A Theory of Slack

How Economic Slack Shapes Markets, Business Cycles, and Policies

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CHAPTER 21.

Opportunities for future research

This book has presented evidence that slack is ubiquitous in the US economy and developed a slackish model of markets and business cycles based on the evidence. There is still a lot that we do not understand about slack, however, and many promising avenues for research. In this chapter we briefly map possible paths for productive future research on slack. We also point to early and ongoing work on slack, including exploratory contributions, in the hope of signaling promising research directions and highlighting existing projects. We discuss how slack could help us better understand development and business cycles in other countries, and how slack could be measured and modeled better.

21.1. Prevalence of slack in other countries

The United States is seen as the paragon of competition and free markets; yet, as we saw, most US markets are actually slackish. This means that the markets feature unsold goods and services, and they equilibrate via tightness while prices are determined by norms. In this section we argue that other countries are likely to be at least as slackish as the United States, which implies the book's theory of slack might be useful there too.

21.1.1. Labor market slack in other countries

Unemployment is a universal problem, found on all labor markets (Feldmann 2009, table 1). This is why it's so important to study it and include it into our models and into policymaking.

Unemployment is of course present throughout the developed world (Elsby, Hobijn, and Sahin 2013). The Beveridge curve is more or less visible in all these countries (Elsby, Michaels, and Ratner 2015).

Unemployment is also prevalent in developing countries (O'Higgins 2003, figure 11). Although developing countries might not have more unemployment than developed countries, they experience a much higher share of self-employment (Poschke 2025, figure 1). And self-employment appears to be a mild form of unemployment in these countries, as workers choose self-employment primarily because they face unemployment in the formal sector (Breza, Kaur, and Shamdasani 2021).

The psychological cost of unemployment has also been confirmed in other developed countries. Just like in the United States, unemployed workers in the United Kingdom suffer from low mental well-being (Clark and Oswald 1994; Blanchflower and Oswald 2004). And they are much more likely to be anxious and depressed and to suffer from low self-esteem—even compared to workers in low-pay jobs (Theodossiou 1998). A typical concern about studies linking unemployment to poor health is that they might not be able to separate between causality (unemployment causes poor health) and selection (people in poor health are more likely to become unemployed). But panel data, following workers over time, are able to identify the causal effect of unemployment on health. For instance, using a large, representative panel dataset of German workers, Winkelmann and Winkelmann (1998) find that unemployment reduces life satisfaction and that the nonpecuniary cost of unemployment is much larger than the pecuniary cost. Using the same panel dataset, Lucas et al. (2004) find that people do not get used to becoming unemployed: workers who have already lost jobs in the past react as badly to a new spell of unemployment as workers who are becoming unemployed for the first time.

Unemployment also appears to have extremely high psychosocial costs in the developing world. A field experiment by Hussam et al. (2022) in Bangladesh illustrates just how large the psychosocial cost of unemployment is. The experiment shows that paid employment raises psychosocial well-being substantially more than the same amount of cash alone. In fact, two-thirds of the workers who were employed in the experiment would be willing to forgo cash payments and continue working for free.

21.1.2. Product market slack in other countries

Slack is also present in product markets all over the world, and probably even more in developing countries than in developed countries, so the slackish framework might be especially useful there. Walker et al. (2024, figure 1) provide evidence of slack in firms across the globe, and argue that rates of slack are higher in low-income countries. They also provide specific survey evidence for urban and rural Kenyan firms, which shows widespread product market slack.

A visible source of product market slack is wasted food. UN Environment Programme (2021) documents that food unsold by grocery stores and restaurants generates a significant amount of food waste across the globe. Brancoli (2021) provides a specific example: he explains why bread remains unsold at grocery stores in Sweden and documents how this generates food waste.

Another element suggesting that product market slack is prevalent globally is that sellers strive to form long-term relationships with buyers in all countries. For example, 70% of firms in the Euro area have long-term relationships with their customers Fabiani et al. (2006, table B3). Firms in developing countries also appear to rely heavily on long-term relationships to operate. Macchiavello (2022, p. 340) reviews a wide range of evidence and concludes that in developing countries:

> Many—and perhaps most—transactions between firms occur in long-term relationships rather than in spot markets, as typically theorized in economic models.

Long-term customer relationships are governed by implicit contracts that alleviate matching problems, as I found in a survey of French bakers in the summer of 2007.[1] First, customer relationships alleviate the uncertainty associated with random demand. A baker told me that demand is difficult to predict and that having a large clientele of loyal customers who make it a habit to purchase bread in the shop was therefore important. In fact, "good" customers are expected to come every day to the bakery. Customer relationships also alleviate the uncertainty associated with random supply. Being a customer means having the assurance that your usual bread will be available, even on days when supply runs low. Of course, this is possible because bakers know exactly what customers order every day through their long association. A baker told me that it would be "unacceptable" to run out of bread for a customer, and that customers would probably "leave the bakery" if that happened.

21.1.3. Price and wage rigidities in other countries

Finally, the rigidities in prices and wages used in the book's model also appear in other countries, which makes a framework with rigid price and wage norms particularly applicable.

Indeed, across the globe, prices and wages do not appear to be fully responsive to shocks. Administrative data and household surveys across 16 Western countries show that wages are fairly rigid (Dickens et al. 2007). Wage rigidity is also prevalent in developing countries (Kaur 2019). Large-scale firm surveys show that prices are quite rigid throughout the Euro area (Fabiani et al. 2006). Given such rigidities, we expect fluctuations in slack

[1] The survey is described in Eyster, Madarasz, and Michaillat (2021).

to be substantial—because adjustments in slack are required to equilibrate supply and demand when prices are rigid.

We argued that price and wage rigidities might be caused by fairness concerns, and we provided evidence from the United States. But there is substantial evidence that people in other countries also care about fairness: Frey and Pommerehne (1993) provides evidence from Switzerland and Germany, Gielissen, Dutilh, and Graafland (2008) from the Netherlands, Boycko and Shiller (2016) from Russia, and Snir et al. (2024) from Israel. Firms across the globe also identify fairness as a major concern in price setting. Researchers have surveyed more than 12,000 firms across developed economies about their pricing practices; among the theories that the managers deem most important in explaining price rigidity, some version of "being fair to customers" invariably appears (Eyster, Madarasz, and Michaillat 2021, tables 1 and 2).

21.2. Applying the theory of slack to other countries

In this book we motivated the assumptions of the theory of slack based on US evidence, we calibrated the models to the US economy, and applied the theory to US policies. But, as unemployment and slack exist in every country, this book's theory should be helpful in other countries too, to understand how markets operate, how business cycles affect the economy, and how policies can be used to improve market outcomes.

21.2.1. Labor market policies in other countries

The slackish labor market model developed in this book, incorporating job rationing within a realistic framework with labor flows, has already been helpful to understand the effects of various policies in several European countries: for example, in France (Crepon et al. 2013), in Austria (Lalive, Landais, and Zweimuller 2015), and in Sweden (Cheung et al. 2025). It might be helpful to study other policies in comparable labor markets.

The model might also be helpful to understand developing economies and design appropriate policies to combat poverty and foster development, and thus to provide more fulfilling lives to workers worldwide. Indeed, although developing countries see large flows of workers on the labor market (Donovan, Lu, and Schoellman 2023), job rationing in the formal sector is prevalent (Breza, Kaur, and Shamdasani 2021). The model implies for instance that policies that stimulate labor demand, such as public employment, might reduce unemployment effectively. Public employment might be especially potent in slack labor markets, when it crowds out private employment less. The theory for instance provides support for India's public work program, the National Rural Employment Guarantee Act, and suggests that the program might be especially effective in slack local labor markets, just as Breza, Kaur, and Shamdasani (2021, section 8) find.

21.2.2. Business cycle shocks in other countries

In the book we find that US business cycles are mostly driven by aggregate demand shocks. It would be interesting to assess if this conclusion holds in other countries. Because we reached that conclusion by looking at Okun's law, a first step would be to ascertain whether Okun's law holds in other countries. Ball, Leigh, and Loungani (2017) show that it holds in a number of developed economies, which suggests that aggregate demand shocks also play a central role there. The slackish business cycle model might therefore be useful in all these economies, as it features aggregate demand shocks that are nonneutral and produce meaningful fluctuations.

It might also be valuable to leverage more slack data and more sophisticated techniques to identify the sources of business cycles in the United States and other countries. Silva and Urias (2025) take a step in that direction: they use sophisticated macroeconometric techniques and sectoral data on slack to isolate the sources of business cycle shocks in US data. They confirm that US business cycles are mostly driven by aggregate demand shocks. Such a data-rich, sectoral approach might be useful in other countries too.

A related task is to use slack data to obtain better measures of total factor productivity, purified from fluctuations in slack. Although total factor productivity might not be an important driver of business cycles, it is of course the primary driver of economic growth, so measuring it well is important to understand long-run development. As we discussed, measuring total factor productivity accurately requires to measure slack accurately and to properly separate fluctuations in slack from fluctuations in total factor productivity—as both enter fluctuations in measured productivity. Silva and Urias (2025) and Gantert (2025a) collect data and develop techniques to do that.

21.2.3. FERU in other countries

As the slackish framework developed in the book is likely to be applicable in other countries, the policy tools introduced in the book should also be applicable beyond the United States. Many countries have a full-employment mandate, but no clear full-employment target. Computing the FERU in these countries would be helpful to guide policymakers towards full employment.

Unemployment rate, vacancy rate, and labor market tightness can be computed in other countries in which data on the number of job seekers, number of job vacancies, and number of labor force participants are available. From this the FERU formula $u^* = \sqrt{uv}$ can be applied. And from it it would be possible to compute the unemployment gap $u - u^*$. For instance, Gokten, Heimberger, and Lichtenberger (2024) apply the formula to Germany, Sweden, Austria, Finland, and the United Kingdom, and analyze the evolution of the unemployment gap in these countries since the 1970s. Moving forward, the real-time

unemployment gaps could be used to adjust monetary and fiscal policy in response to shocks in these countries, as described in the book.

However, the FERU formula does require assumptions on the cost of unemployment, the cost of recruiting, and the shape of the Beveridge curve. In countries in which these statistics take different values than in the United States, the FERU must be computed from a more general formula. The shape of the Beveridge curve is particularly likely to differ across countries (Gaddnas and Keranen 2023, table 1). In that case, it is necessary to use the generalized formula for the efficient labor market tightness and adjust the calibration of the parameters. Gaddnas and Keranen (2023) take a step in that direction and compute the FERU in Finland, Sweden, Germany, and the Netherlands using country-specific Beveridge elasticities.

It would also be possible to compute the FERU and unemployment gap in subnational regions when the data are available. For instance, Germain (2024) compute the FERU in Belgium's three regions—Brussels, Flanders, and Wallonia—using region-specific Beveridge elasticities. Such region-specific unemployment gaps can be useful to tailor regional fiscal policies.

21.2.4. Phillips curve in other countries

In the book we build a slackish Phillips curve that links labor market tightness to inflation. We also show that the Phillips curve ensures that the divine coincidence holds: inflation is on target whenever the labor market is at full employment.

There is good evidence in favor of the slackish Phillips curve in the United States, and it would be fascinating to see whether the slackish Phillips curve holds in other countries too: Do we see that labor market tightness is a superior indicator of inflationary pressures? And do we see that when labor market tightness is at its efficient level, inflation is on target? Benigno and Eggertsson (2024) have started to explore these questions. They find similar patterns in other countries, but more research to confirm and expand these findings would be invaluable. A key empirical challenge here again is to find measures of job vacancies that are of good quality and that cover a sufficiently long period, to obtain a good measure of labor market tightness.

The slackish Phillips curve has also been observed in regional data in the United States (Gitti 2025). It would be interesting to see if it appears in regional data in other countries.

21.2.5. State-dependent multipliers in other countries

In the book we find that the optimal amount of stimulus spending depends among other things on the size of the fiscal multiplier. We also find that multipliers are state dependent. In particular, policies that boost demand have higher multipliers in slack markets than

tight markets. Hence, to design appropriate stimulus packages in other countries, it would be valuable to obtain estimates of the fiscal multipliers there, for different levels of market tightness. Ghassibe and Zanetti (2022) show how to estimate slack-dependent fiscal multipliers in the United States, and Auerbach and Gorodnichenko (2013) show how to estimate state-dependent multipliers in numerous OECD countries. These papers offer a promising starting point to estimate slack-dependent fiscal multipliers outside the United States.

21.2.6. Detecting recessions in other countries

The Michez+ recession indicator can also be computed for any country in which unemployment and vacancy data are available, but the recession threshold of 0.19pp will need to be recalibrated. In other countries, the recession indicator will take different values, and recessions will occur at different times, so the threshold will have to be recomputed to detect recessions as early and accurately as possible. It might also be possible to optimize how the unemployment and vacancy data are smoothed and combined to best detect recessions in other countries, using the method described in Michaillat (2025).

The recession detection methodology might also be helpful to detect rapid changes in disaggregated labor markets—a direction that Sheppard (2025) investigates. Relatedly, it might be possible to combine information obtained in disaggregated labor markets to improve the detection of recessions in the aggregate labor market. For instance, Garimella, Jorda, and Singh (2025) develop a methodology to improve the detection of US recessions using state-level data. This type of methodology might be especially valuable for detecting aggregate recessions in regions composed of very heterogeneous, not necessarily synchronized subregions—the European Union would be one such example.

21.3. Collecting better data on slack

Because standard macroeconomic theory has not focused on slack, statistical agencies have not systematically collected data on it—beyond unemployment. Rectifying this omission would greatly improve both theory and policy. In this section we discuss which data would be especially valuable to improve our understanding of slack in the United States and other countries, and to design better policies based on slack.

21.3.1. Data on labor market slack in the United States

When we computed the full-employment rate of unemployment (FERU), we saw that a key statistic is the amount of man-hours devoted to recruiting by firms. There is little evidence on that, so we used the number of job vacancies reported by firms, together with an estimate of the amount of recruiting per vacancy, to infer the amount of recruiting at any

point in time. This lack of evidence is not ideal to measure the FERU and unemployment gap in the past, but it could easily be remedied in the future. The BLS would only need to add one question to the Job Opening and Labor Turnover Survey. The recruiting cost could be measured every month by asking firms to report how many man-hours they devote to recruiting in addition to how many vacancies they are currently advertising. As part of the American Time Use Survey, the BLS already asks unemployed workers how many hours they spend every day searching for a job (Aguiar, Hurst, and Karabarbounis 2013). It should be easy to ask firms the same thing. Moving from job vacancies to recruiting hours would improve the measurement of the unemployment gap and thus the conduct of stabilization policies.

Another key statistic that could influence the FERU is the social cost of unemployment. We have seen substantial evidence from sociology, psychology, public health, and medical science that unemployment is detrimental to physical and especially mental health. But few studies have been able to quantify the social cost of unemployment. One such study, by Borgschulte and Martorell (2018), uses administrative military data to estimate the value of nonwork relative to the value of work. It would be valuable to measure the social value of nonwork for other workers and in other datasets to confirm or refine the findings and ascertain more confidently the social cost of unemployment. Using a wonderful field experiment, Hussam et al. (2022) find dramatic psychosocial costs of unemployment in Bangladesh—to the point where many of the subjects were happier to work for some salary than remaining unemployed for the same amount of money. It would be interesting to see whether such findings also hold in the developed world.

21.3.2. Data on product market slack in the United States

Data on product market slack are especially scarce in the United States. Given the importance of the issue, product market slack is not something that is well-measured or that the government tracks at all—probably because it is not part of standard macroeconomic theory. It would be valuable to collect more data on product market slack. It would be good to know how many goods remain unsold across the economy at a monthly frequency, and how many employees remain idle each month across the economy—waiting for customers to purchase their labor services.

It would also be good to know how many buyers there are for goods and services at any point in time, which would then allow us to measure product market tightness. Unlike on the labor market, where job vacancies are measured systematically, the desired amount of purchases on the product market is not recorded in any centralized dataset.

And while we have some idea of the cost of filling a job vacancy, there is very little data on the cost of visiting shops and filling help-wanted ads. Collecting some data on the matching cost on the product market would be very valuable—for instance, to calibrate

the product market in the two-market business cycle model and to compute the efficient product market tightness.

21.3.3. Data on slack in other countries

The most important form of slack is unemployment, so the most important statistic is the number of unemployed workers at any point in time. Developed countries now collect such data, but many developing countries still do not. It seems critical to start measuring unemployment in these countries to track and stabilize business cycle fluctuations.

One challenge is that many workers are self-employed in the developing world. To keep track of slack among the self-employed, we would need to measure the number of hours worked each week by these workers. The unemployment rate among the self-employed would be the share of the time that the self-employed are idle. Presumably the unemployment rate among self-employed workers will be larger than among workers employed in the formal sector—consistent with the idea that self-employment is an intermediate status between unemployment and formal employment, a form of disguised unemployment (Robinson 1936).

To assess the tightness of foreign labor markets, it would be key to collect monthly data on job vacancies. To assess the full-employment rate of unemployment, as well as the unemployment gap, it would be important to measure the amount of labor devoted to recruiting in these labor markets. At the minimum, vacancies can be translated into recruiters by assuming some constant number of recruiters per vacancy; but it would be even better to have direct, monthly measures of the number of recruiters.

Of course, in addition to data on slack in the labor market, it would be extremely instructive to measure slack on the product market abroad. This would require measuring the slack rate in firms, small and large, as the Institute for Supply Management (ISM) does in the United States. The ISM asks firms how much more they could produce, given their current capital stock and workforce and organization, if only they had more demand for their product. In the slackish framework, this is the ideal information to compute the slack rate in the product market.

21.3.4. Estimating the rigidity of prices and wages

Finally, it would be valuable to use the large amount of price and wage data collected in the United States and abroad to estimate the rigidity of price and wage norms. This task would require redirecting current empirical efforts, which are guided by current theories but do not estimate the statistics that are crucial to calibrate slackish models.

A tremendous amount of individual price data are now available in many countries. However, a lot of the empirical effort is devoted to estimating "the average frequency and

size of price changes" (Dhyne et al. 2006). In the New Keynesian paradigm, it is central to know how frequently prices adjust. In the slackish model presented here, what is key is how strongly prices respond to shocks: what is the elasticity of prices with respect to underlying disturbances? In other words, what is the passthrough of shocks into prices? A lot of work is required to have a complete understanding of what the passthroughs are in different settings, and what influences them.

A similar comment applies to wages. A large amount of individual wage data have been collected in many countries, but a lot of the empirical effort is devoted to identifying downward nominal wage rigidity (Dickens et al. 2007). This is because Keynes (1936) postulated such rigidity was the main source of unemployment in recessions. But of course, if firms know that they won't be able to cut wages, presumably they will be reluctant to raise them too. So logically, we would expect wages to be rigid in both directions, and in the slackish framework such rigidity explains business cycle fluctuations. What is key is how strongly real wages respond to shocks. In other words, what is key is the elasticity of real wages to shocks. Very few papers estimate such elasticity, so much more work is required to have a complete understanding of how wages respond to shocks in different circumstances.

21.4. Developing the theory of slack further

The theory of slack presented in the book captures essential mechanisms but remains deliberately stylized, leaving many natural extensions open for exploration. We discuss some extensions that might be especially fruitful here.

21.4.1. Microfounding the matching function

The central tool used to model slackish markets is a matching function. We saw that there are standard forms for matching functions (urn-ball, Cobb-Douglas, constant-elasticity-of-substitution), and that there exist microfoundations for these standard forms. However, the microfoundations remain simple and specific to the labor market. More work on the foundations of matching functions in generic markets would be especially valuable.

It would also be helpful to use this foundational work to understand better the shifts of the Beveridge curve on the labor market. In a dynamic labor market model the location of the Beveridge curve is determined by the job-separation rate—which is observed—and the matching function. So understanding the microdeterminants of the labor market matching function would help understand the shifts of the Beveridge curve, and in turn the movements of the FERU. Typical shifts in the labor-market Beveridge curve do not affect the FERU much, but three large shifts over the past century had a sizable impact on the FERU—therefore on the unemployment target for the Federal Reserve. These three

shifts happened during dramatic periods of US history: the Great Depression, World War 2, and the coronavirus pandemic. It is unsurprising that such dramatic events shifted the curve, but it would be good to understand how exactly that happened, and what the precise mechanism was.

21.4.2. Modeling the trickle-down from unemployment to underemployment

In the book we assume that workers who cannot find jobs remain unemployed. This is essentially what happens in the United States: as we saw, when unemployment increases, there is not much trickle-down to involuntary part-time work. But in some other countries, the phenomenon appears much more important. For instance, in India, workers who cannot find jobs in the formal sector appear to trickle down to self-employment (Breza, Kaur, and Shamdasani 2021). In Japan, workers who could not find full-time jobs during its two lost decades appeared to trickle down to part-time employment (Hashimoto, Ono, and Schlegl 2023). In such situations, it would be valuable to have a slackish model with a primary labor market for full-time work, and a secondary labor market with self-employment or part-time opportunities. The challenge would be to model how workers who are unemployed in the primary market trickle down to the secondary market, and more generally the spillovers between the two markets. For this task, the models developed by Barnichon and Zylberberg (2019) and Hashimoto, Ono, and Schlegl (2023) offer interesting starting points.

21.4.3. Modeling price norms

In the models we have used fairly simple price and wage norms that were rigid. But we also saw that such rigidity is caused in large part by fairness concerns. Sellers do not want to charge prices that buyers find unfair, and firms do not want to pay wages that workers find unfair. It would be fruitful to incorporate more realistic price norms, built to mimic real-world fairness concerns, into the models. The concepts of fair wage developed by Akerlof (1980, 1982) and (Akerlof and Yellen 1990), as well as the concept of fair price developed by Eyster, Madarasz, and Michaillat (2021), might be productive starting points.

Relatedly, it would be invaluable to have more estimates of the passthroughs of marginal costs and marginal valuations into prices, as well as estimates of the passthrough of marginal productivity into wages. Having estimates of these passthroughs would be very useful to calibrate price and wage norms more realistically.

21.4.4. Studying out-of-equilibrium dynamics

When we considered dynamic markets, where trading relationships are formed and destroyed over time, we concentrated on the equilibrium of the market—where market

flows are balanced so tightness, sales, and slack are constant. It would be interesting to study out-of-equilibrium dynamics too, for instance as Ahn and Crane (2020) do. We argued that on the US labor market out-of-equilibrium dynamics are fast, so unlikely to matter much, because labor market flows are large. But such dynamics may matter more on other US markets, or in other countries. For instance, labor market flows are much smaller in continental Europe than in the United States (Elsby, Hobijn, and Sahin 2013, table 4). So there it would be especially important to study and incorporate out-of-equilibrium market dynamics.

21.4.5. Modeling international trade

An important aspect of the economy that is not discussed in the book but that could be included in the future is international trade. International trade fits well in the slackish framework: it takes time and effort for suppliers to find customers abroad, and it also takes a lot of effort and money for buyers to find producers abroad. The geographical, cultural, and legal distance makes it difficult to trade with buyers or sellers in another country—even more so in another continent (Egan and Mody 1992). It is because of these difficulties that sellers and buyers are keen to form long-lasting cross-country relationships (Egan and Mody 1992, table 3). The slackish framework might be helpful to model such trade and its macroeconomic impact, for instance following the approaches taken by Drozd and Nosal (2012) and Bai et al. (2024).

21.4.6. Modeling the housing market

Another market where slack is well documented is the housing market. There is always slack on the US housing market: hundreds of thousands of houses for sale but not sold in any month (Realtor.com 2025a). Another manifestation of the slackishness of the housing market is that it takes time to sell a house: the median time that a house stays on the market is always above 1 month, and sometimes as high as 3 months (Realtor.com 2025b). At the same time, we know that the housing market plays a key role in shaping business cycles (Feldstein 2007; Leamer 2007). Integrating the housing market into the slackish business cycle framework might provide interesting insights. (Bianchi, McKay, and Mehrotra 2024) take a first step in that direction.

21.4.7. Modeling networks and granularity

Yet another interesting aspect of modern economies not covered in the book are production networks. Production networks are critical in understanding the modern production of goods and services, as well as the propagation of shocks through the economy (Acemoglu et al. 2012; Baqaee 2018; Baqaee and Farhi 2022). Relatedly, the granularity of

modern economies is not taken into account, although it also plays a significant role in understanding fluctuations (Gabaix 2011). It might be fruitful to embed slackish markets into networks or granular structures so as to obtain even more realistic business cycle models. Schuele and Sheng (2024) and Ghassibe and Zanetti (2025) have started work in that direction.

21.4.8. Modeling inventory

When firms produce durable goods but face slack, they will generate unsold inventory. The framework in this book might be helpful to understand movement in inventories. Along these lines, den Haan and Sun (2024) explore how to explain the behavior of inventories using a matching function on the product market.

21.4.9. Introducing capital

The focus has been on short-run issues, namely business cycles. We have not explored at all how economic slack might help us understand long-run issues, such as economic development and growth. Because of this short-run focus, we have concentrated on labor as a factor of production. We have not paid much attention to capital as a factor of production. We have barely looked at data on capital goods, and we have not explicitly modeled capital and related quantities, such as investment. Yet, capital also remains idle some of the time, and capital utilization varies over time (Gorodnichenko and Shapiro 2011). The slackish framework might be helpful to connect capital utilization and capital accumulation. Along these lines, Sun (2025) has developed an innovative model in which buyers match with firm capacity on the product market, and which interestingly predicts an over-accumulation of capital.

Moreover, slack in the form of low firm capacity utilization seems to be an important determinant of corporate investment (Grullon and Ikenberry 2025). The slackish framework developed in this book might be useful to think about these issues.

Finally, the market for capital goods is also slackish. Capital goods are very specialized, very complex, and often with unique characteristics, so they take time and effort to sell, and to buy: see for instance Gavazza (2011) in the case of commercial airplanes and Ramey and Shapiro (2001) in the case of aerospace equipment. The framework in the book might be helpful to understand trade in capital goods and slack in those markets. In this vein, Ottonello (2024) shows that a matching framework can help understand why capital goods remain unsold for significant periods.

21.4.10. Introducing borrowing constraints and stronger heterogeneity

The book shows how to introduce heterogeneous income and wealth in the slackish model. However, because there are no borrowing constraints, it is easy to aggregate the heterogeneity and solve the model. In the real world, heterogeneity matters because poorer people are more constrained than richer people, which affects how they consume and save. A rich literature has extended the New Keynesian model to account for such heterogeneity, and has shown how it affects the model's behavior and its policy implications (Auclert, Rognlie, and Straub 2025). It would be extremely interesting to introduce such heterogeneity in the slackish model. Because the model features unemployment, which is a major source of inequality in modern economies, the model seems well adapted to such extension. Along these lines, Kopiec (2022) explores the implications of heterogeneity on the effectiveness of fiscal policy in a slackish framework.

21.4.11. Building a quantitative version of the model

Finally, in the book we strove to develop a business-cycle model that is as economical as possible. But eventually, for many applications, especially for policy work, a more complex model will be required. It might be required to introduce several of the elements mentioned above, to introduce stochastic shocks and stochastic policies, and to simulate the dynamic behavior of the model. Such extension would aim to build a computational model that is accurate enough along sufficiently many dimensions to be useful to practitioners. Borys, Doligalski, and Kopiec (2021) take a first step in that direction by building, estimating, and simulating a quantitative version of the slackish model in chapter 13. Gantert (2025b) develops and simulates a quantitative version of the slackish model in chapter 14.

21.5. What causes business cycles?

Having seen how slack transmits aggregate demand shocks and how policy can mitigate them, the deeper question remains: what generates these demand shocks in the first place? As my students always ask when I take questions at the end of the first lecture of my course on unemployment: "But why does unemployment always spike up after reaching rock bottom?" That's a great question: why do we perennially have business cycles?

In this book we saw how unemployment would go up and down in response to shocks to aggregate demand, producing realistic business cycles. We also argued that stabilization policy might not have been conducted perfectly, because it might have ignored unemployment fluctuations or might have overestimated the FERU and so might have tolerated more unemployment than it should have. So monetary and fiscal policy could possibly have done better and smoothed out more forcefully the waves of unemployment.

But it still remains to explain what these fluctuations in aggregate demand are, where they come from, and why they seem to endlessly reappear to trigger the next recession. It seems that each recession has its own story: the 2020 recession was caused by the coronavirus pandemic; the Great Recession of 2007–2009 coincided with the global financial crisis; the 2001 recession followed the burst of the dot-com bubble; the 1990–1991 recession followed the Iraqi invasion of Kuwait; the twin 1980–1982 recessions were caused by the tight monetary policy imposed by Volcker; the Great Depression in 1929–1933 was triggered by the stock market crash October 1929; and so on. In all these recessions the unemployment rate spiked. During the pandemic, it was probably unavoidable that a recession followed and unemployment spiked. But in all other cases, why did the events trigger a full-blown recession with a collapse in aggregate demand, why did similarly important global events not, and why are these downturns occurring like clockwork after periods of expansion and confidence? Is there an underlying reason explaining why some events repeatedly trigger sharp economic downturns?

There is no established answer to these questions, and much more work on it is warranted. One possibility is that some of the events unleash the "animal spirits" that lie dormant otherwise, as Keynes (1936, chapter 12) proposed:

> Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of animal spirits—a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.

It might be that after periods of stability, the animal spirits always awaken and produce bubbles and then crashes. This could explain the dot-com recession and Great Depression (stock market bubbles), the Great Recession (housing market bubble), and maybe the next recession (bubble around artificial intelligence and cryptocurrency). Speculative manias, followed by financial crashes, have happened time and time again throughout history and around the world, driven by irrational exuberance from investors, and often exacerbated by fraudulent behavior.[2]

More generally, animal spirits might be an irrational fervor that drives economic decisions of crowds of people, as proposed by Akerlof and Shiller (2009). This fervor may

[2] See for instance Akerlof and Romer (1993), Kindleberger and Alibert (2005), Shiller (2005), and Akerlof and Shiller (2015).

follow certain events and not others, and when it is triggered, may lead to brash, large-scale reactions—consumers suddenly cutting spending and firms suddenly cutting hiring. The slackish model provides a natural way to formalize how these swings in collective optimism translate into real fluctuations in slack and output, and generate recessions and expansions.

Financial crashes often include collapses of the credit market. A prime example is the Great Depression, when the stock market crash triggered a banking crisis and a generalized collapse of the credit market, which deepened and lengthened the depression (Bernanke 1983). As such, it would be useful to append a credit market to the business cycle model proposed here. Of course credit markets are slackish too, so they should be modeled as such. Wasmer and Weil (2004) and Petrosky-Nadeau and Wasmer (2017) show how this could be done.

Lastly, the slackish model here has a unique solution determined by an aggregate-demand parameter, but that parameter might reflect the animal spirits. Another possibility is that the correct model of the business cycle has several solutions, and the animal spirits push the economy from one to the other solution over time. If one solution has low unemployment and the other has high unemployment, then periods of high and low unemployment will alternate—Howitt and McAfee (1992) propose a nice model in this vein.

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