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Innovation and welfare regimes: Capturing income inequality in theories of technological change

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Introduction

As various scholars have pointed out, there is nothing intrinsically welfare enhancing or necessarily income equalizing about technological change. How should we think of market creation and regulation for innovations? What is the state's role in institutionalizing demand either through product costs, income levels, or non-income supports? Alternately, how do income-enhancing institutions of social protection affect the market for innovations? Institutions are understood here beyond statutory and legal ones, to contain behavioural and cognitive elements, as well as associative and cooperative features. Institutions such as firms and universities are also organisations and as such, have distinct spatial characteristics.

While we know a fair amount from excellent recent contributions to questions of public and private participation in the economy and the nature of market regulation (e.g. Nelson, 2005, Rodrik 2001), we continue to search for ways in which institutions emerge, change, and mediate severe income inequalities within our societies. How are institutions related to questions of economic growth and income inequalities? There is an urgency to attend to questions of inequality in almost all economies. This urgency has been made possibly more acute given that several scientific and technological advances have led to mixed outcomes in well-being and in response to market demands that are at best an imperfect guide to indicators of well-being. The urgency is heightened because several processes of urbanization and 'feminisation" of the industrial process tend to exacerbate income concentration in alarming ways for basic livelihoods, and with worrying consequences for both supply and demand of innovations.

I will limit my analysis in this paper to the nature of product and labour markets, the political constituents of institutions of demand, and to the state's role in instituting such demand. I will briefly address the firm's role in a regional risk ecology that may provide more traction in understanding the relationships between the firm as site of technological changes, its role as employer and income provider, and its social embedding in specific industrialising societies. Social protection and welfare regime formation provide a means by which to analyse how demand and supply interact. Social insurance analysis can provide hints about how demand is demanded and supply actually supplied in specific locations. The concern is not

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simply with job growth, but with how the market-regulating social protection institutions also shape markets for innovations and accommodate those *outside* the labour market at any time, a critical feature of any segmentation and gender analysis.

The paper draws on insights from several years of analysis of Indian and several European social protection policies in comparative historical perspective, the issue of "informal" work and its gendered dimensions in health and social policy (Lund and Srinivas, 2000/2005), the Indian political climate for social insurance and ongoing research on the four southern Indian states (STEP-Srinivas 1999, Srinivas, forthcoming). It also draws from related research on comparative analysis of the worldwide pharmaceutical and biopharmaceutical sectors and their varied embedding in health entitlements and labour politics (Srinivas, 2004, 2006). The conceptual framework for markets and innovation draws from Srinivas and Sutz (2008).The methods employed and time periods studied have been discussed in these various sources. This approach of jointly analyzing innovation and welfare regimes, is especially relevant for industrial sectors providing 'public goods' such as health, energy (industrial recycling to clean technologies), education (from distance learning technologies to textbooks), or even construction (health and safety). By understanding how dual/segmented labour market insights might be applied to the economics of technological changes, we might be better able to understand market demand, the role(s) of the State, and collective institutions such as social insurance.

1 The market myth of a billion-a million mutinies instead?[2]

Innovations can be described as products or processes new to the firm if not new to the world market (Schmookler '66, Nelson and Rosenberg '93). The distinction between newness to the firm and to the world will be explored later because it reflects the relevance and prioritization of innovation efforts and its markets, but for the moment, we can assume that the firm (in its local context) develops a new product or process relative to its prior efforts.

While I was in Uruguay earlier this year to speak at the UNESCO meeting on Science, Technology, Innovation and Social Inclusion for the Latin American and Caribbean region, the evening news on my day of arrival had three inter-related ironic stories on the link between innovation and income inequality, and interestingly enough, all related to India. The three stories were in agriculture and energy prices, automobiles and biofuels, and the health sector. In the case of biofuels, the story's attention was focused on the tensions between the uses of agricultural crops to fuel automobiles versus to feed people. The Indian finance Minister Mr. Chidambaram called it "outrageous" that countries like the U.S. were converting food crops into biofuels, raising the costs of food worldwide. Separately, the second story described the Indian automobile industry where innovation has proceeded apace spurred by both acquisition and innovation. The Tata company, an Indian conglomerate (itself comprised of 98 companies, and contributing 3% of Indian GDP), has made a name for itself both as an innovator and maker of low cost cars (the Nano, projected at U.S.$2500). It has been a newspaper and magazine favourite in buying of Land Rover and Jaguar. Tata now makes the world's cheapest and most expensive cars at once, strategizing on income increases in both the lower income and higher income segments of society. Its innovations in turn have had a knock-on effect in the realm of biofuels, electric cars, steel and automotive manufacturing. While Mr. Chidambaram criticized the U.S. conversion of crop, Indian auto advances are gradually exerting the same pressures at home. A tense battle between industrialists, farmers, and the government has broken out in W. Bengal state from land disputes over the Nano and other manufacturing sites. As acute land pressures, small holding size and low productivity in agriculture persist, subsistence farming and tenant farming has created further inequalities. The story indicated that in parts of India, Bangladesh and Burma, people have begun eating rats to survive. This huge health risk of its own from no

[2] With due apologies to V.S. Naipaul's title.

access to food or healthcare has been induced while both grain production and health technologies are well established in South Asia. The stories underscored the complex political and social relationships between India's industrial choices, its agricultural economy, and its severe land and employment-related insecurities.

Today, most of the world's very low-income residents are concentrated in South Asia and Sub-Saharan Africa. In countries such as India, low-income has become especially difficult because of precarious work and income, lack of effective social policies, the rising costs of living, severe pressures on land, and the prioritization of most government resources to industry. The state, despite considerable industrial successes, is better known for corruption, violence and other abuses of power. Worldwide, one of the hallmarks of economic growth is a marked rise in productivity increases especially in manufacturing, but accompanied by reduced social protections and increasing income inequalities. In the larger growing economies such as China, India and Brazil, significant income divergences are visible both nationally and sub-nationally. In democracies such as India and Brazil, the politics of inclusion and macroeconomic sequencing of redistribution play out in distinct ways.

Fundamentally, how do innovations emerge? How are they supplied and accessed, especially by people with low-income? The innovation may be an iPod, a diagnostic malaria, kit or the electric car, Reva (produced by Bangalore's engineering students and visible all over the city). Several low-income people cannot buy or use these innovations. At least in principle, the innovating institution (private or public firm, university, etc.) pursued the innovation because of projected demand (if not profits) from those who could afford it. The product was priced based on projected or actual demand.

On the demand side, there are two basic ways in which an individual who could not previously afford it could use the innovation: through lowered product costs (even if leasing), and/or through higher income. The question for us in thinking through the political economy of the innovation is the role of the state and market in determining (a) the cost of the innovation and (b) the institutions that shape the effective income of the individual and his/her access to the innovation. States and policy-makers often address the higher income question through two additional means: first, increasing the effective output per worker i.e. higher income (wages) through higher productivity rates; second, through social policies of various types that raise the effective income of the individual in real terms. Certain institutions may additionally make access to innovations (such as health technologies) a possible through minimizing income inequalities, or through fundamental rights, making income irrelevant altogether.

The means of redistribution and income-enhancing supports deserve long-due attention. It would be fair to say that many innovation scholars are more enraptured with the origins of innovation, then the messy attributes of how the fruits of innovations benefit the economy or reach the individual, particularly those with low-income. Given that several economies around the world show us how early redistributive measures can have long-run positive impacts on growth and equality, innovation research may have greater life against a wider political and social backdrop. Moreover, away from national aggregates, the economic growth strategies of industrial services and manufacturing in innovative sectors can have specific *regional* manifestations. In the U.S., there is evidence that state-level economic development strategies based on knowledge-intensive or high-tech industries have caused significant increases in income inequality. Political consensus for capitalist institutions that supported the post-war prosperity of the country has been threatened by the rising income inequality across most states (Cozzens et al. 2005). R&D intensive strategies have also exacerbated employment dualism by increasing the very high-wage end of the income spectrum. Inequality trends have occurred in the midst of the U.S. economic boom of the late 20th century. While until; 1980 economic prosperity had seen the incomes of the bottom 80% grow, the post-1980s period has seen the bottom 20% of the income distribution experience a fall of 9%

while the top 20% has increased by over 40%. States worst hit have been those with employment strategies dependent on innovative, high-tech industries and services growth; those better off in terms of income equality have been those that have maintained manufacturing job growth and complemented these with linked high-tech strategies (Ibid.)

The link between innovation and individual is clearly not without its own political and spatial context. For first time in world history, most people live in urban areas, urban poverty is rising, and urban sectoral favourites such as IT, pharma/biotech, or oil, are driving regional and urban economic strategies. Each of these sectors has its own political economy, and as emphasized in this paper each is constrained by the income inequalities of the population. The national industrial pictures of political economists such as Prebisch, Mahalonobis, continue to be important, but significant decentralisation and political regionalisation have changed the equation for risk-mitigation and cost-sharing in several parts of the country (Srinivas, forthcoming).

At the local level, the political geography of urban and rural regional dislocation and inequality has very real costs to the state, firms, and individuals. Sharpening the Indian political debate around innovation have been state level governments being voted out for over-emphasis on urban high-tech sectors at a time of large agrarian crises and rising farmer suicides. While innovation and regional economic theories have enthusiastically taken on a "global cities" approach (augmented no doubt by Thomas Friedman's essays of our supposed flattening world), the realities are different. Indeed, these locations are increasingly connected with capital, new technologies and organisational forms but labour and political mobilisation continues to be highly localised and specific. In Brazil, India, and S. Africa, Gini coefficients have shown depressing trends. More Indians are now in the Forbes wealthiest lists, and several Indian firms have become innovative in IT services, pharmaceuticals, biotechnologies in life sciences and agriculture, automotive, and steel, and aggressively international in their strategies. The backdrop to this has been worsening conditions of life and work for the poor, extremely limited access to healthcare and the latest health technologies. Although India has a lower Gini coefficient than several other industrialising countries in Latin America, for example, Indian living is rife with basic insecurities that are hidden by the coefficient.

Nevertheless, not a day goes by in the newspapers around the world where some estimate is made of the size of the Chinese and Indian middle class and the market for basic consumer goods and technological innovations in wireless, computers, or automotive sectors. However, the Bottom of the Pyramid approach (so popular in business schools today) has been to assume market participation of low-income individuals as potential *consumers*. They are rarely analysed as *producers* of innovation; and their participation in the market is primarily through income and consumption, not political participation. I will argue that the nature of aggregate demand in India as well as demand for specific innovations has been overstated. Several "sticky" institutional features of social inclusion at urban and regional levels transmit and institutionalise effective demand and the growth of consumption (Srinivas 2008). As a more recent, *laissez-faire* industrialization strategy, India's approach has been to seek the sequencing of growth, then redistribution. This runs counter to several, moiré promising examples worldwide which emphasized redistribution prior to or alongside industrial growth. Of particular interest is the manner in which "informal" workers are gradually incorporated into employment with other income supports over time. These require state-support of some form of "universalisation". This latter action may include the voluntary or forcible integration of risk-pools over geography and time, thus reshaping the nature of political participation and notions of community. Rather than the myth of a billion person market for certain innovations, the issue is under what conditions a million social and political mutinies can be mobilised into reducing income inequalities and maximizing the exchange and understanding of group identities within society.

2 The public interest in market creation and regulation

2.1 Welfare regimes and social protection policies

Polanyi saw social protection as the inevitable double movement of the pendulum in society's effort to regulate the market economy (Polanyi, 1944). As such, social protection and markets were complements, each with regulatory boundaries requiring several social institutions for their sustenance. Social insurance, as a risk-pooling and contributory system of social protection, therefore provides the political and social context by which markets are regulated and market-size determined. The risk-pool provides income support (and possibly some enhancement), but also shapes the nature of both labour and product markets by delineating an income and consumption profile. In the Fordist model of mass production and consumption, innovations are produced and consumed by mass production workers. In a highly segmented labour market with immense heterogeneity of employment status and intermediary institutions, wage dispersion can create significant challenges to creation of consumption markets for the products produced. Thus, the state's role is one essentially of market creation and legitimization, and the concomitant social protections to regulate that dynamic level of market size in the face of large uncertainties. Unlike the neoclassical market failures approach, the 'optimal' market size is mythical. The state here co-evolves, and learns. As in the Austrian models, it has no necessarily better information than do private agents, but it is (in North's sense as with several; other political economists) the institution of last recourse that can most greatly minimise transaction costs. In an open-ended universe context, outcomes of policy and of several interactions with others cannot be known *ex-ante (*see Hodgson 1988, Moreau 2004, Sotarauta and Srinivas 2006).

Social insurance mediates between power and the politics embedded within labor markets, the manner in which it institutionalize large market demand, and the ways in which it contributes to both socioeconomic mechanisms of cooperation and risk mitigation as well as macroeconomic stability. It has potential for addressing transience in the labour market or those excluded as well. These address what Esping-Andersen (1999) and others contend with in the alternatives to firm-centered models of employment and technical change, with important implications for gender disparities. The regional link between firms and risk-pooling institutions is important.

Naturally, income inequalities are one of several types of inequalities in our societies. Gender, age, religion, caste/jati, race and other inequalities exist as well. However, no other single measure galvanises economic debates of disparities within and between countries as does income. Income inequalities are also both effect and cause of other types of social discriminations. To that extent, disparities in income can lead us to other characteristics of our social interactions. However, instead of *individual* income rise and fall as the sole determinant of economic advance, I will propose that the ways in which societies redistribute income is shaped by notions of "otherness", power, and *collective* mediation of market boundaries. Linking innovation and welfare regimes allows us a preliminary language to push forward a little the political economy of innovation and inequality. Social protections will be discussed as collective, politically mediated systems of welfare. Market exchange by price is then only one among several ways in which income inequalities can be mediated.

In general, market-supporting and income-supporting public institutions provide several functions: these might include the often discussed property rights and market regulation, but less discussed social insurance. I will argue here that while we may know that a mixed economy with certain limits to market organization might be the way forward in this century, we know extraordinarily little regarding the functions of two central institutional ingredients: social insurance (including health insurance) and political democracy, particularly in industrialising countries (see also, Rodrik, 2001). As Rodrik and Subramaniam (200X) indicate, geography can affect income directly, but causality between trade

integration and income on the one hand, and institutions and income on the other, can work both ways. In other words, income inequality is at once determined by institutions (as in rights and rules of the game in their meaning) but also that income inequality in turn determines the quality of institutions. While institutions assist in technological changes, rising income inequality can also influence people's increased desire for certain kinds of institutions. As some of the Karnataka discussion will show, this process is not clear. In particular, some of my other writing has indicated that social insurance mechanisms and their emergence do not reflect solely the market-legitimizing function that Rodrik describes, but also provide those of market regulation and stabilization.

However, the state's role is not simply to facilitate the workings of the market, but in many instances to *create and sustain markets* for certain products and processes. More broadly, then, social protection is a political process by which the state creates and regulates markets at the same time that it builds a new polity. Social protection becomes the very means to place bounds on market type and size, rather than simply being the income supports to manage 'market failures' or 'negative externalities'. Social health insurance, for example, becomes the social and political basis by which new markets for innovations in diagnostics, medicines and vaccines are created and sustained. Private health insurance could also be this vehicle. With necessary regulation, private insurers could overcome market fragmentation and engender similar market signals for the same products. The state would again institutionalise demand through integration of several markets (as was done in the case of Japan, and is being done in India with some teething pains). The participatory economic and political process by which planning can be done however, are limited in several essential ways and dependent on co-evolutionary frameworks, information and coordination problems. Rather than seeing this as market failure with an optimum against which the costs of state action can be contrasted, decentralised polities generate several behavioural and cognitive questions of group identities and moralities that cannot be easily circumvented (Srinivas 2008a and 2008b). The cognitive elements of group identities and moralities also take into account an individual's trust in the state's ability to act as an institution of last recourse. This allowing a more behavioural approach to cooperation, rather than the more neoclassical and Marxist rent-seeing or cooptation approaches to corruption (Ibid., see also Lipsky)

By laying out ways in which labour and product markets are linked, I will finally pose some preliminary ideas about how the approach might be extended to the analysis of pharmaceuticals and vaccines and several other sectors where market demand, needs, and income distribution questions are central to the evolution of the industrial sectors. Debating the implications of dual labour market theories and social insurance seems particularly germane if the Globelics mandate is to have even greater impact on economic debates for so-called developing countries.

2.2 The Employment-Health nexus in income inequality

A series of age and health transformations is underway. The youthful age demographic notwithstanding, Indian urban and rural aging has happened rapidly, is doubly vulnerable with sky-rocketing living costs, destruction of the built environment, one of the highest road fatalities in the world, and with a disintegrating and highly migrant family. Several types of care-giving and indigenous health systems have been disappearing, and the absence of a systematic and accessible "western-style" preventative health system has meant the "medicalisation" of health through new technologies, private, expensive hospitals and predominantly curative services. Economic growth has also been accompanied by a controversial policy of retrenchment of public sector activity in key areas such as vaccines even in those segments where private activity has not fully replaced it. Private sector firms manufacturing medicines have also exacerbated the division between drugs that are easy to manufacture for lucrative foreign markets, and the dramatic lack of buying capacity within the domestic market.

Any institutional approach to demand is premised on the nature of employment relations. In an economy where most workers lack clear-cut employers, and are casual, contracted, or self-employed, it becomes relatively unusual to find welfare institutions that can represent the heterogeneity of work. The table below shows how self-employed or own-account workers dominate labour statistics. The newer efforts since the 1990s by the Delhi Working Group to re-analyse worldwide employment numbers has led to several structural and institutional questions about consumption by those citizens with no clear-cut employer or those temporarily or permanently outside the labour market.

Table 1 Self-Employment as % of Non-Agricultural Informal Employment, 1994/2000

	Self-employment as % of NAIE		
Country/Region	Total	Women	Men
Morocco	81	89	78
SSA-Benin	95	98	91
SSA-Guinea	95	98	94
LA-Bolivia	81	91	71
LA-Guatemala	60	65	55
India	52	57	51
Thailand	66	68	64

Source: ILO 2002, prepared by Jacques Charmes, UNIFEM 2005

The employment-health nexus undermines any single income-explanation of inequality. Health being one of the highest out-of-pocket expenses of Indians, a health crisis is also the single biggest cause of a slide into poverty (see also ILO 2001 on SEWA's efforts). Without a large-scale welfare state, and in the absence of assured employment-linked benefits, most Indians survive in severe health insecurity. Only the better-off income-wise, can afford the quality of better private hospitals and clinics. Healthcare and health technologies show among the greatest divergences in national institutional histories. The most significant issue is the nature of entitlements and the increased labour market dualism in all countries, exacerbated by age dynamics. In India, over 50% of the population is 25 years or younger, and over the next decade, the country will add 500 million workers to the labour pool. Over 90% of the unemployed are below 35 years of age, i.e. at least in principle in their prime working and earning life.(Teamlease, 2006, NSSO, GoI). While organized labour job growth with associated benefits of a welfare regime, grew by about 4% in the 1990s, "informal" work grew by 35%, reflecting the acute dependence on wages alone. The immense growth in such work has come through an explosion in urban industrial services jobs such as construction and retail. This is no Lewisian "reserve army" of labour, this *is* the labour force. For India, and several other industrialising countries, the challenge is converting political mobilisation into social policies. By 2020, the estimate is that the Indian working population will equal the total Indian population at the time of reforms 30 years earlier in 1991, at the onset of market liberalisation. This with a projected unemployment rate of over 30% and 211 million unemployed, most of these young people (Teamlease, 2006).

The social protection system or welfare regime is an institutional arrangement between State, families and firms, to provide against risk. In each of Esping-Andersen's (1990) ideal-type system of welfare regimes, risk-mitigation takes a specific form. Either risks are disproportionately bundled onto individuals; they are citizen-ship linked and closer to universal, or forced through compulsory risk-pooling. These path-

dependent systems have had considerable resilience in explaining European, Australian and U.S. systems of social protection and as I argue, also their pharmaceutical, biotechnologies, and vaccine emphases. Specifically, social insurance, as a collective system of risk-pooling, provides a good indication of the nature and philosophy of a country's welfare system, and especially its emphasis on employment as the primary means to reducing income inequalities. Especially visible are the distinct differences between labour-market strategies in the three systems, with the social democratic welfare state being the most "de-commodified" or least a commodity i.e. least dependent on the labour market for mitigating risks, and most likely to use supports other than wage income to minimise risks.

As he indicates, on no single policy can the typology itself rise or fall, since these are regimes. However, here health policy is taken not as a test of the typology itself, but as a subset of policies broadly characteristic of the different welfare regimes. Some primary characteristics are sketched here (1999, p.73-94):

Table 2: Welfare Regime typologies

Welfare Regime typologies	**Representative elements**
Liberal welfare regimes	*do not favour citizen entitlements*, minimize intervention, *individualise risks, high dependenc the market mechanism*, belief in 'self-help' lowered eligibility, limited view of what risks sl be societally assumed, prioritises *unregulated lc markets.*
Social democratic welfare regimes	f*avour citizenship entitlements,* maximize state *comprehensive risk coverage, low or mi dependence on market mechanism*, egalitarianism, as maximizing citizens' enhanced potential, *pa approach to employment management.*
Conservative welfare regimes	*strongly corporatist, familial*[3], *focuses on compu risk pooling*, mixed provision of benefits, *pa approach to employment management.*

By focusing on States, firms, and families, the "three varieties" typology remained dramatically ungendered until Esping-Andersen (1999) built on the works of gender theorists and feminist economists. Skocpol (1992), Orloff 1996, Lund and Srinivas (2000) underscore the importance of understanding how alternate systems of social protection outside the firm evolve and how benefits-specific approaches provide great analytical traction.

2.3 Beyond the firm in industrialising economies

But how exactly can the idea of a welfare state be used to understand technological change and innovation in particular? I will address a set of hypotheses later in the paper, but I introduce the notion of the firm's regional risk ecology to do so.

Income inequality is a manifestation of several decisions external to the firm, but necessarily feeds into the decisions of firms in anticipating demand for their products and processes, and in price segmentation strategies. In the ideal-type neoclassical market place, any individual consumer can express his/her preferences for a specific product. He/she expresses dissatisfaction with the product; assuming substitutes exist, by consuming less of this product and possibly more of another, or by earning more and buying better/more expensive other products. As I discuss in Srinivas (2008), the regional economy emerges

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when an individual's income is not uniquely tied to the firm. This builds on the internal and segmentation approaches of several labour market theorists.

In general, history indicates that central/National state fiat for universalisation is exceptional. Urban and regional institutions are more likely to demonstrate the diversity of non-state provision and the political constituents of such a mix. This will provide a context to reassess the utility of existing welfare regime approaches to the Indian context. Policy-making will be viewed in co-evolutionary terms that incorporate open-ended outcomes and learning, standard evolutionary ideas, but with specific regional economic implications (e.g. Sotarauta and Srinivas 2006, Lewin and Volderba 1999).Politics and urban and regional polity thus provide divergent outcomes to single policy rules because of the nature of interpretation, learning and legitimacy that characterise local economic development. Naturally, it also encompasses problems of corruption, rent-seeking and other standard critiques of overdependence on the State. More importantly, in analyzing technological change, the firm is not accorded prime institutional status. Its risk ecology, especially in countries which are industrialising, comprises families, individual workers, the State, other organisations and institutions such as temple, church or non-profit secular agencies. A catch-up or other evolutionary framework that accounts for the institutional ecology of the region including but not limited to the firm, may provide some answers of income inequality and how it changes over time.

Esping-Andersen's typology was since modified to accommodate the critical historical and gendered impact of families (Esping-Andersen 1999). When the family is placed centre-stage, and firms to the side, a different set of considerations emerge. In particular, the inter-family distribution systems have long been known to be singularly unequal in income and power as many gender scholars have noted, and family-based income supports have gone a long way to exacerbating gender inequalities even in the more income-equal social democratic states n(Orloff 1996). In societies where such regimes are minimal or absent, gender divergences are dramatic in social status, political power, labour market access, as well as health and education (e.g. England 2005, Nelson 1999, Lund and Srinivas 2000, Kantor and Nair 2003). As Esping-Andersen points (1999), familialisation when introduced skews the typology to different forms. For industrializing countries, where significant "informal" work, worksite at home, and strong dependence on family (in the absence of state or employer benefits), health policies and health dynamics are considerably different from those in advanced industrial economies (which are themselves distinct, especially for the conservative regimes). These are hypothesized here to have some significant impact on firm behaviour in pharmaceuticals, skewing products and processes to other markets other than certain needy domestic ones.

The institutional mix that makes a well-regulated economy one that can buttress income supports with other means, and provides access to several innovations that sustain and improve quality of life, are clearly historically and socio-politically specific. Importantly, they are not necessarily specific to stages of economic development, or level of income inequality themselves. Lundvall and Edquist (1993) for example debate the unique flavour of the institutions for innovation within the social democratic (largely Nordic and Scandinavian) countries, giving as they do such importance to regulating the market and providing supports other than wage-income., Indeed, several institutions of innovation proliferation such as universities that have often taken to be central to "innovation systems", have been uniquely shaped in these countries. Srinivas and Viljamaa (2007) discuss how in Finland, for example, universities grew initially out of a commitment to the welfare state. More recent calls for a "Third Role" for universities across Europe and (increasingly) Asia, Latin America, and Africa to involve themselves in regional economic development must be seen in this light. The public (free) university was a bulwark of the welfare state, as was the public employment it generated and the researchers it trained. As several gradual crises overtook the Finnish welfare state, the university became caught between a set of receding state functions in employment and training, and a growing appeal to markets to stimulate innovation (Ibid). The

siren call of universities gradually became ensconced in a language of flexibility, time-bound projects, and "entrepreneurs". The innovative university thus grew out of a changing discourse of welfare statism as manifested in public education, training, and employment. In Latin America as well, there have been important public reforms facing universities and a challenge for "systems" approaches to innovation (Arocena and Sutz 2000).

Evolutionary and structural approaches to technological change have indeed explored the employment implications of industrial upgrading. In particular, the structural dependency theorists including diverse viewpoints from Prebisch, and Hirschman, accommodated employment and inequality concerns through the lens of income and its politics. Latin American scholars with deep concerns for the possible pathways that ISI afforded their economies were especially concerned with the links between institutions and structural features of employment. Each recognized several low-growth and structural traps that stagnant or falling employment creation would generate (see Albuquerque 2007). Myrdal, with his experience of race and employment in the U.S. and social democratic approaches of native Sweden also commented on segmentation in the labour market, and especially its South Asian challenges (Myrdal, 1968). Rosenstein-Rodan and Clark were conscious of low equilibrium traps and the institutions necessary to galvanise employment growth especially in manufacturing. Arthur Lewis's model although premised on strong assumptions of in-migration from a hinterland, was highly sensitive to the institutional and cultural context of underemployment and unemployment. Indeed, Lewis discusses his native economy in terms reminiscent of several other political economists, attending to power relations, the servant economy, surplus problems, and low productivity traps. These theorists recognized that structural features of industrialization could be partially attended to with the 'right' institutions promoting employment, skills, and social cohesion. Edquist, addressing the same concerns of social and political cohesion, discussing the learning and evolutionary aspects of similar institutional elements in different social contexts (Edquist, 1997).

However, for both structuralists and evolutionists, the institutional questions beyond the firm took varied and limited paths. Not surprisingly perhaps, those studying the well-developed welfare state economies of the Scandinavian countries came closest to recognizing and contrasting the institutional mix of innovation with those of alternative economies. Demand models also incorporated the internal product markets catering to social and political elites who translated economic bargaining power into political influence and fundamentally altered the paths of industrialization. Dualism in technological profiles of several sectors arose in part because of these social power relations and the limited expansion of a mass market. Income concentration in a segment of the population's elite reflects specific consumption patterns in accord with those of elites in industrialised country contexts. Gandhism, the Appropriate Technology movement, and several other efforts to devise labour-intensive technologies of production, attempted to simultaneously break existing consumption patterns. Bonfires were lit and people were encouraged to burn foreign-made and imitative domestically-manufactured western consumer goods during India's Quit India movement against British rule. Gandhi's hand-operated *charkha* for hand-spun *khadi* fabric was intended to literally and symbolically expand markets for home-spun clothes and reduce the deleterious effect of Manchester and Lancashire and other mill expansions on the Indian textile industry. The politics and penury of Indian indigo farmers became critical to highlight their exploitation by British dyeing. Gandhi however, was quick to note in his Hind Swaraj writings that forcing the British out of India did not absolve Indian administrators of responsibility to the poor, and that Self-Rule meant exactly that: not rule of India by Indians, but of individual Indians of themselves. In his thinking, income inequalities in the country were emblematic of deeper moral questions for each individual to resolve. Income equality did not mean socialism to Gandhi; on the contrary, some have argued that he was in many respects a libertarian as far as government existence and scope was concerned (Iyer, 2000). Importantly, income inequalities were not neatly tied to productivity increases. Unlike manifestations of a social productivist

social contract in evidence in the Nordic as well as East Asian economies (of admittedly different flavours), market regulation has historically differed by the extent to which workers and non-workers are ;'forced to earn their keep'. For workers, these are more straightforwardly associated with productivity increases to ensure continued welfare supports. For non-workers, these drag along several strong social strictures on individual behaviour (e.g. non-drinking, being 'good' parents, norms requiring sexual abstinence or cohabitation only if married). Unfortunately, even in relatively technologically dynamic and innovative economies such as the U.S., productivity increases and higher education and skills have not been accompanied by corresponding increases in wage and non-wage benefits. The prior institutional mix that assured workers that skill-biased technological change would not affect them, or that promised benefits reflecting their personal investments in skills or education, had effectively broken down (Levy and Temin, 2007).

The more recent political economy effort focused on firm-based models in both the "varieties" of systems of capitalism and innovation have mentioned labor market dualism only in passing. On the other hand, modernization and dependency theories focused on the deep contradictions of capitalism in industrialized nations for labor dualism and informal "sector" growth (some predicting capitalism's complete collapse) while other strains focused on how structural economic changes could eventually pull sufficient numbers of "unlimited supplies" of workers into a growing industrialized (primarily organized manufacturing) labour force. In any event, subsequent attempts to discuss industrial deepening, forward backward linkages and political economy of development have somehow stalled in the more recent discussions of technological change. For example, past political economists such as Lewis, Prebisch, Gerschenkron, Myrdal and Hirschmann were deeply conscious of both the structural and institutional roots to "underdevelopment" and the peculiar types of capitalism and mixed economies emerging in several parts of the world in the wake of independence movements and freed colonies. These institutionalists (Hirschmann, Lewis and Myrdal in particular) recognized that questions of formal and informal institutions, the functioning of the labor market and the relationship to the firm were central not only to the adoption of technology, but also more fundamentally to issues of regional economic development, income disparity, power and politics. Similarly, the welfare regimes literature (Esping-Andersen, 1990) provides a language for politics and inequality in the move to full employment mandates for the Golden years of welfare capitalism. However, whether this period in history is likely to be revived or developed at all in countries with minimal welfare supports is at the core of this paper (see Hall and Midgley 2004, Lund and Srinivas 2000, Wood and Gough 2006).

Industrial upgrading as a vehicle to income equalization and risk mitigation is a relatively poor explanatory variable of rising income equality (Srinivas, forthcoming). Dual labor market theories might provide some necessary institutional links to technological change. Firms make choices in terms of whom they hire, especially when the market is expanding (Piore 1973, Doeringer and Piore 1971). The income inequalities between those outside the "core" with benefits, and those within with more secure employment is hypothesized in these dual and segmented labour models to account for a secondary, less secure work force. Demand then is related to the ability of these workers to sustain a certain income level over time, and be incorporated into some social protection program. However, as discussed in Srinivas (forthcoming), these work-place processes of income supports must be set against a wider regional risk ecology of the firm. Instead of a Smithian market expansion determining the division of labour exclusively, several co-evolutionary "sticky" institutional processes of registration, inspection, organising and so on within the political realm of the economy effectively determine whether or not the firm draws a worker into the "core", and to what extent the firm buffers risk from market expansion by off-loading it onto workers, their families, the State or other institutions. State role(s) on the ground, determined by a co-evolutionary and open-ended discretionary and normative process, determines the status of a worker and the extent to which he/she is included in social insurance programs. This discretionary role of the State at

street-level alters the inclusion into social insurance, and the nature of demand for several products and services such as healthcare, housing, and through income support, the ability of workers to consume. This is far from a mass-produced and mass market Fordist model of production and consumption. The State here through social insurance and public procurement alters the nature of the market, and the firm ceases to be the primary locus of risk-bearing in the market. This forces us away from simple pluralism that income per capita might indicate, to a set of sticky institutional processes having to do with a wider cognitive and behavioural ambit of actors and group identities. Their moral compass and group ethos serves to fracture a traditional tripartite structure of state-labour-firms into something more complex (for a description of such processes, see Srinivas, forthcoming).

Prebisch's ISI focus is worth revisiting here since the ISI strategy was not simply about trade and import substitution and protective tariffs. ISI also aimed to decrease in the short term by local manufacturing routes the effective cost of consumer durables and intermediate capital goods. Its historical challenge was the oil crisis, severe macroeconomic issues associated with changing terms of trade and local industry costs, and the rising social challenges associated with income inequality through inflation and other problems. Indeed, Rodrik (1997) claims that the difference between East Asian strategies and Latin American ones was less about ISI and export-orientation i.e. the nature of domestic versus export markets as such, but in the manner in which macroeconomic fluctuation was domestically managed through several institutions of conflict resolution over linguistic, ethnic, economic or other divisions. East Asian and European risk approaches to macroeconomic management and export-orientation were minimised to some significant degree by the nature of social insurance, other social and life-time employment policies, and by (at least in some countries) relatively homogenous population pools linguistically and ethnically.

Nascent welfare regimes can be manifest in several decisions external to the firm, but also feeds into priorities of firms in terms of projected demand. The state can institute a welfare regimes in such a way that it establishes a collective set of institutions for buying that determines market size, structure and effective purchasing power of a position within a given income distribution. The state potentially acts to represent disenfranchised or otherwise excluded citizens or workers in creating and sustaining a new market. This assumes little ideologically about the state's orientation to the marketplace; liberal, fascist, communist, social democratic or other states have all, in different ways, played with social insurance. Each type of government has also witnessed periods where income supports have themselves become tools of discrimination, from "welfare moms" to stigma associated with being on unemployment insurance in several countries.

Income security is defined in Recommendation No. 67 of the International Labor Organization as the basis through wage "*…income security should as far as possible be on the basis of compulsory insurance whereby insured persons fulfilling prescribed conditions are entitled in consideration of the contributions they have paid to any insurance institution to benefits payable at rates and in contingency is defined by law.*"[4] Social insurance is this contributory institution, where employers, the state, and workers contribute, with differing proportions in each case. Some elements of social insurance such as employment injury benefits are usually fully paid for by employers, where as other benefits such as sickness and maternity are often jointly financed. While Social Security is state or society provided to buffer and individual against any kind of temporary or chronic distress, social protection includes Social Security but may also include non-state provided systems of social insurance and social assistance. In particular, social insurance history seems to show some positive correlation with lowered income inequality. As such, it remains a vital institution with a varied international history and local path-dependencies. In industrial sectors such as pharmaceuticals and biotechnologies, social insurance through its health insurance component, also acts

[4] With due thanks to Mr. R.K.A. Subrahmanya for clarifications on Recommendation 67's Indian history.

as an important price-setting signal of demand. In the aggregate, macroeconomic picture, social insurance has acted in many countries to buffer the volatilities associated with trade. From both political as well as economic standpoints, social insurance is an institution that has played a vital part in industrial history and economic growth. At the sectoral level, its collective institutional role shapes the contours of product demand and provides more predictable markets. However, not all citizens of a country have access to social insurance; it is a labour-market mediated institution, and one reflective of segmentation within the labour market. This paper explores its relationship to innovation in conceptual and empirical terms. As the paper will elaborate, both types of institutions require serious grappling with issues of socio-political and economic change in so-called developing countries. Indeed, social insurance formation as a process of institutional emergence can often be taken to be synonymous with political democracy, but its regional peculiarities reflect deeply different political economies and social norms. Arguably, neither the varieties of capitalism, nor the evolutionary economics approaches to economic growth (including systems of innovation approaches) has successfully grappled with these political institutions which dictate the nature and extent of the labour market and income disparities.

As markets expand through new production systems, the spatial and institutional questions of institutional evolution continue to matter, particularly in an open-ended universe. Politically, it is recognized that an economy's integration into the world markets reduces its government's ability to implement and expand social programs or increase taxation-led redistributive programs. However, history does appear to indicate at least within the OECD that increasing global market risk is accompanied by greater ability of societies to negotiate for increased government intervention to buffer such risk (Rodrik 1997).. However, this may not be accompanied by greater social insurance measures which may be compromised at a time when they may in fact be most needed. For the most immobile workers, the losses may be greatest (Ibid.). The political questions are then whether and how existing systems of social *exclusion* are reproduced and strengthened by technological change and innovation, such that costs of renegotiating costs and risk sharing become too high, or uncertainties blur the cognitive frames within which individuals are able to assess costs. Technological changes embody shifting power relationships, and thus complicate a simple narrative of social insurance expansion alongside industrialisation.

3 Access to medicines revisited: (Bio) Pharmaceutical innovation history through a welfare regime and social policy lens

Better health (not simply the absence of disease) is a renewal mechanism in diverse ways for economic dynamism. More recently, competition policy, economic development, safety and efficacy, and social policy/ health management have pulled in different directions. Much of the recent debates of access to medicine have over-narrowly focused on technological capabilities and appropriate pricing. The right focus, history and common sense tells us, is the nature of welfare-work supports and the manner in which health entitlements have evolved in each instance. "Appropriate" pricing is then a more dynamic outcome of effective demand as seen through *collective* institutions of the social policy or welfare regime.

My ongoing research (especially Srinivas, 2004; 2006; 2008) on Indian social protection and health entitlements indicates the following. First, in the country's pharmaceutical and biopharmaceutical sectors, process capabilities from 1950-2000 were shaped by three different market environments. Second, each of these revealed different links of drug and vaccine production with peculiar and highly types of distribution systems. Each represented distinct types of State and international regulatory contexts for market creation and expansion. Third, industrial and health policies were unable to account for negative redistributive effects. Instead, diverse political and institutional issues associated with highly dualistic labour markets further fragmented health entitlements and access to medicines. Small domestic institutional buyers forced large individual out-of-pocket payments. Urban economic growth strategies have created location and political costs to life-science concentrations.

There are 3 further observations regarding supply and demand of health innovations in relation to income inequality:

1. The *supply-side* story is where the suppliers of innovations have been failed by health policies. It questions the ability for workers to themselves participate, create and innovate in ICs where many are sick, caring for others or simply too tired to be creative citizens. *The demand-side* story here is equally pernicious where the visibility of these citizens is relatively low not only for specific products markets, but also for health policy design itself to enhance productive lives.
2. The second observation is regarding *demand and supply side* for the pharmaceutical sector specifically. The demand side relates to the inducement factors that cause ("pull") technological innovations, while the supply side relates to a messy matrix of effects that "push" innovations into the world. In reality, both are messy processes. Even for the Indian pharmaceutical sector, significantly diverse factors caused capabilities and innovations to emerge, a far different story from the more simplistic explanations resting on intellectual property rights (as demand side), low cost of R&D (as supply side) or multinational firms (and supply).
3. The third observation is that only under certain conditions do industrial and S&T policies for the pharmaceutical sector converge in goals with national health policy, *even* when both may be ostensibly working on the *same disease or technical targets* e.g. malaria, vaccine production. The ground reality is then a litany of common problems: local health product needs are not met, costs of medicines are too high, innovations in certain disease categories do not occur, or industrial outputs service overseas markets instead.

In many parts of the medical system, the doctor specifies what the patient consumes in the state or private insurance picks up the bill. Thus the channel payments and reimbursements is an important part of any innovation model. For example in the United States, the diabetes innovation market 1990-2000 showed that consumers had varied access to innovations, with a dominant explanatory variable being health insurance status. There are several million uninsured U.S. residents, forcing states such as Massachusetts to experiment with multiple health insurance programs and gradual integration of the state's population. In the UK, several health innovations only emerged and then became available via payments from private and national health insurance programs. Australia was caught between a prior relatively stable health management system, where state managed interactions between business, citizen and the government shifted into a fragmentation of policy objectives and agencies (Lofgren, 2001). In Japan, while MITI, the Ministry of industry and other policies received the greatest attention in explaining the political economy and industrial trajectory of the country, the reality is that MITI was subservient to the Ministry of health in Japanese pharmaceutical history. Through its social insurance system, and the integration of several different employment categories, Japan was quite unique in crafting a golf health care entitlements within which is pharmaceutical industry was positioned. In India, firms have been dislocated from such institutions, and in their absence have been exporting in sub sectors were domestic demand continues to be high and unmet. In India, Brazil, and the South Africa, the systems of political and employment representation have not yielded social insurance or health insurance programs that can effectively align the differing priorities of the state and firms in pharmaceuticals, biotechnologies and vaccines.

It is certainly tempting for instance to view the very rapid growth of cell phone use exclusively as a sign of its innovative character. A further analysis in a country such as India reveals that "innovative" is necessarily use and context specific. One of the biggest reasons for their proliferation in India is that it provides a slightly lowered risk to the individual to everything from traffic accidents, health crises in the city, harassment by corrupt officials, finding and keeping employment, and being stranded by strikes, bomb blasts, or epidemics. In other words, the cell phone as emerged as a tool to circumvent risks of several kinds, and as such substitutes in some small way for the complete absence of state-provided basic

amenities, healthcare, safe travel, and emergency response systems. Innovations in this sense depend on income-status, but almost equally on the wider, but related need for security.

The need to consider a wider set of income supports arising from welfare regimes is by no means limited to India or Brazil. Pharmaceutical benefits in European welfare states are growing at a time of falling competitiveness of several local firms. Simultaneously, in the U.S., managed health care and the failure of social health insurance have made many firms shift market strategies. New concerns of social policy rollback, state regulation of private actors and fragmentation of the State's role(s) have occurred in safety and efficacy controls, social policy, and economic development policies. The combined effect of these two institutional characteristics of social insurance and other public procurement demand is that innovation and industrial policies for pharmaceuticals and biopharmaceuticals are in marked contrast to its health and labour market scenario. Many countries and firms which Indian firms view as competitors are in fact embedded in extremely different demand contexts themselves, raising questions for how we do comparative international analysis of innovation 'systems' and socio-political governance of demand. For example, a "penguin" effect is in place within Europe, with public pharmaceutical expenditure on prescriptions looking increasingly similar over countries and time (especially between mid-1980s to 1990s, Cabadies and Guillen, 2001, Guillen and Cabadies 2003). The welfare state expenditure combined with overseas procurement policies has had an important incentive effect for European firms. The challenge is to maintain their productive capacity in important drugs and vaccines where private activity has already decreased, causing worldwide challenges to vaccine supply.

Social health insurance crafts the effective (transmitted) demand for technologies-either as productive tools, consumption products or processes. In the case of the health sector, the political governance of social health insurance, public health insurance, and private insurance provides an enlightening guide to the management of work-place systems of social protection, and the means by which the State regulates the economy. In particular, social health insurance (or its absence) indicates how political coalitions and identity-based group dynamics emerge to pool risks. Because social health insurance is contributory unlike social assistance, it forces a new polity on a region; these effective demand systems may have different entitlement profiles based on citizenship, territory/area, employment-based, labour status, age etc. In industrialising societies with deep social schisms, these may be based on religion, caste, race, ethnicity or gender thus veering the debate away from one of simple solidarity or homogenized risk-pools (which would make for worse insurance risk in any case). In this framework, the U.S., U.K., Germany, Japan, Korea, Australia, Brazil, India, and S. Africa although all pharmaceutical producers and consumers, have extraordinarily different institutional frameworks for managing the industry's outputs and the means by which residents access medicines. In each case, the health insurance and especially politics of social insurance is revealing. In Japan, from the 19th century to the present, a gradual process of evolution of community health systems has evolved risk-pooling mechanisms. At later times, governments have acted to expand the risk-pool and integrate several different segments of workers into a common health insurance system. "Universalisation", Japanese-style took place through political foment and cultural change, several wars and civil unrest over an almost 200-year period. However, lest this be seen simply as an inevitable process of time, or as is the case of the Western European economies as the inevitable upshot of war, Brazil instituted bold new measures in a very short time period, for covering HIV-AIDS patients, and in an arguably similar short period, Australia lost several earlier advances in integration of economic and social policy concerns and design of prescription-coverage and price negotiation institutions. The East Asian Tiger economies had diverse roads to social insurance and integration of different "informal" workers and firm sizes (Gereffi and Chen 199X). Several industrialising economies have in recent years also instituted, either through the state or through community organisations or tripartite institutions, varied social protection programs with substantial benefits (Lund and Srinivas 2000, Srinivas 2007a).

On the demand side, pharmaceutical drug history is also show us the importance of health policy and broader income supports in buying medicines. The welfare regime undoubtedly mattered in the manner in which second-generation, third generation, and fifth generation drugs in particular were created. For instance, the table below derived from Achilladelis and Antonakis (2001) shows that between 1818 in 1913, overcrowding, and disease and several acute problems of the galloping industrial revolution and its negative spillovers created conditions under which a series of second-generation drugs came into being. However at this time, no specific binding policies existed for these drugs. Access was limited, and primarily through sanitary reforms. Arguably sanitation changes had a greater impact than medical innovations at this time. Dramatic changes however were to unfold in the 30 year period between 1930 in 1960, when the second world war fuelled extensive public support for the supply of innovations, at the same time that postwar welfare state legislation created immense demand for the public procurement and/or reimbursement of medicines. In contrast, 5th generation drugs suffered significantly from a rollback in public supports for the welfare state in several countries, along with the post industrial manufacturing unemployment, and aging population demographics. This period coincided with an acute need for several drugs especially those associated with communicable international diseases, but hamstrung by decreased public buying. While the supply side of innovations shifted gradually into the private sector over a period of time, the demand for these drugs continued to be procurement systems (often fueled by health insurance) in several countries.

Table 3 Drug innovation and inducement contexts

Drug generations	**Innovation and introduction**	**Inducement factors**	**Presence of industrialising countries in manufacture and R&D**
1st generation	1820-1880	Chemical Revolution (French school of chemistry, largely mercantilist institutions; trade in medicinal inorganic chemicals and various indigenous medical products, importance of apothecaries.	None
2nd generation	1880-1930	Industrial revolution effects, overcrowding, disease, colonialism and public health-linked geography	Little
3rd generation	1930-1960	WWII needs, public funds for cooperative projects, Welfare State legislation	Industry growing rapidly in India, public procurement and state creating markets especially for antibiotics and anti-infective, significant public investments in manufacturing Industrialisation effects, little sanitation, clean drinking water
4th generation	1960-1980	Public research institutions more in long-term exploratory work, regulation soars after thalidomide tragedies, series of legislations	Public research efforts in India, little welfare regime effect on markets for domestic firms, high out of pocket payments Industrialisation effects on population, crowding, communicable diseases, little sanitation, clean drinking water
5th generation	1980-1992	Unemployment, aging populations, decrease in public support for health insurance, re-emergence of various international communicable diseases	Unemployment, highly segmented labour markets, little or no work-place benefits, absence of working health policies, urban aging and family pattern shifts, slight increases in private health insurance, stagnant public coverage, continued onslaught of several communicable diseases

Intensification of social conditions at the same time that technological abilities are increasing. Lack of political coalitions or widespread social movements to effect change. Union-politics of mass urban or other mobilisation in health and income-supports absent.

Source: Adapted from Achilladelis and Antonakis (2001)

In contrast, in India, a significant time lack occurred in the adoption, imitation or creation of the equivalents of second and third generation drugs under extremely different institutions of buying. Except for antibiotics and anti-infectives, and vaccines, most purchases were made to out-of-pocket payments by individuals. No system of welfare supports provided the extent of public buying as in Europe. Even though several innovative Indian pharmaceutical and biotech companies have generated a series of innovations in medicines, vaccines and diagnostic kits, many continue to source over half of their revenue from export markets which in turn are heavily dependent on European and US welfare states and pharmaceutical buying and reimbursement regimes. In this sense, pharmaceutical and other health technologists in India have been insulated from the actual demand for their products through the relatively well insulated layer of US and European export markets and their associated welfare regimes. This is particularly the case for generics which have been produced through process innovations.

4 Social health insurance in the Indian economy and the politics of innovation in Karnataka state

So why don't societies automatically evolve in a direction that minimizes income risk, increases income equalities, and employs the greatest number? In particular, why is this not happening in Indian states which are innovative, experiencing some of the highest growth rates in the country?

1950-1973, also called the Golden Age of welfare capitalism was unique in post-World War II Western European history. In this 25 year period, several Western European economies grew at 5% per year and extraordinarily unique historical fact. This was nearly twice the growth rate of any previous phase, and more than double the average growth rate from 1820-1950 (Singh, 2008) However, perhaps even more extraordinary was the fact that this economic growth was accompanied by very strong employment growth, reaching the idea of "full employment" levels of textbooks, and additionally incorporating several migrant workers into the labor force (up to 10% in the 1960s). (ibid.) critical to our discussion here, is the fact that this model of economic development was extraordinary in part because it highlighted an institutional coalition, tripartite in nature (employers, the state, workers) and significant political consensus on wage and non-wage benefits, including the sharing of profits, but it also involves several international trading and capital institutions to direct the nature of development. Catch up alone was an insufficient explanation work organization was premised on a broader macroeconomic pattern of growth and several institutional and behavioral characteristics that allowed for an evolving consensus to emerge (Glyn et al., 1990). The equivalent concern would be that industrializing countries today and make a full employment potential which arguably could be mirrored in immense public works and employment programs such as the National Rural Employment Guarantee Act which acts as a de facto welfare regime in its best instances.

Indian and comparative historical analysis is useful to analyse universal and gender characteristics of access to social protections. Rather than taking informality as a given, one can use Indian and Karnataka initial data to consider two dimensions of analysis: (a) 'Sticky' Institutions of Places, Work, and Work-places and (b) the fragmented nature of the Central and Regional States (Srinivas 2007b, forthcoming). This is to account for the disparate policies that the Indian state and subsequent governments engages in different aspects of healthcare and labour regulation. Comparative historicisation of institutional origins gives us views of the State and a different interpretation of universalisation than seen as political victories of labour or civic action alone. Importantly, it allows an evolutionary and lens to view the emergence of risk-pooling institutions into statutory programs. In healthcare sectors, this disparate regional polity has dramatic implications for income dispersions and consumption patterns.

The institutional effect on structural changes in the Indian economy can be seen in the numbers on so-called "informal sector" employment. In Latin America such informal employment accounted for 30 to

50% of total employment, in Asia it was 50 to 70%, Africa, 40 to 60% and finally in one of the poorest areas of the world, 60 to 80% of workers were "informal" within this, self-employment also increased dramatically, confounding policymakers and scholars alike. On the one hand self-employment is a proxy for entrepreneurs; on the other it reflects some of the poorest, marginal workers who have no employment prospects. Several Indian legislations, ironically those intended perhaps to most protect workers, and led to significant structural characteristics of the Indian economy: the Factories Act, 1948, relevant to enterprises with greater than 10 workers, or 19 workers if no electricity is used played its own part in creating schisms within the growth of productivity profiles of small and medium enterprises. Welfare legislation (where health and old-age are prime criteria of such workers) also created the informal economy in part through a series of maneuvers where firms avoided paying minimum wages and benefits to workers. 85% of informal rural workers and 57% of their urban counterparts were paid wages below the national minimum (Kannan and Papola). More recently the 55th round of the National Sample Survey and the 61st round allowed some measure of the informal economy. Indeed, the definition of "informal or unorganized workers" used by the recent National Commission on Enterprises in the Organised Sector (NCEUS) is tautological in several respects. "Unorganised workers consist of those working in the unorganized enterprises or households, excluding regular workers with social security benefits, and workers in the formal sector without any employment/social security benefits provided by the employers" (Kannan and Papola). The Contract Labour Act and the Migrant Workers Act, for example, although well-meaning in several respects have also created institutional loopholes, corruption, and interpretation problems for enforcement. Small enterprises in several sectors, which can often provide significant employment, but not always non-wage benefits, have evaded growing because it allows them several incentives offered by the State. In construction, significant structural dualism has emerged in both technologies and worker profiles, at a time when the industry continues to grow rapidly. Several institutional challenges remain to reducing income inequality, where the firm and contractors buffer risks from market expansion and newer technical standards with fluctuating hire patterns. From both a spatial and institutional perspective, inspection and compliance continue to be complex when ensuring the effective implementation of existing income-equalising legislation (Srinivas 2007b, Srinivas forthcoming).

The southwest kidney bean-shaped Karnataka is among the more industrialised, is leader (primarily driven by Bangalore city) in innovative firms of various kinds, is a relatively more income-equal state, but one but several embedded inequalities of other types. A ranking of Indian states in terms of labor demand, supply and the nature of labor laws, places Karnataka among the top three states in the country, after Delhi and Gujarat (Teamlease, Indicus 2006). As home to one of the more robust public union movements in the 1980s, Karnataka has evolved into a state with a relatively fragmented labor union movement, and a very large casual and contract labor population, much of which has migrated in from out of the state.

The high a degree of economic insecurity that individuals suffer is linked to precarious employment conditions against the backdrop of rapid economic growth. Wage income is the main source of income for low-income individuals (ECOSOC 2006). The informal economy in India accounts for more than 86% of all workers in the unorganized economy, at a declining share of NDP, approx. 60% in 2004-2005). At the same time, non-wage benefits and the combination of operating surplus/mixed income of self-employed workers has remained relatively stagnant. (Bhalla, 2008). Despite extremely high GDP growth rates (up to 9.4% in 2006-2007) in industry and services, very few workers have moved from low productivity agricultural work into productive non-farm employment. Between 1993-94 and 1999-2000, the poorest Indian workers i.e. casual agricultural laborers or the faster growing population pool, a disturbing trend since this is the poorest Indian working group, and poorer than even the Indian unemployed. In both India and China, the absence of rapid growth rates in the rural mass market raises significant concerns for innovation and industry (Ibid.). In particular, rural and low income urban households are the source of future demand as well as employment creation. Growing income inequality in both the Indian and

Chinese context raises several problematic concerns for future industrial policy. Both education and health care could in principle generate many more labor-intensive jobs and alongside stimulate significant supply-side possibilities to industry and innovation that are currently absent.

India currently has one of the lowest public budgets for health: 1.15% of GDP, and one of the highest levels of private spending on health, estimated by the Public Health Foundation of India and several other sources to be approx. 81%. Social insurance, with mandatory wage-based contributions from workers covers approximately 30 million or only 3% of the population. Further, public sector insurance companies cover about 6 million people or only 0.4% of the population. Community insurance groups cover about 50 million people or 5% of the population. Less than 10% of the population is covered by some health insurance at all, but this contributes about 30% of hospital revenues in the main metropolitan areas (Planning Commission, 2002). With approx.16.5% of the world's population, India has 20% of its disease share, and 25% of all maternal conditions. An immense state-sponsored urban financing through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in over 60 India cities has yet to articulate a serious socio-political, economic or health rationale or public mobilisation for the scale of infrastructure investments.

In India, the Employees State Insurance Act frames the context and content off the Employees States Insurance Scheme, which came into effect in 1952 and is predominantly a health insurance scheme alone, covering sickness, maternity and employment benefits. Unlike more comprehensive social insurance programs off some European countries, the Indian ESI scheme has no unemployment benefits whatsoever. In principle, the ESI scheme can act as a strong income equalizing system/ in reality, the ESI scheme covers primarily those in the organized portion of the economy (manufacturing predominantly), roughly less than 10% of the Indian economy. The ESI Corp. regulates the scheme and the ESI fund which these out the various benefits (sickness, maternity, employment injury (disablement and dependents benefits), medical expenses and funeral expenses). The medical benefit covers a variety of outpatient, specialists, and hospital services and is the only benefit in the list that is paid for in kind, while others are paid in cash.[5]

In addition, Providence Fund Schemes are used to minimize economic insecurity in old age or death, and is a compulsory saving scheme funded by workers and employers in different portions. This game was effectively intended (through the Employees Provident Funds and Misc Provisions Act 1952) to be a retirement support and dependents support system. Under the Act, three schemes are available: the Employees Provident Fund Scheme, the Employees Pension Scheme and the Employees Deposits Linked Insurance Scheme. A market-regulating characteristic of th Funds is the extent and nature of private participation and management of such funds.[6]

Politics of identity and the social bounds of recognition of others can be hypothesized to have a marked effect on innovation sets as well as welfare state formation and market creation. Market varieties are then shaped by cognitive elements of self- and other- identification. At the level of the innovator, it limits the elements of the innovation set and innovative possibilities. Srinivas and Sutz's (2008) framework then provides a means to link structural and institutional characteristics of the economy, with the cognitive elements.

[5] For more details, see "Social Security in India: An Overview", by R.K.A. Subrahmanya.

[6] A recent controversy erupting in July 2008 is the allegation by the Communist Party opf India (Marxist), the CPI(M) that in exchange for political support to the ruling United Progressive Alliance (UPA) in order to win the trust vote in parliament to keep the central government in power, one of India's largest private players in capital markets, Reliance Capital, was awarded Fund management of the EPF.

Karnataka state was also one of the few with early initiation of social policies, and the integration of several "backward" castes. The ruling Wodeyar house incorporated "backward" groups in strategic ways reflecting their own 'backward' caste status, and the peasant politics of old Mysore state. Assadi (2006) describes the fragmentation of identity claims in current Karnataka emerging from this layering of entitlements, with dominant caste and income groups asserting their economic power in the newer sectors. However, as the uprisings against the Mandal Commission report has demonstrated, affirmative action or employment "reservations" based on caste and religion have no obvious benefit to low-income groups in "upper" caste categories. The labour market, social policy entitlement clash has been exacerbated by a highly segmented and politically contentious labour market, the dramatic shrinking of public sector employment opportunities, and the rapid rise of contract labour arrangements even in the so-called formal sector. This informalisation of formal work has eroded the political base of former national unions, and created a wide variety of newer organisations representing informal workers across sectors. Both neoclassical and Marxist claims of segmentation and political coalitions appear to break down in Karnataka (See Srinivas 2007a and b for a full discussion of Indian options for universal entitlements, Roy Chowdhury 2008 for the insufficiency of class as an organising principle in the state).

It may well be that for smaller countries such as Finland or even Korea, this regional diversity is less pressing. But for countries such as India with democratic political institutions (even if largely limited to voting), regional political and social disparities are important enough to affect the manner in which products and processes are demanded, redistributed and consumed. As in Europe, where we might assume Serbians and the British might have little shared identity that cohesively binds them, the same is true of India, where residents of Mizoram state and those of Andhra Pradesh are foreigners to each other, politically, linguistically, and by caste, religion, and widely divergent histories. To expect income or economic development alone to fuel common cause for social insurance is unrealistic.

While previous political economists and Indian industrial planners saw the country as a tabula rasa against which backward-forward linkages could be imagined and constructed, today's Indian cities have reached bursting point, unable to socially and politically sustain much greater industrial concentration. The urban-rural political equation has also been complex for successive recent governments. As Bangalore and Hyderabad's status grew as "high tech" cities (Hyderabad often being called Cyberabad), S.M. Krishna and Chandrababu Naidu both rose in national and international attention (largely derived from urban media and the discussions of these politicians with World Bank and other organisations). Karnataka and Andhra Pradesh state elections saw both incumbents lose heavily due to the perceived neglect of critical agrarian issues and a disconnect with rural and lower income voters. Assadi counts farmer suicides in Karnataka in 1998-2006 as approximately 3,000. Country-wide, the number of farmer suicides has risen to over 100,000. (Assadi 2006). Several critics have denounced the state response to the suicides as targeting behaviour of individuals (e.g. alcoholism and other personal reasons) rather than a systemic development path failure. The Millennium Bio-Technology Policy has also created significant tensions in the nature of institutional reorientation of seed procurement, seed market structure, and the demand for genetically modified seeds. Certain Other Backward Castes (OBCs) have welcomed the commodification of land to allow them entry into new land and seek markets, and have joined with the State to support the process of domestic and international agribusiness (Ibid.) As with the Green revolution, certain farmers have clearly done better than others, and while genetic hybrids seem to have raised productivity in some areas, the new political coalitions they have generated remain to be fully studied. Bangalore city also saw protests by farmers and the public since it houses several multinational and local agri-biotech firms (Ibid.) After incumbency losses, subsequent chief ministers have had to placate their agricultural vote-bases, but significant infrastructural and tax concessions have gone directly to high-tech industrial parks, IT and biotech-firms, and to Bangalore city's ever-increasing IT and business process outsourcing (BPO) industry. As CNR Rao, one of Bangalore's long-time residents and the country's leading scientists

described it recently, IT's 'boom' had created Bangalore's 'bust', and perhaps it was not reasonable for residents to wish for the sector's partial demise to revive existence in the city. While the IT/BPO sector is a very large employer, urban costs have created increasing income inequalities in the absence of a broader welfare regime. The urban development crisis fueled by a quest for economic growth and innovation has been marked by sky-rocketing prices for both the low-income and middle-class families, immense land speculation and unsafe, illegal construction, heavy power outages, lack of clean drinking water (or water itself), absence of toilets for most residents, un-walkable roads, severe traffic-related accidents and fatalities, clogged traffic, heavy pollution, noise levels, and an entirely unsustainable stream of locals and migrants wasting hours and income each day in traveling to make their living. Crime rates have seen significant spikes, including rapes and murders of late-night IT workers, violent land grabs in several parts of the city, harassment of older residents living alone to vacate their properties, high-end businesses employing thugs to recover property and loans, and increased theft with high-income residents carrying cash, high-end mobile phones and other electronics. As yet one more incumbent H.D. Kumaraswamy was voted out with his Janata Dal (S) Government, the new Chief Minister of the Bharatiya Janata Party Mr. Yedurappa has seen his party's first win in South India. Calling his ambitions one to make Bangalore a "world class hub**"**, he has promised "industrial decentralisation" to districts which have much less employment and investment, in a bid to decongest Bangalore. At the same time, he treads a fine line with his rural, non-Bangalorean constituents, hoping to remain a C.M to be voted back in 4 years time.[7]

Today, Karnataka shows some interesting increases in insurance coverage. While social health insurance is very low, self-managed community programs in the state show prospects for about 200,000 people with hospitalization and prescription benefits through area-based or sector-based programs. However, this is a state with a disproportionately high percentage of "reservations" into social programs from education to social assistance. Approximately 90% of the population is covered, discounting a Marxist or neo-Marxist "massification" project of social expansion where social protection entitlements are proportional to social or political power, as in Latin America (e.g. Mesa-Lago). From labour inspectorates to new women's union movements, several newer forms of health insurance expansion is visible. Political parties such as the BSP have used a rhetoric based on a universal platform of income and exclusion. However, to date, their widespread political mobilisation around voting has not translated into working income guarantees or wider social policies. On the other hand, in the absence of suitable insurance regulation across the country, private insurance companies and private pay-as-you-go schemes have thrived.[8]. Most insurance programs- have absent or little out-patient coverage, only covering costs of hospitalization and associated treatments. The costs of basic health technologies –from medicines to diagnostic kits- has been largely supported through some public procurement subsidies, but largely from out of pocket payments from poor and rich alike. At the same time, private Indian hospitals have fueled a boom in medical tourism with paying patients from richer economies of the U.S., Saudi Arabia, and Western Europe. The trend is problematic: a disjuncture between domestic and export markets, and from foreigners paying for services that most Indians don't receive. An industrialization strategy premised on high-income consumption and supporting income inequalities is therefore questionable in several respects.

[7] The several bomb blasts across Bangalore and other Indian cities in July 2008 has emphasized the tensions between different social groups and the inability of industrial cities in the country to cope with the security and political repercussions of instability. The media attention focused on whether Bangalore's IT sectors were affected and whether the country's innovative engines would be hit. In fact, the death of a woman garment worker made little news despite it providing over 300,000 jobs to the city, and construction workers die almost daily in sector accidents. Surat's 17 live bombs being defused in and around its very prosperous, but less glamorous and highly labour-intensive diamond industry did not warrant the same media attention.

[8] Denque is a very common mosquito-transmitted problem in Indian metropolises. A dengue test at a reputed private hospital in Bangalore costs approximately Rs. 2400, more than 1.5 times the monthly salary of the janitorial staff at a public research institute which likely helped create the test's technology.

5 LINKING INNOVATION AND WELFARE REGIMES

5.1 The Missing Middle and some hypotheses

Chris Freeman and colleagues, who generated much to benefit science policy research, recognized the limitation of the competitive paradigm: "*the advance of science and technology must find its support and justification, nor merely in the expectation of competitive advantage, whether national or private, military or civil, but far more in its contribution to social welfare, conceived in a wider sense. To the extent that the competitive mechanism may contribute to the achievement of this wider goal, it may serve a useful purpose; but in so far as it fails to do so, it will require drastic modification"* (Freeman et al. 1971).

Nevertheless, with the possible exception of the ECLAC scholars and those such as Myrdal with experience in both Scandinavia and South Asia, the structural roots of marginalization and modernization find limited analysis in several debates of evolutionary economics and "varieties" schools (although certainly some efforts have been made). I can only hypothesize why this has not resulted in more explicit attention to income inequality, but it is certainly true that the issues of factor endowments, income distribution and domestic market importance has been somewhat unfortunately been left wanting (see diverse discussions in Freeman et al. 1971, Srinivas 2005, and Albuquerque 2007).The "Missing Middle" refers to the absence of a mass market of low or middle-income consumption and production, as well as a theoretical gap in understanding the social and cognitive dimensions of innovation and technological change.

These distinctions allow us to visualise the different strategies open to economies. Taiwan and Korea, for example, played significantly with their initial income distribution through land reforms and social policies of various kinds (although with considerable variation between the two countries). Indeed, land redistribution was part of a broader social policy effort prior to its industrialisation effort and before many of the innovations we have witnessed from the two countries. India and Brazil had very limited income redistribution policies and largely failed land reform efforts. Both used import substitution as means to effectively boost domestic capabilities and lower the cost of products. Neither entirely succeeded in either goal. Thus, an alternate framing of the discussion is to ask how social policies and welfare regimes affect technological innovation.

In particular, without an understanding of comparative welfare states and health policy in particular, explanations for technological innovation arising from state or market alone are likely to be incomplete explanations of industrial change. Even within "traditional" industrial policies, there are complex undertones of health and welfare through for example, social protections, occupational health, technical quality and safety standards, training programs, educational systems, and policies for deemed public goods such as R&D outputs.

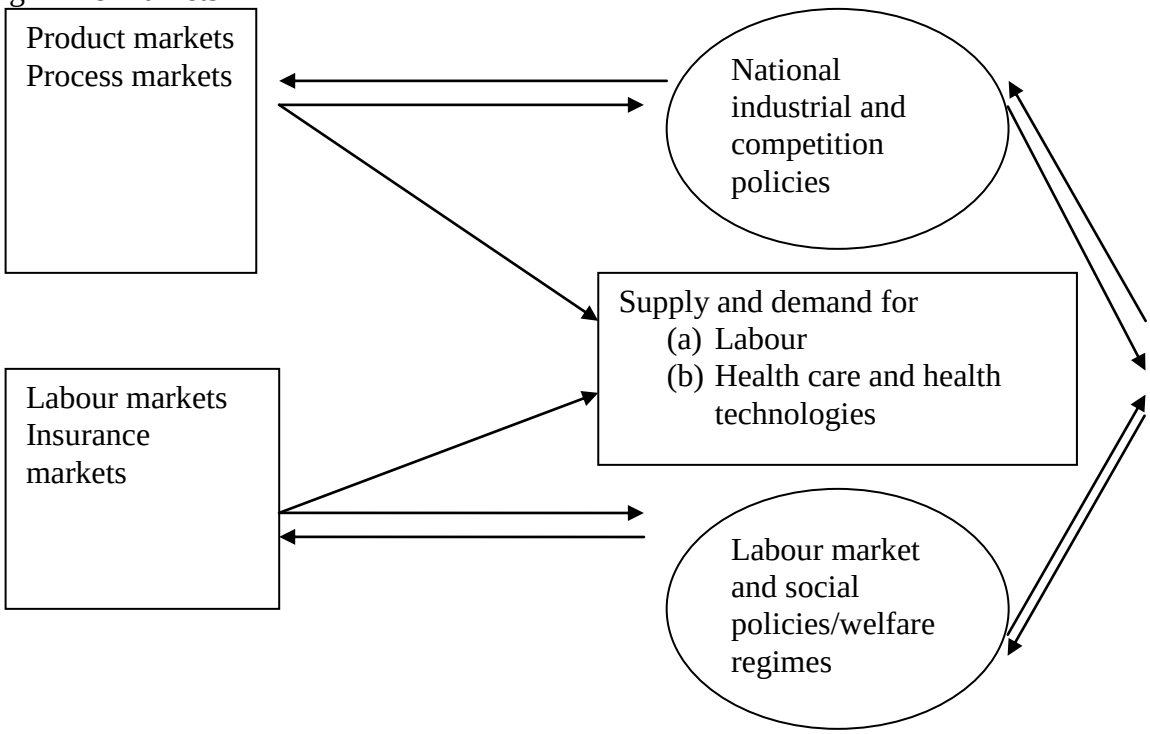
While the "social-shaping of technology" literatures is far more sympathetic to the idea that innovation arises from social situations and interpretations (e.g. MacKenzie and Wajcman (Ed.) 1985, Bijker and Law 1992 (Ed.), some aspects of economic literature do adopt this viewpoint to varying degrees. However, overall economic approaches to technology remain quite deterministic in the sense that technology (particularly innovation and the heroic inventor) is seen to arise from rather socially isolated circumstances; people (besides innovators themselves) are rarely present in the analyses, and that technology continues (even in many endogenous accounts of technical change) to be separate from society, "acting" on the latter. The Western literature which heavily influences literature on technology and innovation in economic conditions and societies which are substantially different, focuses increasingly on theories of information societies/knowledge economies, post-Fordism and post modernity, which arise from strong assumptions about technological change and its social origins and effects (e.g. Kumar 1995).

Even family structures, identity, education, health and production relations are all seen as shaped (and largely determined) by technology's trajectories (fro example, position Landes' (1969) more technologically deterministic account of production organisation versus Noble's more socially structured account of why production technologies took certain forms (Noble, 1979). Importantly, most such views arose from very specific historical readings of technical change in advanced industrialised countries. It remains an empirical question whether either the technological or the social elements of the puzzle can be directly contrasted in countries that are industrialising today. While both technological determinism and social process views have important contributions to make, both have their own choices and slices of the problem. In this sense, this is a partial re-interpretation and rewording of the determinants of technological paradigms and trajectories (Dosi 1982) as they play out in national systems (e.g. Nelson (Ed.) 1993) but being conscious of the political economy and social setting within which both micro-dynamics shift and macro-dynamics at industrial level are shaped, which were not necessarily the foci of the former studies.

The "catch-up" literature, the "modernization" thesis and most studies of industrial and nation building political economy are among the most technologically optimistic in terms of welfare enhancement and institutional convergence.. While various authors (e.g. Edquist and Lundvall 1993, Lundvall 2002, Benner 2003) and others acknowledge the source of comparative institutional advantage of their welfare regimes, here too, one senses that there has been a limited investigation into the links in industrialising contexts today. The varieties of capitalism literature (e.g.Hall and Soskice 1999), the social structures of production literature and National or sectoral Systems of Innovation (e.g. Piore and Sabel 1984 in the first and the latter comprising authors such as Dosi et al. 1988, Nelson 1993, Edquist and Lundvall 1993, Edquist 1997 etc.), those on "catch-up" or induced technical change (e.g. Abramovitz, 1986 or see Ruttan 1997 for the range) all capture crucial elements of innovations' link with industrial development and the institutional underpinnings of production and innovation. However, none of these makes the third link to social policy and welfare regimes particularly visible, except for studies such as Lundvall 2002. The (comparative) welfare states literature on the other hand (e.g. Esping-Andersen 1990, Skocpol 1992, Orloff 1996, Rein and Rainwater 1986) makes extraordinarily important contributions to our understandings of the links and absence of links between social policy and industrial dynamics, especially the nature of gender and other inequalities. However, these are not concerned with technological capabilities and innovation except when it is presumed to automatically emerge from industrial development itself. On the other hand, the economics of technical change literature certainly profoundly influences both our view of innovation and its industrial setting. Rarely however, do we find examples (even from those studying health sector innovations) of a detailed investigation of social and health policy (despite the fact that studies such as Landau et. al 1999 and Achilladelis and Antonakis 2001 provide some clues). The health economics literature has also paid relatively little heed to innovation or its *industrial* dimension. Therefore, countries (such as the US, Finland, India, Brazil, S. Africa, Nigeria) are compared assuming common markets, supporting institutions and varying capabilities. Taken one step further, this feeds into the common view that firms and nations desire the same markets, and some communities feel the globalizing metaphor is alarming in its seeming uniformity of markets, goals and pressures.

The diagram below shows the approach here of how product and process markets are connected via employment and social policies, to labour markets and insurance markets. A risk-mitigation approach to social protection takes into account the varied co-variant, idiosyncratic or other risks that define the working and non-working lives of individuals. It provides an institutional mix by which costs are shared and risks mitigated. When the right side of the diagram becomes fragmented, and national industrial and competition policies de-linked from labour markets and social policies, we have a situation reminiscent of Indian history. However, no simple technocratic fix can work alone; several deep-seated social and political questions underlie the de-linkage.

Fig 1 The Markets



An alternate path to the same analysis adopts a user-innovator relationship that goes beyond product design as envisaged by various authors.. I next discuss a conceptual framework that investigates a specific empirical slice of (a) and (b)-the relationship of health policy to technical change and innovation in the health sector..

5.2 Hypothesis 1: Macro-institutions and Health Innovation Systems

The primary hypothesis is that there is a path dependency in industrial and innovation structures created by certain social policies and processes typified by national welfare regimes. Thus, welfare regimes affect not just the parameters of the health innovation system, but also technological innovation. In other words, welfare regimes and pillars by dictating the degree of universality and the focus of benefits, who pays and who provides, are likely to shape not only the contours and elements of the health innovation system, but also the cognitive focus of innovation, and the resources for innovation and technical capabilities. More specifically, then we might expect that for advanced industrial economies, the rate and local relevance of technological innovation in social democratic regimes where health and welfare policies are seen to be productivity-enhancing is higher than that in liberal welfare regimes where health and welfare policies are seen to be more inimical to economic productivity. We would expect that conservative regimes would fall somewhere in between. Note that if we were simply looking at rates or absolute numbers of innovation, we might not expect to see this correlation, since in Fig. 1, only the link between industrial policies and innovation are explored. However, if the link to social policies and broader health systems is investigated, the premise here is that different trends and substantially different health innovation systems may be observed in both rates and relevance. Some possible explanations for why welfare states affect innovation might rely on economic participation. It is also lower because workers are only partially within the economic and welfare process, thus innovation product markets have fewer perceived targets i.e. the demand side. It is further lowered because health policies such as social insurance themselves are geared towards only a small fraction of workers and citizens-through segmented participation and social stratification. Assuming more insurance coverage for medical products and processes is likely to lead to

higher innovation for such products and processes, the hybrid and partial insurance systems of ICs have a depressed effect on innovation relative to conditions of larger population coverage Note that social policies also influence the participation and *supply* of innovators, although this is not investigated here directly. Thus, the rate and local relevance of technological innovation is lower in ICs because of the relative lower fraction of workers contributing to a creative economic process and thus to innovation i.e. the supply side.

Even so, I argue that today's industrialising countries (ICs) (or developing countries) cannot be compared in the same breath with other countries in a purely industrial or S&T manner judging technological "catch-up" when social policies have an effect and technological innovations as part of health innovation systems may be shaped by substantially different forces in addition to international product competition alone. Today's ICs most often have derivative welfare regimes (and health policies) derived from different (Western) industrial traditions, or hybrid forms deriving from colonial or other overlays on existing kinship systems. Therefore, it seems plausible that the rate and local relevance of technological innovation in leading industrialising countries (by rate and market share of technological innovation) is different from the previous three regimes (social democratic, liberal welfare and conservative) relative to the domestic market.

Thus, linking this to the 'systems of innovation" scholarship, we can revisit the *boundaries* of the "system of innovation". By specifying the elements, boundaries, institutions and dynamics of the system, one may be better able to see how "social" and "technological" facets of health link together (from family systems of health support and values of child health to the (for profit) pharmaceutical sector and pay-provide innovations). The need to understand this link better is visible in scholarly and practical tensions between these "health systems" and international economic contrasts. This can be seen by considering the following: the pharmaceutical and biotechnology sectors of the USA, Finland, India and Brazil are being compared incessantly in a "catch-up" framework, where technological advance is seen as having comparable metrics across countries. However, consider two alternate viewpoints: (a) first, the limits of these national systems have been quite under-studied. One could instead attempt to parse out causal explanations for invention, innovation and diffusion of technologies and then let the emerging explanatory variables determine the limits of the system. (b) Second, one could define "national" to be determined by national institutions outside the *industrial* innovation system. Thus, these countries have (bio) pharmaceutical and biotechnological capabilities that form part of a broader health innovation system whose dynamics remain substantially under-explored. In such an instance, it would be somewhat meaningless to be contrasting innovation in a sector if it can be shown to be affected by variation outside the "industrial" framework, and affected by a range of other social processes that may be vastly different. For example, in some societies economic participation in the workforce outside the family may demarcate the entitlements in health policy and thus influence the nature of innovation for such citizens. This may manifest in women (gendered), children or geriatric health innovations being least attended to (generational inequalities). While regimes describe entitlements and their conditionality, pillars describe who pays for and who provides the benefits (Goodin and Rein 2001). Thus, non-market health transactions such as some aspects of care giving may negatively influence whether attention is given to solving specific health gaps and also, how and where technological and other innovations fit in. For example, childcare and women's healthcare may be seen to be outside this market view of commodities, linked as they are to industrial development (e.g. Sen et al. 2001, Lund and Srinivas 2000) and innovations' gendered forms[9]..

[9] Several media and scholarly works have more recently emphasized how 'lifestyle' drugs such as Viagra have bigger markets, faster development times and regulatory supports than contraception, women's health drugs, or children's illnesses.

Thus, a focus on specific technologies and innovations gives rise to the second hypothesis.

5.3 Hypothesis 2: Micro-dynamics of innovations and trajectories

Technological innovations at micro-level are shaped, at least in part, by demand-led social policies that shape the cognitive contents of the "innovation set" and also create new potential product markets[10].

I use a construct of "innovation sets" as a set of vector possibilities of technical innovations. T The argument here is that no complete innovation set ever exists, and that these innovation 'sets' are merely categories of technical possibilities. If institutions, and markets among them, are socially instituted (e.g. Polanyi, 1957), then they must link behavioural elements of individual action with their collective, social elements. While economists and innovation scholars have tended to acknowledge the social institution of markets somewhat guardedly, empirical investigations into markets for innovation tend to assume their common understanding and completeness. By completeness, the 'market failures' understanding is that although markets may not exist or be underdeveloped for certain products, nevertheless (a) markets as entities are given (however 'underdeveloped') and (b) innovation categories are commonly understood when markets 'develop' and are complete. Every society within each sector has a range of such sets containing different possibilities, many of which remain unexplored and for which markets reward some, and ignore (even punish) others. But this view of reward and punishment is not mechanical. Innovations sit among various possible choices made within economies and are linked to needs in complex ways. The systemic view of the economy is then a better understanding of when such innovation and valuation choices are within a set, when they are undervalued, invisible or absent altogether and how they are ordered by policy preferences and market signals. From a purely evolutionary standpoint, such vectors in a set are simply probabilistic possibilities of occurrence and development. However, societies; institutions- including social policies, industrial policies and so forth, are means by which some of these vectors are selected out and others are not, at any given time. They also depend on implicit categorizations and valuations of change within a system.

The recognition, relevance and prioritisation of some innovations over others and the ways in which they are socially responsive, and diffuse within the economy, are socially instituted processes and these play out differently in different "health innovation systems". In some circumstances international comparisons purely by product categories are then possible, but their wider implications for societal welfare in the home country context should be analysed with considerable caution in light of the framework suggested above. The conceptual framework here is one where the institutionalisation of innovation categories and markets is a cognitive and social process shaped in turn by other social institutions and processes. Thus innovation is situated as a part of a broader, organic system which shapes health, economic and technological features simultaneously in inter-linked (and socio-political, not purely economic) ways. There are thus no universal "innovation sets" of common understanding and agreement worldwide.

The investigation of these social processes and "socialisation" of these innovations, and new ways of doing things, is also attempted in a diverse literature on habits and institutions across a wide range of disciplines. The approach here is that some of these are better suited than others to the hypotheses: that different cultural histories have substantially different ways of doing things, and that politics are intricately associated with specific innovations. This is particularly germane for more technologically deterministic understandings of health, and the means by which it is improved. The approach here, lends

[10] Notice that these technical innovations may not necessarily arise within the private pharmaceutical sector, although this is certainly one of the main sources. They could arise from public research laboratories, community health groups or individuals working outside the formal R&D system.

more weight and realism to social features of health systems such as power, practice, system shifts under colonization, cognitive classification, social grouping and its politics. It attempts to understand elements of innovations processes and outputs which are substantially ignored in the economics of innovation, such as gender disparities, shift of welfare and insurance responsibilities from States to families, changes in the Pay-Provide elements of the health economy and its links, and the bureaucratic and power distribution in economic liberalisation (e.g. Sen et al. 2002, Lund and Srinivas 2000, McPake and Mills 2000).

For example, Malaria may be a much larger problem flagged by health policy in one country and thus may give rise to more innovations, but another country with a much higher disease burden may lack both the health policies and surrounding institutions to support such innovation. Many discussions today regarding the inability of Africa to combat malaria or HIV focused on technical solutions tend to look to industrial and scientific or engineering solutions or the lack of such institutions. However, they do not, in my view, sufficiently acknowledge the cognitive shaping of "innovation sets". In this sense, most current explanations from economists and innovation scholars tend to be technologically deterministic, assuming that technical sets are given, and technical institutions and priorities shape social systems, not necessarily the other way around. One area where economics hold promise for understanding technical change in this respect are the debates of Titmuss (1970) and Arrow (1972) focused on "non-market" exchanges and their valuations such as gifts-in health, from blood donations to organ transplants etc. For health policy and health innovations alike, this understanding of non-commercial goals and intermediary organisations for delivery may be vital to a complete understanding of the health systems and their associated or embedded national characteristics.

5.4 Searching for an alternate approach to markets and industrialization

To link the macro- and micro-dynamics of Hypotheses 1 and 2 back to national and international political economy in Hypothesis 1, I use a framework described in Srinivas and Sutz (2008) of varieties of innovation categories and problem solving, each representing technological varieties and rather different institutional support mechanisms. The 2X2 suggest a conceptually altered framework to understand why certain innovations arise, why certain needs are unmet, and the nature of technological interdependence between countries and within countries. This interdependence is reminiscent of the broader "catch-up" admonition of Abramovitz (1986) who sought a greater understanding of the structural and institutional relationship between countries. At the core of the Srinivas and Sutz (2008) approach is a preliminary attempt to bridge cognitive and evolutionary approaches to technological change with deep-rooted structural imbalances in the nature of industrialization. It details how certain technological efforts can have far greater relevance to local needs than off-the –shelf varieties. This runs counter to some of the discussions of meeting local needs in Rosenberg (1969).

The four quadrants represent .different market environments. As Figure 3 indicates, only Quadrant I, the upper left-hand quadrant depicts the dominant focus of current international political economy. This "menu" of technological options in Figure 3, runs along a spectrum, providing countries and intermediate institutions various choices at any time. The movement between these quadrants and the specializations by sector at any one time should give us some insights into what relevance and prioritisation agenda is being contested within the system of innovation. The quadrants also provide a basis for historical analysis by product and process innovation, geography, and technological capability. When the authors attempted a preliminary listing of innovations, one can systematically analyse them by their initial market, income profile of customers, and the diffusion and "scale-up" of these innovations. From locally devised cotton gins, to electrical motors working in Indian conditions, to Hib vaccines from Cuba, the welfare and income profile of such innovations show us the manner in which off-diagonal elements with local markets might emerge. The 2X2 lends itself to mapping an organisational, chronological or geographic trajectory of innovations such that countries emerge as dominant members of one or other quadrants. When

intellectual property or harmonised technical standards appear as new meta institutions, the quadrants become layered into more localised industrial political economies (.e.g. at state and municipal levels or by sector),and by quadrant. E.g. the current dominant discourses lie in quadrant I, as do the technical harmonisation debates of the WTO, while IPR issues can be analysed in quadrants I and IV (see also Srinivas, 2005).

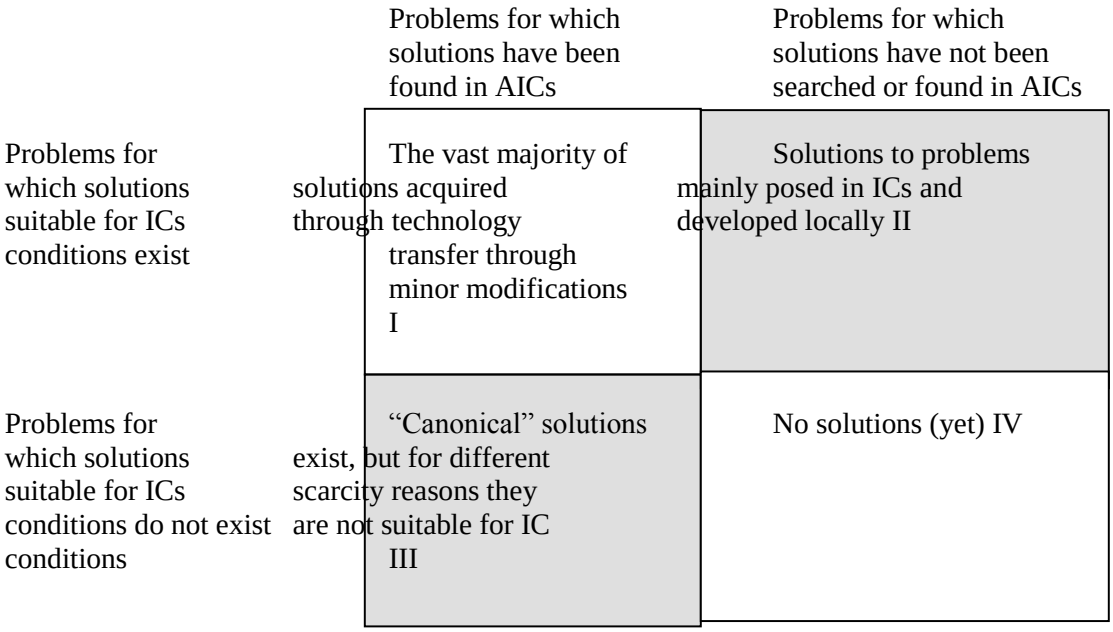


Fig 2. AIC-IC Industrial dynamics and problem solving
Source: Srinivas and Sutz (2008)

Some health policy debates on neglected diseases for example, focus on Quadrant IV, but do not situate these in such a framework, nor position such innovations or their inducements as any different from those in any of the remaining quadrants. The hypothesis here is that welfare regimes (via health policy) to a significant degree affect the ways in which countries specialise technologically and innovate in pharmaceuticals and biotechnology. By using Indian, or Karnataka industrial, social policy and labour market histories, the 2X2 provides a sense of the challenges for why innovative firms in a society with few income supports or broader welfare regimes, may eventually find the domestic market to be a dry well. Urban and regional economic strategies premised on these innovating firms, will be forced into political compromises regarding market structure and size. The evolution of welfare regimes allows us a window into this world of demand, and market and non-market institutions.

6 Conclusion

The conceptual approach developed in this paper, inspired by a wide body of institutional scholarship and inequality concerns of several earlier political and development economists, might be extended from health to sectors such as energy, education, and IT, where domestic market demand, needs, and income distribution questions remain important. It is a misguided attempt to narrowly focus on IPRs alone in health technologies or simplistically contrast countries by technological capabilities. Effective demand needs further attention, as do several 'sticky' institutions that address spatial and temporal employment and income mobility. Dual and segmented labour market theories and the historical and current political dynamics around collective institutions such as social insurance seem particularly germane to scholarship if the Globelics and "catch-up" mandates are to have broader relevance to poverty and inequality in both industrialised and industrialising countries.

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