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Sir William Petty on the Causes and Consequences of Urban Growth

If modern economic science is built on the twin foundations of factual investigation and deductive reasoning from clearly stated premises, Marx's characterization of Sir William Petty (1623–87) as the founder of economics is well deserved. His Political Arithmetick was a pathbreaking effort in the "art of reasoning by figures upon things relating to government." Although Petty's primary concern lay in analyzing problems of taxation, money, international trade, and national income, he was also interested in demographic processes and their relation to economic phenomena. The passage reproduced below from pp. 26–40 of his An Essay Concerning the Multiplication of Mankind Together with another Essay in Political Arithmetick, Concerning the Growth of the City of London with the Measures, Periods, Causes, and Consequences thereof. 1682. (London, 1698) is an appealing display of that interest. The first part of this essay is devoted to an astute if flawed estimation of the size and rate of growth of the population of the globe, of England, and of the City of London. Petty set the global population at 320 million (about half of its actual level) and estimated that it was increasing at a geometric progression with a doubling time of 360 years. Thus, he reasoned, world population "will within the next 2000 years so increase as to give one Head for every two Acres of Land in the Habitable part of the Earth." At that density (with a total population of some 10 billion), Petty expected "Wars and great Slaughter &c." The population of the City of London he estimated as 670,000, doubling every 40 years. Both of these figures (both overestimates) were derived from a time series of burials, taken from Graunt's celebrated Natural and political observations made upon the Bills of Mortality (1662), a series that Petty extended to 1682. (Burials "in such Years as were neither remarkable for extraordinary Healthfulness or Sickliness" tended to be doubling every 40 years, Petty observed, and he assumed that in such years there was one death for every 30 persons alive.) Since the population of England and Wales (like that of the globe) grew much more slowly than that of London, Petty reasoned that London's growth would come to a halt by "Anno 1800, when it will be eight times more than now, with above 4 millions."

What are the "Causes and Consequences" of London's growth? This is the subject Petty addresses in the excerpt reproduced below. Characteristically,

he abstracts from particular historical events and proceeds with a general cost-benefit analysis of larger vs. smaller city size. What if London had a population seven times bigger or seven times smaller than its actual size? Petty realizes that neither a much larger nor a much smaller size is quickly attainable: “the true Question is unto or towards which of the said Two extravagant States is best to bend the present State by degrees, viz. Whether it be best to lessen or enlarge the present City?” He fails, however, to draw a distinction between the costs and benefits attributable to different rates of change and those associated with a particular population size.

Petty lists and assesses 12 benefit-cost criteria, ranging from ease of “Defence against Foreign Powers” to prevention of “the Mischiefs of Plagues and Contagions.” By and large, the advantages of a larger city size seem to predominate. He stresses what in modern parlance are called external economies of scale in production and consumption. Writing a hundred years before Adam Smith offered his paean to the advantages of the division of labor, using the example of pin manufacturing, Petty gives the scarcely less arresting example of watchmaking. The benefits of the division of labor are more easily exploited in a large city. Larger city size also brings advantages in defense, in administration, and in transport, and it favors the “Arts of Delight and Ornament” and the “Propagation and Improvement of Useful Learning.” As to the “preventing of Beggars and Thieves” and as to the level of fertility—“the Increase of People by Generation”—city size is deemed immaterial by Petty. In contrast, considerations having to do with production of food and, most of all, with the plague, show bigness a disadvantage. A true forerunner of modern scholars, Petty concludes his analysis with an all-too-well justified call for more research into his subject.

We have spoken of the *Growth of London*, with the Measures and Periods thereof, we come next to the Causes and Consequences of the same.

The Causes of its *Growth* from 1642 to 1682, may be said to have been as followeth, viz. From 1642 to 1650, that Men came out of the *Country* to *London*, to shelter themselves from the Outrages of the *Civil Wars*, during that time; from 1650 to 1660, the *Royal Party* came to *London*, for their more private and inexpensive Living; from 1660 to 1670, the *King’s Friends* and *Party* came to receive his *Favours* after his *Happy Restauration*; from 1670 to 1680, the frequency of *Plots* and *Parliaments*, might bring extraordinary Numbers to the *City*; but what Reasons to assign for the like *Increase* from 1604 to 1642, I know not, unless I should pick out some *Remarkable Accident* happening in each part of the said *Period*, and make that to be the Cause of this *Increase* (as vulgar People make the Cause of every Man’s Sickness to be what he did last eat) wherefore, rather than so to say, *quidlibet de quolibet*; I had rather quit even what I have above-said to be the Cause of *London’s Increase* from 1642 to 1682, and put the whole upon some natural and spontaneous *Benefits* and *Advantages* that Men find by living in great more than in small *Societies*; and

shall therefore seek for the *Antecedent Causes* of this *Growth*, in the *Consequences* of the like, considered in greater *Characters* and *Proportions*.

Now, whereas in Arithmetick, out of two false *Positions* the Truth is extracted, so I hope out of two *extravagant* contrary *Suppositions*, to draw forth some solid and consistent *Conclusion*, viz.

The first of the said two *Suppositions* is, That the City of *London* is seven times bigger than now, and that the *Inhabitants* of it are four Millions Six Hundred and Ninety Thousand People; and that in all the other *Cities*, *Ports*, *Towns* and *Villages*, there are but two Millions Seven Hundred and Ten Thousand more.

The other *Supposition* is, That the City of *London* is but a seventh part of its present bigness, and that the *Inhabitants* of it are but Ninety Six Thousand, and that the rest of the *Inhabitants* (being Seven Millions Three Hundred Four Thousand) do co-habit thus, One Hundred Four Thousand of them in small *Cities* and *Towns*, and that the rest, being seven Millions Two Hundred Thousand, do inhabit in *Houses* not contiguous to one another, viz. In Twelve Hundred Thousand *Houses*, having about Twenty Four Acres of Ground belonging to each of them, accounting about Twenty Eight Millions of Acres to be in the whole *Territory* of *England*, *Wales*, and the adjacent *Islands*; which any Man that pleases may examine upon a good Map.

Now, the Question is, In which of these imaginary States, would be the most convenient, commodious and comfortable Livings?

But this general Question divides it self into the several Questions, relating to the following Particulars, viz.

- 1 For the *Defence* of the Kingdom against Foreign Powers.
- 2 For preventing the *Intestine Commotions* of *Parties* and *Factions*.
- 3 For *Peace* and *Uniformity* in *Religion*.
- 4 For the *Administration* of *Justice*.
- 5 For the proportionably *Taxing* of the People, and easie *Levy*ing the same.
- 6 For *Gain* by Foreign Commerce.
- 7 For *Husbandry*, *Manufacture*, and for *Arts* of Delight and Ornament.
- 8 For lessening the Fatigue of *Carriages* and *Travelling*.
- 9 For preventing *Beggars* and *Thieves*.
- 10 For the Advancement and Propagation of *Useful Learning*.
- 11 For *Increasing* the People by *Generation*.
- 12 For preventing the Mischiefs of *Plagues* and *Contagions*. And withal, which of the said two States is most Practicable and Natural; for in these and the like Particulars, do lie the *Tests* and *Touchstones* of all *Proposals*, that can be made for the Publick Good.

First, as to *Practicable*, we say, That although our said Extravagant Proposals are both in Nature possible, yet it is not Obvious to every Man to conceive, how *London*, now seven times bigger than in the beginning of Queen *Elizabeth's* Reign, should be seven times bigger than now it is, and Forty Nine

times bigger than *Anno* 1560. To which I say, 1. That the present City of *London* stands upon less than Two Thousand Five Hundred Acres of Ground; wherefore a City seven times as large may stand upon Ten Thousand Five Hundred Acres, which is about equivalent to a Circle of Four Miles and a half in Diameter, and less than Fifteen Miles in Circumference. 2. That a Circle of Ground of Thirty Five Miles Semi-Diameter will bear *Corn, Garden-stuff, Fruits, Hay, and Timber* for the Four Millions Six Hundred and Ninety Thousand Inhabitants of the said City and Circle, so as nothing of that kind need be brought from above Thirty Five Miles distance from the said City; for the Number of Acres within the said Circle, reckoning Two Acres sufficient to furnish *Bread* and *Drink-Corn* for every Head, and Two Acres will furnish Hay for every necessary Horse; And that the Trees which may grow in the Hedgerows of the Fields within the said Circle, may furnish *Timber* for Six Hundred Thousand Houses. 3. That all live Cattel and great Animals can bring themselves to the said City; and that Fish can be brought from the *Lands-end* and *Berwick*, as easily as now. 4. Of *Coals* there is no doubt: And for Water, Twenty Shillings *per* Family (or Six Hundred Thousand Pounds *per* *Annum* in the whole) will serve this *City*, especially with the help of the *New-River*. But if by Practicable be understood, that the present State may be suddenly changed into either of the Two above-mentioned Proposals, I think it is not *Practicable*. Wherefore the true Question is unto or towards which of the said Two extravagant States is best to bend the present State by degrees, *viz.* Whether it be best to lessen or enlarge the present City?

In order whereunto, we enquire (as to the first Question) which State is most *Defensible* against *Foreign Powers*; saying, That if the above-mentioned Housing, and a border of Ground of Three Quarters of a Mile broad were encompassed with a Wall and Ditch of Twenty Miles about (as strong as any in *Europe*, which would cost but a Million, or about a Penny in the Shilling of the House-Rent for one Year) what *Foreign Prince* could bring an Army from beyond Seas, able to beat, 1 Our Sea-Forces, and next with Horse harrass'd at Sea, to resist all the fresh Horse that *England* could make, and then Conquer above a Million of Men, well United Disciplin'd, and Guarded within such a Wall, distant every where Three Quarters of a Mile from the Housing, to elude the *Granadoes* and great Shot of the *Enemy*?

2 As to *Intestine Parties* and *Factions*, I suppose that Four Millions Six Hundred and Ninety Thousand People united within this great City, could easily Govern half the said Number scattered without it; and that a few Men in Arms within the said City and Wall, could also easily Govern the rest unarmed, or armed in such a manner as the *Sovereign* shall think fit.

3 As to *Uniformity in Religion*, I conceive, That if *St. Martin's* Parish (may as it doth) consist of about Forty Thousand Souls, That this great City also may as well be made but as one Parish, with Seven times One Hundred and Thirty Chappels, in which might not only be an Uniformity of Common Prayer, but in Preaching also; for that a Thousand Copies of one Judiciously and Authentically composed *Sermon*, might be every Week read in each of the said *Chappels* without any subsequent Repetition of the same, as in the Case of

Homilies. Whereas in *England* (wherein are near Ten Thousand Parishes, in each of which upon *Sundays, Holy-Days*, and other extraordinary Occasions, there should be about One Hundred Sermons *per Annum*, making about a Million of Sermons *per Annum* in the whole): It were a Miracle, if a Million of Sermons composed by so many Men, and of so many Minds and Methods, should produce *Uniformity* upon the discomposed Understandings of about Eight Millions of Hearers.

4 As to the *Administration of Justice*. If in this great City shall dwell the Owners of all the Lands and other valuable Things in *England*; if within it shall be all the *Traders*, and all the *Courts, Offices, Records, Juries, and Witnesses*; then it follows, that *Justice* may be done with speed and ease.

5 As to the *Equality* and easie *Levy*ing of Taxes. It is too certain, that *London* hath at some times paid near half the Excise of *England*; and that the People pay thrice as much for the Hearths in *London*, as those in the Country, in proportion to the People of each; and that the Charge of Collecting these Duties, have been about a sixth part of the Duty it self. Now, in this great City the Excise alone, according to the present Laws, would not only be double to the whole Kingdom, but also more equal. And the Duty of Hearths of the said City, would exceed the present proceed of the whole Kingdom: And as for the *Customs*, we mention them not at present.

6 Whether more would be *gained* by *Foreign Commerce*?

The Gain which *England* makes by *Lead, Coals*, the Freight of Shipping, &c. may be the same, for ought I see, in both Cases. But the Gain which is made by *Manufactures*, will be greater, as the Manufacture it self is greater and better. For in so vast a City *Manufactures* will beget one another, and each *Manufacture* will be divided into as many parts as possible, whereby the Work of each *Artisan* will be simple and easie; as for Example. In the making of a *Watch*, if one Man shall make the *Wheels*, another the *Spring*, another shall Engrave the *Dial-plate*, and another shall make the *Cases*, then the *Watch* will be better and cheaper, than if the whole Work be put upon any one Man. And we also see that in *Towns*, and in the *Streets* of a great *Town*, where all the *Inhabitants* are almost of one Trade, the Commodity peculiar to those places is made better and cheaper than elsewhere. Moreover, when all sorts of *Manufactures* are made in one place, there every Ship that goeth forth, can suddenly have its Loading of so many several Particulars and Species, as the Port whereunto she is bound can take off. Again, when the several *Manufactures* are made in one place, and shipped off in another, the *Carriage, Postage, and Travelling-Charges* will inhanse the Price of such *Manufacture*, and lessen the Gain upon *Foreign Commerce*. And lastly, when the imported Goods are spent in the Port it self, where they are landed, the *Carriage* of the same into other places will create no surcharge upon such Commodity; all which particulars tend to the greater Gain by *Foreign Commerce*.

7 As for *Arts of Delight* and *Ornament*.

They are best promoted by the greatest Number of *Emulators*. And it is more likely that one *ingenious, curious Man* may rather be found out amongst Four Millions than Four Hundred Persons. But as for *Husbandry*, viz. *Tillage*

and *Pasturage*, I see no Reason, but the second State (when each Family is charged with the Culture of about Twenty Four Acres) will best promote the same.

8 As for lessening the Fatigue of *Carriage* and *Travelling*.

The thing speaks it self; for if all the Men of Business, and all *Artisans* do live within Five Miles of each other: And if those who live without the great City, do spend only such Commodities as grow where they live, then the Charge of Carriage and Travelling could be little.

9 As to the preventing of *Beggars* and *Thieves*.

I do not find how the differences of the said two States should make much difference in this particular; for Impotents (which are but One in about Six Hundred) ought to be maintained by the rest. 2. Those who are unable to Work, through the evil Education of their *Parents*, ought (for ought I know) to be maintained by their nearest Kindred, as a just Punishment upon them. 3. And those who cannot find Work (though able and willing to perform it) by reason of the unequal application of Hands to Lands, ought to be provided for by the *Magistrate* and *Landlord* till that can be done; for there needs be no *Beggars* in Countries, where there are many Acres of unimproved improvable Land to every Head, as there are in *England*. As for *Thieves*, they are for the most part begotten from the same Cause; for it is against Nature, that any Man should venture his Life, Limb, or Liberty, for a wretched Livelihood, whereas moderate Labour will produce a better. But of this see Sir *Thomas Moor*, in the first part of his *Utopia*.

10 As to the *Propagation* and *Improvement of Useful Learning*.

The same may be said concerning it, as was above-said concerning *Manufactures*, and the *Arts of Delight* and *Ornament*; for in the great vast City, there can be no so odd a Conceit or Design, whereunto some Assistance may not be found, which in the thin, scattered way of Habitation may not be.

11 As for the *Increase of People by Generation*.

I see no great difference from either of the two States, for the same may be hindred or promoted in either, from the same Causes.

12 As to the *Plague*.

It is to be remembered, that one time with another, a *Plague* happeneth in *London* once in Twenty Years, or thereabouts; for in the last Hundred Years, between the Years 1582 and 1682, there have been Five great *Plagues*, viz. Anno 1592, 1603, 1625, 1636 and 1665. And it is also to be remembred, that the *Plagues of London* do commonly kill one fifth part of the *Inhabitants*. Now, if the whole People of *England* do double but in Three Hundred and Sixty Years, then the Annual Increase of the same is but Twenty Thousand, and in Twenty Years Four Hundred Thousand. But if in the City of *London* there should be Two Millions of People, (as there will be about Sixty Years hence) then the *Plague* (killing one fifth of them, namely, Four Hundred Thousand once, in Twenty Years) will destroy as many in One Year, as the whole Nation can refurnish in Twenty: And consequently the People of the Nation shall never Increase. But if the People of *London* shall be above Four

Millions (as in the first of our Two *extravagant* Suppositions is premised) then the People of the whole Nation shall lessen above Twenty Thousand *per Annum*. So as if People be worth Seventy Pounds *per* Head (as hath elsewhere been shewn) then the said greatness of the City will be a damage to it self and the whole Nation of Fourteen Hundred Thousand Pounds *per Annum*, and so *pro Rata*, for a greater or lesser Number; wherefore to determine, which of the Two *States* is best, (that is to say, towards which of the said Two *States*, *Authority* should bend the present *State*) a just Balance ought to be made between the Disadvantages from the *Plague*, with the Advantages accruing from the other Particulars above-mentioned; unto which *Balance* a more exact Account of the People, and a better Rule for the Measure of its Growth is necessary, than what we have here given, or are yet able to lay down.