Where Have All Tech Layoffs Gone? A Model of Two Worker Types with Outsourcing

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Abstract

The flourishing of IT-sector and IT-enabled services has led to emergence of different activities by leaps and bounds thanks to proliferation of Virtual plaform-based transactions, and E-commerce. However, massive layoffs started in 2022, as all tech giants encountered revenue declines amidst supply chain issues, inflation, Ukraine war, leading to deflation and fears of recession squeezing consumer and business spending. This has happened across the globe. In the context of the countries supplying low-wage labor (skilled wage in Indian Silicon Valley at Bengaluru is lower than that in the Californian Silicon Valley), similar episodes unfolded but to a different extent. The evidence suggests that layoffs in developing economies like India is much less than that in the US with limited impact on Indian industry despite severe global downturn. Jobs and hiring will move out of the developed markets to these emerging markets with cost advantages owing to lower salaries, as with low demand, drive to cutdown costs will induce firms to outsource some operations outside while focusing on core functions provided the cost of outsourcing is not too high. In this paper, we build a model to show how contraction in demand for IT-enabled works will determine how much of works to be completed in the US (home) and the remainder to be sourced out to say, India (abroad). We identify the conditions under which switching from pure domestic production to outsourcing using hired foreign workers will happen. We show that in both cases of perfectly competitive homogeneous product as well as in case of differentiated goods oligopoly scenarios that the hiring ceases drastically in the home while the outsourced workers will not suffer to a large extent. Home bears the burden of adjustment due to the sheer cost disadvantages of the home.

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1. Introduction:

The flourishing of IT-sector and IT-enabled services has led to emergence of different activities by leaps and bounds thanks to proliferation of Virtual platform-based transactions, and E-commerce (Marjit, Das and Mandal 2023). During Post-Pandemic (Covid-19) period, due to social distancing this has accelerated furthermore thanks to emergence of the online demand and service delivery. This has led to rapid booming of the gig economy and informal sector employment where mostly semi-skilled and low-skilled workers are absorbed.

However, during the Post-Covid-19 phase, gradual elimination of social distancing regulation and return to almost normalcy has led to plummeting of the online activities as work-from-home has been reduced. Not only that, due to uncertain macroeconomic conditions thanks to war and pandemic-induced crisis spillover, the intensity of such work has also gone down in an altered global environment. With high inflation, Russian-Ukraine war driven hike in energy prices, esp., oil, increase in interest rate (continuing still now) to stave off demand, all these dried up the demand after pandemic subsided and resurgence of normal activities occurred. Although massive layoffs started in 2022—just after the hiring binge during work-from-home and lockdown phase supporting e-commerce and remote work—as all tech giants encountered revenue declines amidst supply chain issues, inflation, Ukraine war, leading to deflation and fears of recession squeezing consumer and business spending, it continued in 2023.

This has happened across the globe including the US and other economies as well as in developing economies like India. As per various reports, major tech firms like Amazon, Meta, Microsoft, IBM and Google (Alphabet) have done massive layoffs with hiring cuts. Many IT workers, hailing from India, suffered from this massive layoff overnight as their contracts were terminated suddenly[1]. Several recent issues of 'The Economist' magazine (March 2023, February 2023) have documented this evidence

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[1] https://www.bbc.com/news/world-asia-india-63658535

where it is reported that American tech behemoths have cut 18,000 white-collar jobs and totally 118,000 during 2023 and some of these layoffs are going to new generative AI startups.

In the context of the countries supplying low-wage labor (skilled wage in Indian Silicon Valley at Bengaluru is lower than that in the Californian Silicon Valley), similar episodes unfolded but to a different extent. IT-sector is the backbone of Indian Economy and post-1990 service-sector led growth. It has also experienced layoffs. Start-up sectors have suffered more.[2] They also experienced reduced demand for virtual transactions and work-from-home resulting in layoffs of workers, too.[3]

However, the evidence suggests *that layoffs in India is much less than that in the US*.[4] A recent media report says that there is limited impact on Indian industry despite severe global downturn. Further, it reports- based on Layoffs.fyi- that worldwide 1,044 tech firms cut 1.60 lakh jobs as opposed to only 35.000 job cuts in India-headquartered firms.[5] Thus, the spillover impact of the global slash in hiring in India (and countries alike) could be less without much turmoil in the employment.

Often, firms' overestimation of demand and recessionary spiral led to cutting down on operating and capital expenditure as developed markets in the US, UK, and Western EU experienced low growth. This implies that the adverse demand for such activities will impact the labor demand, and hence, employment in the source (viz., USA) and the client destinations differently. In other words, as USA outsources many of its works to India (and other emerging market countries such as Vietnam, China, etc.), the contraction in demand on pattern of hiring in the US and in the client countries, such as, India or China will change. Typically, *reverse brain-drain* is taking place and not only that, IT-professionals and

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[2] https://techcrunch.com/2023/08/04/tech-industry-layoffs-2023/

[3] Some reports have named it as 'Tech pandemic'. Despite WARN (Worker Adjustment and Retraining Notification) Act, these layoffs took heavy toll all on a sudden.

[4] https://www.thehindu.com/news/national/kerala/tech-layoffs-happening-in-us-not-india-says-union-minister-rajeev-chandrasekhar/article66520445.ece

[5] https://theprint.in/economy/big-techs-laid-off-over-2-6-lakh-people-since-2022-why-indian-industry-will-face-limited-impact/1364896/

workers in the IT sector are staying back in India without migrating via H1B visa, and hence retaining the

skilled professionals in the country as some jobs might be relocated there.[6] Thus, global downturn in

demand may boost hiring in India as with low demand, drive to cutdown costs will induce firms to

outsource some operations outside while focusing on core functions provided the cost of outsourcing is

not too high. Jobs and hiring will move out of the developed markets to these emerging markets with

cost advantages owing to lower salary[7]. With spread of technological talent this might boost hiring in the

local job-market in India and China, upsurging demand for trained workers, with reduced attrition rates.

With cost-advantage, countries like India will face less impact of the economic meltdowns of global

layoffs if the cost of shifting work is not prohibitive. In fact, the director of the reputed IT-company

funder Infosys opined that in these technological cycle, 'tech layoffs are an opportunity for India' (see

https://www.cnbc.com/2023/04/27/us-tech-downturn-is-an-opportunity-for-india-infosys-narayana-

murthy.html). In fact, all these big global tech companies will be looking for relocating production to

more cost-effective countries like India, China, Vietnam, etc. with robust IT services sector as digitization

spreads with rollout of 4G/5G services. Four sectors—startup sector, technology platform firms, IT

services sector, and captive or back-office service delivery center—are crucial, and most of these sectors

try to outsource to countries like India even if there are some costs of outsourcing on top of low salary

unless these costs exceed the cost in the original location.

Thus, the stylized facts of less layoffs in countries like India vis-à-vis the developed nations like

the USA (with higher layoffs) triggered by decline in demand is interesting to analyze. Although changes

in supply-demand dynamics during pandemic and post-pandemic period caused spree in layoffs,

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[6] https://thediplomat.com/2023/02/what-the-us-tech-layoffs-mean-for-india/
[7] https://theprint.in/economy/big-techs-laid-off-over-2-6-lakh-people-since-2022-why-indian-industry-will-face-limited-impact/1364896/

obviously, the important point is to identify the conditions under which switching from pure domestic production to outsourcing using hired foreign workers will happen.

In this paper, we build a model to show how contraction in demand for IT-enabled works will determine how much of works to be completed in the US (home) and the remainder to be sourced out to say, India (abroad). This is from the perspective of the home country who wants to take advantage of the low-wage labor cost (ceteris paribus) abroad (developing economies).

Section 2 builds up the model, Section 3 develops an extension with alternate market structure, and Section 4 concludes.

2: The Model and Results

Consider a multinational or an IT corporation facing two sets of skilled workers, at home (her own country) and abroad (the client) with different wages, but with identical skills (and same productivity).[8] Let the wage rates be W (at home) and W* (abroad), so that:

$$W > W^* \qquad\qquad (1)$$

Labor (professionals with skills tethered to a particular job) is the only factor of production denoted by L (at home, say USA) and L* (say in client country, such as, China or India) respectively.

Total employment is given by: $\overline{L} = L^* + L = (\overline{L} - L^*) + L^*$

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[8] Skill heterogeneity across countries, such as, in the US and India, could be considered. However, that does not undermine our purpose because in IT-based works or Virtual Platform based works, skills are similar types and involve decisions employing either domestic skilled engineers, or H1-B workers (software professional immigrants in the US), or outsourcing to clients such as China, India, Vietnam, etc. countries (see Marjit, Das and Mandal 2023, Cambridge University Press).

The firm can outsource part of production with an outsourcing cost which is increasing in the size of outsourced employment. So, the effective hiring cost[9] is given by:

$$W^* + f(L^*) \text{ with } f(0) = 0, f'(0) \cong 0, f'>0, f'' > 0 \text{ for } L^*>0 \qquad (2)$$

We work with a reduced form revenue function of the firm:

$$R = R (L+L^*) \qquad (3a)$$

And, $$R(0) = 0, R'>0, R'' < 0 \qquad (3b)$$

Profit-maximization would imply:

$$R' = W = W^*+ f'(L^*) \qquad (4)$$

Or, $$W = W^*+ f'(L^*) \qquad (5)$$

R' is the value marginal product of labor (VMPL) for all L+L*.

No outsourcing should imply optimum L* = 0.

Then, it must be true that for L* = 0, W< W*+f'(0) (6)

If f(0) = 0 and f'(0) $\cong$ 0, (6) must not hold as W>W*. Hence, L*>0. That is, some outsourcing has to be there.

Let $\widetilde{L}^*$ be such that W*+ f'($\widetilde{L}^*$) = W (7)

Equation (7) implies that: $\forall L^* > \widetilde{L}^*, W^* + f'(\widetilde{L}^*) > W$

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[9] This type of cost-differentials has been used in the related literature in different contexts, see for example, Bandyopadhyay, Marjit and Yang (2014), Marjit and Kar (2012), Marjit, Ghosh and Biswas (2007). Some outsourcing literature is also quite well-known, for example, Egger and Egger (2006), Jones, (2005), Harrison and McMillan (2011).

Now consider $\dfrac{\partial R}{\partial L} = W$ at $L = \overline{L}$ with $\overline{L} \le \widetilde{L}^*$.

Note that $\forall L^* \le \widetilde{L}^*$, $W^* + f'(\widetilde{L}^*) < W$ (8)

Thus, the entire work would be outsourced if $L \le \widetilde{L}^*$.

Hence, for any $\overline{L} \le \widetilde{L}^*$, there will be no hiring in the home (source) country by the firm.

Let $\overline{L} > \widetilde{L}^*$, then the following proposition is straightforward.

Proposition 1: If $\overline{L} > \widetilde{L}^*$ ***, then*** $(\overline{L} - \widetilde{L}^*)$ ***would be hired at home and*** $\widetilde{L}^*$ ***would be hired abroad through outsourcing.***

Proof: We have shown that upto $\widetilde{L}^*$ all work would be outsourced. Also, $\forall L^* > \widetilde{L}^*$, foreign hiring cost is greater than the home wage rate. So, $(\overline{L} - \widetilde{L}^*)$ would be hired at home (i.e., by the multinational corporation). (QED).

Note that the total employment is $\widetilde{L}^* + (\overline{L} - \widetilde{L}^*) = \overline{L}$. Now, we are all set to study the impact of a contraction in demand for the product or services on the pattern of hiring. As we have discussed earlier in post-Covid times, decline in demand for work from home and/or, many virtual activities led major IT firms to layoff substantial number of workers.

Proposition 2: Suppose $R'(L)$ ***drops due to demand contraction. Then, (i) employment at home must decline but outsourced hiring may remain unaffected. (2) if the decline is substantial, the entire home employment would vanish, but not outsourced hiring.***

Proof: Let $\overline{L}_1$ now solve $R'(\overline{L}) > R'(\overline{L}_1) = W$ (9)

Here $\overline{L}_1 < \overline{L}$. Let $\widetilde{L}^* < \overline{L}_1 < \overline{L}$. Then $\widetilde{L}^*$ remains the same and employment drops as $\overline{L}_1 < \overline{L}$. This

proves (i).

Suppose $\overline{\overline{L}}_1 \leq \widetilde{L}^* < \overline{L}$. Then, entire home employment is wiped out and only outsourced hiring of $\widetilde{L}^*$

continues. This happens with:

$$R'(\overline{L}_1) = R'(\widetilde{L}^*) = W = W^* + f(\widetilde{L}^*) \qquad (10)$$

If $R'(\overline{L}_1)$ drops further, $\widetilde{L}^*$ will fall. This proves (ii) above. (QED).
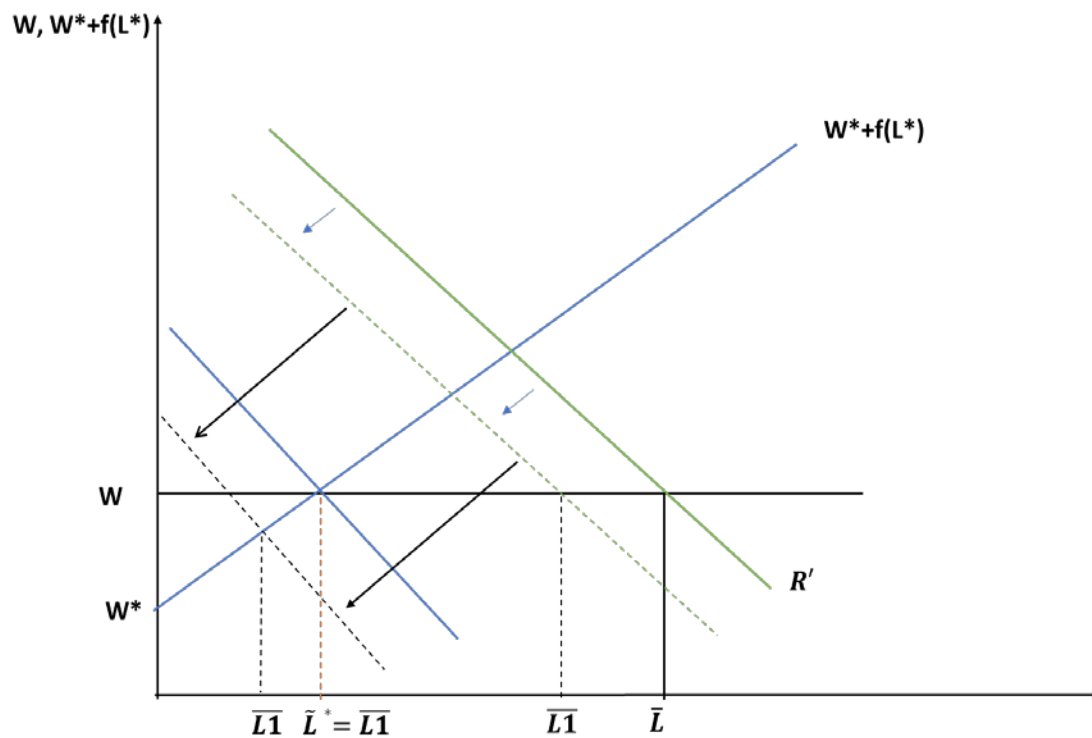
The following picture tells it all.

Figure 1: The mechanism of decline in demand and resultant outsourcing of labor service.

$(\overline{L}, \widetilde{L^*})$ and three positions of $\overline{L_1}$ prove the point that outsourced hiring may not be affected by demand

contraction. R' is the Value marginal product of L + L*. $\widetilde{L^*}$ is the cut-off point for hiring workers at home

and abroad (i.e., outsourcing). Clearly, beyond that point there are zones where home and foreign

workers both are hired while hiring of foreign workers do not contract considering the zones on the left

of the cut-off point. In what follows, we now consider the case of an imperfectly competitive

environment.

3: Extension of the Basic Model

Here we complicate the product market structure by introducing a large number of firms and

differentiated products we demonstrate that our fundamental result, i.e., the burden of the lay-off due

to demand contraction would still be imposed on "home" workers. Bandyopadhyay, Marjit and Yang

(2014) considers oligopolistic structure in the context of outsourcing barriers and trade policy. Several

other papers considering the convex costs in that genre are by Mukherjee (2023) in the contexts of

cooperative R&D and technology licensing. Also, in the context of unionized labor market Mukherjee

(2008) and, Cao and Mukherjee (2018) show that FDI and export both could occur as fixed costs of FDI

affect production strategy of the foreign firm via endogenously determined wage rate when foreign firms

are technologically superior to the recipient. Also, issues related to entry costs, market size and demand

and their impacts on output are discussed in a non-competitive oligopolistic framework (see Dastidar

and Marjit 2022, Marjit, Dastidar and Das 2022).

We start with 'n' firms with symmetrically differentiated goods. The demand function for the

i^{th} good, i=1, 2, 3, …… ….., n would be given by:

$$P_i = a - q_i - \sum_{j \neq i} \theta q_j, \text{ where } \theta \leq 1 \tag{11}$$

"a" represents market size effects, and θ measures the extent of product differentiation where $\theta \in [0,1]$ with $\theta = 0$ implying no close substitutes (unrelated) and $\theta \to 1$ means close substitutes (less product differentiation or more homogeneous), $0 < \theta < 1$ with stronger own-price effect.

The cost function will be

$$C_i = WL_i + W^* \widetilde{L}_i + f(\widetilde{L}^*_i), f' > 0, f'' > 0 \tag{12}$$

Thus, profit is written as:

$$\pi_i = [a - q_i - \sum_{j \neq i} \theta q_j] q_i - WL_i - W^* \widetilde{L}^*_i - f(\widetilde{L}^*_i) \tag{13}$$

We work with the assumption that both for home and outsourced workers, one unit of output requires one unit of labor (same skill or marginal productivity of home and foreign workers) and

$$f(\widetilde{L}_i) = \frac{1}{2} \widetilde{L}_i^2 \tag{14}$$

From (14) and $MC_i = M\widetilde{C}_i$ condition, we get with $\widetilde{q}_i = \widetilde{L}_i$ by assumption,

$$W = W^* + \widetilde{q}_i \tag{15}$$

Therefore, $\quad\quad\quad\quad\quad\quad \widetilde{q}_i = W - W^* \tag{16}$

(16) is easy to interpret. Higher is W or lower is W, $\widetilde{q}_i$ will be higher because of the cost advantage. Also, given $W - W^*$, $\widetilde{q}_i$ is uniquely determined.

Now total employment $\overline{L}_i$ is determined by maximizing π_i and $MR_i = W$ condition:

$$a - 2q_i - \sum_{j \neq i} \theta q_j = W \tag{17}$$

Note that we are in a symmetric world hence the Cournot-Nash equilibrium should yield $\overline{L}_i = L, \forall i$. In other words, $\overline{q}_i = \overline{q}, \forall i$.

Therefore, from (17)

$$a - 2\overline{q} - \theta(n-1)\overline{q} - W = 0 \qquad (18)$$

$$\overline{q} = \frac{a - W}{2 + \theta(n-1)} \qquad (19)$$

Therefore, home employment (output) for firm is:

$$L_h = [\overline{q} - (W - W*)] = \frac{a - W}{2 + \theta(n-1)} - (W - W^*) \qquad (20)$$

On further simplification, we derive:

$$L_h = \frac{[a - [3 + \theta(n-1)].W + [2 + \theta(n-1)].W^*}{2 + \theta(n-1)} \qquad (21)$$

The size of the employment decline following $da < 0$ would be:

$$|dL_h| = \frac{|da|}{2 + \theta(n-1)} \qquad (22)$$

Note that $\tilde{L}(\tilde{q})$ would not change as long as $(\overline{q} - \tilde{q}) \geq 0$ as in the simple case.

Equation (22) suggests that for smaller decline in "a", the drop in L_h would be higher if $\theta(n-1)$ is lower.

Given "W", the less differentiated are goods the more would be the employment decline, and for less competitive industries W low would imply greater contraction in output and employment.

However, the punch line remains the same, i.e., the burden of adjustment falls on the home workers and the outsourced ones won't be affected.

4. Conclusion.

In this paper, we have addressed a recent phenomenon—thanks to post-pandemic decline in demand for online works—of technological layoffs in the USA affecting the skilled engineers, esp. those from other countries, such as, India and China where abundance of skilled professionals migrated to the US with H1B visa. On the other hand, in case of India in particular the layoffs are not that significant. However, this has created a furor over 'reverse brain drains' or 'reverse migration'. Given this backdrop, this paper builds a model to show that irrespective of what happens in hiring (employment) in the source country where multinational corporations head-offices are located, outsourcing to the client abroad will never vanish even though the fall in demand causes contraction in employment in the home to a large extent. In other words, we show that in both cases of perfectly competitive homogeneous product case as well as in case of differentiated goods oligopoly scenarios that the hiring ceases drastically in the home while the outsourced workers will not suffer to a large extent. Home bears the burden of adjustment due to the sheer cost disadvantages of the home.

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