Malthusian Models and Irish History

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Malthusian models occupy a central position in the interpretation and analysis of long-term economic and demographic change in preindustrial societies. The models are logically plausible and attractive, but ultimately they will have to be confronted with systematic evidence before being accepted. In this paper results are reported that cast some doubt on these models in the case of prefamine Ireland. The results indicate that the evidence supporting Malthusian views is not strong, and that the modus operandi of the nexus between economic and demographic variables is probably far more complex than is implied in standard Malthusian models.

This cannot last, Heaven disowns it, Earth is against it; Ireland will be burnt into a black unpeopled field of ashes rather than this should last. . . . The time has come when the Irish population must either be improved a little or exterminated.

Thomas Carlyle, 1839

ONE of the most hotly debated issues in the economic history of nineteenth-century Ireland, is whether Ireland was, in any definable sense, overpopulated.[1] The Malthusian view, which held that Ireland was poor because it contained too many Irishmen, was widely held by politicians and political economists alike. The founder of classical population economics wrote to David Ricardo in 1817 that "the land in Ireland is infinitely more peopled than in England; and to give full effect to the natural resources of the country a great part of the population should be swept from the soil." Although Malthus qualified this statement somewhat in later writings and conceded that other factors possibly were at work, the "overpopulation" explanation became conventional wisdom in nineteenth-century England. The implication was, of course, that the only possible remedy for Ireland was, as Salaman has put it, "one of resignation to the inevitable . . . [a] policy [that] was dignified by a new philosophy and

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[1] Due to space limitations, all footnotes and tables documenting claims and assertions made in this paper have been omitted. The evidence, data, and techniques underlying the conclusions and the doubts expressed in this paper can be found in the following papers by the author: "Love and Life among the Potatoes—An Analysis of Demographic and Economic Factors in Prefamine Ireland," unpublished manuscript, Northwestern Univ., Dec. 1978; "The Deadly Fungus: An Econometric Investigation into the Short-Term Demographic Impact of the Irish Famine," in *Research in Population Economics*, Julian Simon, ed., vol. 2, forthcoming, 1979; "Poverty and Population in Prefamine Ireland: Old Issues and New Data," unpublished manuscript, Northwestern Univ., March 1978; "Industrialization and Poverty in Ireland and the Netherlands: Some Notes toward a Comparative Study," *Journal of Interdisclipinary History* (forthcoming, 1980); "Irish History with the Potato," unpublished manuscript, Stanford Univ. Sept. 1979.

Malthus was its prophet." Some political economists presented an interesting variation on the basic Malthusian theme by arguing that the large population in Ireland caused farms to be subdivided and sublet into small plots that were too small to be economically viable. In this view, overpopulation caused poverty not only directly through diminishing returns, but compounded the damage by prohibiting the realization of scale economies in agriculture.

The "classical view" has been challenged from a number of corners. Marx and Engels, to whom any model that reeked of Malthusian population dynamics was utter anathema, attacked the overpopulation thesis with biting sarcasm. Other contemporary observers disagreed as well. The able political economist George Poulett Scrope, for example, pointed out in 1833 that "in Ireland . . . centuries of turbulence and misgovernment have prevented the utilization of her rich natural powers . . . vast tracts of great natural fertility are still lying waste . . . only requiring drainage or embankments to render them extraordinarily productive." Robert Kane, William Blacker, Michael Sadler, and others expressed similar positions. The assertion that overpopulation was responsible for the loss of scale economies was vehemently denied, in particular by pointing at the Belgian agricultural sector in which allegedly minute subdivision was perfectly consistent with a highly sophisticated and prosperous rural economy.

The debate is mirrored in the interpretations of historians. In his massive but tendentious work, George O'Brien launched a major attack on the overpopulation thesis, reiterating the position that Ireland's non-labor resources would have been sufficient to maintain a high level of income per capita if other conditions had been satisfied. Others disagree: Barbara Solow wrote in 1971 that "prefamine Ireland was a case study in Ricardian and Malthusian economics." K. H. Connell, in his classic work on prefamine Irish population, wrote that "Malthus was an accurate observer: it was platitudinous, but topically platitudinous, for an early nineteenth-century writer to point to food supply as the limit to population growth." T. W. Freeman in his *Pre-Famine Ireland* espoused the same ideas. Modern population economists seem equally divided on the correctness of the Malthusian model as a description of western history. An explicit rejection of the simple Malthusian position can be found, for instance, in Julian Simon's recent *Economics of Population Growth.*

It sounds almost unbelievable that such a hotly contested debate could have taken place without a serious examination of quantitative evidence. Yet, in spite of the relative abundance of information on prefamine Irish population and economic environment, the controversy on overpopulation thus far has been conducted in what may best be termed "an empirical vacuum." A rigorous model that would be instrumental in testing various hypotheses derived from the Malthusian model has not been formulated, and until the recent completion of Eric Almquist's remark-

able dissertation, *Mayo and Beyond*, no attempt has been made to use cross-section data available for prefamine Ireland in a systematic manner.

To make any progress, it is necessary to formalize the exact nature of a Malthusian model. The model consists of two fundamental equations and one identity. The first equation relates income per capita or the wage rate to the ratio of non-human wealth to labor. The second equation relates the rate of growth of the labor force (assumed equal to that of the population) to economic variables of which income per capita is one. Other arguments in this function could be the availability of nonagricultural employment opportunities or the diffusion of labor-intensive crops such as the potato. In the simplest version of the model, the latter variables are considered exogenous. Finally, to close the model, we need an identity relating the present size of the population to past values of population growth. The "economies of scale" version of the model will not be pursued here.

Consider first the second equation relating population growth to income and other variables. The mechanisms allegedly at work here are sufficiently complex to warrant empirical investigation. A primary—but by no means the only—link connecting population growth to economic variables is provided by what may be called the "demand" for marriage, or the "propensity to marry." In a non-contraceptive society, the crude birthrate is heavily affected by the average marriage age of the population and the proportion of population ever married. Looking in isolation at either the age at marriage or the proportion ever marrying could be misleading. It is necessary to examine age-specific proportions ever married and to take into account those who die celibate. The combination of these variables leads to a number of alternative (scalar) measures of the propensity to marry. Once these measures are developed and computed, it is possible to estimate their relations to various economic variables on the one hand and the crude birthrate on the other.

A few observations on this procedure are in order. First, it is useful to carry out separate computations for males and females. It is conceivable that economic factors may have influenced male and female propensities to marry in quite different ways, and that the birthrate was influenced by the average age at marriage of both sexes. Second, economic factors could also affect the birthrate directly, in addition to their indirect influence through the propensity to marry. Marital fertility definitely was affected by nutrition, work habits, religion, and housing conditions.

Furthermore, note that the equation relating the propensity to marry to economic variables has the interpretation of a demand function. Marriage in and by itself was a desirable good. Extramarital sex in prefamine Ireland was, as far as we can tell, extremely rare and risky for the participating female in view of the harshness with which unwed mothers were treated. The 1851 census reported a total of 1,368 "prostitutes and brothel keepers," most of whom were concentrated in urban areas: Dublin ac-

counted for more than half of Gross National Sin, whereas the 458,000 males in the largely rural province of Connaught had only 42 prostitutes at their disposal. Sex may not have been the only motive for marriage. Arthur Young noted in 1779 that "their [the poor's] happiness and ease [were] generally relative to the number of their children . . . this must necessarily have a considerable effect in promoting early marriages, and consequently population." Be that as it may, marriage should be viewed as an economic good, both desirable and costly. An economist therefore would feel intuitively that the propensity to marry should be viewed first and foremost as dependent on relative prices and income. The difficulty, of course, is to isolate correctly those variables that ought to be viewed as "relative prices" as opposed to those that reflect income. Paradoxically, it has been widely maintained that the propensity to marry varied *inversely* with income. Scrope noted that "the destitute Irish, living from hand to mouth . . . marry at the earliest age, reckless of the consequences, and impatient for the only pleasure within their reach." Connell noted that poor living conditions and low expectations for the future encouraged early marriages as a welcome relief from the wretched poverty in which the majority of Irishmen lived. One possible interpretation is that marriage was an inferior good. We have to keep in mind, however, that the income elasticity refers to the *net* effect of income on the demand for marriage, holding relative prices constant. The subtle and unexpected forms that the relative prices of marrying and establishing a family could take make an accurate specification of the demand function for marriage a highly speculative undertaking.

One variable that recently has been put forward as an important influence on the relative price of marriage is a non-agricultural source of employment not subject to diminishing returns, in most cases rural industry. It has been widely asserted that cottage industry tended to relax the constraints on marriage age and thus contribute to population growth. Although attractive on an *a priori* base, the hypothesis will have to stand or fall with systematic evidence. Quantative tests of the hypothesis are rare. One attempt to utilize time series on relative prices and marriage rates in Flanders is too contaminated with econometric error to be deemed conclusive. Almquist has found a significant and positive raw correlation coefficient between various measures of the propensity to marry and the dispersion of spinning among occupied women in 1841. Since other variables such as income and other relative prices were not held constant, however, his findings are difficult to interpret.

Another variable—strongly emphasized by Connell—is the availability of potatoes. Potatoes relaxed the constraints on family formation, as they enabled a man to feed a family on comparatively small plots of land. Data on prefamine potato acreage are available and allow a direct estimate of the elasticity of the demand for marriage with respect to potato acreage per capita or per acre under cultivation. Other independent variables likely to affect the propensity to marry are the average size of farm, the

rate of literacy, the average quality of housing, and various proxies for the ratio of non-labor to labor inputs. These variables should be interpreted as attempts to capture relative prices. For instance, a high literacy rate may indicate higher education standards, implying that children were "costlier" to raise and making marriage relatively more expensive. Large farms and high ratios of livestock to labor made the establishment of new families costlier than in regions in which farm division was widely practiced and reclaimable land (mostly bogs that could be converted into potato patches) was available. As farm size, literacy, and housing quality are all correlated with income, they contain "income effects" insofar as income is measured with error.

Of course, it is entirely possible that the backbone of the Malthusian mechanism consisted of differences in the death rates, especially, one suspects, differences in infant mortality rates. To the extent that the population model operated through death rates rather than birth rates (an issue hitherto hardly touched upon by systematic empirical research), the results below should be modified. In forthcoming research I plan to use the data for Ireland to shed light on this side of the Malthusian debate.[2]

The testing of the first equation in the Malthusian system involves regressing income per capita or other proxies for the productivity of labor on the land/labor ratio and other independent variables that help determine the level of income. Malthusian pressures should be reflected in a positive coefficient on the land/labor ratio. The original concept of overpopulation pertains to a pressure of population against a resource fixed by nature: arable land. It could be argued that we should generalize the model to relate income to a more complete set of non-labor to labor input ratios. By including reproducible non-labor inputs such as land improvements and livestock as another constraint, we would obfuscate the issue of overpopulation, since it would then become undistinguishable from "underaccumulation." Although we should therefore include a capital/labor ratio as an independent variable in the regression, it is the coefficient of the land/labor ratio that provides the acid test of the Malthusian hypothesis. "Pure" land is almost impossible to measure, however, since man-made and nature-given differences in land quality cannot be separated empirically. The technique used in this research is to enter separately the ratio of total land under cultivation to rural population and a variable approximating the quality of land. If the latter is accurate, the coefficient on the land/labor ratio should reflect Malthusian pressures, whereas the coefficient on the land quality variable *could* reflect them as well, if the quality differences reflected natural phenomena and not past investment in land improvement.

To summarize, two sets of Malthusian relations were estimated. One set

[2] In research carried out after this paper was completed, it was found that infant mortality rates conform more to the Malthusian model than do marriage propensities or birthrates. Rural infant mortality rates tend to covary negatively with the diffusion of cottage industry and the availability of potatoes.

of regressions tested for the acuteness of population pressure on non-reproducible resources, and the other set examined the sensitivity of demographic behavior to economic variables. The data set contains cross-sectional data for prefamine Ireland derived from the 1841 census and other original sources describing prefamine Ireland. Every regression was fit to 32 observations (the number of counties). Both Ordinary Least Squares and Generalized Least Squares estimates were carried out in all cases.[3]

The results, although still not entirely conclusive, are not encouraging for those who believe in simple Malthusian models. In particular, the population-pressure regressions do not support the hypothesis that Ireland was overpopulated. The coefficient on the land/labor ratio is consistently negative. Had the "overpopulation thesis" been correct for the Irish case, we should have found that the most densely populated counties (holding other things equal) had the lowest income per capita. As the land/labor ratio is defined as land under cultivation divided by rural population, one cannot attribute the result that relatively wealthy counties like Dublin and Antrim were densely populated to large cities. The negative coefficient could be rationalized in various ways, but whatever the reason for this finding, it is inconsistent with the Malthusian view. I hasten to add that the Malthusian model cannot be considered to have been "refuted" by this finding. For one thing, the possibility that more sophisticated econometric techniques and improved data will reverse the finding cannot be ruled out. But the—admittedly subjective—probability of such a reversal is low.

The estimation results of the second equation in the Malthusian model is equally disturbing for those who believe that population growth in preindustrial Europe was governed by simple models. The estimations were based on a three-equation simultaneous model in which the male and female propensities to marry and the crude birthrate were related to economic variables and to each other. An examination of the results reveals that even though economic variables did indeed influence demographic behavior, the relations were complex and often ambiguous. One unexpected finding is that male and female propensities to marry were in some cases affected in different directions by economic variables, even though they were positively correlated with the birthrate and with each other. For instance, the importance of rural industry in a county was positively correlated with the male propensity to marry, but the coefficient on the fe-

[3] It could, and probably will, be argued that there are inherent dangers in estimating dynamic relations from cross-sectional data. These dangers are obvious, but it is far from clear whether they are large enough to render cross-sectional data useless. Some of the issues arising from the approach taken here are dealt with in Mokyr, "Irish History." One intuitive justification for the use of cross-sectional data for the present purpose is that the various counties, on the eve of the famine, reflect different degrees of economic development and can therefore be viewed as existing at different "points in time." The validity of this view is jeopardized by the existence of internal migration, and my procedures are only correct as long as internal migration does not reach large dimensions. Internal migration was neither negligible nor overwhelming before the famine: in 1841 almost 5 percent of the Irish population were living in counties in which they were not born.

male propensity to marry indicated that rural industry made women marry later given the male propensity to marry. The net effect on birthrates consequently was ambiguous and cannot be distinguished from zero at this stage of the research. The ambiguous behavior of male and female marriage propensities here is consistent with Becker's "A Theory of Marriage," which points out that a high female wage relative to male wage (as was the case with cottage industry as compared to agriculture) *reduces* the gains from marriage. This result casts some doubt on the hypotheses that allege that the growth of population in Europe in the eighteenth and early nineteenth centuries was related to the expansion of cottage industries. Since the present results were derived from cross-sectional data, and from a society that in many ways was *sui generis*, their applicability to other regions and economies is limited. They should, however, stimulate more systematic quantitative research on the effects of non-agricultural activities in the countryside.

The results also are not very comforting to the interpretation of Connell's thesis, which holds that the propensity to marry was indeed an inferior good. The coefficients of the income variables in the structural as well as in the reduced-form equations tended to be insignificant. Birthrate variations, on the other hand, were well explained by literacy rates, housing quality variables, the percentages of urban population, occupational data, and farm size variables. Again, male and female behavior tended to diverge for many of these variables, but on the whole the signs of the coefficients are as predicted, that is, the higher the "relative price" of marriage, the lower the propensity to marry. Remarkably, the prefamine cross-sectional data do not lend much support to the assertion that the potato played a fundamental role in prefamine Irish demography.

Malthusian notions figure prominently in many long-term models of economic historians. The grand models of the *longue durée* espoused by French scholars of the *Annales* school are unthinkable without the basic Malthusian elements. Yet we have been asked to accept these notions on faith in spite of the violent objections of a vocal minority. I submit that, although Malthusian models are plausible and make economic sense, they should not be widely accepted on those grounds alone. As long as history is about what *was* rather than about what *might likely have been*, any hypothesis should be subjected to the scrutiny of statistical or other evidence. In view of its unique history and its impact on the population theorists of the classical school, Ireland is as good as place as any to start.

If our suspicions concerning the Malthusian model for Ireland are further confirmed, it may be time to start re-examining the view that the Irish Famine was somehow "inevitable." Many thought before, during, and after the Famine that a major disaster was the only solution to a case of hopeless overpopulation. Not all disasters, however, can be regarded as "irrepressible" just because they actually occurred. I insist that these concepts do not constitute merely a vacuous juggling with unobservable ex

ante probabilities. The Great Chicago Fire, World War I, and the American Civil War were not disasters that were in some way decreed by immutable forces. Other historical catastrophes such as the sad fate of the American Indian population or the fall of the Roman Empire could well be regarded as the inevitable consequence of profound historical forces. Notwithstanding Carlyle's dire but accurate premonition of the Irish population's "extermination," the results presented above may be interpreted as casting doubt on the inevitability of the Famine.