Inequality and Growth: Where Are We Headed? A Survey.

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Abstract

This paper surveys the evolution of the Kuznet's hypothesis and recent findings of the inequality and growth literature. The main emphasis of the recent literature has been on the rise of wage inequality. Although the negative relation between inequality and growth is now well established in theoretical literature, there are discrepancies in the recent empirical findings. A possible solution is suggested which emphasizes the role of demand patterns created by inequality.

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1 Introduction

Although many fruitful attempts have been made over the last forty years starting with the Kuznet's (55) seminal work, the relationship between inequality and growth still remains a puzzle in terms of its sign , both short term and long term characteristics and underlying mechanisms. For instance, while the older approaches suggest that the inequality and growth are positively linked due to equity and efficiency trade-off , the newer literature questions the validity of this trade-off especially in the presence of incomplete financial markets. While earlier literature suggests a positive relation between inequality and growth due to investment indivisibilities, the newer literature points out that in the presence of investment indivisibilities and imperfect capital markets, inequality is bad for growth. Initial theoretical findings suggest that inequality increase growth.Most of the recent theoretical findings in the literature,however, indicate the opposite. On the one hand ,the recent empirical findings mostly support the negative relation. On the other hand, the support for the nature of this relation, other than the sign, have not been so unambigious.A debate concerns if the relation between inequality and growth can be linearly estimated. There are also discrepancies in the empirical literature.There are many issues like the above at hand, which continuously attracts opposing views.

In a market economy, today's distribution of endowments, along with the market interactions, is responsible in determining the tomorrow's distribution. Since this process repeats itself growth and inequality are necessarily intertwined. The effect of inequality on growth has attracted a renewed interest in the literature and with the emergence of new works on the rising wage inequality in major industrialized countries , the inequality and growth literature has established itself

as a major area of economics. The motivation for this book was in part due to the large amount of work that has been done and its scope. Its aim is to put the body of evidence into a clearer picture and, if at all, to give a perspective which hopefully will shed light into future research. For this purpose, I will first briefly state why the classical economists have maintained the view that inequality is not detrimental to growth and then I will categorize the areas which the newer literature indicate as the possible sources of the negative relation between inequality and growth.

First, the notion of inequality should be made clear. Inequality in this survey is either wealth inequality or wage inequality each of which is relevant to different approaches to the analysis of the link between inequality and growth. When analyzing the effect of inequality on growth using income or wealth inequality or their proxies is more appropriate. When analyzing the effect of growth on inequality then using data on wage inequality is more suitable since changes in productivity are mostly reflected in wages

In this survey I'll try to clarify what those issues are and give a broader picture of the substansive literature and where it is heading. A similar kind of work has been done recently by Aghion,Caroli and Penalosa (2003) who give a summary of the new approaches to inequality and growth , particularly with respect to technical and organizational change and trade liberalization. Their main emphasis is, on the most part, is not on the effects of inequality on growth but rather sources of inequality which have attracted most of the attention in the recent literature. My survey differs from theirs in several aspects: First it directly links the existing theories to the relevant empirical findings by examining the discrepancies in those findings. Secondly, it considers affects of demand patterns on growth which stem from inequality. Third, it considers the most recent empirical findings on

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the sources of the rising wage inequality. And finally, it looks at the Kuznet's hypothesis as a seperate strand of literature.

The plan of this survey is as follows: I will first give a brief historical review on the subject concentrating on Kuznet's hypothesis. In the third chapter, I will briefly review both the theoretical and empirical literature on the effect of inequality on growth with the emphasis on the latter. The fourth chapter surveys the sources inequality in some of the industrialized countries as they matter to the process of growth. I will also summarize the recent empirical findings on the subject. The fifth chapter concludes.

2   Historical Perspective

It will be appropriate to start by briefly mentioning Kuznets not only for the famed inverted U-hypothesis but also for some ideas which have recurred in the literature but seldom cited as his,. (Kuznets 1955, p. 6) wrote:

' As technology and economic performance rise to higher levels, incomes are less subject to transient disturbances, not necessarily of the cyclical order that can be recognized and allowed for by reference to business cycle chronology, but of a more irregular type. If in the earlier years the economic fortunes of units were subject to greater vicissitudes- poor crops for some farmers, natural calamity losses for some nonfarm business units - if the overall proportion of individual entrepreneurs whose incomes were subject to such calamities,..,was larger in earlier decades, these earlier distributions of income would be more affected by transient disturbances'.

Kuznets (1955) observes that inequality in percentage shares within the rural population is lower than in that for the urban population. When this observation is coupled with the fact that the per capita income of the rural population is

also lower than that of the urban, an increasing weight of the urban population, for example a migration to cities, should increase the weight of the more unequal distribution and hence increase inequality. Moreover, higher savings rate of the upper-income groups should yield more income for them and their descendants through higher asset holdings, further widening the inequality. Nevertheless, the empirical evidence until 1955 suggests that income inequality have been narrowing in the industrialist countries for several decades. Kuznets postulates several groups of factors which prevents inequality from increasing none of which could empirically confirmed mainly due to the lack of data . Some of them are the legislative interference in the form of inheritance taxes and limiting the yield on accumulated property , for example, through rent control. The others are the rapid growth of new industries creating new fortunes for the people of lower income groups. The third one is that the wages are limited for the rich and their descendants from above, since for this group the inter-industry shifts are more limited, whereas for the middle wage earners shifts to booming industries are likely. By observing the characteristics of the urban growth with reference to its lower income group Kuznets conjectures a theory of 'swinging' inequality in which the inequality increases during the initial phases of industrialization process and decrease later. The reference group, which consists of people who mostly migrated from rural areas in the course of urbanization constitute a larger part of the population in industrialized countries. Once having settled in the cities, through adaptation and organization they become a political power leading to legislations protecting their interests. And finally,this will gradually enhance their position in the income distribution.

As an implication of the analysis above Kuznets suggested an inverted U-shape relation between income inequality and GNP per head. To fortify his argument

Kuznet's estimated the time periods in which the inequality in industrialist countries has increased and subsequently declined. The increase in inequality he conjectured occured during 1780-1850 in England and during 1840-1890 in US and Germany whereas the fall in inequality occured in the last quarter of 19th in England and after the first world war in US and Germany.

Early estimation of the Kuznets process utilizing cross-section data seem to support the inverted U shape such as in Paukert(73), Adelman and Morris(73), Ahluwalia (74, 76) Chenery and Syrquin (75) and Loehr(81). In particular, Ahluwalia (1976) finds strong support for the reversal of increasing tendency of inequality by estimating the following equation

$$I = \alpha + \beta \log_{10} y + \gamma \left[\log_{10} y \right]^2 + \delta D + \varepsilon$$

where I is an index of inequality ,proxied by the income share of the highest 20% , middle 40% and the lowest 20% percent of the population respectively, and y is per capita GNP. The dummy variable, D, takes the value 1 if the country is socialist and 0 otherwise. Ahluwalia finds positive β and negative γ for the top 20% and vice versa for the rest of the population. This indicates an upright U curve for the evolution of income share of the poor which in turn implies an inverted U-curve with regards to evolution of inequality as per capita GNP increases.

These findings of Ahluwalia along with Paukert's,which are widely cited, seem to form basis of the early support for the Kuznets hypothesis. Robinson (76, p. 437) also indicates that 'the inverse U - relationship has acquired the force of economic law' Furthermore, the Kuznet's hypothesis was used for projections of inequality and poverty by the World Bank in late 70's. [1]

The specification above is later criticised by Anand and Kanbur (93b), who

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[1] An earlier survey of these studies can be found in Fields (80).

argue that the Kuznets hypothesis does not generally lead to a quadratic relationship between inequality and growth. Anand and Kanbur (93a) puts Ahluwalia's estimates further to robustness tests allowing for different functional forms and find that doing so results in shapes not resembling the original. The alternative functional forms used in their research rely on empirical criteria rather than a theoretical prior. Nevertheless, the choice of the functional form seems to matter in the outcome even though there are no specific theories linking their estimations to Ahluwalia's. The choice functional form has been partly overcome later by Deininger and Squire (1998) with the use of a new panel data set. By utilizing their longitudinal data and using the inverse instead of the square-log per capita icome in the above equation they find little support for Kuznet's hypothesis. In their estimation per capita income fails to be siginificantly associated with changes of inequality in the vast majority of countries. And Kuznets curve seems to explain little of the variations in inequality across countries over time.

Barro (2000) extends his study of growth determninants by including inequality in growth regressions and finds strong support for Kuznets curve.Unlike earlier studies Barro(2000) finds that Kuznets curve appearent in the data also over time and not only across countries at a point in time. However, like other studies when the data set includes the variations in inequality across countries over time, Kuznet's curve does not explain much.

And finally, Piketty and Saez(2003) find support for Kuznet's hypothesis by using individual tax return data between 1913 and 1998. If one considers tthe information technology revolution arrived at the 70's as a new wave of industrialization They put steep progressive taxation as a plausible explanation as to why the shocks of Great Depression and the World War II on the top capital owners were permanent. The top of the wage distribution, they find, have only recently

passed their WWII level where the top capital icomes are even lower than their WWI level.

A major problem with estimating the Kuznet's original hypothesis is that the recent increases and falls in inequality have to do more with technological shocks rather than with migration linked changes in income distribution. A more coherent approach is to think that industrialization processes come as waves and they are started by a major technological breakthrough. For the latter part of the twentieth century, such a revolution has taken place in information technology. Arrival of computers indicate a start of an industrial revolution just like the steam engine in the 18th century or later electricity in the 19th century. In this setup, one can think of skill accumulation as the determining factor of the evolution of inequality. And in fact, after the arrival of computers the inequality has risen in the major industrialist countries which might be an indicator of that another inverted U process has started off for the evolution of inequality. This has attracted a lot of interest in the literature and will be mentioned later in the survey. Further examples also exist in which the Kuznets hypothesis is applicaple. A counterpart of the movement from rural to urban industry might be for instance a shift from a financially unsophisticated to a modern one.(Greenwood and Jovanovic 1990)

3   Main Approaches to Inequality and Growth Relationship

There are many theories constructed to assess the relation between inequality and economic growth and there are many ways to categorize these theories. To keep things intact I will briefly give an evaluation of the earlier theories which suggest a positive relation between inequality and growth and classify the later approaches under two headings; The nature of asset markets and the social contract which

include politics of redistribution and social unrest.

One of the most important issues in the literature regards equity and efficiency trade-off. Arthur Okun (1975):

The trade-off between equity and efficiency is our biggest socio-economic trade-off. We can't have our cake of market efficiency and share it equally.

The logic of the trade-off between equity and efficiency implies that policy makers have the choice between higher inequality but higher living standars on the average versus lower living standards but a more just income distribution. To put it differently, more justice in distribution has a welfare cost in form of either a lower output in a static context or a slower growth in a dynamic setting. Until recently most of the economists agreed to the validity of this trade-off. The recent empirical work has shown, however,that there is little evidence suggesting that initial inequality in the distribution of income and wealth has a positive impact on subsequent long-run growth rates. To the contrary, cross-country studies which regress long-run growth rates on inequality mostly find a negative correlation between them. And on a theoretical basis, increasing number of economists agree that inequality itself may have negative incentive effects. For instance, high inequality may lead to lower levels of work effort,or it might reduce both incentives and opportunities to undertake investments in productive education or innovative activities.

Another suggestion for a positive sign is implied by Kaldor's hypothesis which states that marginal propensity to save of the rich is generally higher than that of the poor. Since the traditional growth argument links the growth rates directly to the savings rates, a more unequal distribution in an economy should generate more growth, because more of the national income will be saved. The support for this

view comes from Bourguignon (1981) who show that with a convex saving function aggregate output is higher at the more unequal steady state. If the investments are indivisible or require large sunk costs then concentration of wealth among few individuals who will undertake those investments might be preferred. This argument has found support among the policy advisors to the developing countries especially to the transition economies of former Soviet Union..

Finally another argument in support of the growth enhancing effect of inequality has been made in a moral hazard context. This occurs especially when the efforts by the agents are not observable, a just distribution of wages might reduce the incentives to supply effort.

All of these arguments are criticised by the recent literature which I will summarize below

3.1 The Nature of Asset Markets

The nature of asset markets play an important role in the link between inequality and growth. This is mainly so because of the fact that the classical arguments presented above do not generally apply when the capital perfects are imperfect. Stiglitz(1969) points out that when the capital markets are imperfect, the convergence of wealths might not take place. Galor and Zeira(1993) examine the impact of the redistribution of wealth on aggregate output through the investments in human capital. When there are both imperfect capital markets and indivisibilities in human capital investments, the initial distribution of wealth affects both aggregate output and the long run distribution of skills and wealth. The long run distribution is mainly determined by the parental choices on education and bequests and the subsequent investment opportunities of the offspring.

When we assume diminishing marginal returns to investment in education or

capital then there is a role for redistribution when the economy lacks a functioning capital maket. The idea is that redistributing resources to those poorly endowed with highest marginal returns to the investment will create opportunities which enhances growth. Such an exercise is done by Aghion,Caroli and Penalosa (2003) who show when there are no functioning capital markets that when the individual production function is concave, greater inequality in the distribution wealth results in a lower rate of growth. In their setup, redistribution creates investment opportunities in the absence of capital markets which in turn increases productivity and growth.

Imperfect capital markets not only cause inefficiencies but also increase the existing ones caused by inequality. For instance, lack of well developed credit and loan may prevent individuals at the bottom of the income or wealth distrtibution to undertake invetsments such as education which is the primary source for human capital formation.

Another counter-argument to the traditional view can be stated in the following way. Since the imperfect capital markets exist in the first place due to moral hazard, incomplete contracts(or repayment enforcement problems) or ex-post moral hazard, then whenever there is moral hazard, inequality should be detrimental growth. In support of this view, several authors have point out the inequality is bad for growth as long as effort is increasing in the wealth of individual. The amount an individual borrows is negatively related to her incentives to supply effort because she has to share a larger fraction of the returns with the lender. In this context, increasing the wealth of borrowers will enhance their incentives. On the other hand, the same argument applies to lenders in a negative in that the less they have to lend the less they have to monitor. As long as the effect on borrowers incentives exceed the effect on lenders incentives , decreasing inequality in a moral

hazard situation should increase growth. Aghion and Bolton (1997) show under such circumstances redistribution increases growth, but only when it is sustained for a long time.

If capital markets and related institutions tend to improve as an economy grows, then the effects related to capital market imperfections are more important in poor countries than in rich ones. Therefore the predicted effects of inequality on economic growth would be larger in magnitude for poor economies than for rich ones. However, this is only one way in which the growth and inequality relationship might have a significant sign in the poorer countries. Another possibility is that the position of the poor and the demand for new products increase faster in developing countries causing the firms to invest more and more in R&D instead of traditional technologies. This is a rather new approach to the inequality and growth puzzle and is attempted later in the survey.

3.2   Social Contract and Politics of Redistribution

The balance of power in the political system determine political outcomes and resulting redistributive policies. This strand of the literature deals with the so-called political economy models of growth and redistribution. When individuals vote for a preferred tax rate, inequality leads to higher taxation through the political process. For instance, a median voter in a more unequal society (inequality can be measured by the ratio of mean to median income) would vote for a higher tax rate or higher transfer payments and associated tax finance. Since welfare payments and levies on labor income reduces work effort and higher taxes distort investment incentives which will reduce growth through incentive effects an election outcome causing more redistribution will reduce growth. In this respect it is logical to expect the more equal societies to grow faster.

The politics of redistribution and its relation to growth is analyzed by many authors such as Saint Paul Verdier (1993) Alesina and Rodrik (1994) and Person and Tabellini (1994)[2]. Person and Tabellini (1994) suggest that high inequality in pre-tax incomes leads the majority of people to vote for redistribution which leads to a progressive tax system. Person and Tabelini (1991) and Alesina and Rodrik (1994) and Saint Paul Verdier (1993) 's political economy models show that change in income distribution (e.g distortionary taxation) reduces the growth rate only when the redistribution is from the poor to the rich. Banerjee and Duflo (2000) argue in the short run any kind of redistribution reduces growth which implies any change in inequality is followed by lower growth.

Easterly and Rebelo (1993) analyze the effect of fiscal policy on growth for both industrialized and developing countries. They find that redistribution is growth enhancing. Using spending on social instituitions and several tax rates as indicators of the magnitude of redistribution. Other evidence from East Asian economies show that redistribution in land or education is beneficial for growth.

In the typical case wealth distribution changes slowly. Large changes in distribution over a relatively short period of time are largely due to intense social conflict.The idea that sociopolitical conflict related to inequality reduces the security of property rights and discourages accumulation.When the gap between the rich and the poor widens the rent-seeking or predatory activities increase in both number and intensity. The security of property rights is the main theme of the models of The relation between social conflict and growth are analyzed by Grossman(1991) (1994), Acemoglu(1995), Tornell and Velasco(1992), Perotti (1996), Grosman and Kim(1996) and Benabib and Rustichini (1998). In these models. the economy's potential growth rate is negatively related to the interest groups

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[2]For an extensive survey of this literature see Benabou(1996)

rent seeking abilities.

Another approach emphasizes the polarization in a society as a basis of social conflict, which is in turn known to be detrimental to growth. Easterly (2000) points out as the most common forms of social conflict, class polarization and ethnic polarization. If a society lacks a middle class consensus, then groups in that society will under-invest in education or other infrastructure as long as there is mobility between them. A middle class consensus is a situation in which the a high share of income for middle class is coupled with a minimal ethnic polarization in the society. Easterly(2000) tests the significance of a middle class consensus by assuming that the tropical commodity exporters are more unequal then other societies. In this setup exogenous country characteristics such as resource endowments are a proxy for the existence of a middle class consensus. Easterly(2000) finds in the data that lower ethnic polarization and higher share of middle class income are associated with"higher income, higher growth, more education, better health, better infrastructure, better economic policies, less political instability, less civil war (putting ethnic minorities at risk), more social modernization, and more democracy". Since Easterly(2000) is able confirm the hypothesis with cross-country data, a possible use of resource endowments as instruments for inequality emerges.

3.3 Inequality in Purchasing Power, The Role of Demand Patterns and Nonlinearity

It is suprising that there has been only recent attention in growth literature on how inequality-determined demand structures affect the incentives to innovate and hence growth. What I mean by an inequality-determined demand structure is the distribution of demand across goods at a given time as a result of wealth

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distribution. A distribution of demand can easily be found if one assumes people have hierarchic preferences ,which translates to ranking of goods in an order where the highest goods are the most luxurious and the lowest are the most basic ones. Once this is done the demand for any good can be linked to the inequality level. Hierarchic preferences of this sort have their place in literature. Engel's law,for instance states that as incomes grow people spend proportionally less on food.

The results of Zweimuller (2001) confirm the negative relation between inequality and growth. How the inequality affects the demand spectrum for innovators in a dynamic context is the main contribution of his article. In other words, the inequality plays a role in determining both today's and tomorrows demand for new and better products hence also the innovators incentive to innovate.

To illustrate the relevance of this approach, let me reconsider briefly the recent empirical literature on inequality and growth. Just previous to the panel data presented by Deininger and Squire (1996) researchers have found a robust negative relationship between initial income inequality and growth[3]. Later researchers have presented contrasting fixed effect estimates using the data set[4]. Barro(1999) finds no overall relation between income inequality and rates of growth, unless the sample is divided as rich and poor countries. To complicate matters further, Banerjee and Duflo(2000) find that any change in inequality is associated with lower future growth rates. They also list a number of empirical reasons for the wide array of findings, including the different data sets used with regards to fixed effects estimation, different time-lags assumed or the different control variables included.

In a Schumpeterian setup, Engel's law gives us a theoretical clue as to what the sources of discrepancies between the above empirical findings might be. As

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[3]See Alesina and Rodrik(94), Persson and Tabellini (94), Perotti(96)
[4]See Li and Zou(98), Benhabib and Spiegel (98), Forbes(00)

incomes rise so does the proportion spent on new more efficiently produced goods. At the top of hiearchy there are luxuries which are historically evolved to being inefficiently produced goods probably due to a chronic low demand. With an unequal distribution of income a redistribution from rich to poor increases growth as it increases the demand for new goods by the poor without changing the demand by the rich. But if the poor is rich enough to consume most of the new goods a further redistribution might lead inefficiencies in production, reducing growth.

In the second chapter I will present a model which accounts for the nonlinear relationship between inequality and growth as evidenced by recent empirical literature. The demand for new products and wealth distribution is closely linked when people have hierarchic preferences. At high and low levels of inequality, an increase in inequality has opposite effects on growth. The mechanics of the model is such that the entering firm's potential market size determines the level of growth, whereas the market size is determined by the inequality level, the finite patent length and the growth rate. Initially, as the poor's incomes increase the growth increases because the demand for new, R&D intensive goods increase. However, as the inequality declines below a certain minimum, the demand for luxuries go up high enough so that the resources are diverted to inefficient production methods reducing growth. Hence, there is a non-linear relation between inequality and growth

Furthermore it is shown that in this setup any increase in patent length increases growth. The magnitude of this effect differs with existing inequality level and time preference. The optimal patent length turns out to be infinite because monopolist firms do not mark-up during their monopolist life. This is assumed for tractability purposes. Even though the inequality is higher in some richer countries than the poorer ones, the purchasing power of the poor in the rich country is high enough

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to support new innovations. This might explain the empirical discrepancies found in the literature.

3.4 Recent Empirical Findings on the Effect of Inequality on Growth

The puzzle about the inequality and growth partly stemmes from the fact that the data sets produced have neither been sufficient nor reliable until last decade. This problem is also magnified with the use of proxies for wealth inequality for which extensive data does not exist and the bulk of the theory emphasizes the role of wealth distribution as it is what really matters to the growth process. The most common approach to empirical analysis has been to regress long term growth rates(about 20-25 years) on initial inequality. The choice of long-term growth rates is not arbitrary. Easterly et al.(1993)@@ find the growth rates have low intertemporal persistence within countries.Within this approach, Benabou(1996) compares South Korea and Phillipines in terms of their macroeconomic performance and their initial inequaliy levels. Benabou (1996) finds that Phillipine, initially with a higher level inequality, has experienced a much lower growth rate than South Korea over a 30 year period.

Deininger and Squire(1998) have at least partly overcome the problem of finding "quality" data set[5],which they based on household surveys with the coverage of all sources of income rather than only wages. Empirical studies using this data set have sparked more discussions with regards to the effect of inequality on growth.(more here) Deininger and Squire(1998) find that the effect of initial income distribution and subsequent growth is not very robust. However, inequality in the initial distribution of land rather than income turns out to be negatively related to subsequent growth. This would lend support to the imperfect capital

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[5]see Deininger and Squire(1998) for a criteria of a 'quality' data set. They exclude some countries not fitting those. For a critique of their criteria and the exclusion of those countries see Atkinson and Brandolini (99)

markets argument above, in which the land might act as a form of collateral whenever there are investment indivisibilities. Another important finding is that the investment is significant for growth and declining in income levels, which supports the idea that creating new assets have greater impact on poverty reduction than redistribution of assets.

Benabou (1999) finds that most of the studies of the last decade indicate a negative relationship between inequality and growth .The opposite finding is reported by Forbes (2000) who argues that the previous estimates are biased due to a potential correlation between the explanatory variables [6]. Forbes result is recently challenged by Banerjee and Duflo (2000) who argue that by imposing a linear relation on a highly non-linear data[7] Forbes misinterpreted the data. Their argument relies on the fact that in the data both increases and decreases in inequality are followed by a reduction in growth rate. Therefore, they suggest a non-linear relationship between changes in inequality and changes in growth. They support their nonlinear specification with a simple political economy model based on rent grabbing.

Banerjee and Duflo (2000) also suggest that there is mismeasurement in the Deininger and Squire Data (1996). They list the countries where the gini coefficient changed drastically in the adjacent two periods. They argue these drastic changes are not necessarily due to a political conflict but due to measurement error. They argue that the statistical agency is more likey to mismeasure when there is an economic or political crisis during which also the growth rate falls. Hence, one will expect an u-shaped relation between measured changes in inequal-

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[6]Previous studies report the OLS estimates of:

$\frac{(y_{it+a} - y_{it})}{a} = \alpha y_{it} + X_{it}\beta + \delta g_{it} + v_i + \epsilon_{it}$ wher y_{it} is the logarithm of GDP in country i at date t , a is the time length for measuring growth rate, X_{it} is a set of control variables, g_{it} is the Gini coefficient in country i at date t and v_i is a country fixed effect.

Forbes(2000) argues g_{it} and v_i in the above equation are correlated

[7]Forbes(2000) used the panel data provided by Deiniger and Squire (1996)

ity and changes in the growth rate, rather than in absolute values. They find that any change in inequality is followed by a reduction in growth rate. They argue that their specification is sufficient to explain the discrepancies of the previous estimates, although their underlying model is rather unsatisfactory in political economy literature standards and rather conjectured to create nonlinearity.

4 Sources of Wage Inequality

In this section, I will try to outline the ideas on the sources of wage inequality as it matters to the growth process. There is a huge literature on the sources of inequality , both historical and modern. Here I will confine my survey to the rising wage inequality during the last couple of decades in US and UK, although the ideas apply in a much more general context including developing countries. There are three broad categories under which the sources rising inequality can be identified. Technological change , globalization or trade liberalization and deunionization.

4.1 Technological Change

A regular observation of the last two decades has been the rising wage inequality in industrialized countries (Gottschalk (1997)) . The striking aspect of this observation is that the wage inequality has been increasing not only across groups with different professions ,schooling and skills but also within the same group, no matter how it is narrowly defied. This fact lead to a number of theories where skill biased technological change is the driving force in determining innequality. The technological change is 'skill biased' in the sense that it reinforces existing differences in abilities among workers within or across educational or other cohorts. Although technological change can put an upward pressure on the demand for skilled workers, the supply of skilled workers also increases through education

as a response. This would normally bring a fall in the wage gap. The puzzle here is that despite the evidence of increasing supply of skilled workers causing the skill premia to fall in the 70's and despite the further evidence on increasing skill premia in the 80's , the within-group wage inequality has been steadily increasing since the 70's. Another part of the puzzle lies in the fact that even though there has been extensive technological progress after 70's there also has been a productivity slowdown.

Why does then technological progress lie behind the increasing wage inequality? In the last 25 years there has been a substantial increase in wage dispersion within educational groups in the U.S. This is also a time period when the pace of investment-embodied technological change has accelerated. The initial explanations were that the rising wage inequality was due to higher returns to education which produced the skills necessary to match the new technological requirements of the production processes. Such a link between the two observations above has been explored by several authors[8]who commonly have pointed out that workers with high skills learn the new technologies and move to the top of wage spectrum faster whenever there is faster embodied technical change. The rising skill premia,however, can not fully explain the rise in wage ineuality. If higher returns to education were the sole reason of rising wage inequality we would not observe the increased dispersion of incomes within the educational cohorts as documented by Gottschalk and Murphy (1994). The workers , for the most part , earn their skills on the job through either learning-by-doing or spillovers from other workers or production units. Moreover, in a period of high technical change uncertainty effects those who are at the bottom of the wage spectrum more. Poor people are more prone to shocks. And finally, the skill-specific jobs are easily lost when the

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[8]Violante (1997), Jovanovic,(1998), Greenwood and Yorukoglu (1997)

state of technology shifts substantially. This is true especially with the low-level skill specific jobs.

One of the theories that link inequality to technological progress is as follows: The adoption of new technologies involves a significant cost in terms of learning in which the skilled labor has an advantage. This is attributable to the fact that educated workers can both assimilate and apply the new ideas better and faster. Therefore, a shift in the state of technology will be associated with an increase in the demand for skilled labor. The skill premium will rise and income inequality will widen. The implied evolution of the age distribution of equipment by a higher rate of embodied technological change lead to changes in the equilibrium wage distribution. This is due to either accumulation of skills on the job ,transferability of skills across jobs or the mobility decision of workers.. Violante(1997) points out that technological progress affect wage inequality through the way skill dynamics of the agents interact with the technological environment. Jovanovic (1997) indicates that the equilibrium wage distribution for the ex-ante equal workers widens because high-skilled workers become more selective relative to unskilled ones and turn down jobs on old and less productive technologies. This creates a positive sorting in the equilibrium assignment of workers to technologies) which increases the dispersion of wages. Another argument by Jovanovic et. al. (1997) states that the inequality is a result of the complementarity between machine quality and skills. A worker who is matched with the best machine will acquire more skill and inequality will persist indefinitely. Moreover, since new machines will be used by the most skilled workers, the inequality will increase with the pace of technological change.

Some authors have pointed out that the skill biased nature of the technological change is merely an exogeneous process. It is rather an exploitation on the firm's side of the availables skills by investing more in to R&D and to make use

of the falling skilled wages. Such a paper, Acemoglu(1998), relates the increasing inequality to increasing number of skilled workers who induce skill biased technological change This type of technological change increases the skill premium in the long-run and inequality follows. The rapid increase in the proportion of college graduates in the United States labor force is shown to be the reason of the increase in inequality during the 1980s. The main argument there is that the induced technological changes are skill-complementary not by nature but by design. Therefore, the resulting inequality is a result of preferred type of technological change by the investment sector.

Let me also mention a couple of observations on the nature and timing of the technological progress the industrialist countries have experienced; Gordon(1990) shows that there have been widespread technological improvements in durable goods equipments by analyzing the data on quality-adjusted price indexes over the last 50 years. In addition, Greenwood and Yorukoglu(1974) show that the speed of this progress has accelerated about 30 % since the mid 70's. Further evidence of the 70's rapid technology improvements come from Krusell, Ohanian,Rios-Rull and Violante (1998). It is the nature of the rechnological progresses which increase the inequality.

To illustrate ideas more clearly I will borrow from Aghion,Howitt, and Violante(2002) Suppose every new technology has its own specifications and therefore requires some time to be learned. The productivity of the worker using the new machine increases as she learns by doing. Let the factor, with which the productivity of the worker increases, be η. Her productivity next year will be multiplied by a total factor of $(1 + \eta)$, if she starts with a new machine today and stays with it next year. Suppose now that the technologies gradually arrive and all experience the worker accumulates is not transferrable to the new technology. Let

the the fraction of abilities she can transfer to the new technology $\tau \in [0, 1]$. If the worker then moves from the new machine she used last year to the newly arrived machine, her productivity is multiplied by an amount of $(1 + \tau\eta)$ next period. There is also a possibility that the worker was working in an old machine in the first year and she decides to move to the leading edge old technology instead of the new technology. By moving to the leading edge old technology next year she will benefit from spillovers from the workers, who've stayed with the "new" machine they've started using this year. The productivity increase of the old plants is due to the experience gained in organization, production processes and operation of markets. Let denote the increase in productivity caused by this spillover effect $(1 + \xi\eta)$. $\xi \in [0, 1]$.

Let n_{ij} be the productivity units of labor joining technology j from technology with age i. The productivity units of labor for each machine can be expressed as :

$$
\begin{aligned}
x_0 &= (1 + \tau\eta)n_{00+}n_{10} \\
x_1 &= (1 + \eta)n_{01+}(1 + \xi\eta)n_{11}
\end{aligned}
$$

where x_0 is the newer machine. If $\tau = 0$, then the new technologies require completely different skills. On the other hand if $\tau = 1$, then all skills are completely transferrable to the new technology. As τ goes from 0 to 1, the use technology becomes more independent of specific skills or all new technologies use more the same type skills as the incumbent one. In other words, as τ approaches 1 the technology resembles a general purpose technology. Similarly, If $\xi = 1$ then knowledge is fully spilled over to the newcomers as opposed to the case $\xi = 0$, in which no knowledge is shared within the firm. Let's assume perfect labor markets with an adaptability constraint to prevent all workers being assigned to the new machines.

To introduce such an adaptability constraint, let σ denote the probability that every worker can be productive on the leading edge technology. With the law of large numbers then at most only a fraction σ of the total workers are employed by the new firms. The fraction of labor input demanded by the firms is given by $\sigma^* = \frac{n_{00}+n_{10}}{N} \leq \sigma$.

Furthermore, let γ be the growth rate of the prodctivity in successive technological improvements and let $Y_t = (A_t K_t)^\alpha x_t^{1-\alpha}$, where $A_t = (1+\gamma)^t$, be the production function the firm faces. In equilibrium, with the assumption of perfect labor markets, the marginal product of labor will be equal to the wage rate.

$$w_{00=}(1+\tau\eta)w_{10} = (1+\tau\eta)(1-\alpha)x_0^{-\alpha}$$
$$w_{01=}\frac{(1+\eta)}{(1+\xi\eta)}w_{11} = (1+\eta)\frac{(1+\alpha)}{(1+\gamma)}x_1^{-\alpha}$$

Given the above wage schedule each worker faces then two options; move to the new machine or stay. To analyze how inequality changes with respect to transferability (τ), spillover (ξ), learning-by-doing (η),adaptability (σ), and the speed of embodied technological change (γ), one has to solve for x$_0$ and x$_1$ in equilibrium. The summary of the results are given in the following table

Nature of Technology	Wage Inequality, R
$\tau=0, \xi=1$	$\max\{1, A\}$
$\tau=0), 0<\xi<1$	$\max\left\{\frac{1+\eta}{1+\xi\eta}, B\right\}$
$0<\tau<1, \xi=1$	$(1+\tau\eta)\max\left\{1, \frac{A}{(1+\sigma\tau\eta)^\alpha}\right\}$

Table 1. Technology and Inequality

where $A = \frac{1+\gamma}{(1+\eta)^{1-\alpha}(\frac{\sigma}{1-\sigma})^\alpha}$ and $B = \frac{1+\gamma}{1+\xi\eta}\left[(1+\sigma\eta+(1-\sigma)\xi\eta)\frac{1-\sigma}{\sigma}\right]$ and NA stands for 'not applicable'.The comparative statics results are summarized in the following table.

Nature of Technology	$\frac{\partial R}{\partial \tau}$	$\frac{\partial R}{\partial \gamma}$	$\frac{\partial R}{\partial \eta}$	$\frac{\partial R}{\partial \sigma}$	$\frac{\partial R}{\partial \xi}$
$\tau=0,\xi=1$	NA	>0	<0	<0	NA
$\tau=0,0<\xi<1$[9]	NA	>0	$\gtreqless 0$	<0	<0
$0<\tau<1,\xi=1$	>0	>0	$\gtreqless 0$	<0	NA

Table 2. Comparative Statics

- Case 1 : *No Skill Transferability($\tau=0$),Perfect Spillover($\xi=1$)*

  When skills can not be transferred to the leading edge and there is perfect spillover, there are two seperate wages in equilibrium earned by workers in the old and the new sector. First, wage inequality increases with the γ. Those who can adapt to new technologies will earn relatively more if the technological progress accelerates. Second, the more workers can adapt to the new technologies the less discrepancy there will be in wages due to the supply effect. And third, if the rate of learning-by-doing increases then the comparative advantage of moving to the new sector versus remaining in the old technology diminishes reducing wage inequality.

- Case 2: *No Skill Transferrability($\tau=0$),Partial Spillover($0<\xi<1$)*

  When there is no transferability and only partial spillover, in other words, when the novice workers can neither fully exploit the experienced workers knowledge nor they can bring any skills from their previous assignment, there will be two distinct wages respectively for experienced and novice workers in equilibrium. Given a skill scale , a higher spillover benefits those workers more who are at the bottom, thus a decrease in the spillover rate increases inequality. Moreover , as the magnitude of spillover decreases, the productivity

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[9]For $\gamma > \xi\eta$

increase gained by moving to the leading edge is higher if the technological progress accelerates. Thus, the effect of technological progress on inequality is not only positive but also higher than Case 1. With respect to the effect of the adapatability rate, As in the first case a higher rate of adapatability means that in equilibrium more workers adapt which reduces the wages associated with newer machines.

- Case 3: *Partial Skill Transferrability($0<\tau<1$),Perfect Spillover($\xi=1$)*

Allowing for transferability implies that there are three distinct wages in equilibrium; of those moving from previous leading edge to today's leading edge , of those moving from the old sector the new leading-edge and of those staying with their previous machines. In this case, increased transferability gives an edge to those workers, who can adapt to the new technology, over those who can not, thus increasing wage gap. At the same time, more transferability leads to more workers adapting to the new technology in equilibrium which reduces the wage gap.It can be shown that the first effect $(1 + \tau\eta)$ dominates the second one$(1 + \sigma\tau\eta)$. When the skills are transferable, a higher rate of learning-by-doing(η) implies that once a worker moves to the leading edge technology he can benefit of his skills with new technology , but at the same time remaining workers do increase their productivity faster, as in case I, thus the net effect of a higher rate of learning-by-doing on wage inequality is ambigious. Finally, a higher rate of adapatibility increases the total productivity of the new machine workers but at the same time reduces their wages due to the increased supply of skills available for the leading edge machines. Moreover, the second effect becomes ever more dominant as the transferability increases. Therefore, higher adapatibility implie lower wage inequality.

The parameter, τ, in the above model can also be interpreted as the generality of

technology. So a higher τ implies that the technology at hand is a general purpose technology, the use of which permeates through all sectors after its invention.

One of the main problems in this strand of literature is that there has not been an increase in the rate of productivity growth in the data since 1980's. This has started another wave of discussions related to calculations of total factor productivity as a measure of technical change. Total factor productivity calculations have several problems. For instance, it is explained also by other variables like age of capital, capital labor ratio and the rate of ouput growth. Moreover, it does not accurately reflect skill biased technical change since its increase apply to both unskilled and skilled workers equally. Some of the more appropriate measures are the use of R&D expenditures or the computer usage. There is strong support for skill biased technical change in the empirical literature by using these measures. Berman, Bound and Griliches (74) show that R&D expenditures and computers have significantly positive impact on the increase in share of non-production workers in the total wage bill.[10] Once having solved the 'appropriateness of the measure' problem, the question, however, still remains: Why is the technical change is not reflected in the aggregate data? A possible solution is to look at the effects of a widespread technological shock,like the information technology revolution in the 1970's.

4.2   General Purpose Technologies

One plausible way of explaining the rising inequality across industries is by analyzing disembodied technological change, by which technological improvements arrive as shocks and effect all industries. Such a technological shock might be defined as a general purpose technology which is a technological invention and spreads to the

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[10]For a survey of empirical evidence on this issue see Aghion, Caroli, Penalosa(1999)

entire production line both across and within industries. One of the proposed explanations for the rising wage inequality is that the nature of a new GPT diffusion is non-linear. This is because existence of strategic complementarities between the various sectors of the economy may generate temporary lock-in effects. The idea is a firm might choose not to implement the new GPT unless other firms do so. Or in other words, implementation of a GPT might become beneficial only if the firm can make gains through social learning (by means of network externalities) from other firms.How does this relate to wage inequality? The arrival of a new GPT diminishes the stock of human capital, just like the vintages in the above model, which lead to increased mobility. This leads to sorting of skilled workers in technologically advanced sectors and ineuality increases. Once the GPT is adopted by more and more industries, mobility diminishes and so does inequality. With regards to the question above the implementation of a new technology may induce a temporary productivity slowdown during the experimentation period. Moreover, the productivity increases caused by secondary product innovations related to the use of GPT might not immediately show up in the statistics.

4.3   Trade Liberalization and Deunionization

Another possible explanation to the rising wage inequality has been trade liberalization. Increased trade between developing and developed countries will increase inequality in developed countries, since the demand for skilled labor in the developed country will increase as a result of specialization in the skill intensive good there. While in the developing country the demand for skilled labor will dcerase and inequality will go down. This analysis is just a simple extension if the Hecksher-Ohlin model which states that countries specialize in the production of those goods which use intensively the factors of production in which they

are abundantly endowed with. Although the trade argument seems very strong it has not been supported by data. The empirical findings on the trade's role in increasing inequality are reviewed later in the survey.

Unions have the traditional role of wage supression. One of the main characteristics of the labor markets in the 1980's have been deunionizations which might have contributed to rising inequality. Theoretically, a higher union coverage for workers imply a higher bargaining power and higher wages. Several authors have found strong support for deunionization in explaining rising inequality which will be covered in the next chapter.

4.4 Recent Empirical Findings on the Sources of Rising Wage Inequality

4.4.1 Technological Progress

The empirical findings on the sources of rising wage inequality and its link with the technological progress come from different sources.First, there is evidence solely on the technological improvements via the quality adjusted price indices for durable production equipments. There are also findings solely on the rising wage inequality between or within cohorts of education, skills etc. And finally there are findings on the link between them.

The puzzle with regards to the empirical findings on technological progress is about the slow productivity growth during 1972-1995. During this period US fell behind in numerous industries outside the IT sector in terms of prodictivity despite all the technological improvements(Gordon(2002)). As explained above the arrival and the slow diffusion of GPT causing the productivity initially to fall has been already put forward as an explanation by several authors.

The technological progress is measured by using either quality-adjusted rel-

ative price of capital or by estimating vintage effects in a specified production function. First, the major finding about the technological progress is made by Gordon (90) who documents the technological progress over the last half of the twentieth century using the declining quality adjusted price indices for durable production equipments. The decline in quality adjusted price indexes generally attributed the arrival of computers as a form of GPT. In addition, Greenwood and Yorukoglu (97) show that the rate of embodied technological change has increased about 33% on the average in the decade following the year 1974. Gordon (2002) documents a further technological acceleration, particularly in information technology, between 1995 and 2000 which lead to the revival of productivity growth. The post-1995 technological acceleration, particularly in information technology (IT) and accompanying revival of productivity growth, directly contributed both to faster output growth. Gordon (02) further ponits out that the technological acceleration was made possible in part by permanent sources of American advantage over Europe and Japan. Some of them are the mixed system of government- and privately-funded research universities, the large role of U. S. government agencies providing research funding based on peer review and the strong tradition of patent and securities regulation. Others are the leading worldwide position of U.S. business schools and U. S.-owned investment banking, accounting, and management-consulting firms, and the particular importance of the capital market for high-tech financing led by a uniquely dynamic venture capital industry. The above time path of productivity slow-downs and accelerations have been used as a sort of conjecture to link the wage inequality and technological progress.

Second there are observations on the rising wage inequality during the last quarter of the century. Recently, Gottschalk and Moffitt (2002) decompose the rise in cross-sectional variance of male annual earnings in the U.S. from 1969 to

1996 into permanent and transitory components. They find that the variance of permanent earnings began rising in the late 1970s and has continued to rise in the 1980s. The variance of transitory earnings also rose in the 1980s but declined in the 1990s. Part of this observation is also confirmed by Pikett and Saez(2003) who find that the wage inequality has stabilized in the second half of the 90's. A previous finding by Gottschalk (1994) find that the wage inequality has not only substantially increased across educational, professional or other cohorts but also within those groups which is the departing point of the second part of this survey. Further support comes from Mincer(91) who finds that college graduates earnings, with an average of 8 years experience , have increased relative to those of high school graduates in a period where the R&D intensity has also substantially increased.[11]

Finally , the evidence on the link between the technological progress and the wage inequality Starting from the 1970's there is a positive relation in the time series between inequality within cohorts and the investment specific technical change. For instance, Allen(1996) looks at wage differentials by industry and finds that they are related to R&D intensity, usage of high-tech capital, age of technology, growth in total factor productivity, and growth of the capital-labor ratio. More specifically how changes in technology are related to changes in wage differentials by schooling, experience, and gender. Allen(1996) finds that returns to schooling are larger in industries that have intense innovative activity and high-tech capital. In fact, technology variables account for 30 percent of the increase in the wage gap between college and high school graduates. Krueger(1993) also finds that workers using computers are better compensated than those who do not.

Despite the abundance of evidence supporting the technological progress as a

[11]See Levy and Murnane(1992) and Juhn, Murphy and Pierce(1993) for further evidence on wage inequality during 70's and 80's

possible source of inequality the issue is still in debate. Some authors have discussed the validity of the technological progress as an explanation of the rising inequality, especially after the emergence of data for the period in 1995-2000. Among those, Card and DiNardo(2002) review the evidence in favor of this hypothesis, focusing on the implications of skill biased technological change for economy-wide trends in wage inequality, and for the evolution of wage differentials between various groups. A fundamental problem for the skill bieased technological change hypothesis, they argue, is that wage inequality stabilized in the 1990s, despite continuing advances in computer technology, which is, in fact, supported by th findings of Gordon(02). Skill biased technological change does neither offer an explanation to the closing of the gender gap nor to the stability of the racial wage gap. Furthermore, the dramatic rise in education-related wage gaps for younger versus older workers is not fully explained by skill biased technological change also. Another objection comes from Piketty and Saez(2003) using individual tax return data between 1913 and 1998 find that the technological progress cannot account fully for the observed facts.Their arguments in explaining the are close to those of Kuznets(54) in the sense that they put social norms forward as an explanation of the observed wage pattern.

4.4.2   Trade

Trade between developed or high skill countries and developing or low skill countries shaould cause an increase in the demand in the developed country for skill intensive goods in which it has a comparative advantage. If the trade occurs in the final goods sector than the demand increase should favor those industries which use high skilled workers and cause the skill premia to increase. The inequality

shuold consequently increase across industries (between high skill and low skill industries) rather than within industries. Therefore, even before examining the relevant empirical research on the trade in final goods and its effect on inequality one would expect that it won't fit well to data which shows increasing inequality both across and within cohorts.

If the trade occurs, however, in intermediate goods sector , then there is a possibility of widening of inequality among the workers. If , for instance, unskilled labor is a substitute for intermediate inputs then a declining price of inputs due to trade liberalization will cause the demand for unskilled labor to fall and the demand for its complementarities such as skilled labor to increase. In this setup the prices of final goods would remain the same.Therefore, allowing trade in intermediate goods might cause a widening inequality within industries confirming data.

As expected, there is little support for the implications of the increasing trade in final goods. Berman, Bound and Griliches(1994) find only 30% of the demand increase for skilled workers can be explained by inter-industry labor movements between 1979-1987. Moreover, Machin (1996) finds a similar result for UK data, in which more than 80% of the increase in the demand for non-manual share is due to within industry shifts. Another important,but disputed link is that for the skilled labor wages relatively to increase the relative prices of the skill intensive goods should fall, for which there is little evidence(Slaughter (1998))

With regards to trade intermediate goods , however, the results are more supportive of the theory implications First, Falk and Koebel (1997) find evidence in the German data that unskilled labor is more substitutable to material inputs than skilled labor in the manufacturing and construction sectors. They estimate the cross-price elasticities between production factors such as unskilled labor (no degree), skilled labor (high school degree),high-skilled labor(university

degree),capital and materials. A negative cross price elasticity implies that the factors are substitutes whereas a positive cross price elasticity implies that the factors are complements. They find a high degree of substitutability between material inputs and unskilled labor in the manufacturing and construction sectors. They also find that the demand for high skilled labor is increased by a lower price of material inputs in some sectors. In fact, tha data show that the price of material inputs did fall in Germany at an average 2.4% per year from the last half of 1970's into the first half of 1990's. In US the decline was at 1.3% per year.

A more recent evidence on the role of trade is put forward by Feenstra and Hanson (1999) who develop an empirical framework to assess the importance of trade and technical change on the wages of production and nonproduction workers. Trade is measured by the foreign outsourcing of intermediate inputs, while technical change is measured by the shift towards high-technology capital such as computers. They find that both foreign outsourcing and expenditures on high-technology equipment can explain a substantial amount of the increase in the wages of nonproduction (high-skilled) relative to production (low-skilled) workers that occurred during the 1980s. Surprisingly, it is expenditures on high-technology capital other than computers that are most important. These results are very sensitive, however, to their assumption that industry prices are independent of productivity. When, for instance, they allow for the endogeneity of industry prices, then expenditures on computers becomes the most important cause of the increased wage inequality, and have a 50% greater impact than does foreign outsourcing.

4.4.3 Deunionization and Organizational Change

Amanda Gosling, Thomas Lemieux (2001) compare trends in male and female hourly wage inequality in the United Kingdom and the United States between

1979 and 1998. They find that the pattern of wage inequality became increasingly similar in the two countries during this period. They attribute this convergence to 'U.S. style' reforms that have taken place during that period in the U.K. labour market. The inequality in UK,just like deunionization, has increased faster than the US during the same period. For women, we conclude that the fall and subsequent recovery in the real value of the U.S. minimum wage explains why wage inequality increased faster in the United States than in the United Kingdom during the 1980s, while the opposite happened during the 1990s. Interestingly, the introduction of the National Minimum Wage in the U.K. in 1999 also contributed to the convergence in labour market institutions and wage inequality between the two countries.

Card, Lemieux, Riddell (2003) present a comparative analysis of the link between unionization and wage inequality in the U.S., the U.K., and Canada. Their main motivation is to see whether unionization can account for differences and trends in wage inequality in industrialized countries. They focus on the U.S., the U.K., and Canada because the institutional arrangements governing unionization and collective bargaining are relatively similar in these three countries. The three countries also share large non-union sectors that can be used as a comparison group for the union sector. Using comparable micro data for the last two decades, we find that unions have remarkably similar qualitative impacts in all three countries. In particular, unions tend to systematically reduce wage inequality among men, but have little impact on wage inequality for women. They conclude that unionization helps explain a sizable share of cross-country differences in male wage inequality among the three countries. They also conclude that de-unionization explains a substantial part of the growth in male wage inequality in the U.K. and the U.S. since the early 1980s.

4.4.4   US vs Europe

Contrary to US there was almost no change in wage inequality in continental European economies. (Nickel and Bell,1996). The skill premia have mostly remained constant. Among the answers given by the economists the following are the most common:

i) the relative supply of skills have increased faster than US

ii) wage bargaining instituitions have prevented inequality from increasing

The first explanation claims that the more rapid increase in the realitive supply of skills prevented the skill premia from increasing. The second explanation emphasizes the role of wage setting instituitions, which indirectly control the employment of the skilled. Firms respond to wage bargaining by reducing their demand for the unskilled and by increasing the relative employment of the skilled workers. As a result , the low skill workers wages are higher in equilibrium and their employment is lower. Using the Luxembourg Income Studies Data and a relative supply-demand framework Acemoglu (2002) finds evidence supporting both answers.

4.5   Growth, Inequality and Employment

Another major issue to consider is how the benefits brought about by growth are shared by different classes of the society. The emergence of the political

5   Conclusion

In this survey I reviewed the evolution of the Kuznets process and the recent theoretical and empirical findings in the literature. It turns out that although

the negative relation between inequality and growth is now well established in the literature, there are still discrepancies in the recent empirical findings. As a possible solution I propose to emphasize the effect of demand patterns,caused by inequality, on innovative activities, hence growth.

Most of the time economic growth is accompanied with a widening income distribution One good example is the post-war U.S. economy which has steadily experienced an increase in per-capita income and income inequality at the same time in the last 25 years. The feature of this phenomenon is that the inequality remains increased no matter how narrowly one defines observable control groups such as experience, education,gender,race,industry,occupation,etc. Interestingly,the investment specific technological change has also rapidly increased during the same period. These two characteristics of the observed data suggests that the explanations based on the nature of new frontier technology adoption and learning by doing are more plausible. Other explanations of the rising wage inequality include trade liberalization and deunionization.

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