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Work organization, preferences dynamics and the industrialization process

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ABSTRACT

In this article, the industrialization process can be regarded as the transition from traditional to modern and more coercive work organizations. Workers are heterogeneous (autonomous or non-autonomous) and according to their preferences they choose between these two organizational forms. In addition, preferences evolve through intergenerational transmission mechanisms. This setting allows for a reciprocal interplay between the evolution of workers' autonomy and the industrialization process that generates multiple development paths. Thus, the initial degree of autonomy within the workforce may have long-run implications for the level of industrialization. Finally, taking into account a complementarity between autonomy and incentives to invest in human capital, we conclude to a non-monotonic impact of workers' autonomy on the growth process.

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1. Introduction

The Industrial Revolution paved the way for an unprecedented period of economic growth and technological evolutions. An extensive literature has been developed dealing with the sources and consequences of these economic transformations. However, this economic literature often neglects one major aspect of the Industrial Revolution, which is the dramatic change in workers' environment. Indeed, the industrialization process came along with the appearance of new organizational forms requiring that workers leave home production in order to join large scale factories, characterized by new paces and high discipline and supervision. These organizational evolutions generated resistance movements of a significant proportion of workers, attached to the independence allowed by traditional modes of production (see, for instance, Berg, 1985 or Mokyr, 2002). In turn, many scholars, following Marx's writings, argue that those changes in work organization strongly affected values and preferences within the workforce (see Inglehart and Baker, 2000 and references therein).

The present article develops a theoretical framework in which industrialization explicitly comes with organizational transformations that are more or less accepted by workers according to their preferences for autonomy. Moreover, we consider that workers' preferences are endogenous and evolve through intergenerational transmission mechanisms. This framework allows for a reciprocal interplay between the cultural evolution of workers' autonomy and the industrialization process, which generates multiple development paths. Hence, the initial degree of autonomy within the workforce may

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have long-run implications for the industrialization level; in turn, the industrialization process influences the prevalence of autonomy within the population. The main ingredients of the model are sketched below.

There exist two sectors of production, the *traditional* one and the *modern* one. They differ in terms of productivity but also in work organization. In the traditional sector, individuals work at home or in small scale industries. Conversely, the modern sector encompasses large scale factories using technology intensively and characterized by a deep labor division associated with strong supervision and discipline. Since the modern sector is technology intensive, technological progress is biased in favor of factories. Finally, we consider the existence of externalities in the modern sector: the production process in factories induces learning-by-doing, such that the technological level in the economy is positively related to the size of this sector. This learning-by-doing effect allows for endogenous growth.

The workforce is heterogeneous since workers may be either *autonomous* or *non-autonomous*, autonomous individuals value more the degree of freedom in the workplace than non-autonomous ones. Formally, autonomous workers suffer a higher work disutility in the modern sector, this additional disutility being associated with coercive work conditions within factories. Consequently, wages offered by the modern sector have to be sufficiently high to attract autonomous individuals. The distribution of preferences is not static, it evolves over time *via* intergenerational transmission mechanisms. Following, Bisin and Verdier (2001) parents make effort in order to transmit their preferences to their children. Since parents are altruistic, their effort depends on the utility they expect for their offspring. In particular, if they expect that autonomous children will choose the traditional sector while children socialized with non-autonomous preferences will join the modern one, incentives to transmit autonomy depend on the wage gap between the two sectors. If this gap is too high, parents anticipate that the factory system is likely to supplant traditional organizations, and the transmission of autonomy falls.

Interactions between technological and organizational changes on the one hand, and evolution of preferences on the other hand, allow us to shed light on the role played by workers' preferences for autonomy in the industrialization process. Indeed, the complementarity between the modern sector growth and the diffusion of non-autonomous behaviors may induce a property of multiple development paths. If it is the case, the initial proportion of autonomous workers crucially determines the long-run situation reached by the economy. If this proportion is high, the workforce willing to join factories is limited and the size of the modern sector is small. Few possibilities of learning-by-doing occurs and technological improvements in this sector are slow. Then, autonomous parents estimate that the wage premium is far to compensate for the coercive conditions in factories and have strong incentives to transmit autonomy in order to prevent their offspring from becoming factory workers. Finally, the proportion of autonomous remains high and the modern sector cannot expand; thus the economy ends-up with a low-industrialized equilibrium. Conversely, if the workforce is initially less autonomous, the size of the modern sector is larger and the technology grows fast. Since technological improvements benefit more to factories, incentives to transmit autonomy fall and the economy converges toward a continuous and fully industrialized growth path. Hence, our theory predicts that, in the absence of exogenous technological progress, cultural factors may impede the transition to modern growth. More broadly, the existence of some exogenous sources of growth does not rule out the role of individual attitudes. In particular, we show that even in the presence of exogenous technical changes, preference for autonomy plays a role on the delay of emergence of the modern sector. This result may be backed-up in the literature (see Randall, 1989 or Mokyr, 2002). Those economic historians highlight the role of workers' resistance to mechanization to justify the delays in industrial take-off experienced by different regions of Europe.

In the basic framework above exposed, more autonomy translates into a slower economic growth. This relationship may be mitigated by taking into account human capital acquisition. Skilled occupations give a greater emphasize to workers' initiatives, then skills and autonomy may be regarded as complementary. In that case, autonomous workers have stronger incentives to invest in human capital. In turn, skills acquisition fosters innovations and economic growth. We show that, this opportunity to invest in training may lead to a non-monotonic relationship between workforce autonomy and economic growth. At the beginning of the Industrial Revolution, an economy industrializes and then grows faster if the proportion of autonomous workers is low. Indeed, it gains an advantage to have a population more prone to accept the coercion associated with new organizational forms. However, when the economy becomes fully industrialized, further economic developments are driven by investment in human capital. At this stage, more autonomy among the workforce triggers skill acquisition and fosters economic growth.

Our paper is related to the theoretical literature on the economics of the Industrial Revolution (see Galor and Weil, 2000; Hansen and Prescott, 2002; Cervellati and Sunde, 2005 or Galor and Moav, 2006). Recent contributions to this field often put human capital accumulation at the hearth of the industrialization process. For instance, Galor and Weil (2000) argue that technological change raises the rate of return of human capital while, in turn, more human capital triggers technological innovations; alternatively Galor and Moav (2006) consider a complementarity between human and physical capital, such that the industrialization boosts the demand for education. However, if industrialization is also regarded as an evolution of work organization, it is not clear that formal education is the unique kind of skill rewarded in early factories. As pointed out by Mokyr and Voth (2009), the rise of factory system required discipline, punctuality and respect, in addition to literacy and numeracy.¹ In the present article, we assess the importance of those kinds of 'skills' since the

¹ Berg (1985) or Mokyr (2002) argue that the integration of women and children to the factory workforce during the Industrial Revolution is partly explained by the greater docility characterizing such kind of workers.

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