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Proto-industrialization: The First Phase of the Industrialization Process

The Industrial Revolution is the Rise of Modern Industry, not the rise of industry as such.

Sir John Hicks, *A Theory of Economic History*, p. 141

WELL before the beginning of machine industry, many regions of Europe became increasingly industrialized in the sense that a growing proportion of their labor potential was allocated to industry.[1] Yet, that type of industry—the traditionally organized, principally rural handicrafts—barely fits the image one has of a modernizing economy. There is, however, cognitive value as well as didactic advantage in thinking of the growth of "pre-industrial industry" as part and parcel of the process of "industrialization" or, rather, as a first phase which preceded and prepared modern industrialization proper.

This first phase which, for lack of a better name, I will call proto-industralization was not only marked by the rapid growth of traditionally organized but market-oriented, principally rural industry.[2] It was also accompanied by changes in the spatial organization of the rural economy which will be described below. The second phase of modern, factory, or machine industrialization corresponded to mechanisms of economic change which were in sharp contrast with those of the first phase. In this context, the concept of "industrial revolution" could thus refer to the theoretical instant when an economy enters into phase two.

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[1] Rather than attempting to present even an *aperçu* of the historiography of this subject, I refer readers to Domenico Sella's excellent *European Industries 1500-1700, The Fontana Economic History of Europe*, Carlo M. Cipolla, (ed.), Vol. II, Sec. 5 (London: Collins, 1970); Hermann Kellenbenz, "Les industries rurales en Occident de la fin du Moyen Age au XVIIIè siècle," *Annales E. S. C.*, XVIII (1963), 833-82; and C. T. Smith, *An Historical Geography of Western Europe until 1800* (London: Longmans, 1967), chs. vii and x.

[2] Herman Freudenberger and Fritz Redlich have previously utilized the term "protofactory" in "The Industrial Development of Europe: Reality, Symbols, Images," *Kyklos*, XVII (1964), 372-402. By this term they refer to pre-factory centralized manufacturing plants.

In traditional Europe, the mass of the population derived its wealth and social status from the land. The extraction of the earth's produce had priority over all other activities. It was, however, rigidly constrained by the seasonal rhythm of nature. In temperate agriculture most crops have to be harvested within a very short period of time and the annual demand for labor is thus compressed into rather short intervals.[3] This resulted in the remarkable paradox that even areas with high population density and various other symptoms of population pressure experienced the annual dilemma of the summer crisis—the shortage of harvest labor.[4] It is in this context that the role of rural industry consisted of improving the time pattern of rural employment, not so much increasing the productivity of labor as increasing the productivity of workers. For, from the invention of the spinning wheel in the twelfth century to the adoption of the fly shuttle—that is, not before the 1760's in England—labor productivity did not change much in textile production. The stocking frame, the ribbon frame, and the mechanical silk mill were not important enough to outweigh basic technical stagnation in this largest of all European industries.[5] The adoption of industry by a growing number of peasants during proto-industrialization meant that labor previously unemployed or underemployed during a part of the year was put to work on a more continuous basis.

This had positive impact on aggregate and *per capita* output. There is evidence, however, that in most cases the peasants who became weavers were at the bottom of the social scale and remained there.[6] They were those who had not enough land to eke

[3] Nicholas Georgescu-Roegen, "The Economics of Production," *American Economic Review, Papers and Proceedings*, LX (1970), 1-9; H. A. Luning, *Economic Aspects of Low Labour-Income Farming* (Wageningen: Centre for Agricultural Publications and Documentation, 1967); Franklin Mendels, "Industrialization and Population Pressure in Eighteenth-Century Flanders," (unpublished dissertation, University of Wisconsin, 1969), pp. 112ff.

[4] It is thus interesting to note that, according to Peter Timmer, the "agricultural revolution" increased the labor-intensiveness of the main agricultural processes but did not further increase summer peak loads. I have found, however, that such peak-loads were increased by flax and potato cultivation in Flanders. See C. Peter Timmer, "The Turnip, the New Husbandry, and the English Agricultural Revolution," *Quarterly Journal of Economics*, LXXXIII (1969), 375-95; Mendels, "Industrialization and Population Pressure," pp. 134-38.

[5] Walter Endrei, *L'évolution des techniques du filage et du tissage du Moyen Age à la rèvolution industrielle* (Paris: Mouton, 1968); Sella, *European Industries*, pp. 50-1.

[6] Pierre Goubert, "The French Peasantry in the Seventeenth Century, A Regional Example," in T. Aston (ed.), *Crisis in Europe, 1560-1660* (New York: Anchor, 1967),

out a living for their family after rent and taxes were deducted from gross output. There were, however, opportunities for the accumulation of capital in the hands of urban merchant entrepreneurs for further expansion of an industrial system of this nature.[7] Fixed investments were not a prerequisite for the success of enterprise. Mercantile capital was basically in the form of raw materials, goods in process, and accounts receivable. For the basic tools in most industrial processes were simple. In eighteenth-century Flanders, a linen loom cost only 600 to 800 groten and could last for sixty years.[8] (A family of five could earn approximately 34 groten *per diem* on weaving and spinning, net of the cost of raw materials.) Other instruments, such as the spinning wheels, were quite inexpensive; even the poorest cottagers could own several of them. Sunk capital costs were thus negligible.[9]

Nevertheless, growth was limited. When the demand for English textile products rapidly increased in the late eighteenth century, the urban entrepreneurs began to feel rapidly mounting costs, that is to say, cost curves moved to the left. The division of labor time between agriculture and industry, with absolute priority for agricultural work whose demands were regulated by the weather, necessarily limited the production capacity of each cottage. Expansion then involved the increasing dispersion of workers and a growing distance between "management" and the workers.[10] An

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pp. 127-8; K. Roessingh "Beroep en bedrijf op de Weluwe in het midden van de achttiende eeuw," *A. A. G. Bijdragen*, No. 13 (1965), 204 and Bernhard Slicher van Bath, "Historical Demography and the Social and Economic Development of the Netherlands," *Historical Population Studies, Daedalus* (Spring, 1968), 616; Duncan Bythell, *The Handloom Weavers* (London: Cambridge University Press, 1969), pp. 42-3, 270; Paul Deprez, "De Kasselrij von de Oudburg in de 18de eeuw" (Unpublished dissertation, University of Ghent, 1960), and Mendels, "Industrialization and Population Pressure," pp. 198ff.

[7] There were some areas with particularly favorable social and political structure where some rural weavers accumulated capital to eventually become the launchers of the factory system. E.g., Rudolf Braun, "The Rise of a Rural Class of Entrepreneurs," *Journal of World History*, X (1967), 551-66.

[8] Mendels, "Industrialization and Population Pressure," p. 202.

[9] There was, moreover, an absence of the costs attendant to the migration of large numbers of workers, the construction of housing for them and the provision of amenities (however minimal) which were later required for urban industrialization while capital losses were incurred in the countryside when farm houses were abandoned by migrants.

[10] David Landes, *The Unbound Prometheus* (Cambridge, England: Cambridge University Press, 1969), pp. 57ff; Neil Smelser, *Social Change and the Industrial Revolution* (Chicago: University of Chicago Press, 1959); Sidney Pollard, *The Genesis of Modern Management* (Baltimore: Penguin, 1968), pp. 42-50 and chap v.

observer gives the following account of such pressures for technical change in Verviers, the renowned woolen center near Liège:

> Numerous and unreasonable thefts of which the manufacturers are constantly the victims on the part of the spinners, the inconvenience of not having them under his surveillance and at hand, the interruption in production which can result from delays in spinning and paralyze all other processes, suggested three years ago to Citizen Simonis a plan to enfranchise himself from dependence on the spinners; he cast his eyes on an Irish mechanic who had first successfully practiced his art in Sweden [and hired him to erect a mill in Verviers].[11]

Moreover, cost curves were comparatively steep insofar as fuels and raw materials, timber or water resources, depended in their production on natural forces which caused restrictions on the annual rate of their exploitation as well as its seasonal distribution. Thus, numerous water mills in the mountains had to stop in the summer when rivers were dry or in the winter when they were frozen.[12] It is in the context of these obstacles that the technical industrial innovations of the eighteenth century appeared and were adopted.

Limitation on the side of production costs eventually created the necessity for radical changes in production functions. On the other hand, proto-industrialization had created an accumulation of capital in the hands of merchant entrepreneurs, making possible the adoption of machine industry with its (relatively) higher capital costs. It further helped to form an entrepreneurial class and entrepreneurial skills which played a large role in the beginning of modern industrialization. For a large fraction of the first English textile factory builders were former merchants.[13] Similarly, many of the machine builders of the industrial revolution in England had been trained in the old handicraft industrial sectors, and they were in intimate contact with the scientific advances of their time.[14]

[11] Constans, *Tableau politique du département de l'Ourte* (sic) (Brussels, 1801), pp. 86-7 (translation mine).

[12] A vivid description of the seasonal character in the Ural iron foundries has been made by Roger Portal in *L'Oural au XVIIIè siècle* (Paris: Institut d'Etudes Slaves, 1950), pp. 241-45. For the continued attachment of Russian factory workers to the demands of the village see Theodore von Laue, "Russian Peasants in the Factory," THE JOURNAL OF ECONOMIC HISTORY, XXI (1961), 70-80.

[13] See S. D. Chapman, *The Early Factory Masters* (Newton Abbott: David and Charles, 1967); also Gerhard Adelmann, "Structural Change in the Rhenish Linen and Cotton Trades at the Outset of Industrialization," in François Crouzet *et al.* (eds.), *Essays in European Economic History* (London: Arnold, 1969), p. 97.

[14] A. E. Musson and Eric Robinson, *Science and Technology in the Industrial Revolution* (Manchester: Manchester University Press, 1969).

Finally, a market was created during this phase for agricultural goods among the growing section of the population that was no longer entirely self-sufficient in food. The specialization which resulted from the fact that some regions turned to industry, while others developed their commercial agriculture to supply the needed food surpluses, set the stage for the next phase; here industrialization was accompanied by large-scale urbanization and the food surpluses, therefore, had to be much larger.[15]

Such are the reasons why phase two was facilitated by prior proto-industrialization. These links were fully at work in the leading industrial regions, mostly in Britain. The followers, however, were subject to exogenous forces, namely the British challenge, which in part superseded the forces enumerated above.[16] But even in such cases of relatively backward continental regions, prior proto-industrialization tended to induce the passage to modern industry. It was precisely the entrepreneurs engaged in putting out and the workers who had come to depend for their sustenance on manufacturing who felt the brunt of the British lead in manufacturing. Those who had remained isolated from market forces and those who had become fully specialized in commercial agriculture did not feel the necessity of turning to modern industry as much as those who had been depending on handicrafts. Governments sometimes found it wise to encourage the growth of modern industry at this point to absorb the unemployment generated by the decadence of the old, labor-intensive rural industries. When local skills were not sufficient, entrepreneurs or governments often invited foreigners to help build a modern industry. There are examples of this in Belgium, France, and Prussia in the first half of the nineteenth century.[17]

The force of the challenge from leading industrializers was thus bound to be all the stronger wherever proto-industrialization had advanced further. Moreover, the response to the challenge was likely to be most forthcoming where proto-industrialization had, as in the leading regions, created capital accumulation, market con-

[15] Eric Jones, "The Agricultural Origins of Industry," *Past and Present*, No. 40 (1968), 58-71. See below.

[16] This framework is borrowed from David Landes, *Unbound Prometheus*, pp. 126ff.

[17] W. O. Henderson, *Britain and Industrial Europe* (Liverpool: Liverpool University Press, 1954); Landes, *Unbound Prometheus*, pp. 138, 149, 151; Peter Stearns, "British Industry through the Eyes of French Industrialists, 1820-1848," *Journal of Modern History*, XXXVII (1965), 50-61; Adelmann, "Structural Change," p. 86.

nections, entrepreneurial skills, and agricultural progress. This is why modern industry tended to locate itelf then, even when a change in product specialization was involved, in the regions where there had been handicraft industry before.[18] Exceptions to this can be explained by special circumstances, generally the discovery or linking of new fuels or raw materials, such as in the Campine, Lorraine, or Krivoi Rog where entirely new industrial regions would be created.

Nonetheless, some regions became "de-industrialized" at this point, for instance much of the west of France which had previously developed export-oriented textile industries. It is thus clear that whereas proto-industrialization preceded factory industrialization where the latter occurred, and paved the way for it, there was nothing unavoidable or automatic in the passage from phase one to the next. The history of Alsace, the Rhineland, the area around Lille, or around Ivanovo provide examples of regions which accomplished a rapid transition with relative success. Ulster, Silesia, Brittany, and Flanders could similarly be ranked on a continuum of relative failure in achieving the transition. A similar development of rural industry in phase one could thus lead to broad differences in the extent and pace of industrialization in phase two. Natural resource availability, the location of the essential new fuels and raw materials and, above all, the socio-political framework, determined the success with which the transition was effected under the tensions introduced by the industrial revolution in the advanced regions. The extent of capital accumulation as well as the political and social terrain in which it took place and the personnel in whose hands it fell determined very much the course of future (factory) industrialization.[19]

It must be noted at this point that the role of handicrafts did not cease upon the end of the phase of proto-industrialization. The old crafts sometimes adapted themselves to the new industry; they shifted to areas and specialties which had not yet been mechanized

[18] For industrial maps of Germany, see Wolfgang Zorn, "Eine Wirtschaftskarte Deutschlands um 1820 als Spiegel der gewerblichen Entwichklung," in Friedrich Lütge (ed.), *Wirtschaftliche und soziale Probleme der gewerbliche Entwicklung im 15.-16. und 19. Jahrhundert* (Stuttgart: Fischer, 1968), pp. 142-55; for Russia, W. H. Parker, *An Historical Geography of Russia* (London: Athlone Press, 1968), *passim.*

[19] Herbert Kisch, "The Textile Industries in Silesia and the Rhineland: A Comparative Study in Industrialization," THE JOURNAL OF ECONOMIC HISTORY, XIX (1959), 541-63; Tom Kemp, *Industrialization in Nineteenth-Century Europe* (London: Longmans, 1969).

and adopted new tools and new sources of power, such as electricity. Moreover, new crafts were created to cater to the new demands of the rising factory system (subcontracting) or to service its products. The protracted persistence of the old techniques and organization in the face of the intrusion of the new ones has been noted and described by David Landes.[20] Quantitative work for France and Germany shows the continuation of expansion in the handicraft sector until late in this century.[21] A similar persistence of handicrafts and traditionally organized industries had attracted the attention of historians of Japan as well.

So far, rural industries were described within a process of industrialization which is divided into two phases. For this exercise—phase building—to be fruitful, Simon Kuznets rightfully set forth certain criteria:[22] first, a given phase must possess empirically measurable characteristics. These characteristics and their combination must be unique to that phase; or, in other words, simple precedence in time cannot suffice to define a phase. The analytical relationships with the preceding and the following phase must be indicated. From this list what remains is to identify empirically and explain theoretically the *beginning* of phase one. Since there have always been rural industries of some sort, the phase of proto-industrialization could appear so drawn out that it would lose any significance as a recognizable historical period.[23] Can one find a criterion for the beginning of phase one which would be as visible and concrete as the one we have for the beginning of phase two? At this point, one can only suggest some tentative guidelines mostly suggested by Eric Jones' observations.[24]

Between the sixteenth and the eighteenth centuries, many regions previously engaged in agricultural production *cum* part-time in-

[20] Landes, *Unbound Prometheus*, p. 260.

[21] T. J. Markovitch, *L'industrie française de 1789 à 1964, Cahiers de l'Institut de Science Economique Appliquée*, AF 7, No. 179 (1966); Wolfram Fischer and Peter Czada, "20th Century Changes in the Structure of German Industry," a paper prepared for the 4th International Conference of Economic History, Bloomington, 1968 (mimeographed summary); Wolfram Fischer, "Die Rolle des Kleingewerbes im Wirtschaftlichen Wachstumprozesz in Deutschland, 1850-1914," in Lütge, *Wirtschaftliche un soziale Probleme*; Fischer, "Das Deutsche Handwerk in den Frühphasen der Industrialisierung," *Zeitschrift für die gesamte Staatswissenschaft*, CXX (1964), 686-712.

[22] Simon Kuznets, "Notes on the Take-Off," in W. W. Rostow, (ed.), *The Economics of Take-Off Into Sustained Growth* (London: Macmillan, 1963), pp. 23-4.

[23] In contrast, the beginning of phase two is relatively easy to identify in a given city, industry, or region.

[24] Jones, "Agricultural Origins."

dustry now shed their industries and began to purchase industrial products in other regions while they became specialized in commercial agriculture. Neighboring regions, meanwhile, experienced rapid growth in their rural handicrafts whose products were no longer destined for the immediate local market but for regional, national, or international trade. In addition to the examples already provided by Eric Jones, one can now cite the case of the maritime provinces of the Northern Low Countries, where Jan de Vries has shown how this process took place in the context of urbanization and population growth in the sixteenth and seventeenth centuries.[25] Saxony, Lusatia, and Northern Bohemia saw an expansion of their textile production in the last quarter of the sixteenth and the beginning of the seventeenth century. The industrial products were then exported to Poland, Hungary, and Austria, in exchange for the food which the latter were able to export.[26] It is these phenomena which provide a quasi-empirical definition of the beginning of proto-industrialization. In certain cases where the decline of rural industry can be measured in absolute terms, the identification of the beginning of phase one is a reasonable task. Unfortunately, such is not always the case. The more advanced European regions, such as Flanders or England, are difficult to analyze from this vantage point since they experienced not one, but several broad changes in their spatial organization since the Middle Ages.[27]

[25] Jan de Vries, "The Role of the Rural Sector in the Expansion of the Dutch Economy, 1500-1700" (unpublished dissertation, Yale University, 1970).

[26] Joseph Petraň, "A propos de la formation des régions de la production spécialisée en Europe centrale," *Second International Conference of Economic History, Aix-en-Provence 1962* (Paris: Mouton, 1965), pp. 217-22. From a Japanese farmer's long diary which has been exploited by Thomas C. Smith, we learn of a similar abandonment of hemp production for home consumption in one village while it is increased in another province in the eighteenth century. T. C. Smith, *The Agrarian Origins of Modern Japan* (Stanford: Stanford University Press, 1959). The central importance of traditional industries in the process of industrialization has not escaped the attention of historians of Japan. Kazuki Ohkawa and Henry Rosovsky have stressed not only their persistence, which had already attracted the attention of W. W. Lockwood, but their positive contribution, particularly during the phase of "Initial Modern Economic Growth" (1886-1905). Ohkawa and Rosovsky, "A Century of Japanese Economic Growth," in W. W. Lockwood, (ed.), *The State and Economic Enterprise in Japan* (Princeton: Princeton University Press, 1965), pp. 47-92. On the bimodal distribution of industrial employment which resulted in Japan—and Europe as well—due to the persistence of handicrafts during modern industrialization, see David Landes, "Japan and Europe: Contrasts in Industrialization," in *ibid.*, p. 174.

[27] Henri Pirenne, *Economic and Social History of Medieval Europe* (New York: Harcourt, Brace and Co., 1937); C. T. Smith, *Historical Geography*, chap. vii; Eleanor Carus Wilson, *Medieval Merchant Venturers* (London: Methuen, 1967), chap. iv.

When, finally, one tries to establish causal links between the beginning of phase one and the epoch that preceded it, there can, of course, be no simple answer. Jan de Vries has argued that it was population growth—exogenously determined—which initiated this mechanism in the Low Countries.[28] For Eric Jones, however, it was a slowing down of demographic increases in the late seventeenth century which caused a fall in grain prices and a need to look for agricultural techniques to overcome the ill effects of such a trend on profits. As the new techniques were more adaptable to certain terrains (light soils), they created a redistribution of the comparative advantage of various regions for arable farming.[29] At the same level of generality, Eric Hobsbawm's work provides the alternate suggestion that the beginning of the "new colonialism" in the seventeenth century provided Europe, or at least the regions of Europe which were opened to its trading links, with the kinds of impulse which could result in regional specialization.[30] The form of the response of different regional units to this common impulse was determined by their peculiar institutional and geographic structure at that time.[31]

PROTO-INDUSTRIALIZATION AND DEMOGRAPHY

In the study of the economic determinants of demographic equilibrium and change in early modern Europe, historical demographers have almost exclusively focused on cereal output and prices as indicators of economic fluctuations in the countryside. This has led to the establishment of the concept of subsistence crisis, which follows logically from Ernest Labrousse's influential thesis that high grain prices were the source of short-run deteriorations in income for the mass of the population in France in the Ancien

[28] de Vries, "Role of Rural Sector."

[29] Jones, "Agricultural Origins" and Jones, "English and European Agricultural Development, 1650-1750," in R. M. Hartwell, (ed.), *The Industrial Revolution* (Oxford: Blackwell, 1970), pp. 42-76.

[30] Eric Hobsbawm, "The Crisis of the Seventeenth Century," in Aston, *Crisis in Europe,* pp. 53-6. This would be consistent with the model which was established by Stephen Hymer and Stephen Resnick and purports to analyze the disappearance of rural handicrafts for home consumption and their replacement by the products of specialized manufacturing centers. Under this model, the opening up of a country to foreign trade is one of the forces that could promote such specialization. Hymer and Resnick, "A Model of an Agrarian Economy with Non-Agricultural Activities," *American Economic Review,* LIX (1969), 493-506.

[31] As Professor Landes commented at the Atlantic City meeting.

Régime.[32] Yet, rural industry was a form of activity which profoundly transformed the relationships between people and the land, even in traditional "pre-industrial" Europe.

An examination of short-run population mechanisms in Flanders for the eighteenth century by means of a standard multivariate regression analysis has shown that where rural industry was developed, nuptiality and sometimes fertility reacted to the ratio of grain to linen prices. In some cases, the correlation was higher between marriages and the price of linen than it was between marriages and rye prices, for example in a few villages around Erembodegem, southeast of Ghent, for annual data running from 1693 to 1795:[33]

$$M = .730 - .112\ M_{-1} - .024\ R - .045\ R_{-1} \qquad (1)$$
$$(-1.09) \quad (-.906) \quad (-1.83)$$
$$+ .004\ R_{-2} + .015\ R_{-3} + .034\ L + .374\ L_{-1}^{*}$$
$$(.163) \quad (.639) \quad (.326) \quad (3.47)$$
$$- .095\ L_{-2} + .046\ L_{-3};$$
$$(-.842) \quad (.427)$$
$$R^2 = .340;\ D.W. = 1.99;\ N = 103.$$

In this case the only significant coefficient was that of L_{-1}; the percentage change in the number of marriages—a proxy for the percentage change in the marriage rate—was positively correlated to changes in linen prices, with a one-year time lag, and not to changes in rye prices.

To reflect more accurately a situation where households exchanged linens for grain at the market and were price-takers in both com-

[32] Charles Ernest Labrousse, *La crise de l'économie francaise à la fin de l'Ancien Régime et au début de la Révolution* (Paris: Presses Universitaires de France, 1944); Labrousse, *Esquisse du mouvement des prix et des revenus en France au* XVIIIè *siécle* (Paris: Librairie Dalloz, 1933); Labrousse *et al., Histoire économique et sociale de la France,* Vol. II (Paris: Presses Universitaires de France, 1970), pp. 529-66.

[33] Mendels, "Industrialization and Population Pressure," p. 271.
M is the annual percentage change in the total number of marriages in the considered villages;
M_{-1} is the same variable lagged one year;
R is the annual percentage change in the price of rye in Ghent;
R_{-1}, R_{-2}, R_{-3} is the same variable lagged one, two, and three years;
L, L_{-1}, L_{-2}, L_{-3} is the annual percentage change in the price of linen in Spain and its lagged values;
N is the number of observations.
Numbers in brackets are t-coefficients.
Starred coefficients are significant at the 5 percent level of confidence.
The independent variable M_{-1} measures the tendency of marriages to fluctuate from year to year, which has often been noted by demographers.

modities, one should assume income changes to be a function of changes in the price of linens divided by the price of grain. Since the Flemish linen makers were in competition with other large linen producers and in competition with other regions for surplus grain, this household model could be applied to regional units as well if they were engaged in the same exchange system. Equation (2) shows what results from the application of this model to the same group of villages as was used for equation (1). Here it is shown that the linen-rye price ratio positively affected marriages, with a one-year lag:[34]

$$M = \underset{(1.948)}{.049} + \underset{(2.82)}{.185\,P_{-1}^{*}} - \underset{(-3.47)}{.321\,M_{-1}^{*}}; \qquad (2)$$
$$R_2 = .368; D.W. = 2.10; \mathrm{N} = 103.$$

If, however, one separates years with positive (favorable) price change from years with negative (unfavorable) price change, then:[35]

$$M = \underset{(.328)}{.015} + \underset{(2.74)}{.261\,PP_{-1}^{*}} - \underset{(-2.16)}{.326\,M_{-1}}; \qquad (3)$$
$$R_2 = .395; D.W. = 2.42; \mathrm{N} = 53;$$

$$M = \underset{(.101)}{.005} - \underset{(-.736)}{.173\,NP_{-1}} - \underset{(-2.62)}{.292\,M_{-1}^{*}}; \qquad (4)$$
$$R^2 = .329; D.W. = 2.10; \mathrm{N} = 50.$$

This separation, suggested by studies of the consumption function,[36] shows that certain conclusions can be drawn from short-run response mechanisms to their long-run consequences. For, whereas the linen-rye price ratio was shown to affect marriages positively (equation (2)), it also appears that marriages responded favorably to favorable (upward) changes in this ratio, when considered separately (equation (3)). On the other hand, when unfavorable (negative) changes in the price ratio are considered alone, they can be shown to be uncorrelated with marriages.[37] Thus, marriages did not respond

[34] P_{-1} is the annual percentage change in the linen/rye price ratio, where prices are measured in weight of silver, lagged one year.

[35] *PP* and *NP* are, respectively, positive and negative values of *P*. The same equations were run for six groups of industrial villages. In five cases, the findings were the same as those presented in equations 2, 3, and 4.

[36] See Daniel B. Suits, "The Determinants of Consumer Expenditures," Commission on Money and Credit, *Impacts of Monetary Policy* (Englewood Cliffs, N. J.: Prentice Hall, 1963), pp. 50-1.

[37] As expected, in Maritime Flanders, where rural industry was absent, but where

in a predictable way to downward changes in the price ratio; a good year would be followed by more marriages, but a bad year not necessarily by fewer. Since mortality does not seem to have caused a contrary influence and fertility tended to go up in the areas of rural industry during the eighteenth century, the asymmetry revealed in the statistical analysis can present the link which existed between the short-run fluctuation mechanism and the long-run population trends which have been observed.[38] Under conditions of random exogenous fluctuations, the populaton would tend to increase, irrespectively of the trend of prices.

In this way, cottage industry affected population trends. The development of a labor-intensive industry by the peasants made it possible for them to multiply in their villages without corresponding increase in arable surface. Such was the mechanism that Rudolf Braun and several other historians had already outlined.[39] On the other hand, it also appears that the expansion of rural manufacture took place in various areas in response to population growth.[40] There was mutual and continuing interaction between industrial and demographic growth and rural industrialization was not therefore generally accompanied by sustained increases in the standard of living of the peasants engaged in it.[41] The regions of proto-industrialization were also those where demographic growth was the most rapid, and it was not before the introduction of urban

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a highly developed commercial agriculture had planted firm roots, nuptiality was positively correlated with high grain prices, though not strongly and with an unexplained two-year lag. Demand for labor was here a direct function of the value of the marginal agricultural product. There was no correlation between marriages and linen. Mendels, "Industrialization," p. 271.

[38] See evidence for a falling age of marriage and population growth in Paul Deprez, "The Demographic Development of Eighteenth-Century Flanders," in D. V. Glass and D. E. C. Eversley, (eds.), *Population in History* (Chicago: Aldine, 1965), pp. 608-30.

[39] Rudolph Braun, *Industrialisierung und Volksleben: die Veränderungen der Lebensformen in einem ländlichen Industriegebiet vor 1800* (Zürich: Eugen Rentsch, 1960); a section of this translated in Braun, "The Impact of Cottage Industry on an Agricultural Population," in David Landes, (ed.), *The Rise of Capitalism* (New York: Macmillan, 1964), pp. 53-64; see also Jonathan D. Chambers, *The Vale of Trent, 1660-1800,* Economic History Review Supplement No. 3 (Cambridge, Eng., 1957); Phyllis Deane and W. A. Cole, *British Economic Growth 1688-1959* (Cambridge [England]: University Press, 1962), chap. iii; Paul Deprez, "Demographic Development"; E. A. Wrigley, *Population and History* (New York: McGraw-Hill, 1969), pp. 135-44.

[40] E.g., Joan Thirsk, "Industries in the Countryside," *Essays in the Economic and Social History of Tudor and Stuart England,* F. J. Fisher, (ed.), (Cambridge [England]: University Press, 1961), pp. 70-88.

[41] See above, p. 2.

factories that some of them began, after some lag, to escape from this "trap."

It seems that when modern industrialization began and the stage was set for urbanization and the inflow of labor into factories, the relationships between industrialization and population changes were quite different. Urban industrialization meant the specialization of household members, the separation of the workplace from the home, the separation of household members, and the need for literacy, that is, investment in human capital. In the cotton towns of England, these factors resulted in high infant mortality, a lower age of marriage, and a lower marital fertility.[42] The demonstration effect of cheap mass-produced goods made available in retail outlets and the real possibilities of upward social mobility intensified the incentives to adopt effective means of birth control within a few generations. Industrialization now meant the drastic movement of large numbers of people from an environment—cottage industry —which favored high fertility to one which favored birth control. Meanwhile, whereas the death rate tended to fall, it fell more slowly in the more congested, polluted, and generally unhealthy, environment of cities. Thus, after the onset of the phase of machine industry, industrialization tended to favor a slowing down in the national rates of natural increase.[43]

LABOR

The theoretical importance and policy implications of the concept of labor surplus has been an area of great interest in economic development for almost two decades.[44] Unfortunately, the discussions have been confined to the framework of two-sector models contrasting backward, or traditional agricultural sectors with initially small but modern capitalistic industrial sectors to which the labor force is attracted. John Fei and Gustav Ranis mention in passing that the development of an industrial sector in the countryside in the form of cottage industry would facilitate the process of economic development which they analyze. But this point is not

[42] See Margaret Hewitt, *Wives and Mothers in Victorian England* (London: Rockliff: 1958).

[43] Dov Friedlander, "Demographic Responses and Population Change," *Demography*, VI (1969), 359-81.

[44] A recent survey can be found in Warren C. Robinson, "Types of Disguised Rural Unemployment and Some Policy Implications," *Oxford Economic Papers*, XXI (1969), 373-86.

generally elaborated and there is no stress on the mechanism of the growth and demise of cottage industries supplanted by the factory system.[45]

The debate surrounding labor surplus models centers on the question whether labor is really available in a given developing country at no opportunity cost, in other words, whether labor can be moved into the industrial sector without creating persistent food scarcities. In the present framework, the two phases offer an important distinction. During proto-industrialization, the surplus labor from the slack season is used, so there is no such economic problem as that of "withdrawing" labor from one sector to another.[46] In this phase, therefore, the surplus labor model can be made realistic and useful.

This is ture whether there is an actual labor shortage at the peak season or not. Historical experience shows that tight labor markets have prevailed even in situations of population pressure, labor surplus, and widespread unemployment. The existence of seasonal shortages does not preclude the existence of seasonal surpluses which can be tapped at no opportunity cost for (pre-factory) industrialization.[47]

It is during the phase of modern industrialization only that the availability of labor for industry at no opportunity cost remains an issue. When the expansion of rural industries began to slow down in the face of competition from machine industry, an increased part of the labor force had to move to the city. These migrations were seasonal or temporary at first but eventually agriculture lost a part of its buffer and labor scarcities were perceived; the more so if new crops and new agricultural techniques were

[45] John C. H. Fei and Gustav Ranis, *Development of the Labor Surplus Economy* (Homewood, Ill.: Irwin, 1964), pp. 145, 168.

[46] Arthur Young wrote on the contrary "that when the fabrics spread into all the cottages of a country, as in France and Ireland, such a circumstance is absolutely destructive of agriculture." But this is a fallacious conclusion from his own observations of the existence of specialization between purely commercial agricultural regions and regions with rural industry and subsistence farms: "that the manufacturing districts in France and England are the worst cultivated. That the best cultivation in England, and some of the best in France, must be looked for where no manufactures are found." By "best" he meant large farms producing for the market. Arthur Young, *Travels in France during the Years 1787, 1788, and 1789*, Jeffry Kaplow, (ed.), (New York: Anchor 1969), p. 437 and *passim*.

[47] E. J. T. Collins, "Labour Supply and Demand in European Agriculture, 1800-1880," in Eric L. Jones and S. J. Woolf, (eds.), *Agrarian Change and Economic Development: the Historical Problems* (London: Methuen, 1969), pp. 61-94 and sources cited in fn. 3 above.

becoming more labor-intensive or seasonally unbalanced. But such scarcities could be relieved by technical change in the form of labor-saving instruments.[48] Meanwhile, whether urban industries could or could not benefit from unlimited supply of labor depended on the mechanism under which the rural industries contracted and the rate at which they were doing so.[49] It depended also on the rate at which urban labor demand was moving.

For the Japanese case, K. Ohkawa and Henry Rosovsky argue that the contraction of the traditional sector contributed an unlimited supply of labor to the modern sector at least until 1930.[50] In the French case we find no sustained increase, but perhaps even a decline in the average real wage until the 1850's.[51] This could be the mark of the passage for the French economy into a "neoclassical" full employment growth mechanism. For Belgium, Neyrinck's figures on real industrial wages show no sustained increase until the mid-1860's, which is also the decade of most rapid industrial growth according to the recent work of Pierre Lebrun.[52]

CAPITAL

Labor demand in factory industry is constrained by the availability of circulating capital, a form of capital whose gestation period is the same as that of the production process. As Sir John Hicks pointed out, the essential difference between modern factory industry and handicraft industry resides in the composition of capital.[53] In pre-factory industry the principal form of capital was

[48] Collins, *ibid.*

[49] *Mutatis mutandis*, there is much to be learned here, from Hymer and Resnick, "Model of an Agrarian Economy."

[50] Ohkawa and Rosovsky, "Century of Japanese Economic Growth," p. 81; Henry Rosovsky, "Relations between Traditional and Modern Societies," 4th International Conference of Economic History, Bloomington, 1968 (mimeographed).

[51] Jean Lhomme, *Economie et histoire* (Geneva: Droz, 1967), chap. iv and Maurice Lévy-Leboyer, "La croissance économique en France au XIXè siècle," *Annales E. S. C.*, XXIII (1968), 795.

[52] M. Neyrinck, *De lonen in België sedert 1846* (Louvain, 1944), p. 182; Lebrun's work is reported in Robert Devleeshouwer, "Le Consulat et l'Empire: période de 'take-off' pour l'économie belge?" *Revue d'histoire moderne et contemporaine*, XVII (1970), 611-19.

[53] John R. Hicks, *A Theory of Economic History* (London: Oxford University Press, 1969), chap. ix, "The Industrial Revolution." For empirical evidence, Sidney Pollard finds that: "What was noteworthy was not so much the absolute (and probably also the relative) growth in the quantity of capital, but a change in its composition: the emergence, for the first time, of large concentrations of fixed capital." Sidney Pollard, "Fixed Capital in the Industrial Revolution," THE JOURNAL OF ECONOMIC HISTORY, XXIV (1964), 299. See also Pollard, "The Growth and Dis-

circulating capital, although one could undoubtedly distinguish within pre-factory industry forms which were relatively intensive in capital (for example the centralized manufactories) from the others which made a relatively extensive use of it. In this sense the distinction between the artisan and the pure trader is not economically important.[54] The artisan bought and sold, and was a kind of specialized trader. The important point, as Hicks shows elsewhere, is that this economic structure corresponds with the specification of the Smithian and Ricardian theories of economic growth, where all capital is circulating. With the switch to the factory system and to fixed capital, the economy moves from a Smith-Ricardo growth mechanism to a much more complex one.[55]

Under the Classical model, the dynamics of growth which stem from the link between each production period are simple.[56] Production in one year is only limited by the wage fund which is left from the previous year's net product. When we have factories, machinery, and other capital goods that outlast the production period—in other words fixed capital—then there must be investment, which is part of production and also increases the capital stock. The supply of capital extant at one point in time results from past decisions, and capital accumulation in turn depends upon the return that is expected from it over its whole life time. Now, in a given period, "the producers have to adjust their supply to the demand as best they can with the appliances already at their disposal."[57] The contrast which results from this new economic system is best exemplified by the difference between the Smith-Ricardo and the Harrod-Domar models of growth. In the former, equilibrium will always occur between demand and supply (of goods) at a point which will depend on productivity, wages, and the leakage of funds into "non-productive" uses. In the latter there is only one

tribution of Capital in Great Britain, *c.* 1770-1870," *Third International Conference of Economic History, Munich, 1965* (Paris: Mouton, 1968), p. 362; Chapman, *Early Factory Masters*; and Pierre Lebrun, "Croissance industrielle: l'expérience de l'industrie drapière verviétoise," *First International Conference of Economics, Stockholm, 1960* (Paris: Mouton, 1960), p. 561.

[54] Hicks, *Theory of Economic History*, pp. 28-9.

[55] John R. Hicks, *Capital and Growth* (London: Oxford University Press, 1965), chap iv. Stress on the switch from circulating to fixed capital is also provided in a new model by John Fei and Gustav Ranis, "Economic Development in Historical Perspective," *American Economic Review, Papers and Proceedings*, LIX (1969), 386-400.

[56] The paragraph which follows is based on Hicks, *Capital and Growth*, pp. 31-4.

[57] Marshall, *Principles of Economics*, p. 376, quoted in *ibid.*

possible long-run rate of growth which will equate supply and demand, where fixed capital will be fully employed, and where therefore the expectations of the investors will be satisfied and stabilized. Instability and a new type of business cycles result from this "knife-edge" situation. This fundamental change in economic structure and functioning in itself confirms the place of the factory system in defining the second phase of industrialization.

CONTINUITY AND DISCONTINUITY

There exists among economic historians who write on the industrial revolution a fundamental division between those who present an essentially continuous, non-revolutionary picture of industrialization and those who stress the discontinuous and revolutionary aspects which are imbedded in the term "industrial revolution" itself. Recent quantitative and aggregative studies have tended to support the former since the research on the process of industrialization in England, Germany, France, and Belgium, has led to the revision of older views concerning the existence of an identifiable period when the take-off took place, or the industrial revolution "broke out."[58] Insofar as this quantitative research has been conducted with the concepts of the national accounting model and the division of production into primary, secondary, and tertiary sectors, it has generally invalidated the accepted periodization; the drastic changes which did take place were more of a qualitative, institutional, technological, or organizational nature, and the structural changes could not manifest themselves in the categories of the national accounts without considerable time lags.

Even the kink in the curve of manufacturing output, Alexander Gerschenkron's main criterion for identifying the "great spurt," presents similar difficulties;[59] for in all countries there existed in the nineteenth century a very large, seasonal, non-mechanized "manu-

[58] Phyllis Deane, *The Industrial Revolution in England, 1700-1914, The Fontana Economic History of Europe,* Carlo M. Cipolla, (ed.), (London: Collins, 1969); Walther Hoffmann "tries to establish the fact that [the take-off period could be placed] between 1830-35 and 1855-60" but all that can be established is the weak conclusion "that by the middle of the nineteenth century economic conditions were well set in Germany to allow for a transition into sustained growth." Hoffmann, "The Take-off in Germany," in W. W. Rostow, (ed.), *Economics of Take-off into Sustained Growth* (London: Macmillan, 1963), pp. 96, 117; for France, see below and for Belgium, see above, fn. 52.

[59] Alexander Gerschenkron, *Economic Backwardness in Historical Perspective* (Cambridge, Mass.: Belknap Press, 1962).

facturing" sector. In his studies of industrialization, Gerschenkron has generally not considered such manufacturing as manifestations of modernization. But was the existence of large *kustar* industry sectors in nineteenth-century Russia a symptom of industrial backwardness?[60]

How the old handicrafts should enter into consideration is a fundamental issue in the understanding and measurement of economic development in comparative perspective. Yet, rural industry is the activity of households engaged in both industry and agriculture, partly for the market, partly for home consumption. Phyllis Deane and W. A. Cole, in their pioneering work on British economic growth, although they discussed the problems posed by the mixed nature of this large sector, did not find a satisfactory solution.[61] On the other hand, in a comparable work dealing with France, Tihomir Markovitch shed more light on the issue.

In preliminary estimates of the trends of French industrial development, it has first been found that there was no take-off period in the nineteenth century at all, for the growth of the French economy was very gradual.[62] The share of agriculture in relation to industry in total output was an indicator of the pace of industrialization: agriculture was not surpassed by industry and crafts until approximately 1885—compared with the 1810's in England and 1890 in Germany.[63] In the more recent work, however, it was now found that the product of industry and crafts already surpassed that of agriculture by the time of the Revolution. Markovitch inferred that France was "the first industrial power in the world not only in the eighteenth century but even in the beginning of the nineteenth. The only industrial sectors where Great Britain was

[60] Switzerland is an example of an advanced country—see the calculations made by Paul Bairoch, "Niveaux de développement économique de 1810 à 1910," *Annales E. S. C.* XX (1965), 1091-1117—whose industrialization remained based on old "proto-industrial" forms of organization for much of the nineteenth century. Industry remained decentralized, rural, and in the hands of peasants much later than in any other country with similar advances in *per capita* consumption. See M. Biucchi, *The Industrial Revolution in Switzerland, 1700-1914, The Fontana Economic History of Europe,* Carlo M. Cipolla, (ed.), (London: Collins, 1969) and Alfred Bürgen, "The Growth of the Swiss National Economy," in H. G. J. Aitken, (ed.), *The State and Economic Growth* (New York: Social Science Research Council, 1959), pp. 213-36.

[61] Deane and Cole, *British Economic Growth,* pp. 137-39, 164.

[62] Reported by Jean Marzewski, "The Take-off in France," in Rostow, *Economics of Take-off,* p. 131.

[63] *Ibid.,* p. 120; Deane and Cole, p. 166; W. G. Hoffmann, *Das Wachstum der deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts* (Berlin: Springer, 1965), p. 33.

in advance of France in the beginning of the nineteenth century was the cotton and coal industries."[64] Where did this turnabout originate? Mainly from the new method used in estimating industrial production by calculating raw material input, which led to the inclusion into "industry and crafts" of the output of large-scale manufacturing as well as handicrafts in their broadest possible meaning, even including household industrial work for home consumption. When such non-market production was subtracted from industrial output, the date when agriculture was overtaken by industry was moved back to approximately 1840.[65] One's interpretation of French economic development could thus be drastically changed, depending on the place which is given to "pre-industrial industry."

This is confirmed in François Crouzet's recent attempt to construct finer measures of the trend of France's major industries in the nineteenth century.[66] Major differences in long-run industrial trends are obtained between a measure that includes the traditional industries which basically remained "proto-industrial," and one which excludes them. The first index, "Index 8a," includes mining, metallurgy, metal transformation, chemical industries, food industries, "new" industries (rubber, gas, electricity, automobiles), and textiles. "Index 8b," on the other hand, excludes all textiles but silk and cotton. As shown in Table 1, the exclusion of traditional textiles from Index 8 almost doubles the average annual rate of growth of French industrial production—from 1.68 to 3.24 percent per year.

Furthermore, if one selects the dates which seem to have been marked by inflection points in the curves of industrial production, that is, 1830, 1855, and 1900, and compares growth rates for intermediate sub-periods, one notes the following: in Index 8a the last sub-period is that of most rapid growth but in Index 8b it is the first and the first sub-period, instead of being the one with most rapid growth rate in Index 8b, is the one with the slowest growth rate in Index 8a. This is a clue to one principal source of disagree-

[64] Markovitch, *L'industrie française,* p. 317; restated in Markovitch, "L'industrie lainière française au début du XVIIIè siècle," *Revue d'histoire économique et sociale* XLVI (1968), 578-79.

[65] Jean Marczewski, "Le produit physique de l'économie française der 1789 à 1913 (Comparaison avec la Grande Bretagne)," *Cahiers de l'Institut de Science Economique Appliquée,* AF 4, No. 163 (July 1964), p. xx, Table 3.

[66] François Crouzet, "Essai de construction d'un indice annuel de la production industrielle française au XIXè siècle," *Annales E. S. C.,* XXV (1970), 56-101.

ments on the backwardness of the French economy, the continuity or discontinuities of its growth, and the location of its inflection points.

TABLE 1
FRENCH INDUSTRIAL PRODUCTION, 1815-1913
1913 = 100

	Index 8[a]			*Index 8[b]*		
	Production index	*Growth rate*	*Weight of textiles*	*Production index*	*Growth rate*	*Weight of textiles*
1815	19.2		86.7%	4.2		59.6%
		0.58%			4.55%	
1830	21.0		68.1	8.2		44.8
		2.31			4.23	
1855	37.3		56.5	23.2		27.1
		1.34			2.25	
1900	67.9		39.6	63.2		21.7
		3.01			3.63	
1913	100.0		34.9	100.0		20.8
average		1.68			3.24	

Source: computed from data published by François Crouzet, "Essai de construction d'un indice annuel de la production industrielle française au XIXè siècle," *Annales E. S. C.*, XXV (1970), 56-101.

In international comparisons of growth rates, the problem is compounded by the fact that some countries continued in the nineteenth century to operate according to the old industrial structures much longer than others; France for instance much longer than England. It has been argued that this was not necessarily a manifestation of underdevelopment; on the contrary, it was the relative supplies of labor and capital which created a comparative advantage in this type of industry and dictated the persistence of crafts. There would have been no "underdevelopment" here, but a basically correct allocation of resources.[67] By looking at France through biased accounting concepts which emphasize the growth of the industries and techniques which flourished in England, one would tend to exaggerate backwardness and retardation in France.

CONCLUSION

I have presented an array of facts and arguments showing the importance and role of "pre-industrial industrialization" as a phase of development of itself and as it persists. I have also argued that the distinction of a proto-industrialization from a modern industrial-

[67] Maurice Lévy-Leboyer, "Les processus d'industrialisation: les cas de l'Angleterre et de la France," *Revue Historique*, No. 239 (1968), 281-98.

ization phase merged easily into a number of theoretical categories or arguments. One could briefly mention that the framework which is suggested here has the added advantage of offering to the economics of developing countries an explicit description of the historical experience on the choice of techniques between those which are capital saving and those which are capital using. The fact that the countries examined here appear to have begun their industrialization through labor-using industrial techniques is noteworthy. It does not mean, however, that the same path should be advocated for developing countries in the present century. For the historical experience shows that the demographic consequences of industrialization without urbanization were rather adverse, considering that the severity of demographic pressures is initially much greater in contemporary developing countries than it was in the eighteenth and nineteenth centuries in Europe.[68]

Finally, in assessing the social consequences of industrialization, two areas were recently singled out by Charles and Richard Tilly as crucial:[69] one is the impact of industrialism as a new way of life. The recent literature stresses that the impact was felt mainly through the new discipline imposed by what was peculiar to factory industry, that is, the coordinated, in line arrangement of industrial organization.[70] The other is the impact of industrialism through the demise of rural, traditional industry. Here the recent literature stresses the social and political role of the workers who went bankrupt with this demise.[71] In each of these issues, the framework which has been presented here has the advantage of allowing the economic history of the Industrial Revolution to supply social historians with usable insights and categories.

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[68] See A. J. Jaffe and K. Azumi, "The Birth Rate and Cottage Industries in Underdeveloped Countries," *Economic Development and Cultural Change*, IX (1960), 52-63.

[69] Charles Tilly and Richard Tilly, "Emerging Problems in the Modern Economic History of Western Europe," 1971 (mimeographed), summarized as "An Agenda for European Economic History in the 1970's," THE JOURNAL OF ECONOMIC HISTORY, XXXI (1971), 184-98.

[70] See the work of Sidney Pollard and E. P. Thompson, as cited in Tilly and Tilly, "Emerging Problems," and Nicholas Georgescu-Roegen, "Process in Farming Versus Process in Manufacturing," in Ugo Papi and Charles Nunn, (eds.), *Economic Problems of Agriculture in Industrial Societies* (London: Macmillan, 1969).

[71] See E. P. Thompson, Eric Hobsbawm, and George Rudé, as cited in Tilly and Tilly, "Emerging Problems."