Measuring the Gig Economy: Current Knowledge and Open Issues*

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March 2, 2017

* Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. We thank Ron Jarmin and Kristin McCue for helpful comments and suggestions on an earlier draft.

I. Introduction

In recent years, the popular press has been full of stories premised on the idea that the share of U.S. jobs that do not involve a formal employer-employee relationship is large and growing. Both media sources and scholars have adopted the term "gig economy" to refer broadly to these less structured work arrangements as well as more narrowly to the subset of flexible jobs mediated through various online platforms. The latter have been viewed as yielding an increasingly "on demand" economy where goods and services can be acquired through apps on smartphones and other web based applications. The current discussion regarding alternative work arrangements echoes an earlier discussion that arose in the late 1980s and 1990s (e.g., Abraham 1988, 1990; Barker and Christensen 1998). Then as now, there was talk of dramatic growth in the numbers of people working in contingent or precarious jobs – positions in which workers had no long-term connection to a particular business, but were employed to complete a specific task or for a defined period of time – or under other non-standard employment arrangements. The recent resurgence of interest in non-traditional work arrangements reflects the perception that new technology, along with the restructuring of business enterprises made possibly by this technology, is producing an accelerated pace of change in the organization of work that is having important effects on both workers and firms.

Much of the discussion of the gig economy, as well as the broader discussion of non-employee work arrangements, has focused on the implications of growth in these arrangements for workers and their families. On the one hand, gig work may enable individuals to better match their skills to work projects in a flexible manner that they find attractive. Making a similar point, Hurst and Pugsley (2011), for example, argue that self-employed workers enjoy substantial non-pecuniary benefits in the form of being one's own boss, enjoying flexible hours and so on. On the other hand, some of those performing gig work are not doing so by choice. Similar to others who are not employees of the firms for which they are providing labor services, gig workers do not enjoy the legal rights and protections afforded under the unemployment insurance system, the workers compensation system, the Fair Labor Standards Act and other laws and regulations written with more traditional employment arrangements in mind (Harris and

Krueger 2015). Further, they are markedly less likely to have health insurance or to have a retirement plan (Jackson, Looney and Romnath 2017) and may have hours and earnings that are substantially more variable and less predictable.

Advances in technology resting on digitization and the inter-connectivity of the internet have made it increasingly attractive for firms to re-organize their activities so that a greater share of work is performed by individuals who are not employees of the firm. These new technologies make it more feasible for firms to organize their workforce on a project-specific basis, utilizing a changing cast of workers with the mix of skills that is appropriate for each project (National Academies Press 2017). Such a shift from traditional employees to non-employees may be viewed as a means of reducing wage and benefit costs (Abraham and Taylor 1996; Dube and Kaplan 2010; Goldschmidt and Schmieder 2015) in addition to positioning the firm to be able to respond quickly to shifts in demand. In a related manner, these same technological advances have facilitated the segmentation of the various aspects of firms' production processes (see, e.g., Fort 2016). On the other hand, while offering some clear advantages to firms, increased reliance on outsourcing also implies less accumulation of firm-specific human capital. Even within narrowly defined sectors, there is enormous heterogeneity in the productivity and profitability of individual firms (see, e.g., Foster, Haltiwanger and Krizan 2001). Differences in the ability to attract, train and retain high quality workers, especially those performing functions that are core to the firm, seem likely to be an important contributor to this heterogeneity in firm-level outcomes.

Growth in non-employee work also matters for the measurement of economic activity. The current system of economic measurement is designed for a world in which work generally occurs within traditional employment relationships. Each month, for example, the Current Population Survey (CPS) collects information from households about work that household members have done for pay or profit. Like other ongoing household surveys, however, the survey questionnaire may not always cue respondents to report work that they do not think of as a job and, beyond asking broad questions to distinguish wage and salary work from self-employment or unpaid family work, is not designed to probe regarding the nature of the arrangements under which work occurs. Further, even the questions that are

asked focus primarily on the main job. These limitations could mean that important changes in work activity, including changes in the prevalence of multiple job-holding, are not being captured. Other surveys collect information from businesses on the number of people they employ and the hours those employees work, but do not capture the labor input of people who are not on those businesses' payrolls. To the extent that an increasing share of the labor input embodied in firms' products is supplied by non-employees whose hours are not well captured by existing data collections, measures of labor productivity growth may be distorted. To illustrate, the Bureau of Labor Statistics (BLS) major sector productivity program uses CPS data to measure the labor input of the self-employed. If recent increases in non-employee work are not well captured by the CPS, then labor productivity growth may have been overstated. Further, if different sectors have made more or less intensive use of non-employee labor input, the pattern of growth in productivity may be distorted as well. These potential distortions in sectoral measures of productivity are related to the longstanding issue of whether purchased services are well captured in collected statistics.

While there has been considerable discussion about the changing nature of work and its broader implications for workers and firms, different sources of data send conflicting messages regarding the prevalence of non-employee work generally and gig employment specifically. Individuals performing non-employee work should be classified as self-employed. In the CPS and other household surveys, however, the percentage of the workforce that is self-employed has shown no upward trend and in fact has been drifting downwards since at least the mid-1990s. In contrast, administrative data derived from tax filings provide stronger support for the popular perception that non-employee work arrangements are a growing phenomenon (Katz and Krueger 2016; Abraham et al in progress).

Further, relatively little is known about the answers to other important questions about the gig economy. Who are the people engaged in gig work? Where are they working and what type of work are they doing? To what extent is gig work a primary source of earnings for those who do it as opposed to a source of supplementary income that complements earnings from a wage and salary job? Do those engaged in gig work tend to be low-earning or high-earning individuals? Where does such work fit into

the life cycle career path of individuals? Do individuals engage in such work because they are pushed into doing it or do they do it by choice? Has any or all of this changed over time?

In this paper, we seek to clarify what different sources of data can tell us about changes in the prevalence and nature of both gig employment and non-employee work arrangements more generally over time. We begin with a discussion in Section II of the heterogeneity of non-employee work and the challenges this heterogeneity poses to its measurement and assessment. Section III considers the two main types of data that have been used to study past trends in non-employee work – surveys of households and administrative data. The discrepancy between the flat or declining trend in self-employment shown by measures based on household surveys and the long term growth in similar measures based on administrative data is a significant puzzle. To reconcile these conflicting trends, we turn to analysis of a newly-created linked data file that contains household survey and administrative information based on tax records for the same individuals. Preliminary findings based on this linked file are reported in Section IV. Although there is some CPS self-employment for which we can find no corresponding tax records, the amount of such undocumented self-employment has been relatively stable; in contrast, there has been a notable increase in the volume of self-employment activity reported to the Internal Revenue Service (IRS) that is not reported on the CPS. Looking to the future, Section V considers ways in which household survey data on non-traditional employment might be improved and Section VI evaluates how administrative data, employer survey data and naturally occurring private sector data might be used more effectively to improve our understanding of gig employment specifically and non-employee work more generally. Finally, Section VII offers some initial thoughts about a path forward. Recognizing the limitations of each of the individual available sources of data, our major conclusion is that efforts to develop linked data sets that combine household survey data, employer survey data and, potentially, naturally occurring private sector data are likely to have a high payoff, permitting greater insight into the changing nature of work than is possible using any single data source.

II. Typology of Work Arrangements

Although there has been a great deal of interest in the growth in non-traditional work arrangements in the U.S. labor market, the ensuing discussion has not always fully recognized the considerable heterogeneity in these arrangements. Combining arrangements with very different characteristics and then attempting to draw conclusions about them has the potential to be quite misleading. In Table 1, we have laid out a typology of work arrangements and their characteristics that begins to clarify the similarities and differences across a variety of types of work arrangements. The table also identifies where these arrangements might be captured in household survey and administrative data, as well as where gig employment specifically might be counted.

Work Arrangements and Their Characteristics

One challenge in characterizing the evolution of work arrangements is that there are many different possible ways in which work may be organized. The first column of Table 1 lists a number of such arrangements that have been discussed in the literature. These categories are not necessarily mutually exclusive and, in some cases, a job might fall into more than one category. In addition, any given person may have multiple jobs and work under multiple arrangements. The next five columns of the table identify some key dimensions along with the listed work arrangements may differ.

Despite the ongoing changes in the labor market, traditional employment still accounts for the largest share of work in the U.S. labor market. These are jobs on which workers are paid a wage or salary; generally can anticipate continuing if they so choose; may be full-time or part-time, but have hours and earnings that are relatively predictable; and whose incumbents are supervised by the same firm that pays the incumbent's salary. On-call workers also appear on the payroll of the firm where they are employed; they are called to work only as needed by the firm, though when called they may be scheduled to work for several days or weeks in a row. A seasonal worker is someone whose term of employment is for some defined part of the year, such as a lifeguard hired for the summer or a sales clerk in a department

store hired for the busy holiday season. Interestingly, the share of jobs that are seasonal has dropped significantly in recent decades (Hyatt and Spletzer 2017).

As an alternative to using direct hires to meet irregular, temporary or seasonal demand for labor, a firm with a task or tasks to be performed may call upon a temporary help agency to supply workers or turn to a contract firm whose employees provide needed services. Under both of these arrangements, the firm on whose behalf work is being performed (the client) is a different entity than the firm writing the worker's paycheck (the agency or contract firm).

The self-employed are an important but highly heterogeneous group. Some of the self-employed may own a stable incorporated business, pay themselves a salary, and enjoy relatively predictable hours and earnings thanks to a well-established clientele. Others, however, may operate as unincorporated sole proprietors who earn money by performing a series of one-time jobs for which they are paid agreed sums but who cannot count on continuing employment and whose hours and earnings may be volatile. Given this heterogeneity, as can be seen in Table 1, we have broken the self-employed into several distinct categories. Our operating assumption is that the costs associated with incorporating a business or forming a partnership are sufficiently large that they would not be worth incurring unless a relatively stable flow of work was anticipated. In contrast, many but not all unincorporated sole proprietors may have work that is more sporadic or at least less predictable.

Independent contractor is a related term that has been used in several statistical data collections. The Bureau of Labor Statistics defines an independent contractor as anyone who self-identifies as an independent contractor, independent consultant, or freelance worker. It is listed separately in Table 1 primarily because it is a group about which various surveys have collected information. Independent contractors generally should be classified as self-employed, though in some cases they may have incorporated for business purposes and thus pay themselves a wage or salary.

A day laborer is a person who gets work by waiting at a place where employers pick up people to help with short-term tasks. In some communities, for example, individuals seeking work may be known to wait in a convenience store parking lot or other similar location. On-demand or platform workers can

be thought of as the modern version of a day laborer, but with work obtained by claiming tasks listed through an online intermediary rather than by waiting for work at a physical location. Examples of on-line platforms that facilitate the matching of workers to those requiring services include Uber, TaskRabbit and Amazon Turk.

The first characteristic we have identified as relevant to distinguishing among the various work arrangements is simply whether the person is paid a wage or salary. This can be thought of as a shorthand for whether those working under the arrangement are likely to be covered by unemployment insurance, workers compensation, the Fair Labor Standards Act, and other labor market laws and regulations applicable to employees.[1]

A second important characteristic of a work arrangement is whether the work relationship can be expected to continue. This construct has been used by the BLS as the basis of its definition of *contingent work* (Polivka 1996a). In published BLS statistics based on the Contingent Worker Supplement to the CPS, a contingent worker is anyone for whom no implicit or explicit contract for a continuing work relationship exists. Most traditional employees would not view their employment as contingent. The same is likely to be true of most self-employed individuals who have an incorporated business, a partnership or an established sole proprietorship with regular clients. For consistency with the way that the BLS has applied this concept, however, we have allowed for the possibility that those in such positions might consider their job to be time-limited due to an expectation that the business where they work will fail or for other similar reasons. Accordingly, we have entered "some" rather than "yes" in the relevant cells of Table 1 for these groups. An on-call worker may not work regularly, but nonetheless may have an ongoing relationship with the firm at which they work when called and thus may be considered to have an implicit or explicit contract for continuing employment. Somewhat similarly, workers supplied by a temporary help agency or contract firm may have only a short-term relationship

[1] The application of these laws and regulations to the owners of incorporated businesses who pay themselves a wage or salary is complicated, but in many states they are permitted to opt in to coverage under the unemployment insurance and workers compensation systems.

with the different firms that make use of their services, but a continuing relationship with the temporary help agency or contract firm. Again, we have entered "some" in the relevant cells of the column summarizing whether a continuing work relationship exists. In contrast to the arrangements just listed, sole proprietors whose work consists of a series of less predictable one-time jobs, seasonal workers, day laborers, and on-demand or platform workers do not have an expectation of continuity in their work relationship. Contingent workers in the sense that term is used by the BLS thus can be expected to include all of those in these four categories, plus some of those working in each of the other listed categories.

The third and fourth work characteristic columns pertain to whether the person in the listed work arrangement has a predictable work schedule and whether their earnings when working are predictable. For a traditional employee, both of these conditions generally would obtain. There is more diversity with respect to the predictability of hours and earnings among the self-employed. Both hours and earnings are apt to be unpredictable for day laborers and on-demand or platform workers. An on-call worker or temporary help agency worker often will have unpredictable hours, but his or her pay while working is likely to be quite predictable.

A final work characteristic, applicable only to those who are paid a wage or salary, captures whether on-the-job supervision is provided by the same firm that pays the worker's salary. This would be the case for traditional employees, on-call workers, and seasonal workers, all of whom are hired onto the payroll of the firm requiring their services. It would not be the case, however, for the employees of temporary help agencies or contract firms who perform tasks under the supervision of the client firm but are paid by a different firm. This characteristic is associated with the so-called fissuring in the labor market that has been identified by some scholars as having weakened the opportunities and protections for workers who previously would have been employed directly by the firm for which they provide services but now are employed by a different company (Weil 2014).

Capturing Different Work Arrangements in Household Survey and Administrative Data

The next three columns of Table 1 indicate where the different work arrangements might appear in household survey and tax data. Household surveys such as the CPS, the American Community Survey (ACS) and others commonly distinguish among wage and salary workers, the incorporated self-employed and the unincorporated self-employed. In addition to traditional employees, on-call workers, seasonal workers, temporary help agency workers and contract firm workers generally should be categorized as wage and salary in these data. The incorporated self-employed also typically are treated as wage and salary workers in published household survey data, but if a different breakout is desired it is possible to identify them separately. Work arrangements for which the table's first column indicated not being paid a wage or salary generally should be categorized as unincorporated self-employment in the household survey data; this includes partnerships, sole proprietorships, most independent contractors, day laborers, and on-demand or platform workers.

Tax data permit distinctions to be made between wage and salary work and self-employment work. Any job on which the person who holds it earns $600 or more in wages or salary during the year should generate the filing of a Form W-2. If the recipient is required to file a tax return, that income will be reported on their Form 1040. This includes the owners of incorporated businesses who pay themselves a wage or salary. Incorporated business owners also may receive distributions of business profits reported on a Form W-2, a Schedule K1, or payments of dividends reported on a Form 1099-DIV. Assuming that the individual is required to file a tax return, that income will be reported on their Form 1040. Proceeds flowing from a partnership business to the individual partners are reported to the recipient on a Schedule K1 and, when the individual partners file their tax return, these proceeds are reported on their Form 1040s.

In contrast to wage and salary workers, the owners of incorporated businesses and partners in partnership businesses, a substantial share of the payments made to sole proprietors and others doing non-employee work generate no associated information return. If there is an information return, it is likely to be a Form 1099-MISC (for payments of non-employee compensation of $600 or more made by a business

during the year) or, since 2011, possibly a Form 1099-K (for settlement of payment card transactions or of transactions conducted through third-party networks such as PayPal that exceed certain thresholds). While self-employment earnings are only partially covered by information return reporting, anyone receiving non-wage payments in return for services provided is expected to report those payments on Schedule C of their Form 1040. This is true even if they received no information returns associated with those payments and even if their business expenses fully offset the gross payments received. In addition, anyone with net self-employment earnings in excess of $433 over the course of the year is required to file a Schedule SE, the form used to calculate liability for payroll taxes on self-employment earnings.

We also are interested in where we should expect gig employment to appear in household survey and administrative data. To answer this question, we first need to define what we mean by a gig worker. The term "gig" originated in the music industry, where musicians go into the studio to record one song or play in a band for one performance. The musicians with such gigs have no expectation of recording at the same studio the following day or playing with the same band the following night. Borrowing from the music industry, we define "gig employment" as one-time jobs where workers are employed on a particular task or for a defined period of time. In terms of the work arrangement characteristics examined in Table 1, a gig worker is not paid a wage or salary; does not have an implicit or explicit contract for a continuing work relationship; and does not have a predictable work schedule or predictable earnings when working. Applying this definition, some sole proprietors, some independent contractors, and anyone who is a day laborer or on-demand/platform worker should be considered a gig worker.

In household survey data, gig workers are included among the unincorporated self-employed, but that group is broader than gig workers. Because many household surveys focus on main jobs to the exclusion of supplemental employment, however, they may not capture gig work that is taken on as a supplement to a person's primary employment. In tax data, some gig workers may receive a Form 1099-MISC, but the same form also may be used to report payments to other self-employed individuals who are not gig workers. The same is true of payments reported on a Form 1099-K. We would need to know more about the reason a payment was received – specifically, whether it was a payment to an

unincorporated self-employed worker performing one-time jobs – to determine whether the recipient was a gig worker. Further, not all gig work generates either a Form 1099-MISC or Form 1099-K. All gig workers should file a Schedule C and Schedule SE to report their earnings from the gig job, but not all Schedule C or Schedule SE filers are gig workers.

In both household survey and tax data, then, we are able to identify the number of unincorporated self-employed. In the case of some household surveys, this may encompass only those for self-employment is their primary work activity. Where both primary and secondary employment as an unincorporated self-employed worker is captured, the size of this group is an upper bound of the number of gig workers. Trends in unincorporated self-employment, which are publicly available from multiple sources, thus are a first place to look for suggestive evidence of whether gig employment has been growing over time.

III. Historical Data on Non-Employee Work Arrangements

Several household surveys conducted by the U.S. Census Bureau produce regular information about the prevalence of self-employment among working Americans. The monthly Current Population Survey (CPS), conducted by the Census Bureau for the Bureau of Labor Statistics, is the source of official statistics about the U.S. labor market. It is an interviewer-administered household survey that includes questions about labor market activity during a specific reference week. CPS data can be used to characterize the *main* job each household member held during the reference week as self-employment or wage-and-salary employment. Each spring, the Annual Social and Economic (ASEC) supplement to the CPS collects information about income and employment over the prior calendar year, including information on the longest job and on calendar year self-employment earnings and wage-and-salary earnings. Finally, since 2005, the American Community Survey (ACS), a large mixed-mode survey conducted on a rolling basis throughout the year, has been another source of published self-employment estimates. These refer to the main job during the survey's reference week (described to the respondent as "last week").

More recently, analysts have turned to tax records in an effort to learn about the prevalence and nature of non-employee work. Sole proprietors, general partners and farmers who have net earnings at or above a fairly low threshold (set since 1994 at $433) are required to file a Schedule SE, Self-Employment Tax. The Master Earnings File (MEF) database maintained by the Social Security Administration incorporates information on self-employment income from the Schedule SE together with information on wage earnings from any Form W-2's a person has received during the year. The U.S. Census Bureau receives an extract (called the Detailed Earnings Record, or DER) that includes MEF records for each CPS respondent for whom a Protected Identity Key (PIK), an encrypted Social Security Number, is available and this extract can be used to produce an estimate of the number of Schedule SE recipients. In addition, unincorporated self-employed individuals with any gross non-employee or business income on their individual tax return are required to file a Schedule C. Schedule C information is a key ingredient in the construction of the master list of non-employer businesses maintained by Census. Whereas both Schedule SE and Schedule C are filed by the recipients of self-employment income, Form 1099-MISC is filed by businesses that make payments of non-employee income of $600 or more to any entity or individual during the calendar year. Tracking entities or people who received one or more Form 1099-MISC's during a calendar year offers another perspective on trends in self-employment, though the use of these data is complicated by the fact that some Form 1099-MISC's report payments made to businesses rather than individuals and a considerable amount of self-employment income has no associated Form 1099-MISC.[2] Since 2011, Form 1099-K has been used to report settlement of payment card transactions or settlement of third-party network transactions that exceed $20,000 or 200 transactions per year. Some self-employed individuals may receive a Form 1099-K, but this is relatively unusual and most Form 1099-Ks are not issued to unincorporated self-employed individuals.

[2] The Data Appendix provides additional details about the various household survey and administrative data sources just described. Although occasional supplements to the monthly CPS have asked more probing questions about the nature of individuals' employment arrangements, these questions have not been asked routinely and consideration of the data generated by these occasional supplements is deferred to later in the paper.

Figure 1 shows the trend in a number of different measures of the self-employment rate (the number self-employed under different definitions as a percent of the corresponding total employment measure).[3] The four series at the bottom of Figure 1 all derive from household survey data. The longest of these series, based on the monthly CPS, captures the percent of employed people who are self-employed on the main job held during the survey reference week, averaged across the twelve months of the year. This series has trended steadily downwards, falling from 8.3% in 1996 to 6.7% in 2012. The main job series based on ACS data is conceptually comparable to the monthly CPS series and, although somewhat lower in level, shows a similar downward trend over the years for which it is available. The remaining two household survey measures, derived from the annual CPS-ASEC, show the percent of people with any employment during the year whose longest job was in self-employment and the percent of people in the same group who reported any self-employment income. Again, both series exhibit a clear downward trend. By construction, the first three of these series do not capture self-employment that is supplemental to a primary job. In principle, however, the CPS-ASEC series based on having earned any self-employment income during the year should pick up income-generating self-employment activity whether it is a person's primary activity or supplemental to a primary job and that measure behaves very similarly to the others.

Five self-employment series based on administrative data series appear in the upper part of Figure 1. These series are most comparable in concept to the CPS-ASEC series based on earnings during the calendar year. The numerator in each case is some measure of the number of people or entities with self-employment earnings during the year; the denominator for all of the measures is the number of individuals with earnings from any source in the DER. The share of persons with any earnings in the DER who have self-employment earnings has trended steadily upwards, rising from 9.5% in 1996 to 11.3% in 2012. Census counts of non-employers are available from 1997 through 2014 (2015 Nonemployer statistics will be released in May 2017); sole-proprietor non-employers are identified

[3] In Figure 1 and throughout this paper, all analysis that presents results from the CPS-ASEC or from the DER is based upon the weighted CPS-DER linked data.

separately in published data beginning in 2004. Both of these series have trended upwards as a percent of the number of earners and, over the years where both are available, sole-proprietor non-employers have represented a fairly steady fraction of the overall non-employer population. Finally, the number of entities receiving non-employee compensation reported on a Form 1099-MISC, taking individuals and businesses together, and the number of individuals for whom such compensation was reported are available for the period 2000-2012. These measures also have shown growth relative to the number of people with earnings.

Figure 1 makes clear that published data sources provide quite different answers to the simple question of what is the level and trend of self-employment in the U.S. economy. Others have noted divergences between specific series; Katz and Krueger (2016), for example, show the divergent trends in estimates of self-employment based on monthly CPS data and IRS Schedule C filings. Figure 1 shows that this divergence is quite general. Household surveys consistently show lower levels of self-employment than administrative data sources and a relatively flat long-term trend in self-employment as contrasted with the upward trend that is evident in administrative data.

It would be nice to be able to say that one or the other type of measure – estimates based on household survey data or estimates based on tax data – accurately represents the prevalence and evolution of self-employment over time. In truth, however, measures of both types suffer from potential weaknesses. On the one hand, constraints on the length of the monthly CPS and ACS questionnaires mean that neither survey instrument probes deeply about household members' work arrangements. This may lead to a variety of reporting errors. For example, a household member who is doing work for a business may be reported as an employee of that business, even in cases where further probing might reveal that the person is in fact an independent contractor. To take another example, a household survey respondent might simply fail to mention informal work that they do not think of as a job, something that, again, further probing might recover. To the extent that non-traditional work arrangements are of growing importance, these problems could have become more serious over time.

On the other hand, administrative data capture only the information that is reported to the tax authorities on tax or information returns. Non-reporting or under-reporting of income to the tax authorities is an acknowledged issue, especially with regard to self-employment and other hard-to-verify types of income. As already noted, anyone who makes payments of wage or salary income of $600 or more to an employee over the course of the year is required to file a Form W-2 documenting that payment with the IRS. In contrast, the tax reporting required for payments to self-employed individuals is much less complete. Businesses that make payments of $600 or more to a self-employed individual for services rendered are required to report them on a Form 1099-MISC. In 2011, business tax forms were modified so that business owners must certify that all required Form 1099-MISCs have been filed. Also taking effect in 2011 was the requirement that payment settlement entities that process electronic payments to businesses must report those payments to the IRS on a Form 1099-K if they exceed certain thresholds. There is no requirement, however, that households paying for services file a 1099-MISC. Despite efforts by the Congress to tighten the requirements for information reporting, a great deal of self-employment income generates no associated information return (GAO 2007, Slemrod et al 2015). Further, any information return that is filed captures only the gross payment made. It is equally important to be able to gauge the expenses incurred in connection with this gross income to determine net self-employment earnings, but these expenses are generally not subject to required information reporting (GAO 2007, Slemrod et al 2015). Not surprisingly, tax audit studies have shown that virtually all wage and salary income is reported on individual tax returns, but that a much smaller share of net non-farm proprietor income and net farm income is reported (Slemrod and Bakija 2008).

One question is whether changes in information reporting requirements, such as those introduced in 2011, could have affected the reported prevalence and amounts of self-employment income. Research to date has not identified discontinuities in the administrative time series related to self-employment associated with changes in reporting requirements. With respect specifically to the changes introduced in 2011, this may be in part because the relatively minor increases in reported gross self-employment

income that the changes appear to have induced were offset by the reporting of increased expenses (Slemrod et al 2015).

Another potential issue to flag is that, in the household survey data we have examined, our attention has been focused on the unincorporated self-employed. One reason for this is that the unincorporated self-employed as measured in the CPS and ACS are conceptually most comparable to the measure of self-employment that we are able to produce using data from the DER. Were it the case that a growing share of the self-employed are now choosing to incorporate, the trend in unincorporated self-employed in the household survey data could be misleading (Hipple and Hammond 2016). To check on this possibility, we have recomputed each of the four household survey self-employment series with the incorporated self-employed included. Although these data show that the self-employed have become somewhat more likely to incorporate, including them in the series does not change the conclusion that self-employment as measured in the household survey data has been at a lower level and steady or declining, rather than increasing as is the case in the tax-based administrative data.

IV. Reconciling Household Survey and Administrative Estimates of Nonemployee Work

The most straightforward approach to understanding the discrepancies between household survey estimates and administrative data estimates of self-employment is to compare information from the two sources for the same set of people. Using an internal Census Bureau identifier—the Protected Identify Key or PIK—we have linked records covering the years 1996 through 2012 from the Annual Social and Economic Supplement to the CPS (the ASEC files) to administrative records from the DER. In both of the linked data sets, we identify self-employment based on reports of any earnings from unincorporated self-employment during the calendar year, meaning that they are conceptually comparable.

We have used these data to ask how well the CPS-ASEC and the DER agree with respect to the classification of individuals as self-employed. Table 2, taken from Abraham et al (in progress), displays a weighted cross-tabulation of self-employment status in the CPS-ASEC with self-employment status in the DER, using data that are pooled across the years 1996-2012. Despite the comparability of the definition

of self-employment in the two data sources, there is substantial disagreement between them regarding individuals' self-employment status. On average over the 17 years for which we have data, approximately 65% of those with self-employment income in the DER do not report any self-employment income in the CPS. Conversely, approximately 51% percent of those with self-employment income in the CPS-ASEC do not report any self-employment income in the DER.

The fact that there is disagreement between the household survey and administrative data employment measures is not surprising. In earlier research, we found that, on average over the period 1996-2003, about 6% of individuals who had unemployment insurance (UI) earnings during the first quarter of the year reported no CPS wage-and-salary employment in a UI-covered sector during the year's first three months; conversely, about 18% of individuals reporting CPS wage-and-salary employment in a UI-covered sector during the first three months of the year had no first-quarter UI earnings (Abraham et al 2013). Similarly, in weighted tabulations using the linked data file that we are using to explore the sources of discrepancy in alternative self-employment series, about 9% of those with DER wage-and-salary income had no reported CPS-ASEC wage-and-salary income for the same year; conversely, about 12% of those with reported CPS-ASEC wage-and-salary income for a year had no DER wage-and-salary income for that same year.

What is surprising, however, is the size of the off-diagonal cells in the tabulations shown in Table 2. Whether taking the DER self-employed or the CPS self-employed as the base, a majority of those who are categorized as self-employed in the data set in question are not so categorized in the other data set. At least to some extent, this reflects the complexity of self-employment activity. There are many different types of self-employment work and a highly heterogeneous set of arrangements under which such work might occur. Neither the household survey data nor the administrative data may be ideally suited to pick up all of that activity.

We also are interested in how the discrepancy between the CPS-ASEC and the DER measures of self-employment has changed over time. Figure 2A displays the number of self-employed people as measured in the CPS-ASEC annual earnings data and the corresponding measure based on earnings data

from the DER. While self-employment based on the DER grew markedly between 1996 and the mid-2000s, the corresponding CPS-ASEC measure has been stagnant. Figure 2B shows the off-diagonals associated with cross-tabulating the CPS-ASEC and DER data on a year-by-year basis. That is, it plots the number of people who are self-employed in the DER but not the CPS-ASEC and, separately, the number who are self-employed in the CPS-ASEC but not the DER. It is apparent that virtually all of the growth in DER self-employment relative to CPS-ASEC self-employment can be attributed to growth in the share of people who are self-employed in the DER but not in the CPS-ASEC.

To further explore the discrepancy between the two measures of self-employment, we have looked a bit more closely at these off-diagonals. We have grouped those who are self-employed in the DER but not the CPS-ASEC into three mutually exclusive categories:

1) No CPS employment: No employment income in the CPS-ASEC; self-employment income in the DER.
2) Self-employment second job not reported in CPS: Only wage-and-salary income in the CPS-ASEC; both wage-and-salary income and self-employment income in the DER.
3) CPS job wage and salary, classification issue: Only wage-and-salary income in the CPS-ASEC; only self-employment income in the DER.

Those in the first two groups may be people performing self-employment work who do not think of themselves (or are not thought of by the CPS respondent in their household) as self-employed, whether because the activity in question generated only a small amount of earnings or for some other reason. The third group may be capturing those who think of themselves as employees and may in fact be employees according to the relevant legal criteria, but are paid as non-employees and classified that way in the administrative data. Given the growing concerns about worker misclassification (see, e.g., Leberstein 2012), this group may for some purposes be the most interesting.

We also have grouped those who are self-employed in the CPS-ASEC but not in the DER into three mutually exclusive categories:

4) No DER employment: No employment income in the DER; self-employment income in the CPS-ASEC.
5) Self-employment second job not recorded in the DER: Only wage-and-salary income in the DER; both wage-and-salary income and self-employment income in the CPS-ASEC.
6) CPS job self-employed, classification issue: Only wage-and-salary income in the DER; only self-employment income in the CPS-ASEC.

The fourth and fifth categories capture self-employment income that is reported in the CPS but does not appear in the administrative data, either work generating too little income to trigger tax reporting requirements or off-the-books work. Category six may be capturing individuals who are indeed self-employed but operate an incorporated business, meaning that they should not have been counted in the CPS measure of non-incorporated self-employment and would appear in the administrative data as having wage and salary income, but not self-employment income.

Figure 3A shows the evolution of the three groups within the DER{SE=1}/CPS-ASEC{SE=0} category; Figure 3B shows the evolution of the three groups with the CPS-ASEC{SE=1}/DER{SE=0} category. Whereas there has been growth in all three of the DER{SE=1}/CPS-ASEC{SE=0} groups, employment in the three CPS-ASEC{SE=1}/DER{SE=0} has changed very little.

One way to summarize the information presented in these figures is to ask what share of the growing discrepancy between the number of people with self-employment income according to the DER and the number of self-employed people according to the CPS-ASEC is accounted for by each of the groups. For this purpose, we have averaged the numbers for the two starting years and the two ending years in our data series, then calculated the overall change in the discrepancy between those averaged endpoints. Note that either *increases* in the size of the DER{SE=1}/CPS-ASEC{SE=0} groups or *decreases* in the size of the CPS-ASEC{SE=1}/DER{SE=0} groups may add to the overall discrepancy.

The percentages of the growth in the overall discrepancy accounted for by each of the six groups described above are shown in Table 3. As was apparent from Figure 2, the growing discrepancy between the DER and CPS-ASEC estimates of self-employment is accounted for entirely by the growing number

of people identified as self-employed in the DER who are not so identified in the CPS-ASEC. This growth is split roughly evenly between the three DER{SE=1}/CPS-ASEC{SE=0} groups. The net effect of changes in the size of the CPS-ASEC{SE=1}/DER{SE=0} off-diagonals is small and works in the direction of slightly offsetting the growing size of the DER{SE=1}/CPS-ASEC{SE=0} off-diagonals. In other words, the main issue would appear to be that there are people who are earning self-employment income and reporting that income to the tax authorities, but are not answering the questions on the CPS in such a way that this work can be identified in those data.

V. Improving Household Survey Measures of Non-Employee Work

The preceding discussion shows clearly that the standard CPS-ASEC questions asked about calendar year earnings miss a significant and increasing amount of self-employment activity. Because this series has behaved so similarly to other series based on household survey data, there is every reason to suspect that the same is true of other household survey measures of self-employment.

One way to improve on the existing household survey measures of self-employment and alternative work arrangements more generally would be to add questions to these surveys that probe more directly regarding these arrangements, either as part of the core survey or (perhaps more plausibly) on periodic supplements. Three household surveys on which such additional questions have been asked and thus are potential sources for national estimates of the prevalence of alternative work arrangements are listed in Table 4. The Contingent Worker Supplement (CWS) to the CPS, fielded on several occasions between 1995 and 2005, takes as given the responses to core questions regarding whether a person was employed and then asks further questions about the nature of any main job reported. The same basic approach has been adopted by Katz and Krueger for the Rand-Princeton Contingent Work Survey (RPCWS) and by the Quality of Worklife Supplement to the General Social Survey. Each of the three surveys has produced estimates of the prevalence of each of four different categories of alternative work performed as a person's main job—independent contractors, on-call workers, temporary agency workers and workers at contract firms.

Several other surveys have collected information that could shed light on the prevalence on alternative work arrangements, but for various reasons these surveys seem less useful for our purposes. The Survey of Income and Program Participation includes a category for reported work on a person's main job that cannot easily be classified as either work for an employee or self-employment, but these data do not allow different arrangements within the "other" category to be distinguished.[4] The Enterprising and Informal Work Activities (EIWA) Survey (Robles and McGee 2016) and the McKinsey Global Institute (MGI) independent work survey (Manyika et al 2016) are recent one-time efforts that attempted to capture all informal or independent work, whether it represented a person's primary work or was supplemental to a primary job. The EIWA survey was designed to collect detailed information about those performing informal work, but because anyone who did not report such work in response to the initial screener items was not questioned further, it is not suitable for estimating the overall share of employed individuals who are engaged in informal work. The independent work concept applied in the MGI survey is not comparable to that applied in other research.

The CWS was first fielded as a supplement to the CPS in February 1995 (Polivka 1996a, 1996b; Cohany 1996) and then repeated in February of 1997, 1999, 2001 and 2005. In addition to collecting information on contingent employment (main jobs in which the individual lacks an explicit or implicit contract for long-term employment), the CWS also included questions to identify those employed on their main job in any of four alternative work arrangements (working as an independent contractor, employee of a temporary help firm, employee of a contract firms, or on-call worker). Due to budget pressures, the CWS has not been repeated since 2005, though it is scheduled to be fielded again in May 2017.[5] Katz and Krueger (2016) arranged for the core CWS questions to be administered on the RPCWS, fielded through

[4] The "other arrangement" category is a catchall that includes a heterogeneous mix of "odd jobs, on-call work, day labor, one-time jobs, and informal arrangements like babysitting, lawn mowing or leaf raking for neighbors."
[5] As described in the Federal Register notice, BLS is proposing to add four new questions to the end of the CWS. These new questions will explore whether individuals obtain customers or online tasks through companies that electronically match them, often through mobile apps, and examine whether work obtained through electronic matching platforms is a source of secondary earnings.

the Rand Corporation's online American Life Panel during October and November 2015. The intention was to produce estimates for 2015 that could be compared to the CWS estimates for earlier years.

Estimates based on the CWS and the RPCWS are shown in the upper panels of Table 5. The first set of CWS estimates are those originally published by the BLS; the second set are those recomputed by Katz and Krueger to be conceptually comparable to the numbers it was possible to produce using the RPCWS.[6] Taken at face value, comparison of the RPCWS numbers with those from the earlier CWS surveys suggests that there has been dramatic growth in three of the four types of alternative work arrangements, (independent contractor, on-call worker and, especially, contract firm employee). This finding has received extensive press coverage, but there is reason to be skeptical about the comparability of estimates from the RPCWS to those from the original CWS. Although Katz and Krueger have produced estimates based on microdata from the original CWS that are comparable *in concept* to those based on the RPCWS microdata, the very different underpinnings of the RPCWS and CWS surveys may mean they are not comparable *in practice*.

One reason for concern about the comparability of the RPCWS estimates with the earlier CWS estimates is that that RPCWS data were collected through an online panel, the ALP, whose members are assembled from a variety of sources with an unknown response rate. This means that the RPCWS sample may be less representative of the population than the CPS in ways that reweighting based on observables cannot correct.[7] Second, the CWS asks respondents to provide information for all household members, whereas the RPCWS asks respondents to report only for themselves. To the extent that respondents report more fully about their own experience than about the experiences of others in their household, this

[6] One difference is that the Katz and Krueger CWS estimates do not restrict contract workers to those "who are usually assigned to only one customer and usually work at the customer's worksite." In addition, because the RPCWS question about day laborers was not strictly comparable to the question on the original CWS, this small group was excluded from the Katz and Krueger CWS on-call worker estimates. Finally, the Katz and Krueger calculations impose the requirement that an individual have worked during the survey reference week, excluding those with a job but not at work.

[7] The technical documentation for the American Life Panel available on the RAND website at https://alpdata.rand.org/index.php?page=panel includes information on the observable characteristics of panel members and on survey completion rates for those in the panel, but no information on the rate at which potential sample members from different sources were successfully recruited into the panel initially.

could mean that the RPCWS responses are more accurate than the CWS responses, but by the same token also could mean that the RPCWS reports of non-employee work are elevated compared to the corresponding CWS responses. Third, though this seems less likely to matter very much, the RPCWS and the CWS have different reference periods, with the CWS asking about work during a mid-February reference week and the RPCWS asking about work during reference week during October or November. These differences between the RPCWS and the earlier CWS surveys suggest caution in drawing strong conclusion about trends in the prevalence and nature of non-employee work arrangements based on comparisons between the two.

Estimates of alternative work arrangements for 2002, 2006, 2010 and 2014 from the Quality of Worklife Supplement to the General Social Survey (GSS) are reported in the bottom panel of Table 5. In contrast to the significant growth for several of these arrangements implied by a comparison of the RPCWS estimates for 2015 with the CWS estimates for 2005, the GSS measurements based on a consistent methodology show no consistent pattern of growth. This provides further grounds for caution about making too much of the comparison between the RPCWS and CWS estimates.

One feature of the surveys discussed thus far is that, by design, they ask only relatively simple questions about work arrangements and inquire only about each person's main job. This implies that they could be missing a significant amount of non-employee work. In the linked data described in the previous section of the paper, there are a significant number of people for whom no self-employment is recorded in the household data but who have self-employment income that is captured in the DER. These are divided between people with no employment at all in the CPS (19%, averaged across all years); with a CPS main job that is wage and salary but a secondary self-employment job in the DER (45%, averaged across all years); and people who have only wage and salary income in the CPS and only self-employment income in the DER (36%, averaged across all years). The typical household survey probes for learning about alternative work arrangements, such as those in the CWS and the Quality of Worklife Survey in the GSS, would not ask about self-employment for the first two sets of cases. Focusing narrowly on the nature of reported CPS main jobs is likely to miss important ongoing changes.

As described in greater detail in Abraham and Amaya (in progress), a recent survey experiment provides some new information about how different approaches to probing for informal employment might affect the share of people for whom employment activity is reported (the employment rate) and the share of those with employment for whom more than one job is reported (the multiple job holding rate). The data collected as part of the experiment also shed light on potential differences in effects between a person reporting for themselves and a person reporting as a proxy for others in the household.

The experiment was embedded in a survey carried out for the 2016 Joint Program in Survey Methodology (JPSM) practicum. Subjects for the survey were recruited using Mechanical Turk, Amazon's crowdsourcing platform. Respondents were younger and considerably more educated than the population as a whole. In addition, the fact that all of the respondents are Turkers means that, even were the data to be reweighted to match the observable demographic characteristics of the overall population, the employment estimates derived from the survey responses could not be generalized to the population as a whole. The survey findings should be informative, however, about the sensitivity of survey estimates to asking more probing questions or structuring the probes in different ways.

The first section of the survey collected information on the characteristics of all members of a respondent's household, including standard questions concerning age, marital status, race and ethnicity, education and relationship to the household respondent. The second section of the survey asked questions to identify each household member's employment status and, for those who were employed, whether they held more than one job. With the exception of some special questions concerning sexual orientation and gender identify included for testing, all of the questions about household members' characteristics and employment status were taken directly from the Current Population Survey (CPS) questionnaire. The use of the CPS employment questions on the JPSM practicum survey means that the responses can be used to construct CPS-like measures of both employment and multiple job holding during the survey reference week ("last week," defined as the most recent completed week beginning on a Sunday and ending on a Saturday).

Additional questions about informal or gig employment were asked about one randomly-selected member of each survey respondent's household. In one version, randomly assigned to half of the cases, respondents were asked a global yes/no gig employment question (the *global* question). In the second version, respondents were asked about each of six different possible types of gig employment, with examples provided for each of them, and to indicate whether any other type of gig work had been performed (the *detailed* question).[8] In cases where CPS employment had been reported for the person to whom the question applied, the respondent was asked to indicate whether the activity reported in response to the gig employment question had been included in the CPS job count.

The first step in analyzing the data was to construct measures of the employment rate (the percent of people in the sample who were employed) and the multiple job holding rate (the percent of employed persons with two or more jobs) based on the responses to the standard CPS questions. Next, these measures were recomputed taking into account the additional information provided in response to the probes for whether the person in question had done informal work for pay during the survey reference week. Finally, a measure of the difference between the two measures was constructed. In these calculations, multiple job-holders are defined as those for whom more than one job was reported in response to the CPS questions or for whom one CPS job plus some additional informal employment not included in the CPS job count was reported.

The first row in the upper panel of Table 6 displays the employment rate that is estimated based on the standard CPS questions; the second row displays the augmented employment rate that incorporates the additional information provided in response to the informal employment probe; and the third row shows the difference between the two estimates. Estimates are shown separately for respondents asked to report for themselves and respondents asked to report for another member of their household, in each case differentiated by whether the respondent received the global gig employment question or the more

[8] The exact wording of the questions asked is displayed in Appendix B.

detailed gig employment question. The second panel of Table 6 reports similar information on the multiple job-holding rate for those identified as employed based on the standard CPS questions.

One clear message conveyed by the findings shown in Table 6 is that probing to ask about possible gig employment leads to higher estimated employment rates and higher multiple job-holding rates. This is true both when respondents are reporting for themselves and when they are reporting for other members of their household. Although little can be concluded from the magnitude of these estimates, the fact that probing consistently raises the estimates does suggest that learning about informal work arrangements is likely to require asking more than the standard employment questions.

A second clear message concerns the differential impact of asking the global question about possible gig employment versus asking the more detailed question listing different types of work someone might have done. For those reporting about their own work activity, the two forms of the question have very comparable impacts, raising the estimated employment rate by a few percentage points and the multiple job-holding rate among those who are CPS employed by 24 percentage points. Looking at the answers that respondents provide for others in their household, however, the more detailed question appears to have a significantly larger impact. The detailed probe raises the estimated employment rate for other household members by about 7 percentage points versus an increase of about 3 percentage points when the global question is asked. It raises the estimated multiple job-holding rate among other household members who are CPS employed by about 11 percentage points versus an increase of about 3 percentage points when the global question is asked. Again, given the way in which the survey sample was selected, comparisons between the estimates for respondents and the estimates for others in their household could be misleading, but the fact that more detailed probing makes a larger difference when the respondent is being asked about others in the household does seem meaningful.

In summary, there has been growing recognition that standard household survey questions may miss some individuals' primary work activities if the survey respondent does not think of those activities as a job. Further, to the extent that non-employee work reflects marginal jobs or activities of individuals marginally attached to the labor force, detailed probing is likely to be needed to overcome the tendency of

individuals to focus on their primary activities in their survey responses, whether that primary activity is employee work, being a student, being engaged in childcare or care of other family members, or transitioning to retirement from the workforce. Devising an appropriate set of more probing questions that could be asked at regular intervals on ongoing household surveys would allow trends in work activity and work arrangements to be gauged more accurately.

VI. Other Sources of Information on Non-employee Work

In additional to household survey data and administrative data derived from tax returns, useful information about non-employee work could be gleaned from employer surveys, records of information reporting for tax purposes, private financial data or other private sector data. We discuss each of these potential data sources briefly in turn. A core theme of our discussion is that integration of these additional types of data with survey and administrative data has the potential to add important new insights to our understanding of the changing nature of work.

Employer Surveys. A natural approach to learning about alternative work arrangements would be to ask employers. Efforts to date suggest on the one hand that this approach has potential, but on the other hand suggests that it faces a number of challenges. Dey, Houseman and Polivka (2012) used a longitudinal version of the Occupational Establishment Survey to generate estimates of the extent to which Temporary Help Service (THS) and Professional Employee Organizations (PEO) were placing workers at manufacturing firms. They found a significant volume of such activity and showed that accounting for it had an impact not only on manufacturing employment but also in turn on measures of labor productivity in manufacturing. In spite of these findings suggesting that there is an important issue to be addressed, however, both BLS and Census have faced challenges in developing more systematic survey approaches to capturing THS and PEO activity for official statistics. At BLS, a study of the feasibility of collecting the industries where workers were placed from THS and PEO firms in the Current Establishment Survey (CES) was carried out in 2005. Many firms were unable or unwilling to provide this information. Likewise, at Census, questions added to the 2002 Economic Census on employee

leasing activity also yielded low response rates. In both of these cases, the primary objective was to improve the allocation of employment by industry which is an important but limited objective. Even had they been successful, these approaches would not have gotten at payments to non-employees or information on their hours worked.

Another approach that may have promise is to add modules to existing employer surveys that provide more information about the extent of non-employee work at different types of firms. A module along these lines was included in the 2015 Annual Survey of Entrepreneurs (ASE).[9] The 2015 ASE module includes questions on types of workers, such as full time, part time, and contractors, independent contractors, or outside consultants, as well as questions regarding the types of tasks performed by each type of worker. For our purposes, this approach is especially interesting since it offers the possibility of insights into the use of non-employee workers by young businesses that may be innovative in their workforce organizational structure. The tabulations for the 2015 ASE and the underlying micro data have not yet been made available for research purposes so we don't yet know about the success of this approach or the new insights that may emerge from these data.

Tax Data. The integration of the CPS with the DER already shows the value added of integrated survey and administrative data. The further integration with the full LEHD data infrastructure based on the UI wage records has great potential for analyzing how non-employee work fits into the career paths of workers. Integration of the Form 1099-MISC data into this infrastructure also would be very valuable. Being able to track the longitudinal relationship between individuals identified through their PIKs (SSNs) and the EINs issuing the Form 1099-MISC's to those individuals would be especially interesting. Some individuals may have longstanding relationships with one firm; these would be reflected in the individual receiving a 1099-MISC from only one firm for many years consecutively. Other individuals may be receiving multiple 1099-MISC's from multiple EINs with considerable turnover in the latter. These two patterns imply quite different work arrangements from the perspective of both the individual and the firm.

[9] The ASE is a survey of approximately 290,000 employer firms, where roughly 47% of these firms are less than 10 years old. See Foster and Norman (2016) for more detail about the ASE.

Financial Data. Another potential source of information about certain forms of non-employee work consists of anonymized individual-level financial records. In an interesting recent study, Farrell and Greig (2016) use data from customers with Chase banking and credit card accounts to examine flows of income that come through online platforms. Their findings suggest that online platform workers reflect a small but rapidly growing sector of the workforce. However, their findings also suggest that such work is mostly a secondary source of income for most households. At this point, however, no long time series of such data exists and there are questions about the generalizability of findings from this sort of private data source that have yet to be answered. Greater access by the research community to these type of private data would greatly facilitate what we can learn from them. Even better would be integration in an appropriately secure environment of such data at an individual level with the type of survey and administrative data discussed above.

Private Sector Company Data. Researchers increasingly are gaining access through a variety of arrangements to individual company level data for research purposes. This has included researchers interested in the rise of the online platform economy who have obtained access to personnel data from companies in the online platform sector to gain insights about the nature of work for non-employee workers. Hall and Krueger (2015), for example, have analyzed administrative data on Uber's "driver/partners" derived from the company's records. In addition, to enhance the administrative data, they also carried out a survey of these driver/partners. To help provide perspective on their findings, they compare patterns of activity of drivers/partners to information from the ACS on taxi drivers and chauffeurs. They find, for example, that Uber drivers/partners work fewer hours per week than taxi drivers and chauffeurs. In this respect, their findings are consistent with those of Farrell and Greig (2016) suggesting that being an Uber driver/partner is a secondary source of income for families. Using such individual firm level data for companies that are engaged in new forms of workplace organization has great potential but also great challenges that mimic those we stated above for private financial data. Greater data access and integration with other data sources are needed.

VII. Conclusion and A Path Forward

The widely perceived rise of the gig economy is as yet not well understood or well measured. Gig economy workers should be classified as self-employed, but the core traditional household surveys do not show an increase in self-employment activity. There is more evidence in the administrative data of growth in the number of individuals receiving income from self-employment activity but it is unclear to what extent this is driven by growth in gig activity as conceived in popular perception. This warrants our attention, since mismeasurement of any increase in nontraditional employment may mean that our estimates of employment growth are too low, that our estimates of aggregate productivity growth are too high, and that the pattern of productivity growth has been distorted.

. Our review of the state of knowledge in this area highlights that a challenge in understanding and measuring the rise of the gig economy is to be clear about where such activity fits into the full range of non-employee work. Identifying the key attributes that characterize different forms of non-employee work, such as independent contractors, self-employed business owners, on call workers, temporary help agency workers, and seasonal workers, help us close in on the traits of jobs that are most consistent with gig work. In the framework we have developed, gig workers are a subset of contingent workers and also are a subset of the unincorporated self-employed as identified in multiple data sources. We have discussed the challenges to quantifying the prevalence of gig employment using existing household survey data or administrative records by themselves.

Our analysis highlights the potential payoff from improvements in economic measurement along two key dimensions. First, there is a high potential payoff from survey modules conducted at regular intervals on ongoing surveys that probe more deeply about non-employee work activities. This should not be surprising, since gig employment is often a secondary source of income that does not occur regularly. This means it is likely not to be mentioned by respondents for whom gig work is not their primary activity and who may not understand the subtle differences in terms such as self-employment, contract worker, and independent contractor. To the extent that job attributes define the various types of

non-employee work arrangements, one possible path forward is to supplement employment probes with questions relating to job attributes.

A second improvement in economic measurement would be to develop estimates based on survey and administrative data that have been integrated at the individual level. Such integration offers great potential for understanding the changing nature of work, particularly for non-traditional work activities that are inherently difficult to define and measure. Our analysis shows that tax data measures an increasing amount of self-employment activity that is missed in household surveys, yet this tax data by itself is not informative about who these workers are. Linking tax data with household survey data gives us not only the worker's demographic characteristics, but also the worker's family characteristics – something that is crucially important for understanding how gig employment is related to family income and health insurance coverage.

A key missing piece of the puzzle is to understand where non-traditional work fits into the career paths of workers. This issue is of general interest but especially important in terms of understanding the role of the gig economy in changing the nature of work in the future. One view, which the current limited evidence seems to support, is that much of the online platform/on-demand non-employee work is supplemental in nature. That is, there is not yet compelling evidence that the primary activity over the course of an individual's career is increasingly taking the form of non-employee work. This inference must be drawn with great caution, however, because the type of survey and administrative data integration that we are advocating is at a very early stage. Longitudinal matched employer-employee data that also fully integrates non-employee work activity is needed to address these questions. Developing such data infrastructure is a challenge but one we believe can be surmounted by building on the work we have already carried out using the CPS-DER and LEHD data infrastructures. Pushing in this direction would be greatly facilitated by full integration of Form 1099-MISC data that includes identifiers for both the recipients and the providers of the reported payments of non-employee compensation. More generally, the objective should be to develop the survey and administrative data so that the full taxonomy

of non-employee work as characterized in Table 1 could be measured and analyzed in the context of the career paths of workers over their life cycle.

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Appendix A: Available Household Survey and Administrative Self-Employment Data Series

Household survey data on self-employment. The Current Population Survey (CPS) is a monthly household survey with a sample that represents the civilian population of the United States. The basic monthly CPS questionnaire collects relatively rich information on the characteristics of all members of selected households age 16 and older, including their age, sex, race, ethnicity, nativity, disability status, and education. The monthly instrument also contains questions to determine whether household members were employed during the survey reference week (normally the week that includes the 12th of the month) and, if so, whether each person had more than one job during that week. For those categorized as employed, the CPS asks about the occupation and industry of the main job, hours on the main job, and combined hours on any other jobs. Additional questions are asked that allow the main job to be categorized as a wage and salary, self-employed or unpaid family worker position. In published Bureau of Labor Statistics (BLS) statistical series on self-employment, individuals who operate an incorporated business are categorized as wage and salary workers rather than as self-employed, but both the incorporated and the unincorporated self-employed can be identified in the underlying microdata. Information on the industry, occupation and type of employment for any reported *second* jobs is collected for just a quarter of the sample—those in the so-called outgoing rotation groups—and is not collected at all for any additional jobs. Finally, for the quarter of the sample in the outgoing rotation groups, the monthly CPS collects information on earnings on the main job. All of these data are available on a consistent basis beginning in 1994, the year of the most recent major CPS redesign.

The Annual Social and Economic (ASEC) supplement that is administered each spring to CPS households collects information for the preceding calendar year. Respondents are asked about the number of weeks during the year worked by each member of the CPS household, the number of jobs held at different times during the year, and the industry, occupation and type of the longest job.[10] These data

[10] Individuals who hold two jobs simultaneously rather than in sequence are instructed to report holding just one job.

allow the longest job held during the year to be categorized as self-employed or wage-and-salary. In addition, the CPS-ASEC supplement contains questions intended to identify business income and wage and salary income received during the year. Business income consists of income from both incorporated and unincorporated self-employment. Data from the CPS-ASEC supplement are available beginning in 1962.

The American Community Survey (ACS) is a Census Bureau survey with a very large sample that represents the U.S. civilian population. For each household member age 15 years or older, the ACS asks whether the person worked for pay during the prior seven days ("last week"). For those who are reported to have worked, additional questions collect information about the main job held during the reference week—the industry and occupation of the work and whether the person was an employee, self-employed with an incorporated business, self-employed with an unincorporated business, or an unpaid family worker. In addition, the ACS requests the total amounts of self-employment income and employee compensation earned by each household member over the prior 12 months that could in principle be used to construct a measure of self-employment activity based on receipt of business income that is similar to that based on CPS-ASEC data. ACS estimates of self-employment on the main job are available from 2005 through the present. Some ACS data were collected beginning in 2001, the survey was not fully implemented until 2005 and that is the first year for which published estimates are available.

Tax data on self-employment. The Master Earnings File (MEF) maintained by the Social Security Administration (SSA) is one source of administrative data on self-employment earnings. The MEF includes information on each W-2 a person received for a calendar year, for 1978 onward, including the earnings reported on the W-2 and the employer from whom those earnings were received, and on the total self-employment earnings reported for the year on a Schedule SE filed by a taxpayer. A Schedule SE is required of sole proprietors, general partners and farmers with gross self-employment earnings above a defined threshold that has been set effectively at $433 over the period covered by our analysis. More than 85 percent of Schedule SE filers are sole proprietors (Jackson, Looney and Ramnath 2016). The MEF records are not public, but an extract called the Detailed Earnings Record (DER) covering all

linked CPS-ASEC and SIPP respondents between 1991 and the present have been provided to the Census Bureau for specified statistical uses.

The Census Bureau's Business Register (BR) is the master business list that the Census Bureau maintains for use as a sample frame for all of its business surveys as well as a source that is tabulated directly to produce a variety of business statistics. The BR is based primarily on administrative data from business income and payroll tax returns. It includes records for both employer businesses and non-employer businesses. Each record on the file is assigned a detailed industry code. Employer businesses are those with positive payroll in a year while non-employer businesses are those with qualifying business revenue but no paid employment. As stated on the Census Bureau's website, "most nonemployers are self-employed individuals operating unincorporated businesses (known as sole proprietorships), which may or may not be the owner's principal source of income." To be included in the non-employer universe for tabulation, other than in construction, a business must have at least $1,000 in revenue. Businesses with more than some maximum amount of annual revenue are excluded from the non-employer universe on the grounds that businesses with revenues over the threshold amount are likely to have employees and thus to appear on the list of employer businesses. The upper revenue threshold is determined based on the business's legal form of organization (sole proprietorship, partnership or corporation) and industry. The information about payroll and business costs recorded in the BR make it possible to distinguish between sole proprietors who are running an independent business (with or without employees) versus those who are engaged in the type of non-employee work that is the focus of this analysis.[11] The Census non-employer data are available beginning in 1997.

One challenge in making the non-employer microdata useful for person-level analysis is the ability to cleanly identify the owner of the business. Non-employer businesses most frequently are sole proprietorships and are thus identified based on the filing of a Schedule C. Individuals with any gross

[11] The revenue and cost data for sole proprietors are from the Form 1040 Schedule C. Our approach for distinguishing business owners from non-employee workers is similar in spirit to that employed in work in progress by Jackson, Looney and Ramnath (2016).

non-employee or business income on their individual tax return are required to file a Schedule C. For these sole proprietorships, Census integrates information from the Schedule SE filed by the owner (roughly 75 percent of Schedule C filers also submit a Schedule SE). In these cases, it is straightforward to identify the business owner. Among the 25 percent of Schedule C filers who do not submit a Schedule SE, it is also straightforward to assign ownership if the Schedule C does not accompany a 1040 submitted by a married and jointly filing household. Among Schedule Cs filed by married and jointly filing households with no accompanying Schedule SE information, Census uses all observed ownership history as well as wage and salary work history to impute which spouse to associate with the Schedule C. Finally, roughly twenty percent of active non-employer entities file as partnership or incorporated entities. In these cases, the identity of the owner is currently not observed.

The Form 1099-MISC also contains information relevant to assessing trends in self-employment income. This is the tax form used by businesses to report payments of non-employee compensation. Applicable regulations require that a Form 1099-MISC be filed by business payers when nonemployee compensation paid to any source equals or exceeds $600 over the course of a year; applicable amounts are recorded in Box 7 of the form. One complication is that a Form 1099-MISC may be issued either to an individual (using an SSN) or to a business (using an EIN). Further, the dollar amounts reported on the Form 1099-MISC are gross payments rather than the net amounts earned by the recipient after expenses. Individuals or businesses performing work for a homeowner rather than for a business will not receive a Form 1099-MISC.[12] Staff at the Department of the Treasury have compiled counts of the number of individuals and the number of businesses receiving Form 1099-MISCs that had positive amounts reported in Box 7, Non-employee Compensation, for each year from 2000 through 2012. These counts are available from U.S. Department of the Treasury (2015).

Linked Household-Administrative Data File. Individuals in our linked sample were interviewed by the CPS-ASEC in at least one year between 1997 and 2013 and provide employment and earnings

[12] See U.S. Department of the Treasury (2015) for a more detailed discussion of Form 1099-MISC reporting.

information for the prior calendar year, 1996 through 2012. These CPS-ASEC individuals were linked to W-2 and Schedule SE earnings information provided to the Census Bureau by the Social Security Administration (SSA) in the form of the Detailed Earnings Record (DER), an extract from the SSA Master Earnings File. This linking is performed using a Protected Identity Key (PIK), which is a replacement identifier for the SSN. We restrict our analysis sample to the set of CPS respondents with a PIK.

One complication in creating the linked file is that the PIK is missing for 20 to 30 percent of ASEC respondents, depending on the year. We use propensity score methods to reweight the sample of people for whom we have a PIK so that they represent the population as a whole. For each year, we estimate a regression model in which an indicator for having a PIK is regressed on indicators for age group, gender, race, education, marital status, foreign-born status, state of residence, and whether the person reported being employed in the relevant CPS-ASEC. The coefficients from this model are used to calculate each individual's probability of having a PIK and a weight adjustment equal to the inverse of this probability is applied to the CPS-ASEC estimation weight. Individuals with a PIK are retained in our sample regardless of whether we are able to locate any W-2 or Schedule SE earnings for them in the DER.

Appendix B: Questions about Informal Employment, JPSM Practicum Survey Experiment

Version 1 (global question):

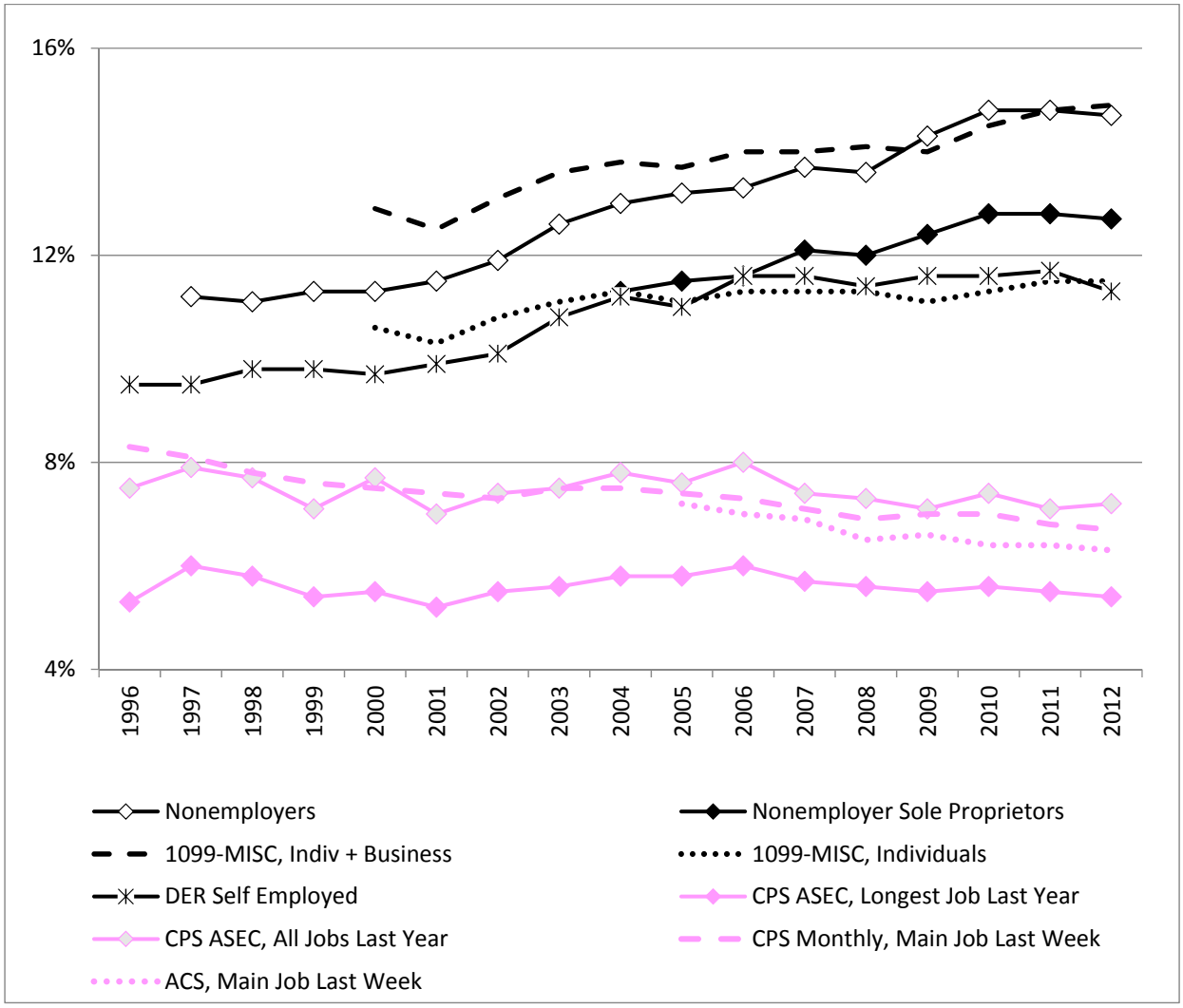
Sometimes, in addition to working at a job where there is a definite arrangement for work on a continuing basis, people do other things to earn money. Outside of a job, did [NAME] do other things to earn money **last week**?
[*This might include work you've already told us about.*]

Version 2 (detailed question):

Sometimes, in addition to working at a job where there is a definite arrangement for regular work on a continuing basis, people do other things to earn money. Outside of a job, did [NAME] do any of the things listed below to earn money **last week**?
[This might include work you've already told us about.]
If you're not sure where to put work [NAME] did, choose the category that seems to fit best. Choose more than one category only if you are reporting more than one type of work.

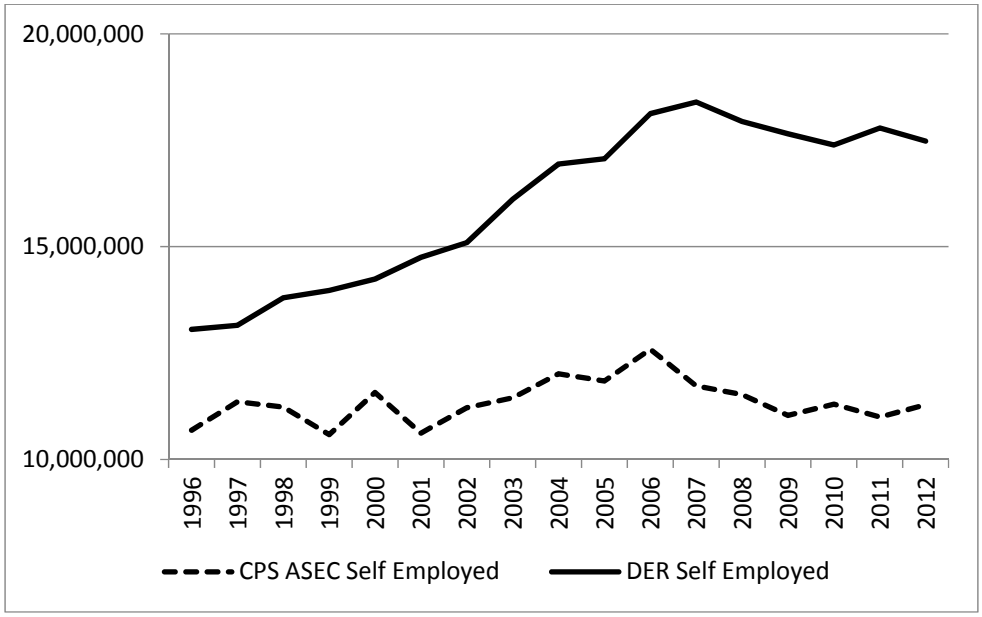
	Yes	No
a. Provided services to other people (for example, babysitting, house sitting, dog walking, yard care, housecleaning, tutoring, picking up dry cleaning, running errands, assembling furniture, or providing other personal assistance)		
b. Provided services to a self-employed individual or business (for example, consulting on a project, editing, setting up or maintaining a computer system, building maintenance or repairs)		
c. Performed as an actor, musician or entertainer (for example, singing at a wedding, entertaining at a children's party or juggling at a street fair)		
d. Drove for a ride sharing service (for example, Uber, Lyft, Sidecar, or a local limousine company)		
e. Assisted with medical, marketing or other research (for example, participating in a medical study, responding to a survey, or being part of a focus group)		
f. Posted videos, blog posts, or other content online (for example, running a travel blog or You Tube channel that generate ad revenues or commissions)		
g. Did other informal work or side job (*please specify*)		

Figure 1: Household Survey and Administrative Data Self-employment Rates, 1996-2012



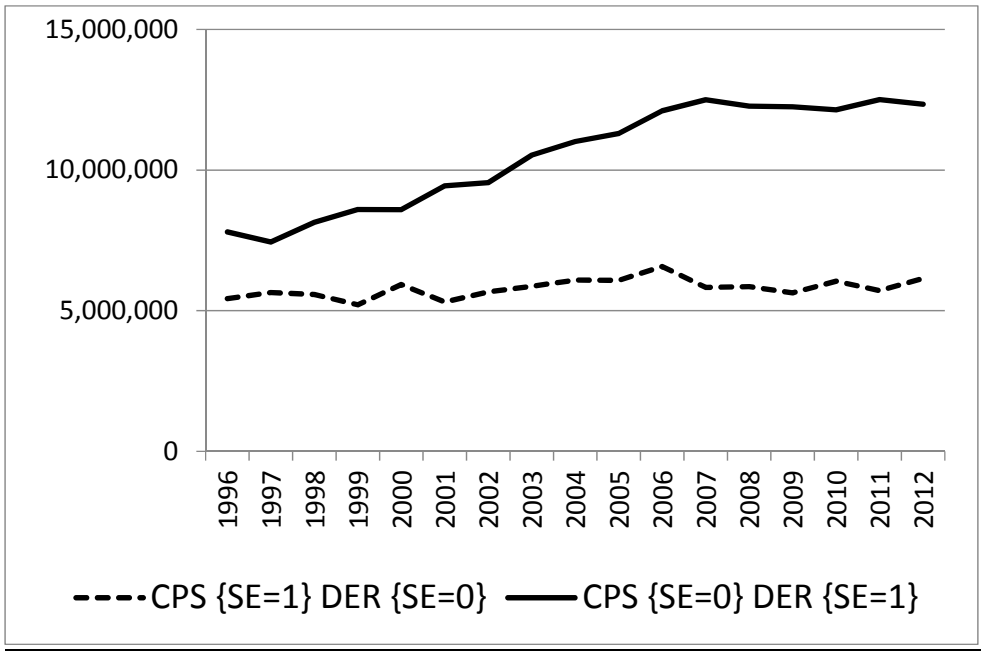
Source: "CPS Monthly, Main Job Last Week' is downloaded from the BLS website.
"ACS, Main Job Last Week" is downloaded from the Census Bureau website.
"CPS ASEC, All Jobs Last Year" is authors' calculations from integrated CPS and DER data.
"CPS ASEC, Longest Job Last Year" is authors' calculations from integrated CPS and DER data.
'Nonemployers' is downloaded from the Census Bureau website.
'Nonemployer Sole Proprietors' is downloaded from the Census Bureau website.
"1099-MISC, Indiv + Business" is from U.S. Department of Treasury (2015).
"1099-MISC, Individuals" is from U.S. Department of Treasury (2015).
"DER Self Employed" is authors' calculations from integrated CPS and DER data.

Figure 2A: Self-employment in the CPS and the DER



Note: Tabulations by authors from integrated CPS and DER data.

Figure 2B: "Off-Diagonal" Patterns of Self-employment from the CPS and DER



Note: Tabulations by authors from integrated CPS and DER data. The dashed line is the set of individuals who have positive self-employment in the CPS but no self-employment in the DER. The solid line is the set of individuals who have positive self-employment in the DER but no self-employment in the CPS.

Figure 3A: Decomposing the Off-Diagonal of DER (SE=1), CPS (SE=0)

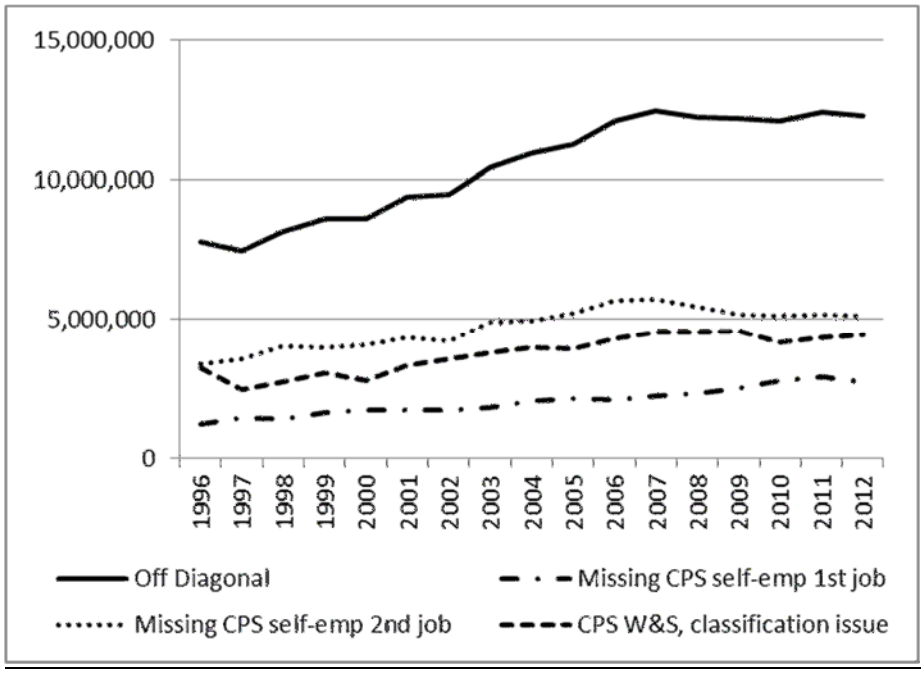
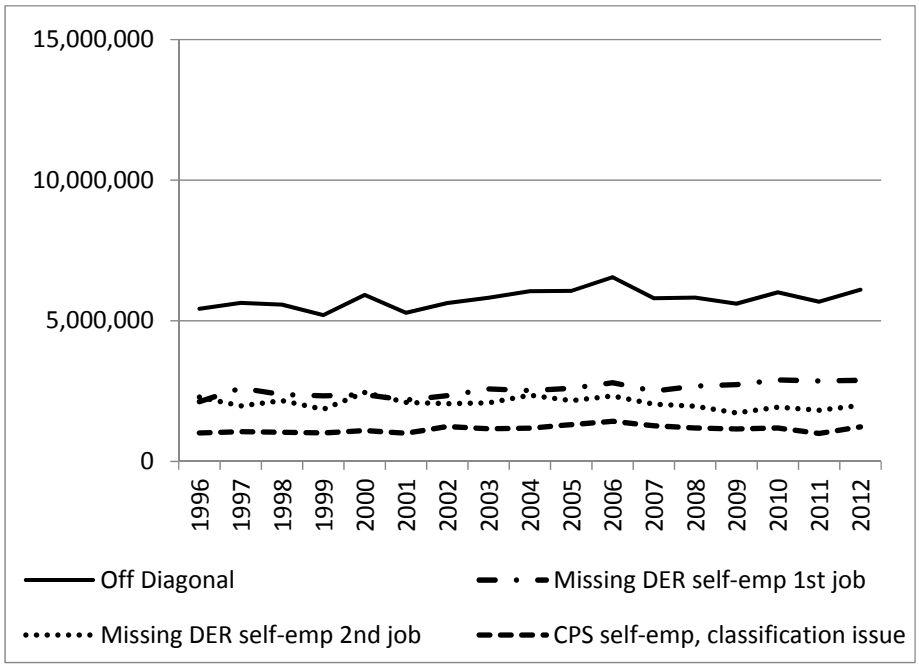


Figure 3B: Decomposing the Off-Diagonal of DER (SE=0), CPS (SE=1)



Source: Tabulations by authors from integrated CPS and DER data.

Table 1: Work Arrangement Types and Characteristics

	Work Arrangement Characteristic					How Work Arrangement Reported			
Work arrangement type	**Paid a wage or salary**	**Implicit or explicit contract for continuing relationship**	**Predictable work schedule**	**Predictable earnings when working**	**Work supervised by the firm that pays the salary**	**Classified as self-employed in HH surveys**	**Information return on which payer may report earnings [1]**	**Tax form that worker should file with the IRS [2]**	**Gig Worker?**
Traditional employee	Yes	Some	Yes	Yes	Yes	No	W2	1040	No
On-call worker	Yes	Some	No	Yes	Yes	No	W2	1040	No
Seasonal worker	Yes	No	Some	Yes	Yes	No	W2	1040	No
Temporary help agency worker	Yes	Some	No	Yes	No	No	W2	1040	No
Contract firm worker	Yes	Some	Yes	Yes	No	No	W2	1040	No
Self-employed									
Incorporated business owner	Some	Some	Some	Some	NA	Inc. SE	W2, K1 or 1099-DIV	1040	No
Partnership	No	Some	Some	Some	NA	Uninc. SE	K1	1040	No
Unincorporated sole proprietor									
Established business/regular clients	No	Some	Some	Some	NA	Uninc. SE	1099	Sched C, SE	No
One-time jobs	No	No	No	No	NA	Uninc. SE	1099	Sched C, SE	Yes
Independent contractor	Some	Some	Some	Some	NA	Inc. SE or uninc. SE	Varied	Varied	Some
Day laborer	No	No	No	No	NA	Uninc. SE	1099	Sched C, SE	Yes
On-demand/platform worker	No	No	No	No	NA	Uninc. SE	1099	Sched C, SE	Yes

[1] Information returns are required to be filed with the IRS only by certain types of payers and only for payments that exceed certain thresholds. Depending on the arrangements under which they work, those receiving non-employee compensation could receive a 1099-MISC or, since 2011, possibly a 1099-K.

[2] Individuals with incomes that are sufficiently low may not be required to file an income tax return.

Table 2: Cross-Tabulation of Self-Employment Status in the CPS and the DER, 1996-2012

		Not self-employed in DER	Self-employed in DER	Total
Not self-employed in CPS				
	Number	202,311,037	10,459,170	212,770,208
	Row Share	95.1%	4.9%	100.0%
	Column Share	97.2%	65.4%	95.0%
Self-employed in CPS				
	Number	5,776,887	5,531,764	11,308,651
	Row Share	51.1%	48.9%	100.0%
	Column Share	2.8%	34.6%	5.0%
Total				
	Number	208,087,924	15,990,935	224,078,859
	Row Share	92.9%	7.1%	100.0%
	Column share	100.0%	100.0%	100.0%

Note: Weighted tabulations of linked CPS-DER data file described in the Data Appendix. An individual is considered to be self-employed in a given data source if any self- income was received during the calendar year (SE=1) and otherwise considered not to be self-employed (SE=0). Numbers reported are as a share of the population age 16 plus. Data for all years 1996-2012 pooled.

Table 3: Accounting for Growth in Discrepancy Between CPS-ASEC and DER Self-Employment Estimates, 1996-97 to 2011-12

Off-diagonal Category	Percent of Growth in Discrepancy Explained
DER{SE=1}/CPS-ASEC{SE=0}	
1) No CPS employment	34.50%
2) Self-employment second job not reported in CPS	38.40%
3) CPS job misreported as wage and salary	35.20%
CPS-ASEC{SE=1}/DER{SE=0}	
4) No DER employment	-11.60%
5) Self-employment second job not reported in DER	5.20%
6) CPS job misreported as self-employment	-1.80%

Table 4: Household Survey Data on Prevalence of Alternative Work Arrangements on the Main Job

Survey Name and Survey Sponsor	Year(s)	Data Collected	Reference Period?	Coverage?	Survey Methods?	Sample Size(s) and Response Rate(s)
Contingent Work Supplement, Bureau of Labor Statistics	February 1995, 1997, 1999, 2001, and 2005	Survey measures contingent work, meaning a job a respondent does not expect to last (several specific variants defined); separately, measures number of people who are independent contractors, on-call workers, temporary help agency workers, and workers provided by contract firms.	Survey reference week	One person reports for all household members	Supplement to Current Population Survey; phone or in-person interview	Sample size of approx. 50,000 households per year; response rates NA in 1995; 86.0% in 1997; 84.7% in 1999; 86.5% in 2001; 84.5% in 2005
Rand-Princeton Contingent Worker Survey, Katz and Krueger (2016)	October/ November 2015	Survey measures contingent work, meaning a job a respondent does not expect to last (three specific definitions); separately, measures number of people who are independent contractors, on-call workers, temporary help agency workers, and workers provided by contract firms.	Survey reference week	Self only	Online panel (RAND American Life Panel)	3,850 responses; information on panel recruitment needed to compute a response rate not available
Quality of Worklife Module, General Social Survey, NORC, University of Chicago	2002, 2006, 2010, and 2014	Employed persons categorized as independent contractor, consultant, freelance worker; On call, work only when called to work; Paid by a temporary agency; Work for contractor who provides workers/services; Regular, permanent employee	Status as of interview date	Self only	In-person interview	1,777 responses, 70.1% response rate in 2002; 1,712, 71.2% in 2006; 1,156, 70.3% in 2010; 1,240, 69.2% in 2014. Response rates for GSS overall.

Table 5: Estimates of the Prevalence of Selected Work Arrangements on Main Job (percent of all workers)

Source	Independent Contractors	On-Call Workers	Temporary Help Service Workers	Contract Firm Employees
Contingent Worker Supplement, Current Population Survey, BLS estimates				
1995	6.7	1.7	1.0	0.5
1997	6.7	1.6	1.0	0.6
1999	6.3	1.5	0.9	0.6
2001	6.4	1.6	0.9	0.5
2005	7.4	1.8	0.9	0.6
Contingent Worker Supplement, Current Population Survey, Katz and Krueger estimates [a]				
1995	6.3	1.6	1.0	1.3
2005	6.9	1.7	0.9	1.4
Rand-Princeton Contingent Worker Survey, American Life Panel				
2015	8.4	2.6	1.6	3.1
Quality of Worklife Supplement, General Social Survey[b]				
2002	13.9	2.1	0.7	2.5
2006	13.7	2.6	1.0	3.7
2010	13.3	3.7	1.4	3.1
2014	14.1	3.1	0.5	2.7

[a] The Katz and Krueger estimates differ from the BLS estimates based on the Contingent Worker Supplement data because Katz and Krueger require all sample members to have worked during the survey reference week; do not count day laborerers together with on-call workers; and do not restrict contract workers to those "who are usually assigned to only one customer and usually work at the customer's worksite."

[b] In estimates based on the Quality of Worklife Supplement, the first response option is "work as an independent contractor, consultant or freelance worker"; the second is "on call, and work only when called to work"; the third is "paid by a temporary agency"; and the fourth is "work for a contractor who provides workers and services to others under contract."

Table 6: Employment and Multiple Job Holding Rates With and Without Probes for Informal Employment

	Response for Self			Response for Other Household Member		
Estimate	**Global Informal Employment Question**	**Detailed Informal Employment Question**	**Detailed Minus Global Difference**	**Global Informal Employment Question**	**Detailed Informal Employment Question**	**Detailed Minus Global Difference**
Employment rate (percent)						
CPS questions only	94.65	94.64	-0.01	69.76	69.54	-0.22
CPS plus additional questions	96.92	98.14	1.21	73.56	76.28	2.72 *
Difference	2.27 **	3.50 **	1.22	3.80 **	6.74 **	2.94 **
Sample size	1,365	1,343	--	1,131	1,113	--
Multiple job-holding rate among CPS employed (percent)						
CPS questions only	32.04	31.86	-0.18	10.52	10.18	0.44
CPS plus additional questions	55.96	56.57	0.61	13.43	21.32	7.88 **
Difference	23.92 **	24.70 **	0.79	2.92 *	11.24 **	8.33 **
Sample size	1,292	1,271	--	789	774	--

* Significant at 0.05 level. ** Significant at 0.01 level.

Source: Abraham and Amaya (forthcoming)