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Introduction

Producer Dynamics

Timothy Dunne, J. Bradford Jensen,
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The process of firm entry, growth, and exit has always been an integral part of the mechanism of resource reallocation in a market economy. Spurred by developments in micro data construction by government statistical agencies and access to these data by researchers, the empirical analysis of producer dynamics has become a major focus of economic research over the last fifteen years. The crucial input that has made the empirical study of producer dynamics possible is comprehensive longitudinal micro data that allow researchers to track new firms over their lifetimes. Using these data for a large number of countries, researchers have identified links between the characteristics of firms and their subsequent success or failure that provide a better understanding of the sources of firm and worker dynamics and their implications for the long-run growth and performance of a market economy. In recognition of its importance to public policy-making, the primary U.S. statistical agencies—the Census Bureau and the Bureau of Labor Statistics (BLS)—have recently begun to produce official statistics that measure the dynamic movements of firms in and out of business and workers in and out of jobs.

The development of new data resources and empirical facts on producer dynamics has impacted many research fields in economics including industrial organization, labor, growth, macro, and international trade. Since the initial measurement studies of Dunne, Roberts, and Samuelson (1988, 1989), the longitudinal data sets have been exploited by industrial organi-

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zation economists to study the competitive effects of producer turnover and why the process differs across industries and time periods. Building on the work of Davis, Haltiwanger, and Schuh (1996), an enormous literature, both empirical and theoretical, has developed in labor and macro economics to measure and explain the gross employment flows due to job creation and job destruction by firms. Bailey, Hulten, and Campbell (1992) and Griliches and Regev (1995) show how sectoral and industry productivity gains can be traced back to productivity differences that exist at the micro level combined with the exit of low productivity firms and the entry and growth of higher productivity firms. The intertemporal pattern of lumpy plant-level investment present in the micro data (Doms and Dunne 1998) have been analyzed by macro economists as a source of aggregate investment fluctuations (Caballero, Engel, and Haltiwanger 1995). International economists have also studied how trade flows are shaped by both the growth of existing exporters and importers and the flows of producers in and out of international markets (Bernard and Jensen 1995; Bernard, Eaton, Jensen, and Kortum 2003; Das, Roberts and Tybout 2007). None of these lines of research could have developed without the use of firm- and plant-level longitudinal surveys and censuses conducted by government statistical agencies.

This volume is the result of a two-day conference in April 2005 devoted to the measurement and explanation of producer dynamics. The meeting was sponsored by the Conference on Research in Income and Wealth (CRIW) and had as its primary goal, as do all CRIW conferences, encouraging interaction between the statistical agencies that are developing the longitudinal firm-level data series, and data users from academics, government, and the private sector. The timing was motivated by the development of several new micro-data sets that provide much more comprehensive coverage of U.S. firms and plants than has been previously available. These include: the Longitudinal Business Database (LBD), constructed at the Center for Economic Studies of the Census Bureau; the Business Employment Dynamics (BED) and Job Openings and Labor Turnover Survey (JOLTS) programs at the Bureau of Labor Statistics; and the matched worker-employer database under construction as part of the Longitudinal Employer-Household Dynamics (LEHD) program at the Census Bureau.

These data sets are also the major source of new government statistics on producer and employment dynamics. The BLS produces quarterly statistics on gross job gains and gross job losses for private sector employers through its BED program. The BED is constructed from state unemployment insurance records and provides job creation and job destruction statistics by industry, state, and firm size. Complementing the BED job flows data is worker flow data from the relatively new JOLTS program at BLS. Job Openings and Labor Turnover Survey (JOLTS) is a monthly survey of roughly 16,000 nonfarm establishments that measures job vacancies, new

hires, and separations. It provides higher frequency data that is more timely than the BED but has less geographic detail. The Census Bureau has also institutionalized a program to construct Quarterly Workforce Indicators (QWI) that summarize employment dynamics in local labor markets and are based on the data from the LEHD project. The QWI reports information on both job and worker flows down to the county level and for detailed industries. These are some of the first government statistics to summarize the dynamic patterns of producer-level adjustment in the U.S. economy. These programs are discussed in chapters in this volume. Each of these data sets is a significant new resource, and together they are going to be a major source of our knowledge of producer dynamics in the U.S. economy for at least the next decade. The chapters also include analysis of longitudinal micro data sets from Canada, the OECD countries, Sweden, and the United Kingdom, which provide useful sources for comparison.

Other chapters in this volume are designed to disseminate information on these data sources within the research community, provide a reference source for future users of the data, and present new empirical results that extend the measurement and analysis of producer dynamics to sectors of the economy beyond manufacturing, to a broader range of countries, to firm transitions in international markets, and to linkages between firm and worker turnover. All of these are areas where empirical research on producer dynamics is in its infancy.

Cross-Country Comparison of Producer Dynamics

The volume is divided into five sections based on the type of data that is used in each chapter. The first section reports the results of a project undertaken by Eric Bartelsman, John Haltiwanger, and Stefano Scarpetta to develop comparable cross-country data on firm entry, exit, and turnover. Over the last decade there has been tremendous effort to develop statistics on producer dynamics in many countries, but the efforts are largely independent and reflect idiosyncracies in each countries' data collection process. The usual problems of comparability that exist when analyzing data from different countries' national accounts are compounded when cross-country comparisons on firm turnover are attempted. The unit of analysis (establishment, firm, line of business), the population of firms under study, the definitions of entry and exit, and the variables used to measure entry and exit (producer counts, employment, sales) often differ across countries. In this chapter, the authors report results from a large research project bringing together researchers from twenty-four countries to standardize data definitions and construct comparable statistics on producer dynamics and productivity.

Even with the extensive coordination in the construction of the individual country data, measurement differences still exist, but the authors are

able to draw some broad comparisons. Looking across countries, annual entry and exit rates are substantial in most cases, averaging between 5 percent and 10 percent of the business population. Somewhat surprisingly, countries that are often believed to have rigidities that impede the development of new businesses have relatively high entry and exit rates. For example, France has entry and exit rates quite similar to the United States and Canada. Eastern European countries, in general, are found to have extensive restructuring in their business populations with very high entry rates of new businesses. Less than one-half of new firms survive through their seventh year in most countries studied. Bartelsman, Haltiwanger, and Scarpetta also document the micro-level sources of productivity growth through a set of productivity decompositions. The goal is to identify the relative contributions to labor productivity growth of entering and exiting firms, within firm productivity changes, and between firm reallocation in shares. The findings show that the within-firm changes in productivity and net entry are the major sources of labor productivity growth in most countries.

Employment Dynamics

A second significant line of data construction and research over the last decade has focused on the patterns of employment dynamics—the movement of workers in and out of jobs and the creation and destruction of employment positions. The Bureau of Labor Statistics and Census Bureau have made considerable progress in developing new data surveys and augmenting existing data programs to produce information on employment dynamics. The second section of this volume contains four chapters that discuss and utilize these new data series.

The first two chapters, by Jason Faberman and Éva Nagypál, report on a new BLS survey: Job Openings and Labor Turnover Survey (JOLTS). This survey provides information on labor force dynamics by surveying establishments monthly about vacancies, hiring, and separations. Faberman presents an overview of the JOLTS program and an analysis of establishment-level vacancies and employment flows. A particular strength of the JOLTS program is that it produces a new series on job vacancies that is much less idiosyncratic than the help-wanted indices used in previous studies. The micro data also show a much more complex adjustment process than that observed in the aggregate series. Cyclical variation in separations is driven more by shifts in the distribution of growth rates of establishments than by changes in the average separation rates across the distribution of establishments. Establishments that are contracting or expanding have greater hiring *and* separation rates than stable establishments. While these patterns in labor turnover are related systematically to local unemployment conditions, differences in state unemployment rates explain little of the overall variation in establishment-level employment flows.

Nagypál raises a number of important measurement issues in the JOLTS data. First, she identifies the large discrepancy in employment growth over the period 2000 to 2004 between JOLTS and other BLS establishment surveys. It is due primarily to the understatement of separations in the earliest JOLTS surveys. Over time, BLS has made improvements to the survey to reduce the problem, though Nagypál reports that at the industry-level large discrepancies remain. Nagypál also discusses a number of measurement issues with regard to vacancies. Job Openings and Labor Turnover Survey (JOLTS) only measures vacancies that are to be filled within a thirty-day period. Hiring environments where vacancy posting substantially precede the actual hiring date are excluded from the data. Job Openings and Labor Turnover Survey (JOLTS) also measures vacancies as a stock of positions and misses short-duration vacancies. The magnitude of the measurement error will be larger in sectors and time periods with high arrival rates of job candidates. Each of these issues will cause a systematic understatement of vacancies in the data. The final step of the author's analysis estimates a simple matching function from the JOLTS data, and she finds that the matching function differs markedly across industries.

The third chapter in this section, by Richard Clayton and James Spletzer, provides an overview of the Business Employment Dynamics (BED) database at the BLS. This database has been constructed from state unemployment insurance records through the Quarterly Census of Employment and Wages (QCEW) program. The BED contains data on virtually all private business establishments in the United States from 1992 onwards and produces statistics on quarterly job creation and destruction due to plant openings, expansions, contractions, and closings. Clayton and Spletzer provide a detailed analysis of job creation and destruction in the 2001 recession and the subsequent years. Job destruction initially rose sharply but then fell back to prerecession levels quickly. Alternatively, the drop in job creation persisted. To better understand the sources of job flows during the 2001 recessions, the authors examine the underlying micro changes and find that most of the decline in employment is due to concentrated increases in job creation and destruction in a relatively small number of establishments.

The final chapter in this section, by John Abowd, Bryce Stephens, Lars Vilhuber, Frederik Andersson, Kevin McKinney, Marc Roemer, and Simon Woodcock, presents detailed documentation of the LEHD data sources and the methods used to construct the QWI. The QWI represents a major new statistical initiative by the Census Bureau to construct job flow statistics for county and MSA-level labor markets. The data underlying the QWI are drawn from the LEHD database, which combines employer and employee information. The QWI reports statistics on job creation, new hires, separations, and earnings for all employees and new hires disaggregated by industry, geography, and worker characteristics such as age and

gender. This level of detail is far greater than any other currently available statistics on employment flows. In addition to the creation of the underlying micro data set, the QWI project has invested heavily in the development of disclosure techniques that preserve the confidentiality of the data but allow for the release of very disaggregated summary statistics. Overall, the chapter provides a valuable reference source for users of the QWI and the LEHD.

Sector Studies of Producer Turnover

The earliest studies of producer dynamics focus on the manufacturing sector because this tends to be the sector that is most consistently surveyed and has the best micro data on producers. In addition, almost all studies of producer dynamics use data on firms with paid employees and ignore non-employer firms. The third section of this volume contains chapters that look beyond the traditional data sources, focusing on producer dynamics in retailing, service industries, and agriculture, and extending the measurement of producer dynamics to the nonemployer segment of the business universe.

The chapter by Ron Jarmin, Shawn Klimek, and Javier Miranda documents the entry and exit of establishments and firms in the U.S. retail sector based on analysis of the Census Bureau's newly developed Longitudinal Business Database (LBD). The LBD covers all establishments with at least one paid employee and all industrial sectors of the economy for the period 1976 through 2005. While the LBD contains limited information on the establishment's characteristics and activities, it can be linked with other Census Bureau establishment data, which considerably enhances the scope and depth of the available information. This new data has the potential to enhance our understanding of such topics as job creation and destruction, firm turnover, the life cycle of establishments, and changes in the industrial structure of the U.S. economy.

In their chapter, Jarmin, Klimek, and Miranda document the overall changes in employment and the number of establishments in the retail sector focusing on differences between chain stores and individually-owned establishments. Over the last several decades there has been a fundamental shift in the organizational structure of the industry, with a significant expansion of stores owned by multi-store firms and a decline of individually-owned stores. The chapter shows that firm turnover has declined over time in most retail industries but differs systematically by market size and ownership structure. Metro areas have the highest producer turnover while rural areas have the lowest turnover. Independently-owned stores experience higher turnover compared to chain stores, but there is little difference in turnover across different types of chain stores—local, regional, or national chains.

Continuing with the analysis of the retail sector, Jonathan Haskel and

Raffaella Sadun document producer dynamics and productivity growth in U.K. retailing. Store entry and exit rates are quite high in the United Kingdom, averaging 10 to 15 percent per year over the period 1998 to 2003. These rates are similar across most retail industries with the exception of pharmacy stores, which has much lower rates. The chapter decomposes changes in sectoral productivity between 1998 and 2003 and finds that entry and exit play an important role in accounting for the productivity growth in U.K. retailing. These findings suggest that producer turnover in U.K. retailing enhances productivity by replacing lower productivity exiting firms with higher productivity entering firms. One complication in the U.K. micro data is that the surveys collect information from different reporting levels, making it difficult to combine data on firm-level productivity with store-level entry and exit measures.

The chapter by Timothy Dunne, Shawn Klimek, Mark Roberts, and Daniel Yi Xu models the entry and exit flows in two medical services industries—dentists and chiropractors—using data for small geographic markets in the United States. They provide some of the first evidence on producer dynamics in healthcare industries using the U.S. Census Bureau's Census of Services. In the industrial organization literature, researchers have used models of entry to explain differences in the number of firms across markets of different size. While useful for understanding long-run market structure, the models do not explain differences in entry and exit flows across markets. The authors use a dynamic model that recognizes the different costs faced by incumbent producers and potential entrants, and specify entry and exit flow regressions consistent with the dynamic framework. They find an important role for past market structure and the number of potential entrants as determinants of the level of producer turnover; this supports the dynamic framework.

A common theme of virtually all papers on producer turnover is that they focus on firms or establishments with paid employees. In the United States in 2000, almost 75 percent of all firms (15.4 million out of 20.8 million) had no employees. The chapter by Steven Davis, John Haltiwanger, Ron Jarmin, C. J. Krizan, Javier Miranda, Al Nucci, and Kristin Sandusky represents the first effort to measure producer dynamics for this segment of the business population. A key contribution of the project is that it not only documents producer turnover in the nonemployer segment but also identifies transitions between nonemployer and employer firms. Of the 2.3 million employer businesses in their industry sample in 2000, 11 percent can be linked to a nonemployer business that existed between 1992 and 2000. However, it is rare for a nonemployer firm to become an employer firm. Of the almost 7.4 million nonemployer firms in the industries under study in 1994, only 3 percent became an employer firm by 1997. This data source provides enormous potential for a better understanding of the evolution of young and small firms. For example, the study shows that fluctuations in

nonemployer size, measured in terms of revenue, from year to year are much larger for nonemployer firms than employer firms; but as nonemployer firms age and grow, the volatility of their revenue stream declines. This latter finding is similar to age and volatility patterns observed in the employer data.

The final chapter on sectoral patterns of producer turnover provides the first statistics on producer dynamics in the agriculture sector. Mary Ahearn, Penni Korb, and Jet Yee utilize data from the U.S. Census of Agriculture from 1978 to 1997 to provide new statistics on the entry, exit, and growth of farms. Entry and exit rates are measured by the number of farms, the volume of sales, and the acreage of land under cultivation. The main patterns show considerable turnover of farms over the entire period. Average annual entry and exit rates appear higher than those reported for other sectors of the U.S. economy, especially when one considers weighted measures such as sales or acreage share of entering and exiting farms. In their data, entry and exit include the sale and purchase of farmland; thus, entry and exit statistics can reflect sales or leases of an existing farm and thus does not directly correspond to the movement of land in or out of agricultural production. The authors document patterns of producer dynamics that differ from those found in many manufacturing sectors. Older cohorts have relatively low shares of sales and land and there is only a slight increase in the average size of farms as a cohort ages. Within a cohort, small continuing farms actually tend to shrink over time while larger farms have higher growth. This is opposite the patterns one sees in manufacturing, where there is a strong inverse relationship between growth and size conditioning on a firm remaining in business.

Employer-Employee Dynamics

A broader view of labor market dynamics integrates producer decisions to enter and exit production and expand and contract the employment positions within a firm, with the worker's decisions to move in and out of existing employment positions. Both are a potentially important source of labor market flows, but the data requirements to measure these separate sources are demanding. Section four of this volume includes chapters that use linked employer and employee data to present a more detailed picture of worker turnover and the human capital present at a workplace.

The first chapter, by Don Siegel, Ken Simon, and Tomas Lindstrom, uses matched employer-employee data from the Swedish manufacturing sector to study how corporate ownership changes affect the performance of the firm and the composition of the firm's workforce. They find that plants undergoing ownership changes have lower labor and total factor productivity prior to the ownership change but that productivity rises to industry norms after the ownership change. The composition of the plant's

workforce also changes. Average age, worker experience, and the percent of college-educated employees rise in the plant after a change in ownership, while the share of women falls slightly. Overall, it appears that in the downsizing of these operations, plants shed workers with short job tenures and these are more likely to be younger and female workers.

The two remaining chapters in this section use data from the LEHD. John Abowd, Kevin McKinney, and Lars Vilhuber utilize the LEHD to measure the human capital embodied in a firm's workforce and relate it to the performance of the firm. The authors construct an index of human capital for each worker in a plant by decomposing the employee's wage into a firm component and a worker component. For each employer, they construct the distribution of human capital for the workforce and examine if this is correlated with the probability a firm undergoes a mass layoff or closes. They find that mass layoffs and firm failure are much more likely in firms with a large proportion of low human capital workers. Finally, firms that do not fail generally upgrade the human capital of their workforce.

Anja Decessin, Tomeka Hill, Kristin McCue, and Martha Stinson leverage the richness of the LEHD data set by augmenting the LEHD with publicly-available data on employee benefits (collected in IRS Form 5500) offered by different companies. This allows them to combine measures of worker characteristics and employer characteristics with information on nonwage compensation, including health plans and defined benefit and defined contribution pension plans. The authors show that the level of benefits offered by the firm is negatively correlated with employee turnover, but this largely reflects underlying differences in the human capital of the workforce. Firms that offer benefits have higher-skilled workers and these skilled workers have lower turnover rates. Moreover, firms offering benefits have higher labor productivity and are more likely to survive, even after controlling for worker and firm characteristics and wage compensation.

Producer Dynamics in International Markets

Research in international trade has recognized the importance of firm heterogeneity in productivity and profitability as factors that affect the decision to participate in international markets. The final section of this volume contains two chapters that use micro data to study transitions of firms into and out of import and export markets. Andy Bernard, Brad Jensen, and Peter Schott develop a new data set on import and export activity of U.S. firms, and provide a set of stylized facts on participation patterns. The authors combine transaction-level records of imports collected by U.S. Customs with firm-level exports collected by the U.S. Census Bureau for the period 1993 to 2000. They link these observations with the LBD, which will allow researchers to incorporate a large set of firm characteristics from the LBD into the analysis of micro trade flows. An important feature of

these data is that it allows the authors to distinguish between related party and arms-length transactions. Thus, one can measure the flow of cross-border goods within multinational firms.

The chapter documents a number of striking patterns. The fraction of firms engaged in trade is small but growing—two to three percent of the total number of firms in the United States. However, these importing/exporting firms are large, accounting for approximately 40 percent of private sector employment in the United States. Ninety percent of import and export activity involves multinational firms and related-party transactions make up approximately one-half of imports and one-third of exports. The authors also analyze the employment dynamics of firms involved in trade. Firms that export had higher employment growth than nonexporters, and firms that entered the export or import market between 1993 and 2000 experienced very high employment growth rates. Alternatively, firms that stopped exporting and/or importing suffered declines in employment.

The final chapter, by John Baldwin and Wulong Gu, explores the impact of trade liberalization resulting from the 1989 Canada-U.S. Free Trade Agreement on the decision of Canadian manufacturers to enter or exit the export market. Using a theoretical framework in which producers differ in their productivity, they characterize the determinants of a firm's decision to enter the export market. Firms export depending on their relative cost advantage—the most efficient firms produce for the domestic and export markets, less efficient firms produce only for the domestic market, and the least efficient firms close. Trade liberalization increases the size of the market and results in greater firm specialization. Exporting firms withdraw from some product markets and expand the volume of output in their remaining products. Nonexporting firms, however, do not benefit from this increase in market size and instead face increased competition and, on average, become smaller. Using micro data for Canadian manufacturing plants, the authors test the predictions of the model using tariff rate changes as a measure of trade liberalization. They find that nonexporting firms reduce the number of product lines and decrease plant size in response to a lowering of tariffs. They find that exporting firms become more specialized and larger but these changes are not strongly correlated with industry-specific tariff reductions.

Conclusion

Producer dynamics can be viewed from many perspectives, including movements of firms or plants in or out of production, transitions between different geographic or product markets, or shifts of an entrepreneur from self-employment to employer status. Regardless of the focus, the decisions of firms to change the nature of their production is an important mechanism contributing to the reallocation of resources. The chapters in this vol-

ume have developed and utilized a number of important micro data sets that provide a window on this diverse set of producer transitions.

A recent report by the National Research Council, “Understanding Business Dynamics: An Integrated Data System for America’s Future” (Haltiwanger, Lynch, and Mackie 2007), presents a blueprint for further development of the U.S. data system to allow more accurate and timely measurement of the dynamic forces at work in the economy. Among the recommendations in the report is one to encourage the interaction of the statistical agencies that create the producer micro data and the researchers from academia, business, and government that analyze it. The chapters in this volume provide ample evidence of the knowledge that can be gained by researchers working with the statistical agencies to document and analyze the dynamic process of firm entry, growth, and exit. In many areas, particularly the service sector, the nonemployer universe, and the international arena, measurement issues have only recently begun to be addressed and much work remains.

The recent efforts of the U.S. statistical agencies to produce new statistics that document the flows of workers and firms in a timely and consistent way is another important avenue through which knowledge of the process of producer dynamics is expanding. The Business Employment Dynamics (BED) program at the BLS and the Quarterly Workforce Indicators (QWI) program at the Census Bureau are providing timely information on dynamic aspects of the U.S. economy that complement the traditional focus on aggregate statistics at a point in time. Still, the series are relatively new and a better understanding of the economic forces that drive the dynamic patterns in the producer data is needed.

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