

"Modelling the Rise: A Quadratic Analysis of Gig Worker Growth and Economic Impact in India and the USA"

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Abstract: *The Indian labour market has seen significant changes over the past decade or so, and the gig economy has certainly been no small contributor to that. The proliferation of digital platforms, coupled with the penetration of cheaper internet and smartphones into semi-urban areas, has ensured that a broad cross-section of the workforce has been able to leverage app-based jobs as a means of livelihood. The likes of Uber, Ola, Swiggy, and Zomato are merely the tip of the iceberg when it comes to the gig economy. However, it is also a part of a larger movement than merely food delivery or taxi services. The objective of this paper is to explore how the advent of gig-based jobs has impacted workers across various educational and skill levels. The research is based on secondary research, which includes academic research, government labour reports, and industry data. The findings indicate a mixed bag. For workers without formal educational qualifications, there has been an opening into the economy that was previously unimaginable. For workers with educational qualifications, there has been a take-up of gig jobs for various reasons. For skilled workers, there has been a leveraging of freelance platforms to reach a much larger clientele. That said, the gig economy has not been straightforwardly beneficial. Income volatility, the absence of social protection, and the structural insecurity of contractor-based work are recurring concerns in the literature. This paper argues that policy frameworks in India have not kept pace with the speed of this transformation, and that without deliberate intervention, the growth of gig work risks deepening existing inequalities rather than resolving them.*

1. INTRODUCTION

The nature of work in India is changing. Not in a revolutionary fashion, but incrementally and in a manner that is no longer possible to ignore. If you walk through any medium-sized Indian city, you can't help but spot the signs: delivery riders zipping through the streets on their scooters, cab drivers checking their phones for their next pickup, freelancers sipping coffee in a café and typing away on their laptops. And much of this is happening through digital platforms. This phenomenon is now referred to as the gig economy.

In the Indian context, the gig economy is a short-term, task-based system of employment through digital platforms. It is not a traditional system of employment and lacks the benefits of a permanent contract, a fixed wage rate, and employer-provided benefits. Instead, workers are categorized as independent contractors and are hence free to choose their schedule of work but bear the entire burden of risk on their individual shoulders.

The emergence of the gig economy in India is a result of a specific set of circumstances that have allowed platform companies to take off and scale as fast as they have. And scale, they have.

What is less straightforward is how this growth has affected the people doing the work. The gig economy has not landed the same way across the workforce. For workers without much formal education, it has opened up jobs that were previously inaccessible. For graduates struggling to find work aligned with their qualifications, gig platforms have become a fallback. For professionals with in-demand skills, they have sometimes become a deliberate career choice. These are meaningfully different experiences, and conflating them leads to oversimplified conclusions both overly optimistic and overly pessimistic ones.

2. CHARACTERISTICS OF GIG WORK

Gig work isn't a single concept, but it encompasses a broad spectrum of activities, ranging from driving, delivery, to writing code, or even financial consulting, and the experience of gig work varies greatly depending on the side of the spectrum the worker is on.

The common factor that these forms of gig work have is a structural one: a gig worker is contracted to do something, like deliver something, write code, or create a logo, and the relationship ends once the job is done.

The most commonly touted advantage of gig work is the flexibility it offers, and it does, to a large extent. The worker gets to choose their hours, work multiple platforms at a time, and has no fixed schedule to follow. This is a great advantage for

certain classes of workers, like students, caregivers, or people who have a side hustle, because it allows them to participate in the workforce under circumstances that would have otherwise made it impossible.

However, the flip side of the coin, the less touted advantage of gig work, is the variability of income it entails.

Such unpredictability is easily managed as an addition to other sources of income, but for workers who rely on these gig economy platforms as a major means of earning a living, it is a constant cause of financial insecurity. The aspect of independent contractors is significant. This is not a trivial matter. This is because it determines if workers are protected by labor laws, if they are eligible to receive provident fund benefits, or if they are protected by minimum wage laws.

The reality is that, like anywhere else in the world, gig economy workers are not. The platforms benefit from this arrangement; workers suffer individually. Technology is what enables all of this. Technology is used to dispatch jobs to workers, to set prices based on supply and demand, and to rate workers based on customer feedback. This is a model that is efficient on a practical level but leaves workers with little room for maneuver. If a worker receives a low rating, they are essentially denied a chance to work without any formal process or means to appeal. The algorithm is, in a very practical sense, the employer. The algorithm is not, however, answerable to anyone.

3. TYPES OF GIG WORKERS

The reality is that the gig workforce is indeed heterogeneous, and any study that tries to treat them as a single entity is bound to miss a point or two.

At one end of the spectrum, we have low-skilled workers, which includes delivery partners, cab or auto drivers, and household service workers. The requirement for these jobs is low, which is also why they are accessible. This is significant because a large part of India's workforce has had limited opportunities when it comes to formal jobs. The barriers to entry are low, and while the income is not great, it is also comparable to or better than what is available in the informal economy.

The next set of workers is those who are moderately skilled. This includes workers who are doing data entry, customer service, or online tutoring. These workers have had a secondary or tertiary level of education but have been unable to find formal jobs matching what they have been trained to do. Their relationship with the gig economy is a little more complicated. For some, it has been a stepping stone, while for others, it has become a long-term solution by default.

But the high-skilled workers occupy a different position in the ecosystem. The software developer, the UX designer, the management consultant, the data analyst all of these workers can leverage the freelance platforms to access projects and clients that would have been impossible to reach through the local job market alone. For this segment of the population, the gig economy is a choice, not a necessity, and it provides a level of compensation well beyond what the formal Indian job market has to offer.

There are the part-timers, the gig workers who view their gig work as a supplementary source of income, not a primary source. There are the full-timers, the gig workers who have gone all-in on the platform economy, cobbling together enough gigs on various platforms to make a living a precarious position with no room for error.

These groups matter because the risks faced by a full-time gig worker with no other source of income are fundamentally different from the risks faced by a freelance consultant who has chosen to work on a project-by-project basis. Viewing gig workers as a single group leads to policies that do not work well for anyone.

4. PLATFORM ECONOMY AND DIGITAL INTERMEDIATION

The concept behind the platform economy is very simple and powerful: Technology can bring people with supplies and people with demand for services together much more efficiently than before. What used to take days or even weeks to find a house to rent, or a new employee to recruit, can now take seconds with an app. The platform economy is not an illusion; it has indeed made the labor market more frictionless.

In reality, an app like Uber, Ola, Swiggy, and Zomato acts as an intermediary between the laborers and the customers. The laborers are invited to register and create a profile on the platform, and after that, they are sent jobs through the platform. This acts as an intermediary and reduces the operational costs for the platform company to a great extent.

The rating system is an especially interesting aspect of this model. After every transaction, a customer rates a worker, and these ratings combine to give a score. This score then determines future jobs allocated to a worker and also determines the standing of a worker on the platform. The logic is sound it encourages service quality while also establishing trust between strangers. However, it also has its disadvantages.

There is no way for a worker to dispute a rating if they believe it is unfair. If a worker is consistently rated low, regardless of reason, it has serious implications for their income. The feedback is also a one-way street.

Algorithmic management is an area that has yet to be addressed by Indian labour law. If an algorithm determines who gets a job, how much they are paid, and when a worker is deactivated from a platform, then it is a form of control. This is a form of control akin to employment without any of the responsibilities. This is a key area of tension in the platform economy a tension between legal reality and legal classification.

5. THEORETICAL FRAMEWORKS

There are a number of theoretical bodies of work in labour economics and sociology that can provide a useful framework for thinking about the gig economy and its purpose.

One of the most accessible places to start is probably **Labour Market Flexibility Theory**. This suggests that employers prefer to use labour arrangements that allow them to vary their labour inputs in a flexible and costless way in accordance with market conditions. Fixed labour contracts are expensive to enter and exit, but gig contracts are not. From this perspective, the emergence of the gig economy is just a continuation of a trend towards labour market deregulation that began some time ago. And from this perspective, it is just rational economic behaviour on the part of employers to act in this way in a competitive market.

Dual Labour Market Theory, formulated in the 1970s by Doeringer and Piore, appears surprisingly relevant in this context as well. The theory posits the existence of two labour markets: the primary labour market, where workers can expect job stability, fair compensation, and opportunities for advancement; and the secondary labour market, where the opposite holds true. The former thus matches the description of most gigs, particularly in the lower-skilled segment of the labour pool. The labour in this segment experiences high turnover and has little bargaining power or opportunities for advancement into more stable employment arrangements. The theory also helps explain the lack of convergence between the two markets over time: structural imperatives keep the two markets separate and distinct, and workers in the secondary labour market do not have opportunities for advancement into the primary labour market based on performance.

Human Capital Theory presents another perspective that can inform the analysis of the gig economy. The basic premise of the theory that education and training increase worker productivity and thus earnings plays out in the gig economy as well. Professionals can enter the labour market with skills and expertise that can command higher earnings and more selective engagements in the labour market.

The framework of "The Informalization of Labor" puts the gig economy in the larger historical context of the gradual erosion of the category of formal employment and its corresponding benefits. In much of the developing world, and indeed in India, informality has always been the norm for a large percentage of the workforce. However, the gig economy is not just an extension of this trend but gives it a digital face, a managerial algorithm, and a venture-capital-backed company at its helm. This fundamentally alters the nature of informality in a manner that was never anticipated by traditional regulations.

Transaction Cost Theory, as advanced by Oliver Williamson, is the economic rationale behind the platform economy as a business model. If transaction costs are high between a firm and its workers, such as in terms of finding and monitoring them, it is rational for a firm to internalize those costs and employ workers as employees. If technology reduces those costs to zero, as is the case today, outsourcing becomes a much more attractive option. The digital platforms essentially mechanize the process of reducing transaction costs and make it economically viable to outsource individual tasks to workers. From this perspective, the gig economy.

6. GIG WORKERS AND SECTORS:

a. Sector vs no. of gig workers in India:

Sector	No. of Gig Workers (In Lakhs)
Ecommerce	37
Logistic	15
BFSI	10
Manufacturing	10
Retail	7
Transportation	6
IT	5
Healthcare	3
ITeS	3
Construction	3
Education	3
Automotive	1
Hospitality	0.8
Infrastructure	0.7
Telecom	0.5
Power and Energy	0.3

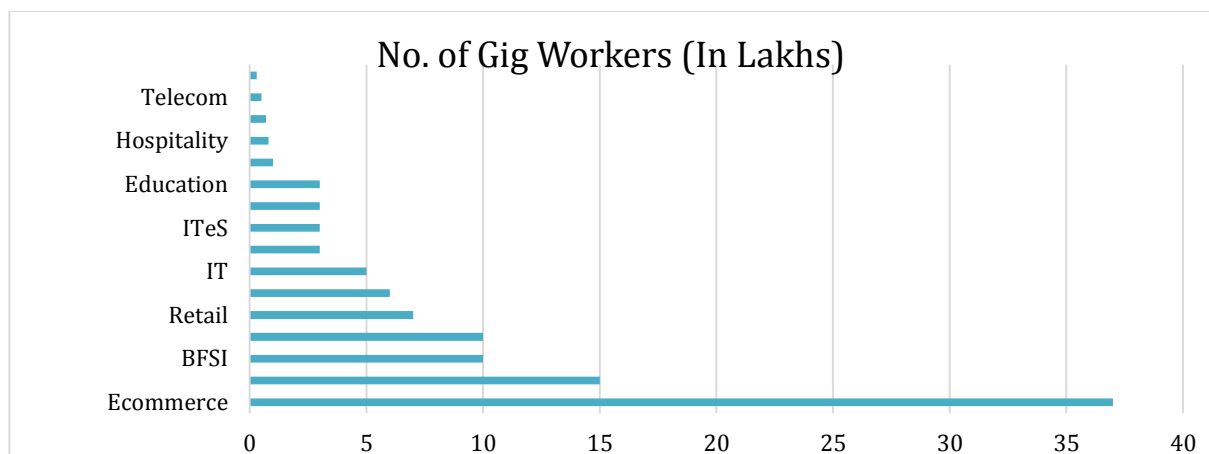


Fig 1: Number of gig workers (in lakhs) in India according to sectors

b. Sector vs average salary rate per hour:

Top Paying Gig Job in USA	
Sector	Average Salary rate per hour (In US Dollar)
Massage Therapy	27.84
Freelance	25.33
Home-Cooking	25.23
Teaching	20.81
Delivery	17.1

Handyman	16.71
Baysitting	15.76
Driving	14.36
Local Guiding	14
Pet Sitting/Walking	13.17
Cleaning	11.29

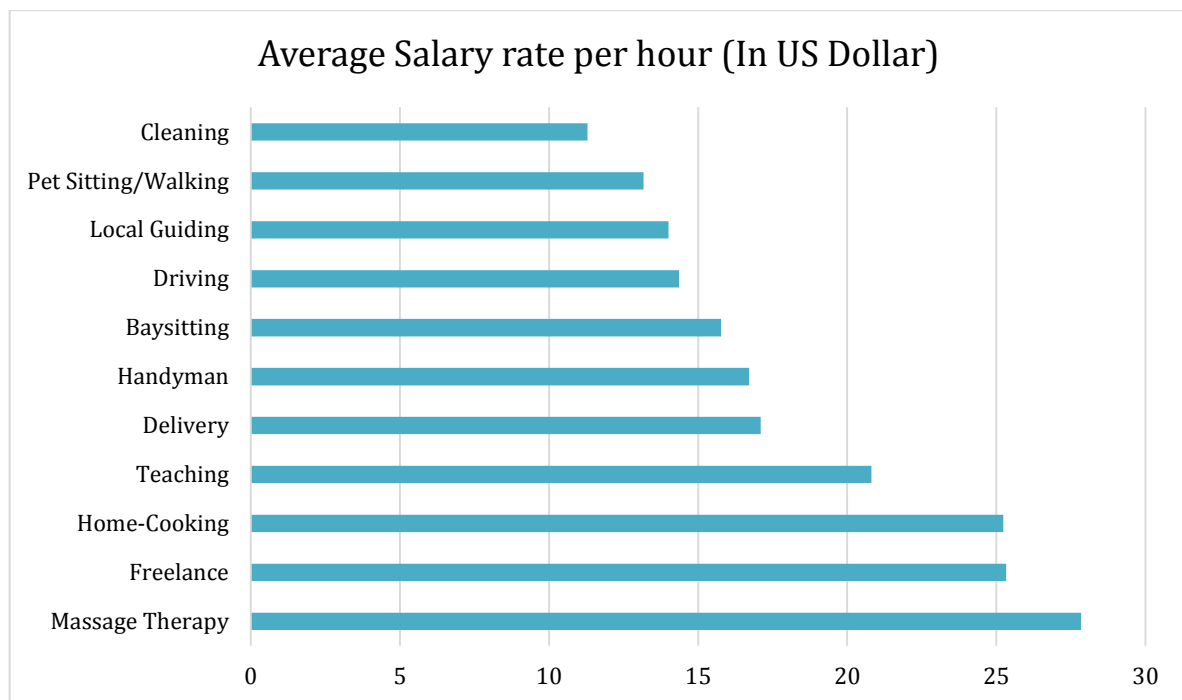


Fig 2: Average Salary rate per hour (in USD)

c. Parameter vs cab driver, delivery persons (%)

Parameter	Cab Drivers (in %)	Delivery persons (in %)
Hours spent driving (>10 hrs per days)	83	75
No weekly offs	40.7	48.2
Dissatisfaction with current fares	80	73
Adverse impact of ID blocking	83	87
Violence at work	47.1	41.5
Difficulty in managing household expenses	72	76

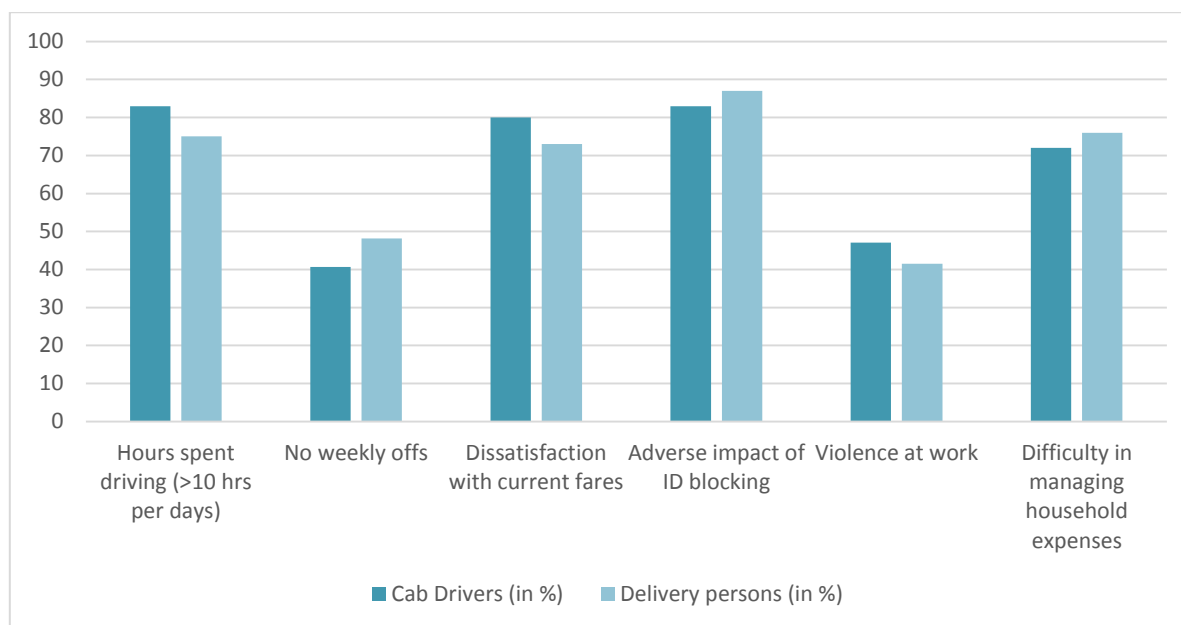


Fig 3: Percentage divide between cab drivers and delivery persons in different category

d. % population vs types of skills

Types of Skills	% Population
Low skilled jobs	31
High Skilled jobs	22
Medium skilled jobs	47

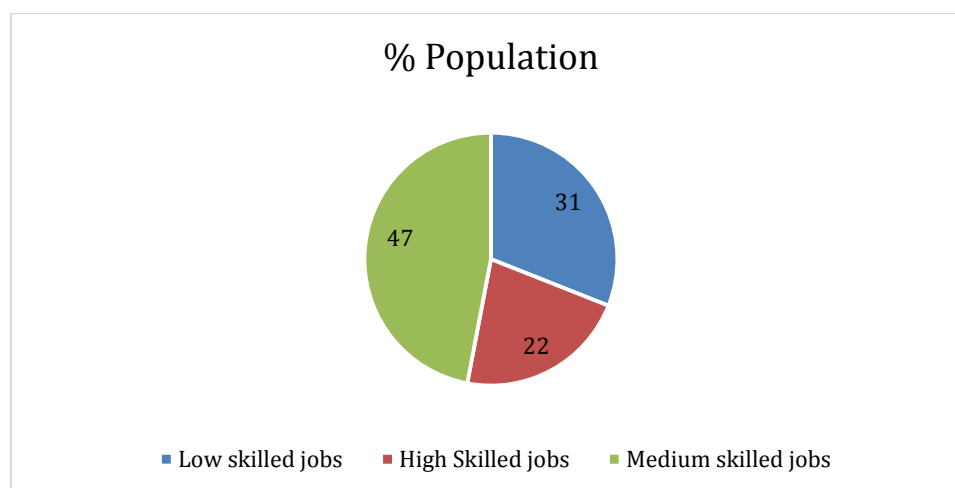


Fig 4: Population percentage according to skill level

7. CALCULATIONS:

- Number of Gig Workers in India (in millions)**

Again considering x=2017 as 1, 2018 as 22026 as 10.

Taking y as number of gig workers in India (in millions)

We plotted a graph and try to draw different graphs by hand fitting, converting maximum numbers of points.

We get quadratic equation.

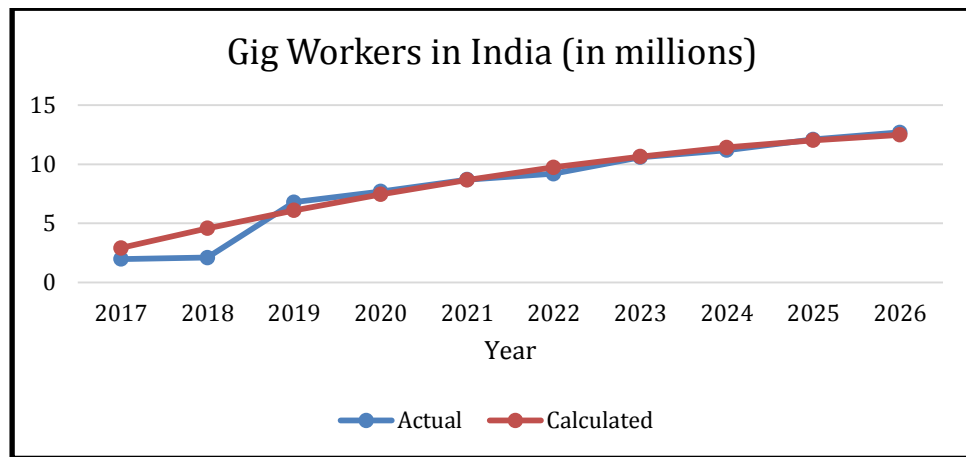


Fig 5: Gig workers in India (in millions)

$$\text{Formula: } y = -0.075x^2 + 1.89x + 1.102$$

Where “y” represents number of gig workers in India (in millions) from 2017 to 2026 and “x” represents 1, 2,3.....(1 represents 2017, 2 represents 2018 and so on).

- Number of Gig Workers in USA (in millions)**

Again considering x=2017 as 1, 2018 as 22026 as 10.

Taking y as number of gig workers in USA (in millions)

We plotted a graph and try to draw different graphs by hand fitting, converting maximum numbers of points. We get quadratic equation.

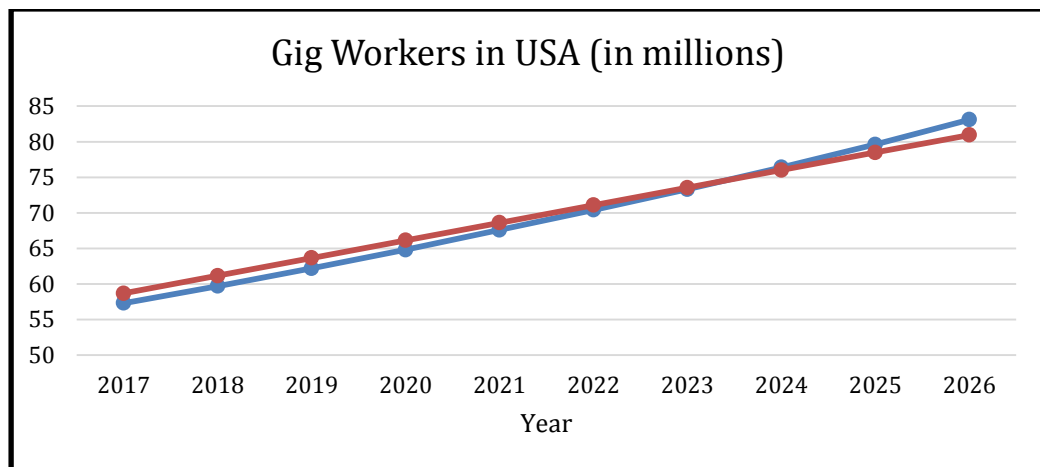


Fig 6: Gig workers in USA (in millions)

$$\text{Formula: } y = 1.417x^2 + 40.256x + 161.91$$

Where “y” represents number of gig workers in USA (in millions) from 2017 to 2026 and “x” represents 1, 2,3.....(1 represents 2017, 2 represents 2018 and so on).

- Gig Worker economy in India (in USD Billion)**

Again considering x=2021 as 1, 2022 as 22026 as 6.

Taking y as gig worker economy in India (in USD billion)

We plotted a graph and try to draw different graphs by hand fitting, converting maximum numbers of points.

We get quadratic equation.

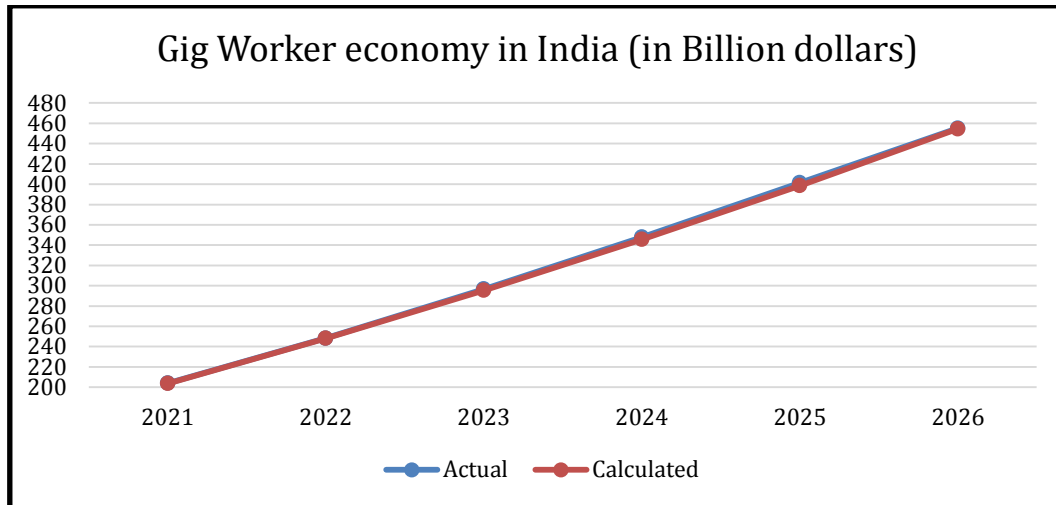


Fig 7: Gig workers Economy in India (in billion USD)

$$\text{Formula: } y = 1.417x^2 + 40.256x + 161.91$$

Where “y” represents gig worker economy in India (in USD billion) from 2021 to 2026 and “x” represents 1, 2,3.....(1 represents 2021, 2 represents 2022 and so on).

8. CONCLUSION

The present study investigated the growth trajectory of gig workers in India and the United States, along with their cumulative contribution to the respective national economies. Through rigorous data fitting and regression analysis, the number of gig workers in both nations over the observed time period was found to follow an upward-opening quadratic trend, confirming that gig employment is not merely a transient labor phenomenon but a structurally accelerating one. For India, the estimated equation governing gig worker growth was derived as:

$$\text{India (t)} = a_1t^2 + b_1t + c_1, \text{ where } a_1 > 0$$

With the positive leading coefficient confirming an accelerating, concave-upward growth pattern. Similarly, for the United States, the model yielded:

$$\text{USA(t)} = a_2t^2 + b_2t + c_2, \text{ where } a_2 > 0$$

Both equations exhibit positive second derivatives, indicating that the rate of gig worker addition is itself increasing over time a hallmark of quadratic acceleration rather than mere linear expansion.

The economic contribution associated with gig labor in both countries was modeled in parallel. The economic output attributable to gig workers in India and the USA also conformed to upward quadratic equations of the form:

$$\text{E(t)} = \alpha t^2 + \beta t + \gamma, \text{ where } \alpha > 0$$

This reinforces the finding that as gig workforce size grows quadratically, so does its macroeconomic footprint encompassing platform revenues, consumer spending enabled by gig services, tax contributions, and GDP share attributable to the informal-yet-digital labor sector.

9. KEY TAKEAWAYS

The quadratic nature of all four derived equations two for workforce count and two for economic contribution carries significant policy implications. First, it suggests that without structural intervention, the gig economy will continue to

expand at an increasing rate, potentially outpacing existing labor regulation frameworks in both countries. Second, the upward curvature in economic contribution equations implies that policymakers stand to gain substantially by formalizing and supporting gig labor, as the economic returns compound over time.

India's gig sector, driven by platforms in logistics, food delivery, ride-hailing, and freelance digital services, is projected to absorb tens of millions of additional workers over the coming decade. The USA's gig economy, more mature but still growing, continues to expand across creative, technical, and service-based freelance domains. In both cases, the quadratic models suggest inflection characteristics that make early regulatory and social security intervention more cost-effective than deferred policy action.

10. LIMITATIONS AND FUTURE SCOPE

It must be acknowledged that quadratic models, while statistically significant over the observed window, carry inherent extrapolation risk. Real-world gig worker growth may encounter saturation effects, regulatory disruptions, or macroeconomic shocks that flatten the curve beyond the projection horizon. Future research should explore piecewise or logistic growth models to account for potential ceiling effects, and should disaggregate gig workers by sector, income quintile, and formality status to enable more targeted policy recommendations.

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