The Logistic Marginal Farebox: A Theoretical Model for Wages and Worker Classification in the Gig Economy

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Abstract

The emergence of the online gig economy has fundamentally changed employment relationships. The use of online platform marketplaces subjects workers to short term changes in supply and demand, and creates the potential for worker exploitation. The guiding principle of labor in these markets is flexibility, but the rigid nature of existing legislature and the corresponding perspectives of policymakers limit feasible regulation. A potential compromise to the particular situation of the gig economy is the development of a wage determination algorithm based on continuous inputs. The reliance of current perspectives on discrete inputs limits possible solutions, allows for loopholes, and polarizes the lead firm. This paper proposes a continuous wage determination model, *the logistic marginal farebox*, that increases benefits of workers most reliant on gig work, while maintaining the flexibility necessary in these markets.

Literature Review & Background

Defining the gig economy

In 2021, 9% of American adults earned income on an online gig platform. Of this 9%, nearly one third considered gig work their main job (Pew Research Center [PEW] 2021). Uber, the largest firm in the gig economy, has existed for a little more than a decade, but recorded over 17 billion dollars in revenue in the year 2021 (Wall Street Journal [WSJ], 2022). Disruption and a rapid rise to scale characterize the online gig economy, but to best understand it one must first recognize its distinguishing factors. Primarily, the networking capabilities of online transactions, and the subsequent ability to mobilize latent supply. Although online transactions have existed for a few decades, the widespread growth of information systems through the use of personal devices such as smartphones has expanded the reach of online transactions.

In this context gig economy refers to the use of online platforms developed by a third party to connect supply and demand for simple, completable tasks. The third party serves only as an intermediary to connect a willing buyer and seller, increasing available information and charging a premium for doing so. The opportunity created by the online gig platforms is the mobilization of latent supply, either labor or capital, that is otherwise inaccessible in the market for services. For example, workers willing but unable to provide traditional labor can find work on these platforms, or unused capital, such as a car that is not in use, can be employed on these platforms; both scenarios create activity that is otherwise impossible.

A driving factor in the growth of the gig economy is the leveraging of the platform business model, which is enabled by the low cost of replication in information systems. In the past, most transactions followed a linear flow through the market, such that producers would add value to each additional unit of production, and consumers would consume individual products or services. The advent of online networks, however, creates new market relationships, where producers generate a single unit of value with high fixed costs, and can replicate this value with little to no additional variable costs. Platform design of firms in the online gig economy involves the development of infrastructure that allows for the interaction of producers and consumers, and the power of these platforms is gauged not by the ownership of resources but by the strength of their network (Choudary, 2015).

Potential problems of the gig economy

In 2014 David Weil published, "The Fissured Workplace," to document a noticeable change in the status and wellbeing of American workers; the title being a metaphor for the erosion of employment relationships. Under the pressure of capital markets, wages, benefits, and fundamental labor standards have been skirted by employers to cut costs and increase efficiencies. The online gig economy, led by Uber, is the most recent development in the fissured workplace, as it may exploit workers through lowered wages, less worker power, and a general commodification of labor.

Uber driver-partners, as well as most service providers of the gig economy, are recognized as subcontractors and not employees. Subcontracting, although it has been commonplace in some industries for more than a century, is a tool of growing importance in the fissured workplace, because it shifts responsibility away from the lead firm, and does not require labor standards such as minimum wage, overtime pay, and unemployment insurance (Harris & Krueger, 2015; Department of Labor, 2022). The distinction of new subcontracting relationships is that firms subcontract functions central to their business operations. Consider the difference, for example, between the importance of an Uber driver to Uber's business operations, and the importance of a janitor of Uber's workspace to business operations; the former being absolutely necessary to the services provided, and the latter being important, but complimentary to the services provided. As described by David Weil (2014) below, these relationships also directly subject workers to the perils of the market:

> As a result [of subcontracting relationships], the lower tiers of fissured structures in many industries are very competitive; have low barriers for new entrants; provide services that are relatively easily observed; or draw on contractual provisions, monitoring technologies, and organizational formats that make the consequences of failing to meet standards costly. The upshot is that conditions at the secondary level (and below) are frequently tough: competitive, price sensitive, and subject to fluctuating demand. (p. 100)

Subcontracting, although a necessary alternative to employment in some cases, weakens the power of workers and limits compensation and labor standards. More concerning, though, is the potential for the fissuring of work in the gig economy to spread to other sectors of the economy. Fissured business models have been limited in the past by coordination failures and customary practices, but the gig economy weakens resistance on both of these fronts, which leads to the potential of fissuring in many service sector jobs. Grocery store employees, a fundamental low skill job, are being replaced in California by subcontractors, and this practice may spread to related industries (Eidelson, 2021).

The failure of policymakers

Labor relationships rely on a fundamental tradeoff between flexibility and stability. Jobs that provide predictable compensation have rigid schedules, and jobs that don't have set schedules lack steady pay and benefits. Firms generally favor flexible labor relationships because it allows for more precise adjustments, but it may enable exploitation and subject workers to fluctuations in supply and demand. In the case of the gig economy, policymakers have failed to adequately address this tradeoff, which results in either worker exploitation, or, in the opposite case, a fundamental weakening of the business model of gig firms.

Flexible work is the distinguishing factor of the online gig economy. Workers can offer services at their own convenience, and accept relative changes in compensation. According to the Pew Research Center (2021), 49% and 35% of online gig workers respectively cite "being able to control their own schedule" and, "being their own boss," as a major reason for providing services on online platforms. Hall and Krueger (2016) collected and published an extensive report on Uber driver-partners, and included that, "the hours that driver-partners spend using the Uber platform can, and do, vary considerably from day to day and week to week, depending on workers' desires in light of market conditions" (3), with other reports in support of these claims (Chen et al., 2017; Robinson, 2017; Mastercard & Kaiser Associates, 2019; Harris & Krueger, 2015). Current regulatory tools, however, are incapable of maintaining the flexibility that workers value, while also restricting exploitative behavior by firms.

In the United States workers can be one of two classifications: employees, or subcontractors. Employees are paid regularly for labor provided, while contractors are compensated at the completion of a task (Department of Labor, 2022). Workers providing services on gig platforms are currently recognized as independent contractors, and are not covered by labor laws, such as minimum wage and overtime pay, among other protections. Worker classification is often recognized as the best tool in limiting the negative effects of the gig economy, and the argument is made by labor economists to increase the number of discrete bins to categorize workers (Harris & Krueger, 2015). Although the binary classification of workers and contractors in the United States is flawed, discrete classification of any sort will likely fall short of the flexibility needed in the online gig economy. A possible solution is to derive compensation from a continuous input, such as labor hours.

Methodology

This paper discusses an alternative algorithmic framework, the logistic marginal farebox, for wage determination in the gig economy. As a replacement for discrete worker classification, the logistic marginal farebox leverages a continuous function to reward workers that provide high labor units, while maintaining flexibility for workers that provide low labor units. The motivation of this model is to link the interests of firms, workers, and policymakers in the gig economy. Workers most reliant on gig platforms, high hour workers, do not have minimum wage or overtime protections. These same workers are valued by Uber and online platforms due to their productivity.

Three publications are relied upon henceforth for their relevance to the topics discussed: "An analysis of the labor market for Uber's driver-partners in the United States" by Hall and Krueger (2016); "The value of flexible work: Evidence from Uber drivers" by Chen et al. (2017); and "Uber vs. taxi: A driver's eye view" by Angrist, Caldwell, and Hall (2017). These are the most comprehensive reports on the labor market of Uber driver-partners, and are largely concurrent in the distribution of weekly hours worked. At the time of their release, Uber driver-partner wages were calculated as a "farebox," where a driver received a flat rate of the fare of each ride completed. Drivers in Boston, for example, would earn 75% of the passenger fare, such that a $10 ride would yield $7.50 for the driver, and $2.50 for Uber (Angrist, et al., 2017). Uber has since adopted a more complicated wage setting model, but the recommendation of this paper draws more directly from the farebox model.

Instead of remaining constant, this paper proposes a decrease in the farebox and an increase in driver earnings based on hours worked per week, such that driver's working more hours per week earn a greater percentage of the ride fare. The framework is a logistic growth curve bounded between 65% and 90% of a ride fare, based on hours worked per week, with an inflection point at 20 hours worked per week. The equation below represents the percentage, *p*, of the fare paid to the driver-partner as a function of hours worked, *h*, per week:

$$p = \frac{25}{1+e^{(-0.2*(h-20))}+60}$$

The logistic growth curve reaches an inflection point at 20 hours representing the transition from part- to full-time work; wage increases at an increasing rate when hours worked is less than 20, and increases at a decreasing rate when hours worked is greater than 20. Furthermore, with some albeit arbitrary values, Angrist et al. (2017) calculate 20 hours worked per week as breakeven point for Uber driver-partners when compared with taxi drivers. Figure 1 is a graphical representation of the function described above.

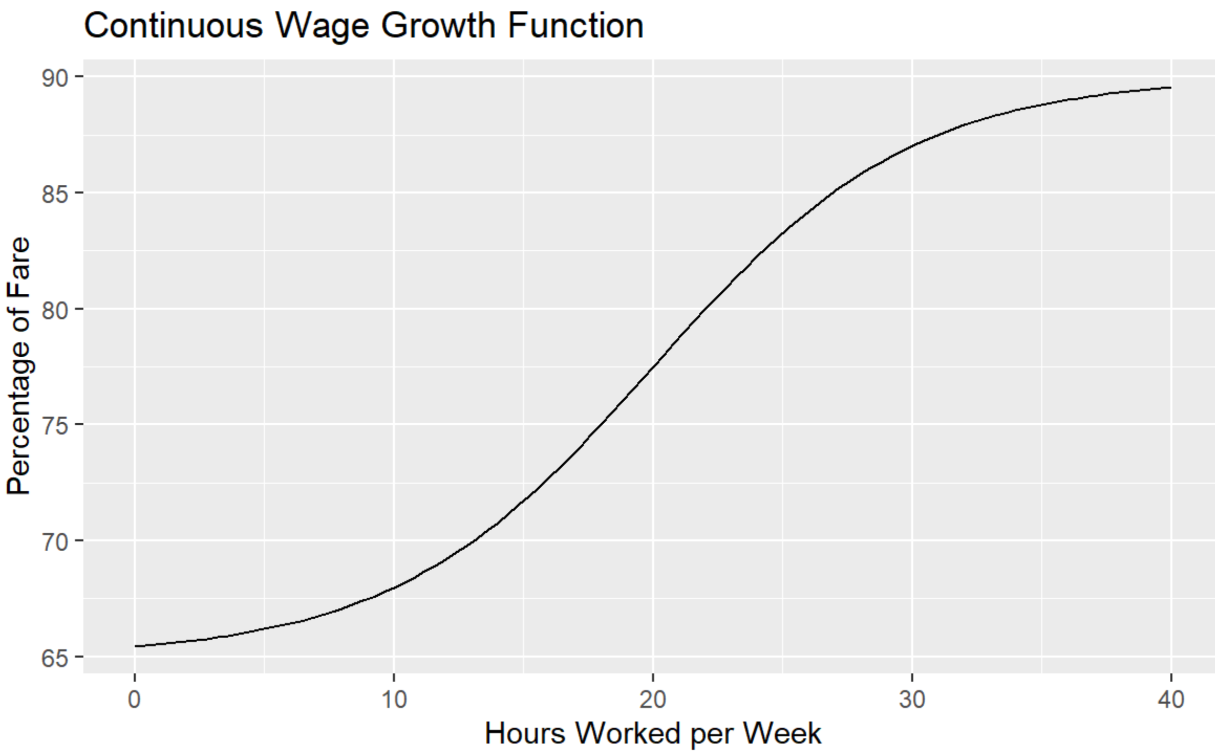

Figure 1: The graph above represents the function proposed to determine the percentage of each fare earned by Uber driver-partners. The vertical axis represents the percentage of the ride fare that the driver earns; from each ride Uber would earn *1 - Percentage of Fare*. The horizontal axis is weekly hours worked by the driver-partner. As the number of hours worked increases, the percent of the ride fare earned by the driver increases.

Most Uber driver-partners are active for less than 12 hours per week on the Uber driver app, and only around 10% are active for 40 or more hours per week (Chen et al., 2017). Furthermore, the flexibility of the app allows for drivers to change their labor in the short term, and workers exhibit a great degree of variation in labor provided from week to week. The distribution of hours worked per week as determined by Hall and Krueger (2016), and Chen et al. (2017) are shown in figure 2 and figure 3.

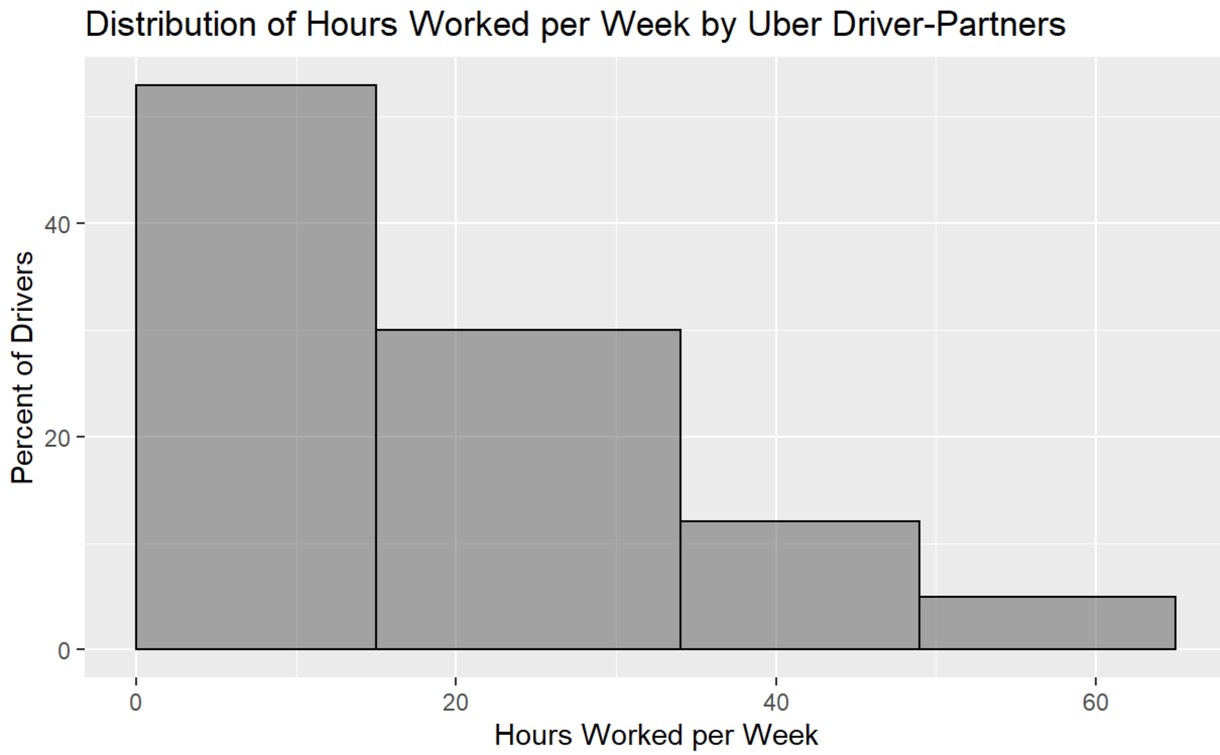

Figure 2: Distribution of hours worked per week, as found by Hall and Krueger (2016). Bins are separated at 15, 34, and 49 hours per week. The data are skewed left, with most workers providing 15 or fewer hours per week.

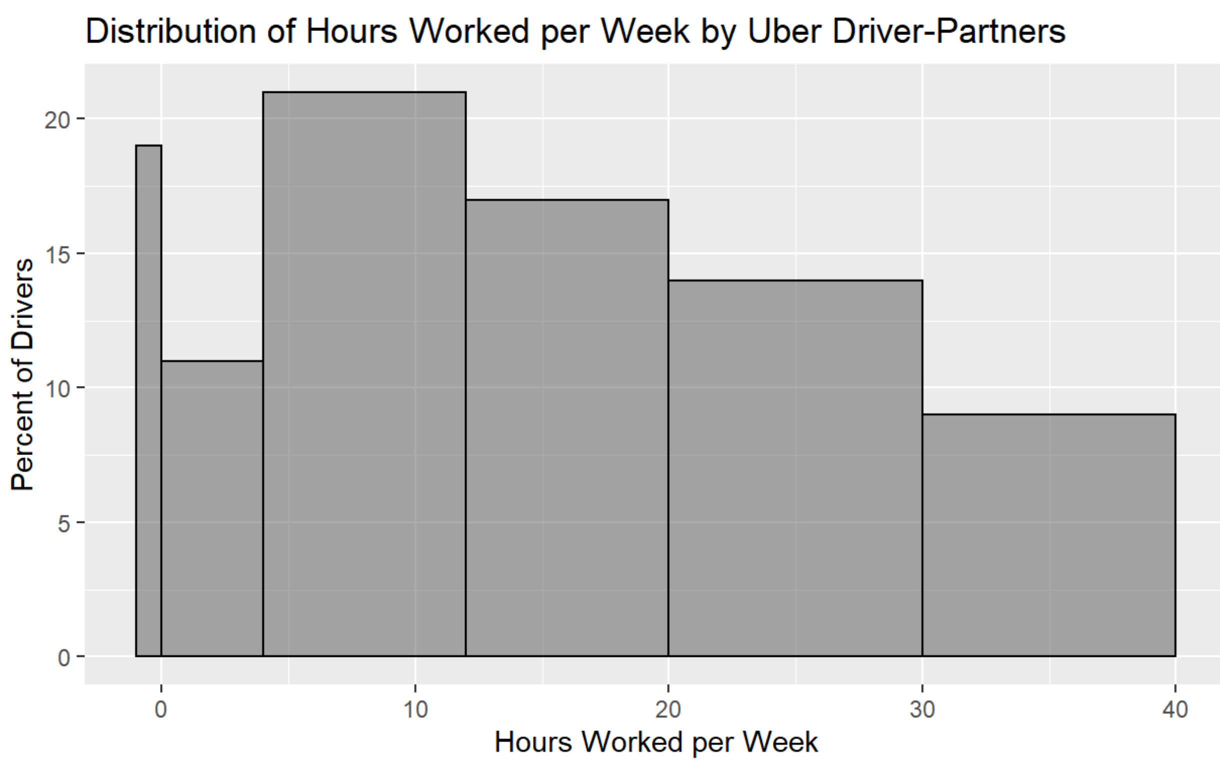

Figure 3: Distribution of hours worked per week, as found by Chen et al. (2017). Findings are similar to that of

Figure 2, in that most driver-partners work fewer than 12 hours per week. Bins are separated at 0, 4, 12, 20, 30, and 40 hours per week. This distribution shows not only that many drivers work few hours per week, but also that 19% of active drivers won't work at all in a week (represented by the narrow bin ending at 0).

Observing the distribution of hours worked per week by driver-partners is useful, but these papers do not provide access to actual driver-partner data. As a result, only a few conclusions can be made. First, that most Uber drivers would make less than they do now. Over half of active Uber drivers work less than 15 hours per week, and this cohort would receive a smaller percentage of each ride fare. This is expected, though, as it is reasonable to assume flexibility is particularly valuable to those working fewer hours. Second, that only a small percentage of drivers would greatly exceed their current earnings. Less than 10% of drivers work more than 41 hours per week, and only 5% work more than 50 hours per week. These are the drivers that would greatly exceed their current earnings, and are likely the drivers that are most reliant on providing services.

Conclusion

The online gig economy is a large and growing sector of both consumer markets and labor markets. With the structure of the modern gig firm, however, it is difficult to remove negative aspects of these markets, without also limiting the flexibility that is fundamental to their success. A solution is to leverage a logistic growth curve to better compensate workers that provide the most labor. A logistic marginal farebox will increase wages of workers providing the most labor in the gig economy, without limiting worker flexibility.

Under the current conditions, gig work is recognized as a subcontracting relationship. Flexibility is essential to workers of the gig economy, and subcontracting allows workers to provide labor only when they desire. Where this relationship is limited however, is the protections of contractors from exploitation, as they are not required to receive minimum wage, or overtime pay as well as other basic labor rights. Even including a third worker classification in the United States, an argument made by many labor economists, would fall short of the flexibility necessary to workers in these markets. Instead, workers should be compensated based on continuous inputs, such as hours worked per week.

The function described here is a logistic growth curve, as it would best represent part-time and full-time workers with an inflection point at 20 hours per week. Most workers would earn slightly less, but a percentage of workers, those working the most hours per week, would earn a higher and more stable wage. Furthermore, all workers have the opportunity to provide more labor and earn a greater wage. It is worth noting, though, that workers must still complete their task, such as a ride in the case of Uber, and when they do they will receive a varied but predictable percentage of the total fare.

Limitations and Considerations for Future Work

This study is not an experiment and should not be treated as such, but should rather guide future research. Due to the circumstances of this work, there are a few key limitations. First, this research was conducted under a time sensitive schedule, and was limited in its analysis of the *effects* of the model proposed, both cross sectionally and over time.

Cross sectional analysis was limited by access to relevant data on Uber driver-partners, their hours worked, and their wages, as well as other attributes. As a result, actual conclusions reached are broad and based on assumptions. For example, even though the distribution of hours worked was provided by Hall and Krueger (2016) and Chen et al. (2017), the data supporting these distributions was not available, and a distribution function could not be reasonably derived, so the exact effect on driver earnings is unknown. While cross sectional analysis was limited by the availability of data, perhaps the most telling information regarding the practicality of the logistic marginal farebox is its effects on labor market participation over time, which could only result from an experiment.

Workers' response to a logistic marginal farebox is unknown, difficult to estimate, and essential to the model's success. Not only is the shape of the supply curve of labor missing from existing literature, but the marginal farebox introduces a complex incentive problem. It is possible that changing earnings between drivers will be received poorly, and viewed as price discrimination, despite the even application of this model to all drivers. It may also discourage workers that typically provide less labor; if these workers drop out of the labor market, the gig economy will be dominated by full-time workers, and the market will fail. The full effects of the logistic marginal farebox over time can only be known through an experiment.

Finally, perhaps the most important factor to consider, is the current wage setting algorithm of Uber drivers. Uber and most other firms of the online gig economy use black box algorithms to calculate current earnings, and the "farebox" idea in this paper is mostly outdated. As a result, firms are self interested in the wage setting algorithms used, and have little pressure to change due to information failures on both the part of workers, and on the part of policy makers. It is possible, for example, that firms may practice wage discrimination right now, paying two workers different rates for identical work based on their individual elasticities. If, however, firms of the online gig economy are pressured to be transparent, then the model in this paper will align the interests of firms, workers, and policymakers.

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