Macroeconomic implications of labor market frictions
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Citation for published version (APA):

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Chapter 1

Introduction and Overview

And it came to pass at the end of two full years, that Pharaoh dreamed: and, behold, he stood by the river. And, behold, there came up out of the river seven well-favored kine and fat-fleshed; and they fed in a meadow. And, behold, seven other kine came up after them out of the river, ill-favored and lean-fleshed; and stood by the other kine upon the brink of the river. And the ill-favored and lean-fleshed kine did eat up the seven well-favored and fat kine. So Pharaoh awoke.

Genesis 41:1-4

This excerpt from the Bible is from the story when Joseph was imprisoned in Egypt. During that time Pharaoh had the dream, but did not understand what it meant and also none of his wise men was able to interpret it. Pharaoh learned of a prisoner, Joseph, and his skills in interpreting dreams and therefore had him summoned. Joseph interpreted the dream as foretelling that seven years of abundance would be followed by seven years of famine and advised Pharaoh to store surplus grain during the years of abundance. Pharaoh did as Joseph advised and Egypt managed to survive the seven years of famine that followed.

While this story was not the reason why I became interested in economics, it probably is the first documented business cycle forecast. More importantly, it shows that people have been concerned with fluctuating economic conditions, business cycles, for a long time. This interest has not died out over the centuries. On the contrary, after two decades of relatively smooth economic development, the most recent crisis has sparked
new intensive research in this topic.

An important factor in shaping the character of fluctuations in economic activity is the labor market. People work in order to be able to buy food, a house or to purchase any other good or service. For some people, even work alone brings pleasure. PhD students are a great example of such individuals. On the other hand, firms need workers to operate their machines in factories, to drive trucks that deliver the goods to supermarkets, to sell those goods to customers etc. However, the labor market, as many other markets, does not operate smoothly. Neither workers, nor firms are all the same. Therefore, it often requires a substantial amount of time and effort to look for a job or a suitable worker and to agree on the terms of employment. These search and matching frictions are the reason why unemployed workers and vacant jobs coexist.\footnote{They are also the reason why Peter Diamond, Dale Mortensen and Christopher Pissarides obtained their Nobel prize in 2010.}

My thesis focuses on business cycles, the welfare costs related to them, and how developments in the labor market impact the overall economy. I pay special attention to the different characteristics of both workers and firms in determining aggregate labor market outcomes. The ease (or difficulty) with which workers are able to find jobs or the way different firms react to overall business conditions both drive movements in aggregate employment and output. Understanding these links can then help evaluate alternative policy measures aimed at boosting employment or reducing the adverse effects of economic downturns.

Overview

While business cycles seem to interest the general public and there is an underlying feeling that they are detrimental for the economy, economists have struggled to show that fluctuations in economic activity actually decrease the wellbeing of society. Intuitively, is it not the case that times of recessions are "averaged out" by high economic activity during booms? Why should then governments and central banks be so concerned about "smoothing out" the cycle? In an influential contribution, Robert Lucas (1987) calculated how much better off an economy would be if its fluctuating consumption stream were replaced by its average consumption level. Put differently, Lucas asked
what fraction of consumption would a person living in the postwar U.S. economy be willing to give up in return for a life in a world that has the same average consumption level, but no economic fluctuations. The answer is one tenth of a percentage point. This means that if our hypothetical person has an average consumption level of say $100, he is willing to give up 10 cents of his consumption each period in return for a life without business cycles. Lucas’s conclusion turned out to be frustratingly difficult to disprove in realistic models and these tiny costs of business cycles have intrigued the profession ever since.

The second chapter of my thesis, which is joint work with Wouter den Haan, focuses on the question of why business cycles could be more costly for the economy than Lucas predicted. The novelty of our approach is that we consider the interaction between costs to entry and a friction resulting in inefficient project shutdowns.

To make our argument, we compare a typical economy we live in with a hypothetical world without fluctuations in economic activity. In both economies, there is a range of projects (either jobs, or entire firms) that create output. Each project is different in terms of its productivity and its startup costs.

Another important ingredient in our framework is the belief that the world we live in does not always operate efficiently. Specifically, decisions to startup or continue a project are subject to ”inefficiencies” that force some profitable projects to shut down. For example, entrepreneurs typically seek external funds for their business. Often it is quite difficult for an entrepreneur to convince the bank of the project’s profitability, especially during bad times. Not being able to obtain the funds required to run a profitable project, either because the entrepreneur has no credit history, or simply because the bank does not believe his claims, is an example of an inefficiency.

In a world without business cycles, only projects with productivity above a certain threshold are able to overcome the inefficiencies and operate. Projects below that threshold do not even startup as they would be immediately forced out of business by the inefficiency. In a world with business fluctuations, this threshold is lower in booms and higher in recessions. In other words, it is relatively easier to overcome the inefficiency in good times and relatively more difficult to overcome it in bad times (it

\[ \text{For Douglas Adams fans, this is as close as one can get to the question, to which the answer is 42.} \]
is harder for the entrepreneur to convince the bank of a project’s profitability during a downturn and vice versa). However, this means that some projects that were able to happily operate in a world without business cycles are forced by the inefficiency to shut down during recessions, which substantially lowers their expected duration and thus their expected benefits. It makes a huge difference whether you think you can operate your business for the rest of your life, or whether you think you will only survive until the next recession.

So what? On the one hand, some projects which can operate in a world without business cycles are forced out of business during recessions. On the other hand, however, some projects which could not operate in a world without fluctuations are able to startup during booms as they have an easier time overcoming the inefficiency. It seems that things average out again and the costs of business cycles will be negligible also in this model.

However, so far I have ignored the last crucial ingredient in our story - the startup costs. Remember that each project differs not only in terms of productivity, but also in terms of startup costs. Given that any reasonable entrepreneur compares the expected benefits of starting up a project with the associated costs, a reduction in the expected duration of a project can be fatal. Indeed for some projects which can operate without the presence of business cycles, but which are forced to shut down during recessions, the expected benefits become too low to cover the associated costs. Therefore, in the presence of business cycles it no longer makes sense to startup such projects.

Put differently, the projects which can operate in a world without business fluctuations, but do not even startup in the presence of economic cycles, permanently reduce the level of output. Our estimates suggest that such a permanent decrease in output can easily exceed several percent and in some cases can be even much larger. Hence, the interaction between inefficiencies and startup costs in our simple model generates costs of business cycles that are several orders of magnitude higher than the estimate of Lucas.

Having established that fluctuations in economic activity may come with large costs to society, Chapter 3 looks at how the severity of search and matching frictions, match efficiency, affects the unemployment rate and in turn the magnitude of business
cycles. For example, the most recent recession was accompanied with a peculiar fact which raised many eyebrows within the economic profession. As in any other recession, unemployment shot up and the number of vacant jobs decreased. However, typically as the economy starts recovering the number of vacant jobs starts increasing pulling unemployment down as it is easier for people to find work again. This time, while vacancies increased during the recovery, the unemployment rate remained stubbornly high. Thus, while there seemed to have been jobs in the economy ready to be filled and many unemployed ready to work, the two somehow did not click.

One of the culprits in these developments is a reduction in match efficiency. For instance, a lot of construction workers lost their jobs during the recession. During the recovery, many jobs in health care and education sectors were opened up, but obviously these were not suitable for the unemployed construction workers. Another reason why mismatch might have increased has to do with problems in the housing market. During the housing slump, it became more difficult for people to move for jobs as they had a harder time refinancing their mortgages (as analyzed for instance by Sterk, 2010). These are examples of why search and matching frictions, match efficiency, can fluctuate over the business cycle.

Chapter 3 focuses on the ease (or difficulty) with which unemployed people find jobs and how it is affected by match efficiency and in turn how this affects the unemployment rate. Specifically, using data from the U.S., I employ econometric techniques to estimate how the probability with which an unemployed worker finds a job is affected by match efficiency. Although match efficiency is not directly observed in the data, the econometric technique is able to extract its estimate. It turns out that match efficiency is estimated to move together with the business cycle. This means that recessions are times when unemployed workers have a harder time finding jobs not only because there are less vacant jobs and more unemployed competing for them, but also because search and matching frictions become more severe. Quantitatively, match efficiency accounts for about 1/4 of the movements in the probability with which an unemployed person finds a job. Put into a different perspective, during the most severe recessions the unemployment rate increased on average by 3.5 percentage points. 1/5 of this run-up is due to a drop in match efficiency alone.
To further analyze the role of match efficiency in determining aggregate labor market dynamics, Chapter 3 also examines a simple theoretical model. I show that measured match efficiency moves together with the business cycle in a model incorporating search and matching frictions, workers with different skills and firms which are free to flexibly hire and dismiss employees.

Finally, Chapter 4 examines the role of firm heterogeneity for developments on the labor market. There is a long list of studies focusing on the link between a firm’s size and its growth. The general conclusion of these studies is that small firms grow faster than larger ones and that small firms are important for job creation in the economy. However, recent studies suggest that it is not firm size, but rather the age of a businesses that matters for firm growth. This questions the current way of thinking and poses new challenges as the link between a firm’s age and its growth has received very little attention. In Chapter 4, I explicitly investigate (both empirically and theoretically) the role of firm age for business growth and the importance of young firms for aggregate labor market dynamics.

Recent studies focusing on firm age show that young firms have higher exit rates and conditional on survival they grow faster than older ones, young firms create relatively more jobs, job creation and destruction rates fall with firm age and while young firms are mainly small, small firms are not all young. I extend these findings by showing that, compared to old firms, employment growth in young businesses is more volatile and that business start-ups are important for determining unemployment rate developments.

The main contribution of Chapter 4 is a novel general equilibrium model incorporating labor market frictions and heterogeneous firms which aims to capture the above empirical facts. Firms in this model differ in their productivity which evolves persistently over time. They are free to enter the economy and if their individual business conditions are so bad that it no longer pays to operate, they choose to shut down. Furthermore, depending on the economy wide and firm specific conditions businesses also choose whether to expand or shrink their workforce.

This model is shown to be consistent with the above-mentioned empirical facts relating to firm age. The key to understanding the model’s performance is the inherent selection process of successful firms. Only the relatively more efficient firms are able
to survive, expand and grow old. Therefore, younger firms exhibit a higher risk of shutting down and thus also a higher rate of job destruction. Moreover, younger firms are mainly small and as such they can take advantage of the lower worker turnover and the associated costs (in absolute terms) resulting in them having relatively more resources for expansion compared to older businesses. The model is also consistent with the dynamics of aggregate labor market variables, such as the unemployment rate, the vacancy rate and the probability of finding a job. The model correctly replicates the co-movement of these variables over the business cycle as well as predicting realistic sizes of their fluctuations.

The model is then used to analyze the impact of a government policy aimed at supporting young firms as drivers of job creation. Such measures were recently proposed under the "Startup America" initiative of the White House. Within the model, government intervention can also be justified, since firms receive a relatively small fraction of output and thus entry could be inefficiently low and firm exit inefficiently high.

The results suggest that subsidizing firm entry increases welfare as a higher number of new firms reduces unemployment and increases the level of output. However, if the government focuses its resources only on subsidizing existing young firms welfare decreases. The reason is that such a subsidy enables relatively less productive firms to survive and crowd out entrants. Lower firm entry together with higher survival rates of relatively less efficient firms results in lower average firm productivity. Moreover, the reallocation process of workers from relatively less productive firms to more efficient businesses is hampered. The overall impact of these effects is that the output level in the economy falls and thus welfare is reduced. Hence, the model suggests that government policies should focus on reducing barriers to firm entry, quickly withdrawing their support thereafter so that the economy can pick its own winners.