

## Building Human Capital to embrace World of AI, Data & Machine Learning as tools of Growth using automated National Labour Exchanges (NLXs)

YAMINI AGARWAL\*  
AMAN AGARWAL\*\*

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### Abstract

Human Capital is key to success to organizations, countries and the world. They determine the trajectory of growth that is built on values of society and understanding of growth and development. The new world embraces what we mathematically call a program of human mind known popularly as the Artificial intelligence with Data being new Gold. With the fancy of the governments to bring everything in control, the new military rule is the digitalization of this public Gold. The data can be trained, tested, develops a new algorithm to ape the human mind but without the heart. Machine learning an interesting revision to the algorithm developed, perfects itself with testing and training. The paper considers that Labour is a valuable Resource and a Wealth of the Nation, having potential to generate more wealth. The paper extends the work on setting up of a National Labour Exchange (NLX) along the lines of NSE, BSE, NASDAQ and Commodity Exchanges Worldwide in order to promote efficiency in the labour market, full employment and generating wealth and positive contributions to GDP.

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**JEL Code :** D51; D53; J12; J18; J24

**Keywords :** AI; Data; Human Capital; Machine Learning; Labour; Exchange ;  
India

### I. Introduction

JUNZO WATADA (PRESIDENT, ISME & Professor, Shimonoseki City University & Waseda University, Japan); Jeng-Shyang Pan (Professor, Nanjing University of Information Science and Technology, China); Witold Pedrycz (Professor, University of Alberta, Canada); Yoshiyuki Yabuuchi (Professor, Shimonoseki City University, Japan); Yoshiyuki Matsumoto (Professor, Shimonoseki City University, Japan); Naruki Shirahama (Professor, Shimonoseki City University, Japan); TV Gopal (Vice-Chair, ISME

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1 Invited to be delivered as Keynote Address at 19th International Symposium on Management Engineering (ISME) & 20th International Conference on Intelligent Information Hiding & Multimedia Signal Processing (IHMSP) in Matsue, Shimane JAPAN from October 4th-6th, 2024

\* Professor of Finance & Economics and HOD, IIF College of Commerce & Management Studies (CCSU), 45 A, Knowledge Park III, Greater Noida, Uttar Pradesh 201310, INDIA

\*\* Professor of Finance, Dean (International Relations) & Director (Rektor), Indian Institute of Finance, 45 A, Knowledge Park III, Greater Noida, Uttar Pradesh 201310, INDIA

*Submitted September 2022; Accepted October 2024*

& Professor, Anna University, India); Tien-Weng Sung (Vice-Chair, ISME & Professor, Fujian University of Technology, China); Felbin C. Kennedy (Professor, Stella Maris College, India) and other members of the Scientific Committee and scholars from all over the world, it is an Honour to be invited by ISME (International Society of Management Engineers, Japan) to deliver the Plenary Keynote Address at the joint conference hosted at the 19th International Symposium on Management Engineering (ISME Japan) and 20th International Conference on Intelligent Information Hiding and Multimedia Signal Processing (IIHMSP Japan) hosted at Matsue Terrsa in Shimane Japan from October 4th-6th, 2024 at the Heritage City of the Gods Izumo Taisha Shrine. We would like to enlighten the august house on how building Human Capital to embrace World of AI, Data & Machine Learning as tools of Growth using automated National Labour Exchanges (NLXs) based on our earlier works on "Theory of Employment, Wealth and Efficent Labour Market through National Labour Exchange (NLx)" (Agarwal, Agarwal, Agarwal and Agarwal, 2017; Agarwal and Agarwal, 2024).

Human Capital is key to success to organizations, countries and the world. They determine the trajectory of growth that is built on values of society and understanding of growth and development. Educational institutions, peer groups, communities, societies and families together build the human capital. Development and growth are defined by the societies and their histories of thoughts, ideas, cultures and traditions. Among the many landscapes of the shifting paradigm, the human values and their essence have commonly held the technical, economical and social meanings of success, growth and development. Technology has always shifted the production frontier to a higher level promising incremental gains to productivity. The present world observes constantly evolving algorithms that augment the human brain; behavior patterns and life choices with the advantage of speed dial access to data and processing, evaluation, feedback and reorientation. The advancements have changed the way we interact, express, respond and develop our expectations and life anchors. Our habits, attitudes, preferences, movements and even thought today can be mapped by our digital footprints on mobiles, laptops, web apps, smart cards, digital transactions, smart cars and e-governance digital databases. Educational landscapes determined the choices a person made in his life which are today wider in thought and inspiration with each interaction of the world beyond the human interaction. I remember when the computers came for the first time, people feared they would take over humans and their jobs. We also remember how many movies have shown how the human mind by his own creation caused most destruction by developing what was not controllable beyond a point. The Computer did change the way we think, work and live our lives. The algorithms have not stopped there. They have gone beyond the desire to becoming God by creating human like intelligence with machine at its heart. The new world embraces what we mathematically call a program of human mind known popularly as the Artificial intelligence. Data is the new gold. With the fancy of the governments to bring everything in control, the new military rule is the digitalization of this public gold. The data can be trained, tested, develops a new algorithm to ape the human mind but without the heart. Machine learning an interesting revision to the algorithm developed, perfects itself with testing and training. Does all this challenge the human capital?

The fear of the unknown has always haunted the wise. Ignorance is bliss but can the human capital afford to remain ignorant of the impact of artificial intelligence, data and machine learning. Human capital will constantly face challenges from them in every sphere of life. An essential aspect with the race of being God is still in the souls that humans and their touch presents over any algorithms that can imitate human emotions but not human interactions. The human capital needs to train itself to the development of the new technology that closely exhibits powerful intersection of complex and speed processing of mathematically defined situations. It does add to the benefits of productivity in the human working space. Challenging the mere existence or need for human intervention or working. However what a machine cannot be trained is to have a soul for its own, which the creators do not have the power to generate as well. Building human capital in embracing the artificial intelligence, data and machine learning would need that it rests on the soul of values, thoughts and ideas that have cultivated mankind for centuries. The strength of the human capital in understanding the fields of economics, finance, technology, science or any other is possible through the knowledge one gains in understanding these fields and reference output these machines would generate. Yet the use for the solutions offered in managing these technologies will hold the key to human endeavours paving a better life for all.

#### 1.1 *Labour as a Capital Resource*

Labour is the most important resource that utilizes natural or capital resources in most productive manner to create and generate wealth for nations, companies, organizations and for themselves. Despite the technological revolution and advancements in the artificial intelligence, labor continues to be supreme and guides the functioning of all economic events and economic systems. Labor in itself is wealth of a nation. But it is not effectively utilized. Labor suffers from lack of employment opportunities, poverty, poor wage, income variations, immobility and many other problems. In developed economies, wages constitute about 70 % to 80 % of the pre-tax income and post transfer payments with at least one working member in each household. However, in developing and emerging economies this share is less than 50% for example it is 40-50% in Argentina, 40% in Peru and 30% in Vietnam. Self Employment is the main source of income in most of the developing and emerging economies for lack of employment opportunities, information, corruption, lack of transparency, and accountability in recruitments and lack of skills and adequate training. Despite the importance of labor in the world economy, labor market is far from perfect for lack of necessary information available (Agarwal, Agarwal, Agarwal and Agarwal, 2017; Agarwal and Agarwal, 2024).

Labor market in economics implicitly assumes perfect information. It believes that each individual knows everything about all the existing job offers and he or she is just to choose the number of hours he or she would like to contribute to earn a desired wage which is offered as per segmented market determined wages rates. The implicit assumption is erroneous and suffers from distortions. It makes the analysis of labor market to be far from reality. Besides this, there are a number of other distortions even in the most developed and efficient labor market such as : existence of gender

discrimination both in terms job profile, number of hours, wages and promotions. In some countries, reservation policy based on caste both in terms offering jobs and promotions, immobility of labor, wage differentials due to nature of work or type of employer create labor market imperfections.

Theories developed in the past are the foundation stone, an important base, hold due importance for any further work in this field. However, with the changes over the last century, complexity and size of labor market and innovations and information technology, it has become necessary to revisit some of the works developed so far. It is imperative to develop a mechanism or policy framework to deal with some of these and other distortions in the labor markets so as to bring about near perfect situation in the labor market to help both the job seekers and job providers and reach near full employment situation and take care of some of these other distortions. An attempt has been made in Agarwal, Agarwal, Agarwal and Agarwal (2017) to suggest/propose such a mechanism.

#### 1.2 *Global Growth Story in Times of Un-Certainty*

Growth as identified by countries is the Gross Domestic product and its growth rates. It is also observed in many other economic parameters like per capita income, inflation, employment. However, the economies that strive through socio-economic indicators continue to foster strong communities that share joy and sorrow with each other. Similarly, many organization observe their profitability and market valuation with stakeholders as guiding forces of their growth and development. The understanding of the world that can survive for its future generation comes from sustainability. As humans seek sustained growth, they focus on establishing the right balance by interlocking national, organizational and personal growth. The answers may lie with specific fields of accounting, economics, statistics, econometrics, behavioural sciences, medical sciences, engineering sciences or others. They may lie in the complex solutions offered by the highly technically operated artificial intelligence, data usage and machine learning. However there is no one click or push button solution to sustainability. The 17 sustainable goals of no poverty; zero hunger, good health and well being; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice and strong institutions; partnership for goals make the work of building human capital essential and cognitive to the foundation of the mankind's existence of what moves the soul.

The global opportunities for growth are plenty. The world is open to the common man. He or she with the window of their mobile, laptops or any other device can access and understand the world wide networks, institutions, people, societies, communities and markets. The present geopolitical situations pose a challenge to the world economies. The Russia-Ukraine war, Israel-Hamas conflict, Bangladesh civil disturbance, slowing of growth in India and China, election in the world, newly elected ministers are all facing great challenges to livelihoods and people at large. Government continue to struggle with equilibriums in the market both internally and externally especially with social discord and civil unrest affecting internal

well-being. Economies continue to dependent on each other for trade, capital flows and human resource. Many challenges have dealt with the mobilization of data, machine learning and artificial intelligence. Institutions at different levels together with digital wings of development have enabled governments, intelligence agencies and defence forces to gear up for any contingencies that may arise now or then. The state of recession and accommodative stances of the central banks with the elections across the world have a defining order for the flow of money, inclinations and also neural network and human interventions and interactions. Socio-economic growth and environment discipline is essential for survival. Injustice, discriminations, exaggerated actions and impulse reaction at any of the levels of family, organization or country can be potentially damaging. It is important that there is sustainable energy supplies and financial infrastructure to support the same. The world exists on the interdependence of each other and this sustenance is the essential element that should bind growth and development that builds the human capital with or without technology. The promise of a shared prosperous future for generations to cherish needs to be build in goal of human capital development. It is in the times of Covid that digital technologies had enabled people to interact with each other virtually. It is also at those times that people were locked in and their positions could be identified with the google app through the Cowin app. However, in the most difficult solution India devised a vaccine to come out of the pandemic through the help of science and technology. Many digital applications came to use to the government at the difficult times of Covid to locate the cases of infected people, provide vaccination, and also assess the deaths that were caused in the real time basis and take necessary steps to find timely solutions. Today the artificial intelligence based on the data it gathers from the digital or real time spaces through satellites can determine the location, preferences, actions and response of individuals, societies and communities. Science has advanced to the stage to find life in plants in space. Much complexities exists that can be deciphered by the processing of the steps observable and discovered during the process of human interaction development and growth which is much given in the algorithms and coding of the development of artificial intelligence based on data and machine learning with frameworks like ChatGTP, Claude, Google Gemini, Zapier Agents, Microsoft Copilot, Meta AI, Jasper, Amazon Lex, Deep AI, Deepseek as AI Chatbots.

A wide gap is being witnessed between the job seekers and the jobs available because of information asymmetry. The matching of the two is being done through advertisements, through personal contracts or placement agencies and placement consultants. The cost of hiring and also getting jobs through any of the existing sources is costly and does not give the desired choice either to job seekers or to the employers at any level. This is more so when it comes to labor (as defined by ILO). Analysis of the unemployment rate in different countries is indication of the people suffering from income insecurity, poverty and lower quality of life. It is one of the major objectives of any government in any country that employment is generated to alleviate poverty and meet other economic and political motives. Employers always claim that there is a shortage of appropriate skilled and trained labour while skilled labour and trained personnel cry that there are no jobs in the market.

As per ILO estimates 73% of the world population or about 5.2 billion people continue to live without adequate social protection that highlights the social crisis and grave social injustice our economies and societies exist with. About 800 million are poor workers and many of them work in the informal markets. Fiscal Consolidation and adjustment threaten the ongoing processes of egalitarian distributive justice as they impact the living standards of several thousand of households in an economy. High level of poverty, vulnerability and inequalities deepen the social crisis.

Globally, it is estimated that unemployment rates are hovering around 5% as against 5.8% in 2017 which is approximately 201 million people unemployed in 2017. These numbers have sustained with given Covid-19 and Economies in Debt Trap with Central Banks in major economies losing monetary and fiscal control. It is expected to have been increased to 211 million in 2024-25. In developing countries, unemployment has been hanging around 5.7% since 2017. Even developed economies have been observing an unemployment rate is around 4.5 in 2023 (ILO, 2024).

The Central Banks have been playing a crucial role in supporting economic activities. The present challenges of slow growth, inflation and money circulation has demanded accommodative stances from the Central Banks. Many Central banks across the world take their clue from the actions of the Federal Reserve Bank. The accommodative stance adopted in the past has also made many countries rethink their policies to neutralize or accommodate the monetary positions. Further the challenges of geo-political risks and social disorders have further compelled the Central Banks to rethink their monetary policy. Decreased consumption, high inflation, unemployment and social unrest have made it difficult to balance the external and internal position of trade, capital flows and immigration together with money supply. Unfortunately the trained data or information access and modeling of algorithms do not offer complete and foolproof solutions to the challenges that stand before economies. It is an art and not science of things that makes the world go round. Training the human capital to deal with requisite complex variables with variations of human behavior and their interacting complexities is yet a challenge. Nevertheless, the data, machine learning and artificial intelligence does offer a solace to the fact that technical solutions of humanly defined problems that generate institutions of human interaction can be resolved is yet the bulwark of the main challenge the world faces today. In India there have been various Banking amendments and the advent of Insolvency and Bankruptcy code to reduce NPAs. Also, Cooperatives have been brought under the new Ministry of Cooperation. Further, the large exposure in interbank transactions and hype of securities market poses challenges of deposit-loan gap. Further, there is a constant push by the government to invest in securities market by either through National Pension Scheme for adults or for the minors. The over and excess exposure of domestic financial institution and high amount of Initial public offerings appear to be above normal levels of market buoyancy.

The digital revolution has been the push point of the present government. It has constantly aimed at forcing people to use digitalized services whether in demonetization or through the adoption of different platforms for the survival. E-governance has always traditionally been accompanied by the

manual records and manmade systems. However, the inability to provide human interface despite a large labour population and constantly moving to digital ambits cause serious digital divide in India furthering the levels of injustice and poverty in India. It has been observed that the government is constantly subsidizing the employment at the private level through PLI schemes and EPFO new scheme but at the same time is disinvesting heavily in public sector undertakings. The recent take on the highest levels of dividend paid by RBI and Public sector undertakings to the government put in question their sustainability. Further to the effect on the profits made by SBI which is highest in last 64 years, raises one question that what is the social agenda of the national banking system in India. Centralized records at all levels and taking control on the different private and public data to manufacture artificially gained production or incomes may be of serious concern to a large economy like India.

India had recently ventured into internationalization of rupee after the Russia-Ukraine war and has been importing cheap oil from Russia despite the sanction from the West. Reserve Bank of India has further ventured into the introduction of digital currency (Agarwal, Agarwal, Agarwal and Agarwal, 2018; Agarwal and Pandey, 2023). The ability to make payments through the Indian rupee has always been a plus point in the Asian markets. However, neither the paper Rupee nor the digital rupee by its production offers grounds to be gained in payments or international transfers. Further, a study done at Indian Institute of Finance also indicated that it does not empower the common man to have digitalized services though it is commonly observed that a click in 24x7X365 days has its potentially leveraging effect (Agarwal and Pandey, 2023).

The growth story of nations need to build on modeling development, growth and well being for the building human capital that is build for employments that generate growth and development. It is the only resource which generates itself and is regenerative. They need to be provided with returns that can meet the fast changing pace of technology. The returns on investments must accommodate for the growth and development of the human capital that thinks of nation first, then organization and then family units and individuals. To achieve sustainable development the interlocking of technology, environment, ecology and human capital is needed. It is further needed that there is financing of the human capital to build itself.

### 1.3 Nobel Prizes : Linkage between Academic Research & Reality

Daron Acemoglu, Simon Johnson and James Robinson (Nobel Prize Winner 2024) have demonstrated the importance of societal institutions for a country's prosperity. Societies with a poor rule of law and institutions that exploit the population do not generate growth or change for the better. The laureates' research helps us understand why how one needs to build the right kind of Human Capital and the rightful allocation of Labour (man hours) for prosperity at individual, institutional and national level is critical. Their work clearly show how some countries become trapped in a situation with extractive institutions and low economic growth. The introduction of inclusive institutions would create long-term benefits for everyone. Building Human capital with induced technological support can facilitate "Reducing

the vast differences in income between countries is one of our time's greatest challenges. The laureates have demonstrated the importance of societal institutions for achieving this," says Jakob Svensson, Chair of the Committee for the Prize in Economic Sciences.

Claudia Goldin (Nobel Prize Winner 2023) work demonstrated the importance for having advanced our understanding of women's labour market outcomes. Goldin's work provided the first comprehensive account of women's earnings and labour market participation through the centuries. Her research reveals the causes of change, as well as the main sources of the remaining gender gap. Women are vastly underrepresented in the global labour market. Her work has trawled the archives and collected over 200 years of data from the US, allowing her to demonstrate how and why gender differences in earnings and employment rates have changed over time. This can be done away through the automated NLXs proposed in our earlier works (Agarwal, Agarwal, Agarwal and Agarwal, 2017; Agarwal and Agarwal, 2024). Despite modernisation, economic growth and rising proportions of employed women in the twentieth century, for a long period of time the earnings gap between women and men hardly closed. According to Goldin, part of the explanation is that educational decisions, which impact a lifetime of career opportunities, are made at a relatively young age. If the expectations of young women are formed by the experiences of previous generations – for instance, their mothers, who did not go back to work until the children had grown up – then development will be slow. This can be easily done away if we induce Human Capital with AI and ML based learnings through automated NLXs matching the labour requirements, irrespective of the breaks one may have and given that they will be gender neutral like scrips on stock exchanges.

Bernanke Ben, Douglas Diamond, and Philip Dyvbig (Nobel Prize Winner 2022) were awarded the Noble prize for their understanding of the role of banks in the economy, particularly during financial crisis. An important finding of the researchers was why avoiding bank collapses is vital. They emphasized that savings need to be channelized into investments. There exists a conflict that savers want their money instantly in case of unexpected outlays, while businesses and homeowners need to know they will not be forced to repay their loans prematurely. Banks are vulnerable to rumors about their imminent collapse. The dangerous dynamics can be prevented through the government providing deposit insurance and acting as a lender of last resort to banks. Diamond emphasized that the banks help in assessing borrower's creditworthiness and ensuring that loans are used for good investments. A right kind of Human Capital resource helps gain financial literacy and better understanding of the banking nuances leading to less crisis situations. When banks collapse then valuable information about borrowers was lost and could not be recreated quickly. The work improved the ability to avoid both serious crises and expensive bailouts. Hence the need to rightly balance the need for building human capital with necessary interplay with AI, Data and ML.

Card David, Joshua Angrist, Guido Imbens (Nobel Prize Winner 2021) got the prize for their work on delving into cause and effect in ways that shed light on labour markets. Card David developed research to examine questions like whether raising minimum wages causes people to lose jobs.



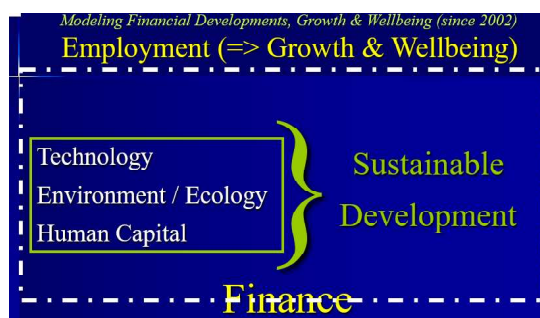
Angrist and Imbens developed research tools that help economists use real life situations to test big theories like how additional education affects earnings. "Sometimes, nature, or policy changes, provide situations that resemble randomized experiments," spoke Peter Fedriksson, Chairman of the award committee. The authors contribution to shows that natural experiments help answer important questions of the society. Card's work has challenged the conventional wisdom in labour economics that higher minimum wages led to lower employment. One can help build this with the NLXs proposed in our earlier works (Agarwal, Agarwal, Agarwal and Agarwal, 2017). Angrist and Krueger tried in the early 1990s to gauge how much benefit people derive from extra years of education. The effect of an additional year of education, they estimated, was a 9 percent increase in income. They found that it was possible to identify a clear effect from an intervention in people's behavior – like a subsidy that might encourage people to ride bicycles to work. Both these work point out how economic prosperity can be induced through human capital buildup and NLXs.

Milgron R. Paul and Robert B. Wilson (Nobel Prize Winner 2020) worked on the pair of improvements to auction theory and invention of new auction formats. They have used their insights to design new auction formats for goods and services that are difficult to sell in traditional ways such as radio frequencies. Their discoveries benefitted sellers, buyers, and taxpayers around the world. They opened new possibilities in real world transactions. Their insights into bidding and pricing have become an integral part to our modern economy. This is exactly how the NLXs are supposed to work with Labour (manhours) being traded like scrips on stock exchanges. The work provided insight into auction designs and competitive bidding strategies for communication, oil and power industries, and in the design of innovative pricing schemes. Human Capital is only self re-generating resource, which has high financial value and long term impact to growth. Hence to link Human Capital with AI, Data and ML through automated NLXs is critical (Agarwal and Agarwal, 2024).

Abhijit Banerjee, Esther Duflo and Michael Kramer (Nobel Prize Winner 2019) were awarded the Nobel prize for their work on experimental approach to alleviating global poverty. They studied the problems of education deficiencies and child health for evidence about which interventions can solve them. The laureate's work inspired public investment in preventive health care. They were recognized for their real world trials. India is one of the economies which have implemented their works through the Aayushman Bharat and Jan Dhan Yojna. Other initiatives for Digital Influx programs in education, healthcare, housing and banking have empowered the creation of the experimental approach for alleviating poverty in India by building the right kind of Human Capital required for India in 2050. There work further the cause of spread of vaccination drives through gossips at the village level, which was well utilized during Covid-19 Vaccination drives. A healthy, skilled and well educated population can help build the right kind of societal ecosystem for a brighter future for any economy.

William D. Nordhaus and Paul M. Romer (Nobel Prize Winner 2018) works integrated the outlays for integrating technological innovations, Climate change and the long-run macroeconomic analysis. Their works

addressed some of our time's most basic and pressing questions about how we create long-term sustained and sustainable economic growth. At its heart, economics deals with the management of scarce resources. Nature dictates the main constraints on economic growth and our knowledge determines how well we deal with these constraints. The contributions of Paul Romer and William Nordhaus are methodological, providing us with fundamental insights into the causes and consequences of technological innovation and climate change. The Models proposed by JD Agarwal and Aman Agarwal since 2002 based on their works at the Italian Parliament, Finland Parliament, Uzbek Parliament, European Parliament, Danish Parliament and Swedish Parliament at various forums outlines the need for human capital, environment and technology to induce sustainable development surfaced by finance for long term growth of societal prosperity (see Figure 1).



**Figure 1**  
**Model for Financial Development, Growth and Wellbeing**  
**(Agarwal, and Agarwal, 2002)**

Similarity, the works of many other authors who aligned their thoughts to the development of economy and its problems include Chanakya / Kautilya (4th Century BC) on Arthshatra, the 1st ever written text in Economies in 350 BCE even valid today countering Adam Smith's work on "The Wealth of Nations" making Chanakya (Kautilya) truly the father of economics in real sense.; Copernicus (1517) ; Bodin (1568) ; Hume (1748); Hetzel (1987) ; Mill (1948); Fisher (1911) ; Keynes (1924); Friedman, (1956, 1970); J.D. Agarwal (1978); Aman Agarwal (1999, 2001, 2003); Joseph Stiglitz (2003, 2007); J.D. Agarwal (2004); Martin Wolf (2005); J.D. Agarwal and Aman Agarwal (2005, 2007, 2017); Hubert Fromlet (2005, 2008); J. D. Agarwal and Aman Agarwal (2004, 2006, 2007, 2022); Aman Agarwal, Yamini Agarwal and Saurabh Agarwal (2006); Mario Baldassarri & Pasquale Capretta (2007); J.D. Agarwal (2008, 2013, 2017, 2018); J.D. Agarwal, Manju Agarwal and Aman Agarwal (2014, 2015, 2016, 2017); WDR (2016) ; WDI (2010-18); GEP (2015-17) ; J.D. Agarwal, Aman Agarwal and Yamini Agarwal (2016, 2017, 2018); RBI Bulletin (2000-17); Economic Survey (2000-18); J.D. Agarwal, Manju Agarwal, Aman Agarwal and Yamini Agarwal (2016,17,18,20); Manju Agarwal, Aman Agarwal & Yamini Agarwal (2018, 2019); Aman Agarwal and Yamini Agarwal (2021, 2022, 2023) and Aman Agarwal and Krishna Nath Pandey (2023). The works highlight the socio-political will to develop economic systems, processes and operation through different means of economic and financial structures of the economy.

It is also observed that the Literature on wages and salaries also present a dismal picture in terms of inequalities of incomes to different wage earners. Most exclusive focus has been placed on the characteristics of workers and on the changes in their relative demand. But these do not explain the variability in wages among workers of similar individualistic characteristics. It has also been found that the labour at all level is exploited both in terms of the time frame and the wages paid to them. It is also witnessed that the quality of life of labor is poor around the world. The gap between the wages/salaries of lowest paid and the highest paid in a company is too wide leading to desperation and high level of turnover and lower productivity. Wage inequalities are hence observed between enterprises and within enterprises. A strong labor market institution, like the exchange IIF proposed, and wage policies can help reduce these disparities.

There is also danger of labor unrest in situations where labor is exploited beyond a particular level. However, if there is a mechanism where they can have an opportunity to seek gainful employment, help raise income level, quality of life and level of job satisfaction. Such mechanism would greatly help both the job seekers and job providers and the nation to utilise this resource (wealth) effectively. Labor as a resource has time dimension. If not utilized to contribute and generate wealth at a given time is wasted forever for the contributions which could have been made during that time. It is unlike other natural or man-made resources which do not get wasted over time. There is an urgent need to provide a mechanism wherein the gap is filled up through an agency set up at National or Regional level in different countries of the world. An attempt has been made in this paper to propose such a mechanism.

People seek income security by participating in the workforce. Income security includes employment, employment protection, wages (including minimum wages), collective bargaining, benefits and allowances to workers with families, reservations to mitigate inequalities, healthcare facilities to employed and their families, incentive based system to mitigate risk of inflation, pension protection, affordable housing schemes or special segmented labor housing schemes and fringe benefits along with employment benefits. Tax Rebates, Negative Taxes, Social Insurance schemes and other specific schemes have been in existence for the benefits and children and families that are not included in the labor workforce. Alarming high Un-Employment, Under-Employment, informality, dangerous and unhealthy work surroundings, declining real wages and inadequate social provisioning is increasing the number of working poor. Social Security scheme contributory or non contributory never cover the economically active stream of workforce that unable to earn the minimum substantial levels of income to pull themselves and their families out of the trap of poverty. Non-contributory programs for such workforce can help them reduce the impact of poverty. Information on health care, education, conditional cash transfer programs, cash for work programs also known as public employment programs, skill development programs or vocational training programs, entrepreneurship development programs, small and medium enterprise development programs, self help group programs despite being advertised do not reach the ultimate beneficiary because of lack of information and public awareness. A social security system that guarantee

dissemination of these information in native's language along with the official languages can play a key role in creating sustainable inclusive growth that can eradicate poverty and break the vicious circle of poverty.

Social Protection as policy responses are key measures to reduce high and persistent levels of poverty, economic insecurity, and income inequality and to increase investments in human capital and human capabilities especially when there is weak aggregate demand during recessions or depressions. The National Labor Exchange (NLXs) is one such social protection measure that the governments / markets can adopt within their fiscal space which would provide for policy response that can address the challenges of reducing poverty, vulnerability and inequalities leading to inclusive growth while building the human capital capacity with informed demand potentials and provisioning for Universal human right that is social security creating avenues for social and economic development. It would foster inclusive and sustainable growth in the economy and its economic systems by correcting distortion in product or factor markets created by the information asymmetries of labor supply curves.

## II. Theories on Labor and Employment : Review & Synthesis

### 2.1 Classical Theory and Labour Markets

Adam Smith's seminal work "*Wealth of Nation 1770*" can be considered to be the classical economics. Although it was Karl Marx originally coined the term "*Classical Economics*" ranging for the period 1830-1875 referring to David Ricardo's economics with a major bearing from Adam Smith's and Petty's work. While suggesting a framework for efficient labour market we cannot ignore the reference to the classical economics, which gave new twist to labour market during a period when industrial revolution was leading to vast changes in Western Europe. It was also a period when capitalism was emerging and replacing feudalism and imperialism in which slavery and exploitation of labor was quite prevalent.

In connection of labour and labour markets, classical economics recognized that the income produced by various factors of production i.e. land, labour and capital is the national income instead of King's income.

Classical economics also recognized that total wealth increases when two parties freely agree to exchange things of value because there is profit in exchange for both parties. In the context of labor markets, employer and employee would be involved in exchange. However, for classical economists, market is not the best way to serve the common good. The observations of classical economist that markets generally regulate themselves holds good in case of efficient labour markets.

We believe and support the assertion of classical economist that market function with minimal government interference. This holds true in case of labor market through policies of reservation, minimum wages, pay commission determining wages and salaries and labour related regulations as against the Keynesian theory of government interference which emerged during great depression, when firms were failing and labor were being laid off.

In our opinion the Classical economist's theory of value or price is relevant in terms of labour market. Petty's assertion that there is a par between land and labour assigns importance to the contribution of labour to wealth and national income. While Adam Smith's assertion that national prices distinct from market prices were sum of natural rates of wages, profits (including interest on capital

and wages of superintendence) and rent, recognizes the contribution of labour in generating wealth. Despite the fact that Adam Smith described rent as price determining factor, David Ricardo disputed Adam Smith's assertion and stated that labour theory of value was a price determining factor than rent. In the present context Ricardo's assertion is better approximation. In our opinion Ricardo's view is more relevant in the context of efficient labour market and our proposed model for generating full employment, maximizing wealth, (both individual and national) and social welfare.

The proposed model would induce competition both among employers and labour to maximize the productivity, wealth, GDP and social welfare. Adam Smith's fears about the dangers of monopoly in labor market would be automatically taken care off.

### 2.2 Neo Classical Theory & Labour Market

Alfred Marshall and other Neo Classical economists believed that there is one theory of Value and distribution. In connection with labour and labour market, Neoclassical Theory states that labor makes a conscious consumer choice between work and leisure while estimating the consumption of goods on the Y-axis and leisure-work tradeoff on the X-Axis. Labor supply curve is well known to be backward bending. The trade off between consumption and leisure can be shown using a utility curve which is  $U(C, L)$  where, C is the consumption of goods and L is consumption of leisure. Let  $L_0$  be amount of time he spends on working out of  $L_0$  as the total time. He is with leisure hours  $h=L_0-L$ . Let  $\bar{U}$  be the indifference curve with set of pairs of (C, L) which give the same utility level. If the real hourly wage is w, the income from wages. Budget constraint is given by  $C \leq wh + R$  where, R expressed in real terms, is the set of resources like Investment Income, transfer income and even gain from undeclared or illegal activities. A wage is demand of an individual for hours of work he substitutes for leisure. Wage is not the sole determinant of supply of labor but factors like personal wealth, income derived from other sources, spouse income, education level and household production<sup>1</sup> play an important role. Tradeoffs are more complex than a simple allocation problem between work and leisure. The decision of the consumer is expressed as

$$\text{Max}_{[C,L]} U(C,L)$$

Subject to

$$\begin{aligned} C + wL &\leq R_0 \\ 0 < L < L_0 \\ C > 0 \end{aligned}$$

Given that the agent is disposes of the potential income  $R_0$  obtained by dedicating the entire endowment of time to working and that he or she buys leisure and consumer goods from the income he derives.

For Interior solutions with strictly positive labor supply curve  $\mu \geq 0$  to denote Lang range multiplier associated with budget constrain

$$l(C, L, \mu) = U(C, L) + \mu (R_0 - C - wL)$$

With partial derivative to the upper and lower bounds of utility given as  $U_L$   $U_U$   $U$  respectively.

First order condition is met when

$$U_c(C, L_c) - \mu = 0$$

$$U_L(C, L_c) - \mu w = 0$$

Complementary Slackness condition is given by

$$\mu = (R_0 - C - wL) = 0, \mu \geq 0$$

Utility function increases with each of its components and budget constraint is binding such that the first order condition is

$$\mu = U_c(C, L) > 0$$

With budget line

$$C + wL = R_0$$

Optimal solution is  $C^*$  and  $L^*$  given as

$$\frac{U_L(C^*, L^*)}{U_c(C^*, L^*)} = w$$

$$C^* + wL = R_0$$

The basic model suggests that as labor supply increases when wage is low and subsequently diminishes as it becomes extremely high. With the concept of utility and consumer choice between two products work and leisure, one based on the utilities of the commodities can derive indifference curve. The convexity of the indifference curve would give the marginal rate of substitution  $\frac{U_L}{U_c}$  between work and leisure which would decrease as one moves to the south-east direction of the indifference curve.

Since the marginal rate of substitution also represents the slope of the tangent to an indifference curve, an agent offers strictly positive quantity of hour of work if and only if the following condition is satisfied that is

$$\frac{U_L}{U_c} < w$$

The labor would supply work hours only if the wage rate is higher than the reservation wage<sup>2</sup>. The reservation wage would be defined as

$$W_R = \frac{U_L(R, L_0)}{U_c(R, L_0)}$$

With respect to the reservation wage, the labor supply is strictly positive if and only if the leisure considered as a normal good. Increase in non-wage incomes or other resource endowments increases the reservation wage.

The labor supply curve is a combination of substitution effect and income effect. Hicksian elasticity which is also compensated elasticity suggests that income of a labor varies for him to stay on the same indifference curve. Demand for Leisure  $L^*$  is function of wage and potential income given as

$$L^* = \wedge(w, R_o)$$

The corresponding labor supply is  $h^* = L_o - L^*$  called the Marshallian or uncompensated labour supply curve. Partial derivative would give the effect of the non-wage income on the leisure demand and can be given as

$$L^* = \wedge_2(w, R_o)$$

The impact of variation in wages is by differentiating function with respect to  $w$  such that

$$R_o = wL_o + R$$

$$\frac{\partial L^*}{\partial w} = \wedge_1 + \wedge_2 \frac{\partial R_o}{\partial w}$$

With

$$\frac{\partial R_o}{\partial w} = L_o > 0$$

where,  $\wedge_1$  is the usual compound substitution and income effects in the theory of consumer which is partial derivative of function  $\wedge$  with respect to wages.

Marshallian Elasticity or Non-compensated elasticity takes the real variation in the income resulting from the variation in wages. Hicksian Supply of labor arrived at by minimizing the consumer expenditure and it is given by

$$\underset{[L,C]}{\text{Min}} C + wL$$

Subject to

$$U(C, L) > \bar{U}$$

where,  $\bar{U}$  is the exogenous minimal level of Utility.

Hicksian Elasticity of labor supply is given by

$$\eta_w^h = (w/\hat{h}) (\partial \hat{h} / \partial w)$$

Hicksian elasticity is called compensated elasticity. Marshallian and Hicksian elasticities are linked by Slutsky equation as:

$$\eta_w^{h*} = \eta_w^h + \frac{wh}{R_o} \eta_w^{h*}$$

The part after the addition in the equation represents the global income effect and is positive if the leisure is a normal good.

Substitution effect dominates over income effect above the reservation wage and income effect dominates over the substitution effect after the global effects swells to reach a certain level.

Stiglitz (2001) also found much relevance to efficiency wages<sup>3</sup> which lead to unemployment<sup>4</sup> in equilibrium too. On the labor supply curve one needs to further estimate the impact of overtime remunerations, progressive income taxes, fixed cost to jobs and flexible versus fixed working hours. Further, family has considerable role to play in participation of a labour force. Unitary Models and Collective Approach takes into account this consideration and its utility functions with enlarged constraints that impact the decision making ability of individuals or a particular labor group. Additionally, economists have a choice to select from static versus dynamic models of labor markets. Within the income-leisure choice framework, unemployment simply has no interpretation as a consequence of the assumptions that jobs are instantaneously available at market clearing wage rates known to the labor, Mortensen (1986).

In a dynamic model, labor one must make his or her choice over life cycle measured over different interval of time periods. The utility function then produces different consumption and leisure allocations for different time periods. To understand the utility function better they may be temporally separated and be called instantaneous utility of a given period. The equality between marginal rate of substitution and current wages is maintainable in all time periods. This wage would be cumulatively creating marginal utility of wealth. Elasticity is then called intertemporal substitution elasticity. Marginal utility of wealth is a stochastic process where the multipliers of wealth utility depend solely on the interest rates.

Aggregate Employment in any economy fluctuates a great deal with business and economic cycles. Real business cycle theory proposes the intertemporal substitution of leisure as the principal cause for fluctuations in the employment levels in an economy. Shocks in an economy of technology, allocation and distribution impact the rewards of labour and capital to which the factor markets respond in their supply curves. According to theory of real business cycles, employment is very sensitive to small changes in wages. Further, level of employment may also be influenced transitorily by movements in interest rates as increase in interest rates have an inverse movement towards consumption of goods. Employment levels in an economy are also impacted by the financial incentives given for early retirements or continued wage earners. "Yet the theories that we were taught paid little attention to poverty, said that all markets cleared - including the labor market, so unemployment must be nothing more than a phantasm, and that the profit motive ensured that there could not be economic discrimination" Stiglitz (2001).



The proposed model may take care of employment levels in a country automatically and induce building up right kind of Human Capital which is interlocked with the AI, Data and Machine Learning frameworks.

### 2.3 Keynesian & New Keynesian Economics and Labour Market

Theories forming a part of Keynesian economics are based on John Maynard Keynes book 1936 - The General Theory of Employment, Interest and Money. Keynesian thought in the book was highly affected by the issues, challenges and problems of Great Depression (1931-36). Subsequent extensions of Keynesian theory was influenced by the happenings of World War II (1939-45), and post war expansion and changing world economic order (1945-73).

In Keynesian view aggregate demand does not necessarily equal the productive capacity of the economy. It is influenced by a number of factors and at times erratically affecting production, employment and inflation. He advocated government interference as opposed to classical and neo classical economics prescriptions. According the Keynesian Economists the private sector decisions lead to inefficient macroeconomic outcomes and require government intervention particularly through monetary policy and fiscal policy in order to stabilise output over the business cycle particularly during recession. According to Keynesian assertion, there are situations in which a depressed economy would not quickly self-correct towards full employment and potential output.

In the Keynes theory, interaction of aggregate demand and aggregate supply determines the level of output and employment in the economy.

According to Keynes the wages that are determined are nominal and not real as negotiated between the employer while according to classical economists mass unemployment during great depression was due to high and rigid real wages. Keynes further asserted that it would be difficult to cut wages for various reasons. He also rejected the idea that cutting wages would help in recession.

Keynesian theory does not hold good in the normal situations as it fail to deliver results in seventies due to oil shock of 1973 and economic problems of 1970s. During this period many economies experienced high and rising unemployment together with high and rising inflation. In 1990s there was an advent of New Keynesian Economics. It provided modified and provided microeconomic foundations for New Keynesian theories, which dominate mainstream economics now.

The need for cutting wages nominal or real does not arise if there exist efficient labour market. Efficient labour market would also take care of problems of unemployment, underemployment in different business cycles. We hope the proposed model would prove to be worthy of ironing out some of these issues.

### 2.4 Econometrics of Labor Supply Curve

Econometric empirical estimates indicate that the labor supply equation often contained as regress and hours  $h$  worked by a given individual with regressors or control variables as hourly wage, Income other than current wage and  $\theta$  as the vector dimensions of  $(n, 1)$  comprising of  $n$  parameters in a double log model framework. The model frameworks commonly in use are ANOVA,

ANCOVA, Logit, Probit, distributed lag model with Kyock transformations using the vector dimensions as the regressors. In a life cycle model a two stage budgeting process may be used by using a distributed lag model considering marginal utility of wealth as one of the explanatory variables.

### 2.5 Job Search Models

Unemployment cannot always be reasoned by the acts of the unions or minimum wage laws (Stiglitz 2001) there would be more to the reason for existence of natural and cyclical unemployment. Burdett (1978) work explained the job-to-job transitions and wage growth with the same employer. Pissarides (1979) search model with an employment agency, no wage variability and the separation rate is exogenous. His search models are random search and search via an employment agency favoring random search for increasing the overall matching rate. Job searches may register themselves with agencies and receive offers or may apply themselves to different jobs. Jobless workers may choose random searches. Firms, on the other hand, may use advertisement to optimize their strategy. He assumes that firms offer same wages to rule out search on the job. Fraction of unemployed, let's say  $S$  may register themselves with employment agencies such as  $S < U$  where  $U$  is the total unemployed Labour force. In a simple one open position, with total number of firms  $V$ ,  $R$  firms register themselves with employment agency. Vacancies left for random searches taken as  $A$  are given as  $A = V - R$  Jobs that are over are given at a rate  $\delta$ . Total separation are given by  $\delta(L - U)$ ,  $L$  given as the total labor force and  $U$  as the unemployed labor force. Probability that a vacancy will not be searched by any of those Unemployed workers  $S$  is given by  $(1 - 1/A)^S$ . Probability the number of vacancies will be filled  $1 - (1 - 1/A)^S$ . Total number of job matched by random searches be  $x$  and by employment agencies be  $y$ . The total number of job matched will be  $x+y$ .

Unemployment Equilibrium will be given by

$$x(S,A) + y(U,R) = \delta(L-U)$$

Probability that a job seeker would receive job from Employment agency is given by  $q = y / U$

Probability that a job seeker would receive a job by random search is given by  $p = x / S$

$$\Omega^U = b + \frac{q}{1+r}W + \frac{1-q}{1-r}\Omega^U - q.h$$

$$W = w + \frac{\delta}{1+r}\Omega^W + \frac{1-\delta}{1-r}W$$

where, Registered Job seeker receive benefits  $b$ ; Random search costs is  $c$ ; Agency charges for job searches is  $h$ ; Return per vacancy be given by  $w$ ; Lifetime returns of the employee be  $W$  which would be function of  $\Omega^u$ ; Return of unemployed working not in the Random searches is given by  $\Omega^u$

Unemployed engaged in random search would then be

$$\Omega^W = -c + \frac{p}{1+r}(W - \Omega^U)$$

By substituting the W and  $\Omega^U$  we get

$$\Omega^W = \frac{p}{r + \delta + q}(w - b + q.h) - c$$

Let  $\pi$  be profit per employee for a firm,  $\rho$  be the cost of capital for each vacancy,  $\alpha$  be the advertising cost per vacancy. Profit of a filled vacancy would be  $\pi - w - \rho$  per period. Let  $\Pi$  returns from a filled position for a firm. Let  $\Omega^A$  returns from a vacancy not registered with employment agency

$$\Omega^A = -\alpha - \rho + \frac{a}{1+R}\Pi + \frac{1-a}{1+r}\Omega^A$$

$$\Pi = \pi - w - \rho + \frac{\delta}{1+r}\Omega^A + \frac{1-\delta}{1+r}\Pi$$

Returns from registered vacancies be given as  $\Omega^R$ ,  $\Omega^R$  is the return before registration,  $v$  is the agency charges for a successful match

$$\Omega^R = -\rho - \frac{g}{1+r}\Pi + \frac{1-g}{1+r}\Omega^R - gv$$

$$\Pi = \pi - w - \rho + \frac{\delta}{1+r}\Omega^R + \frac{1-\delta}{1+r}\Pi$$

$$\Omega^A = \Omega^R + c$$

At equilibrium both methods are useful  $\Omega^A = \Omega^R = 0$ . Market equilibrium would satisfy simultaneously satisfaction of

$$\begin{cases} \Omega^W = 0 \\ \Omega^A = 0 \\ \Omega^R = 0 \\ -x(S, A) - y(U, R) - \delta U + \delta L = 0 \end{cases}$$

where, net marginal returns from random search are zero, then two mean that the returns from opening up more vacancies are zero and the unemployment pool is constant over time.

Hall (1979) provides for direct interaction between the factor and the firm. He estimates the equilibrium unemployment rate using the notion of unemployment and employment durations. Efficient durations using the human resource concept are defined as the cost of recruitment and training for firms and for the labour as the cost of finding a job. With  $V$  firms offering jobs to  $S$  job seekers such that the probability of finding a job is  $1/S$ . The probability that the agent would receive no job is given by

$$1 - f = (1 - 1/S)^V = [(1 - 1/S)^{-s}]^{-V/S}$$

where,  $f$  is the finding rate of a job  $S \rightarrow \infty, (1 - 1/S)^{-s} \rightarrow e$  and hence the job finding rate would be

$$f = 1 - e^{-v/s}$$

$$\rho = V / (f \cdot S)$$

$$V/S = -\ln(1-f)$$

where,  $\rho$  is the number of vacancies needed to be opened for one job opening.

$$\rho(f) = -\ln(1-f)/f$$

$$S = (1-f)S + s \cdot E$$

where,  $s$  is separation rate and  $E$  is number of employed workers.

Unemployment rate ( $U$ ) would then be given as

$$U = \frac{(1-f)S}{E + (1-f)S} = \frac{s}{s + f / (1-f)}$$

when,  $\lambda(s)$  probability that job is filled as a function of separation rate then expected cost is given by  $w \lambda(s)$ . Unconditional probability that the job is vacant is  $s$ . Conditional probability given by  $s \lambda(s)$  flow of offers would be given by  $\rho(f)s \lambda(s)$ . If  $\mu$  is the cost of an offer to the firm then it would be minimized as follows

$$C(w, s, f) = w \cdot \lambda(s) \cdot (r \cdot s \cdot \rho(f) + 1)$$

Effective income would be given as where  $u$  is the expected time the agents or worker expect to be unemployed.

$$y = (1-u)w \frac{f}{(1-f)s + f} w$$

$$s = f = \arg \min \left\{ \left( 1 + s \frac{1-f}{1-f} \right) y \cdot \lambda(s) \cdot (\mu \cdot s \cdot \rho(f) + 1) \right\}$$

Burda and Profit (1996) consider define their search activity with respect where and how many jobs to apply for. They identify the cost dimension to the job search process based on the cost for appearing for an interview. Each spatial unit has an agency. Random searches are possible. Cost of interview is  $c$  once the candidate is shortlisted. Let  $i$  be the region of origin and  $j$  be the region where the applicant has applied and  $i \neq j$  then interview cost is increased by  $a$  such that total cost of interview is  $c+a$ .  $f$  denoting the job finding probability,  $m$  the search intensity,  $r$  the interest rate then objective function of a job search in region  $j$  is given by

$$\max_{m_j} [1 - (1-f_j)^{m_j}] w / r - m_j (c + a \cdot D_{ij})$$

where,  $D_{ij}$  is the distance between the two locations. Optimal search intensity is observed by the author to be increasing given the wage and decreasing in

discount rate and cost of applying job assuming that the expected income in unemployment is zero and is given by

$$mj = \left\{ \begin{array}{l} f_j^{-1} \ln(f_j(w/r) / (c+a)D_{ij}) \\ 0 \end{array} \right. \left. \begin{array}{l} f_{ij}(w/r) / (c+a)D_{ij} \geq 1 \\ \text{otherwise} \end{array} \right\}$$

Burda and Profit (1996) and Ommeren and Straten (2005) provide for distance from the work place as an important explanatory variable for job search. Franz (2006) gave the Single wage offer model in discrete time which found optimally, the present value of acceptable wage offers must be equal to the present value of the returns to search. Also, reservation wage decreases with search costs. Reservation wage increases with unemployment benefits and wages as the value of employment must exceed the value of unemployment. An unemployed person would accept a job offer or supply his services if the wage offer is more than the reservation wage which  $w = w^R$ . The probability to receive a job offer is  $q$  and vector  $z$  represents individual characteristics like age, sex, qualifications. On an assumption that the chances of getting a job are decreasing with wage offer due to high and increasing competition. The probability of a successful match is given by along with the present value of the reservation wage as follows:

$$p(z, w^R) = \int_{w^R} q(z, w) f(w) dw$$

$$\sum_{t=0}^{\infty} \frac{w^R}{(1+r)^t} = \frac{(1+r)w^R}{r}$$

Unemployment benefits as  $b$  and cost per period search as  $c$  then present value of expected wages and cost of search would be given by

$$\frac{(b-c)(1+r)}{r} + p(z, w^R) \cdot E(w/w \geq w^R) \frac{1+r}{r(r+p(z, w^R))}$$

Optimum discounted returns to the wage would be equal to discounted reservation wage given by

$$w^R = \frac{r(b-c) + p(z, w^R) E(w/w \geq w^R)}{r - p(z, w^R)}$$

Reservation wage once affected by individual characteristics would vary as follows

$$\frac{\partial w^R}{\partial p(z, w^R)} = \frac{E(w/w \geq w^R)(r+p(z, w)) - r(b-c) - p(z, w^R) E(w/w \geq w^R)}{(r+p(z, w^R))^2}$$

$$\frac{r(R[w/w \geq w^R + c = b])}{(r+p(z, w^R))^2} > 0$$

McCall (1970) gave classical search model. He identified the loss of a job as a capital loss, and a spell of unemployment as an investment in searching for an acceptable job. Mortensen(1976) is an extension of the model presented here. The special feature of the model is that it considers multiple offers that are made to the agent for his choice of the highest bid. The model assumes perpetuity of work for the agent with no separations or quit from employment. Once a job offer is refused, the agent cannot retrieve it back. The cost of search is  $c$  per time period and  $\beta(h)$  is the discounting factor for time  $\tau$ . The distribution of wage is given as  $F(w)$  with  $n$  job offers in a given time period and  $n$  being the random variable that follows Poisson distribution given by

$$q(m, \tau) = \frac{e^{-\lambda\tau} \lambda^{\tau m}}{m!}$$

where,  $\lambda$  is the arrival rate. Continuous discounting rate is given for  $\beta(\tau) = e^{-r\tau}$ . If the agent receives multiple offers he chooses the maximum then the wage function would be  $w_m = \max\{w_1, w_2, w_3, \dots, w_m\}$  which follows an extreme value distribution  $G(w_m)$ . Assuming  $F(w)$  and  $q(m, \tau)$  are time invariant the Bellman equation would be given as where  $\Omega$  denotes the value for search,  $b$  the value for leisure period,  $W(w)$  value of employment

$$\Omega = (b-c)\tau + \beta(\tau) \left[ \sum_{m=1}^{\infty} q(m, \tau) \int_0^{\infty} \max(\Omega, W(w)) g(w_m) \partial w + q(0, \tau) \Omega \right]$$

$$\Omega = (b-c)\tau + \beta(\tau) \left[ \sum_{m=1}^{\infty} q(m, \tau) \int_0^{\infty} \max(\Omega, W(w) - \Omega) g(w_m) \partial w + q(0, \tau) \Omega \right]$$

$$W(w) = w\tau + \beta(\tau)W(w) = \frac{W(w)}{1-\beta(\tau)}$$

Probability of receiving more than one job offer in infinitely small intervals of time is zero.

$$r\Omega = (b-c) + \lambda \int_0^{\infty} \max[0, \{W(w) - \Omega\}] \partial F(w)$$

Reservation wage would be given by

$$w^R = b - c + \frac{\lambda}{r} \int_{w^R}^{\infty} (w - w^R) \partial F(w)$$

with  $\int$

$$w^R = \frac{r}{r+\lambda} (b-c) + \frac{\lambda}{r+\lambda} E(w) + \int_0^{w^R} F(w) \partial w$$

Wage distribution is characterized by the mean and variance. Shape parameters have been well defined in the literature with different distribution depending upon the nature of the distributions. Most commonly accepted forms are mean preserving spreads which means that reservation wage is increasing function of time, decreasing in cost of search and increasing in the mean wage distribution.

These models can hence be used to determine the wage at which the labour can be listed on the exchange for trade of his or her services.

### **III. National Labour Exchange : Model for Full Employment (Agarwal, Agarwal, Agarwal & Agarwal, 2017)**

The existing literature takes Labour as physical or manual labor in terms of man hours or a wage earner. It does not treat labor as wealth for himself or for the Nation. Labor – a valuable resource, as wealth generates income and wealth for himself and contributes towards GDP through value addition and wealth for the nation. Labor not used in time to is lost forever and is a national resource lost. It is divisible like any other resource like land and capital or a factor (as defined in classical economics). A nation as well as an individual can ill afford such a valuable resource in a given time. Wage paid to labor is a cost exactly the interest paid use of capital, rent paid for the land, and depreciation for using an asset, cost of depletion of mines etc. Accordingly, labor is a resource and a wealth. All other resources by themselves cannot generate wealth without the use of labor. Treating labour as a wage earner or physical or manual labor is not proper. Any theory based on this concept in our opinion is outdated, redundant and inappropriate. The labor is to be looked at in this new perspective i.e. as resource or wealth exactly any other resources including as securities. There is need to use this resource through a mechanism whereby this wealth can be effectively utilized through capacity building through human resource. This can be done by having National Labor Exchange along the lines of National Stock Exchange of India, Bombay Stock Exchange or Commodity Exchanges Worldwide where information about the jobs available and jobs offered are traded freely to utilize the available human resource. It will give boost the market driven economic system in the labor market. To the best of our knowledge there is no such labor exchange in any country of the world.

For such a National Labor Exchange, information about the resource available in a country or world economy is pertinent. As rightly pointed out by Stigler (1961) Information is valuable resource and knowledge is power. It is critical to build Human Capital tuned to AI, Data and ML structures within the work forces, as has been clearly reflected in the works of Nobel Prize Winners since

Many of the major political debates over the past two decades have centered around one key issue: the efficiency of the market economy, and the appropriate relationship between the market and the government, Stigler (2001). Stigler (2001) further in noble prize winning lecture said that the Pareto Optimal states are not a reality and we do not live in a world of Pareto Optimal best possible efficient frontiers. These states belie us for the want of information efficiency. Imperfection of Information, absence of markets and dysfunctional institutions were a reality. Recession and Depression with massive unemployment echoed the market failures<sup>5</sup> which

Adam Smith (1776) invisible hand could not correct in all market including goods, labor and capital markets. Stiglitz (2001) reiterated that market imperfections caused by information asymmetries magnified economic shocks and made them persistent. Pooling information and reducing the information asymmetries could lead to correcting some part of market failure that leads to allocation or distributional distortions.

Labor market in economic theories implicitly assumes perfect information and labor as wage earner or physical or manual labor. It believes that each individual knows everything about all the existing job offers and he or she is just choose the number of man hours he or she would like to contribute to earn a desired wage which is offered as per segmented market determined wage rates<sup>6</sup> which are universally known and accepted. Firms also do not know the productivity level of potential employees but may be better informed about their market conditions than the labor<sup>7</sup>. The chief cost for firms is time and money spent by them in developing and retaining the requisite human resource. Unfortunately this assumption of perfect information is not true in the real world. The only means to achieving some symmetry is signaling by workers and screening by employers. The real world is full of contradictions, segmentation and paradigms of changes over time and space. Information between the labor and firms is not symmetrically distributed. Information asymmetries create inefficiencies in market for exchange. Imperfections arise because buyers and sellers do not have perfect knowledge. The forces of demand and supply tend to be distorted by creation of convex or concave elasticity of the two forces namely demand and supply. Interactions are dependent on the so formed demand and supply curves. Such demand and supply curves are dependent on the information on the quantity and prices, in case of labor markets, labor hours and wage rates. What, How and For Whom is the labor as a resource, supplied or demand is a continuous question answered in an asymmetric information constrain that continues to exist and distort supply and demand labor curves in all world markets which lead to market failure in the system. With the growing rate of unemployment and specialization of the labor markets, it becomes important for international agencies and governments to take a step to reduce the asymmetries in information exchange of the labor with the firms

The asymmetrical distribution of information that leads to knowledge creation creates inefficient frontiers that interact with each other to provide unstable equilibriums (small amount of information imperfection could have a profound effect on the nature of the equilibrium, Stiglitz, 2001). The effects tend to magnify themselves with subsequent equilibriums drawing from the past experiences or past perceived supply or demand curves. Creating inefficiencies in exchange and affecting most the vulnerable groups of the society as information and knowledge creation is transmitted and absorbed in the value chains by them at fading end tails of the distribution.

Inefficiencies in exchange would further spoil the allocation and distributional efficiencies in the market. The basic premise of exchange is based on the free play of demand and supply forces under perfect information symmetries. Information became a commodity with the introduction of information technology that transcended barriers of boundaries and regulations with online platform fast changing the landscape of exchange.



However this exchange could not be reached to the labor market which continues to grapple with serious problems, associated with world market suffering from recessions, adverse labor market condition and growing poverty among vulnerable groups. Governments and international agencies have been cooperating to develop social protection frameworks that transform jobs, labor markets and economic systems into frameworks that can eradicate poverty and create new meaning to shared prosperity. Information Communication Technology has reduced the real time gaps in information which introduced allocation and distribution efficiencies and effectiveness in many markets. Labor is not a commodity, It is a resource i.e. wealth of a nation. The focus of all governments is to generate employment rather than effective use of national resource - labour i.e. wealth. Labor deserves to be positioned in the market for exchange with least information inefficiencies that result in allocation and distributional inefficiencies not only in factor markets but also in the product markets.

Economic organizations take on a new meaning when they are considered from the point of view of information Stigler (1961). He further argued that prices change in varying frequency and unless markets are centralized no one will know all the prices which various sellers (or buyers) quote at a given time. Information is costly to obtain and returns in the future are uncertain, in the labor market, Stigler (1962). Information affects decision making in every context – not just inside firms and households, Stiglitz (2001). It is this information that needs to be freely accessible to the household and firms. Accessibility of this information would play an important role in reducing poverty and enabling several old models of economics that do not hold good to approximate their goodness with this near perfect information transmittal system. As reiterated by Stigler (1961) who while recognizing the importance of information, argued that once the real costs of information were taken into account, even with imperfect information, the standard results of economics would still hold. He further argued that with economies of scale, competition among firms would eliminate the profitability of quoting very high selling prices and low buying prices and will render impossible some of the extreme price bids which in context of wage inequalities can easily draw its parallel when a centralized market system like National Labor Exchange which, as, proposed to be developed would register and take record of the entire labor force of an economy. It would result in greater efficiency in all respects like in the capital markets and financial markets. Greater the reduction in the average cost with volume, the smaller will be dispersion of wages. Search<sup>8</sup> would be simpler and repetitive searches would not command premium but unique searches would command premiums. This would optimize the search process for both the buyers and sellers. Identification of buyers and sellers would reduce the cost of search. In case of markets for part time workers there would an opportunity for price discrimination in individual contracts. Expected savings of search the National Labor Exchange would create would be the present value of all expected savings of the buyers and sellers. Specialization in labor and differentials in wages<sup>9</sup> would add to the search costs for firms and labor. A new firm or labor would not be exploited by the market as the norms would be transparent and accountable. Some known benefits of this centralized labor market at the national level which would also highlight the dispersion in the wages would be (a) Larger the expenditure on labor greater

would be the saving from the search and better the quality of search (b) Greater the number of repetitive demands for a specified labor the more effective would be the search with labor contract being more standardized with standardized pays with more effective search results (c) Greater the number of similar labor offerings the more similar the wage demands leading to lesser dispersions in standardized wage rates (d) the saving on cost of search would be smaller, greater the integration of the geographically diversified and differently specialized labor markets. The effects of pooled information and comparison would lead to higher utility indifference curves for both the firms and labor and would reduce the cost of search. The distribution of demand and supply would be self evident and it would be possible to empirically estimate the same. Correlations between several factors like gender, race, educational qualification, wealth, experience, marital status and network effects could be easily estimated by determining the correlations between successive wage rates<sup>10</sup> within a group of similar and dissimilar labor class. Policy guidelines for discriminating between relevant knowledge and skill to one that become obsolete leading to structural unemployment's could be signaled through the demand of the firms and innovation driven demands in the labor market. Monopoly created in the collection and dissemination of information would benefit the overall economy by streaming informal segments of the society into formal economic segments and introducing the economic systems and its development to unorganized sector.

Governments need to step in to develop National Labor Exchanges along the lines of the National Stock Exchange that would digitalize the records of labor at a micro unit like a district and link it with a social security number like the Aadhar Card in India or Social Security Number in US which can further be linked with income tax numbers like the PAN Card in India and other national identities like the Election card and mobile numbers. Presently in India the Income Tax Returns are linked with national identities like the Aadhar Card, Mobile numbers, Emails and Bank Information for digital transfers. The Exchange would digitalize the records of the labor to estimate the supply of the different specialized labor in different parts of the country on one exchange. It would create one NATIONAL market for labor exchange, uniting the country and its countrymen to one Common Working Platform removing the discrimination of regional imbalances, labor immobility and information asymmetries that create distortion in the demand or supply of labor.

The organization structure of the National Labor Exchange can be along the lines of National Stock Exchange / Bombay Stock Exchange / Commodity Exchanges Worldwide with some modifications. This structure could have representatives from Trade Unions, from industry or industry chambers or associations, government and NGOs.

The Exchange may require to filter of the information for the Domestic and international firms, domestic and international government, International agencies and financial institutions on the labor available with simplest filters of skilled, semi skilled and unskilled labour class. With further classifications based on age, gender, experience, race, caste, education, financial status and wage requirement. The registration of person or persons would be free of charge with a fee charged from a gainful employment for any employment advertised on the exchange. The pricing of the hours of labour services can

also be done via Goal Program Model Approach (Agarwal, 1969, 1988). The exchange can also earn from the advertisement that the firms would like to release to seek the required labor force. The government sector which suffers from lack of transparency in recruitment at various levels can introduce their employment vacancies on the exchange which would permit greater penetration to the markets. Transparency, Accountability and efficiency can be reached to the people by giving them access to the Information Communication technology that would introduce exchange of their labor services either as an OTCEI exchange or an exchange like the National Stock Exchange. Legal Consultation on creation of employee contracts or disputes of layoffs would also be dealt by a special legal cell of the exchanges. The Legal cell would also advice employees on whether a labor contract is exploitative or not and what would be quantitative and qualitative implications of such contracts. A fee or charge may also be taken by the exchange for providing such legal advice.

Any discord in the labor matter would be resolved in the exchange via arbitration request from the firms or at the behest of an employee which can be further addressed by the courts of the land. This would reduce the cost of strikes or other discords that prove to be expensive for either the firm or the employees. The exchange would also enable labor reforms that are much needed to provide the requisite impetus to the manufacturing and other sectors in the economy. The exchange would reduce the search costs, add convenience and confidence to the markets. The exchange can find penetration with the Jan Dhan<sup>11</sup>, AADHAR and Mobile (JAM) trinity that the present government has initiated to reach to more and more people. The introduction of the new contract class of labour in the agriculture sector with contract farming would also find gainful employment once they are registered with the exchange.

Social Protection Scheme and introduction of any transfer payment can also be easily identified and introduced through this exchange, whether it is distribution of unemployment allowance, or minimum job offer like in MGNREGA<sup>12</sup> or the cash subsidy transfers to the vulnerable groups would also be permitted using the exchange.

Foreign Direct Investment in need of requisite labour would be well informed about the availability of labor, its nature, quality and wage distribution before they plunge into taking the decision to invest in any region or part of the country. Malpractices of lower wages than the minimum wage rate or the corruption in distribution of wages either at the private and public level would also be rectified if the labor employment records are linked to bank record and the exchange ensures that the employers pay their dues to the labor. The exchange would also play a key role in preventing child labor as the excesses would match the deficits. Gainful employment can then be linked to loan grants for health care, education and skill development for weak and vulnerable. Labour Markets aide the primary source of income security for the present and future of an individual needs, the exchange would play a major role in smoothing incomes and matching them to aggregate demands creating a structural paradigm change in the exchange in labor markets empowering them to take advantage of economic opportunities. Social protection Schemes tend to support men and women

by stabilizing their incomes in the event of unemployment, employment injury, disability, sickness and maternity. They ensure that they have at least a basic level of income security but do not provide an equitable opportunity to earn with dignity. The schemes are a burden on the governments expenditure and do not ensure livelihoods in a permanent course of life. The exchange would provide for a renewed opportunity to reenter the work life in case any of the above circumstances arise.

The payment to labour should be based on return to labour on the basis of value addition, rather than as wages as is being currently done. Payment of wages is exploitative on one or the other ground. Labour is resource (wealth) as much as land or capital and deserves return to labour. The proposed work states that the wages paid to labour should be replaced by "Return to Labour" based on value addition. Return to Labour would be automatically directly linked to productivity. It would give dignity and enhance or reduce return.

#### **IV. Human Capital, AI and the NLXs**

The work on the automated National Labour Exchanges (NLXs) draws upon the well celebrated work of the economic, financial, social and political spheres of markets that affect labour, industry, productivity and overall development. The proposition of the automated National Labour exchange provides for a digital market space where the national and international labour and employers come and interact to hire the most suitable choices available for their jobs. A centralized yet ubiquitous system that allow exchange of manhours and not physical men and women for work. The manhours or labour hours can be exchanged through interactions over calls, verified through aadhar or any publicly accepted ids and provision to price discoveries of the manhours with requisite evaluation from the market. The labour hours shall be equally held responsible for their actions as the employers for their feedbacks and ratings shall be publicly available. Further education qualification, certification and other work attributes can be well qualified with ratings across board through market determined systems.

There presently exist many online platforms that provide for employers and workers to meet together. They include naukri.com, linkedin, shramportal and others. Also there are aggregators of specific seller services like Amazon, Zomato, urban company and other that offer aggregation of labour services for a specific purpose. They however do not offer a unified set of service meant only for the entire employable class. They need to have a similar set up like the National Stock exchange that permits stocks to be traded nationally and internationally, this should similarly offer manhour exchanges across the board for the development of the overall economy. Even the Delhi Government tried to initiate the Rozgar Exchange and the Uttar Pradesh Government had made announcements to open NLXs for efficient market performance and reducing un-employment in their respective states. Many works in the past have also indicated that services of people are often restricted to search cost by both the employers and employees and also due to information asymmetries. The National Labour exchange provides for the eliminating the search costs and information asymmetries. Further bringing close, accountability and responsibility on the both the parties through transparency and information dissemination. A penalty to the non performers or the irresponsible stakeholder is provided

in the market visibility of actions that offer incentive for good actions through market evaluations. The limitation of digital divide can be overcome through collaborative systems developed at the village and other smaller units of the economy and also coding the system with voice enablers, colour codes and understandable patterns which make the user interface acceptable for the illiterate also as technology by itself is not subservient to the literate world.

Labour is considered as a resource that self-generates itself. It is traditionally offered through different means. The most traditional forms were the employment exchanges where one could register for offering one's services, advertisement in newspapers like *Employment News*, newspapers and digital medium have also been helpful in providing access to information of the offers that are available in the market. Most often the outcry is the limitation that many private jobs are taken informally without advertisement and the government jobs are advertised a fewer times. Many job seekers in the market do not know where to go. They are not aware what and whom to approach. A digitalized exchange with its presence in every nook and corner with community registration like RWAs, village boards or panchayats or even other super market owners can provide access to labour to the digitalized medium or exchange so proposed. The classical economist believes that supply creates its own demand and the *laissez faire* is most efficient form of resource allocation. Reducing the limitation of information, user's interaction and also provisions for interaction of supply and demand with verifications can offer a medium of full employment in the labour markets with wage discoveries governed by the market regulations. This does not limit the offering of the social labour market created by the government or the derived demand market created by the private sector or the one offered in partnership. It is an automatic way of generating wealth for the nation, society, communities and individuals. It also creates a Census or the survey of the total population available for employment in the market. Population Census by itself could have generated the data for the information of each and every person living in India. The survey can itself contain the working population group and their educational qualifications and work profiles to meet the need of the country. The availability of manhours is crucial to the understanding of their employment.

The resource is crucial as it has the ability to organize and utilize all the resources namely, land, labour, capital and entrepreneurship. It is able to productively outperform its outcomes by newer innovation, creativity and ability to connect with the thoughts, ideas and deliberations that transcend borders and offers progress and productivity. The biggest social protection to the labour force is ability to transcend from one job to another in same or different organizations. The network externalities offered by the exchange provide the social protection of earning without prejudice and but by work referrals and work credits which are bilateral. The credits earned by both the employee and employer can be used to credit rate their working abilities. This does not in any way diminish the possibilities of work provided protection in the form of health insurances, pensions, gratuities, allowances and perquisites associated with well-being of the labour market participants. It also does not diminish the need for government-protected schemes of high interest rates for specific groups, pension plans, government jobs and grievance redressal mechanism through labour courts.

Fiscal consolidations have affected the manner in which labour is employed in the generative social capital institutions like public sector undertakings, basic services and other necessitated merit goods. The egalitarian approach to distributive justice was found in many ways through the institutions developed in the many countries of socialistic ideologies. They created middle order structure irrespective of social backgrounds through the job offering the government and non government institutions. They also set the benchmark of expectation of what was good and most desired in the forms of labour remunerations which is fully build on market determined structures. The strength of the structures do outline the survival of the fittest but for all other that need help, there is a need for a lending hand which may or may not be fully sufficed by the exchange itself unless special mention to the specially needed people is made as part of the public policy and framework of this exchange so proposed. Adam Smith's assertion that national prices are distinct from market prices and were sum of the natural rates of wages, profits and rent recognize the contribution of labour in generating wealth.

Further our study also proposes the transparency and accountability in the labour markets as part of the need for social justice and order. It improves the utility of the individual, society and nation at large by improving their decision taking ability as specified in the unitary models and collective approach. Mornstand (1956) provided the income-leisure approach by which the unemployment simply has no interpretation as a consequence of assumptions that jobs are instantaneously available at market clearing wage rates known to the labour. Unemployment cannot always be a reasoned by the acts of the unions or minimum wage laws. (Stiglitz 2001) there would be more reason for existence of natural & cyclical unemployment. Burdett (1978) explained the job-to-job transitions & wage growth with same employer. Pissarides (1979) search model with an employment agency, no wage variability and the separation rate is exogenous. His search models are random search and search via an employment agency favoring random search for increasing the overall matching rate. McCall (1970) gave classical search model. He identified the loss of a job as a capital loss, and a spell of unemployment as an investment in searching for an acceptable job. The labor (man hours) is to be looked at in this new perspective i.e. as resource "Wealth" exactly like any other resources including as securities. There is need to use this resource through a mechanism whereby this wealth can be effectively utilized through capacity building through human resource. Recession and Depression with massive unemployment echoed the market failures, which Adam Smith (1776) invisible hand could not correct in all markets including goods, labor and capital markets. Stiglitz (2001) reiterated that market imperfections caused by information asymmetries magnified economic shocks and made them persistent. Pooling information and reducing the information asymmetries could lead to correcting some part of market failure that leads to allocation or distributional distortions.

## V. Summary & Conclusion

The proposed work provides a General Theory of Employment, Wealth and Efficient labour market through setting up of a National Labour Exchange and their interlock with AI, Data and Machine Learning will

help build a stronger and resource rich society along the lines of the Nobel Prize works of the last 7 years. The National Labour Exchange can be a vehicle of facilitating information for available jobs i.e. employment opportunities at given return to labour and availability of labour offering the services for a return based on their value addition. The proposed work will fill the existing gap of asymmetrical information. The paper proposes setting up of a National Labour Exchange along the lines of National Stock Exchange, Bombay Stock Exchange and Commodity Exchanges Worldwide in order to promote efficiency in the labour market, full employment and generating wealth and positive contributions to GDP. The paper also considers that Labour as a valuable resource and a Wealth of the Nation, having potential to generate more wealth. The paper opposes the concept of Wages or Price of Labour as in classical economics, but supports Ricardo's theory of Value and Laissez faire through efficient labour market. The paper opposes Keynesian theory outlining Government Intervention to generate Employment through Monetary Policy changes and Fiscal Policy as Keynesian theory based on the book on "The General Theory of Employment, Interest and Money" is a product of Great Depression of 1931-36 not reflecting normal economics and business conditions in the economy when business failed and labour laid off in abundance. The paper critically evaluates various theories on Labour.

The proposed work would induce competition both among employers and labour to maximize the productivity, maximizing wealth, GDP and social welfare. Labour, instead of being idle or underemployed would prefer to pick up a job with lower return. It would provide transparency, avoid exploitation of labour, Efficiency in labour market would help foreign investors, to know about the skill, experiences, qualifications and desired return of labour in a country. This in turn will remove any fears regarding the availability of labour in a given industry.

The payment to labour should be based on return to labour on the basis of value addition, rather than as wages as is being currently done. Payment of wages is exploitative on one or the other ground. Labour is resource (wealth) as much as land or capital and deserves return to labour. The proposed work states that the wages paid to labour should be replaced by "Return to Labour" based on value addition. Return to Labour would be automatically directly linked to productivity. It would give dignity and enhance or reduce return.

The proposed work would create one NATIONAL market for labor exchange, uniting the country and its countrymen to one Common Working Platform removing the discrimination of regional imbalances, labor immobility and information asymmetries that create distortion in the demand or supply of labor. It would encourage labour at all levels to acquire certificates, degrees, skill and focus on maximizing productivity so as to qualify for a composite score that is high to get better return on jobs and choice of firms.

The National Exchange model hence offers Exchange where Man Hours are Traded like Scrips in Stock Exchanges; Automatic verification of Degrees, Ranking and Rating of Qualifications Obtained; Gender Neutral Framework;

AI based Matching of Orders and Use of Data and Machine Learning to Connect Employers and Man-Hour Pricing. A new firm or labor (man-hours) would not be exploited by the market as the norms would be transparent and accountable. Some known benefits of this centralized labor market at the national level which would also highlight the dispersion in the wages would be (a) Larger the expenditure on labor greater would be the saving from the search and better the quality of search using AI, Data Science & ML; (b) Greater the number of repetitive demands for a specified labor the more effective would be the search with labor contract being more standardized with standardized pays with more effective search results using AI & ML; (c) Greater the number of similar labor offerings the more similar the wage demands leading to lesser dispersions in standardized wage rates; (d) the saving on cost of search would be smaller, greater the integration of the geographically diversified and differently specialized labor markets. The effects of pooled information and comparison would lead to higher utility indifference curves for both the firms and labor (man-hours) and would reduce the cost of search using Data Sciences with advanced AI & Machine Learning.

National Labor Exchange which, as, proposed to be developed would register and take record of the entire labor force of an economy. It would result in greater efficiency in all respects like in the capital markets and financial markets. Search would be simpler and repetitive searches would not command premium but unique searches would command premiums. The effects of pooled information and comparison would lead to higher utility indifference curves for both the firms and labor and would reduce the cost of search operation. The distribution of demand and supply would be self evident and it would be possible to empirically estimate the same using Data Science. Correlations between several factors like gender, race, educational qualification, wealth, experience, marital status and network effects could be easily estimated by determining the correlations between successive wage rates within a group of similar and dissimilar labor class. The exchange can find penetration with the Jan Dhan, AADHAR (Social Security Number given by National Governments) and Mobile (JAM) trinity that the present government has initiated to reach to more and more people. The introduction of the new contract class of labour in the agriculture sector with contract farming would also find gainful employment once they are registered. Social Protection Scheme and introduction of any transfer payment can also be easily identified and introduced through this exchange, whether it is distribution of unemployment allowance, or minimum job offer like in Digital Currency (like Digital Rupee) Agarwal, Agarwal, Agarwal & Agarweal (2015, 2017, 2018, 2020, 2022; Agarwal and Pandey, 2024) will facilitate streamless e-transfers like cash movements and ease in NLXs settlements. MGNREGA (Rural Employment Scheme in India) or the cash subsidy transfers to the vulnerable groups would also be permitted using the exchange. NLXs as proposed would also help Rating Certificates, Diplomas, Degrees, skill development and experiences based on Scores and would facilitate transparency in the Efficient Labour Markets.

The proposed Model of creating efficient Labour Market through National Labour Exchange will facilitate an automatic way for Full Employment, generating wealth for the nation, firm and labour, easy access



to information about the availability of labour (man hours) and jobs. It would also help save employment costs in a Market Driven Economic System with Asymmetric Information. National labour Exchange as proposed would also help Rating Certificates, Diplomas, Degrees, skill development and experiences based on Scores and would facilitate transparency in the Efficient Labour Markets. It would automatically adjust the return to labour based on value addition and economic and business conditions avoiding the problems of laying off. Efficient Labour Market would facilitate perfect or nearly perfect mobility of labour through National Labour Exchange.

The biggest security to labour is his manhours and its credits that he encashes over his lifetime. The exchange provides him with the opportunity to use these credits at his will with information and knowledge at the core along with technology of artificial intelligence, data and machine learning to create efficient markets through enhanced Human Capital.

### Notes

1. Labor involved in preparing oneself for a job including preparation of meals, arranging clothing, housekeeping and other jobs like educating children
2. For empirical work see Kasper (1967). Axel (1984) provides for variations in the reservation rates with different utilities for leisure.
3. Wages higher than the minimum wages to promote higher productivity and to incur lesser turnover costs.
4. Unemployment is not always a cost to the economy as the labour may then have the incentive not to shirk his responsibilities for the fear of being unemployed. If there is no fear of being unemployed, productivity would be adversely impacted. Firms also do not own any responsibility for clearing markets. Though they are willing to pay higher wage rates to attract more able employees, if it guarantees by better production efficiencies. Full employment would also lead to the problem of moral hazard where the employee would be reckless with his work as he is full insured from any uncertainty to his incomes.
5. Stiglitz (2001) rejected the cornerstone of basic economic laws like the law of demand and supply (holding that market equilibrium was characterized by market clearing), the law of the single price, holding that the same good sold for a single price throughout the market, the law of the competitive price, holding that in equilibrium price equaled marginal cost, the efficient markets hypothesis, holding that in stock markets prices convey all the relevant information from the informed to the uninformed under restrictive market conditions.
6. Stigler (1961) noted that whatever be the distribution of prices (in our case wages) it is certain that increased search would diminish returns as measured by expected reduction in the minimum asking price. This is obviously true for rectangular distribution with minimum asking price of  $1/n+1$  with  $n$  searches and also of normal distributions. If the asking distribution did not display this feature then it would be an unstable distribution.
7. Stigler (1961) also noted the saving for the buyer (for us the firms) searches as the expected reduction in price with additional searches. The saving on labor cost would be greater, greater the expenditure on developing the human resource. The precise saving will be the quantity which would be purchased at higher prices (wages) plus the additional price on additional purchases induced by lower prices (wages). Screening and previous experience of employment would add to the saving from the search cost.
8. One may like to understand the concept of appropriating returns (Stiglitz 2001) and unrevealed information on the part of labour while understanding the process of the search which may not always yield optimal results despite every effort made to make information accessible.

9. As per efficiency wage theory (Stiglitz, 2001) differential in wages or wage distribution may not purely be the function of the ability of the labour or their productivity (Bontemps, Robin, and Van Den Berg (2000), Bowlus and Grogan (2001)) but may be a functional relationship of his inefficiencies and the perceived loss to the firm. Burdett and Mortensen (1998) analyses within a search model framework defines the wages which the firms set that differ for identical workers and even with identical firms. Albrecht and Axell (1984), Eckstein and Wolpin (1990) work also indicates how wages may differ due to difference in utility of leisure.
10. See Burdett and Wishwanath (1984) work on mean wage and dispersion.
11. A scheme initiated by Prime Minister Narendra Modi that enables underprivileged and disadvantaged people to open bank accounts in the country.
12. Mahatma Gandhi National Rural Employment Gaurantee Act which is one of the government of India's largest schemes and 41% of direct benefit expenditure of the government next goes to PAHAL (The LPG subsidy schemes) which is about 37%, National Assistance program has 14% share in total disbursements, scholarship schemes which are 29 have &% share and other schemes for labour, women and banking have a 1% share.

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