Fixed x any crisis		0.804				3.028**		
		(0.655)				(1.434)		
Negative current account at t=0			0.595				2.993**	
			(0.564)				(1.219)	
Neg. current acct, any crisis			0.990				1.711	
			(0.679)				(1.468)	
Private debt/GDP $\geq$ 2, t=0				-0.194				-1.919
				(1.013)				(2.281)
Private debt/GDP $\geq$ 2, any crisis				-0.526				-0.793
				(1.163)				(2.619)
Constant	0.762	1.225	0.166	0.762	2.000	3.686	-0.993	2.000
	(2.520)	(2.703)	(2.592)	(2.516)	(5.520)	(5.915)	(5.605)	(5.666)
R^2	0.490	0.504	0.510	0.509	0.397	0.424	0.433	0.403
N	299	270	289	275	299	270	289	275
Countries	81	79	81	74	81	79	81	74
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B.2 Great Recession

Table B3 shows estimates of the severity and duration of labor market downturns worldwide that include a dummy for whether the recession was part of the Great Recession (e.g., started in 2007–2008). Columns (1) and (3) control only for the Great Recession and show that it was associated with a 2.2 percentage point larger rise in unemployment and 4.4 additional quarters of rising unemployment as compared to all other recessions in the typical country. Columns (2) and (4) control for financial crises and house price busts, the relevant shocks during this period. Nearly half of the severity of the Great Recession and a quarter of the long duration can be understood as the influence of these shocks. At the same time, controlling for the Great Recession does not eliminate the importance of systemic financial crises or house price busts, suggesting that the large estimated effects of these shocks is not only accounted for by the Great Recession.

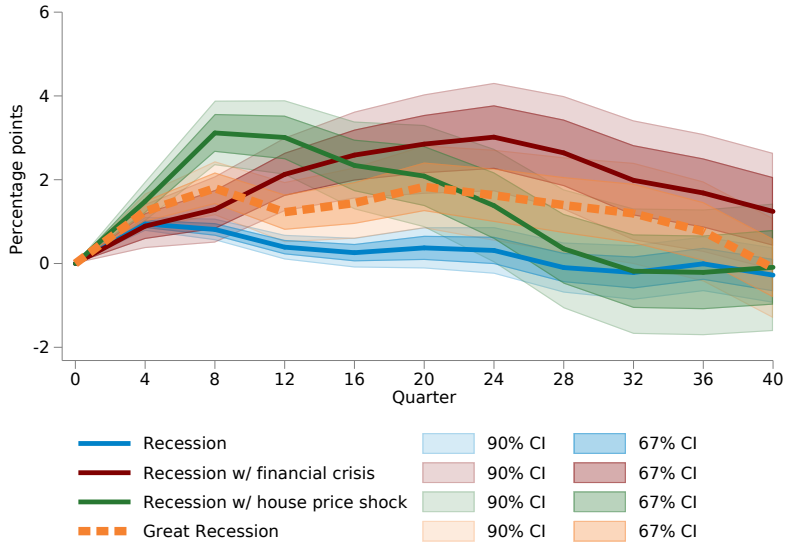
Table B3: Unemployment Response to Recessions and the Great Recession

	Severity		Duration	
	(1)	(2)	(3)	(4)
Great Recession	2.162***	1.385***	4.402***	3.134***
	(0.449)	(0.473)	(0.922)	(0.988)
Systemic financial crisis		2.606***		3.011*
		(0.797)		(1.665)
Non-systemic financial crisis		0.195		0.334
		(0.877)		(1.832)
House price bust		1.742***		3.627***
		(0.585)		(1.222)
Constant	0.762	0.762	2.000	2.000
	(2.755)	(2.647)	(5.656)	(5.530)
R^2	0.379	0.434	0.355	0.392
N	299	299	299	299
Countries	81	81	81	81
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure B1 shows the corresponding estimated local projections of unemployment to recessions, the Great Recession, a financial crisis, and a house price shock. Again, the Great Recession is estimated to have an effect that is larger than a non-crisis recession, but that much of this can be accounted for by the fact that it included in many countries a financial crisis and/or a house price shock.

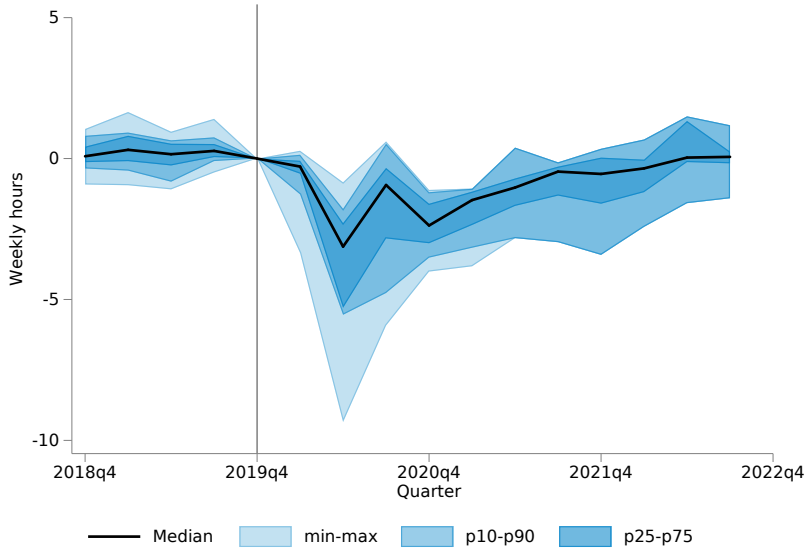
Figure B1: Unemployment Response to Recessions and the Great Recession



B.3 COVID-19

COVID-19 was an unusual event in terms of labor market statistics, in two senses. First, it disrupted data collection. Several countries suspended collection activities entirely and so have no microdata and no reported unemployment rate in early 2020. Most other countries altered their data collection procedures and experienced changes in nonresponse rates. Labor market statistics from early 2020 should be treated with caution.

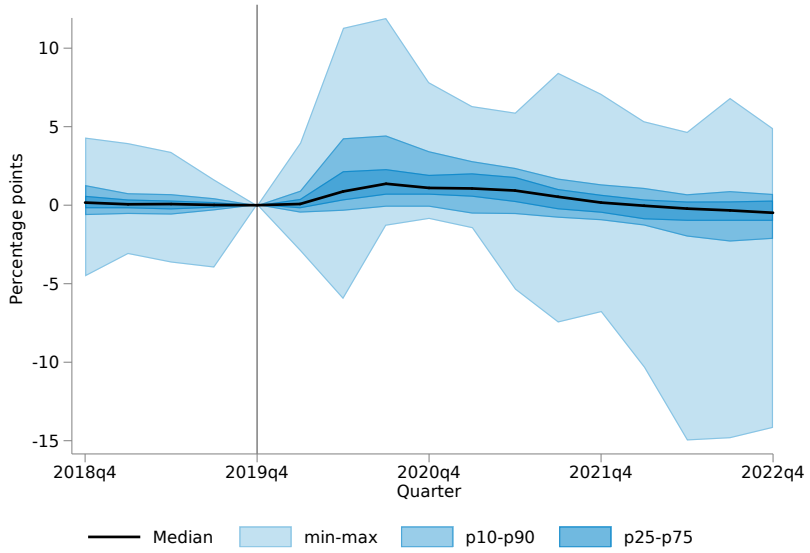
Figure B2: Effects of the COVID-19 on Hours (Micro Data Set)



Second, the effects of COVID-19 on many labor market statistics, particularly the aggregate unemployment rate, are highly dependent on the details of policy. To help clarify matters, we use the micro data set to estimate the path of average hours worked per person relative to 2019q4. Figure B2 plots moments of the distribution across countries in the change in average hours worked per person relative to 2019q4. Every country that reports statistics reports lower hours worked in 2020q2, ranging from a one hour decline in the least affected country to a nine hour decline in the most affected country; the median decline is about three hours. Hours worked per person remain depressed in most countries well into 2021. Hence, the data are clear that people in every country worked less.

However, the effects on measured employment and unemployment depend on the details of country restrictions and particularly how developed countries implemented COVID relief policies (Bruenig et al., 2024). Countries such as the United States that

Figure B3: Effects of the COVID-19 on Unemployment (Aggregate Data Set)



implemented these policies through the unemployment insurance system report elevated levels of unemployment; but countries that implemented them through payments to employers for keeping employees on their payroll report declines. Figure B3 plots moments of the distribution across countries in the change in the unemployment rate relative to 2019q4. There is large policy-induced variation in these patterns, ranging from dramatic increases of more than 10 percentage points to dramatic declines of more than 5 percentage points within two quarters. We take from this that measured unemployment is not a useful indicator of the labor market effects of COVID-19.

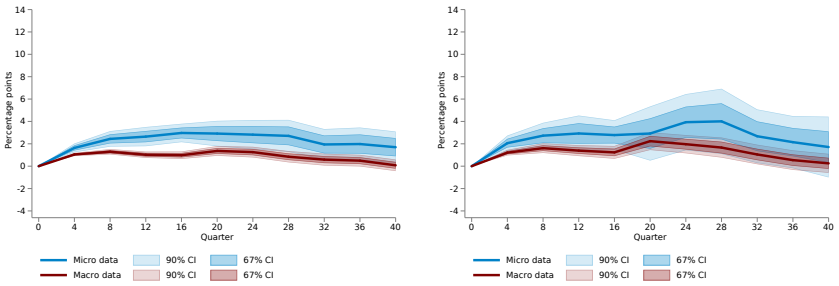
B.4 Comparison of Results, Aggregate and Micro Data Sets

Our aggregate and micro data sets agree on the patterns of labor market responses to recessions and crises. Figure B4 shows the estimated unemployment response to non-crisis recessions, crises, and multidimensional crises. Already we see that they agree on broad features, particularly the severity of multidimensional crises.

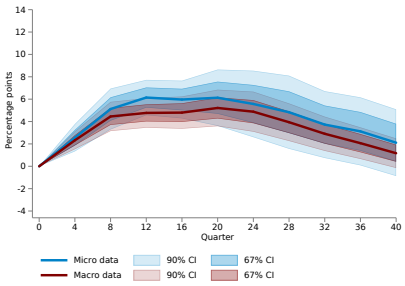
Figure B4: Estimated Unemployment Responses, Unmatched Samples

(a) Recessions

(b) 1 shock



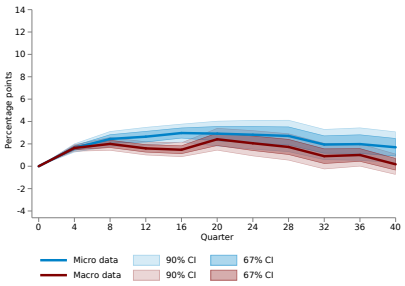
(c) 2+ shocks



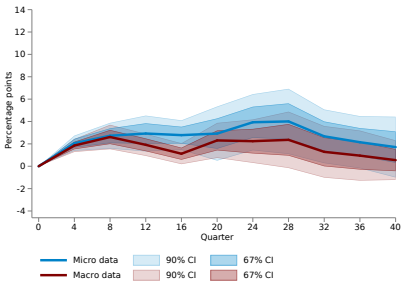
We then limit our attention to the recessions and crises that are covered in both the aggregate and macro data sets. We estimate the labor market responses to these common shocks separately in each data set. Figure B5 shows the resulting estimates. Now the estimates are even more similar, both in terms of shape and magnitude. We do see that even for the same events the estimates of the rise in unemployment are larger when we use the micro data, but the discrepancy is small and often statistically insignificant. Overall, we conclude that our main findings of interest hold in both the aggregate and micro data sets and that the variations in details in terms of how countries compute and report their official unemployment rate are not first-order for the study of the cyclical dynamics of labor markets.

Figure B5: Estimated Unemployment Responses, Matched Samples

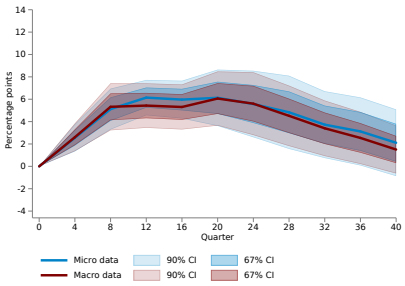
(a) Recessions



(b) 1 shock



(c) 2+ shocks



B.5 Additional Results on Self-Employment

Our baseline results treat self-employment as part of employment. However, recent research has provided evidence that self-employment plays a different role in developing countries, more akin to a substitute for missing unemployment insurance that allows people to earn income while searching for wage work (Schoar, 2010; Poschke, 2013; Donovan, Lu and Schoellman, 2023). These findings lead us to explore whether our headline figures on unemployment may miss some labor underemployment in the form of a possible expansion of self-employment after recessions.

Table B4: Average Labor Market Statistics by Region

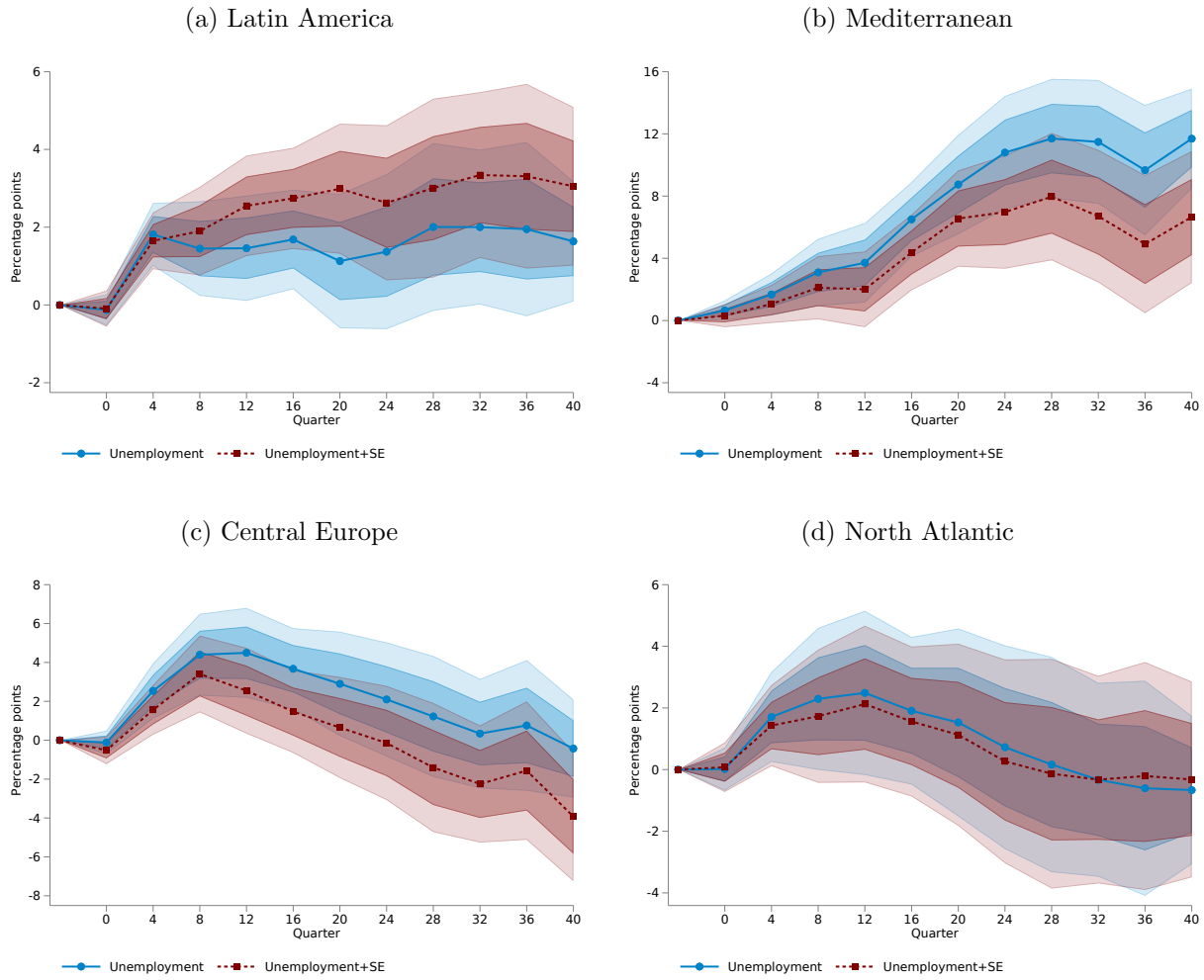
	Shares (%)				Rates (%)	
	Emp.-to-Pop.	Self-emp.	Unemp.	Long-Term Unemp.	Separation	Job-Finding
Region						
Latin America	61.8	29.4	7.9	1.3	3.1	41.3
Mediterranean	50.3	21.6	17.3	9.9	2.8	18.0
Central Europe	63.7	14.6	8.9	3.9	1.1	20.4
North Atlantic	72.6	10.5	6.3	1.3	1.5	36.3
World	62.3	19.5	9.9	3.6	2.2	29.6

Latin America includes Argentina, Brazil, Chile, Costa Rica, Ecuador, Mexico, Paraguay, Peru, and the Philippines.
Mediterranean includes Croatia, Egypt, Greece, Italy, Portugal, Slovak Republic, South Africa, Spain, and West Bank & Gaza.
Central Europe includes Cyprus, Czech Republic, Estonia, France, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, Romania, and Slovenia.
North Atlantic include Austria, Denmark, Iceland, Sweden, Switzerland, United Kingdom, and United States.

To investigate this, we break countries into four groups that capture different labor market institutions as reflected in very different labor market outcomes. These groups of countries roughly conform to geographic regions, so we label them as such for ease of reference. Table B4 lists the four groups, some important average labor market outcomes, and lists the countries in each group. The Latin America group includes countries with a high share of self-employment, low unemployment, and fluid labor markets. The Mediterranean group has still fairly high self-employment, but higher unemployment, lower employment, and less fluid labor markets. The Central Europe group has higher employment, lower self-employment, and lower unemployment. Finally, the North America group has the highest employment rates, low self-employment and unemployment, and fluid labor markets. Relating to the previous literature, we think of these groups as capturing important differences in the availability of wage work, the generosity of the unemployment insurance system, and the role that self-employment plays.

We study two measures of underemployment: the unemployment rate and a broader notion that adds unemployment and self-employment. Figure B6 shows local projections

Figure B6: Unemployment and Extended Unemployment during Recessions



estimates of how each of these two measures responds to the onset of a recession, computed using the micro data set. The results that include an interaction with crises are similar but imprecise because there are few crises per region and are not shown. In the North Atlantic countries, there is no meaningful difference between the two measures of underemployment. For Central Europe and the Mediterranean, the broader measure actually rises by less than the unemployment rate, which suggests that there is some substitution from self-employment into unemployment after recessions. Finally, Figure B6a shows that in Latin America, the rise in unemployment may understate labor underutilization. While the rise in unemployment rates is estimated to be modest at roughly 2 percentage points, self-employment expands by an additional 1–1.5 percentage points after a recession. This is consistent with previous findings by Bosch and Maloney (2008). More broadly, the finding that the cyclicality of self-employment depends on labor market

institutions is consistent with Fiess, Fugazza and Maloney (2010).

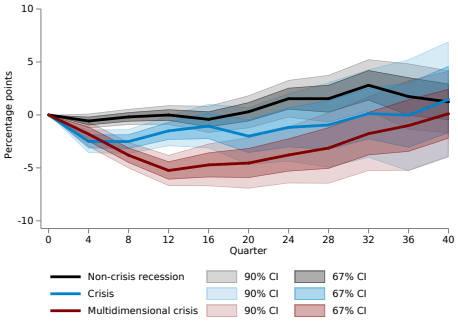
B.6 Additional Results on Industry Employment Trends

We harmonize industries to be consistent with the indgen codes in Minnesota Population Center (2019). This results in fifteen broad industries: agriculture, forestry, and fishing; mining and extraction; manufacturing; utilities (electricity, gas, water, and waste management); construction; wholesale and retail trade; hotels and restaurants; transportation, storage, and communications; financial services and insurance; public administration and defense; business services and real estate; education; health and social work; private household services; and other services.

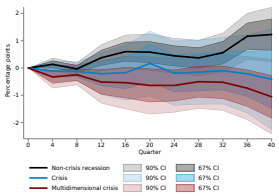
Figure B7 shows results on the sectoral employment-population ratio for all fifteen sectors. Figure B8 shows the same results for de-trended sectoral employment-population ratios, where we remove a sector-specific linear trend from the sectoral employment-population ratio before estimating the local projections. Figure B9 shows the results for sectoral log employment.

Figure B7: Sectoral Transmission of Crises: All Industries

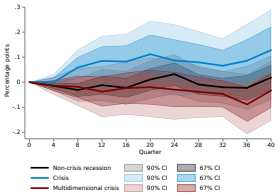
(a) Overall



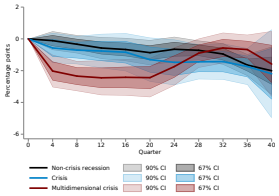
(b) Agriculture



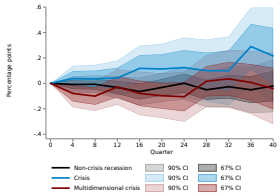
(c) Mining



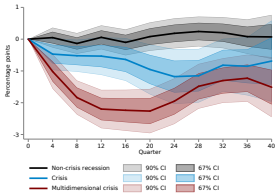
(d) Manufacturing



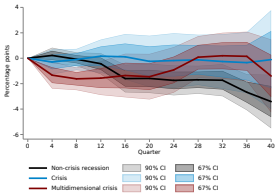
(e) Utilities



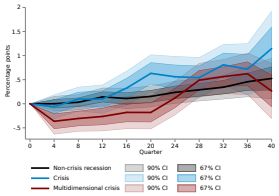
(f) Construction



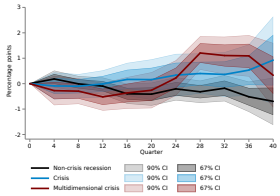
(g) Wholesale & retail



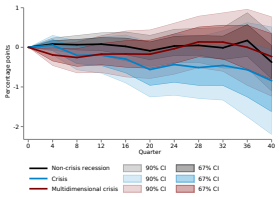
(h) Hotels & restaurants



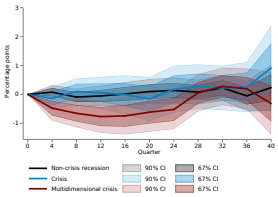
(i) Transport & Storage



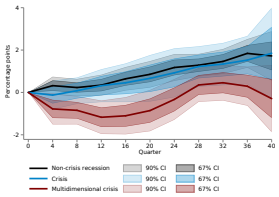
(j) Finance & insurance



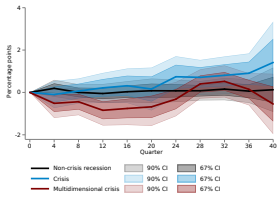
(k) Public & defense



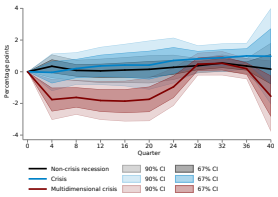
(l) RE & bus. serv.



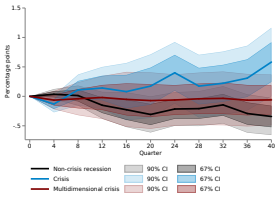
(m) Education



(n) Health & social work



(o) Pvt. hh services



(p) Other services

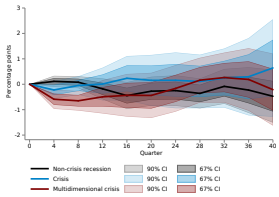
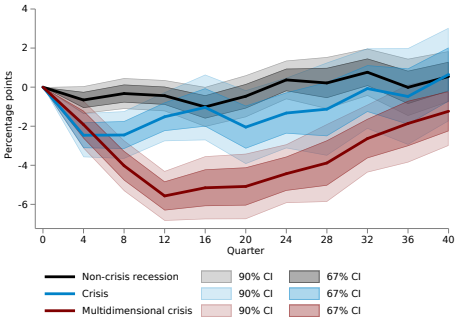
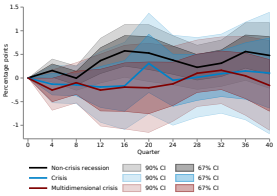


Figure B8: Sectoral Transmission of Crises: Detrended

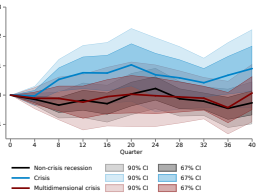
(a) All sectors



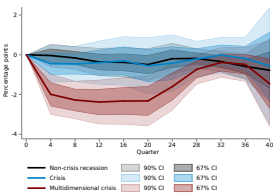
(b) Agriculture



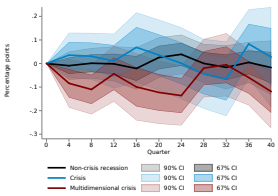
(c) Mining



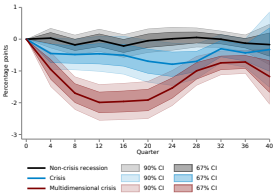
(d) Manufacturing



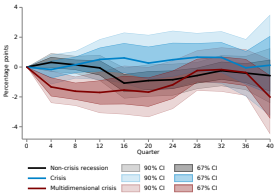
(e) Utilities



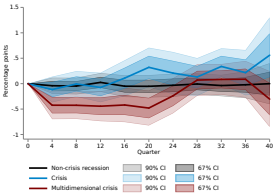
(f) Construction



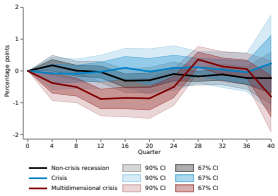
(g) Wholesale & retail



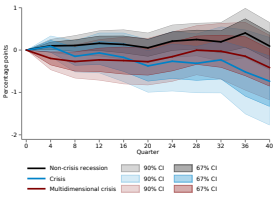
(h) Hotels & restaurants



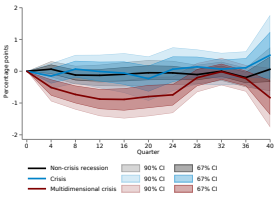
(i) Transport & storage



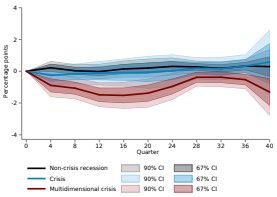
(j) Finance & insurance



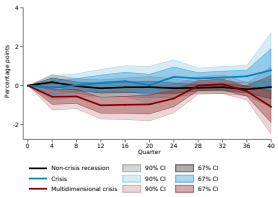
(k) Public & defense



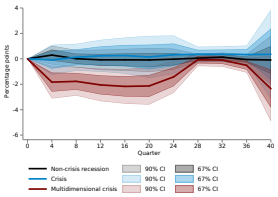
(l) RE & bus. serv.



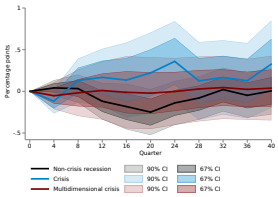
(m) Education



(n) Health & social work



(o) Pvt. hh services



(p) Other services

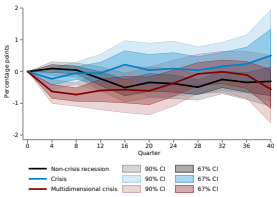
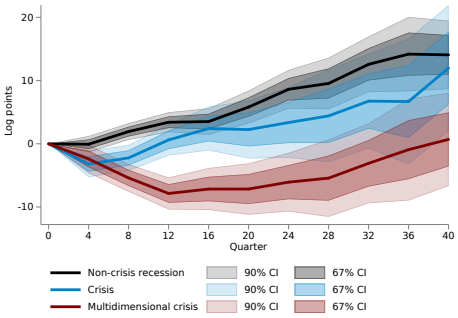
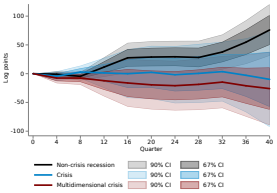


Figure B9: Sectoral Transmission of Crises: Log Employment

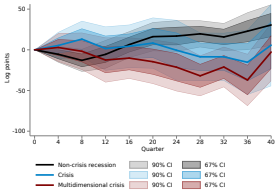
(a) All sectors



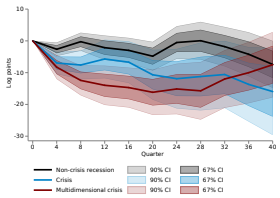
(b) Agriculture



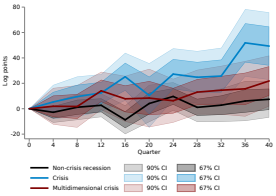
(c) Mining



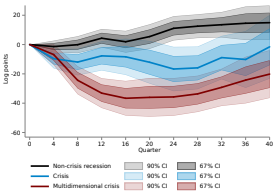
(d) Manufacturing



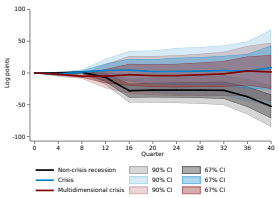
(e) Utilities



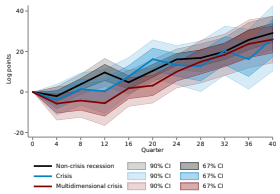
(f) Construction



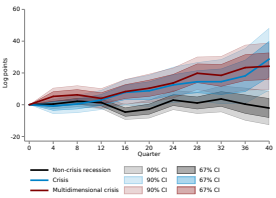
(g) Wholesale & retail



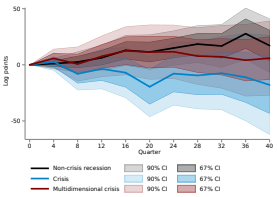
(h) Hotels & restaurants



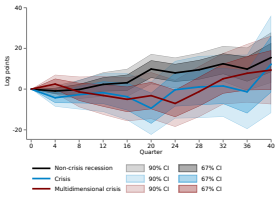
(i) Transport & storage.



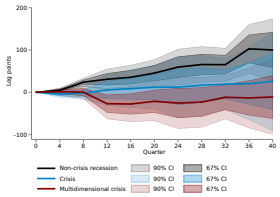
(j) Finance & insurance



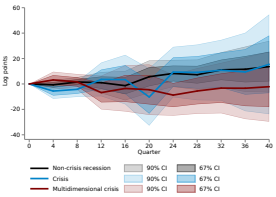
(k) Public & defense



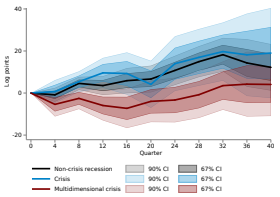
(l) RE & bus. serv.



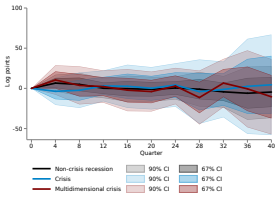
(m) Education



(n) Health & social work



(o) Pvt. hh services



(p) Other services