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Applying Game Theoretic Frameworks to Assess the US - India H1B Issue of 2017

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Abstract: ***Throughout the US Election race of 2016 the Trump administration has mentioned increasing the US workforce in multiple fields, including the IT sector. One of the prominent proposed solution to increase the amount of US technicians in IT companies was to reduce the H1-B visa quota for non-indigenous IT companies. The purpose of this case study is to analyze how the Indian IT companies should react to this 'visa reduction' using Game Theoretic frameworks involving Equilibrium (Nash) analysis.***

Keywords: Game Theory. Nash Equilibrium, Foreign Policy, H1-B visa

1. Methodology

The paper is drafted on the premise of both players i.e. US administration and Indian IT companies considering certain strategic options. The paper deliberates upon the logic of each option and its assumptive value in the payoffs.

The application of this method of problem solving assumes "player rationality" in selection of the most optimal choices. The payoffs have been constructed on the basis of subjective probabilities, which could differ in their magnitude between readers. However such payoff alterations, without loss of generality, will not dramatically alter the outcomes in strategic decision making.

The objective of the US Administration is to reduce the Unemployment rate in the US. There are two prominent ways of achieving it, a) By increasing the number of US citizens in the IT sector or b) Gaining tax - revenue by increasing the Cost to hire Indian workforce.

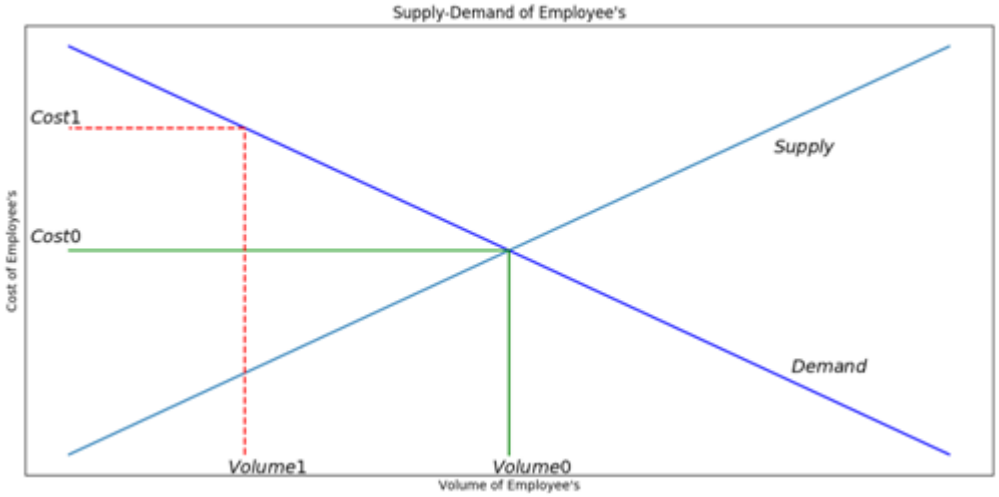

Figure 1: Demand-Supply Graph

Let us assume that currently the US Administration and the Indian IT companies are at equilibrium with respect to demand and supply of labor. The current Volume of Employee's is Volume0 and the current Cost of Hiring an employee is Cost0 as seen in the above diagram 1,

The US Administration will either change the Volume to Volume1 or change the Cost to Cost1. Both options will lead to a similar conclusion for the IT companies i.e. the cost of each employee will increase and hence the equilibrium shifts leading to a decrease in the volume of Indian employees.
The ΔV which is V0 - V1 is a loss of Indian IT jobs which in turn gets converted to a gain for local US jobs, satisfying the US Administration's goal
While the ΔC which is C0 - C1 which is a resultant of the above option will lead to an increase in tax-revenue for the Administration which can be used to create more jobs for their citizens.

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Keeping in mind the inference from the above analysis,we have listed an exhaustive list of options available to both the Trump Administration and the Indian IT companies which could be pursued in case there is a stringent norm on importing overseas labor in the US.

Set of hypothetical options considered are listed below.

Options for the Trump Administration

1) Impose a limit for H1-B visas to 90k
2) Increase the Base Salary(Minimum wage) for everyIT technician
3) Increase the tax on US jobs for non-indigenous IT companies

Options for Indian IT companies

1) Automate a significant amount of process in the Companyto save long term costs
2) Aggressively increase presence in Emerging Markets (Brazil, Europe, Japan etc.)
3) Offshore many employees from US back to India.

The above list has been constructed using qualitative analysis derived from inference of articles in established journals, net available papers and quotes from prominent people in Indian IT companies and the US Administration.

The lists are used to form a Payoff Matrix with the US options as the Row Player and the Indian options as the Column player.
Since the options considered in the paper, are three a player, we develop this into a 3X3 matrix.

The values in the matrix are constrained to a scale from 0 to 10. These values are not actual revenue/ sales etc. but merely indicative to how much overall 'gain' which is perceived by the players over their current positions. The matrix could also have been developed considering loss from the scale of -10 to 10. To keep the analysis straight forward, we have considered a strict positive value matrix.

Table 1: Payoff matrix

	Offshoring	Automating	Emerging markets
Limit for IT H1-B visa	(5,5)	(3,7)	(7,3)
Increase base Salaries	(7,3)	(5,5)	(7,3)
Increase Tax on US tenders.	(6,4)	(5,5)	(6,4)

The above matrix has Columns as Options for Indian IT Companies and Rows as Options for the Trump led US administration.

Each cell is written in the form (x, y), where eachx corresponds to the payoff for the Trump Administration choosing the row option andy corresponds to the payoff for Indian IT companies choosing the column option. A detailed explanation for why each $x_i$and y_i was allotted to the cell is given below.

Calculating the Payoffs:
The payoff for each cell is calculated in a similar fashion as the example below.

For Automating and Limiting H1-B cell, when we take the base anchor 5 for each Player, then the 2 (perceived loss) lost by US Administration is gained by the Indian IT companies.
For US Administration: 5 - 2 = 3
For Indian IT Companies: 5 + 2 = 7 (Same 2 that was lost by US Administration)

Reasoning behind each Payoff Cell:
Player 1: US Trump Administration
Player 2: Indian IT Companies

1) X1, Y1 (Limiting H1-B and Offshoring): Both Players have equal payoffs, as Offshoring and Limiting H1-B will reduce the Indian workforce, in turn creating more jobs for the US citizens and relaxing the strain on the US population.
2) X1, Y2 (Limiting H1-B and Automating): Automating reduces the human error, training cost and HR services for the IT companies and for the US govt., it increases the influx in its economy as more jobs for US citizens and better results for the US companies due to Automating.
3) X1, Y3 (Limiting H1-B and Emerging Markets): Attacking Emerging Markets reduces the population in the US but also creates lack of employers for them, but conversely the US markets are much more return giving and easier to control as the IT companies have set up relations there from before, hence Attacking Emerging markets seems as an excellent move when US plays reducing the visa's, but has lower payoff's due to the increase in cost of hiring new employee's.
4) X 2,Y1(Increase in base Salaries and Offshoring): Increase in base salaries leads to increase in jobs for US citizens and increases the influx in its Economy and creates a good payoff for the US Administration.IT companies minimize doling out a lot of money by offshoring, but ultimately are at a loss.
5) X2, Y2 (Increase in base Salaries and Automating): Both Players have an equal payoff, as Automating reduces the number of jobs and hence nullifies the effect of increasing the base salary. But invariably both have gains as the cost of each new employee increases.
6) X2, Y3(Increasing the base salary and Emerging markets): When the IT companies move to emerging markets, there will be lesser jobs in the US, but ultimately it will lead to an increase in the Cost of hiring a new Indian employee which will be a greater gain for US Administration.
7) X3, Y1(Increasing tax on US tenders and offshoring): The payoff are higher for the US Administration as increasing tax will boost the US economy but offshoring will reduce the cost barred by the IT companies.
8) X3, Y2(Increasing tax on US tenders and Automating): Automating will help get more tenders and faster results, leading to more projects for the IT companies but in turn more tax, hence US administration has an equal payoff to that of the IT companies

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9) X3, Y3(Increasing Tax on US tenders and Emerging markets):The IT companies are at a loss as the Emerging Markets are harder to break into than the already established US market. The increase in Tax will benefit the US Administration as it will boost the economy by increasing tax-revenue.

As we can clearly see from the payoff matrix, for the US Administration, Increasing base Salaries dominates the other strategies i.e. Limiting H1-B and Increasing Tax on US tenders. On the other hand, for Indian IT companies, Automating seems to be a dominant strategy over Offshoring and Moving to Emerging Markets.

Consequently, we discard all the dominated strategies and keep only Increasing Base Salaries and Automating options.

We don't need to search this matrix for Pure Nash Equilibriums. As there is only one cell left, that is Pure Nash Equilibrium.

2. Analysis

Understanding the Trump Administration choices of strategy which lead to Pure Nash Equilibrium:i.e. **Increasing Base Salaries**.

During the US 2016 Election, Donald Trump mentioned several times in his speeches that the main goal of any visa reduction or placing sanctions will be to decrease the US unemployment rate. The above option, exhibits just that.

We can also infer from the above Demand-Supply graph that increasing the cost of hiring a new employee will lead to reducing the volume of Indian employees which in turn increases the number of jobs for US citizens.

Understanding the Indian IT company's choices of strategy which lead to Pure Nash Equilibrium: **Automating IT processes'**

On closer observation the above optionis in line with the recent 2017 layoffs in India. Many CEO's and CFO's have stated that the main reason for the layoffs has not been the H1-B visa problem rather the laid – off employees had not upgraded their skill sets. Automating and Artificial Intelligence, brings less human error, reduced cost and clinical precision to the table, which is something the current crop of IT employees need to cope up with.

Even as we have charted out the Pure Nash Equilibrium, it seems that Indian IT companies are dominated in almost all the strategies.

Reasons for why Indian IT companies face a set of dominated strategies:

There are 2 positions seen in strategic dominance games, players using dominant strategies against players with dominated strategies.

In the context of the paper, India's outside options appear to be slimmer than India's insideoptions; India's best strategic response is to play the "least loss" strategy since most of its strategies appear to be dominated.

There are a few reasons why Indian IT companies are always dominated:

1) Dollar is more powerful than other currencies:
The strength of the US Dollar is one of the main reasons why US has the power to dominate the above game, the payoff the Dollar provides is better or at least equal to that of other currencies.

2) Cost of entry in other markets is higher than US:
Albeit most of the IT companies already have a presence in Emerging Markets, it is minimalistic compared to what they have in the US. Hence it increases the cost of setting up offices, building customer relationships to a level where it would be practical to remain in the US for now.

3) US market is an important area for IT:
For a many years, US has been a very important market for IT sector as a whole. The returns provided by the US markets outweigh that from others. Reducing its presence there will lead to lesser profits and lower market capitalization. Which many IT companies cannot afford.

4) India's Domestic market and currency is not as strong as USA:
The IT companies take the benefit of this fact when they Offshore it's projects back to India, but the Domestic market has many more years to reach the level of the US markets. It poses the same problem as the 3rd point, where US is too important a market to lose for IT companies.

Which makes India's outside options are far weaker than inside options, ultimately leading to a dominated game.

3. Conclusion

As there exists a clear Pure Nash Equilibrium,Player 1's strategy will not change in accordance to what Player 2 will play and vice-versa. The main aim of the US administration is to increase jobs for their citizens even though Indian IT companies may have multiple reasons to employ Automation as their strategy. One compelling reason is the cutting down of overall costs which is aptly fitting the game played above where increased employee costs due to raised salary limit in the US can be offset by Automation in the short run and for the long run, achieving a lower level of overall manpower requirement in IT.

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We are also aware that there may be other strategies available to the Players, which will change the whole matrix. Our reasoning behind each cell and their respective weights may also differ between the readers due understanding of the situation. We have provided an outsider's analysis to what may occur and as of now, most of what we have mentioned has occurred indeed.

US administration has deliberated the H1-B visa reduction and it is a by-product of the Dominant option for the Administration which is increasing the Base Salaries. IT companies have employed automation. Numerous news articles from various publications and magazines validate this.

We invite the reader to change the payoffs of a cell or even add a new strategy to the above set of options and examine whether other game theoretic situations and solutions exist to this India IT companies predicament.

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