THE NEED TO DIFFERENTIATE THE FORMAL LABOR MARKET FROM THE INFORMAL LABOR MARKET IN PAKISTAN

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1. Objective and Contribution of the study:

This study aims to do two things.

One, it aims to estimate informality using a new criterion of a subsistence wage because existing criteria are found to be either inadequate in the case of the Government of Pakistan (GOP) or virtually impossible to empirically estimate given data limitations, in the case of the International Labor Organisation's (ILO) very comprehensive definitional criteria. The most important takeaway for us from ILO's very comprehensive criteria, to distinguish between formality and informality, is *the regulatory environment of state legislation and enforcement.* The principle of this takeaway is the conceptual foundation of our essay. ILO uses the principle of regulatory writ to be indicated by social protection. Given the extreme paucity of any significant modicum of social protection in developing countries like Pakistan and India, we are adopting another criterion indicative of legislative writ, which is the wage rate. The wage rate is arguably the most important working condition in the labor market.

Two, using this critical indicator of informality, the subsistence wage rate, this study will then estimate the distribution of wages and employment in the informal labor market in Pakistan, at one point in time, for the most recent year. It will then estimate the same distribution of wages and employment in the formal labor market in Pakistan, at one point in time, for the same year.

The whole point of demarcating the formal labor market from the informal labor market, is to show that the two distributions behave differently. That agents in the formal labor market, as posited and then observed by their behavior, in their relationship between wages and employment, behave differently. From agents in the informal labor market, as posited and observed by their behavior, in their relationship between wages and employment.

To show this difference in agent behavior, between the formal and informal labor markets in Pakistan, which would be generalizable to the labor markets of other developing countries, is the raison d'etre of this study.

To do this, this study will examine:

(a) the cross-sectional relationship between wages and hours worked in the informal labor market, which is the supply curve for labor in the informal labor market;
(b) the cross-sectional relationship between wages and hours worked in the formal labor market, which is the

supply curve for labor in the formal labor market;

The existing literature, and global policy, led by the ILO, infers that strengthening regulatory fiat in the formal labor market will eventually trickle down to affect the informal labor market. We contend that this model of the causal relationship between formality and informality is flawed. We take a classical Lewisian model to examine the labor market. This model contends that surplus labor in the informal labor market has to exhaust, before bidding up the wage in the informal labor market and the formal labor market. So, we are standing theory on its head. We are implying reverse causality that the informal wage has to lead and the formal wage has to follow.

The reason for the informal wage having to lead and the formal wage to follow, is the theorized and observed agent behavior in the informal labor market. Agents in the informal labor market, defined as lying below subsistence wage rates, are compelled to reach the equivalence of subsistence for the household, in a perverse Says Law, by offering themselves at weaker wage rates. Therefore, surplus labor, compels agents in the informal labor market to weaken their own wages, because of the compulsion of reaching the equivalent of subsistence. While agents in the formal labor market do not face this compulsion of subsistence, and behave according to the neoclassical concept of wage incentives. Hence trickle down from the formal labor market will not break the compulsion of subsistence in the informal labor market. Surplus labor has to be exhausted in the informal labor market, to bid up those wages above subsistence, to break the compulsion of subsistence.

This essay has very strong policy implications, because if the Lewis hypothesis is supported, then global policy to improve conditions in the formal labor market, as advocated by the ILO, is misplaced. The need to differentiate the formal labor market from the informal labor market has been demonstrated in that, the informal labor market operates under a perverse Say's Law, which weakens its own wages because of the presence of surplus labor, implying the need for specific policy, aimed separately at the formal labor market and the informal labor market. This is because, we cannot rely on a trickle-down effect from the formal labor market to the informal labor market.

Policies aimed at generating aggregate demand for employment in the informal labor market, which allow the bidding up of the wage in the informal labor market, have to be formulated. An example in this regard is the National Rural Employment Guarantee Act (NREGA) in India (Islam, M., & Sivasankaran, A. (2015). Which aims to generate employment and prop up rural wage in a market which is not readily subject to the writ of the state's regulatory framework. Such policies have been designed and even legislated in Pakistan, but have

fallen victim to politics in the past.

2. Introduction

2.1 The evolving concept of Informality

The global informal economy, as estimated by the ILO, accounts for approximately 2 billion people, making it 61% of the total employed global population (ILO, 2018). The concept of informality was first introduced as a residual sector, aimed at absorbing all of the surplus labor left unemployed by the formal sector, in the International Labor Organization's Kenya report of 1972, as mentioned previously. This limitation of the capacity of the formal sector to employ labor can be explained by the high population growth rates and weak GDP growth in contrast Where the informal sector employed those left unemployed by the formal sector, providing them a safety net.

This early concept of the informal sector evolved. The informal sector came to be seen as a way to bring down costs by avoiding being subject to government regulation. To reduce operational costs, firms in the formal sector resorted to outsourcing some work, usually labor intensive in nature, to the informal sector, which considerably brought down their expenses. This of course, adds to the complex nature of informality. With the ILO pointing out the possibility of informal jobs existing even in the formal sector.

So, the concept of the informal sector evolved into a broader, more complex concept of informality. Because it was no longer limited to a standalone informal sector. And in fact, extended through informal workers to the formal sector.

Workers in the informal labor market have one major commonality, vulnerability. The major characteristics of vulnerability are lower wages, weaker social protection, onerous conditions of work, including long, unregulated hours, weak and often a hazardous Occupational Safety and Health (OSH) work environment. These weaker conditions of work exist in the informal labor market because of the absence of the writ of the state's regulatory environment, and enforcement. Unless informal employment is legally covered by state writ, it will remain vulnerable and precarious in nature.

2.2 Measuring Informality

As this definition of informality has become more complex, estimating informality in the labor market becomes

more challenging. Unless we have the statistics that reflect the actual proportion of informality in the labor market, it remains a challenge to come up with policies that are directed towards the economic well-being of the informal workers.

To demarcate formality from informality, the ILO uses the criterion of registration of workers. And in effect, the registration of workers is specified to be covered under some or any measure of social protection. This criterion adopted by the 17th ICLS [1](International Conference of Labor Statisticians) has now become the global standard for defining informality and formality. However, as the methodology section shows below, it is difficult to base estimation of informality on this criterion, given the data limitations of the labor force surveys of many countries. Certainly, in the case of labor force surveys we plan to examine for Pakistan's labor market.

In Pakistan's case, the considerable literature on informality has not evolved along with the international literature to use the ICLS criterion of registration and social protection. The Pakistan Bureau of Statistics' (PBS) estimates of informality are based on the Factories Act of 1934 which uses the size of employment and type of enterprise as the criteria for estimating informality based on the Labor Force Survey.

This essay finds the PBS definition of informality to lack the comprehensive nature of the ILO's definition of informality. However, the dilemma remains of estimating informality using ILO criterion on account of data limitations in Pakistan's Labor Force Surveys.

Therefore, we propose to use the essential concept of informality in order to define it, which is the purview of the writ of the government's regulatory environment and enforcement. This concept has allowed the ILO to identify one particular variable to be the defining criterion for informality, which is registration of workers and enterprises, for social protection. But the paucity of social protection in Pakistan, would lump most workers into the informal labor market.

The proposal in this essay, then is to use the wage as a criterion to demarcate the informal labor market from the formal labor market in Pakistan. This raises the question of what should be the boundary wage to set between the informal and formal labor market. From the most important welfare point of view, the wage should

[1] *In November-December 2003 the Seventeenth International Conference of Labor Statisticians (17th ICLS) endorsed Guidelines concerning a statistical definition of informal employment (hereinafter referred to as the 17th ICLS Guidelines), which complement the 15th ICLS Resolution.0

be a subsistence wage. The definition of a subsistence wage (ILO, 2008) is that it should allow subsistence for the household. That is, the earner's wage should be sufficient to meet the subsistence requirements of the household's dependents. This subsistence wage criterion becomes arguably the most important distinction from a welfare point of view, to separate informality from formality in the labor market. And the state's regulatory environment should focus on this primary criterion for raising the wage, to become, at the very least, a subsistence wage.

For this purpose, we divide this study into two parts.

The first part will estimate informality and formality in Pakistan's labor market using three criteria. The first criterion is that used by the GOP and the literature in Pakistan of registration under the Factories Act of 1934, of ten or more workers.

The second criterion is the ILO's registration for social protection. This is based on filling in a very complex matrix of formality and informality even among registered enterprises. Data constraints allowing, some attempt at estimation is made using this criterion.

The third criterion used is the one proposed here, of a subsistence wage. This estimate seems to vary significantly from the other two estimates and arguably allows a better and more comprehensive estimate of the labor market in Pakistan. Which is one justification for this study.

The purpose of demarcating informality from formality in the labor market, has to be to examine critical differences in working conditions between them. The most important working condition has to be the wage. The wage is the household's means of subsistence, and if the wage does not meet subsistence, the worker will eventually die of hunger, regardless of the improvement in other working conditions. This renders all other working conditions secondary, making wage the primary indicator. Unemployment cannot capture the job quality in the labor market, for which, the wage then becomes an important metric which can both, judge the quality of jobs and the level of vulnerability in the informal labor market. Moreover, the neoclassical and classical models also use the wage as a mechanism to study the demand and supply of labor in the labor market. More importantly, when we use the wage as an indicator of job quality, we are also able to explain the vulnerability of piece-rate workers and the exploitation through the wage (Mahmood, 2019).

We have the data to explain that wage has to be the most important working condition. (Mahmood,

2019). Therefore, it becomes important to examine the nature of the wage in the informal part of the labor market, compared to the formal part of the labor market in Pakistan.

The literature examined below and global policy led by the ILO, focuses on the formal labor market. Policy is aimed at improving working conditions in the formal labor market through more comprehensive regulatory fiat and extension from the formal labor market to the informal labor market.

The theoretical argument that emerges, underlying this policy platform, is that improvement in the working conditions in the formal labor market will trickle down to improvements in the informal labor markets. Call this the trickle-down argument for labor markets.

An alternative theory to this trickle-down argument is posited here. This is derived from the classical Lewis model of development. The Lewis model is based upon surplus labor in a traditional sector with low productivity and hence low wages. A modern sector, on the other hand, has higher productivity and higher wages. We are positing here that the traditional sector can be likened to the informal labor market. And the modern sector can be likened to the formal labor market. The Lewis model allows a rise in the wage in the formal labor market, as the flow of surplus labor from the informal labor market to the formal labor market reduces, and eventually gets exhausted.

Ergo, rather than trickle down from the formal labor market to the informal, the Lewis model by extension, can be used to imply a model of exhaustion of surplus labor in the informal labor market affecting the formal.

Therefore, we propose, what we think is an even more important variable to indicate the essential concept of being under the purview of the writ of the state's regulatory environment. This variable is the subsistence wage. The subsistence wage is the most important of working conditions in the labor market.[2] And certainly, the most important working conditions for welfare transitions to the formal labor market. But most importantly, the rise in the wage in the modern sector is only possible as the surplus labor in the traditional sector is exhausted.

This Lewisian analogy applies to wages in the informal and formal labor markets. In that, a rise in the informal labor market wage has to enable a rise in the formal labor market wage. Certainly, the causality cannot be, as posited by the trickle-down theory. Which is, an improvement in the formal labor market wage leading to

[2] It is important to note that this entire discussion is predicated by the existence of a labor market with free agents able to transact their labor power, without any extra economic coercion, such as bonded labor, and forced labor.

an improvement in the informal labor market wage.

The second part of this study will then demarcate the formal labor market from the informal labor market, to show different agent behavior between the two. To show that surplus labor leads agent behavior in the informal labor market to a compulsion of subsistence. Which weakens the wage in the informal labor market. Which trickle down from the formal labor market cannot affect. Requiring instead that this compulsion of subsistence weakening the wage in the informal labor market be broken by the exhaustion of surplus labor.

3. Literature Review

The International Labor Organization's first take on informality can be dated back to the Kenya report of 1972, where the informal sector was simply seen as a residual sector which absorbed all the surplus labor that could not get employed in the formal sector. The high population growth rates and weak GDP growth in contrast, limited the capacity of the formal sector to absorb any surplus labor which would ultimately get employed in the informal sector. This informal sector then acted as a temporary refuge for those left unemployed by the formal sector, providing them a safety net.

De Soto (1989) and the Legalist school during the 80s and 90s were of the view that the informal economy was more a sector which accommodated refuge capital than the refuge labor. The informal sector was not a last resort to gain employment, rather a way to bring down costs by avoiding being subject to government regulation. The complex regulatory framework made operating in the formal sector inconvenient and expensive for entrepreneurs who could avoid all the additional costs in the informal sector.

The Structuralist school of thought (Portes et al., 1989) built further on the Legalist school and brought an end to the dualism of the two sectors, rather seeing the two having linkages with one another. To reduce operational costs, firms in the formal sector resorted to outsourcing some operations, usually labor intensive in nature, to the informal sector, which considerably brought down their expenses but ended up increasing employment in the informal sector. The Voluntarist school (Maloney, 2004) sees this as an attempt at profit maximization at the expense of fair competition and social protection of labor. Since informal enterprises escape the regulatory framework, they are able to bring down the cost of doing business and this creates unfair competition for the formal enterprises who comply with the regulatory policies. The informal sector then acts as a periphery to the core formal sector which is usually exploitative in nature.

3.1 ILO's evolving conceptual framework on Informality

The global economy accounts for a significant portion of informal employment, especially in the developing countries, which practically encompasses every employed person who isn't subject to state labor regulation and is not covered by the social protection net or employment benefits.

Informal employment isn't confined to the informal sector only, with the possibility that individuals can have informal jobs in formal enterprises as well. In developing countries, informal employment can account for more than half of non-agricultural employment. The International Labor Organization (ILO) statistics record informal employment as a part of non-agricultural employment to be at 82% for South Asia, 66% for Sub-Saharan Africa and 51% in Latin America. (ILO, 2013)

Production Units by Type	**Jobs by Status in Employment**								
	Own-account workers		Employers		Contributing family workers	Employees		Members of producers' cooperatives	
	Informal	Formal	Informal	Formal	Informal	Informal	Formal	Informal	Formal
Formal sector enterprises					1	2			
Informal sector enterprises	3		4		5	6		8	
Households	9					10			

Source: ILO (2013)

*Cells shaded in light blue refer to formal jobs. Cells shaded in light green represent the various types of informal jobs. Blank cells by definition do not exist in the type of production unit in question.

*Informal employment: Cells 1 to 6 and 8 to 10.

*Employment in the informal sector: Cells 3 to 8.

*Informal employment outside the informal sector: Cells 1, 2, 9 and 10.

Conditions for informal sectors vary across countries, making the informal sector highly segmented within a country and across different economies. Therefore, ILO (2013) characterizes informality as part refuge labor and part refuge capital. However, the definition introduced by the International Labor Organization (ILO) in its 17th International Conference of Labor Statisticians in 2003 (see ILO, 2004) is the one common thread that connects informal economies globally, with its three operational criteria.

· Informal employment without legal protection
· Informal employment without social protection
· Informal employment both inside the informal sector and outside it as well

Informal employment can therefore be categorized as any form of employment which does not fall under state labor legislation, which is not bound by any written contracts or subject to income taxation, social protection or any employment benefits including severance pay, annual or sick leaves, pension funds, etc. (ILO, 2013). Usually, these workers are employed as domestic help or on a short term/seasonal basis.

The terms informal employment, informal sector and informal economy are used interchangeably which is not correct statistically, since using the right terminology is key to collecting the right data. The above definition specifies the criteria for measuring the informal economy. Informal employment, on the other hand, is defined distinctly from informal economy by the International Labor Organization (ILO) in its 17th International Conference of Labor Statisticians in 2003. The standard informal employment consists of:

· – Informal contributing family workers in both formal and informal enterprises
· – Informal own-account workers, in informal enterprises and household production units
· – Informal waged employees in formal and informal enterprises and household production units
· – Informal members of production cooperatives

The formal and informal labor markets cannot be divided into black and white, rather it's easier to categorize it into greys i.e., formality within informality and informality within formality. The non-registration criterion of employees is reflective of the conditions of informal employment which differ considerably from those that are normally present in formal employment. For example, no written contracts make it convenient for employers to flee state legislation that is there in the first place to protect the workers. This criterion classifies any enterprise as informal where the workers are not registered and helps in overcoming the informality within formality phenomenon (ILO, 2013).

Formality within informality exists in situations where employees are registered with the state but enterprises are not, making them part of the informal sector but not informal employment. These employees are subject to state labor legislation, social protection and employment benefits.

As far as informality within formality is concerned, Paragraph 3 of the 17th ICLS guidelines defined 'informal employment' as the total number of informal jobs, whether carried out in formal sector enterprises, informal sector enterprises or households, during a given reference period. Informal employment outside the informal sector comprises the following types of job: employees holding informal jobs in formal sector enterprises (Cell 2 in the matrix above) or as informal paid domestic workers employed by households (Cell 10); contributing family workers working in formal sector enterprises (Cell 1); own-account workers engaged in the production of goods exclusively for own final use by their household, if considered employed according to the 13th ICLS definition of employment (Cell 9). Therefore, instances of informal employment within formal employment is a common phenomenon which is not limited to the developing countries. (ILO, 2013)

Without a formal labor market, there would have been no informal labor market. This means that the existence of a formal sector is a prerequisite for the informal sector to thrive, since the formal sector provides subcontracting opportunities, home based work and other forms of temporary employment which largely account for the informal employment. (Chen et al, 2004)

3.2 Pakistan Bureau of Statistic's definition of Informality:

The Pakistan Bureau of Statistics uses size of employment and type of enterprise as the criteria for estimating informality in the Labor Force Survey, using the Factories Act of 1934 as its definitional criterion. Household enterprises and enterprises with less than 10 persons employed make up for the informal sector in Pakistan. Agricultural employment and those involved in non-market production are excluded from the informality criteria. This estimates Pakistan's informality at a very high 72% of total employment, compared to 28% workers employed in the formal sector (Labor Force Survey, 2017-18).

3.3 The need to estimate informality

For countries with large informal economies, mostly in the case of developing countries, low unemployment rates are the second-best metric in the labor market. While this might be a good indicator for Advanced

Economies where the informal labor market makes up for a small portion of the total labor force, a majority of the workers in the developing countries are employed by compulsion, since they cannot afford to be unemployed (ILO, 2013). Lack of any significant social protection coverage forces them to take up any job(s) available, regardless of the weak working conditions or low wage levels. This particular section of the society involved in hazardous and vulnerable employment comprises the "working poor", a term coined by the International Labor Organization (ILO) which has gained significance in recent years. (ILO, 2013). Therefore, job quality instead of quantity should be the key metric to observe growth.

A study by Tahir and Tahir (2014) also reiterates that lack of employment opportunities in the formal labor market and availability of surplus labor in the rural areas is responsible for rural-urban migration. These migrants largely account for the informal workers who are hired at lower wages and are not covered by state regulation. Since they are usually unskilled, they accept jobs at lower wages which is the primary cause of poverty amongst the employed. Another study by (Mengyun Wu, et al. (2019) estimates that 70% of the rise in informal employment in Pakistan emerges from migration of individuals from formal to informal jobs within the manufacturing sector. (Mengyun Wu, et al. (2019) further build on the exploitation of the workers in the informal labor market by highlighting that it is the informal workers who are the first to be laid off in case of adverse shocks experienced by the firms, since no national labor legislation forbids them from doing so. Informal workers have been found to work for longer hours (49.84 and 46.41, respectively) than their formal counterparts.

In the case of Pakistan, informal enterprises are exempt from state legislation based on the ten or more workers' criterion laid out by the Factories Act of 1934. This makes it commonplace for SMEs to hire individuals as contract workers rather than as employees. They might resort to outsourcing or hiring through agencies, which helps them in circumventing labor legislation and reducing operational costs which is made possible through surplus labor that is willing to work for lesser wages. (Hisam, 2015)

Laborers usually lack the capacity to acquire adequate knowledge of the law or legal representation. Labor policies have also remained divorced from legislation. As a result, informal and agricultural workers remain deprived of the simple right of association. Absence of bargaining power which prevents them from gaining access to practically any other benefits that come with formal employment.

A recent survey by Choudhry and Zoega (2016) indicates that a striking 47.6% of informal enterprises pay workers below the minimum wage, whereas this incidence is relatively lower (17.5%) for the formal sector

enterprises. This can be due to the non-binding nature of the state laws in the informal labor market.

The Minimum Wage Ordinance 1961 and equivalent provincial legislation expressly excludes workers in informal sector enterprises or workers holding informal jobs from its protection. There is no legal requirement that a "worker" as defined under the legislation possess written contracts or formal agreements in order to be covered by the minimum wage. Apart from that, Pakistan is not a signatory to the International Labor Organization (ILO)'s Minimum Wage Fixing Convention, 1970 and the absence of a clear definition of the minimum wage in national legislation calls for the formulation of a policy directed towards informal employment. (ILO, 2016)

Burki and Afaqi (1996) observe that the salaries for waged employees are lesser compared to those who are self-employed in the informal labor market. However, their study indicates that there is a great potential for workers to progress in the informal labor market by learning new skills. Vertical mobility is made possible through skills learning but is hindered by a lack of access to credit and technology. Absence of national labor legislation deprives business owners of the benefit of state policies that ensure a conducive business environment.

Empirical evidence from different countries supports this theory which lays the foundation for our model as well. A study on the impact of minimum wage in the formal labor market by Suryahadi et. Al. (2010), finds that a rise in minimum wages imposed in the formal labor market dampens the wages in the informal labor market by shifting labor from the formal labor market to the informal labor market, thereby having an opposite effect as opposed to what the existing global and Pakistan literature suggests.

As much as 1% of the total employment level will plummet with a 10% increase in the minimum wage (Suryahadi et. Al., 2010). However, the white-collar workers or highly skilled workers stay rather immune to layoffs as a result of higher minimum wages in the formal labor market. Moreover, firms will improve technology at the cost of the labor they hired earlier as a response to increases in minimum wages. This suggests that improving wage conditions in the formal labor market does not have a trickle-down effect rather has a countercyclical impact on the informal labor market wages and eventually the working conditions.

4. Conceptual Framework

We begin our conceptual framework by examining some challenges in estimating informality.

Since all countries do not have a standard data source, it becomes a challenge to compare data across countries. Some rely on the labor force surveys, some take data from household and enterprise surveys while others conduct dedicated informal labor market surveys. Another common issue that arises is selection of workers based on the primary or secondary jobs, since some workers might be working primarily in the formal labor market but also working part time in the informal labor market. A similar challenge is that of seasonal workers, where representation becomes a problem as a short reference period surveyed (e.g., a week or a month) might not be representative of employment for the whole year for seasonal workers. Lastly, developing countries are constrained by their capacity to collect data and generate national level statistics due to limited resources.

The International Labor Organization (ILO)'s criteria of registration and social protection to define formality does not capture the erosion of the wage below subsistence and those who work without sufficient remuneration for long hours in hazardous conditions. Social protection has to be a lower rung on the ladder of metrics of informality, wages being the first and foremost. Our model measures job quality through money wages offered in both informal and formal economies, which becomes the first best metric to estimate and compare employment in terms of quality. It shows a significant drop in the wages for the informal labor market which explains the concept in monetary terms while the absence of social protection and worker benefits, vulnerable employment conditions, excessive hours worked with no paid leaves are all non-monetary indicators of job quality in the informal labor market.

Another difficulty with using the ILO criterion is the presence of informality within formality. Even if an enterprise complies with the ILO criterion of registration, it does not distinguish informal workers from formal workers, as 'informal employment' under the 17th ICLS is defined as the total number of informal jobs, whether carried out in formal sector enterprises, informal sector enterprises or households, during a given reference period. Since these workers are not registered, even formal enterprises can get away with not providing incentives that are associated with formal employment. This reiterates the difficulty of the ILO registration criteria for estimating informality.

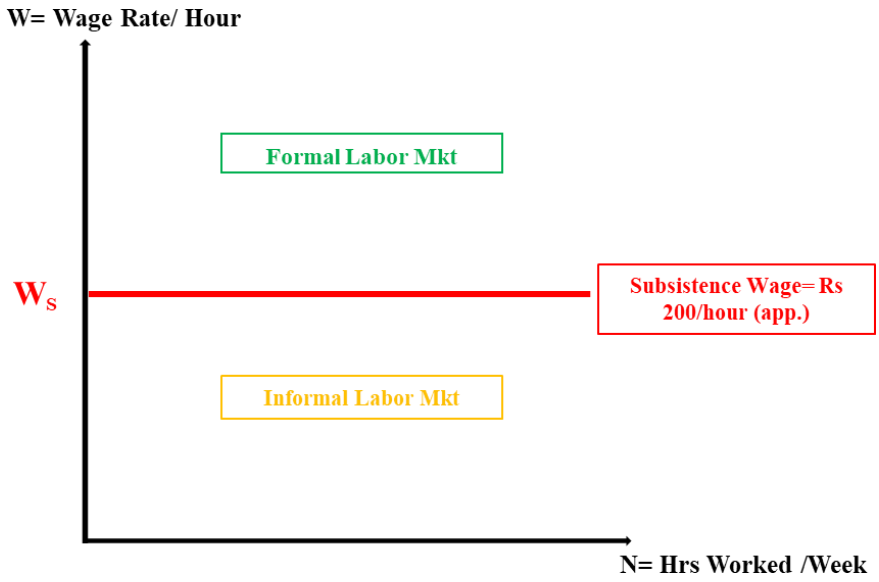
This methodology is also not suitable to estimate informality in the case of Pakistan since there is no direct question about registration of employees or enterprises in the Labor Force Survey. Which has also been confirmed bilaterally to us by the Pakistan Bureau of Statistics officials.

Using the GOP's criterion comes with its own set of challenges. Unlike the international literature, the literature on the informal labor markets has not evolved over time to use the 17th ICLS criterion of registration and social protection. The Pakistan Bureau of Statistics' estimates of informality are still based on the Factories Act of 1934, which classifies all household enterprises and enterprises with less than ten workers as informal. There is no mention of informal workers in the formal sector or formal workers in the informal sector. The PBS definition of informality lacks the comprehensive nature of the ILO's definition of informality. Regardless of the size of the enterprise, it should be subject to national legislation.

We therefore propose estimating informality in the labor market on the basis of the most important working condition for welfare which is arguably, the wage. The idea is to bring workers and enterprises under the purview of the writ of the state's regulatory environment on the basis of a subsistence wage.

We use the wage as a criterion to demarcate the informal labor market from the formal labor market in Pakistan. The boundary to set between the two should be a wage which ensures that a household is able to meet its subsistence requirements through it. This makes the subsistence wage the most important distinction, to separate the two labor markets from one another.

Figure 1: The Aggregate Labor Market



The problems associated with estimating informality and the need to assess job quality as a better metric of the labor market rather than just the quantum of unemployment, support the idea of using the wage as a determining criterion. The wage is therefore a primary indicator of vulnerability in the informal labor market Moreover, the wage can be used as a mechanism to observe demand and supply of labor in the labor market, as in the Classical and Neoclassical models of the labor market. And the wage has immediate policy implications as well.

Most importantly, wages as a job quality indicator also incorporate individuals who work on a piece rate basis, perhaps earning a subsistence wage. Piece rates allow employers to circumvent wage rate regulations in the formal labor market. If the wage rate in the formal labor market is set at say a minimum wage, which may be above subsistence, paying piece rates, implies use of family labor, which will lower the wage per household member, allowing it to fall below subsistence. The piece rate model of production also brings with it a number of other challenges, child labor [3]being one of them, where in order to meet supply targets, children are forced to work without being accounted for in the labor force. This obviously means that they are not entitled to any form of remuneration and are exploited alongside other contributing family workers.

Although the ILO estimation criterion includes contributing family workers as part of informal employment, estimating this number is a challenge in itself.

Wages are therefore used as a cut off criterion to distinguish the formal labor market subject to regulatory fiat, from the informal labor market which is not.

The labor market is shown to be bifurcated by the differences in the many important working conditions between formality and informality, including remuneration, working hours, workload, and OSH. However, the most basic of all working conditions has to be the wage or the remuneration, since it is the first consideration of any employee seeking a job and that of the employer as well. Therefore, to demarcate the informal labor market from the formal labor market, we use the concept of a subsistence wage as the distinguishing criterion to separate the two. The subsistence wage is the most important working condition for welfare and precedes any other working conditions.

The fundamental theoretical point of distinguishing between the formal labor market and the informal labor market, is to determine whether agent behavior may vary between them. Workers behavior in the formal

3 Child labour refers to work that is mentally, physically, socially or morally dangerous and harmful to children; and interferes with their schooling, by depriving them of the opportunity to attend school; by obliging them to leave school prematurely; or by requiring them to attempt to combine school attendance with excessively long and heavy work. (ILO, 2002)

labor market may vary from workers behavior in the informal labor market. So, the supply of labor may vary between the formal labor market and the informal labor market. And equally, employer's behavior may vary between the formal labor market and the informal labor market. So the demand for labor may also vary between the formal labor market and informal labor market.

So, we need to examine the relationship between wages (W) and employment (N) in the formal labor market and compare it to the relationship between wages and employment in the informal labor market.

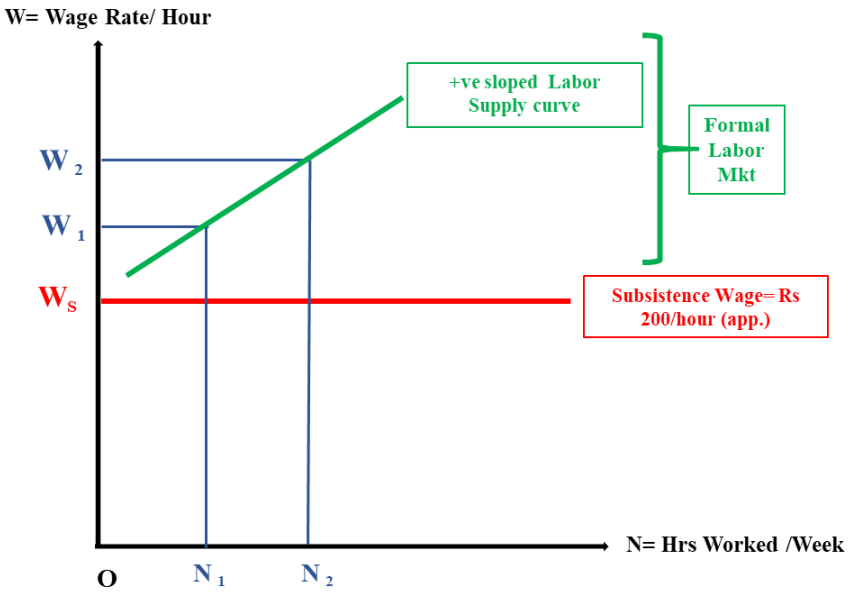
For this we need to develop a theoretical model to understand how the relationship between wages and employment in the formal labor market differs from this relationship between wages and employment in the informal labor market. Our distinguishing criterion between the formal and informal labor markets, is then posited as a subsistence wage. Which is a wage that is sufficient for a household to be able to meet the subsistence requirements of all its family members.

Above a subsistence wage in the formal labor market, we can then theorize that a particular relationship between wages and employment will hold. While below the subsistence wage, in the informal labor market, we theorise that another, different relationship between employment and wages will hold. That is, agents will behave differently in the formal labor market, compared to the informal labor market.

Let us begin with the supply curve for labor. And then come to the demand curve for labor.

For the formal labor market, consider the labor supply curve in a neoclassically competitive labor market in Fig.2. Given an equilibrium wage rate per hour of W1, and hours worked of N1, an agent will require a higher wage rate per hour, of W2, as an incentive to increase their employment, or work more hours, to N2. Conversely, at an equilibrium wage rate W2 and hours worked N2, a drop in the wage to W1 will decrease the agent's labor supply down to N1, as the agent will have less incentive to work. This gives a positive supply curve of labor, in the formal labor market.

Figure 2: The formal labor market



In the formal labor market, lying above a subsistence wage rate, agents' total hours worked (N) will be a positive function of their Wage rate (W), Where the hours worked are the dependent variable determined by the wage rate which is the independent variable.

N= + fn (W)

Therefore, Fig. 2 shows that the mathematical form of the supply relationship for the formal labor market, that hours worked, which represent employment, will be a positive function of the wage rate,

In fig.s 1-3, the area above WS is the formal labor market and the area below it is the informal labor market.

Below the subsistence wage **Ws** in Fig. 3, in the informal labor market, we expect the supply curve of labor to change, from the neoclassically posited positive supply curve of labor. The supply curve for those employed in the formal labor market is an upward sloping one, where a higher wage will increase labor supply resulting in increased employment. So, the positive supply curve of labor in the regulated formal labor market will be incentive based.

However, for the informal labor market, which is not subject to government regulation, we expect agent behavior to change. In Fig. 3, below the subsistence wage **Ws**, a wage rate of W3 will give an employment

level, of hours worked, of N3. So, workers are already not meeting the subsistence needs of their family. Therefore, compared to a wage rate of W1 in the formal labor market, giving an employment level, of hours worked of N1, the lower wage rate, and below subsistence **W**s, in the informal labor market, now requires more employment, more hours worked, of N3, which is greater than N1, to meet the subsistence needs of their family. So, a lower wage rate below subsistence, already requires more hours worked, compared to a wage rate above subsistence.

Now, suppose employers offer an even lower wage rate than W3, in the below subsistence informal labor market. Then workers compulsion to meet the subsistence needs of their family, will require them to increase their hours worked further, from N3 to N4.

This implies that in the informal labor market, below a subsistence wage rate, as the wage rate falls, employment, hours worked, increase. This means that in Fig. 3, below a subsistence wage rate **W**s , the supply curve of labor becomes negative.

This leads us to our second hypothesis:

Hypothesis 2: In the informal labor market, lying below a subsistence wage rate, agents' total hours worked (N) will be a negative function of the Wage rate (W). Where the hours worked are the dependent variable, determined by the wage rate which is the independent variable,

W= - fn (N)

Hypotheses 1 and 2 have two important caveats for the informal labor market, lying below a subsistence wage rate compared to the formal labor market lying above a subsistence wage rate.

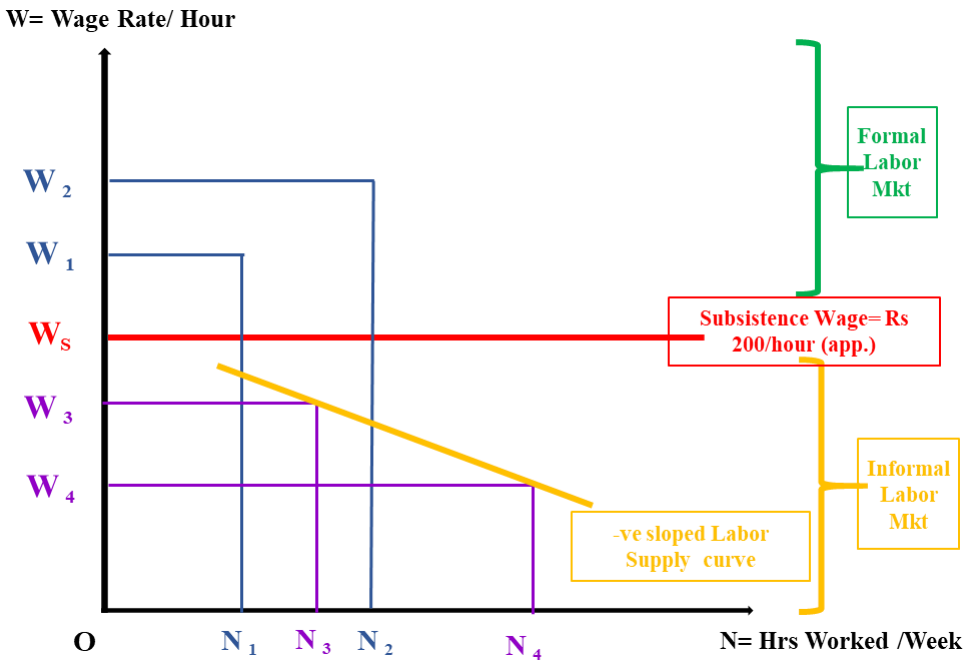
One, in the formal labor market, lying above the subsistence wage rate, neoclassical competition, requires price incentives, making the supply curve of labor a positive function of the wage rate. But in the informal market, lying below the subsistence wage rate, price incentives give way to the compulsion of subsistence, making the supply curve of labor a negative function of the wage rate.

Two, in the formal labor market, lying above the subsistence wage rate, the demand for labor will be that posited neoclassical, negatively sloped, with higher wage rates reducing the demand for labor. However, in

the informal labor market, lying below the subsistence wage rate, the compulsion of subsistence, will lead labor to create its own demand. As the wage rate falls further below subsistence, from W3 to W4, the compulsion to meet family subsistence will drive agents to seek greater employment, more hours worked. Ergo, in the informal labor market, lying below subsistence wage rates equivalent, labor supply will create its own demand, in a perverse Says Law.

This perverse Says Law operating in large informal labor markets lying below subsistence wage rate has huge macro-economic implications, for the behavior of labor supply determining employment (Mahmood 2022), to be investigated in follow up research for Pakistan.

Figure 3: The Informal Labor Market



The question then arises, that if indeed , an above subsistence wage rate in the formal labor market, and a below subsistence wage rate in the informal labor market, then what allows them to coexist?

The ILO's original explanation would be surplus labor. So, if there is surplus labor above that employed in the formal labor market, as seen in Fig. 4, then this surplus labor will offer itself for below subsistence wages in the informal labor market. The compulsion of the working poor, to not able to afford to be unemployed, will drive them to work at lower remuneration and more onerous working conditions, (Mahmood 2018).

However, if there is indeed surplus labor, why does neoclassical equilibrium not apply across both parts of the labor market, formal and informal, to lower the wage in the formal labor market, and raise the wage in the informal labor market, to arrive at one equilibrium wage for the entire labor market?

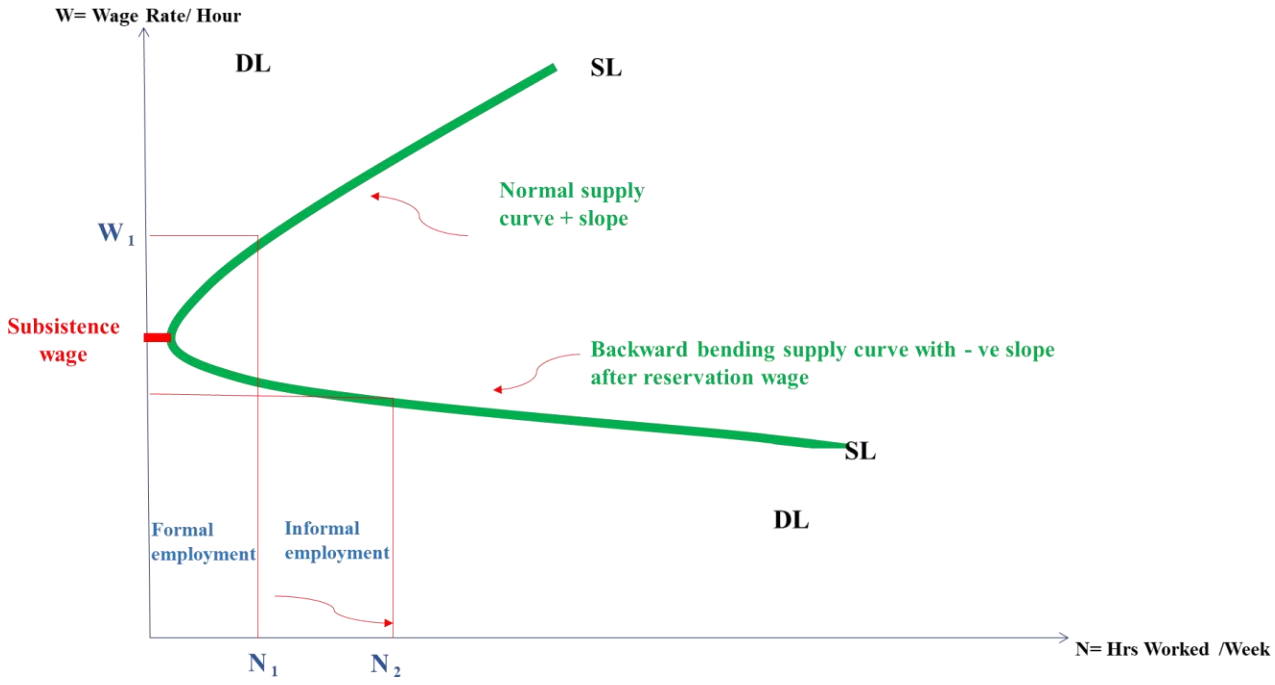
And the answer to the neoclassical equilibrium model prevailing across the entire labor market, has to be two part.

The first part lies in the essential definition of the informal labor market, as being the absence of the state's regulatory fiat. This absence of regulatory fiat will allow the coexistence of two wage rates, above subsistence in the formal labor market where regulatory fiat rules. And below subsistence in the informal labor market where regulatory fiat fails.

The second part lies in applying the Lewis model of two sectors, a traditional sector with lower productivity and hence lower wage rates, and a modern sector with higher productivity and therefore higher wage rates. Applied to the labor market, this implies that the higher wage rate formal labor market will be enabled by higher productivity. While the lower wage rate informal labor market will be enabled by lower productivity. This explanation is consistent with the neoclassical axiom of the wage rate being sustainable in the long run only by productivity.

The coexistence of two separate wage rates, one above subsistence in the formal labor market, and the other below subsistence in the informal labor market, then allows their relationships with employment, hours worked, to also vary. An above subsistence wage rate in the formal labor market, will make employment, hours worked, incentive driven as in the neoclassical model. The wage rate will have to rise to provide an incentive to increase hours worked. Giving a positive supply curve for labor in the formal labor market. While a below subsistence wage rate in the informal labor market, will make employment, hours worked, subsistence driven, by Says Law. At lower wage rates, or falling wage rates, the compulsion to reach subsistence will increase hours worked. Giving a negative supply curve for labor in the informal labor market. And with Says law of supply creating its own demand, the demand curve for labor in the informal labor market will tend to coincide with the supply curve for labor.

Figure 4: The non-linearity in the labor market



Through our theoretical framework, we have posited the coexistence of two wage employment relationships. A positive wage employment relationship, giving a positive supply curve for labor, in the above subsistence wage rate formal labor market. And a negative wage employment relationship, giving a negative supply curve for labor, in the below subsistence wage rate informal labor market. These are captured in testable form in hypotheses 1 and 2.

Fig. 5 now puts the two labor supply curves, the formal labor market positive supply curve, and the informal labor market negative supply curve, together to give us a total supply curve of labor. This should be non-linear, with a positive supply curve above the subsistence wage rate in the formal labor market and a negative labor supply curve below the subsistence wage rate in the informal labor market, with the turning point approximately at the subsistence wage rate.

Mathematically, this describes a quadratic equation which is convex to the origin:

N= -fn (W) + (W)2

Where employment, hours worked will be negative function of the wage rate, and a positive function of the wage rate squared.

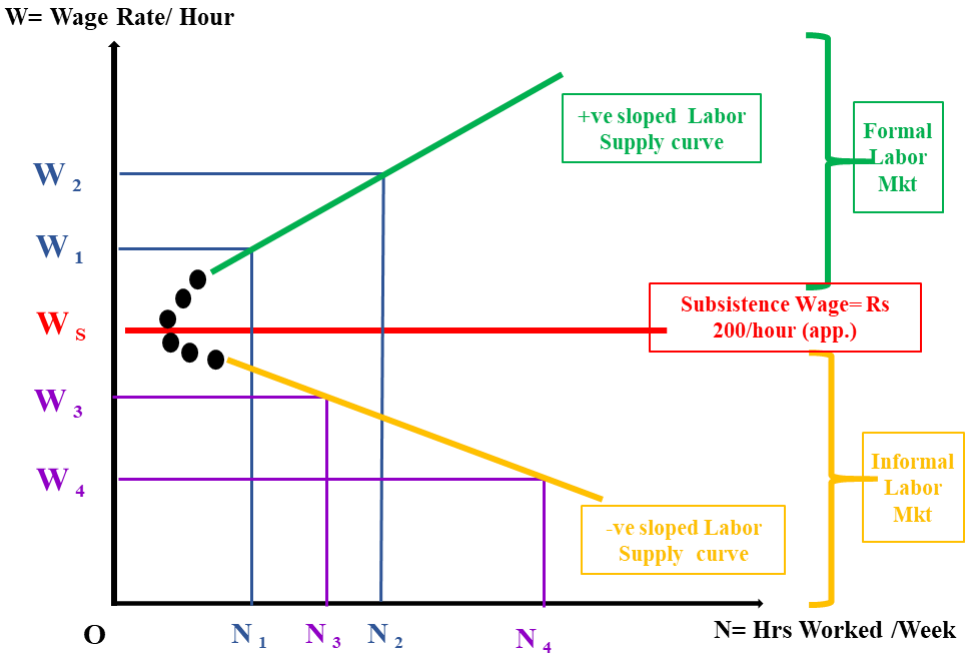
This leads us to our third hypothesis.

Hypothesis 3:

(a) In the aggregate labor market, the supply curve of labor will be non-linear. With a positive slope above the subsistence wage, in the formal part of the aggregate labor market, and a negative slope below the subsistence wage, in the informal part of the aggregate labor market.

(b) The turning point will be approximately at the subsistence wage rate.

Figure 5: The formal and informal labor markets



The compulsion to meet subsistence in the informal labor market raises the weekly hours worked above the weekly hours worked in the formal labor market.

By testing the first three hypotheses, we aim to establish that the formal labor market and the informal labor market behave differently in the case of developing economies like Pakistan. And that the labor market is in fact bifurcated into a formal and informal labor market, based on the distinguishing criterion of a subsistence wage.

The formal labor market is based on the neoclassical theory of a wage incentive, where an increase in the agent's wage rate will bring about an increase in the hours worked as well, which is a wage incentive.

However, for the informal labor market, the wage incentive model does not hold, rather, it is replaced by a compulsion-based model. The logic is reversed, and now a reduction in the agent's wage rate leads to an increase in the number of hours worked. Below subsistence, at lower wage rates, agents have to increase their hours worked, in order to meet the subsistence requirements of the household. This subsistence compulsion pushes these agents working at wage rates lower than the subsistence wage rate to work longer hours. And the supply curve of labor turns negative, as shown in Fig 4.

The labor supply curve below the subsistence hourly wage rate then equals the demand curve in the informal labor market, since the agents create a demand curve of their own, at lower wage rates. This is in keeping with Say's law, where supply creates its own demand. In the case of the informal labor market, we see that the surplus supply of labor creates its own demand, where these agents offer themselves at lower wage rates. Consequently, the behavior of agents changes below the subsistence wage rate, where they have to put in longer hours of work to meet the subsistence wage rate, which the formal labor market agents were able to earn by putting in lesser hours of work.

So, we now wish to observe the weekly hours worked on average by agents earning more than the hourly subsistence wage rate, in the formal labor market. And for agents earning less than the hourly subsistence wage rate, in the informal labor market. And we hypothesize:

Hypothesis 4: On average, the agents earning below the hourly subsistence wage rate work the greatest number of hours, compared to the agents earning above the hourly subsistence wage rate.

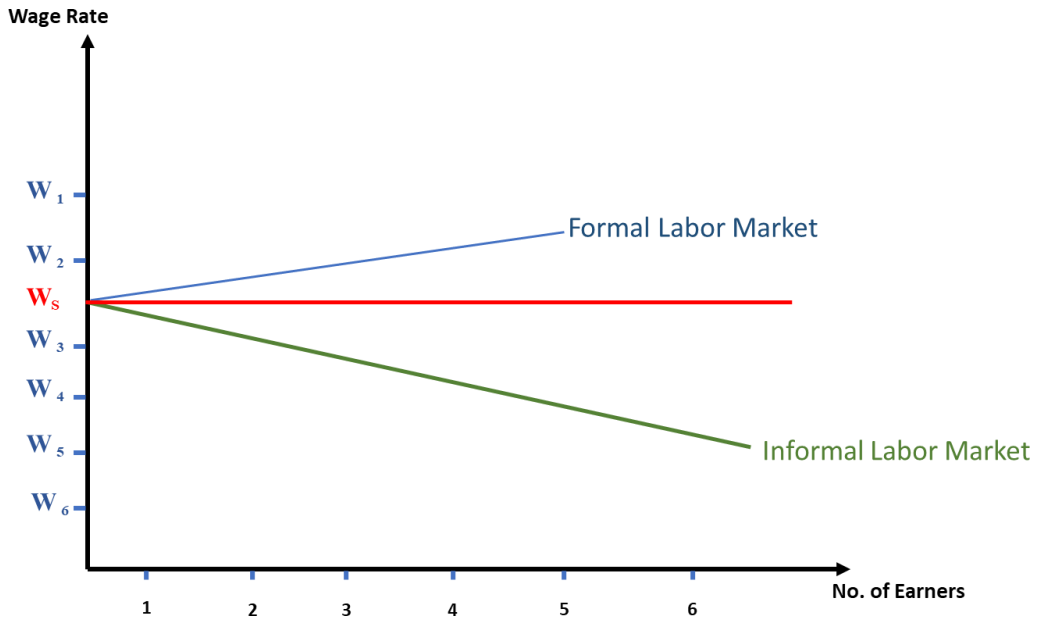
The compulsion of subsistence in the informal labor market, to increase hours worked as the wage rate drops, then logically adds more earners per household.

Our first and second sets of hypotheses establish that the most vulnerable workers are those who work under onerous conditions. We first defined these onerous conditions of work using the subsistence wage as our definitional criterion to separate the formal labor market from the informal labor market. Next, we moved on to show that the most vulnerable workers are the ones who are working for the longest hours at very low wages. This is because the low wage rates are not sufficient for the household to meet their subsistence requirements and they have to put in more hours of work at low wage rates to be able to earn the equivalent of the same subsistence wage that earners at higher wage rates make by working for lesser hours.

However, the compulsion does not end with one earner working for very long hours. With the household size being as high as 6.6, in the case of Pakistan, the subsistence requirements surpass the wage being earned, even by working for very long hours. There are a limited number of hours an earner can work in one day. If one earner is working for the maximum number of hours possible per day, yet is unable to meet the subsistence requirements of the household, other members of the household have to seek employment to meet these subsistence requirements.

This constraint on the number of working hours in a day is then addressed when more members of the same household seek employment.

Figure 6: The impact of wage rate on the number of earners per household



Using the criteria of a subsistence wage rate to differentiate the formal from the informal labor market, Fig. 6 gives the wage rate on the vertical axis, and the number of earners per household on the horizontal axis. So below a subsistence wage rate, in the informal labor market, we expect that as the wage rate falls, the compulsion to meet subsistence, to increase the total number of hours worked per household, the number of earners per household will increase. Giving a negative relationship between the wage rate and the number of earners per household.

However, above a subsistence wage rate, in the formal labor market, which is more incentive based, as the wage rate increases, the number of earners should increase. Giving a positive relationship between the wage rate and the number earners per household.

So, we hypothesize:

Hypothesis 5: Below the subsistence wage rate, as the wage rate falls, the number of earners per household will increase. This makes earners per household a negative function of the wage rate.

Earners per Household= -fn (Wage rate per hour)

Hypothesis 6: Above a subsistence wage rate, as the wage rate increases, the number of earners per household will increase. This makes the log of earners per household a positive function of the log of the wage rate.

Earners per Household= +fn (Wage rate per hour)

The compulsion of subsistence in the informal labor market, to increase hours worked as the wage rate drops, and therefore to add more earners per household, further adds more child labor per household.

We further explore worse forms of vulnerabilities by building on the same logic. So far, we have established that reducing the wages below subsistence leads to

(i) longer working hours which classify as an onerous condition of work, and,
(ii) an increasing number of earning members from each household, working at very low wages.

When working for the maximum number of hours does not fulfill the subsistence requirements, more household members start working to meet these needs i.e. the limitation on the number of hours in a day is addressed by adding more members of the family to the labor force. These households are then met with another limitation, that of the earners who fall within the working age. There is only a certain number of household members who fall within the working age of 15-64 years of age as defined by the ILO. When all of the members belonging to the working age are employed and the subsistence needs are still unmet due to fairly

large family sizes and low wage rates, the age of the earner has to be disregarded and children are compelled to work.

Therefore, we can deduce that the limitation on the number of hours in a day leads to more household members seeking work. And the limitation on the number of earners falling in the working age within a household leads to disregarding the concept of age when it comes to seeking work. As a result, children are forced to work, in onerous conditions of employment. It is in fact the poorest and most vulnerable of households whose children will seek work.

Therefore, we can hypothesize that a reduction in wages is responsible for child labor, which is undoubtedly the worst form of vulnerability.

Hypothesis 7: As the agent's wage rate falls, to meet the subsistence requirements, children in the household are forced to work.

Working Children per household= - fn (Wage rate/hour)

We expect a negative relationship between the number of working children per household and the wage rates i.e. a reduction in the wage rate will force children of the household to seek work.

The policy implications of this theoretical and empirical framework

The policy implication of this empirical analysis of the formal and informal labor market, extends to all developing countries, but is applied here to Pakistan. The grave policy implication is that the perverse mechanism operating to iteratively weaken the conditions of work can only be reversed under two conditions:

The first policy caveat is to expand employment till the point where the surplus labor being absorbed in the informal labor market is absorbed sufficiently to raise the prevalent wage rates, eventually above subsistence.

For as long as surplus labor is available, it will keep driving down the wages of the informal labor market. Therefore, any policy that targets the formal labor market cannot possibly bring about wage reforms in the informal labor market or improve their working conditions, unless we reach the Lewisian turning point, where there is a shift from low productivity informal labor market, rich in surplus labor to a high productivity formal labor market.

This theoretical concept also finds empirical evidence in the case of China's Hu-Kou system of migrant labor. The Chinese growth model is based on high levels of investment, recorded approximately at 40%, beginning in the 1980s and still remaining consistent to date. Chinese investment levels were significantly higher than the global average of investment as a share of GDP. This investment came primarily from national savings as there was no other external source of funding. The national savings were a result of surplus earned by capitalists through an output growth rate that was higher than the average wage growth rate. Wage growth levels remained low because the macro model was based on bringing in labor from rural areas who were hired at lower wages, since labor was available in surplus in these areas, compared to urban areas. (Lu, D., Mahmood, M., & Yongding, Y, 2009)

Availability of surplus labor naturally brought down wages as supply was higher than the demand for labor. This was controlled through the Hu-Kou migrant labor system which slowly allowed for migrant labor from rural origins to come to urban areas and work for cheaper rates. Under this system every citizen was legally bound to register her or his single permanent place of residence. Strict controls were imposed on mobility of rural hukou holders to urban areas, perpetuating discrimination against them in several ways.
The rural migrants were mostly unskilled rural laborers, treated as outsiders with limited access to economic resources and opportunities. Those with a rural hukou were socio-economically worse off than those with an urban hukou in China.

This is a classic example of the Lewisian turning point, according to which workers will move from the low productivity informal labor market to the high productivity formal labor market as the wages are increased up to subsistence level in the informal labor market. As the surplus labor diminishes (rural hukou holders, in case of China), wages in the informal labor market rise, ultimately bringing an increase in formal labor market wages.

The second policy caveat, is to expand the purview of the state's policy environment specifically to the informal economy.

5. Methodology

Section I

5.1 Estimating Informality Based on the ILO, the (PBS) and the Subsistence Wage Criterion

The first part of our empirical study comprises estimating informality and comparing the estimates based on the ILO criterion, the Pakistan Bureau of Statistics (PBS) criteria and the subsistence wage criterion respectively. The rationale behind ILO's registration criterion is to see how many employed individuals fall under the social protection net. To estimate informality in Pakistan using ILO's criteria of registration for social protection, we first look at the Labor Force Survey to see any questions regarding the registration of employees. The LFS, however, does not have any questions regarding the registration of employees which has been confirmed by the Pakistan Bureau of Statistics (PBS) officials. Therefore, we then resort to using a proxy variable, which is compliance with any modicum of provision regulated by the state.

This proxy variable consists of two questions: whether or not the employees are given old age pensions, or social insurance, or medical care, or family support in case of death of breadwinner and whether the enterprise keeps written accounts. These two questions are the two nearest criteria to the ILO's criteria of registration that capture the essence of social protection. Using this proxy variable, we then do a headcount of the percentage of the working age population who are entitled to these provisions by their employer.

Next, we estimate informality in Pakistan using the criterion of the Pakistan Bureau of Statistics. The Pakistan Bureau of Statistics' estimates of informality are based on the Factories Act of 1934 which uses the size of employment and type of enterprise as the criteria for estimating informality in the Labor Force Survey. Household enterprises and enterprises with less than 10 persons employed make up for the informal labor market in Pakistan. Agricultural employment and those involved in non-market production are excluded from the informality criteria.

We estimate this PBS headcount of informality by accounting for:

Informal labor market in non-agriculture = owners of enterprises hiring under 10 workers + their waged employees + contributing family workers + self employed

Section II

5.2 Observing the Labor Supply Curve in the Labor Market based on the Subsistence Wage Rate Distinction

Our distinguishing criterion between the formal and informal labor markets, is then posited as a subsistence wage. Which is a wage that is sufficient for a household to be able to meet the subsistence requirements of all its family members. This is based on using the international poverty line of $1.90 a day which is enough to provide 2250 calories per individual. Since the wage decides whether or not the individual will be able to ensure an intake of 2250 calories for themselves and their family members, it is the most important criterion of all. We use the Purchasing Power Parity estimates for the Cost of Basic Needs (CBN) poverty line for 2018-19, and arrive at a value of the subsistence wage rate per hour per earner.

The agent referred to in our study is each earner per household whose wage has been reported by the LFS. This is regardless of their gender or status in the household. We have already incorporated the number of dependents per household on average, in estimating the subsistence wage. The LFS does not provide data on asset ownership and that is our primary data source for this study.

The stepwise breakdown of this value is given as follows:

- To estimate a value for the subsistence wage, we begin by using the CBN Monthly Poverty Line per adult equivalent given by the World Bank. This has been taken from HIES (Household Integrated Economic Survey 2013-14). After 2013-14, the CBN poverty line has been adjusted for CPI for each succeeding year. However, the growth rates for CPI and CBN differ from one another, as is found from (Irfan, 2022). So, we resort to using the CBN growth rate instead of the CPI growth rate. The CBN poverty line per adult equivalent calculated in 2013-14 by HIES is therefore adjusted for the CBN growth rate to give us a CBN poverty line per adult equivalent for the year 2018-19.
- We then multiply this by the average household size in Pakistan, which is provided by the Labor Force Survey 2018-19, to give us the daily poverty line for the entire household.
- **Monthly per capita CBN poverty line * Average household size = Monthly subsistence wage per household**
- Dividing this by 4 gives us the Weekly CBN poverty line per household.
- **Monthly subsistence wage per household / 4 = Weekly subsistence wage per household**
- Assuming that a week has approximately 40 working hours, we divide this value of the weekly subsistence wage by 40 to arrive at an hourly subsistence wage rate.
- **Weekly subsistence wage per household / 40= Hourly subsistence wage rate**

We then use this hourly subsistence wage rate equivalent as our cut-off point to separate the formal labor market

from the informal labor market. In our conceptual framework, we theorized that for the formal labor market, a neoclassical competitive labor market exists where a higher wage would provide an incentive to agents to increase employment or work more hours. The supply curve for these agents employed in the formal labor market is an upward sloping one, where a higher wage will increase labor supply resulting in increased employment. So, the positive supply curve of labor in the regulated formal labor market will be incentive based. This leads us to our first hypothesis.

Hypothesis 1: In the formal labor market, lying above a subsistence wage rate, the total hours worked (N) will be a positive function of the Wage (W) rate earned by labor. Where the wage rate is the independent variable, determining the hours worked as the dependent variable.

N= + fn (W)

Therefore, Fig. 2 shows that the mathematical form of the supply relationship for the formal labor market, that hours worked, which represent employment, will be a positive function of the wage rate,
We will now test the function econometrically by running an OLS regression to test the relationship between the weekly hours worked and the wage rate per hour above the hourly subsistence wage rate. Where our dependent variable on the left-hand side of the equation, is the number of weekly hours worked, and the predictor variable on the right-hand side of the equation, is the wage rate per hour. To separate the formal labor market from the informal labor market, we separate the two distributions at the hourly subsistence wage rate. And we test the relationship between wage rate per hour and the weekly hours worked for the distribution above the hourly subsistence wage rate.

Next, we move on to test our second hypothesis, which looks at the informal labor market. In our conceptual framework, we established that in the informal labor market, below the hourly subsistence wage rate, as the agents wage rate falls, their employment, hours worked, increase. This means that the supply curve of labor becomes negative.
This gave us the following hypothesis:

Hypothesis 2: In the informal labor market, lying below a subsistence wage rate, the total hours worked (N) will be a negative function of the Wage (W) rate earned by labor. Where the wage rate is the independent variable, determining the hours worked as the dependent variable.

In the informal market, lying below the subsistence wage rate, price incentives give way to the compulsion of subsistence, making the supply curve of labor a negative function of the wage rate.
Therefore, mathematically, the function becomes:

N= - fn (W)

Where hours worked, which represent employment, will be a negative function of the wage rate.
We will test the function econometrically by running an OLS regression to observe the nature of the relationship between the weekly hours worked and the wage rate per hour below the hourly subsistence wage rate. Where our dependent variable on the left-hand side of the equation, is the number of weekly hours worked (N) and the predictor variable on the right-hand side of the equation, is the hourly wage rate (W). To separate the formal labor market from the informal labor market, we separate the two distributions at the hourly subsistence wage rate. And we test the relationship between wage rate per hour (W) and the weekly hours worked (N) for the distribution below the hourly subsistence wage rate.

Through our theoretical framework, we have posited the coexistence of two wage employment relationships. A positive wage employment relationship, giving a positive supply curve for labor, in the above subsistence wage rate formal labor market. And a negative wage employment relationship, giving a negative supply curve for labor, in the below subsistence wage rate informal labor market. Then, we put the two labor supply curves, the formal labor market positive supply curve, and the informal labor market negative supply curve, together to give us a total supply curve of labor. We theorized that this should be non-linear, with a positive supply curve above the hourly subsistence wage rate in the formal labor market and a negative labor supply curve below the hourly subsistence wage rate in the informal labor market, with the turning point approximately at the hourly subsistence wage rate.
Mathematically, this describes a quadratic equation which is convex to the origin:

$$N= -fn (W) + (W)^2$$

Where employment, hours worked will be a negative function of the wage rate, and a positive function of the wage rate squared.

Recalling our third hypothesis

Hypothesis 3:

(a) In the aggregate labor market, the supply curve of labor will be non-linear. With a positive slope above the subsistence wage, in the formal part of the aggregate labor market, and a negative slope below the subsistence wage, in the informal part of the aggregate labor market.

(b) The turning point will be approximately at the subsistence wage rate.

To show this non-linearity in the labor market, the distribution should be convex from the origin. For this, we test the quadratic function for the entire labor market econometrically. The dependent variable, on the left-hand side of the equation, is the weekly hours worked (N) and the predictor variables on the right hand side of the equation, are the wage rate per hour (W) and the quadratic form of the wage rate per hour (W^2).

5.3 Observing the Hours Worked in the Labor Market based on the Subsistence Wage Rate

Through our theoretical framework, we posited that in the informal labor market, a reduction in the agent's wage rate leads to an increase in the number of hours worked. The agents in the informal labor market, are forced by a subsistence compulsion to work at wage rates lower than the subsistence wage rate, for longer hours. Because, at these wage rates, they cannot afford to work for lesser hours as it does not sum up to an amount equivalent to the subsistence wage rate. Therefore, to meet the subsistence requirements of the household, these agents in the informal labor market have to put in the greatest number of hours, to be able to earn the of a subsistence wage rate.

Therefore, recalling hypothesis 4:

Hypothesis 4: On average, the agents earning below the hourly subsistence wage rate work the greatest number of hours, compared to the agents earning above the hourly subsistence wage rate.

To test this, we will use the subsistence wage criterion to divide the labor market into a formal labor market and informal labor market. Then, we sub divide the informal labor market into wage rate slabs of Rs 0 to Rs 100, Rs 100 to Rs 200, Rs 200 to Rs 300. And we sub-divide the formal labor market into wage rate slabs of Rs 300- Rs 400, Rs 400- Rs 500, Rs 500- Rs 600 and Rs 600- Rs 700, to observe the behavioral response of agents to the change in the wage rate, in their weekly hours worked. Then we calculate the average number of hours worked per week for each wage rate slab. Following this, we look at the average number of hours worked

per week for those earning below Rs 300 [4]as one distribution (Table 1) and the average number of hours worked per week for those earning above Rs 300 as another (Table 2).

Table 1: Average number of hours worked per week for those earning below Rs 300

Wage Rate Slabs	**Average No. of Hours worked/ week**
Rs 0- Rs 100	N_1
Rs 101- Rs 200	N_2
Rs 201- Rs 300	N_3
Avg: <=Rs 300/hr	$\bar{N}$

Table 2: Average number of hours worked per week for those earning above Rs 300

Wage Rate Slabs	**Average No. of Hours worked/ week**
Rs 301- Rs 400	N_1
Rs 401- Rs 500	N_2
Rs 501- Rs 600	N_3
Rs 601- Rs 700	N_4
Avg: >Rs 300/hr	$\bar{N}$

By comparing the two means, we are able to see the difference between the behavior of the agents in the formal and informal labor markets, through the average number of hours worked per week by them. To ensure that the two distributions are significantly different from one another, we run a t-test of the means of the two distributions.

5.4 Observing the Relationship between the number of earners per household and the wage rate per hour

Through our first and second set of hypotheses, we established that in the informal labor market below subsistence wage rates, the extremely low wage rates are not sufficient for earners to meet their subsistence requirements. Consequently, these earners have to put in more hours of work at low wage rates to be able to earn the same equivalent of a subsistence wage rate that earners at higher wage rates make by working for lesser hours. Even by doing so, the compulsion does not end with one earner working for very long hours, due to large

[4] The rationale for this will be explained later on pages 48 and 49.

household sizes (6.6 in the case of Pakistan). This constraint on the number of working hours in a day is then addressed when more members of the same household seek employment.

Here, we will observe the relationship between the wage rate per hour and the number of earners per household in the formal and informal labor markets.

Using the criteria of a subsistence wage rate, we expect that in the informal labor market, below the subsistence wage rate, as the wage rate falls, the compulsion to meet subsistence will lead to an increase in the total number of hours worked per household, because of which, the number of earners per household will increase. Giving a negative relationship between the wage rate and the number of earners per household in the informal labor market.

So, we hypothesize that:

Hypothesis 5: Below the subsistence wage rate, as the wage rate falls, the number of earners per household will increase. This makes earners per household a negative function of the wage rate.

Earners per Household= -fn (Wage rate per hour)

Where the earners per household is a negative function of the wage rate per hour. To test this relationship, we will divide our distribution based on the subsistence wage criterion i.e. using the cut-off point as the hourly subsistence wage rate, giving us a formal labor market above the subsistence wage rate and an informal labor market below it. Then, we test this function econometrically by running an OLS regression to observe the nature of the relationship between the number of earners per household and the wage rate per hour for the distribution below the subsistence wage rate, which is the informal labor market. Our dependent variable on the left-hand side is the number of earners per household and our predictor variable on the right-hand side, is the wage rate per hour. We take the log of our right-hand side variable i.e. wage rate per hour to effectively go from a unit change to a percentage change, which is a better metric for explaining this comparison.

Next, we test the nature of the relationship between the number of earners per household and the wage rate per hour for the formal labor market, above the subsistence wage rate, which is more incentive based. As the wage rate increases, the number of earners should increase. Giving a positive relationship between the wage rate and

the number earners per household.

So, we hypothesize:

Hypothesis 6: Above a subsistence wage rate, as the wage rate increases, the number of earners per household will increase. This makes the log of earners per household a positive function of the log of the wage rate.

Earners per Household= +fn (Wage rate per hour)

We test this function econometrically by running an OLS regression to observe the nature of the relationship between the number of earners per household and the wage rate per hour for the distribution above the subsistence wage rate, which is the formal labor market. Our dependent variable on the left hand side, is the number of earners per household and our predictor variable on the right hand side, is the wage rate per hour. Our left hand side variable is a logarithm of the right hand side variable to effectively go from a unit change to a percentage change.

5.5 Observing the Relationship between the number of working children per household and the wage rate per hour

Through Hypothesis 5 and 6 we deduced that the limitation on the number of hours in a day leads to more household members seeking work. And the idea that the limitation on the number of earners falling in the working age within a household leads to disregarding the concept of age when it comes to seeking work, laid the basis for our next test. As a result, children are forced to work, in onerous conditions of employment. This posit is tested using Hypothesis 7:

Hypothesis 7: As the agent's wage rate falls, to meet the subsistence requirements, children in the household are forced to work.

Working Children per household= - fn (Wage rate/hour)

We expect a negative relationship between the number of working children per household and the wage rates. That is, a reduction in the agents' wage rate will force children of the household to seek work. So, the

number of working children per household is a negative function of the wage rate per hour.
We test this function econometrically by running an OLS regression to observe the nature of the relationship between the number of working children per household and the wage rate per hour, for the total distribution. Our dependent (left hand side) variable is the number of working children per household and our predictor (right hand side) variable is the wage rate per hour. We take the log of our right-hand side variable i.e. wage rate per hour to effectively go from a unit change to a percentage change.

The data was extracted using a combination of two variables, i.e., the working age and the employment status of the person. If the household member was below the working age and was employed, they were categorized as working children. The wages of children however, were only reported for a very small number of the sample, which cannot be used to make estimations for the entire sample, therefore we cannot comment on whether they are paid less or the same as adult workers.

6. Results

Section I:

6.1 Estimating Informality Based on the ILO, the PBS and the Subsistence Wage Criterion

We now proceed to estimate the size of the informal labor market and the prevalence of informality in Pakistan's labor market through three different criteria.

(a) ILO's criterion of registration

(b) Pakistan Bureau of Statistics' criterion

(c) The subsistence wage criterion

(a) ILO's criterion of registration

The first part of our empirical study comprised estimating informality and comparing the estimates based on the ILO criterion, the Pakistan Bureau of Statistics (PBS) criteria and the subsistence wage criterion respectively.

To estimate informality in Pakistan using ILO's criteria of registration for social protection, since the LFS does not have any questions regarding the registration of employees, we resorted to using a proxy variable, which is compliance with any modicum of provision regulated by the state.

This proxy variable consisted of two questions:

(i) whether or not the employees are given old age pensions, social insurance, medical care, family support in case of death of breadwinner and

(ii) whether or not the enterprise keeps written accounts.

These two questions are the two nearest criteria to the ILO's criteria of registration that capture the essence of social protection. Using this proxy variable, we then do a headcount of the percentage of the working age population who are entitled to these provisions by their employer.

Out of the total sample of earners for Pakistan's non-agriculture labor force of **38,618** individuals, only **7,798** had a written contract with the employer, ranging from less than one year up to 10 years. This makes up for only **20.19%** of the total employed sample.

Next, we use compliance with any modicum of provision regulated by the state, including old age pensions, social insurance, medical care, family support in case of death of the breadwinner and whether or not the enterprise keeps written accounts, as a proxy variable to estimate the prevalence of informality within Pakistan's labor market, since this question is available in the Labor Force Survey 2018-19. According to this, only **7,599** from a total of **38,618** earners are provided one or more kind(s) of social protection from the five listed options. This makes up for **19.68%** of the total employed sample.

Total Earners as reported in the LFS 2018-19	38,618
Earners with **Written Contracts**	7,798
Earners with Written Contracts (% of total earners)	20.19%
Earners with at least one social protection benefit	7,599
Earners with at least one social protection benefit (% of total earners)	19.68%
Formality Count as per the ILO Criterion	**20%**

Therefore, using ILO's criterion of registration gives us an estimate of formality at approximately 20% of the total employed sample. This makes the actual size of the informal labor market in Pakistan at 80% of the

non-agriculture labor force, which we can compare to the estimates of informality made by the Pakistan Bureau of Statistics and our further estimates based on the subsistence wage criterion.

(b) Pakistan Bureau of Statistics' criterion

Next, we use the estimate of informality provided by the Pakistan Bureau of Statistics. The Pakistan Bureau of Statistics' estimates of informality are based on the Factories Act of 1934 which uses the size of employment and type of enterprise as the criteria for estimating informality in the Labor Force Survey. Household enterprises and enterprises with less than 10 persons employed make up for the informal labor market in Pakistan. Agricultural employment and those involved in non-market production are excluded from the informality criteria.

The PBS headcount of informality should account for:

Informal labor market in non-agriculture = Owners of enterprises hiring under 10 workers + their waged employees + contributing family workers + self employed

According to this criterion, PBS estimates informality at **72%**, implying that 72% of all employment in Pakistan's labor market is informal employment. This essay finds the PBS definition of informality to lack the comprehensive nature of the ILO's definition of informality. And estimating informality using ILO criterion does not give an accurate estimate on account of data limitations in Pakistan's Labor Force Surveys. Therefore, we move next to using the subsistence wage as our distinguishing criterion between the formal and informal labor markets.

(c) The subsistence wage rate criterion

We define the subsistence wage rate as one that is sufficient for a household to be able to meet the subsistence requirements of all its family members. This is based on using the international poverty line of $1.90 a day which is enough to provide a Require Dietary Allowance (RDA) OF 2250 calories per adult equivalent. Since it is the wage that allows an individual will be able to ensure an intake of 2250 calories for themselves and their family members, it is the most important criterion of all. We used the Purchasing Power Parity estimates for the Cost of Basic Needs (CBN) poverty line for 2018-19, and arrived at a value of the subsistence wage rate per hour per earner.

To estimate a value for the subsistence wage, we used the CBN Monthly Poverty Line per adult equivalent given by the World Bank. This has been taken from HIES (Household Integrated Economic Survey 2013-14). After 2013-14, the CBN poverty line has been adjusted for CPI each succeeding year.

CBN Monthly Poverty Line per adult equivalent (Base 2013-14) **(World Bank 2021, HIES 2018-19)**	Rs. 3,030

However, the growth rates for CPI and CBN differ from one another, as is found from (Insert fahad's thesis ref). So, we resort to using the CBN growth rate instead of the CPI growth rate. The CBN poverty line per adult equivalent calculated in 2013-14 by HIES is therefore adjusted for the CBN growth rate to give us a CBN poverty line per adult equivalent for the year 2018-19.

CBN Growth rate **(Irfan, 2022)**	8.49%
CBN Monthly Poverty Line per adult equivalent (After Adjusting for CBN Growth rate) **(Irfan, 2022)**	Rs. 4,556

We then multiply this by the average household size in Pakistan, which is provided by the Labor Force Survey 2018-19, to give us the daily poverty line for the entire household.

CBN Monthly Poverty Line per adult equivalent * Average household size = Monthly subsistence wage per household

Average household size in Pakistan (LFS 2018-19)	6.6
CBN Monthly Poverty Line per adult equivalent (After Adjusting for CBN Growth rate) (Fahad's Thesis)	Rs. 4,556
Monthly subsistence wage per household	**Rs 30,070**

Dividing this by 4 gives us the Weekly CBN poverty line per household

Monthly subsistence wage per household / 4 = Weekly subsistence wage per household

Weekly subsistence wage per household	**Rs 30,070/4= Rs. 7,517**

Assuming that a week has approximately 40 working hours, we divide this value of the weekly subsistence wage by 40 to arrive at an hourly subsistence wage rate.

Weekly subsistence wage per household / 40= Hourly subsistence wage rate

Hourly subsistence wage rate	**Rs. 7,517/40= Rs. 190 (app.)**

To estimate informality, we demarcated the formal labor market from the informal labor market using the subsistence wage criterion. We arrived at a monthly subsistence wage line of Rs. 30,070 (approximated to the nearest hundred for convenience), which gave us a weekly subsistence wage line of Rs. 7,500 and an hourly subsistence wage rate of Rs.200 approximately. Out of the 38,618 earners in the LFS sample, only 28,050 had reported their wages. LFS data only reports wages for earners who are working as employees and does not report wages for all other forms of employment arrangements i.e. employers, own-account workers, sharecroppers, own cultivators and contributing family workers. So, empirically, our sample was restricted to 28,050 observations. From these 28,050 earners, who had reported their wages, 3,522 (13%) were earning more than the hourly subsistence wage rate of **Rs. 200**, falling above the hourly subsistence wage rate in the formal labor market. The remaining 24,528 (87%) were earning less than the hourly subsistence wage rate of Rs. 200, falling below the subsistence wage level, in the informal labor market.

This estimation is based on the size of households provided by the Labor Force Survey 2018-19. It includes both nuclear and joint families, however the distinction for each observation is not given in the data.
We have accounted for the household size and we test for the number of earners per household later in Hypothesis 5 and 6.
However, more than one earning members will not affect the subsistence wage since the subsistence wage is defined as a wage that allows subsistence for the household, regardless of the number of earners. Moreover, the

subsistence wage has been calculated using the average household size regardless of the number of earners and nature of the household (nuclear or joint). Mathematically, this possibility is also covered, because if the wage required by one earner to sustain a household is Rs.190/hour and with two earners, the wage rate required to sustain a household will reduce to Rs.95/hour with the increase in number of earners.

Total Earners (LFS 2018-19)	38,618
Earners with Reported Wages	28,050
Formal Labor Market: Earners with a wage rate higher than the subsistence wage Rs.200	3,522
Formal Labor Market (%)	**13%**
Informal Labor Market: Earners with a wage rate lower than the subsistence wage Rs.200	24,528
Informal Labor Market (%)	**87%**

Summarizing the informality estimations from Section I:

ILO criteria	**PBS**	**Hourly Subsistence Wage Rate Criterion**
80%	72%	87%

So, the PBS criteria gives the lowest estimate of informality at 72% of the nonagricultural labor force. Using the ILO criteria gives us a higher estimate at 80% of the nonagricultural labor force. While the subsistence wage criterion, estimate of informality, based arguably on the most important indicator of welfare, survival, gives the highest estimate at 87% of the nonagricultural labor force. This shows that 87% of the working employees are not earning an hourly wage rate which would be sufficient to support a family size of 6.6 and meet their subsistence requirements.

We have a surprising agreement with both, the PBS estimate and our ILO criteria based estimate of informality. However, there is still a significant difference of 15% between the PBS estimate and our subsistence wage-based estimates. And a difference of 7% between our ILO based estimates of informality,

and our subsistence wage-based estimates. These differences in estimates account for substantial portions of the nonagricultural labor force.

This has far-reaching implications for the policy makers who should be setting the minimum wage rate at a level sufficient to sustain large family sizes. Moreover, the implementation of minimum wage laws in the informal labor market is of key importance, since any such laws are currently applicable to only the formal labor market which makes up for a very small section of the working population, according to both, the PBS and the subsistence wage criteria. Estimating the size of informality is therefore pivotal in the formulation of labor market policies, especially in countries like Pakistan, where the labor market and the economy is dampened by the large size of the informal labor market.

Section II

6.2 Estimating the slope of the Labor Supply Curve in the Labor Market based on the Subsistence Wage Rate Distinction

For our second set of empirical results, we move to looking at the differences between the formal and informal labor markets on the basis of the most basic of all working conditions: the subsistence wage rate. Since earning an income is the raison d'etre for all employment. It is therefore the first consideration of an employee seeking a job and that of the employer as well.

In Section 1, using the Purchasing Power Parity estimates for Cost of Basic Needs (CBN) poverty line, we arrived at a value of Rs.191 per hour for the subsistence wage per individual, which we rounded off to Rs. 200.

Harking back to our conceptual framework, this means that below a wage rate of Rs.200, households will have to increase their number of working hours to be able to meet the subsistence requirements of working at the subsistence wage rate.

Now, for our first set of results for Section II, we will run three specifications:

(i) the relationship between the wage rate per hour and the weekly hours worked for the formal labor market,

(ii) the relationship between the wage rate per hour and the weekly hours worked for the informal labor market, and

(iii) the relationship between the wage rate per hour and the weekly hours worked for the formal labor plus the informal labor market. That is for the aggregate labor market, to determine if there is a non-linearity.

We theorized that for the formal labor market, a neoclassical competitive labor market exists where a higher wage gives the agent an incentive to increase their employment, or work more hours. The supply curve for those employed in the formal labor market is an upward sloping one, where a higher wage will increase labor supply resulting in increased employment. So, the positive supply curve of labor in the regulated formal labor market will be incentive based.

Recalling Hypothesis 1:

In the formal labor market, lying above a subsistence wage rate, agents' total hours worked (N) will be a positive function of their Wage rate (W), Where the hours worked are the dependent variable determined by the wage rate which is the independent variable.

N= + fn (W)

Hypothesis 1 specifies the wage rate per hour as a positive function of the weekly hours worked. Where our dependent variable on the left-hand side of the equation is the number of weekly hours worked and the predictor variable on the right-hand side is the wage rate per hour. To separate the formal labor market from the informal labor market, we separated the two distributions at the hourly subsistence wage rate of Rs. 200. And we test the relationship between wage rate per hour and the weekly hours worked for the distribution above the hourly subsistence wage rate of Rs.200.

We need to test if the increase in the wage rate per hour will bring an increase in the weekly hours worked by agents, for the formal labor market. For this we tested the two variables using a simple OLS linear regression. The left-hand side variable is agents weekly hours worked and the right-hand side variable is their wage rate per hour. To be able to explain the wage incentive that exists in the formal labor market, we expected weekly hours worked to be positively correlated to the wage rate per hour.

We are expecting agent behaviour to change at a subsistence wage rate of Rs.200. We arrived at this value using the CBN poverty line. Above this hourly subsistence wage rate of Rs.200, we have the incentive based formal labor market, with a positive labor supply curve. Below this hourly subsistence wage rate of Rs.200, we have the compulsion driven informal labor market, with a negative labor supply curve.

However, our tests for Hypothesis 1 and 2 show a slight variation from our expectations. We find that agent behavior does flip, but it does so at a higher wage rate of Rs.300 instead of at a subsistence wage rate of Rs. 200. Therefore, we re-establish the observed subsistence wage rate, which is higher than the theorized and estimated subsistence wage rate.

This can be attributable to two possible reasons.

(i) A risk aversion concept (Donoghue and Somerville, 2018), (Varian, 1990) (Stiglitz, 1984). Which theorizes that agents do not wait for their wage rates to fall to Rs.200 and below to increase their working hours. As observed, agents start to change their behavior, by working for more hours at a higher wage rate of Rs. 300. This is because agents with wage rates on the margins of subsistence will tend to be risk averse and prepare to meet their subsistence requirements at a higher wage rate, before the wage rate falls to the minimum value given by the Cost of Basic Needs level of Rs 200. This difference between the theorized and estimated subsistence wage rate of Rs.200, and the actual wage rate at which agents are observed to change their behavior of Rs.300, can be attributed to risk aversion. The concept of risk aversion (Donoghue and Somerville, 2018), (Varian, 1990) has been used multiple times in the literature, however in the context used, it comes up thrice in the literature. It firstly comes up in the concept of nutritional wage (Stiglitz, 1984), where the employers pay their workers a wage that is higher than the marginal product of labor, although the neoclassical equilibrium is supposed to occur at the point where the marginal product of labor is equal to the wage. But, the employer in this case is willing to offer a wage that is higher than the equilibrium point where, marginal product of labor equals the wage, to provide the workers with sufficient nutrition for them to be able to work.

Secondly, the concept of risk aversion is explained through an employer's viewpoint, where a risk averse employer is reluctant to offer a wage where the marginal product falls to the wage level. This is explained as risk aversion on part of the employer.

Similarly, in our case, a worker whose wage is threatened to be decreased to the subsistence wage, or even lower, will be risk-averse. Consequently, the worker will respond to this by changing their behavior at a wage which is higher than the subsistence wage, in order to avert the dire consequences of falling below the subsistence wage, that could follow.

(ii) Possible estimation problems in getting a precise value of the hourly subsistence wage rate, given our use of secondary data provided by the PBS and HIES.

Therefore, for our empirical estimations in Section II, and the rest of this study, we will use a subsistence wage rate of Rs.300 instead of Rs.200.

Table 3 shows the results for an OLS linear regression for total weekly hours worked and the wage rate per hour for the formal labor market. For agents working at an hourly wage rate of Rs.300 and above, on average, a reduction in the wage rate per hour by Rs 100 is associated with a decrease in the weekly hours worked by 0.06 hours. The coefficient is insignificant, which means that the labor supply curve is infinitely elastic, as was shown in Fig. X.

The coefficient for the wage rate per hour comes out to be very small at -0.00065, and insignificant. Which means that the coefficient is insignificantly different from zero. So the supply curve of labor in the formal labor market is flat at the subsistence wage of Rs 300. This means that the supply curve of labor in the formal labor market, at a subsistence wage rate of Rs. 300 is infinitely elastic that is, only a very small wage incentive is required for agents to expand their labor supply. In fact, this makes the labor supply curve in the formal labor market in Pakistan akin to the infinitely elastic labor supply curve posited by textbook neoclassical economics for a competitive labor market.

We're estimating a pure supply and demand mathematical function and testing them for a simple correlation that quantity on the left-hand side is a function of price on the right-hand side. Which we have demonstrated with a significant correlation with the required sign. (-ve). In future work, when we wish to establish further causality, other variables can be added to help establish it. (Chiang and Wainwright, 2005)

Table 3: OLS Linear Regression for total weekly hours worked and the wage rate per hour for the formal labor market[5]

VARIABLES	total_hours_weekly
wage_per_hour	-0.000651
	(0.000550)
Constant	40.31***
	(0.336)
Observations	1,589

R-squared	0.001

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The sample size varies across the tests for each hypothesis. The methodology for choosing the overall sample has been explained in the Results section 6.1 (a). Our primary source of data was the Labor Force Survey 2018-19, from where we have chosen our sample of waged employees, as explained in the text. The variation in the number of observations across the estimations is due to the nature of the tests. Since we are looking at different variables for each estimation, for example, the size of the formal labor market in hypothesis 1, the size of the informal labor market in hypothesis 2 and the total labor market in hypothesis 3, we have a different sample size each time.

We are estimating an abstract labor supply function relating the hours worked to the wage rate in Hypothesis 3 and 4. At this stage we are not using any control variables, because we wish to examine the aggregate impact of wages on labor supply. Which is to say that we are hypothesizing that this function applies regardless of the impact of any control variables such as productivity or gender. That all employment is subject to this function. And we establish this correlation well. In further research work, when we wish to investigate causality more, we can choose a couple of control variables such as labor productivity and gender.

Next, we move on to test our second hypothesis, which looks at the informal labor market. For the informal labor market, we expect agent behavior to change. In our conceptual framework, we established that in the informal labor market, below the subsistence wage rate, as agents wage rate falls, their employment, hours worked, increase. This means that the supply curve of labor becomes negative. This is because price incentives are replaced by the compulsion of subsistence, forcing agents to seek more hours of work to approximate the subsistence wage rate, making the supply curve of labor a negative function of the wage rate. This compulsion of subsistence leads labor to create its own demand, in a perverse Says Law.

Recalling Hypothesis 2:

Hypothesis 2: In the informal labor market, lying below a subsistence wage rate, agents' total hours worked (N) will be a negative function of the Wage rate (W). Where the the hours worked are the dependent variable, determined by the wage rate which is the independent variable,

Therefore, mathematically, the function becomes:

N= - fn (W)

We repeat the same econometric test of running an OLS regression, but now to observe the nature of the relationship between the weekly hours worked and the wage rate per hour **below** the subsistence wage rate. Where our dependent variable is the number of weekly hours worked (N) and the predictor variable is the hourly wage rate (W). To separate the formal labor market from the informal labor market, we again separate the two distributions at the subsistence wage rate of Rs.300. And we test the relationship between wage rate per hour (W) and the weekly hours worked (N) for the distribution **below** the subsistence wage rate of Rs. 300.

On the left-hand side of the equation, we have agents employment in terms of the weekly hours worked, which is the dependent variable, and on the right-hand side of the equation, we have their wage rate per hour, which is our independent variable. Table 4 shows the results for OLS linear regression for total weekly hours worked and the wage rate per hour for the informal labor market. Our results show that for agents working at an hourly wage rate of below Rs.300, on average, a reduction in the wage rate per hour by Rs 100 is associated with an increase in the weekly hours worked by 5.6 hours. The coefficient is statistically significant.

The hours worked per week are a negative function of the wage rate, which is in accordance with our hypothesis. This shows that as the wage rate continues to fall further below subsistence, the compulsion to meet family subsistence will drive agents to seek greater employment, more hours worked, making it a compulsion-based employment. Our results show a negative coefficient that is highly statistically significant and confirm that in the informal labor market, lying below the subsistence wage rate, the compulsion of subsistence, will lead agents to create their own demand.

Again, we're estimating a pure supply and demand mathematical function and testing them for a simple correlation that quantity on the left-hand side is a function of price on the right-hand side. Which we have demonstrated with a significant correlation with the required sign. (-ve). In future work, when we wish to establish further causality, other variables can be added to help establish it. (Chiang and Wainwright, 2005)

Table 4: OLS linear regression for total weekly hours worked and the wage rate per hour for the informal labor market[6]

VARIABLES	total_hours_weekly
wage_per_hour	-0.0562***

	(0.00122)
Constant	55.00***
	(0.133)
Observations	26,358
R-squared	0.074

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As theorized in the conceptual framework, if there is surplus labor that remains unemployed in the formal labor market, then this surplus labor will offer itself for below subsistence wages in the informal labor market. The compulsion of the working poor, to not be able to afford to be unemployed, will drive them to work at lower remuneration, which is what our second result shows.

This has a very important implication for the entire labor market. While we have established that the informal labor market is marked by vulnerabilities and workers have to work for longer hours in hazardous conditions to be able to earn the equivalent of a subsistence wage rate, the situation is not entirely different in the formal labor market either, contrary to what he had hypothesized. The dampening impact of the informal labor market is explained through this result where we see that despite the prevalence of the writ of the state, the formal labor market is not immune to the vulnerabilities of the informal labor market. This is confirmed by this result which shows that a very small change in the wage rate per hour can bring about a pronounced increase in the hours worked by the labor. This is explained by two factors: (a) lack of bargaining power of the workers and (b) the presence of surplus labor in the informal labor market.

As long as surplus labor is present in the informal labor market, workers cannot bid for higher wages, as there will always be additional workers in the informal labor market who will be willing to work at lower wages. This, in turn, will continue to inhibit the increase in wage rates in the formal labor market since wages in the formal sector cannot increase unless the surplus labor is employed at a standard minimum wage rate

which is equal to the subsistence wage rate. And employees have the bargaining power to ask for higher wage rates.

Moving on, through Hypothesis 3, we posited the coexistence of two wage employment relationships. A positive wage employment relationship, giving a positive supply curve for labor, above subsistence wage rate formal labor market. And a negative wage employment relationship, giving a negative supply curve for labor, in the below subsistence wage rate informal labor market. Then, we put the two labor supply curves, the formal labor market positive supply curve, and the informal labor market negative supply curve, together to give us a total supply curve of labor. We theorized that this should be non-linear, with a positive supply curve above the hourly subsistence wage rate in the formal labor market and a negative labor supply curve below the hourly subsistence wage rate in the informal labor market, with the turning point approximately at the hourly subsistence wage rate.

Mathematically, this describes a quadratic equation which is convex to the origin:

$$\mathbf{N= -fn\ (W) + (W)^2}$$

Recalling our third hypothesis:

Hypothesis 3:

(a) In the aggregate labor market, the supply curve of labor will be non-linear. With a positive slope above the subsistence wage, in the formal part of the aggregate labor market, and a negative slope below the subsistence wage, in the informal part of the aggregate labor market.

(b) The turning point will be approximately at the subsistence wage rate.

To demonstrate this non-linearity in the labor market, the distribution should be convex from the origin. For this, we tested the quadratic function for the entire labor market econometrically. The dependent variable is agents weekly hours worked (N) and the predictor variable is their hourly wage rate (W) and the quadratic form of their wage rate per hour (W^2). We expected our linear term to have a negative coefficient and our squared term to have a positive coefficient to demonstrate the existence of a nonlinearity.

On the left-hand side of the equation, we have agents employment in terms of the weekly hours worked, which is the dependent variable, and on the right-hand side of the equation, we have their wage rate per hour, which is our independent variable and the quadratic squared term of their wage rate per hour. Table 5 shows the results for quadratic regression for total weekly hours worked, the wage rate per hour and the squared wage rate variable, for the aggregated labor market. Our results show that on average, as the wage rate per hour decreases

for lower values of the wage rate, a 100-rupee decrease is associated with an increase of 3.12 weekly hours. However, for higher values of the wage rate per hour, it has a significantly positive effect on the weekly hours worked.

The linear coefficient is significantly negative, taking a value of -0.0312. And we get a significantly positive quadratic term taking a value of 0.0000002. This confirms that the hours worked function is quadratic in nature. And the total distribution is in fact nonlinear. Both the coefficients are highly statistically significant.

Table 5: Quadratic regression for total weekly hours worked, the wage rate per hour and the squared wage rate variable for the aggregate labor market

VARIABLES	total_hours_weekly
wage_per_hour	-0.0312***
	(0.000633)
wage_perhour_square	2.22e-06***
	(7.54e-08)
Constant	52.67***
	(0.0976)
Observations	28,441
R-squared	0.079

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Our results show that the linear term is negatively sloped and the squared term is positive, showing a quadratic which is convex to the origin, showing that Pakistan's labor market is therefore non-linear, and is split between formality and informality, above and below the subsistence wage rate of Rs. 300. This proves the coexistence of two separate supply curves, one above subsistence in the formal labor market, and the other below subsistence in the informal labor market. Which gives two different relationships between hours worked

and wage rates. Agent behavior above the subsistence wage rate, in the formal labor market, is incentive based. Requiring only very small increases in the wage rate to increase their hours worked. While agent behavior below the subsistence wage rate, in the informal labor market is compulsion based. As the wage rate falls below subsistence, the compulsion to meet subsistence drives agents to increase their hours worked. In a perverse Says Law, and this agent behavior flips, at the subsistence wage rate, falling here at Rs 300 per hour.

A subsistence wage rate estimated using secondary data approximates Rs 200 per hour. The observed subsistence wage rate, at which agent behavior flips, from incentive to compulsion based, comes in higher Rs 300 per hour. Implying agents' behavior to be risk averse. That the risk of falling below the subsistence wage rate flips agent behavior above the theorized and estimated subsistence wage rate.

6.3 Estimating the Hours Worked in the Labor Market based on the Subsistence Wage Rate Division

Now, we move to our third set of results, where we demonstrate that agents in the informal labor market work for the longest hours, because they are forced by a subsistence compulsion to work at wage rates lower than the subsistence wage rate. This, in turn, is because of surplus labor in the formal labor market being pushed into the informal labor market, which exists below the subsistence wage rate of Rs 300.

Therefore, recalling Hypothesis 4:

Hypothesis 4: On average, the agents earning below the hourly subsistence wage rate work the greatest number of hours, compared to the agents earning above the hourly subsistence wage rate.

To test this hypothesis, we first used the subsistence wage criterion to divide the labor market into formal and informal labor markets. Then, we sub-divided these markets into wage rate slabs starting from Rs 0-100, ranging up to Rs 601- Rs 700. Against each wage rate slab, we add the average number of hours worked for that wage rate slab, shown in Table 6 and Table 7.

Table 6: Average number of hours worked for each wage rate slab below Rs 300

Wage Rate Slabs	**Average No. of Hours worked/ week**
Rs 0- Rs 100	51.5
Rs 101- Rs 200	46.5
Rs 201- Rs 300	42.4
Avg: <=Rs 300/hr	$\bar{N}$ **= 49.7 hours**

Table 7: Average number of hours worked for each wage rate slab above Rs 300

Wage Rate Slabs	Average No. of Hours worked/ week
Rs 301- Rs 400	40.4
Rs 401- Rs 500	39.5
Rs 501- Rs 600	40.1
Rs 601- Rs 700	38.8
Avg: >Rs 300/hr	$\bar{N}$**=39.9 hours**

We created a dummy variable, where the distribution above a subsistence wage rate of Rs 300 was assigned a value of 0 and the distribution below the subsistence wage rate of Rs 300 was assigned a value of 1. Then we calculated the respective means of the two distributions, which are shown in Table 8 below.

Table 8: Two sample t-test for the Average Working Hours per Week for the Formal and Informal Labor Market

Average working hours/week for earners below the Rs 300 wage rate	Average working hours/week for earners above the Rs 300 wage rate	Average Working hours/week Difference in Mean
49.74	39.94	-9.79***

Our results show that on average, agents earning above the subsistence wage rate of Rs 300 work for 39.9 hours per week while agents earning below the hourly subsistence wage rate of Rs 300 work do 49.7 hours per week. This means that on average, the informal labor market agents are working 9.7 more hours per week than the formal labor market agents. Table 6 is also consistent with our first set of results showing a negatively sloped supply cum demand curve for labor in the informal labor market lying below a subsistence wage rate. And table 7 is also consistent with our first set of results showing a pretty constant and therefore infinitely elastic supply curve of labor in the formal labor market lying above the subsistence wage rate.

To determine the significance of this difference, we ran a t-test for the means of the two distributions. The result shows that on average, working hours for agents earning above Rs 300 per hour are significantly less by 9.7 hours than the working hours for those earning below Rs 300 per hour. The difference between the

means of the two distributions is significantly different, confirming that the two distributions are significantly different from one another.

6.4 Testing the Relationship between the number of earners per household and the wage rate per hour

Through our first and second set of results, we established that agents have to put in more hours of work at low wage rates to be able to earn the same subsistence wage that agents at higher wage rates make by working for lesser hours. Even by doing so, the compulsion does not end with one earner working for very long hours, due to large household sizes (6.6 in the case of Pakistan). But there is an absolute constraint on the number of hours that can be worked daily. This constraint on the number of working hours in a day, and human effort, given the compulsions of below subsistence wage rates, then requires increasing the number of earners per household. With more members of the same household seeking employment.

So, now we test the relationship between the wage rate per hour and the number of earners per household in the formal and informal labor markets. We do this by using the subsistence wage rate criterion from the first set of results.

Using the criteria of the subsistence wage rate, we expect that in the informal labor market, below the subsistence wage rate of Rs.300, as the wage rate falls, the compulsion to meet subsistence will lead to an increase in the total number of hours worked per household, because of which, the number of earners per household will also begin to increase. Giving a negative relationship between the wage rate and the number of earners per household in the informal labor market.

Recalling Hypothesis 5:

Hypothesis 5: Below the subsistence wage rate, as the wage rate falls, the number of earners per household will increase. This makes earners per household a negative function of the wage rate.

We then test the mathematical function:

Earners per Household= -fn (Wage rate per hour)

Where the earners per household is a negative function of the wage rate per hour. We tested this function econometrically by running an OLS regression. Our dependent variable on the left-hand side, is the log of the number of earners per household and our predictor variable on the right-hand side, is the log of the wage rate per hour. Table 9 shows the results for OLS linear regression for the wage rate per hour and the number of earners per household for the informal labor market. Our results show that on average, For the earners working

at an hourly wage rate of below Rs.300, on average, if the wage per hour decreases by 1%, the number of earners per household increase by 0.078%. The coefficient is statistically significant.

This confirms our hypothesis that a reduction in the wage rate per hour pushes the poorest families to send in more family members to earn, because the low wage rates do not allow them to meet their subsistence requirements despite working for longer hours. This also shows that those working at very low wage rates are the ones putting in the greatest number of working hours, in the form of more household members working.

The variation in sample size for cases such as Hypothesis 5 and 6, is because we are looking at two variables, the number of earners per household and the wage rates. Since we can only take observations that report both these variables, the sample size varies from the previous estimations.

Table 9: OLS linear regression for the wage rate per hour and the number of earners per household for the informal labor market

VARIABLES	Log_earnersize
log_wageperhour	-0.078***
	(0.0069)
Constant	0.709***
	(0.3144)
Observations	13,299
R-squared	0.009

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Next, we were to test the nature of the relationship between the number of earners per household and the wage rate per hour for the formal labor market, above the subsistence wage rate, which is more incentive based.

So, we hypothesized:

Hypothesis 6: Above a subsistence wage rate, as the wage rate increases, the number of earners per household will increase. This makes the log of earners per household a positive function of the log of the wage rate.

Earners per Household= +fn (Wage rate per hour)

Where, the number of earners per household is a positive function of the wage rate per hour, above the subsistence wage rate. We repeat the same econometric test of OLS regression to test this hypothesis. Where our dependent variable on the left-hand side of the equation is the log of the number of earners per household and our predictor variable on the right-hand side of the equation is the log of the wage rate per hour. Table 10 shows the results for OLS linear regression for the wage rate per hour and the number of earners per household for the formal labor market. Our results show that for the earners working at an hourly wage rate of Rs.300 and above, on average, an increase of 1% in the wage rate per hour is associated with an increase in the number of earners per household by 0.04%. However, the coefficient is insignificantly different from zero. We expected the number of earners per household to increase with the increase in the wage rate, following the neoclassical concept of an incentive based formal labor market. However, our results observe that above the subsistence wage rate of Rs.300, the workers in the formal labor market do not increase the number of working members of the household, simply due to a higher wage.

Table 10: OLS linear regression for the wage rate per hour and the number of earners per household for the formal labor market

VARIABLES	Log_earner_size
log_wageperhour	0.0430
	(0.0373)
Constant	0.0193
	(0.228)
Observations	1,100
R-squared	0.001

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Hence this result shows that it is only the compulsion in the informal labor market where earners are forced to work for longer hours and then add more household members to the labor force, to simply meet subsistence requirements.

6.5 Testing the Relationship between the number of working children per household and the wage rate per hour

Through tests 5 and 6, we deduced that the limitation on the number of hours in a day leads to more household members seeking work. Now another constraint, the limitation on the number of earners falling in the working age within a household, further implies the possibility of disregarding the working age, in adding more earners per household. As a result, children are forced to work. In often onerous conditions of employment. This lays the basis for our next test.

Recalling Hypothesis 7:

Hypothesis 7: As the agents' wage rate falls, to meet the subsistence requirements, children in the household are forced to work.

We expect a negative relationship between the number of working children per household and the agents wage rates i.e. a reduction in the agent's wage rate will force children of the household to seek work. So, the mathematical function then becomes:

Working Children per household= - fn (Wage rate/hour)

Where the number of working children per household is a negative function of the agents' wage rate per hour.

We test this function econometrically by running an OLS regression to observe the nature of the relationship between the number of working children per household and the wage rate per hour, for the whole distribution. Our dependent variable on the left-hand side of the equation is the number of working children per household and our predictor variable on the right-hand side of the equation is the log of the agent's wage rate per hour. Table 11 shows the results for OLS linear regression for the agent's wage rate per hour and the number of working children per household for the total distribution. The coefficient for the number of working children per household takes a value of -0.095 and is highly significant. For the aggregate labor market, on

average, a decrease of 1% in the wage rate per hour is associated with an increase in the number of working children in these households by 0.1 units.

Table 11: OLS linear regression for the wage rate per hour and the number of working children per household for the total distribution

VARIABLES	childlabor_hh
log_wageperhour	-0.0955***
	(0.0238)
Constant	0.527***
	(0.0956)
Observations	963
R-squared	0.020

This result confirms that when all of the members belonging to the working age are employed and the subsistence needs are still unmet due to fairly large family sizes and low wage rates, the age of the earner has to be disregarded and children are compelled to work.

We next run this regression for just the informal labour market. Table 12 shows the results for the OLS linear regression for the wage rate per hour and the number of working children per household for the informal labor market. For the earners working at an hourly wage rate of less than Rs 300, with a reduction in wages by 1% is associated with an increase in the number of working children in these households by 0.1units. The coefficient is statistically significant. This shows that for the informal labor market, families are compelled to send their children to work and the number of working children per household are a negative function of the wage rate. As the wage continues to drop in the informal labor market, ultimately children are forced to seek employment.

Table 12: Table 12: OLS linear regression for the wage rate per hour and the number of working children per household for the informal labor market

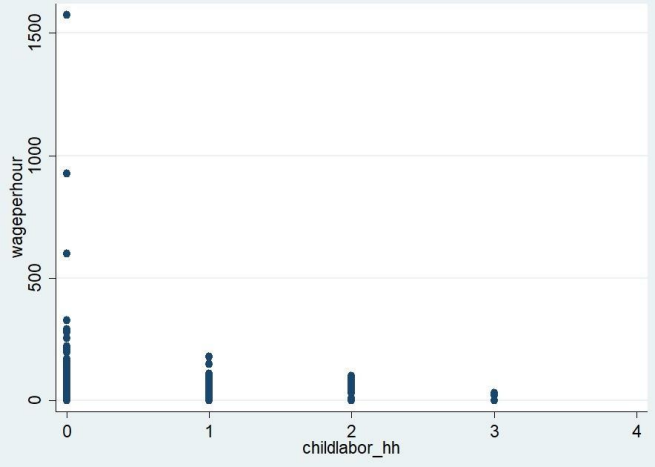
	(1)
VARIABLES	childlabor_hh
log_wageperhour	-0.0991***
	(0.0225)
Constant	0.540***
	(0.0871)
Observations	959
R-squared	0.020

This effect then dampens the entire labor market, as we saw in Table 11, where the aggregate labor market is dampened by the informal labor market. This is because above the hourly subsistence wage rate of Rs 300, there is no child labor. So, running the same test for the formal labor market does not give us any significant results. This explains why the aggregate labor market is dominated by the impact of the informal labor market, as this effect is absent from the formal labor market.

This phenomenon is also shown in the scatterplot below. Where, we can see the reduction in the hourly wage rate brings about an in increase in the number of working children per household. Moreover, it should be noted that this phenomenon is practically absent in the distribution of earners working at an hourly wage rate of Rs 300, which is our formal labor market.

The variation in the sample size varies because of the number of missing values in the data changes with the combination of variables we are estimating for each hypothesis. In the case of Hypothesis 7, the reported number of observations for the wage rates of children is very less, so we can only base our estimations on the available data.

Figure 7: Scatterplot for the Number of working children per household and the Wage Rate per Hour



7. Conclusions

7.1: The need to estimate and analyze the informal labor market in Pakistan

The global economy accounts for a large share of informal employment, especially in the developing countries, which encompasses every employed person who isn't subject to state labor regulation and is not covered by the social protection net or unemployment benefits. In developing countries, informal employment can account for more than half of non-agricultural employment. Conditions for informal sectors vary across countries. For countries with large informal economies, lack of any significant social protection coverage forces them to take up any job(s) available, regardless of the weak working conditions or low wage levels. Moreover, developing countries are constrained by their capacity to collect data and generate national level statistics due to limited resources, which makes estimating informality a challenge.

In the case of Pakistan, informal enterprises are exempt from state legislation based on the ten or more workers' criterion laid out by the Factories Act of 1934. This makes it commonplace for SMEs to hire individuals as contract workers rather than as employees. They might resort to outsourcing or hiring through agencies, which helps them in circumventing labor legislation and reducing operational costs which is made possible through surplus labor that is willing to work for lesser wages.

Consequently, laborers usually lack the capacity to acquire adequate knowledge of the law or legal representation. Labor policies have also remained divorced from legislation. As a result, informal and agricultural workers remain deprived of the simple right of association. Absence of bargaining power which prevents them from gaining access to practically any other benefits that come with formal employment.

Estimating informality is of key importance because without quantitative estimates of the actual proportion of informality in the labor market, and analysis of agent behavior in the informal labor market, policy towards the economic well-being of the informal workers will be hamstrung and misplaced.

To demarcate formality from informality, the ILO uses the criterion of registration of workers. And in effect, the registration of workers is specified to be covered under some or any measure of social protection. However, as the methodology section shows, it is difficult to base estimation of informality on this criterion, given the data limitations of the labor force surveys of many countries.

The existing literature, and global policy, led by the ILO, infers that strengthening regulatory fiat in the formal labor market will eventually trickle down to affect the informal labor market. We contend that this model of the causal relationship between formality and informality is flawed. We take a classical Lewisian model to examine the labor market. This model contends that surplus labor in the informal labor market has to exhaust, before bidding up the wage in the informal labor market and the formal labor market. So, we are standing theory on its head. We are implying reverse causality that the informal wage has to lead and the formal wage has to follow.

In Pakistan's case, the considerable literature on informality has not evolved along with the international literature to use the ICLS criterion of registration and social protection. The Pakistan Bureau of Statistics' estimates of informality are based on the Factories Act of 1934 which uses the size of employment and type of enterprise as the criteria for estimating informality based on the Labor Force Survey.

So, this thesis first aims to estimate informality using a new criterion of a subsistence wage. Because existing criteria are found to be either inadequate in the case of the GOP. Or very difficult to empirically estimate given data limitations, in the case of ILO's very comprehensive criteria.

After this estimation of the formal and informal labor markets in Pakistan, we see the enormity of the size of the informal labor market. The fundamental problem then is to try to capture the essential weakness in the informal labor market, compared to the formal labor market. We do this through a conceptual framework that examines agent behavior in the formal labor market and posits contrasting agent behavior in the informal labor market.

7.2: The conceptual framework

To estimate and analyze the informal labor market, differentiating it from the formal labor market, we set out a conceptual framework based on a logical argument.

The labor market is shown to be bifurcated by the differences in the many important working conditions between formality and informality, including remuneration, working hours, workload, and OSH. However, the most basic of all working conditions has to be the wage or the remuneration, since it is the most important consideration of any employee seeking a job and that of the employer as well. Consider too that the Classical and the Neoclassical models of the labor market, are based on two key variables, wages and employment.

Therefore, to demarcate the informal labor market from the formal labor market, we use the concept of a subsistence wage as the distinguishing criterion to separate the two. Which is a wage that is sufficient for a household to be able to meet the subsistence requirements of all its family members.

Above a subsistence wage in the formal labor market, we then theorize that a positive relationship between wages and employment will hold. Where an increase in the agents' wage leads to an increase in their hours worked, making the supply curve of labor a positive function of the wage rate. We call this a wage incentive-based model. But in the informal market, lying below the subsistence wage rate, we theorize that due to the absence of government regulation, agent behavior changes. Since agents are working at a wage rate below subsistence, that implies they are already unable to meet the subsistence needs of the household. And as the wage rates are further lowered, the agents move further away from earning a subsistence wage. This gap is then covered by working for longer hours at lower wage rates. The logic therefore, is reversed, and now a reduction in the agents' wage rate leads to an increase in the number of their hours worked.

Therefore, we can say that in the informal labor market, price incentives give way to the compulsion of subsistence, making the supply curve of labor a negative function of the wage rate. Ergo, in the informal labor market, lying below the subsistence wage rate, labor supply will create its own demand, in a perverse Says Law. And with Says law of supply creating its own demand, the demand curve for labor in the informal labor market will tend to coincide with the supply curve for labor.

So, we need to examine the relationship between wages (W) and employment (N) in the formal labor market and compare it to the relationship between wages and employment in the informal labor market.

Then we aggregate the two labor supply curves, the formal labor market positive supply curve, and the informal labor market negative supply curve, together to give us an aggregate supply curve of labor. This should be non-linear, with a positive supply curve above the subsistence wage in the formal labor market and a negative labor supply curve below the subsistence wage in the informal labor market, with the turning point approximately at the subsistence wage.

After establishing the contrasting nature of the relationship between wage rates and hours worked per week in the formal and informal labor markets, we move on to examine the further implications of this agent behavior in the informal and informal labor markets. Which actually implies further vulnerabilities in the informal labor market. The negatively sloped supply cum demand curve for labor in the informal labor market, implies that agents in the informal labor market will work longer hours than agents in the formal labor market, this is because the low wage rates are not sufficient for earners to meet the subsistence requirements of their households. So, they have to put in more hours of work at low wage rates to be able to earn the same subsistence wage that earners at higher wage rates make by working for lesser hours.

So, the longest number of hours worked will be in the informal labor market. This is implied by the compulsive agent behavior to meet subsistence posited for the informal labor market. And is a well noted vulnerability in the literature, on the onerous conditions of work in the informal labor market.

The compulsive agent behavior to meet subsistence, and the longer hours worked, in the informal labor market, both have a further implication for the informal labor market. There is a maximal constraint on the number of hours that can be worked by an earner in the day. And if the compulsion does not end with one earner working for very long hours, this constraint on the number of working hours in a day is then addressed when more members of the same household seek employment. So below the subsistence wage rate, in the informal labor market, we expect that as the wage rate falls, the compulsion to meet subsistence, to increase the total number of hours worked per household, the number of earners per household will increase. Giving a negative relationship between the wage rate and the number of earners per household.

And, above the subsistence wage rate, in the formal labor market, which is more incentive based, as the wage rate increases, the number of earners should increase. Giving a positive relationship between the wage rate and the number of earners per household.

The compulsive agent behavior to meet subsistence, the longer hours worked, and the higher number of earners per household, in the informal labor market, has yet another logical implication for the informal labor market.

Agents in the informal labor market are met with two limitations: the limitation on the number of hours in a day is addressed by adding more members of the family to the labor force; a second limitation, of the earners who fall within the working age. When all of the members belonging to the working age are employed and the subsistence needs are still unmet due to fairly large family sizes and low wage rates, the age of the earner has to be disregarded and children are compelled to work. Therefore, we can deduce that the limitation

on the number of hours in a day leads to more household members seeking work. And the limitation on the number of earners falling in the working age within a household leads to disregarding the working age when it comes to seeking work. Which implies that there should be more child labor per household in the informal labor market. Compared to the formal labor market.

So, we expect that a reduction in wages below subsistence is responsible for child labor, which is undoubtedly the worst form of vulnerability.

7.3: The data available to apply this conceptual framework for estimating and analyzing the informal labor market in Pakistan

In this study, we make use of the most recently available data given by the Labor Force Survey for 2018-19, Household Integrated Economic Survey 2013-14 data and the World Bank data for our estimations. For the informality count based on the ILO and PBS criteria, we make use of the Labor Force Survey data for 2018-19. To estimate informality in Pakistan using ILO's criteria of registration for social protection, we used a proxy variable that enquires about social protection of any kind and whether or not a firm keeps written accounts, from the LFS dataset.

Informality using the PBS criteria is relatively easy to estimate since the LFS directly asks questions about the size of the firm. Any firm with less than ten employees is categorized as an informal firm and any firm with ten or more employees counts as a formal firm.

To estimate informality using the subsistence wage criterion, we used the CBN Monthly Poverty Line per adult equivalent given by the World Bank. This has been taken from HIES (Household Integrated Economic Survey 2013-14). After 2013-14, the CBN poverty line has been adjusted for each succeeding year to 2018-19.

7.4: The methodology used to test this conceptual framework for estimating and analyzing the informal labor market in Pakistan

This conceptual framework applied to Pakistan, and the given data sources, gives the following methodology to test this conceptual framework.

To estimate informality, we demarcated the formal labor market from the informal labor market using the subsistence wage criterion. We arrived at a monthly subsistence wage line of Rs. 30,070 (approximated to the nearest hundred for convenience), which gave us a weekly subsistence wage line of Rs. 7,500 and an hourly subsistence wage rate of Rs.200 approximately.

However, our tests for Hypothesis 1 and 2 showed a slight variation from our expectations. We found that the behavior of agents in the informal labor market does change from the behavior of agents in the formal labor market, but it does so at an observed higher hourly wage rate of Rs.300, instead of the estimated hourly subsistence wage rate of Rs. 200. This is difference is posited to be due to agents with wage rates on the margins of subsistence, being risk averse. Hence, they start to meet their subsistence requirements at a higher observed wage rate, before the wage rates fall to the estimated minimum value of Cost of Basic Needs level of Rs 200. This difference between the theorized and estimated subsistence wage rate of Rs.200, and the actual wage rate at which agents are observed to change their behavior of Rs.300, can be attributed to risk aversion by agents whose wage rates are on the margins of subsistence.

Therefore, we re-establish an observed subsistence wage rate, which is higher than the theorized and estimated subsistence wage rate.

(i) Then we use this subsistence wage rate to differentiate the formal labor market from the informal labor market and observe the nature of relationship between wage rate and the hours worked per week by running OLS regressions for the formal distribution, the informal distribution and the total distribution. To prove the existence of a non-linearity in the labor market, we run a quadratic regression. Where we expect the linear term to show a negative sign and the squared term to show a positive sign, to prove that the distribution is convex to the origin.

Next, we move on to examine the logical implications of the theorized compulsive behavior of agents to meet their subsistence requirements, by increasing their hours worked as the wage rate falls:

(ii) Through longer hours worked by the agents in the informal labor market to meet subsistence requirements. This is tested by calculating the means of the formal and informal distributions and then comparing the means using a t-test.

(iii) Through more earners per household in the informal labor market seeking employment due to an inability to meet subsistence requirements. This is tested by running an OLS regressions for the number of earners per household and the wage rate for the formal and informal labor markets. Where, earners per household is a negative function of the wage rate per hour, for the informal labor market. And earners per household is a positive function of the wage rate per hour, for the formal labor market.

And,

(iv) Through children being compelled to work due to an inability of agents to meet subsistence requirements, tested by running OLS regressions for the number of working children per household and the wage rate per hour for the total distribution and the informal distribution. Where the number of working children per household is a negative function of the wage rate per hour.

7.5: Results

I: Estimation of the informality labor market in Pakistan

Our first set of results comprised estimating the size of the informal labor market and the prevalence of informality in Pakistan's labor market through three different criteria.

(a) ILO's criteria of registration

(b) Pakistan Bureau of Statistics' criterion

(c) The subsistence wage criterion

To estimate informality in Pakistan using ILO's criteria of registration for social protection, we resorted to using a proxy variable, which is compliance with any modicum of provision regulated by the state.

This proxy variable consisted of two questions:

(i) whether or not the employees are given old age pensions, or social insurance, or medical care, or family support in case of death of breadwinner OR

(ii) whether or not the enterprise keeps written accounts.

Only **7,599** from a total of **38,618** earners are provided one or more kind(s) of social protection from the five listed options. This makes up for **19.68%** of the total employed sample, according to the ILO criterion of social protection.

Out of the total sample of earners for Pakistan's non-agricultural labor force of **38,618** individuals, only **7,798** had a written contract with the employer, ranging from less than one year up to 10 years. The formal workers therefore, make up for only **20.19%** of the total employed sample according to the ILO criterion of registration of contracts.

This makes the actual size of the informal labor market in Pakistan at about 80% of the non-agricultural labor force.

Next, we use the estimate of informality provided by the Pakistan Bureau of Statistics. The Pakistan Bureau of Statistics' estimates of informality are based on the Factories Act of 1934 which uses the size of employment and type of enterprise as the criteria for estimating informality in the Labor Force Survey. Household enterprises and enterprises with less than 10 persons employed make up for the informal labor market in Pakistan. Agricultural employment and those involved in non-market production are excluded from the informality criteria. According to this criterion, PBS estimates informality at **72%**, implying that 72% of all employment in Pakistan's nonagricultural labor force is in informal employment.

Finally, we estimate the value of a subsistence wage to demarcate the formal labor market from the informal labor market. This subsistence wage is based on a criterion of sufficiency to meet the caloric requirements of the entire household. This is based on using the international poverty line of $1.90 a day which is enough to provide an RDA of 2250 calories per individual. Since the wage ensures an intake of 2250 calories for themselves and their family members, it is the most important criterion of all. We used the Purchasing Power Parity estimates for the Cost of Basic Needs (CBN) poverty line for 2018-19, and arrived at a value of the subsistence wage rate per hour per earner.

To estimate a value for the subsistence wage, we used the CBN Monthly Poverty Line per adult equivalent given by the World Bank. This has been taken from HIES (Household Integrated Economic Survey 2013-14). After 2013-14, the CBN poverty line has been adjusted for CPI for each succeeding year to 2018-19.

We arrived at a monthly subsistence wage line of Rs. 30,070 (approximated to the nearest hundred for convenience), which gave us a weekly subsistence wage line of Rs. 7,500 and an hourly subsistence wage rate of Rs.200 approximately. Out of the 38,618 earners in the LFS sample, only 28,050 had reported their wages. LFS data only reports wages for earners who are working as employees and does not report wages for all other forms of employment arrangements i.e. employers, own-account workers, sharecroppers, own cultivators and contributing family workers. So, empirically, our sample was restricted to 28,050 observations. From these 28,050 earners, who had reported their wages, 3,522 (13%) were earning more than the subsistence wage rate of **Rs. 200**, falling above the hourly subsistence wage rate in the formal labor market. The remaining 24,528, which makes up for **87%** of the labor force were earning less than the subsistence wage rate of Rs. 200, falling below the subsistence wage level, in the informal labor market.

Summarizing the results for Section I, the PBS criteria gives the lowest estimate of informality at 72% of the nonagricultural labor force. The ILO criteria gives a higher estimate at 80% of the nonagricultural labor force. While the subsistence wage criterion, estimate of informality, based arguably on the most important indicator of welfare, which is survival, gives the highest estimate at 87% of the nonagricultural labor force. This shows that

87% of the working employees are not earning an hourly wage rate which would be sufficient to support a family size of 6.6 meet their subsistence requirements.

II: Analyzing and contrasting agent behavior between the formal labor market and the informal labor market in Pakistan

Section II looks at the differences between the formal and informal labor markets on the basis of the most basic of all working conditions: the subsistence wage rate.

Now, for our first set of results for Section II, we run three specifications:

(i) the relationship between the wage rate per hour and the weekly hours worked for the formal labor market,

(ii) the relationship between the wage rate per hour and the weekly hours worked for the informal labor market, and

(iii) the relationship between the wage rate per hour and the weekly hours worked for the formal labor plus the informal labor market. That is for the aggregate labor market, to see if there is a non-linearity.

Recalling **Hypothesis 1:**

In the formal labor market, the total hours worked (N) is a function of Wage (W) earned by individuals, where wage is the independent variable.

N= + fn (W)

To separate the formal labor market from the informal labor market, we separated the two distributions at the hourly subsistence wage rate of Rs. 200. And tested if the increase in the wage rate per hour will bring an increase in the weekly hours worked by the earners, for the formal labor market. However, our results showed that agent behavior changes, but it does so at a higher wage rate of Rs.300 instead of a subsistence wage rate of Rs. 200. Therefore, we re-establish the observed subsistence wage rate at Rs 300, which is higher than the theorized and estimated subsistence wage rate of Rs 200.

We tested hypothesis 1 using a simple OLS linear regression. The results show that for the agents working at an hourly wage rate of Rs.300 and above, on average, a reduction in the wage rate per hour by Rs 100 is associated with a decrease in the weekly hours worked by 0.06 hours. The coefficient however is insignificantly different from zero. Which means that the labor supply curve is infinitely elastic. This indicates that agents in the

formal labour market, lying above subsistence, only a very small wage incentive is required to expand their labor supply.

Next, for the informal labor market, we expected agent behavior to change. This is because price incentive is replaced by the compulsion of subsistence, forcing agents to seek more hours of work to approximate the subsistence wage rate, making the supply curve of labor a negative function of the wage rate. This compulsion of subsistence leads labor to create its own demand, in a perverse Says Law.

Recalling **Hypothesis 2:**

Hypothesis 2: In the informal labor market, lying below the subsistence wage rate, the total hours worked (N) will be a negative function of the Wage (W) rate earned by labor. Where the wage rate is the independent variable, determining the hours worked as the dependent variable.

Therefore, mathematically, the function becomes:

N= - fn (W)

We repeated the same econometric test of running an OLS regression to observe the nature of the relationship between the weekly hours worked and the wage rate per hour **below** the subsistence wage rate. Our results showed that for agents working at an hourly wage rate of below Rs.300, on average, a reduction in the wage rate per hour by Rs 100 is associated with an increase in their weekly hours worked by 5.6 hours. The coefficient is statistically significant. This means that as the wage rate continues to fall further below subsistence, the compulsion to meet family subsistence will drive agents to seek greater employment, more hours worked, making it compulsion-based employment.

Moving on, through Hypothesis 3, we posited the coexistence of two wage employment relationships. A positive wage employment relationship, giving a positive supply curve for labor, in the above subsistence wage rate formal labor market. And a negative wage employment relationship, giving a negative supply curve for labor, in the below subsistence wage rate informal labor market. Then, we aggregated the two labor supply curves, the formal labor market positive supply curve, and the informal labor market negative supply curve, together to give us an aggregate supply curve of labor. We theorized that this would be non-linear, with a positive supply curve above the hourly subsistence wage rate in the formal labor market and a negative labor supply curve below the hourly subsistence wage rate in the informal labor market, with the turning point approximately at the hourly subsistence wage rate.

Mathematically, this describes a quadratic equation which is convex to the origin:

$$N = -fn(W) + (W)^2$$

Recalling our third hypothesis:

Hypothesis 3:

(a) In the aggregate labor market, the supply curve of labor will be non-linear. With a positive slope above the subsistence wage, in the formal part of the aggregate labor market, and a negative slope below the subsistence wage, in the informal part of the aggregate labor market.

(b) The turning point will be approximately at the subsistence wage rate.

For this, we tested the quadratic function for the aggregated labor market econometrically. The dependent variable is the weekly hours worked (N) and the predictor variable is the hourly wage rate (W) and the quadratic form of the wage rate per hour (W^2). We expected our linear term to have a negative coefficient and our squared term to have a positive coefficient to show the existence of a nonlinearity.

Our results show that on average, for lower values of the wage rate per hour, a 100-rupee decrease is associated with an increase of 3.12 weekly hours. However, for higher values of the wage rate per hour, it has a significantly positive effect on the weekly hours worked. The linear coefficient is significantly negative, taking a value of -0.0312. And we get a significantly positive quadratic term taking a value of 0.0000002. Both the coefficients are highly statistically significant.

This confirms that the hours worked function is quadratic in nature. And the total distribution is in fact nonlinear, proving that Pakistan's labor market is therefore non-linear, and is split between formality and informality, above and below the subsistence wage rate of Rs. 300.

Now, we move to our third set of results, where we demonstrate that agents in the informal labor market work for the longest hours, because they are forced by a subsistence compulsion to work at wage rates lower than the subsistence wage rate. Therefore, recalling Hypothesis 4:

Hypothesis 4: On average, the agents earning below the hourly subsistence wage rate work the greatest number of hours, compared to the agents earning above the hourly subsistence wage rate.

To test this, we created a dummy variable, where the distribution above a subsistence wage rate of Rs 300 was assigned a value of 0 and the distribution below the subsistence wage rate of Rs 300 was assigned a value of 1. Then we calculated the respective means of the two distributions, which were then compared using a t-test for means. Our results show that on average, agents earning above the subsistence wage rate of Rs 300

work for 39.9 hours per week while agents earning below the subsistence wage rate of Rs 300 work 49.7 hours per week. This means that on average, agents in the informal labor market are working 9.7 more hours per week than agents in the formal labor market. The difference between the means of the two distributions is significantly different, confirming that the two distributions are significantly different from one another.

After establishing that agents at extremely low wage rates have to put in more hours of work to be able to earn the equivalent of a subsistence wage that agents at higher wage rates make by working for lesser hours, we then run into a constraint on the number of working hours in a day. In order to increase their hours worked beyond the constraint of the working day, agents at below subsistence wage rates need to increase the number of earners per household to be able to meet their subsistence requirements. With more members of the same household seeking employment.

Recalling **Hypothesis 5:**

Hypothesis 5: Below the subsistence wage rate, as the wage rate falls, the number of earners per household will increase. This makes earners per household a negative function of the wage rate.

We then test the mathematical function:

Log of Earners per Household= -fn (Log of Wage rate per hour)

We tested this function econometrically by running an OLS regression for the log of the earners per hour and the log of the wage rate per hour, for the informal labour market lying below subsistence. Our results showed that, for the agents working at an hourly wage rate of below Rs.300, on average, if the wage per hour decreases by 1%, the number of earners per household increases by 0.078%. The coefficient is statistically significant.

Next, we tested the nature of the relationship between the number of earners per household and the wage rate per hour for the formal labor market, above the subsistence wage rate, which is more incentive based.

So, we hypothesized:

Hypothesis 6: Above a subsistence wage rate, as the wage rate increases, the number of earners per household will increase. This makes the log of earners per household a positive function of the log of the wage rate.

Log of Earners per Household= +fn (log of the Wage rate per hour)

We repeated the same econometric test of an OLS regression to test this hypothesis. Our results showed that for the earners working at an hourly wage rate of Rs.300 and above, on average, an increase of 1% in the wage rate per hour is associated with an increase in the number of earners per household by 0.04%. However, the coefficient becomes negligible since it is insignificantly different from zero. Showing that above the subsistence wage rate of Rs.300, agents in the formal labor market do not increase the number of working members of the household, simply due to a higher wage. And that, it is only the compulsion in the informal labor market where agents are forced to work for longer hours, then add more earners per household to meet their subsistence requirements.

Through tests 5 and 6 we deduced that the constraint of the number of hours in a day leads to more household members seeking work. The next implication is that the limitation on the number of earners falling in the working age within a household leads to disregarding the working age when it comes to seeking work, As a result, more children are forced to work, in the informal labor market.

Recalling **Hypothesis 7:**

Hypothesis 7: As the agent's wage rate falls, to meet the subsistence requirements, children in the household are forced to work.

Working Children per household= - fn (Wage rate/hour)

Where the number of working children per household is a negative function of the wage rate per hour.

We test this function econometrically by running an OLS regression to observe the nature of the relationship between the number of working children per household and the wage rate per hour, for the whole distribution, and then for the informal labor market.

Our results for the OLS linear regression for the wage rate per hour and the number of working children per household for the total distribution show that for the aggregated labor market, on average, a decrease of 1% in the wage rate per hour is associated with an increase in the number of working children in these households by 0.1 units. The negative sign indicates that with the marginal reduction of the wage rate per hour, the number of working children per household increases.

The results for OLS linear regression for the wage rate per hour and the number of working children per household for the informal labor market show that for the earners working at an hourly wage rate of less than Rs

300, a reduction in wages by 1% is associated with an increase in the number of working children in these households by 0.1 units.

Running the same test for the formal labor market does not give us any significant results. This explains why the aggregate labor market is dominated by the impact of the informal labor market, as this effect is absent from the formal labor market.

8. Policy Implications

The policy implication of this empirical analysis of the formal and informal labor markets, extends to all developing countries, but is applied here to Pakistan. The grave policy implication is that the perverse mechanism operating to iteratively weaken the conditions of work can only be reversed under two conditions:

The first policy caveat is to expand employment till the point where the surplus labor being absorbed in the informal labor market is absorbed sufficiently to raise the prevalent wage rates, eventually above subsistence.

For as long as surplus labor is available, it will keep driving down the wages of the informal labor market.

Therefore, any policy that targets the formal labor market cannot possibly bring about wage reforms in the informal labor market or improve their working conditions, unless we reach the Lewisian turning point, where there is a shift from a low productivity informal labor market, rich in surplus labor to a high productivity formal labor market.

This theoretical concept also finds empirical evidence in the case of China's Hu-Kou system of migrant labor, where wage growth levels remained low because the macro model was based on bringing in labor from rural areas who were hired at lower wages, since labor was available in surplus in these areas, compared to urban areas. (Lu, D., Mahmood, M., & Yongding, Y, 2009)

Availability of surplus labor naturally brought down wages as supply was higher than the demand for labor. This is a classic example of the Lewisian turning point, according to which workers will move from the low productivity informal labor market to the high productivity formal labor market as the wages are increased up to subsistence level in the informal labor market. As the surplus labor diminishes (rural hukou holders, in case of China), wages in the informal labor market rise, ultimately bringing an increase in formal labor market wages.

The essay has very strong policy implications, because if the Lewis hypothesis is supported, then global policy to improve conditions in the formal labor market, as advocated by the ILO, is misplaced. The need to differentiate the formal labor market from the informal labor market has been demonstrated in that, the informal labor market operates under a perverse Say's Law, which weakens its own wages because of the presence of surplus labor, implying the need for specific policy, aimed separately at the formal labor market and the informal labor market. This is because, we cannot rely on a trickle-down effect from the formal labor market to the informal labor market.

Policies aimed at generating aggregate demand for employment in the informal labor market, which allow the

bidding up of the wage in the informal labor market, have to be formulated. An example in this regard is the National Rural Employment Guarantee Act (NREGA) in India (Islam, M., & Sivasankaran, A. (2015). Which aims to generate employment and prop up rural wage in a market which is not readily subject to the writ of the state's regulatory framework. Such policies have been designed and even legislated in Pakistan, but have fallen victim to politics in the past.

The second policy caveat, is to expand the purview of the state's policy environment specifically to the informal economy. The implementation of minimum wage laws in the informal labor market is of key importance, as it is imperative to set the minimum wage rate at a level sufficient to sustain large family sizes. Since any such laws are currently applicable to only the formal labor market which makes up for a very small section of the working population, according to both, the PBS and the subsistence wage criteria, the informal economy should come under the state legislation.

Thirdly, the problems associated with estimating informality and the need to assess job quality as a better metric of the labor market rather than just the quantum of unemployment, support the idea of using the wage as a determining criterion. Moreover, the wage can be used as a mechanism to observe demand and supply of labor in the labor market, because it is the primary indicator of vulnerability in the informal labor market.

This perverse Says Law operating in large informal labor markets lying below subsistence wage rates has huge macroeconomic implications, for the behavior of labor supply determining employment in the entire labor market.

Fourth, this essay has a very important implication for the entire labor market as well. While we have established that the informal labor market is marked by vulnerabilities and workers have to work for longer hours in hazardous conditions to be able to earn a subsistence wage rate, the situation is not entirely different in the formal labor market either. The dampening impact of the informal labor market is explained through this result where we see that despite the prevalence of the writ of the state, the formal labor market is not immune to the vulnerabilities of the informal labor market, which is explained by a lack of bargaining power of the workers and the presence of surplus labor in the informal labor market. This vulnerability is then shown by the existence of child labor, and the increasing number of household members, including pregnant women and the elderly seeking employment solely due to the inability to meet subsistence requirements, which are a direct consequence of wage rates lower than the subsistence wage rate in the informal labor market.

Raising minimum wages by keeping the subsistence wage rate in view can have a ripple effect on not only improving the working conditions for the workers but also addressing other forms of vulnerabilities that extend to the households of these poor workers.

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