How did Industrialisation Affect Subjective Well-being in England and Wales between 1861-1901?

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Abstract

The debate around the change in living standards during the Industrial Revolution has received much attention with little consensus reached. Many methods have been used to assess living standards, but none have successfully incorporated a measure of subjective well-being into their analysis. New research has demonstrated that subjective well-being may be independent of factors that determine economic development. Furthermore, new methods of determining subjective well-being such as suicide rates have been shown to be an effective proxy. This poses an issue for the living standards debate, as Durkheim has argued that industrialisation increased suicides. Using suicide data from the Registrar General between 1861 - 1901, suicides are compared to changes in urbanisation and occupational structure. Multivariate regression analysis demonstrates that there was a significant positive relationship between both urbanisation and increases in industrial employment.

1. Introduction

Subjective well-being is a new measurement of economic performance that is being widely utilised to assess economic performance. Specifically, it is a measurement of happiness that is traditionally self-reported through surveys.[1] Easterlin was one of the first to analyse trends in subjective well-being, finding that happiness did not necessarily correlate with traditional metrics of economic development, especially income statistics.[2] Whilst the use of self-reported surveys has been criticised, outcome-based proxies have been shown to be

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[1] Paul Dolan And Robert Metcalfe, "Measuring Subjective Well-Being: Recommendations on Measures for Use by National Governments," Journal of Social Policy 41, No. 2 (December 2012): Pp. 409-427.

[2] Richard A. Easterlin, "Will Raising the Incomes of All Increase the Happiness of All?" Journal Of Economic Behavior and Organization 27, No. 1 (1995): Pp. 35-47.

effective.[3] Daly and Wilson demonstrate that suicide data can be used as a sufficient proxy for subjective well-being.[4]

This poses an issue in the debate around living standards in the Industrial Revolution, as Durkheim has documented a positive relationship between industrialisation and suicides in *Le Suicide,* implying that the Industrial Revolution may have had a negative impact on subjective well-being.[5] Given that the book was originally published in 1897, Durkheim's analysis is short of empirical analysis due to a lack of data. Despite this, Durkheim's theoretical analysis of anomic suicide is used as the framework to assess the underlying causes of suicides in the Industrial Revolution.

Anderson has disputed Durkheim's theory using data from Victorian England and Wales finding that there was no relationship between industrialisation and suicides.[6] However, Anderson's analysis is also limited given that she focuses on averages for short periods and does not analyse changes over the long run. Additionally, Anderson makes no use of regression analysis in her research. Using the same data from the Registrar General, paired with county-wide urbanisation and occupation data, I expand Anderson's analysis by examining long run trends from 1861 to 1901 as well as using multivariate regression analysis. Overall, I find that suicides were significantly positively correlated with industrialisation, indicating that subjective well-being may have been negatively affected by the Industrial Revolution.

Section 2 of the paper expands on the historiographical context and expands on the gaps in the literature that need to be filled. Section 3 discusses the primary source used, the potential issues with its use, and the external datasets used. Section 4 discusses the methodology used to analyse the data, discussing

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[3] Mary Daly And Daniel Wilson, "Happiness, Unhappiness, And Suicide: An Empirical Assessment," Journal of The European Economic Association 7, No. 2-3 (2009): Pp. 539-549.
[4] Ibid.
[5] Émile Durkheim, *On Suicide* (London: Penguin, 2006).
[6] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past And Present* 86, No. 1 (1980): Pp. 149-173.

potential biases and how they have been mitigated. Section 5 displays descriptive aggregate statistics that show the long-run trends of suicides. Section 6 expands on this by observing the correlation between urbanisation and suicides. Section 7 observes the correlation between changes in county-wide occupational structure and suicides. Finally, Section 8 concludes the analysis and suggests potential future avenues for research.

2.   Historiographical Context

2.1 Standards of Living in the Industrial Revolution

Economic historians have sought to establish how industrialisation affected peoples living standards, but little consensus has been established. A range of methodologies and metrics have been used to attempt to establish these ideas. There are two main schools of thought in the literature; the pessimists and optimists.[7] Engels offered the original pessimistic account of the Industrial Revolution in *The Condition of the Working Class in England* published in 1845, arguing that the living standards of the working classes were impeded by the Industrial Revolution.[8] Optimists argue that there was significant growth in living standards from the later eighteenth century to the mid-nineteenth century.[9] Lindert and Williamson are the main source of optimism and have argued that living standards almost doubled between 1820-1850.[10] They additionally find that the average income for traditional occupations was far lower than the occupations that expanded as a result of the Industrial Revolution, which in their eyes signifies an increase in the standard of living.[11] However, this notion has been challenged by the inclusion of other metrics that more adequately represent living standards. Joel Mokyr for instance has used

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[7] Joel Mokyr, "Is There Still Life in The Pessimist Case? Consumption During the Industrial Revolution, 1790-1850," *The Journal of Economic History* 48, No. 1 (1988): Pp. 69-70.
[8] Friedrich Engels, *The Condition of The Working Class in England* (London: Electric Book Co., 2001).
[9] Joel Mokyr, "Is There Still Life in the Pessimist Case? Consumption During the Industrial Revolution, 1790-1850," *The Journal of Economic History* 48, No. 1 (1988): Pp. 69-92, 69-70.
[10] Peter Lindert And Jeffrey Williamson, "English Workers' Living Standards During the Industrial Revolution: A New Look," *The Economic History Review* 36, No. 1 (1983): Pp. 1-25, 4.
[11] Ibid. 7.

data on the consumption of goods such as sugar, tea and tobacco concluding that the hypothesis that living standards did not increase significantly "cannot be rejected."[12] However, others have seen fit to look outside of the lens of income growth. Feinstein takes account of the negative effects of urbanisation, and adjustment in family size.[13] Crafts however has gone a step further, encouraging the use of as many metrics as possible.[14] Crafts pointed out that the way we assess economic development must include more factors.

For instance, today the UN offers an alternative measure of the development of economies in its Human Development Index.[15] As such, Crafts suggested the use of alternative metrics such as political corruption, crime, mortality, and other important aspects of living standards which cannot be captured by simple real wage data.[16] The downside of Crafts' suggestions is that there is no incorporation of measurements in subjective well-being, which is now becoming an ever-prominent metric to assess the performance of an economy. Optimists have attempted to challenge Engels' original pessimistic account but few have grasped the metrics that Engels has incorporated into his analysis that go beyond economic growth and development.[17] Engels instead focused on social systems and disruption to society as a whole, all of which would have an obvious impact on subjective well-being.[18] He pointed towards factors such as the displacement of labour by new technology, and the environment in which people endured in urban areas.[19] This is a key area that is missing from the current literature.

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[12] Joel Mokyr, "Is There Still Life in The Pessimist Case? Consumption During the Industrial Revolution, 1790-1850," *The Journal of Economic History* 48, No. 1 (1988): Pp. 69-92, 69.
[13] Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and The Standard of Living in Britain During and After the Industrial Revolution," *The Journal of Economic History* 58, No. 3 (1998): Pp. 625-658.
[14] Nicholas Crafts, "Some Dimensions of the 'Quality of Life' During the British Industrial Revolution," *The Economic History Review* 50, No. 4 (1997): Pp. 617-639.
[15] Ibid.
[16] Ibid.
[17] Friedrich Engels, *The Condition of The Working Class In England* (London: Electric Book Co., 2001).
[18] Ibid. 215-282.
[19] Ibid. 79-143.

<u>2.2 Disparities between Economic Development and Subjective Well-being</u>

There exists an increasing body of literature outside of this debate that urges the incorporation of subjective well-being into our assessments of any economy, as it has been observed that happiness levels may not always follow traditional metrics such as income levels. One of the first to identify this was Easterlin.[20] Easterlin attempts to create a measure of subjective well-being, mainly drawing from the results of surveys to measure happiness levels. He found for instance that there was no specific trend in happiness in the US between 1946 and 1977, despite the fact that real GDP per capita more than doubled during the period.[21] Graham has gone further to associate how happiness is affected by other metrics as opposed to just income.[22] Graham finds that increases in income can be associated with increases in happiness only for very poor countries compared to developed countries, but also finds that happiness is determined by other variables such as employment status, marital status, health and so on.[23]

However, she also finds outliers in the data where certain counties have been able to adapt to poor economic circumstances and retain happiness levels that exceed countries that are more economically developed. Graham gives the example of Nigeria which is significantly poorer than Japan in terms of income but has higher happiness levels.[24] This calls into question the ability of traditional methods to establish the levels of subjective well-being during the Industrial Revolution. Hills, Proto, Sgroi and Seresinhe have attempted to measure historical subjective well-being in the industrial revolution by using the occurrence of certain words such as "happiness" in millions of digitized books as a proxy of subjective well-being.[25] They found that happiness levels were higher in the nineteenth century. From 1825 to 1900 happiness levels stayed relatively

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[20] Richard A. Easterlin, "Will Raising the Incomes of All Increase the Happiness of All?" *Journal Of Economic Behavior and Organization* 27, No. 1 (1995): Pp. 35-47.

[21] Ibid. 37-8.

[22] Carol Graham, *Happiness Around the World: The Paradox of Happy Peasants and Miserable Millionaires* (Oxford: Oxford University Press, 2012).

[23] Ibid. 47-87.

[24] Carol Graham, *Happiness Around the World: The Paradox of Happy Peasants and Miserable Millionaires* (Oxford: Oxford University Press, 2012). 48.

[25] Thomas Hills, Eugenio Proto, And Daniel Sgroi, "Historical Analysis of National Subjective Well-Being Using Millions of Digitized Books," *Ssrn Electronic Journal*, 2016.

constant in the UK according to their results.[26] Finding no overall trend in happiness despite the consistent rise in GDP across the period in question reinforces Easterlin's hypothesis.[27] However, the authors urge caution when using the data for long-run comparison as there may be issues with the robustness of the methodology used; the data is dependent on the demand for literature, and who the literature was demanded by.[28] As they mention, the demand for literature shifted over time from the elite to the working classes which may have had an impact on the contents of the literature that data is being extracted from.[29] Therefore, we must turn to other methods to gain an insight into how subjective well-being was influenced by the Industrial Revolution.

2.3 Durkheim's Analysis of Suicides

One such metric that has received particular attention in the field of sociology has been that of suicide. This began with Emil Durkheim writing during the Industrial Revolution, who demonstrated that there was a "social suicide rate."[30] He observed that external effects have a general impact on the level of suicide, as opposed to the conventional wisdom that assumed it was consistent over time and entirely dependent on the individual.[31] He further categorised the reasons for suicide into three factors: egotistical suicide, altruistic suicide, and anomic suicide. Egoistical suicide is described as being the "suicide that results from excessive individualism."[32] An example of this was the difference in suicide rates between Catholics and Protestants. Conversely, Altruistic describes the opposite situation "in which the individual does not belong to himself, or else is merged with something other than himself, and where the pole star that guides his behaviour is situated outside himself, that is to say in one of the groups to which he belongs" or in other words "suicide resulting from intense altruism."[33] Most

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[26] Ibid. 1273.
[27] Ibid. 1274.
[28] Ibid. 1273.
[29] Ibid.
[30] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 331.
[31] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 331.
[32] Ibid. 225.
[33] Ibid. 239.

important to our investigation, however, is Durkheim's concept of anomic suicide. This is described as a situation in which a lack of social regulation - especially due to social disruption – leads someone to suicide.[34] Here there is a clear link here to Engels' analysis, in that Engels placed a large focus on the displacement of workers by machinery.[35] Anomic suicide is the most crucial factor in Durkheim's analysis that can be related to the existing literature on living standards in the Industrial Revolution, as Durkheim argues that this specific phenomenon explains why non-agricultural workers seem to commit suicide more frequently.[36] Durkheim establishes this relationship by looking at average suicide rates between 1866-1891 in various European countries and their respective occupational structures.[37]

For Durkheim, the reason for this was that agricultural occupations had a tangible ceiling in the living standards they would be able to achieve, but the ceiling for those in industry and commercial occupations was simply a "void" that they were "obliged to lose themselves in."[38] This was because the Industrial Revolution freed "industrial relations from any regulation."[39] He argues that when individuals' expectations are not regulated, they can surpass their means, which ultimately results in despair since they are not able to satisfy their wants.[40] There are also parallels here to the Easterlin Paradox, especially where Durkheim explicitly states that "If industrial and financial crises increase suicides, it is not because they impoverish people, since critical increases in prosperity have the same result; it is because they are critical, that is to say, disturbances in the collective order."[41] Through the lens of Durkheim, living standards in the Industrial Revolution were about more than increases in income. But suicide data in this context has not been used as a measure of

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[34] Ibid. 262, 283.
[35] Friedrich Engels, *The Condition of The Working Class in England* (London: Electric Book Co., 2001). 79-143.
[36] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 283.
[37] Ibid.
[38] Ibid.
[39] Ibid. 279.
[40] Ibid. 271-2.
[41] Ibid. 267.

subjective well-being, rather it has just been focused on in isolation without any claim to be linked to any form of subjective well-being. Fortunately, newer literature has established the link between suicide rates and measures of subjective well-being, which is discussed further in section 4. In any case, it is clear that there are elements of well-being that are yet to be examined by current literature, and suicide data is a potential avenue for this.

2.4 Suicides and Industrialisation in Victorian England and Wales

The main benchmark for this article is Olive Anderson's paper *Did Suicide Increase with Industrialization in Victorian England?* given that we both use the same source for our suicide data – the Registrar General.[42] Anderson's article is a direct response to Durkheim, arguing that Industrialisation was not associated with higher suicides in England and Wales. She comes to three main conclusions: (1) that there is no association between industrialisation and suicide in Victorian England and Wales; (2) people ending their working lives in industrial towns had a higher proclivity towards suicide; and (3) that there was variation in suicide rates between occupations at in regions at different stages of industrialisation as well as between different 'cultural' regions.[43] I argue that this analysis can be taken further in the methods used to come to these conclusions, which is where I am to fill a gap. Anderson pays little attention to the trend of the suicide rate over time, instead simply observing the static averages for given periods and variables. For instance, in her analysis of occupation suicide rates, Anderson examines the averages for three points in time: 1878-83, 1890-2 and 1900-2. From this, she concludes that textile workers

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[42] Olive Anderson, "Did Suicide Increase With Industrialization In Victorian England?," *Past And Present* 86, No. 1 (1980): Pp. 149-173; *Registrar General, Twenty-Fourth To Sixty-Fourth Annual Report Of The Registrar-General* (P.P 1861 Xxiv; 1862 Xxv; 1863 Xxvi; 1864 Xxvii; 1865 Xxviii; 1866 Xxix; 1867 Xxx; 1868 Xxxi; 1869 Xxxii; 1870 Xxxiii; 1871 Xxxiv; 1872 Xxxv; 1873 Xxxvi; 1874 Xxxvii; 1875 Xxxviii; 1876 Xxxix; 1877 Xl; 1878 Xli; 1879 Xlii; 1880 Xliii; 1881 Xliv; 1882 Xlv; 1883 Xlvi; 1884 Xlvii; 1885 Xvliii; 1886 Xlix; 1887 L; 1888 Li; 1889 Lii; 1890 Liii; 1891 Liv; 1892 Lv; 1893 Lvi; 1894 Lvii; 1895 Lviii; 1896 Lix; 1897 Lx; 1898 Lxi; 1899 Lxii; 1900lxiii; 1901 Lxiv)

[43] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 160-1.

had the highest suicide rates, but other industrial occupations had the lowest suicide rate such as glassworkers.[44]

However, using outside data on the occupational structure of each county, we would be able to expand this analysis from 1861 to 1901, which also gives us a clearer picture of how these suicide rates may have changed over time in comparison to the occupational structure of a given county. Additionally, Anderson makes no use of regression analysis, which would allow us to come to a more robust conclusion. This is because we are able to control for unobserved effects such as culture which Anderson has highlighted as a potential issue in her analysis. She highlights for instance the potential impact of differences in levels of concealment between counties depending on cultural factors.[45] Using a county fixed effects regression analysis may help mitigate some of these potential difficulties. I aim to further develop Anderson's analysis through the use of a wider range of data and also to bridge a gap between the social history of suicides and the economic history of living standards in the Industrial Revolution.

3.   Discussion of Primary Sources

3.1 Summary of Primary Sources

Using suicide data from Registrar General for England and Wales, I aim to analyse how the suicide rate changed over time, and in comparison, to other metrics from existing datasets such as urbanisation and occupational structure. Data on suicides only becomes available on a continual basis from 1858, when William Farr – who was responsible for handling the data in the Registrar General at the time - introduced suicide as an official cause of death.[46] From then on, this data is compiled on an annual basis from 1858 to 1910. The data has been transcribed from 1861 in order to be able to compare to the external

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[44] Ibid. 150.
[45] Ibid. 164.
[46] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 151.

datasets; the datasets use official census data for urbanisation and occupational structure, which is collected on a decennial basis, recorded on the first year of every decade; 1861, 1871, 1881 and so on.

3.2 The Reliability of the Registrar General

The data in the Registrar General can be widely deemed to be trustworthy. It has been extensively used in the literature on living standards during the Industrial Revolution. An example is Davenport's article *Urbanization and Mortality in Britain c. 1800-50,* where mortality data from the Registrar General is used.[47] The General Register Office still exists as a government body today to record births, deaths, marriages and so on.[48] The data compiled in the source is the main source of the causes of death in the UK, and as Anderson remarks is more reliable than the judicial statistics which relied on coroners to transmit to the Home Office the annual "verdicts of their juries."[49] On the other hand, registrars of the Registrar General were required to submit quarterly returns of deaths, making the data much more precise and reliable.[50] Therefore, we can be fairly sure that the data is reliable.

3.3 Measurement Errors

With that being said, the data may still have been affected by some measurement issues. One for instance is that more prosperous areas are better equipped to accurately report deaths, which may lead to an overrepresentation of suicides in these areas. This is a potential drawback, as we may associate areas that are more prosperous with being more industrialised.

However, according to Anderson, only a "handful" of highly urbanized counties were exceptionally efficient at registering deaths, as they had the "lowest

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[47] Romola Davenport, "Urbanization and Mortality in Britain, c. 1800–50," *The Economic History Review* 73, no. 2 (2020): pp. 455-485.
[48] Government Digital Service, "General Register Office," *GOV.UK* (UK Government, March 4, 2019), https://www.gov.uk/general-register-office.
[49] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 149.
[50] Ibid.

proportion of uncertified deaths in the 1880s."[51] Part of the reason for this was that these areas attracted "first-rate" coroners by paying them more.[52] As a result, suicides registered in these few counties may be higher, but should not pose a large issue if the trends are also similar for the smaller counties. Another issue can be found in the vagueness of the definition of suicide in the nineteenth century. Durkheim highlights this as being a prevalent issue.[53] This presents a potential issue, as for many counties the sample size of total deaths by suicide is small. This leaves a small margin for error and exacerbates differences between counties if there is a difference in the likelihood of a death being classed as a suicide.

3.4 External Datasets and their Limitations

The Registrar General categorises deaths into males and females, but it does not have data on causes of death for specific occupations or urbanisation. This is something that must be constructed using external data. Two external datasets are used to compare results: data on county-level urban population by Bennett, and data on occupational structure by Lee.[54] Data in both have been derived from official census data, which means that it has been tabulated on a decennial basis, giving us five points in time for comparison. Data on regional occupation structure has been categorized into 27 occupations.[55] The occupational data is split by male and female; however, the Urban population data only contains aggregate-level data. The data by Lee also contains data on the total population of each county.[56] For both datasets, the main problem is that we cannot peg this data to the specific individuals who committed suicide, but if industrialisation did have an effect on an individual's propensity towards suicide, we would expect that there would be a correlation over time towards features of an industrialised

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[51] Ibid. 162.
[52] Ibid. 163.
[53] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 15.
[54] Robert Bennett, *Urban Population Database, 1801-1911 [Data Collection]*, 1st ed. (Manchester, Lancashire: University of Manchester, Department of Geography, 2012); Clive Howard Lee, *British Regional Employment Statistics, 1841-1971* (Cambridge: Cambridge University Press, 1980).
[55] Clive Howard Lee, *British Regional Employment Statistics, 1841-1971* (Cambridge: Cambridge University Press, 1980).
[56] Ibid.

area or the compositional structure of a given area and an increase in the level of suicides.

4.   Research Design

4.1 Research Outline

I aim to understand how industrialisation affected subjective well-being, using suicide as a proxy. The first step is to establish the long-run trends of suicides between 1861 and 1901, which is something that Anderson has failed to consider. The aggregate trends may give insight into how the number of suicides changed over time, which gives insight into how subjective well-being changed over the period, as well as any potential link to economic development. The results are compared with existing standards of living data to check for any disparities. However, aggregate data alone tells us little about the causation. To do this, suicide data is paired with urbanisation data. Anderson uses urbanisation as a proxy for industrialisation so the results can be easily compared to hers. Aggregate long-run trends are observed for both and subsequently compared to see if the trends in suicides and urbanisation are similar, to see if there may be a relationship. Subsequently, regression analysis is used to control for potential biases. This allows us to observe a robust relationship between suicides and urbanisation. The results are compared to the existing literature in the living standards debate that focuses on the negative effects of urbanisation to observe where the results fit into the literature.

However, as urbanisation is a crude measurement of industrialisation, the use of county occupational structure data is used to take the analysis even further, as this is something that Anderson considers only for a limited number of points in time - I878-83, I890-2 and 1900-2.[57] The use of county-wide occupational structure can tell us about how different types of economic development may have influenced suicides. It is potentially the case that suicides were not

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[57] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 150.

influenced by the rise in industrial occupations, but by other occupations such as commercial or professional occupations. Like urbanisation, the aggregate long-run trends in occupational structure are compared with suicides to observe the relationship. To cement the analysis, regression is used again to control for biases and observe the relationship between suicides and each occupational class. Finally, the results are placed in the context of the wider literature and existing evidence.

4.2 Suicide as a Sufficient Proxy for Subjective Well-being

The first issue to address in the methodology is the use of suicide as a proxy for subjective well-being. It has been well-established that there is a relationship between suicide and subjective well-being by many authors. For example, using a large sample from Finland Koivumaa-Honkanen et al. show that people who had a below-average level of subjective well-being were four times as likely to commit suicide in the following 10 years.[58] Qian has offered some critique to this idea using data from 81 countries, finding that suicide risk does not have a negative association with subjective well-being as a whole, but it does correlate negatively with two aspects of subjective well-being: positive self-emotion and positive inter-personal emotion.[59] Positive self-emotion is described as having a purposeful life, and positive interpersonal emotion as being treated with respect.[60]

However, this analysis relates more to suicide as a comparison between countries and not within countries. As Qian notes, reported happiness may differ between countries due to many factors such as different cultural conceptions of happiness, so it does not necessarily pose an issue for intra-national comparison.[61] Alternatively, by using multivariate regression analysis, Daly and

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[58] Heli Koivumaa-Honkanen et al., "Self-Reported Happiness in Life and Suicide in Ensuing 20 Years," *Social Psychiatry and Psychiatric Epidemiology* 38, no. 5 (January 2003): pp. 244-248.
[59] Ge Qian, "Associations of Suicide and Subjective Well-Being," *OMEGA - Journal of Death and Dying* 84, no. 1 (April 2019): pp. 103-115, 103.
[60] Ge Qian, "Associations of Suicide and Subjective Well-Being," *OMEGA - Journal of Death and Dying* 84, no. 1 (April 2019): pp. 103-115, 107.
[61] Ibid.

Wilson have shown that there is a strong relationship between subjective well-being and suicide risk on an individual level.[62] Whilst it may be argued that suicide data can only represent those who are the least happy in society, and not those at the top of the happiness distribution, Daly and Wilson have shown that on an individual level, suicide is strongly correlated with factors that determine subjective well-being.[63]

The same factors that increased suicide risk were also responsible for decreasing an individual's happiness levels, which they argue means that suicide data can be used to evaluate the happiness levels of the general population and not just those at the bottom levels of the happiness distribution.[64] For instance, educational attainment is correlated with both suicide risk and happiness levels to a similar extent on an individual basis.[65] Therefore, we might expect that for a given country that if suicides rise, we may expect the individuals of that country to have a lower subjective well-being. Given that our analysis is not comparative at the inter-country level and focuses purely on suicide data for individuals in England and Wales, suicide rates can serve as a good proxy for subjective well-being. At the very least, suicide data can tell us about the subjective well-being of the most unhappy portion of the population. As Helliwell states, suicide is the "ultimate assessment of life satisfaction", where suicide is the "final act."[66] If the optimistic view of the Industrial Revolution is correct, we would expect to see suicide rates decrease overall.

4.3 Summary of the Regression Models and Variables

Two regression analyses have been conducted: one to assess the effect of urbanisation on the level of suicides, and one to assess the impact of occupational structure on the level of suicides. Both utilise a Linear OLS panel model, where

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[62] Mary Daly and Daniel Wilson, "Happiness, Unhappiness, and Suicide: An Empirical Assessment," *Journal of the European Economic Association* 7, no. 2-3 (2009): pp. 539-549.
[63] Ibid. 539.
[64] Ibid. 547.
[65] Ibid. 546.
[66] John Helliwell, "Well-Being and Social Capital: Does Suicide Pose a Puzzle?" *Social Indicators Research* 81, no. 3 (2006): pp. 455-496, 456.

the dependent variable is total deaths by suicide. For the urbanisation regression, a variety of explanatory variables have been employed. The main effect variable is the amount of the population living in urban areas in absolute terms. Additionally, the growth rate of urban population is also used, as Anderson has claimed that towns going through earlier stages of urbanisation had higher suicide rates. We may expect areas with higher growth rates to be at an earlier stage.

To compare the analysis with Andersons even further, interaction variables have been constructed for the three sizes of towns that Anderson uses in her analysis. Size I areas correspond to counties where over 66 percent of the population is living in urban areas. Size II areas correspond to counties with less than 66 percent but over 33 percent of its inhabitants residing in urban areas. Size III corresponds to counties with less than 33 percent living in urban areas. This will allow us to see the difference in slope for each type of county. For occupation, a completely different set of variables are employed. The occupational dataset gives more detailed information than urbanisation figures do.[67] Lee has categorised employment into 27 categories. Using information from the Census, these occupations can be categorised into 6 broad classes as listed: I professional; II domestic; III commercial; IV agricultural; V industrial; VI indefinite and non-productive.[68] Unfortunately, we are missing data for domestic and non-productive classes, but this still leaves us with the classes most relevant to our investigation. The number of people in each occupational class are used as the main effect variables. Additionally, the "growth rate in occupations outside agriculture" is used to assess the effect of higher growth rates, again to assess the correlation for areas at an earlier stage of industrialisation. This variable has been calculated by computing the percentage of all employment made up of non-agricultural occupations and calculating the percentage change per decade.

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[67] Clive Howard Lee, *British Regional Employment Statistics, 1841-1971* (Cambridge: Cambridge University Press, 1980).
[68] *Census of England and Wales, Population tables (P.P 1861, Vol I, p. 12)*

4.4 Confounders

If regression analysis is used, we must assess the potential biases. First of all, there is a potential bias in that of gender; if more males are moving to urban areas or being employed in specific occupations then the suicide rate will rise purely because more males are in urban areas or in these occupations. Additionally, we may see more females come into employment in some counties as they may be gradually moving away from the domestic sphere to other roles. For instance, whilst on the whole it seems that employment shifted towards males, there are certain counties where it did not. The share of employment occupied by females increased in Berkshire for instance between 1861 and 1901.[69] This is a problem because according to Durkheim, males commit suicide far more frequently on average.[70] Gender can be a confounder in that depending on the ratio of males to females in the workforce the suicide rate may decrease or increase. If the amount of employment increases overall, but it is only males who occupy this new employment, we may expect the level of suicides to increase as well as the number of people in any occupation.

Luckily the data from 1861-1901 displays deaths by suicide for males and females. Although the urbanisation data does not categorise observations by male and female, the occupational data does, which opens the possibility of controlling for gender. As such, a control variable for the "share of people employed who are male" has been introduced for the occupation regression. This has been calculated by finding the total amount of people employed for a given cross-section and calculating what proportion of this is male by looking at the male total employment. For the urbanisation regression, data from occupations is used to calculate the "share of those employed outside of agriculture who are male", which will control for a higher amount of males either living or working in

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[69] *Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general* (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV)
[70] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 331.

urban areas. This will account for any changes in employment between genders that may confound our results.

Another area we must consider is the influence of age on suicide. The risk of suicide generally increases with age.[71] However, the data does not display the ages of those who committed suicide in each county, so we cannot control for age. As Anderson notes, many rural areas experienced outward migration of younger people to industrial areas.[72] Despite this, she finds the effect of this to be only marginal, so we can discount this to an extent.[73] Additionally, the fact that younger people seem to commit suicide less can only create a bias towards a negative correlation between suicides and industrialisation. This is therefore only a problem if we conclude that industrialisation was significantly negatively correlated with suicides.

The final and most important confounder is population. If the population increases in a given county, we can expect the number of people in all occupations or people living in urban areas to increase, and at the same time, we may expect suicides to increase if suicides per capita remain constant. Without controlling for population, an increase in any occupation would lead to an increase in suicides purely because the size of the population has increased. As a result, the total population has been introduced as a control variable to check for robustness.

4.5 Variation Between Counties

Variations between counties in unobserved factors such as culture must be considered. Anderson has noted that there were significant differences in suicide rates between "one cultural region and another."[74] These differences could be found in differing efficiencies of reporting suicides between counties, differing

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[71] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 152-3.
[72] Ibid. 153.
[73] Ibid.
[74] Ibid. 161.

rates of concealment, and potentially different definitions of suicide, all of which would have had an effect on the registering of suicides but are difficult to quantify as a whole.[75] As such, the model has been tested using county fixed effects to control for unobserved effects that do not change over time but may have influenced the number of registered suicides. However, the county fixed effects can only control for factors that remained constant over time. Therefore, some elements of culture may not be controlled for if they have changed over the period examined. With that said, we are still able to control for some potential biases that Anderson mentions, so the outcome is still more robust.

4.6 Ecological Fallacy

One other point of note is the potential for ecological fallacy; we cannot derive statements on the individual level based on correlation on an aggregate level. Freedman has explained this to be a major issue with Durkheim's conclusion that Protestants commit suicide more frequently than Catholics.[76] This is because Durkheim's data for suicide is collected on an individual level, but the data for religion is not pegged to a specific individual and is instead measuring numbers on a county-level. Freedman calls this an 'aggregation bias'.[77]

Due to the data being collected on different levels, i.e. the suicide data being collected on an individual level, and occupational data being collected on an aggregate level for each county, we must be careful not to conclude that a correlation in suicide rates with a change in employment of a specific occupation on the aggregate level means that being in that occupation changes your likelihood of committing suicide. Even though it may suggest that working in these occupations might influence an individual's proclivity towards suicide, the only conclusion we can logically make is that a change in the number of people in this occupation in a given county changes the likelihood of the entire population of that county to commit suicide.

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[75] Ibid.
[76] David Freedman, Ecological Inference, and the Ecological Fallacy (Berkley, California: University of California Berkley Department of Statistics, 1999).
[77] Ibid. 1.

Therefore, occupational structure is largely used as a proxy for industrialisation. Looking into the specific occupational structures gives us insight into the type of economic development, i.e., was there a higher correlation where certain industries expand? Despite this, as Freedman notes, ecological inferences can still "offer valuable clues about individual behaviour", but the conclusions in this sphere are not as concrete.[78]

5. Long-Run Analysis

5.1 Suicides Between 1861-1901

Long-run trends in the aggregate data can give us insight into the trends in the number of suicides across the period, demonstrating the change in subjective well-being. The results show that on the aggregate level, suicides increased significantly between 1861 and 1901. Using annual data from the Registrar General, the total percentage of deaths by suicide has been calculated by using data on deaths from suicides, as well as total deaths.[79] The results of this can be displayed in Figure 1. Graph 1 demonstrates that from 1861 to 1901, the percentage of deaths resulting from suicides had increased from around 0.3 percent to almost 0.6 percent. According to this metric, suicides almost doubled within four decades.

However, this could have been due to a reduction in other causes of death which would disproportionately increase the significance of deaths caused by suicide as a proportion of total deaths. Despite this, total deaths also increased throughout the period, but not at the same rate as total deaths by suicide, as demonstrated by Graph 2 in Figure 1. Total deaths steadily increased but at a slower rate; at
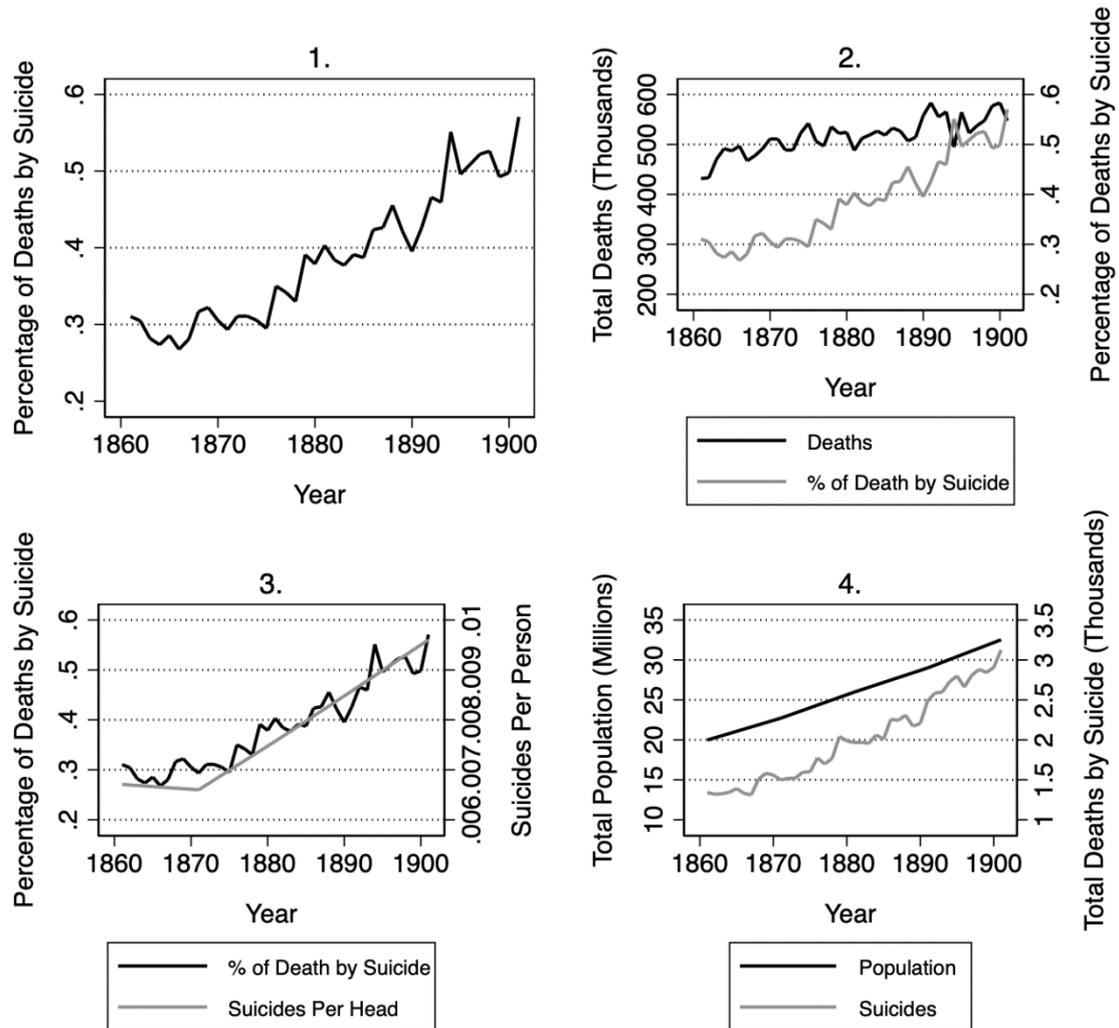
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[78] David Freedman, *Ecological Inference, and the Ecological Fallacy* (Berkley, California: University of California Berkley Department of Statistics, 1999). 5.
[79] *Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general* (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV)

the start of the period total deaths sat at 431,745, yet by the end this had only increased by 26 percent to 547,346.

Figure 1. Suicides in England and Wales, 1861-1901

The final issue may be that suicides were simply increasing because of an increase in population. To prove that this was not the case, graph 3 in Figure 1 compares the rise in the percentage of deaths by suicide to suicides per head.

Because population data was only collected on a decennial basis by the Census, we can only calculate suicides per head on a decennial basis, but the trend is generally still upward, following a similar trajectory to total suicides. Suicides per head increased from 0.006 in 1861, to 0.009 by 1901, indicating a 50 percent rise in suicides per person over the whole period, only decreasing from 1861 to 1871. Graph 4 of Figure 1 displays the same relationship in absolute terms, showing that whilst both population and suicides were rising, suicides were rising at a faster rate. Both metrics were steadily increasing on an almost linear basis, with suicides increasing at a faster rate overall. Therefore, based on this data, we can safely assume that on the aggregate level, the number of suicides increased within the period, and therefore subjective well-being decreased.

The data poses a problem for both Anderson and the optimists. By focusing on the average rates for specific decades, the change over time is something that Anderson has seemingly failed to consider.[80] Alternatively, if we look at the aggregate level and take into account the trend between 1861 and 1901, it is quite clear that suicides were increasing on the whole. This is important because it suggests that as the economy developed, suicides increased. Therefore, there may be a further link between industrialisation and suicides. In terms of the living standards debate, if we compare this to historical HDI data by Prados de la Escosura a discrepancy emerges.[81] He found that HDI in the UK increased by 33 percent between 1870 and 1900.[82] Conversely, it seems that living standards in terms of subjective well-being did not, as suicides per head increased in the period by 50 percent. On aggregate, we can see that regardless of any material gains the standard of living, subjective well-being seems to decrease steadily between 1861-1901.

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[80] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" Past and Present 86, no. 1 (1980): pp. 149-173. 153.
[81] Leandro Prados de la Escosura, "Augmented Human Development in the Age of Globalization," The Economic History Review 74, no. 4 (2021): pp. 946-975.
[82] Ibid.

5.2 Disparity Between Males and Females

Examining the data for males and females further hints at a link between industrialisation and suicides. Firstly, males had a significantly higher propensity to commit suicide than women in the period. Graph 1 of Figure 2 shows that there was a large gap between male and female suicide rates. Female suicides never reached 1000 for the entire period, and yet by the end of the period this figure had reached almost 2500 for males. What is more

Figure 2. Male vs Females Suicides in England and Wales, 1861-1901
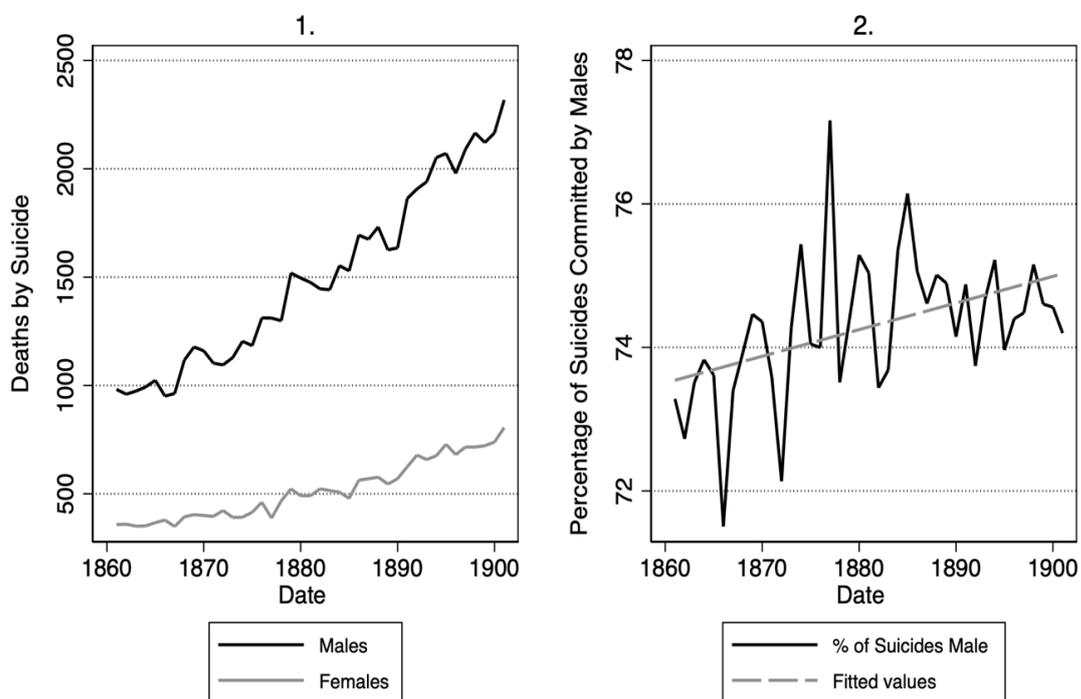
Source: Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV)

interesting is that likelihood that a male would commit suicide was increasing at a faster rate during the period than for women. Graph 2 of Figure 2 displays the ratio of suicides, comparing males to females. As we can see, the percentage of total suicides that were male were increasing over the period. The percentage

seems to increase over time towards males. This suggests that over this period, men were more exposed to something that was affecting their tendency towards suicide. We know that males were more participant in the labour market in this period, and therefore more exposed to the impacts of industrialisation. Horrell and Humphries have demonstrated that between 1790 and 1865, women and children only contributed between 18 to 22 percent of family income on average.[83] The data from Lee matches this trend: on average between 1861 and 1901, the total workforce outside of the domestic and non-productive spheres was on average around 70 percent male.[84] As Durkheim notes, it is likely that women committed suicide less than males due to the fact that they were less involved in "collective life", and so less exposed to the social factors that determine the suicide rate.[85] This hints at a link between suicides and industrialisation, as if men were more active in the labour market - and therefore more likely to be taking up non-agricultural employment – they were more exposed to the negative effects of industrialisation.

5.3 Long-Run Regional Differences

If industrialisation contributed towards suicides, we may expect to see regional differences in the suicide rate over time, given that different regions experienced industrialisation to different degrees. For instance, in 1861 around 50 percent of people worked in agriculture, whereas in London this was only 1 percent.[86] If Durkheim is correct, we would expect to see suicides rising at a faster rate in counties that are transitioning compared to ones that have already done so.

Despite this, the results suggest that every region had different base levels of suicide, but the rate at which suicides were increasing for each region also seemed to be similar. Figure 3 demonstrates this fact. Naturally, every region

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[83] Sara Horrell and Jane Humphries, "Women's Labour Force Participation and the Transition to the Male-Breadwinner Family, 1790-1865," *The Economic History Review* 48, no. 1 (1995): p. 89-117, 100-1

[84] Clive Howard Lee, *British Regional Employment Statistics, 1841-1971* (Cambridge: Cambridge University Press, 1980).

[85] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 331.

[86] Clive Howard Lee, *British Regional Employment Statistics, 1841-1971* (Cambridge: Cambridge University Press, 1980).

has a different average suicide rate, but they all seem to be broadly similar, with only Monmouth and Wales being an exception. The North Midland counties seemed to be the highest here. What is striking is that each region seems to have a growing suicide rate, all at a similar pace. Graph 2 of Figure 3 demonstrates this by showing the linearised suicide rate for each region, showing that all regions follow a similar trajectory. Each of the regional divisions had a higher suicide rate by the end of the period. Strikingly, even London follows this trajectory even though we would already expect it to have a high urban population compared to the other regions.[87] This suggests that there must have been something common to all the regions that was causing their suicide levels to increase. As a result, industrialisation may not have been the main factor in increasing suicides since many counties such as London were already highly industrialised by the period. At the very least, it cannot be the only factor that increased suicides.

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[87] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173.

Figure 3. Suicides by Regional Division in England and Wales, 1861-1901, with linearised results
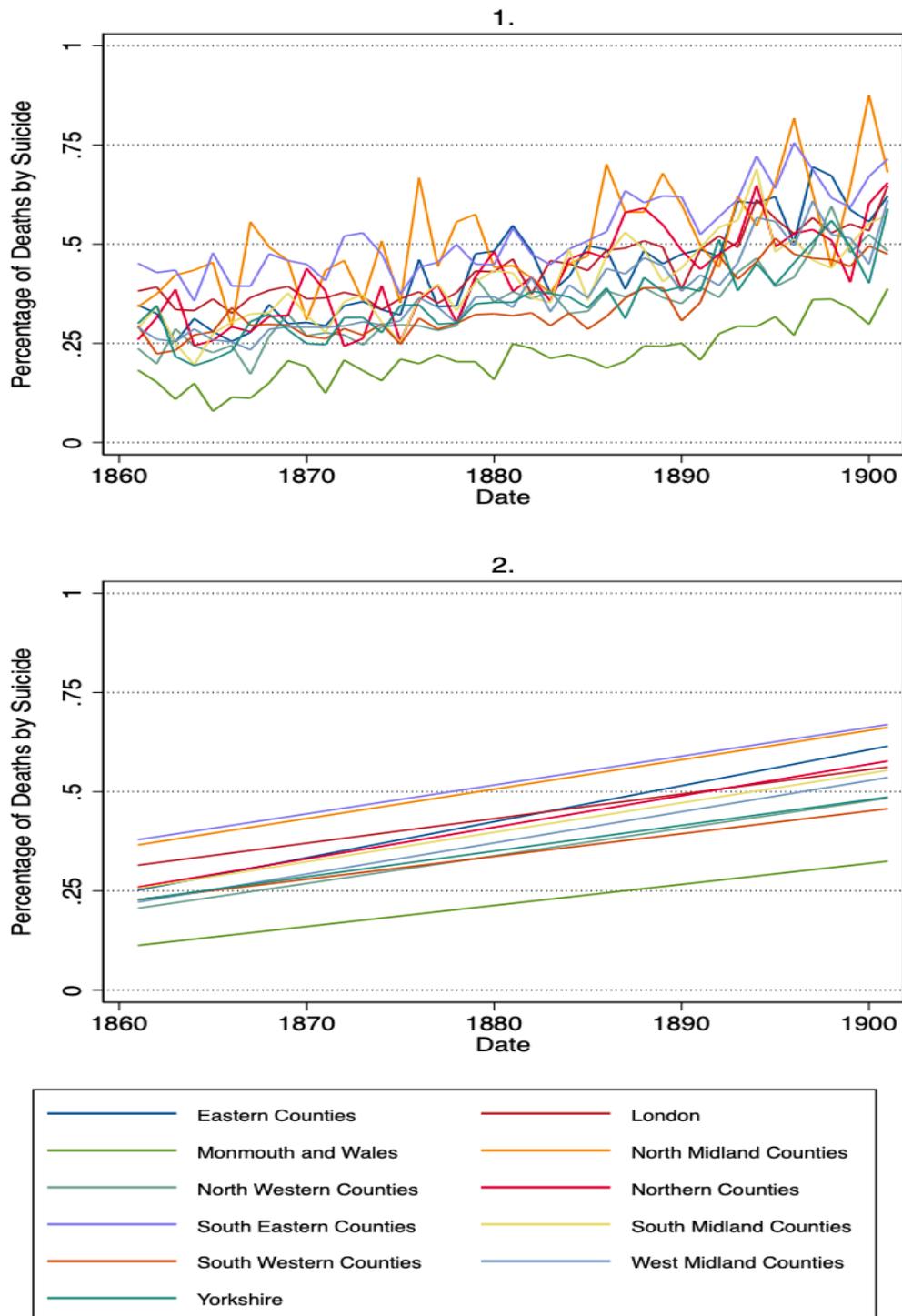
6.   The Effects of Urbanisation

6.1 The Importance of Urbanisation

The aggregate statistics show that subjective well-being declined between 1861-1901, but further analysis is required to determine whether industrialisation was the main factor that caused this. Urbanisation is commonly used as a proxy for industrialisation because it is a direct by-product of industrialisation. For instance, both Davenport and Feinstein have argued that the negative impacts of urbanisation must be considered.[88] As Feinstein notes, "Urban living provides better access to education and other amenities but may also mean slum housing, disease, and crime. The gains from industrialization may be paid for by increased intensity of work or adverse consequences for family life."[89]

 Anderson has attempted to examine the effect of growth in urban population on suicides but found no clear relationship.[90] In fact, Anderson finds that industrial areas often had far lower suicide rates, but this is based on a sample of only 13 counties in two decades.[91] Additionally, she argues that suicide trends were different at different levels of urbanisation by categorising towns into 3 sizes.[92] She finds the correlation to be largest in size 2 towns which were going through more rapid change.[93]

6.2 Long-Run Trends in Urbanization and Suicides

Long-run analysis displays a different picture to Anderson's. Figure 4 shows that the percentage of people living in urban areas increased over time, similarly to the number of deaths that were a result of suicide. Urban population on

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[88] Romola Davenport, "Urbanization and Mortality in Britain, c. 1800–50," *The Economic History Review* 73, no. 2 (2020): pp. 455-485; Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution," *The Journal of Economic History* 58, no. 3 (1998): pp. 625-658

[89] Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution," *The Journal of Economic History* 58, no. 3 (1998): pp. 625-658. 627.

[90] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173, 153.

[91] Ibid.

[92] Ibid. 155-6.

[93] Ibid. 160.

aggregate increased from under 60 percent to 78 percent by 1901, coinciding with the increase in deaths by suicide. When we consider the data on a county-level basis, there seems to be a potential correlation. Graph 2 of Figure 4 shows that there was a correlation on a county-level.

basis between 1861-1901 if we compare the level of suicides to the percentage of the population living in urban areas.

Figure 4. Suicides vs Urbanization, England, and Wales, 1861-1901.
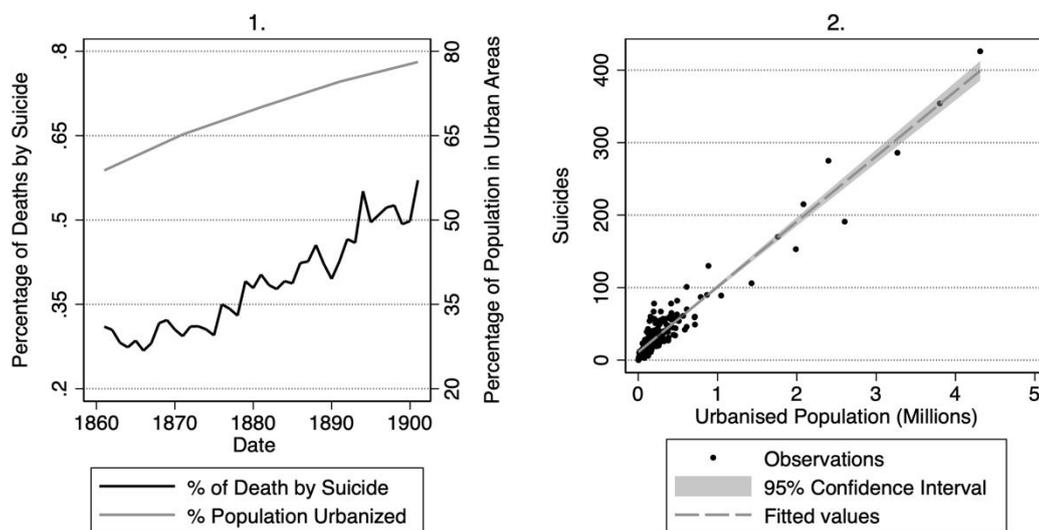
Source: Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV); Robert Bennett, Urban Population Database, 1801-1911 [Data Collection], 1st ed. (Manchester, Lancashire: University of Manchester, Department of Geography, 2012).

6.3 Regression Analysis of Urbanisation

On the surface, there is a correlation, but these results mean nothing if we cannot control for key confounders such as population. It would therefore prove useful to go deeper into the analysis by constructing a regression analysis to assess the change in the suicide level in relation to urbanisation. Table 1 displays the results of the regression models, where the dependent variable is

the absolute count of suicides registered in the Registrar General for each county.

Table 1. Urbanisation Regression. Dependent Variable: Deaths by Suicide

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Urban Population	0.000118***	0.0000870***	0.0000306*	0.0000389***	0.0000384***	0.0000389***	0.0000385***	0.0000389***
	(92.36)	(15.62)	(1.99)	(6.09)	(5.19)	(6.08)	(6.00)	(6.06)
Total Population		0.0000189***	0.000112***	0.0000906***	0.000106***	0.0000911***	0.0000914***	0.0000907***
		(4.60)	(6.63)	(10.99)	(10.94)	(10.96)	(10.98)	(10.96)
Share of those employed outside of agriculture who are male				0.637**	0.547*	0.651**	0.598*	0.619*
				(2.76)	(2.18)	(2.79)	(2.53)	(2.57)
Urban Population Growth Rate					0.104			
					(1.56)			
In Size I Urban Areas						-0.0205		
						(-0.54)		
In Size II Urban Areas							0.0252	
							(0.76)	
In Size III Urban Areas								-0.0186
								(-0.26)
County Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-3.940	0.260	-61.87***	-63.22***	-67.86***	-64.03***	-61.53***	-61.93***
N	230	215	215	210	168	210	210	210
R	0.988	0.989	0.982	0.970	0.973	0.970	0.970	0.970

t statistics in Parentheses
* p<0.05, ** p<0.01, *** p<0.001

The main effect variable is 'Urban Population' which is a count of people living in urban areas in a given county at a given point in time. In every model there is a statistically significant positive relationship between the main effect variable and suicides, meaning that as urban population increases, so do suicides for the entire county. Model 4 introduces all control variables before interaction terms are included. It shows that when we hold population, and the share of those employed who are male constant, along with county fixed effects, suicides still increase when urban population increases. The coefficient appears to be small, as an increase of 1 person in urban areas leads to a .00384 percentage point increase in suicides for the entire county. However, an increase of 1 person is not a significant increase, given that the average amount of people living in urban areas for any county across the entire period was 407976.[94] If we instead increase the urban population by 10'000 people – around 2.5 percent of the average urban population size - this would raise suicides by 38.4 percent for the entire county.

Taking the average amount of suicides for a county across the entire period would increase suicides from the average of 27 to 37. This is a significant relationship despite the small coefficient. However, we cannot observe a statistically significant relationship for the interaction terms that are introduced, or the growth rate for urban areas. This means that despite Anderson's claim that the effect of living in an urban area depends on the stage of industrialisation, we are unable to reject the null hypothesis given the data provided.

6.4 Secondary Evidence on the Impacts of Urbanisation

The findings are compatible with the findings of the pessimist camp to an extent due to the association between urbanisation and worsening mortality rates, but this only aligns with the data on suicides until the 1870s. They match what Engels described as the life of a working-class urban dweller being particularly

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[94] Robert Bennett, *Urban Population Database, 1801-1911 [Data Collection]*, 1st ed. (Manchester, Lancashire: University of Manchester, Department of Geography, 2012).

harsh.[95] Engels notes the overcrowded slums dedicated to the working classes in the cities, for instance, Bethnal Green in London which contained "1400 houses, inhabited by 2795 families, or about 12,000 person. [Yet] the space upon which this large population dwells, is less than 400 yards."[96] Conditions such as these had the side effect of increasing the transmission of disease. Davenport finds a significant relationship between population density and a worsening in infant mortality rates, and a stagnation of life expectancy between 1820 and the 1870s.[97] Woods has argued a significant reason for this was the importation of cholera which caused crises in 1831-2, 1848-9, 1854 and 1866.[98] Overall it seems that there was an increase or at the very least a stagnation from the early nineteenth century until around 1870.[99] However, it is clear that suicides outstripped this on the basis that not only was there an association between urbanisation and suicides, but this relationship extends to the brow of the twentieth century. This shows that whilst aligning with the pessimistic view to a large extent, the side effects of urbanisation had a longer-lasting impact on subjective well-being than they did mortality rates.

7.   The Effects of Occupational Structure

7.1 The Importance of Occupational Structure

Despite this, we must extend our analysis, as urbanisation is a crude measurement of industrialisation. Theoretically, urbanisation can occur without a significant increase in the number of people employed in industrial occupations. It is potentially true that suicides were more associated with sectors less influenced by industrialisation such as professional occupations. Therefore, suicides must be compared with changes in county-level occupational structure.

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[95] Friedrich Engels, *The Condition of the Working Class in England* (London: Electric Book Co., 2001).
[96] Ibid. 86.
[97] Romola Davenport, "Urbanization and Mortality in Britain, c. 1800–50," *The Economic History Review* 73, no. 2 (2020): pp. 455-485, 467, 459
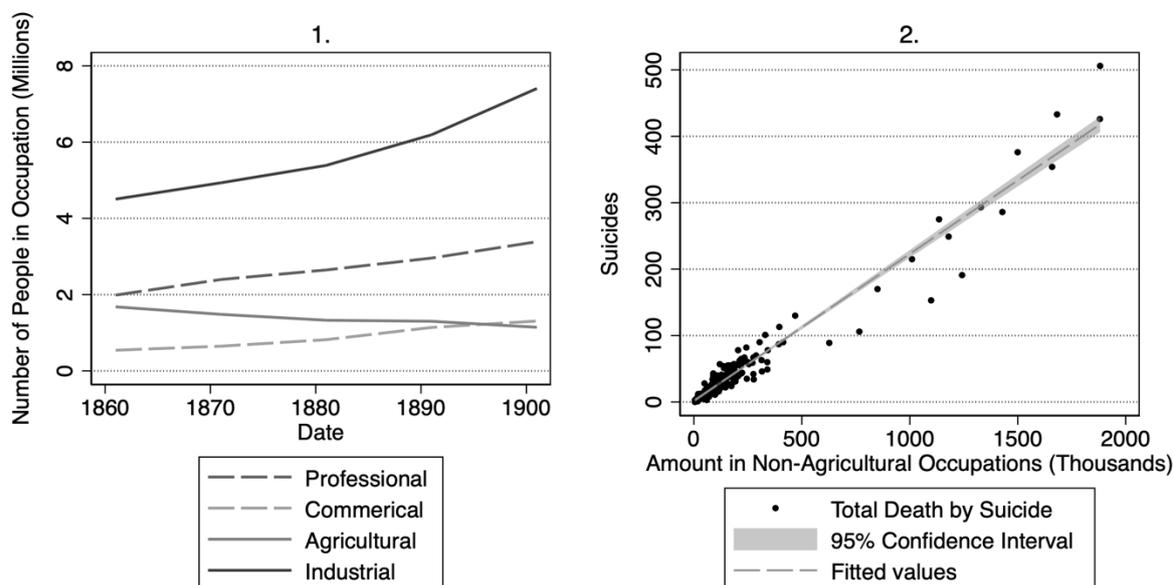[98] Robert Woods, *The Demography of Victorian England and Wales* (Cambridge: Cambridge University Press, 2010). 370.
[99] Romola Davenport, "Urbanization and Mortality in Britain, c. 1800–50," *The Economic History Review* 73, no. 2 (2020): pp. 455-485, 468.

7.2 Long-Run Analysis of Occupational Structure and Suicides

Figure 5. Occupational Structure and Suicides, England, and Wales, 1861-1901.

Source: Clive Howard Lee, British Regional Employment Statistics, 1841-1971 (Cambridge , Cambridgeshire: Cambridge University Press, 1980); *Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general* (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV).

The long-run trends in occupational structure also hint at a potential link between industrialisation and suicides. Figure 5 displays the aggregate change in occupational structure in England and Wales across the period. Graph 1 of Figure 5 shows that over time, the industrial class had significantly increased. Precisely, it increased from 4,505,381 in 1861 to 7,407,206 by 1901. The only class to decline overall was the agricultural class, which decreased from 1,681,266 to 1,144,319. This shows that during the period, the occupational composition of England and Wales was moving away from traditional forms of employment and towards modern employment on all levels. Comparing this to the data on suicide, there is a clear correlation. Graph 2 of Figure 5 shows reported suicides compared to the number of workers outside of the agricultural class. Similarly, to Urbanisation in Figure 4, it is clear that both follow a very

similar trajectory, increasing at a strikingly similar pace. Despite this, separating the data by regional division suggests that there may not be a correlation.

Table 2. Average Suicides and Non-Agricultural Employment by Regional Division, England, and Wales, 1861-1901.
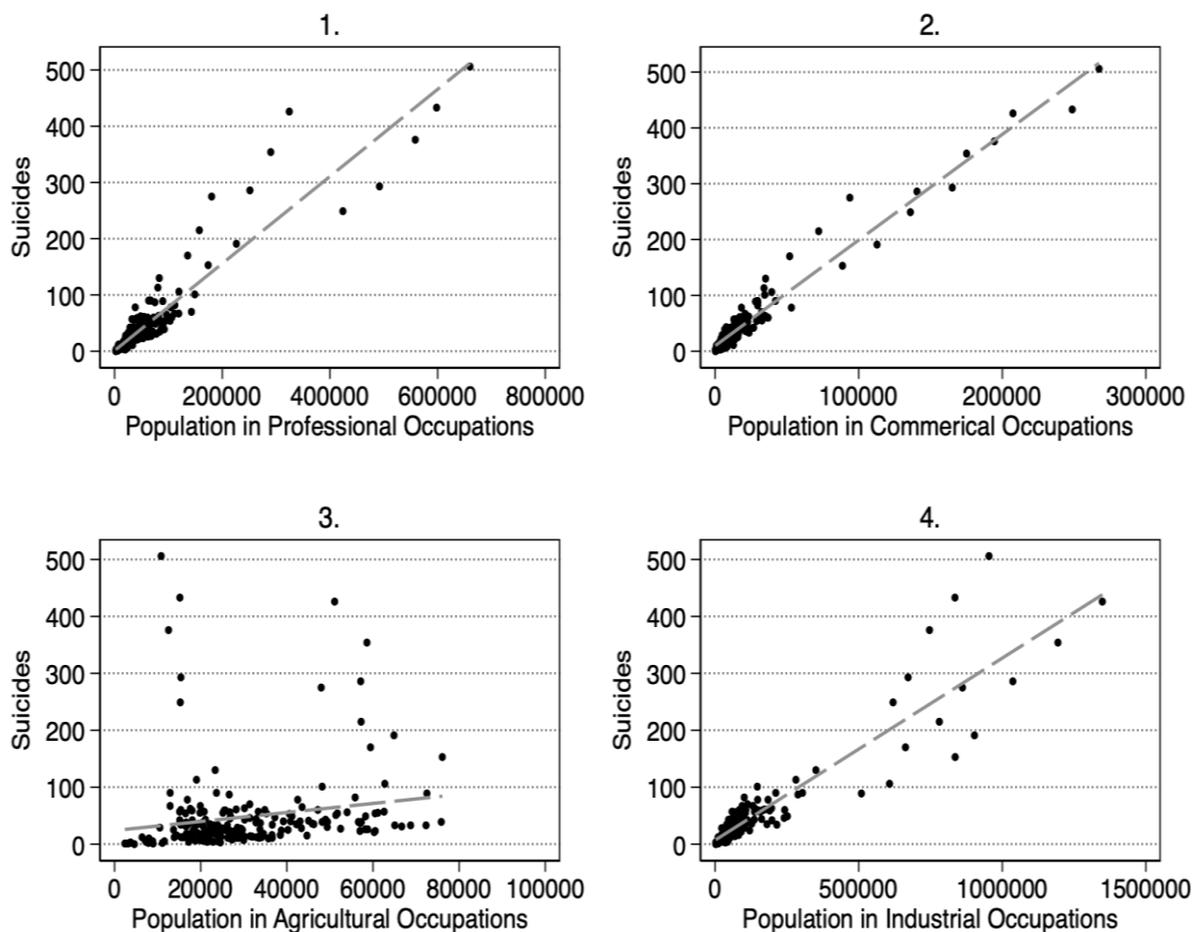
Regional Division	Average Percentage of Deaths by Suicide 1861-1901	Average Percentage Outside of the Agricultural Class 1861-1901
South Eastern Counties	0.515159928	79.73609823
North Midland Counties	0.507942421	77.04775767
London	0.433686012	99.05715706
Eastern Counties	0.428506833	68.97898999
Northern Counties	0.412218078	82.89567916
South Midland Counties	0.400822911	71.60859196
West Midland Counties	0.373397983	81.0784726
Yorkshire	0.351160091	82.46493454
South Western Counties	0.341986888	74.06723033
North Western Counties	0.34124172	91.32824871
Monmouth and Wales	0.214491529	81.03339816

Source: Clive Howard Lee, British Regional Employment Statistics, 1841-1971 (Cambridge , Cambridgeshire: Cambridge University Press, 1980); *Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general* (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV).

Table 2 demonstrates this. Similarly, to Anderson's analysis, it displays the average amount of deaths by suicide for the regional divisions, and the average number of people employed outside of agriculture for the whole period. The average percentage of deaths by suicide is sorted from highest to lowest, which highlights that there is no downward trend in the percentage of people working outside of agriculture. For example, South-eastern Counties had the highest average percentage of deaths by suicide, but the average percentage of people

outside of the agricultural class was only two percent lower than Monmouth and Wales, which had the lowest percentage of deaths by suicide. Conversely, London had the third highest percentage of deaths by suicide, but it had the highest percentage of people outside of the agricultural class, whereas Eastern Counties had roughly the same amount of percentage of deaths by suicide, but the lowest population of people outside of the agricultural class. This suggests that occupational structure was not the cause of the higher suicide rate. However, different results can

Figure 6. Correlation between county level occupational structure and suicides, England, and Wales, 1861-1901.

be found by diverting our attention from the average figures. Figure 6 shows that for all occupations, wherever there was a rise in that occupation, there was also a rise in suicides. The relationship is least clear for agricultural occupations. This is partly due to the fact that London and Lancashire have an extremely low amount of people employed in agricultural occupations relative to the size of the population, which explains the observations that have extremely high suicides, but low amounts of people in agricultural occupations. Their higher population means that they also have far higher suicides. Despite this, there still seems to be a slightly positive correlation between suicides and agricultural employment levels, but less so than for changes in the other occupational structures. This suggests that there may be a relationship between certain types of county-level occupational structures and higher suicides that Anderson has not explored due to focusing purely on average levels.

7.3 Regression Analysis of Occupational Structure

Again, the significance of these findings is severely limited unless we can control for crucial factors like population, as it is only through such regulation that we can observe the actual correlation. Table 3 displays the results of this analysis, where deaths by suicides in each county is the dependent variable. We can observe a statistically significant positive relationship between total suicides and an increase in the industrial class, and an increase in the commercial class. There is also a statistically significant negative relationship between an increase in the agricultural class and professional class, however it holds less statistical significance. Interestingly, an increase in the commercial class has a much larger impact on suicides than the industrial class.

However, the results only become significant once all control variables have been introduced. Model 4 controls for all potential biases in population, the share of males employed, and county effects. It is the best model to observe, as the only difference between models 4 and 5 is the addition of a new explanatory variable: the growth rate of non-traditional employment. The inclusion of this variable does not help control for biases but changes the coefficients unnecessarily.

Rather it helps observe the relationship between higher growth rates and suicides. For the main effect variables, the coefficients are small similarly to urbanisation, but if we interpret them in the same way the outcome is even more significant than urbanisation. For instance, an increase of 1000 industrial workers would increase the number of suicides by 28.5 percent. This means that if we take the average amount of suicides for a county, suicides will increase from 27 to almost 35. For commercial employment, this relationship is even stronger. Commercial occupations encompass those in transport, communication, and distributive trades, and are therefore still highly linked to industrialisation.[100] For these occupations, an increase of only 1000 workers in commercial occupations increases suicides for the whole county by 99.8 percentage points. For an average county, suicides would increase from 27 to almost 54. We can also tentatively observe a negative relationship between an increase in agricultural workers and suicides, although the relationship in model 4 is only to a 5% significance level. The result implies a 24.6 percentage point decrease in suicides for an increase in 1000 agricultural workers.

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[100] *Census of England and Wales, Population tables (P.P 1861, Vol I, p. 12)*

Table 3. Occupational Structure Regression. Dependent Variable: Deaths by Suicide

Variables	(1)	(2)	(3)	(4)	(5)
Population in Professional Occupations	-0.000373	-0.0000405	-0.000431*	0.0000420	-0.0000195
	(-0.43)	(-0.27)	(-2.14)	(0.44)	(-0.18)
Population in Commercial Occupations	0.00193	0.000757	0.000622	0.000998***	0.000707**
	(0.96)	(1.54)	(1.43)	(5.95)	(3.35)
Population in Agricultural Occupations	-0.00170	0.0000173	-0.000270	-0.000246*	-0.000558**
	(-1.14)	(0.07)	(-0.81)	(-2.04)	(-2.76)
Population in Industrial Occupations	0.000111	-0.0000734	-0.0000194	0.000285***	0.000287***
	(0.35)	(-1.67)	(-0.24)	(5.61)	(4.55)
Total Population		0.0000821***	0.000146***	0.00000350	0.0000275
		(94.18)	(75.59)	(0.18)	(1.15)
Share of those in employment who are male				0.198	0.0209
				(0.90)	(0.08)
Growth rate of non-traditional employment					-0.230
					(-0.84)
County Fixed Effects	No	No	Yes	Yes	Yes
Constant	109.7	-4.967	-52.33***	-19.43	-2.169
	(1.64)	(-0.67)	(-3.53)	(-1.15)	(-0.10)
N	230	215	215	210	168
R	0.053	0.978	0.974	0.947	0.942

t statistics in Parentheses
* p<0.05, ** p<0.01, *** p<0.001

Source: Clive Howard Lee, British Regional Employment Statistics, 1841-1971 (Cambridge , Cambridgeshire: Cambridge University Press, 1980); Registrar General, Twenty-fourth to sixty-fourth annual report of the registrar-general (P.P 1861 XXIV; 1862 XXV; 1863 XXVI; 1864 XXVII; 1865 XXVIII; 1866 XXIX; 1867 XXX; 1868 XXXI; 1869 XXXII; 1870 XXXIII; 1871 XXXIV; 1872 XXXV; 1873 XXXVI; 1874 XXXVII; 1875 XXXVIII; 1876 XXXIX; 1877 XL; 1878 XLI; 1879 XLII; 1880 XLIII; 1881 XLIV; 1882 XLV; 1883 XLVI; 1884 XLVII; 1885 XVLIII; 1886 XLIX; 1887 L; 1888 LI; 1889 LII; 1890 LIII; 1891 LIV; 1892 LV; 1893 LVI; 1894 LVII; 1895 LVIII; 1896 LIX; 1897 LX; 1898 LXI; 1899 LXII; 1900LXIII; 1901 LXIV).

For the average county, this means a decrease in suicides from 27 to 20. Furthermore, we can observe a negative relationship between suicides and professional occupations in model 3 to a 5% significance level, but this relationship is not robust to the inclusion of changes in the ratio of males to females employed, so we cannot be sure that this is simply just because of more females being employed into professional occupations over time. Importantly, this shows that the rise in suicides was due to more industrial and commercial employment rather than employment in professional occupations. Overall, the regression analysis displays a clear relationship between increases in industrial and commercial occupations and suicides, and potentially a negative relationship between increases in agricultural occupations and suicides. These findings therefore further contrast with Anderson's conclusion that there was no link between industrialisation and suicide.

7.4 Secondary Evidence on the Impacts of Changes in Occupational Structure
Whilst the results largely contradict Anderson's findings, it is important to note that Anderson concludes that suicides were higher in areas in earlier stages of industrialisation, where "occupational structure was most open."[101] Therefore, the mechanism overall may still be similar. This is because the results imply a county-wide effect of increased industrialisation, which means an increase in employment for industrial occupations also increased suicides for people who were not employed in the industry. What this means is that an increase in industrial employment could have predominantly affected agricultural workers due to their perceived displacement. This is entirely possible and aligns with the arguments of Engels.[102] For instance, Luddite riots were prevalent in rural areas until the 1850s.[103] Agricultural workers were unhappy with the displacement of their work with new technology, particularly with new horse-powered threshing

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[101] Olive Anderson, "Did Suicide Increase with Industrialization in Victorian England?" *Past and Present* 86, no. 1 (1980): pp. 149-173. 160.

[102] Friedrich Engels, *The Condition of the Working Class in England* (London: Electric Book Co., 2001).

[103] Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution," *The Journal of Economic History* 58, no. 3 (1998): pp. 625-658, 651.

machinery.[104] Whilst the date of these riots precedes our analysis, they offer insight into the mental effects of displacing agricultural workers that surely had an effect on their subjective well-being. Therefore, it is entirely possible that whilst higher suicide rates may not have been associated specifically with certain occupations, industrialisation on the whole - and in particular development of the commercial class - had a county-wide effect on suicides.

For Durkheim, the specific mechanism here is a lack of social regulation associated with industrialisation, leading to a rise in anomic suicides.[105] This is because the ceiling for agricultural workers was far lower, and so they were able to match their expectations with their means.[106] He finds that Between 1866 and 1891 in France, Switzerland, Italy, Prussia, Bavaria, Belgium Württemberg, and Saxony that suicide rates among modern occupations were significantly higher.[107] In Saxony for instance, suicides were almost five times higher for those in occupations that were traditionally associated with industrialisation.[108] We cannot conclude that suicides are associated with specific occupations due to the nature of the data being collected on different levels, but the results are at least suggestive of a deeper connection between an individual's occupation and their likelihood of committing suicide.

Regardless of the potential ecological fallacy, these findings can still fit with Durkheim's concept of anomic suicide, as there is an important distinction between the agricultural sector in countries that Durkheim looks at compared to England and Wales – agricultural labourers were wage earners far earlier in England and Wales than in the rest of Europe.[109] Durkheim refers to the old regulatory powers of these countries that posed limits on the agricultural

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[104] John Fletcher Clews Harrison, *The Common People of Great Britain: A History from the Norman Conquest to the Present* (Bloomington: Indiana University Press, 1985). 249-253.
[105] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 282.
[106] Ibid. 269.
[107] Ibid. 283.
[108] Ibid.
[109] Larry Patriquin, "The Agrarian Origins of the Industrial Revolution in England," *Review of Radical Political Economics* 36, no. 2 (2004): pp. 196-216.

class.[110] However, in England and Wales, potentially as early as 1640, social relations in agriculture were more capitalist than they were feudal; wage-labour was a dominant sector.[111] Engels described the period where the "abandoned fields [were] thrown together into large farms and the small peasants superseded by the overwhelming competition of the large farmers. Instead of being landowners or leaseholders, as they had been hitherto, they were now obliged to hire themselves as labourers to the large farmers or the landlords."[112] Davenport also alludes to the integration of agriculture into markets between 1650 and 1750.[113]

This nuance in England's past was evident in the nineteenth century in the difference in the size of holdings in England compared to the continent: less than 2 percent of holdings in France were larger than fifty hectares compared to almost 80 percent of the farms in England being over 100 hectares by 1850, and over 34 percent over 300 hectares.[114] The ceiling for agricultural workers that Durkheim alludes to was more like the "void" that he claimed was only present for industrial workers.[115] Agricultural workers in England and Wales were exposed to the market at a far earlier stage, and therefore did not have the same ceiling as agricultural workers in other European countries. As Patriquin notes, "The English figures for the nineteenth century are unusual because they reflect the culmination of a five-hundred-year history that saw peasants become wage-laborers."[116] Taking this into account can explain the reason for higher county-wide suicide rates as a result of increased industrialisation; the cause can rather be placed on the displacement of agricultural workers who had previously been

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[110] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 282, 3.
[111] Larry Patriquin, "The Agrarian Origins of the Industrial Revolution in England," *Review of Radical Political Economics* 36, no. 2 (2004): pp. 196-216, 211.
[112] Friedrich Engels, *The Condition of the Working Class in England* (London: Electric Book Co., 2001). 370.
[113] Romola Davenport, "Urbanization and Mortality in Britain, c. 1800–50," *The Economic History Review* 73, no. 2 (2020): pp. 455-485, 476.
[114] Larry Patriquin, "The Agrarian Origins of the Industrial Revolution in England," *Review of Radical Political Economics* 36, no. 2 (2004): pp. 196-216, 212.
[115] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 283.
[116] Larry Patriquin, "The Agrarian Origins of the Industrial Revolution in England," *Review of Radical Political Economics* 36, no. 2 (2004): pp. 196-216, 212.

tied to their land. The English economy faced massive reorganization between 1830 and 1880 such that by 1880 only one-seventh of the workforce was working in agriculture.[117]

Agricultural workers were forced to migrate to urban areas that according to Engels, had a totally unique social fabric.[118] This is similar to what Durkheim views as 'Industrial Crises'.[119] To Durkheim, industrial crises increase suicides in the same way that financial crises do because they are critical "disturbances to the collective order."[120] This was exactly what happened to agricultural workers during this time, as they faced massive displacement. It is potentially in this sense that an increase in employment outside of agriculture increased suicides, as it created a disturbance to the collective order.

In terms of the living standards debate, this poses an issue. The existing data has shown that wages were far higher for workers outside of agriculture. Lindert and Williamson's data has shown that by 1851, wages for an average worker compared to agricultural labourers were 160 percent higher.[121] Even compared to blue-collar labourers, their wages were 81 percent higher than agricultural labourers by the same time.[122] However, the results suggest they may not have been any less happy, and potentially had a higher subjective well-being. An increase in the number of workers working outside of agriculture had a significant effect on the entire county in increasing suicide levels. Although it is unclear whether industrial workers had higher suicides due to the problem of ecological fallacy, at the very least the literature fails to consider secondary county-wide effects that may have caused higher suicides through the disruption caused, which seems to have offset any gains in income. Only Feinstein considers

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[117] Larry Patriquin, "The Agrarian Origins of the Industrial Revolution in England," *Review of Radical Political Economics* 36, no. 2 (2004): pp. 196-216, 212.
[118] Friedrich Engels, *The Condition of the Working Class in England* (London: Electric Book Co., 2001). 81.
[119] Émile Durkheim, *On Suicide* (London: Penguin, 2006). 267.
[120] Ibid.
[121] Peter Lindert and Jeffrey Williamson, "English Workers' Living Standards during the Industrial Revolution: A New Look," *The Economic History Review* 36, no. 1 (1983): pp. 1-25, 7.
[122] Ibid.

this at all when talking about the Swingers riots in the early nineteenth century and the disruption caused by urbanisation.[123]

8.   Conclusion

Overall, there are three conclusions from the data: (1) subjective well-being decreased significantly between 1861 and 1901 in England and Wales; (2) there was a significant negative correlation between urbanisation and county-wide subjective well-being; (3) an increase in industrial and commercial employment had a significant negative county-wide effect on subjective well-being. On aggregate, suicides increased significantly over the period, suggesting a decrease in subjective well-being. Even when compared to growth in population, total suicides were growing at a much quicker pace. Per head, suicides increased by 50 percent from 1861 to 1901. Where urban population is increased by 10'000 county-wide suicides on average rise by 38.4%. Finally, where industrial employment is increased by 1'000, on average county-wide suicides increase by 28.5%. For commercial employment, the relationship is stronger, increasing suicides by 99.8%. Therefore, it seems that there was a negative relationship between industrialisation and subjective well-being.

As such, whilst there were unmistakable gains in certain aspects of the standard of living as a result of the Industrial Revolution, it is unclear whether these gains resulted in an improvement in subjective well-being. Existing literature has failed to adequately consider the effects on subjective well-being, and yet the data would suggest that there was an overall decline between 1861-1901. Observing the long-run trend is a key element missing from Anderson's analysis and warrants a deeper explanation.

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[123] Charles H. Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution," *The Journal of Economic History* 58, no. 3 (1998): pp. 625-658, 651.

The relationship between urbanisation and suicides matches some of the pre-existing analyses conducted by the pessimists, but analysis of the long-run data shows that the negative effects of urbanisation on suicide seem to outlast the effect of urbanisation on overall mortality rates. Additionally, the relationship between increases in non-traditional employment and suicides contradicts Anderson's analysis, as it seems that industrial employment may have been associated with greater suicides. Finally, the results here contradict Lindert and Williamson's conclusion that the higher wages for non-traditional employment resulted in a higher standard of living as a result of industrialisation. The findings align more with the outlook of Engels who emphasises the role of disruption in employment.

Nonetheless, it seems that industrialisation may not have been the only factor that worsened subjective well-being during the Industrial Revolution given that suicides increased for every county between 1861 and 1901, despite some counties already being largely industrialised. This calls for a wider examination of subjective well-being in the Industrial Revolution. Nonetheless, it seems that industrialisation may not have been the only factor negatively impacting subjective well-being given that suicide rates were rising at a similar rate for counties that were already highly industrialised as compared to counties that were not. This opens the door for more research into the factors affecting this increase outside of industrialisation.

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