Economic Convergence in the Nordic Societies in the Long Run: Europe and Other Comparative Mirrors

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Abstract:

In this paper we analyze Nordic long-run economic performance and wages by focusing on convergence (or divergence) over time among the Nordic countries and whether they converged toward the economic leaders, such as Europe, UK and USA, in particular time periods. Our first comparative mirror was the development of real GDP per capita from the early 19th century to 2016 – it seems that there was a catch-up process in play both among the Nordic economies and in terms of the relationship towards the economic leaders, especially from early 20th century up until the 1970s. Our second comparative mirror was the development of Swedish, Finnish, and Norwegian real wages from the 16th to 20th century, and the results suggested very similar development between these countries, with Sweden having higher standards of living, up until 18th century. Then all of them diverged from the West European "path", and in particular Finland seemed to stagnate during the 19th century. Our third comparative mirror was formed by a large sample of seamen's wages in Sweden and Finland from the mid-17th century to the First World War. It appears that divergence was not a uniform phenomenon in the 19th century, since sailors' wages increased substantially during the so-called first era of economic globalization. It is possible that export-led growth path of the Nordic countries already emerged in the late 19th century, although the impact would not materialize fully until the post-Second World War period.

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1. Introduction

Convergence of wages, prices, and commodities – i.e., globalization – between different parts of the world in different time periods is a popular topic among economists, sociologists, and historians – for example, economic historians have recently become particularly interested in earlier periods of economic integration, like the so-called first era of globalization from the early part of the 19th century to the First World War.[1] For economists and economic historians globalization typically means convergence, meaning a flattening of differences, of prices between two places due to market competition, increased interaction and better economic information, and other types of globalization infrastructure such as banks and monetary instruments. Kevin O'Rourke and Jeffrey Williamson have argued that price convergence, for example between mother countries and their colonies, only started in the 19th century, not during the discovery of the New World or even in earlier cultures and empires. To most economic historians this was the first true "wave" of globalization, rather spectacular by nature, only to be broken apart by the First World War. Another "wave" did not emerge until the post-Second World War period.[2]

Other scholars like Andre Gunder Frank and many world historians espousing world systems theories have placed the beginning of economic globalization much earlier, perhaps millennia earlier. They claim there have been earlier "waves", some starting as early as the discovery of the New World in 1492 or the founding of Manila in 1571, or perhaps earlier with the rise and fall of the various empires, the Roman Empire being a typical example.[3] Another issue where historians and development theorists disagree with economists and economic historians is

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[1] **Allen, Robert C.; Jean-Pascal Bassino; Debin Ma; Christine Moll-Murata and Jan Luiten van Zanden.** 2011. "Wages, Prices, and Living Standards in China, 1738–1925: In Comparison with Europe, Japan, and India." *Economic History Review*, 64(1), 8-38, **Williamson, Jeffrey G.** 1996. "Globalization, Convergence, and History." *The Journal of Economic History*, 56(2), 277-306.

[2] **K. H. O'Rourke and J. G. Williamson**, "When Did Globalisation Begin?," *European Review of Economic History* 6, no. 01 (2002). On the changing trade flows and economic development, see especially **R. Cameron and L. Neal**, *A Concise Economic History of the World. From Paleolithic Times to the Present*, 4th ed. (Oxford: The Oxford University Press, 2003), **A. Maddison**, *Monitoring the World Economy 1820-1992* (Paris: OECD, 1995), ———, *The World Economy. Historical Statistics* (Paris: OECD, 2003). A good account of 19th and 20th century globalization patterns can be found in **M. D. Bordo, A. M. Taylor, and J. G. Williamson**, *Globalization in Historical Perspective* (Chicago: University of Chicago Press, 2005).

[3] **A. McKeown**, "Periodizing Globalization," *History Workshop Journal* 63, no. 1 (2007). See also **K. Rönnbäck**, "Integration of Global Commodity Markets in the Early Modern Era," *European Review of Economic History* 13, no. 01 (2009), for evidence of integration of commodity markets before the 19th century. Note also how utilizing sources for smaller nations like Sweden can bring fresh evidence into such broad debates typically dominated by great power perspectives.

the role played by colonies in the globalization "waves" and the subsequent emergence of the industrial revolutions. Immanuel Wallerstein and dependency scholars have suggested that the decline of the feudal world and the emergence of merchant societies led to the Age of Exploration and the discovery of colonies. For Wallerstein the early European globalization not only ushered in an era of colonialism and global dependencies, but fostered one of the greatest economic changes in history.[4] Many economic historians disagree with this interpretation, especially since the study of industrial revolutions along with the Great Depression in the last 50 years has yielded many new findings. For example, Patrick O'Brien has argued that the trade between the colonies and mother countries was not big enough to have started the British Industrial Revolution.[5]

The rise of the West, or European empires in particular, can also be linked to the relative decline of other world empires and increases in trade. One of the biggest issues in the evaluation of globalization trends is what happened to China from the 15th to the 19th century. The end result is not under debate: China was humiliated in the Opium Wars in the 1840s by British gunboats. The starting point is also not very much open for debate: China was the wealthiest empire in the world in the beginning of the second millennium. However, sometime in mid-millennium China experienced a decline or, respectively, was surpassed by the West, or Britain in particular. Kenneth Pomeranz has maintained that China was quite well off up until the 18th century, and could have potentially entered into the Industrial Age, given enough time and resources. He maintains that the Yangzi Delta region was on par with England during most of this period. Many other economic historians disagree, arguing on the basis of comparisons with wage and price data that England had pulled ahead much earlier.[6] The debate over the economic development, the timing, and the causes of China's possible decline has become known as the Great Divergence debate. Pomeranz claims that the reason that China did not industrialize was linked to its lack of ready access to coal and other raw materials. Others, like Angus Maddison, claim that it was because of the stifling impact of the bureaucratic class, which turned China inwards following 1433, after convincing the

[4] See e.g. **I. Wallerstein**, "The Rise and Future Demise of the World Capitalist System: Concepts for Comparative Analysis," *Comparative Studies in Society and History* 16, no. 04 (1974).
[5] **P. O'Brien**, "European Economic Development: The Contribution of the Periphery," *The Economic History Review* 35, no. 1 (1982).
[6] See **K. Pomeranz**, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton: Princeton Univ Press, 2001). One of the critiques of this can be found in **S. Broadberry and B. Gupta**, "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800," *Economic History Review* 59, no. 1 (2006).

new emperor to burn Zheng He's great fleet.[7] The role of trade, or lack thereafter, seems to be a crucial component in this debate. There is now also considerable new scholarship on developments within Europe, which generally tends to highlight an emerging "Little Divergence", a reversal of fortunes between Mediterranean Europe and Northern Europe between the 15th and 19th centuries. Most economic historians, however, agree that divergence in its many regional forms occurred prior to the 19th century.[8]

While the focus on global historians is generally on the Great Divergence (and on non-European spheres and their ties to other regions), the Little Divergence is an important research focus as well. However, most of those studies either do not discuss the Nordic polities or do so in a rather cursory manner. In fact, the question we want to investigate is how the Nordic economies compare in these large global processes, namely whether they were part of the Little Divergence or other similar phases. Also, we want to investigate the timing of Nordic development during crucial phases, such as the 19th century globalization and the 20th century economic expansion. Typically Nordic countries are studied because of their rather spectacular economic performance in the 20th century, their remarkable societal trend toward equality, similar historical pasts, the emergence of extensive welfare states, and the currently extremely well-performing educational systems.[9]

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[7] See e.g. **A. Maddison**, *Chinese Economic Performance in the Long Run* (Paris: Organization for Economic Development, 1998).

[8] **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47, **Allen, Robert C.; Jean-Pascal Bassino; Debin Ma; Christine Moll-Murata and Jan Luiten van Zanden.** 2011. "Wages, Prices, and Living Standards in China, 1738–1925: In Comparison with Europe, Japan, and India." *Economic History Review*, 64(1), 8-38, **Broadberry, Stephen and Bishnupriya Gupta.** 2006. "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500–1800." Ibid.LIX, 2-31. For an argument for earlier dating of the first globalization period, see **De Vries, Jan.** 2010. "The Limits of Globalization in the Early Modern World." *The Economic History Review*, 63(3), 710-33.

[9] See e.g. **Arnesen, Anne-Lise and Lisbeth Lundahl.** 2006. "Still Social and Democratic? Inclusive Education Policies in the Nordic Welfare States." *Scandinavian Journal of Educational Research*, 50(3), 285-300, **Christiansen, Niels.** 2006. *The Nordic Model of Welfare: A Historical Reappraisal*. Museum Tusculanum Press, **Esping-Andersen, Gøsta.** 1990. *The Three Worlds of Welfare Capitalism*. Polity press Cambridge, **____.** 1996. *Welfare States in Transition: National Adaptations in Global Economies*. Sage, **Kettunen, Pauli.** 2001. "The Nordic Welfare State in Finland." *Scandinavian Journal of History*, 26(3), 225-47, **Kuhnle, Stein.** 2004. *The Survival of the European Welfare State*. Psychology Press, **Petersen, Klaus.** 2011. "National, Nordic and Trans-Nordic: Transnational Perspectives on the History of the Nordic Welfare States." *Beyond Welfare State Models: Transnational Historical Perspectives on Social Policy, Cheltenham: Edward Elgar*, 41-64. For a bit dated accounts on the Nordic economies and states, see e.g. **Flora, Peter.** 1986. "Growth to Limits. The European Welfare States since World War Ii (3 Vols.)," Berlin: De Gruyter, For a good conceptual overview, see **Mokyr, Joel.** 2006. "Successful Small Open Economies and the Importance of Good Institutions." *The road to prosperity: an economic history of Finland*.

But was there an economic development "path" that they followed? If convergence toward common economic, social, and institutional policies emerged in the late 20th century, does this apply to long-term economic development of the Nordic countries? And how did they fare in comparison with other European nations, including Eastern and Southern European nations? Were the Nordic countries part of the Little Divergence? Here we look at long run macroeconomic data only as we are interested in the convergence (or divergence) of the national economies and wages in Denmark, Finland, Norway, and Sweden. Recent studies, in particular, have analyzed the wages in number of European towns from a period starting from middle ages until our times[10], converted the data to real wages[11], and compared the long term wage series across different countries.[12] This type of data enables us to study economic and societal structures in the very long run.

This paper is part of a larger project to study the Finnish economy in the long run, and the authors are in the process of gathering a lot of long-run data on prices and wages, and the existing Nordic studies offer fairly good data on long-run economic growth, i.e. GDP data, as well as newer data on the development of real wages over several centuries.[13]Thus, we combine the discussion on wage convergence and dispersion by, first, analyzing whether the Nordic countries themselves experienced economic convergence, via GDP per capita, in the 19th and 20th centuries (=first comparative mirror); then, by examining the long-run real wage data for Sweden, Finland, and Norway in various European comparisons, to see how these Nordic economies fared compared to the leading European economies and some of the smaller ones, and also exploring a possible East-West or North-South dichotomy (=second comparative mirror); and finally, by analyzing the

[10] **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47, **Broadberry, Stephen and Bishnupriya Gupta.** 2006. "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500–1800." *Economic History Review*, LIX(1), 2-31, **Clark, Gregory.** 2005. "The Condition of the Working Class in England, 1209–2004." *Journal of political Economy*, 113(6), 1307-40, **Van Zanden, Jan Luiten.** 1999. "Wages and the Standard of Living in Europe, 1500-1800." *European Review of Economic History*, 2, 175-97.

[11] **Edvinsson, Rodney; Tor Jacobson and Daniel Waldenström** eds**.** 2011. *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008*. Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, **Söderberg, Johan.** 2011. "Long-Term Trends in Real Wages of Labourers," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, 453-78.

[12] **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47. Finnish real wages provided by Ilkka Nummela.

[13] For the latest real GDP data, see **Bolt, Jutta; Robert Inklaar; Herman de Jong and Jan Luiten van Zanden.** 2018. "'Rebasing 'Maddison': New Income Comparisons and the Shape of Long-Run Economic Development," *Maddison Project Working paper 10.* Groningen: Groningen Growth and Development Centre, cf. the old data in **Bolt, Jutta and Jan Luiten van Zanden.** 2013. "The First Update of the Maddison Project; Re-Estimating Growth before 1820," *Maddison-Project Working Paper WP-4, University of Groningen, January.* Groeningen:

development wages of Swedish and Finnish seamen in various occupation categories in comparison with other unskilled and skilled European laborers, which also reflects landward opportunities at home and abroad, and by investigating the dispersion of wages within the Nordic shipping industry (=third comparative mirror).

Our results indicate that Nordic countries did experience an economic catch-up process, but mostly in the 20th century. Moreover, it seems that for example the Swedish and Finnish (and Norwegian, to a large extent) real wages developed fairly similarly from the 16th to the 20th centuries, although Sweden experienced higher economic growth rates in the 18th and 19th centuries. Both countries, but especially Finland, diverged from the West European economic development in the 18th and 19th centuries. Therefore, at least Finland did not initially participate in the Little Divergence. However, in the 20th century the Nordic economies converged on the leading world economies. Furthermore, based on a large sample of seamen's wages, not all sectors of the Nordic economies diverged from the 19th century European expansion, driven by globalization. The wages of Nordic sailors rose dramatically in the 19th century, even exceeding the landward opportunities in many major European cities. However, at the end of the century those opportunities were no longer as exceptional. In general, though, opportunities emerging in foreign trade may have preceded the export-led growth of the Nordic economies in the 20th century.

2. Globalization, Convergence, and the Nordic Economies: A structural perspective

There is no denying the transformative power of the current "wave" of globalization that started 30 or so years ago; it most certainly has changed the dynamics of world politics and economics, although scholars disagree about the timing of the beginning of that event. This debate has even permeated popular public discourse – for example, Thomas Friedman, an author and New York Times columnist, calls the *very latest* phase in that modern globalization, which he identifies as having started around year 2000 as something quite dramatically new and changing with increasing velocity: "Globalization 3.0 is shrinking the world from a size small to a size tiny and flattening the playing field at the same time.[14]

[14] **T. L. Friedman**, *The World Is Flat 3.0: A Brief History of the Twenty-First Century* (New York: Picador, 2007), 10.

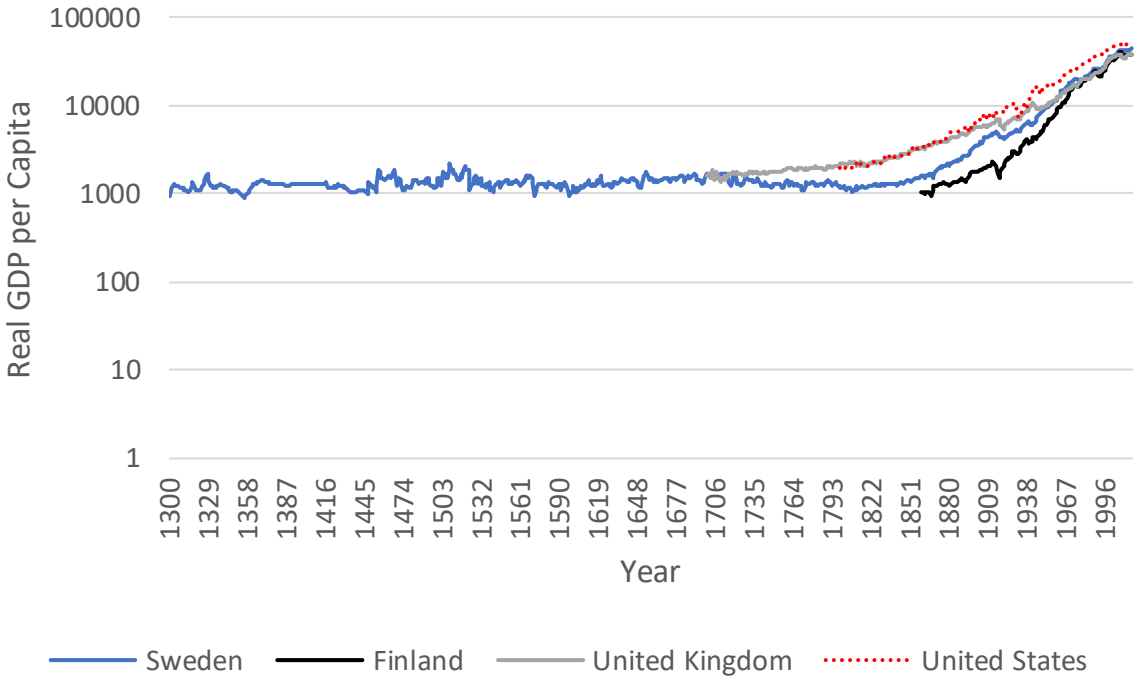
Typically scholars imply certain interpretations, such as increasing connectedness between countries and regions, interaction beyond national borders, the spreading of ideas and technology at an ever faster pace, and movement of people over borders and natural boundaries. Precise definitions are much harder to find or formulate due to the different methodological emphases among scholars. Implying some sort of correlation or causal outcome as the end result, globalization is often analyzed in conjunction with other important phenomena like conflicts, spread of democracy, trade treaties and other institutions, economic development, the decline of national identities and cultures, and the growing importance of multinational corporations and other supranational organizations.[15] Here we are particularly interested in the globalization waves prior to the 20th century, especially the convergence and divergence patterns in the last 500 years and their implications for the Nordic economies.

In order to start examining the performance and development of the Nordic economies, we want to place them in various comparative mirrors. First, we wish to utilize the real GDP per capita data for these nations. In general, in the early modern era Nordic economies fell behind Great Britain (and also the emerging United States). The catch-up process for the Nordic countries began mostly in the 20th century, especially after World War I. In the post-World War II period, the British economy slowed and has converged on the Nordic GDP per capita levels. Unfortunately, we do not yet have very detailed information on all of these economies, since for example the Finnish historical national accounts only go as far back as 1860. The most meaningful way to form longer economic time series, short of reconstructing national accounts and/or estimating them backwards is to utilize real wages. Here we want to use a large source of data to assess structural qualities of Nordic labor markets and wages in the long run. However, we first wanted to examine Swedish and Finnish economic development in comparison with the economic leaders of the 19th and 20th centuries, respectively the UK and the USA (see Figure 1). It seems that Sweden and Finland were rather consistently behind the leading economies, although they were able to keep

[15] On globalization and terrorism, see **Q. Li and D. Schaub**, "Economic Globalization and Transnational Terrorism: A Pooled Time-Series Analysis," *Journal of Conflict Resolution* 48, no. 2 (2004). On whether democracy promotes or hinders democracy, see e.g. **Q. Li and R. Reuveny**, "Economic Globalization and Democracy: An Empirical Analysis," *British Journal of Political Science* 33, no. 01 (2003). Or conflicts (**J. Eloranta**, "From the Great Illusion to the Great War: Military Spending Behaviour of the Great Powers, 1870–1913," *European Review of Economic History* II, no. August (2007), **E. Gartzke and Q. Li**, "War, Peace, and the Invisible Hand: Positive Political Externalities of Economic Globalization," *International Studies Quarterly* 47, no. 4 (2003)), gender (**C. Freeman**, "Is Local: Global as Feminine: Masculine? Rethinking the Gender of Globalization," *Signs* 26, no. 4 (2001)), discourse (**M. J. Shapiro**, "Globalization and the Politics of Discourse," *Social Text* (1999)), corporations (**C. A. Williams**, "Corporate Social Responsibility in an Era of Economic Globalization," *U.C. Davis Law Review* 35 (2001)) etc.

pace with those economies for most of the period, even prior to the 19th century. And some significant catching up occurred in late 20th century, as they caught up to the UK, for example.[16]

Figure 1. Swedish and Finnish Real GDP per Capita in the Long-run Comparisons with the UK and USA

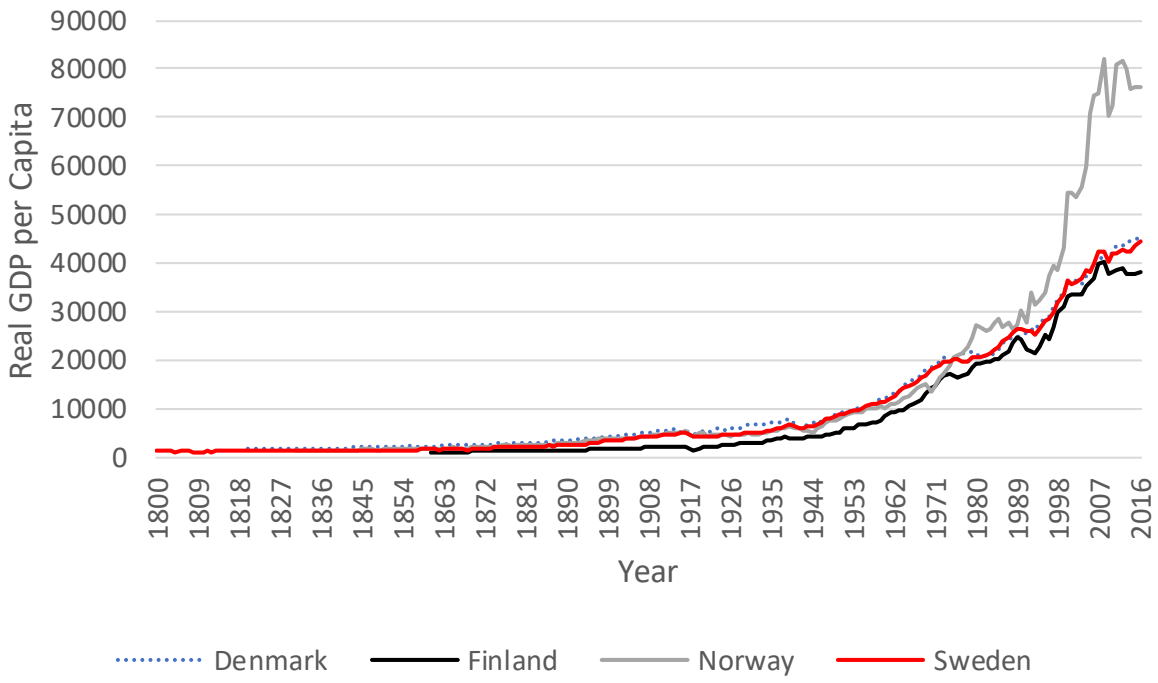


Source: Maddison Project Database, version 2018. Bolt, Jutta, Robert Inklaar, Herman de Jong and Jan Luiten van Zanden (2018), "Rebasing 'Maddison': new income comparisons and the shape of long-run economic development", Maddison Project Working paper 10. The figures are in 2011 USD, based on multiple benchmarks. Please note that the data is very sporadic beyond the 19th century, often just point estimates for selected years.

We next plotted the real GDP per capita for all the Nordic countries during the 19th and 20th centuries. In general, the economic development of the Nordic countries has been fairly uniform, especially in the 20th century, as seen in Figure 2. Denmark was clearly above the rest until the 1930s when the others started to catch up. Norway took the lead since the 1980s and clearly diverged from the Nordic pattern, and the rest converged toward similar levels of development by the end of the 20th century, although the economic recession of the 1990s affected them in different ways. The story, however, seems to be one of convergence in the long run.

[16] See also **Kokkinen, Arto; Jukka Jalava; Riitta Hjerppe and Matti Hannikainen.** 2007. "Catching up in Europe: Finland's Convergence with Sweden and the Eu15." *Scandinavian economic history review*, 55(2), 153-71.

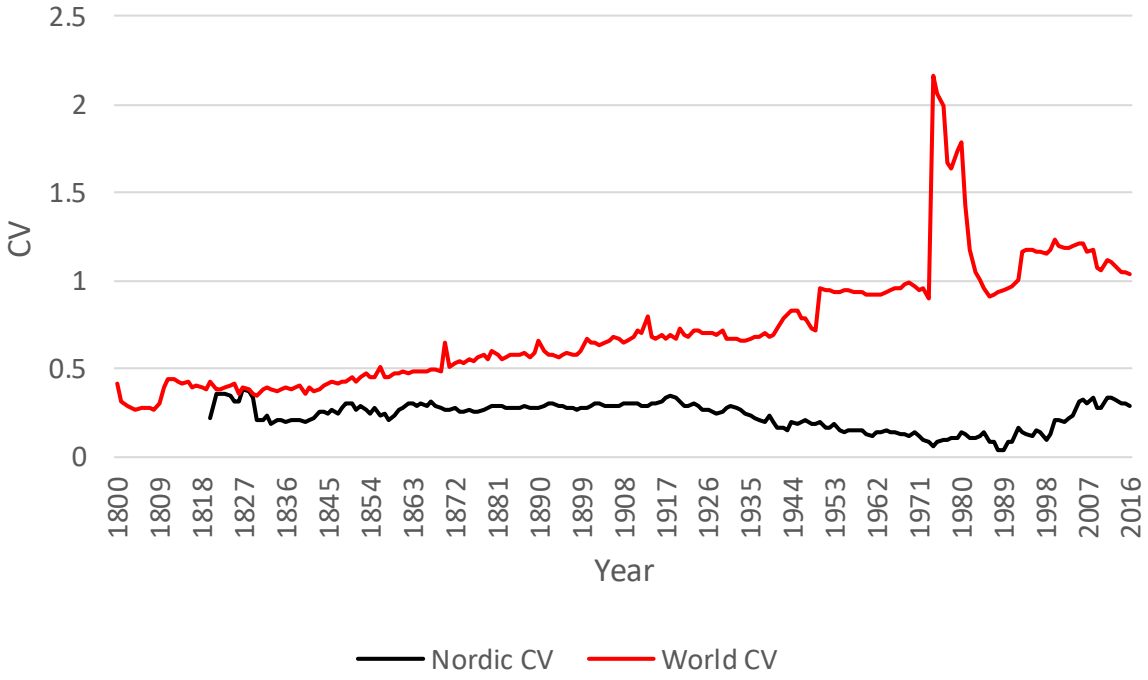
Figure 2. Real GDP per Capita for Denmark, Finland, Norway, and Sweden, 1800-2016



Source: Bolt et al. (2018).

What about convergence and divergence between the Nordic countries themselves and in terms of their relationships to the economic leader nations? As seen in Figure 3, there was still divergence among the Nordic economies until the beginning of the 20th century. The coefficient of variation, which is one way to measure so-called sigma (σ) convergence along with standard deviation (measuring dispersion in the real GDP per capita levels over time), declined sharply after that almost continuously until the 1980s and 1990s, when a divergence pattern emerged again, driven by Norway's fast economic development. On average, the Nordic economies have experienced steady and accelerating economic expansion from the early 20th century onward, especially when compared with the world pattern. While Denmark was the early leader, in the 20th century Sweden and especially Norway have surpassed it.

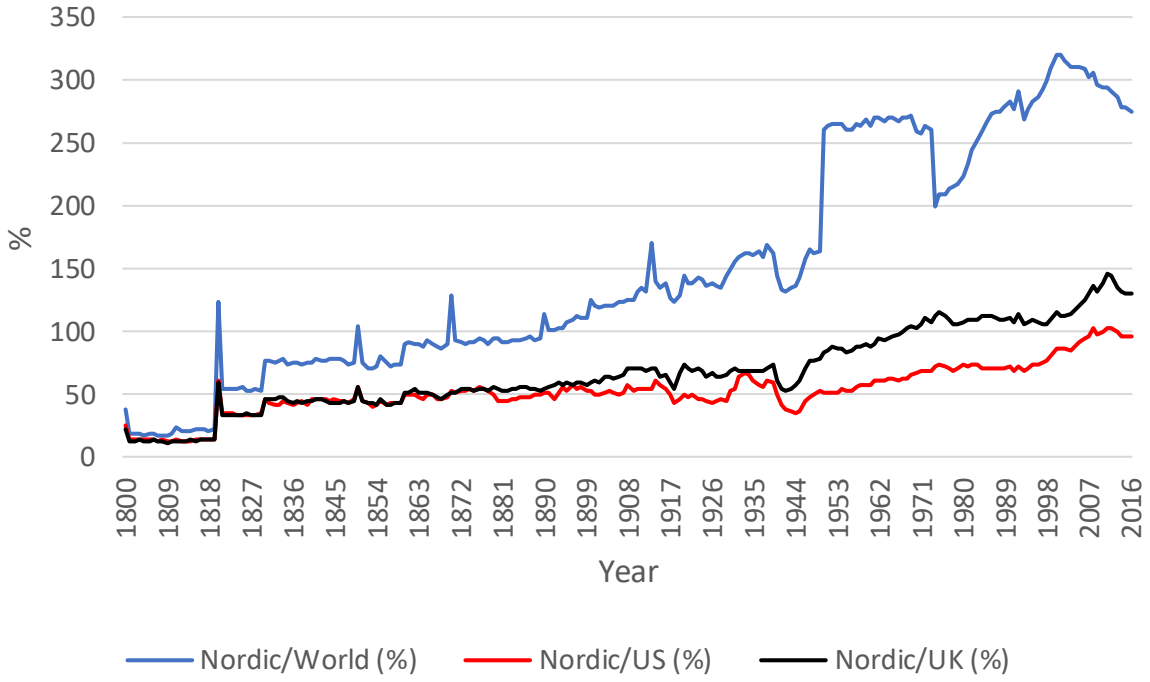
Figure 3. Nordic Versus World Economic Convergence, 1800-2016



Source: Bolt et al. (2018). CV = coefficient of variation.

Nordic economies have certainly fared much better than the world, on average (see Figure 4). However, when compared with the leading economy of the 19th century (UK) and the leading economy of the 20th century (USA), the picture gets a bit murkier. Nordic economies starting to, slowly and in fits, catch up to the UK from the early 20th century onwards, reaching parity in the late 1960s and maintaining a dwindling edge until the early 21st century. As for the USA, the Nordic economies steadily lost ground in the 19th century until the 1920s, when they temporarily gained some ground, only to lose it again during the Second World War. In the post-war period, however, they have experienced some catching up, although never gaining (on average) parity.

Figure 4. Nordic Economic Performance Compared to the Leading Economies (UK, USA) in the Long Run



Source: Bolt et al. (2018).

Along with σ-convergence, a typical way to examine convergence between economies is to see if beta (β) convergence occurs, implying that poorer countries develop faster than rich ones, i.e. they catch up over time.[17] Here we measure β-convergence in the following fashion:

$$\Delta y_{it} = \alpha + \beta(y_{i,t-1}) + \mu_{i,t,} \quad \textbf{(1)}$$

where delta y_{it} represents the annualized growth of real GDP per capita for the given country (Denmark, Finland, Norway, and Sweden) in the panel in logs; α is the common constant; beta is expressed as the previous years' growth rate in logs for the given country; and the μ is the error term. Usually this type of β-convergence is called *absolute* convergence, since it does not take into

[17] **Barro, Robert J and Xavier Sala-i-Martin.** 1992. "Convergence." *Journal of political Economy*, 223-51, **Barro, Robert J; Xavier Sala-i-Martin; Olivier Jean Blanchard and Robert E Hall.** 1991. "Convergence across States and Regions." *Brookings papers on economic activity*, 107-82, **Sala-i-Martin, Xavier X.** 1996a. "The Classical Approach to Convergence Analysis." *The economic journal*, 1019-36, ____. 1996b. "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence." *European Economic Review*, 40(6), 1325-52, **Young, Andrew T; Matthew J Higgins and Daniel Levy.** 2008. "Sigma Convergence Versus Beta Convergence: Evidence from Us County-Level Data." *Journal of Money, Credit and Banking*, 40(5), 1083-93.

account other possible factors, in comparison with *conditional* convergence. Here we do not examine conditional convergence in the typical way (i.e., by including regional dummies and/or sectoral shares in the regressions), due to lack of data mainly, but in addition we estimated a variation of this equation.[18]

This analysis represents a catching-up process that unfolds as weaker countries imitate the technological and managerial frontier of the leader. The ability of any country to do this depends on the gap between the country and the leader. The gap, in terms of per capita income, may be written in logs:

$$y_t - y_{t-1} = \alpha' + \beta'(y^*_{t-1} - y_{t-1}), \qquad \textbf{(2)}$$

where y is the log level of real income per capita of the follower country, and y^* is the log level of real income per capita of the leader country, α' is the exogenously given growth rate of the leader and β', the catch-up parameter lies in the interval (0,1). Defining the gap as $z_t = y^*_t - y_t$, (2) can be rewritten as:

$$z_t = (1-\beta')\, z_{t-1} \qquad \textbf{(3)}$$

The model has only one steady state solution, namely when z=0 and full catching up has occurred. This follows from the implicit assumption that the only factor driving growth is the gap. The potential role of other infrastructural variables - human and physical capital and research and development expenditure, for example - is largely ignored. In this paper, due to lack of data as noted above, we simply augment equation (1) by the gap variable and estimate:

$$\Delta y_{it} = \alpha + \beta(y_{i,t-1}) + \beta'(z_{t-1}) + \mu_{i,t}, \qquad \textbf{(4)}$$

which, as before, assume that poorer countries develop faster than rich ones, and the growth rate of the follower country depends of its position with respect to the leader country.

[18] See e.g. **Kangasharju, Aki.** 1998. "Beta Convergence in Finland: Regional Differences in Speed of Convergence." *Applied Economics*, 30(5), 679-87, **Lall, Somik V and Serdar Yilmaz.** 2001. "Regional Economic Convergence: Do Policy Instruments Make a Difference?" *The annals of regional science*, 35(1), 153-66.

Most studies have found evidence for β-convergence, but usually the data used has been for the post-Second World War period. As in the classic studies by Robert Barro and others, it has been suggested that the catch-up usually occurred at the rate of 2 per cent per year.[19] Studies of Nordic convergence (or divergence) are rather rare. There are some that have investigated for example regional convergence, as in the case of Finland in the 20th century.[20] Aki Kangasharju confirmed the 2 per cent long run convergence rate, but also noted that in the short run convergence tended to be quite unstable.[21]

Typically these types of studies use fixed 30- and/or 60-year periods in their testing. Here, however, we wanted to avoid possible time series distortions due to unit roots and structural breaks. First of all, all of the series, based on based on both individual country and panel standard ADF-tests (and no cointegration vectors were found using the various individual series and panel tests) were found to be I(*1*). We then performed the Bai-Perron test to see how many potential structural breaks the series had. For most of them there was a break in the 1860s, for some during the First World War, for all after the Second World War and during the mid-1970s. Next we performed the Perron-test, which allows for one structural break and unit root to occur, apparently all the series most likely had both, indicates that the world wars formed major breaks in the series. Based on these tests, we divided up the sub-periods for our convergence analyses accordingly: 1820-1865, 1866-1913, 1914-1946, 1947-1974, and 1975-2010.[22] Table 1 provides an overview of the

[19] **Barro, Robert J; Xavier Sala-i-Martin; Olivier Jean Blanchard and Robert E Hall.** 1991. "Convergence across States and Regions." *Brookings papers on economic activity*, 107-82, **de La Fuente, Angel.** 2003. "Convergence Equations and Income Dynamics: The Sources of Oecd Convergence, 1970-1995." *Economica*, 655-71, **Kangasharju, Aki.** 1998. "Beta Convergence in Finland: Regional Differences in Speed of Convergence." *Applied Economics*, 30(5), 679-87, **Sala-i-Martin, Xavier X.** 1996b. "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence." *European Economic Review*, 40(6), 1325-52, **Young, Andrew T; Matthew J Higgins and Daniel Levy.** 2008. "Sigma Convergence Versus Beta Convergence: Evidence from Us County-Level Data." *Journal of Money, Credit and Banking*, 40(5), 1083-93.

[20] **Arnesen, Anne-Lise and Lisbeth Lundahl.** 2006. "Still Social and Democratic? Inclusive Education Policies in the Nordic Welfare States." *Scandinavian Journal of Educational Research*, 50(3), 285-300, **Heichel, Stephan; Jessica Pape and Thomas Sommerer.** 2005. "Is There Convergence in Convergence Research? An Overview of Empirical Studies on Policy Convergence." *Journal of European Public Policy*, 12(5), 817-40, **Kangasharju, Aki.** 1998. "Beta Convergence in Finland: Regional Differences in Speed of Convergence." *Applied Economics*, 30(5), 679-87, **Østbye, Stein and Olle Westerlund.** 2007. "Is Migration Important for Regional Convergence? Comparative Evidence for Norwegian and Swedish Counties, 1980–2000." *Regional Studies*, 41(7), 901-15.

[21] **Kangasharju, Aki.** 1998. "Beta Convergence in Finland: Regional Differences in Speed of Convergence." *Applied Economics*, 30(5), 679-87.

[22] Results of all of the statistical tests are available from the authors by request.

statistical characteristics of the growth variables, both for the entire period and for the chose sub-periods.[23]

Table 1. Statistical Overview of the Nordic Real GDP per Capita Series, 1820-2010

Period	Denmark	Finland	Norway	Sweden
1820-2010	Mean:6,941 Median:3,826 Std. Dev.:6859 Min.:1,274 Max.:25,060 N:191	Mean:6,313 Median:2,988 Std. Dev.:6,641 Min.:781 Max.:24,694 N:153	Mean:6,543 Median:2,615 Std. Dev.:7,774 Min.:767 Max.:28,556 N:182	Mean:5,749 Median:2,258 Std. Dev.:6,642 Min.:766 Max.:25,377 N:211
1820-1865	Mean:1,526 Median:1,452 Std. Dev.:193 Min.:1,274 Max.:1,875 N:46	Mean:923 Median:955 Std. Dev.:62.9 Min.:781 Max.:969 N:8	Mean:987 Median:956 Std. Dev.:132 Min.:767 Max.:1,293 N:37	Mean:1,017 Median:979 Std. Dev.:97.8 Min.:888 Max.:1,225 N:46
1866-1913	Mean:2,648 Median:2,462 Std. Dev.:615 Min.:1,840 Max.:3,912 N:48	Mean:1,421 Median:1,315 Std. Dev.:306 Min.:886 Max.:2,111 N:48	Mean:1,716 Median:1,692 Std. Dev.:277 Min.:1,304 Max.:2,447 N:48	Mean:1,808 Median:1,617 Std. Dev.:451 Min.:1,113 Max.:2,874 N:48
1914-1946	Mean:4,791 Median:4,785 Std. Dev.:712 Min.:3,459 Max.:5,993 N:33	Mean:2,666 Median:2,666 Std. Dev.:694 Min.:1,370 Max.:3,697 N:33	Mean:3,319 Median:3,387 Std. Dev.:670 Min.:2,243 Max.:4,441 N:33	Mean:3,988 Median:4,033 Std. Dev.:844 Min.:2,782 Max.:5,646 N:33
1947-1974	Mean:9,522 Median:9,062 Std. Dev.:2,555 Min.:6,035 Max.:13,945 N:28	Mean:6,744 Median:6,444 Std. Dev.:2,249 Min.:3,717 Max.:11,361 N:28	Mean:7,761 Median:7,400 Std. Dev.:2,035 Min.:4,864 Max.:11,726 N:28	Mean:9,422 Median:8,913 Std. Dev.:2,456 Min.:6,091 Max.:13,885 N:28
1975-2010	Mean:19,548 Median:18,910 Std. Dev.:3,519 Min.:13,621 Max.:25,060 N:36	Mean:17,046 Median:16,033 Std. Dev.:4,054 Min.:11,355 Max.:24,694 N:36	Mean:20,698 Median:19,719 Std. Dev.:5,208 Min.:12,271 Max.:28,556 N:36	Mean:18,527 Median:17,400 Std. Dev.:3,614 Min.:14,004 Max.:25,377 N:36

Source: Bolt and Van Zanden (2013). The First Update of the Maddison Project; Re-Estimating Growth Before 1820, Maddison Project Working Paper 4. Available from: http://www.ggdc.net/maddison/maddison-project/home.htm [cited 10.10.2013].

[23] On some of these tests and applications, see e.g. **Bai, Jushan.** 1999. "Likelihood Ratio Tests for Multiple Structural Changes." *Journal of Econometrics*, 91(2), 299-323, **Banerjee, Anindya and Giovanni Urga.** 2005. "Modelling Structural Breaks, Long Memory and Stock Market Volatility: An Overview." Ibid.129(1), 1-34, **Drennan, Matthew P; José Lobo and Deborah Strumsky.** 2004. "Unit Root Tests of Sigma Income Convergence across Us Metropolitan Areas." *Journal of Economic Geography*, 4(5), 583-95.

Note! Finnish series has annual values only from 1860 onwards, Norway from 1830 onwards. Both have some spot estimates before those years, however. For Denmark and Sweden we have full series for the entire period. Also, we intend on replicating these results with the new Maddison Project dataset.

Table 2. Beta Convergence for Nordic Economies, 1820-2010

	Specification 1 (only β)		**Specification 2 (β, and Convergence with UK or USA**			
Period	β-coefficient	Adj. R^2	β-coefficient	UK	USA	Adj. R^2
1820-1865	0.04	0.00	-0.76**	1.05***	-	0.08
1866-1913	0.09	0.00	0.09	0.16**	-	0.01
1914-1946	-0.34***	0.05	-0.29*	-	0.08	0.05
1947-1974	-0.14**	0.03	-0.07	-	0.11*	0.05
1975-2010	-0.21***	0.14	-0.26***	-	0.15***	0.13

Sources: see previous figures. The dependent variable is the annualized GDP per capita growth rate in logs. The beta convergence variable is explained in the text. UK refers to the difference between UK's real GDP per capita and the particular Nordic country's real GDP per capita in the panel (t-1). USA refers difference between USA's real GDP per capita and the particular Nordic country's real GDP per capita in the panel (t-1) .Method: pooled EGLS (Estimated Generalized Least Squares). We tested the equations with three different frameworks: 1. Cross-section weights and cross-section PCSE standard errors and covariances, with fixed effects; 2. Period weights and period PCSE standard errors and covariances; 3. Period weights and period PCSE standard errors and covariances, with individual intercepts for the countries. We utilized the framework in which the β-coefficient was statistically most significant or the one with the highest adjusted R^2 in the table. An intercept was used in each estimation, but the values are not reported here.

Here we found that β-convergence was not a consistent feature in the period. It seemed to apply mostly in the 20th century among the Nordic countries, as seen in Specification 1. Nordic countries exhibited this late convergence with rather large coefficients, implying (Specification 1) a 21-34 per cent growth impact, although the results are rather imprecise and unstable. Moreover, when we look at Specification 2, the catch up impact seems to have applied in most of the period. The impact of UK as a leader was more sizable and statistically significant than that of the USA, although the role of the USA became more pronounced towards the end of the period. Overall, the bigger the previous years' gap with the leading economy, the bigger the annualized Nordic growth rate, implying catch-up behavior. In general, the adjusted R-squared values were small, and it is likely that the various shocks had an impact on the β-coefficients.

We also estimated the beta convergence with the new Maddison dataset, and we opted to use panel data analysis with clustered standard errors (proposed by Liang and Zeger (1986). For each regression we ran a Hausman test in order to know if a fixed or random effects model should be chosen. The results varied, as for some specifications it was preferred with the random effects model, while it was the opposite for others.

Table 3. Pooled Beta Convergence for the Nordic Countries, 1820-2016

Specification 1: $\Delta y_{it} = \alpha + \beta(y_{i,t-1}) + \mu_{i,t}$

	(1-1)		**(1-2)**		**(1-1)**	
	Random effects		**Random effects**		**Fixed effects**	
	Beta	R^2	Beta	R^2		
1820-1865	.002	.005	-.002***	.005		
1866-1913	.001	.005	.011*	.005		
1914-1946	-.011**	.008	-.028*	.008		
1947-1974	-.006***	.005	-.006	.005		
1975-2016	-.006**	.007	-.027***	.007	-.018	.0130
Country fixed effects	No		Yes		Yes	

Source: based on Bolt et al. (2018).

For all but the 1975-2016 period, the Hausman test indicated that the random effects was the preferred model. We included the 1975-2016 with random effects for the purposes of comparison with the earlier Maddison Project dataset. For the 1975-2016 period, the fixed effects results were included as well. The results in general do indicate a similar pattern as the original results. However, the size of the coefficient is considerably smaller.

The models chosen for specification 2 were the opposite; for all but the 1914-1946 period, the Hausman test indicated that the fixed effects model was preferred. We also ran the fixed effects for the 1914-1946 as well for comparison, while we have also estimated the random effects model for the 1914-1946 period.

The results are broadly similar to the original ones prior to 1974, but differ greatly for the 1975-2016 period. This might partly be due to the longer time period. But we also suspect it has to do with the "Norway problem" in the data set (which goes for both the old and the new version of the dataset). The GDP per capita figures for Norway are too high to be plausible, especially in comparison with other Scandinavian countries. And not just for the "oil period" following 1973, but even before that.

Table 4. Pooled Beta Convergence Models for the Nordic Countries, 1820-2016

Specification 2: $\Delta y_{it} = \alpha + \beta(y_{i,t-1}) + \beta'(z_{t-1}) + \mu_{i,t}$

	(2-1)			(2-2)			(2-3)		
	Fixed effects			Random effects			Random effects		
	Beta	Follow	R^2	Beta	Follow	R^2	Beta	Follow	R^2
1820-1865	-.074**	.235**	.154						
1866-1913	.120**	.241**	.073						
1914-1946	-.010	.047**	.027	.008*	.024**	.018	-.010	.047***	.027
1947-1974	.003	.0291	.008						
1975-2016	-.018	.121	.130						
Country fixed effects	Yes			No			Yes		

Source: based on Bolt et al. (2018).

Table 5. Determinants of Sigma Convergence for Nordic Countries, 1820-2010

	Specification 1 (only β)		**Specification 2 (β, and Convergence with UK or USA**			
Period	β-coefficient	Adj. R^2	β-coefficient	UK	USA	Adj. R^2
1820-1865	0.35***	0.67	0.20**	0.19***	-	0.87
1866-1913	0.26***	0.79	0.18***	0.16***	-	0.72
1914-1946	-0.76***	0.88	-0.74***		-0.06***	0.77
1947-1974	-0.44**	0.89	-0.44***		-0.08***	0.88
1975-2010	0.08***	0.05	0.10***		0.03**	0.07

Sources: see previous figures. The dependent variable is the coefficient of variation for the Nordic countries' GDP per capita levels in logs. The beta convergence variable is the same as in the previous table. Everything else is the same as explained in Table 1.

Beta convergence is usually highlighted as a necessary pre-condition for the sigma convergence, which is what we test for in Table 5 (and in Figure 3). Moreover, we tested again the impact of the UK and the USA on the Nordic convergence.

$$\sigma_t = \alpha + \beta(y_{i,t-1}) + \mu_{i,t} \quad \textbf{(5)}$$

where the dependent variable is the coefficient of variation for the Nordic countries' real GDP per capita levels in logs. The rest of the variables are the same as explained before. Based on the estimations, it seems that β-convergence explained the σ-convergence quite well. However, the coefficients were positive for three out of the five sub-periods, so the results are not entirely straightforward to interpret. Convergence occurred in the period from the First World War to the Oil Crises, and divergence during the other period. The Nordic countries were also responsive to the gap with the leading economy. An increase in the gap with the UK also increased the coefficient of variation in the 19th century; however, the period 1914-1974 stands out again, since this the period when the Nordic countries were catching up to the USA. Finally, it is also notable that the explanatory value of the framework declines dramatically during the last sub-period, possibly, again, due to various shocks. In general, we can confirm the existence of β-convergence as a force that tended to reinforce σ-convergence. However, we need to still replicate these results with the new Maddison dataset, and with a variety of pooled models.

3. Nordic Wages in Long Run European Wage Mirrors

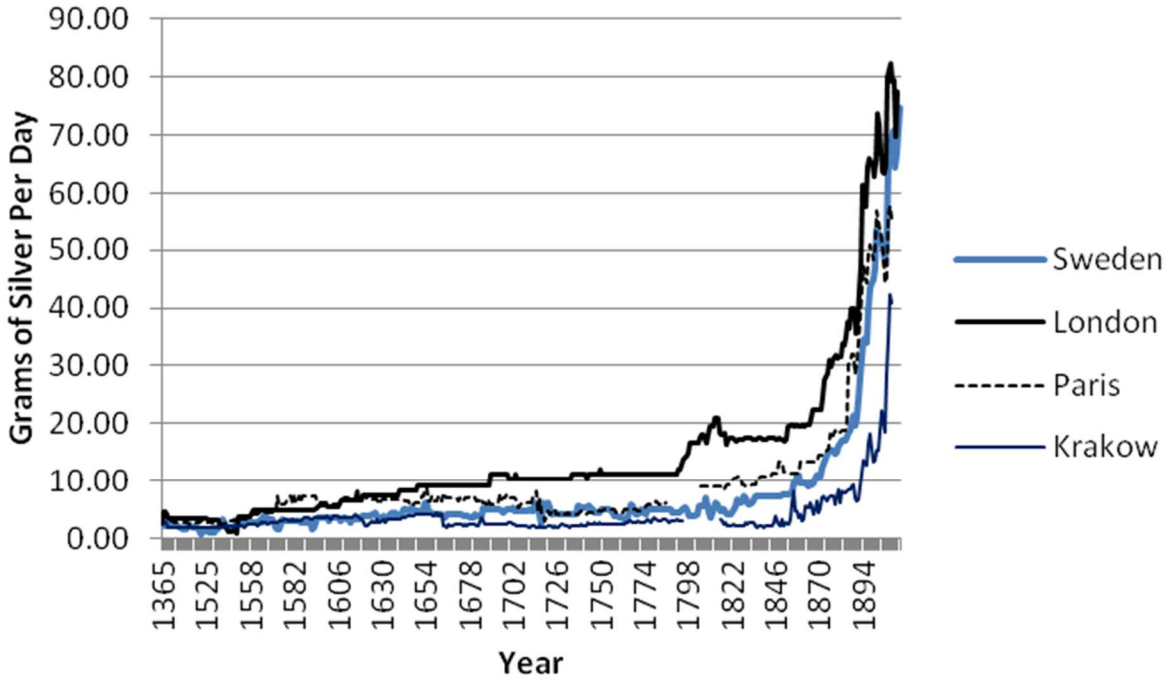
The limitations of the real GDP data are rather obvious, namely that they become scarce toward the early 19th century (or beyond). Even though there are now efforts underway in the various Nordic countries, it is still difficult to obtain real GDP per capita figures for the period prior to 1800, with Sweden being one of the few exceptions. The new series are now available going all the way to the beginning of the 16th century.[24] Given these problems, here we wish to analyze the development of the Finnish, Swedish, and in some instances Norwegian, economies in the long run through real wages.[25] Real wages themselves are not without problems. In particular, they are

[24] See esp. **Broadberry, Stephen and Alexander Klein.** 2012. "Aggregate and Per Capita Gdp in Europe, 1870–2000: Continental, Regional and National Data with Changing Boundaries." *Scandinavian economic history review*, 60(1), 79-107, **Edvinsson, Rodney.** 2013. "New Annual Estimates of Swedish Gdp, 1800–2010." *The Economic History Review*, 66(4), 1101-26, **Schön, Lennart and Olle Krantz.** 2012. "The Swedish Economy in the Early Modern Period: Constructing Historical National Accounts." *European Review of Economic History*, 16(4), 529-49.

[25] The data on Norwegian or Danish real wages is not readily available. On Swedish real wages, see **Söderberg, Johan.** 2011. "Long-Term Trends in Real Wages of Labourers," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, 453-78. Finnish real wages were obtained from Ilkka Nummela, and utilized in conjunction with the data collection efforts in the bigger project on the Finnish economy.

an imperfect proxy for real GDP per capita.[26] Nonetheless, they do tell us about broad trends in development over time. For example, Sweden's long run development, as depicted in Figure 5, seems quite similar to most European cities, with the exception of London that is clearly ahead of the rest. Sweden in fact looks rather like Paris rather than Krakow. In a sense, Sweden is clearly following a West European development path in the *longue duree*.

Figure 5. Real Wages in Sweden Compared to Major European Cities, 1365-1914

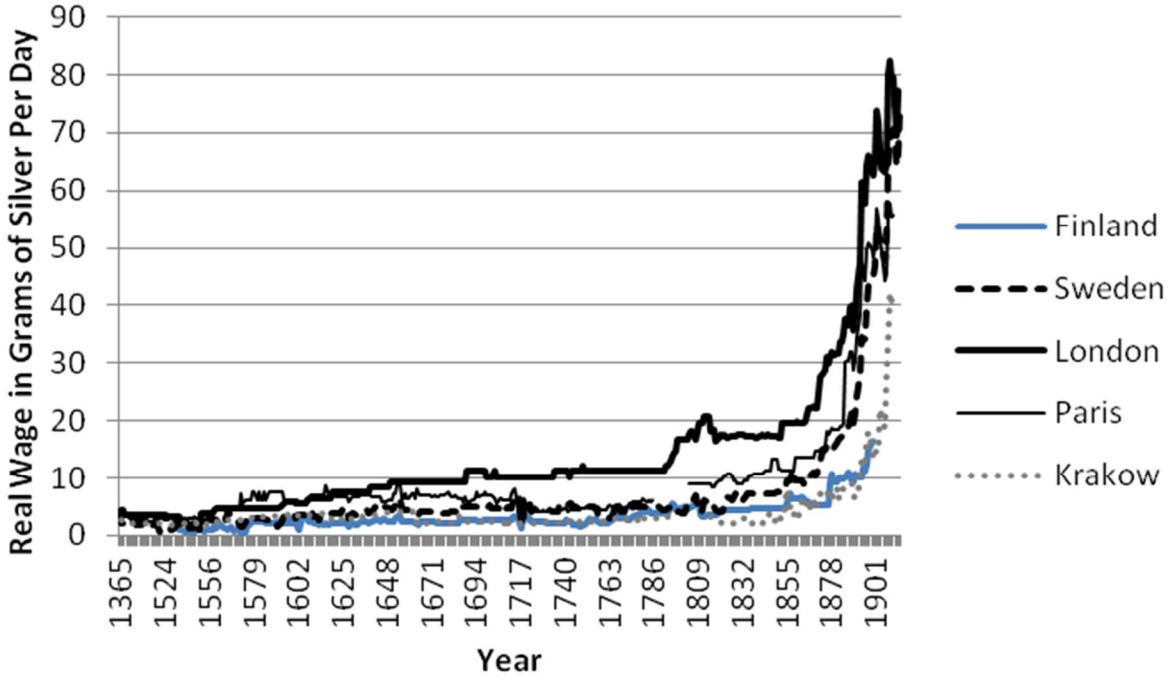


Sources: see previous figures.

[26] Regardless, the correlation between real wages and real GDP per capita is very high for Sweden (in 1560-1914: 0.94) and Finland (1860-1900: 0.88) in the 19th and early 20th century. For further discussion, see e.g. **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47, **Baumol, William J.** 1986. "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show." *The American Economic Review*, 1072-85, **Crafts, Nicholas FR.** 1997. "The Human Development Index and Changes in Standards of Living: Some Historical Comparisons." *European Review of Economic History*, 1(03), 299-322, **Crafts, Nicholas FR and Terence C Mills.** 1994. "Trends in Real Wages in Britain, 1750-1913." *Explorations in Economic History*, 31(2), 176-94, **Maddison, Angus.** 2001. *The World Economy: A Millennial Perspective*. Paris: OECD, **Özmucur, Süleyman and Şevket Pamuk.** 2002. "Real Wages and Standards of Living in the Ottoman Empire, 1489-1914." *Journal of Economic History*, 293-321, **Van Zanden, Jan Luiten.** 1999. "Wages and the Standard of Living in Europe, 1500-1800." *European Review of Economic History*, 2, 175-97, **Williamson, Jeffrey.** 1999. "Real Wages Inequality and Globalization in Latin America before 1940." *Revista de Historia Economica-Journal of Iberian and Latin American Economic History*, 17(1), 101-42.

When we add Finland to the mix (Figure 6), the situation becomes more muddled. Clearly there is no uniform Nordic development path for the entire period. In particular, a divergence emerged between Finland and Sweden starting in the 18th century, and this gap widened in the 19th century. Moreover, Finland's development is more in line with Eastern European cities like Krakow, in essence putting Finland in a different category than Sweden prior to the 20th century. Of course, both Poland and Finland were part of the Russian Empire in the 19th century, and subjected to similar institutional and economic constraints, so this is not entirely surprising.[27]

Figure 6. Swedish and Finnish Real Wages in the Long Run, in Comparative Mirrors, 1365-1914



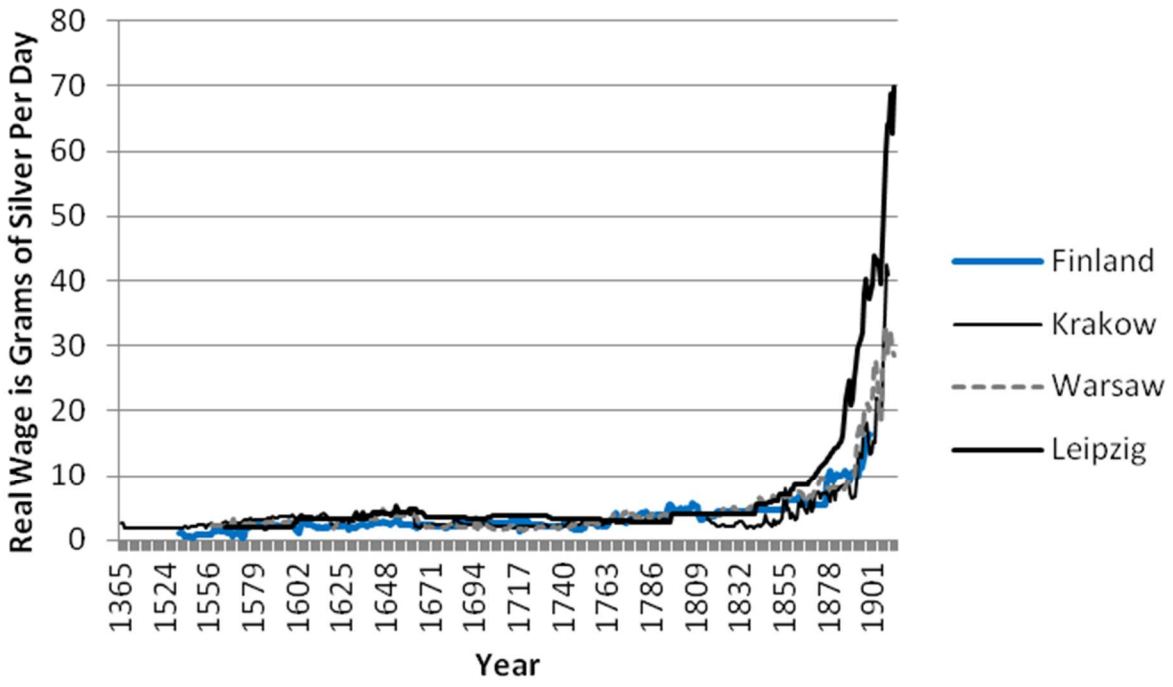
Sources: see previous figures. Please note that the Finnish series starts in 1541.

Figure 7 shows this even more clearly: In the 18th and 19th centuries, Finland followed the Eastern European development path. For example, the real wages in Leipzig in the 19th century were substantially higher than in Finland, which was not true a century earlier.

[27] See also **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47.

What about Southern Europe? How do Sweden and Finland compare to the Mediterranean economies? This particularly relevant for the discussion of the Little Divergence, i.e. did the Nordic economies stagnate in a similar fashion as the Mediterranean economies did. We see some of those patterns in Figure 8. Both Milan and Madrid were likely substantially ahead of Finland until mid-18th century; after that, they develop relatively similarly over the 19th century.

Figure 7. Finnish Long-run Real Wages in Comparison with Eastern Europe

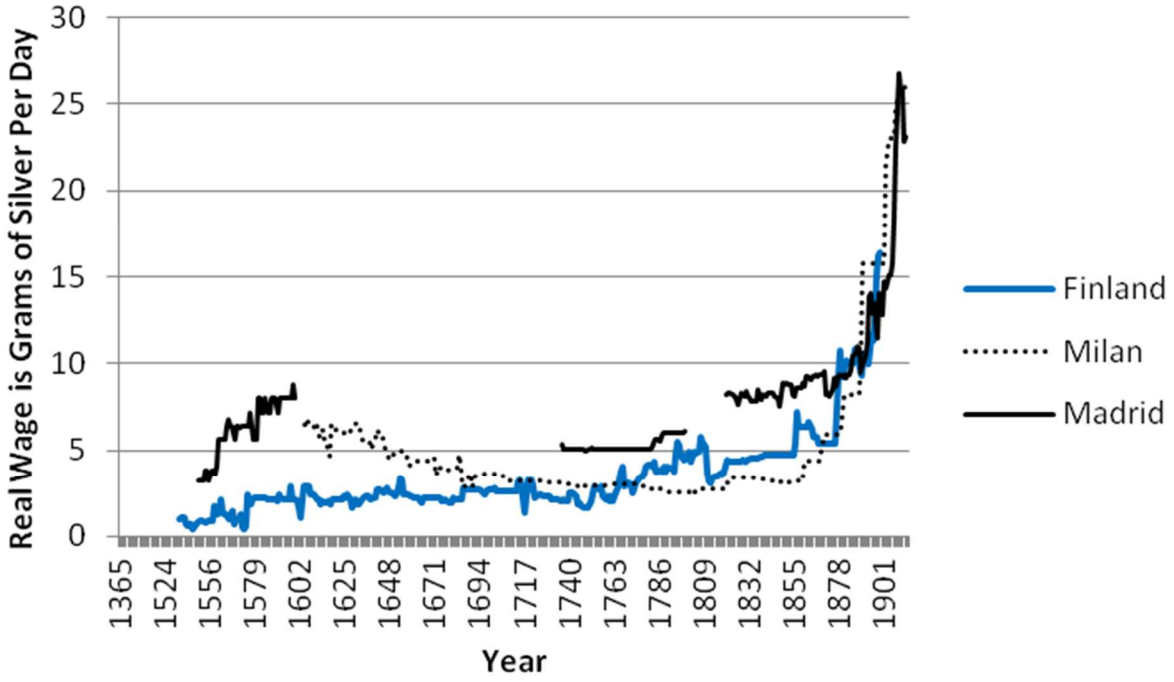


Sources: see previous figures. Please note that the Finnish series starts in 1541.

In essence, a European periphery emerges in the 18th and 19th centuries compared to the industrializing West European nations. However, the timing of the Nordic divergence was completely different: Whereas the Mediterranean economies lost ground to Western Europe since the 15th century, the Nordic economies actually kept pace with the West, at least until the 18th century. Then the later timing of the industrialization most likely caused them to diverge from the West European path and join the periphery, at least until the mid-20th century. Of course, Finland

diverged from the Swedish economic development path too, so there were differences among the Nordic countries too.

Figure 8. Finnish Real Wages in Comparison with Milan and Madrid, 1541-1914



Sources: see previous figures.

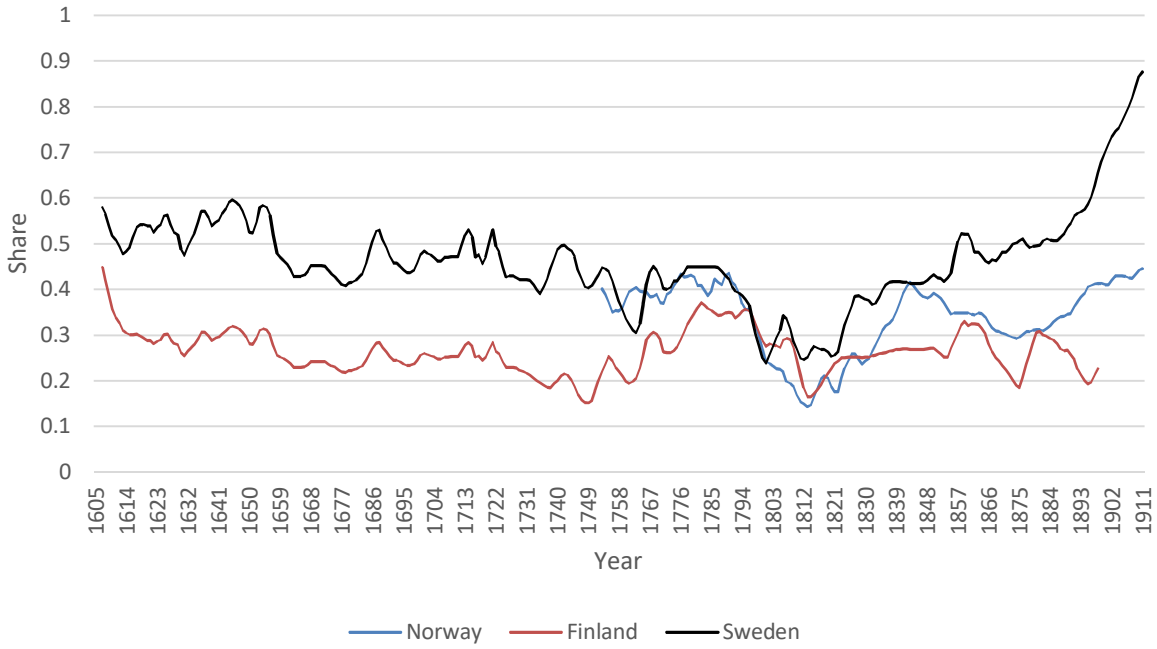
Table 6. Real Wages in Russia, Sweden, and Finland, 1613-1871

Year	Moscow, unskilled	Novgorod, St. Petersburg, unskilled	North Dvina, unskilled	Urals, state workers	Sweden, urban laborers	Finland, urban laborers
1613	1.57	-	-	-	2.70	1.8
1650	1.54	-	1.19	-	4.70	2.52
1700	1.00	1.44	-	2.17	5.00	2.68
1750	-	1.57	-	1.68	4.50	1.69
1830	-	-	-	2.31	7.00	4.39
1871	13.32	-	-	7.36	10.8	5.34

Sources: GPIH (Russia, P's, w's, 1613-1871, Mironov: http://gpih.ucdavis.edu/files/Russia_p_w_1590s-1871.xls); Nummela; Söderberg.

As seen in Table 6, we can see how the development paths of Sweden and Finland diverged up until the 20th century. While both stagnated in the 18th century, the Swedish real wages rose much faster than the Finnish wages. Moreover, Finnish real wages were not substantially different from the Russian wages in the 18th century. We do, however, start to see a change in the 19th century, when the Finnish wages start to increase faster than the Russian (in Urals) wages. By 1871, it is apparent though that Finland somewhat stagnated in the 19th century in comparison with both Sweden and Russia, or at least parts of Russia.

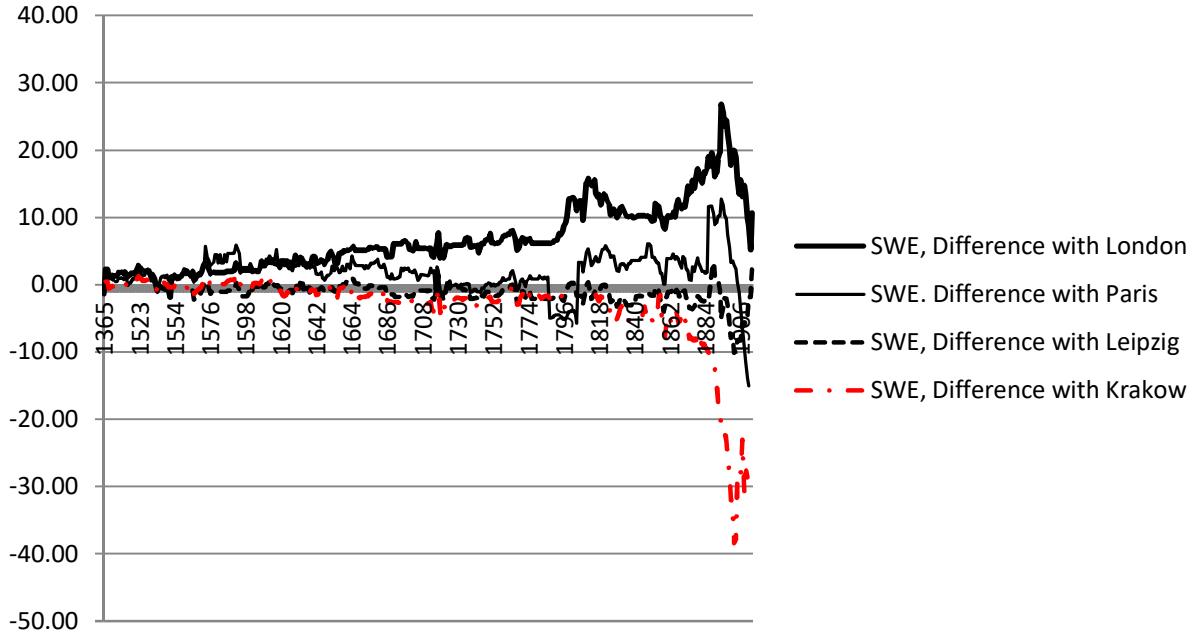
Figure 9. Share of London's Real Wage (Five-year Moving Averages)



Source: see previous figures. Norway's real wage data is from Grytten (2009).

If we add Norway into the mix, the pattern is quite similar to Sweden and Finland, and in fact Norway developed slower in the 19th century like Finland, at least until the latter part of the century, as seen in Figure 9.

Figure 10. Difference between Swedish and Certain European Cities' Real Wages, 1365-1914

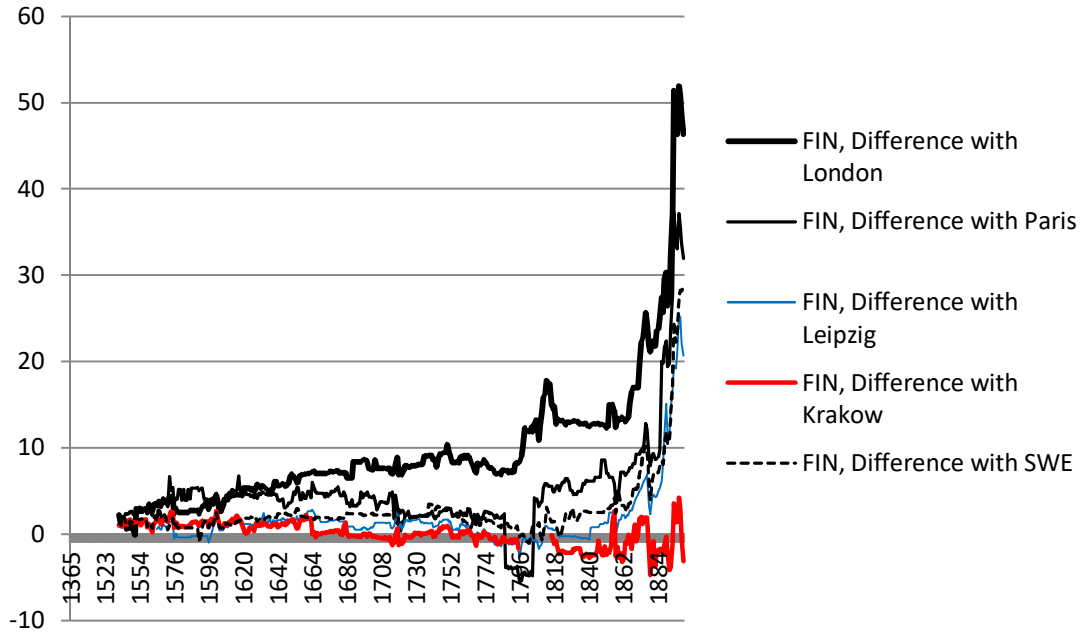


Sources: see previous figures for details. Calculated as the difference between the European city and Sweden's (or Finland's) real daily silver wage.

Was Sweden, then, part of the "West" and Finland (and perhaps in some way Norway) part of the "East" in terms of long-term economic development prior to the 20th century economic miracle.[28] In the long run, Swedish real wages maintained parity with wages in Leipzig and Krakow, at least until the end of the 18th century (see Figure 10). After that, Swedish real wages rose in comparison with those cities, and clearly surpassed from mid-19th century onwards. Moreover, the gap with Paris was relatively small until early 19th century; after that, Paris clearly developed faster, especially towards the late 19th century. Wages in London developed faster throughout the period, and the gap widened even faster in the 19th century. In particular, the globalization of the latter part of the century accelerated that process. However, in all cases the gap started close, or was eliminated entirely in the last two decades before the First World War.

[28] On the Finnish 20th century growth performance, see esp. **Ojala, Jari; Jari Eloranta and Jukka Jalava** eds**.** 2006. *The Road to Prosperity. An Economic History of Finland*. Helsinki: SKS. On Finland's orientation between the East and the West, see e.g. **Risto, Alapuro.** 1988. *State and Revolution in Finland.* Berkeley: University of California Press, Berkeley. See also **Alapuro, Risto.** 2004. "What Is Western and What Is Eastern in Finland?" *Thesis Eleven*, 77(1), 85-101.

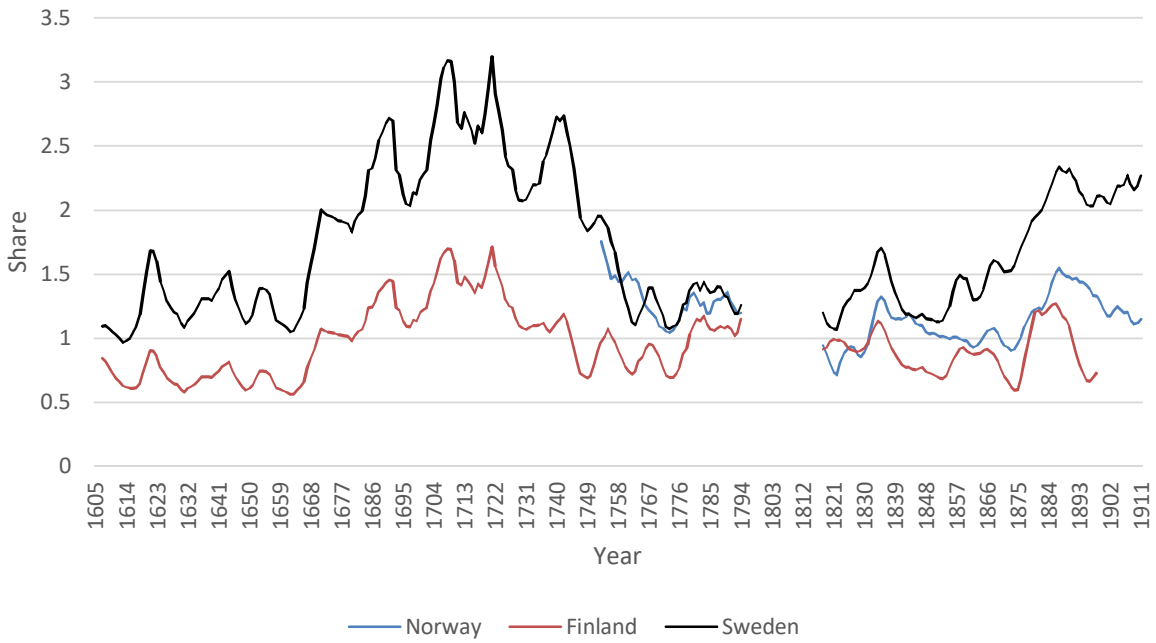
Figure 11. Difference between Finnish and Certain European Cities' Real Wages, 1541-1900



Sources: see previous figures for details. Calculated as the difference between the European city and Sweden's (or Finland's) real daily silver wage.

Respectively, the Finnish real wages developed in a similar fashion as the Swedish ones until the late 18th century, as we can observe in Figure 11. From there on, the Swedish wages grew a lot faster, and the Finnish real wages were closer to for example Polish real wages. In all comparisons the gap increased in the late 19th century, as Finland was slower to industrialize. As seen in Figure 12, Finland and Norway followed the Polish pattern much more closely, especially into the 19th century. Sweden's temporary stagnation in the 18th century provided brief near parity with Warsaw, but that changed in the 19th century. Thus, even Baltic convergence seems fairly implausible at this time.

Figure 12. Share of Warsaw's Real Wage (Five-year Moving Averages)



Sources: see previous figures.

Furthermore, we also performed the Bai-Perron breakpoint tests on the time series formed from the gap between the real wage in London and the Swedish (or Finnish) real wage for the uniform period of 1541-1900.[29] It seems that the relationship of the Swedish wage to thriving London was, as the previous graphs attest to, more prone to structural breaks in the earlier part of this period. For Sweden, the structural break years were 1601, 1656, and 1798. Moreover, given that the ADF-test did not reveal any unit roots, the results are fairly robust. For Finland, the breaks occurred slightly later, in 1640, 1793, and in 1847. While the Finnish series most likely had a unit root too and the results are less robust, it seems that Finland's relationship to the fastest growing economy was indeed one of strong decline. Clearly there were at least two Nordic economic divergence and convergence paths, one in the West (Sweden) and one in the East (Finland). But was this representative of all economic sectors? It is rather well-established that both countries industrialized late, Finland being even slower in this process.[30]

[29] The results are available from the authors by request.

[30] **Heikkinen, Sakari.** 1997b. *Labour and the Market: Workers, Wages and Living Standards in Finland, 1850-1913.* Finnish Society of Sciences and Letters Helsinki, **Heikkinen, Sakari; Riitta Hjerppe; Yrjö Kaukiainen; Erkki Markkanen and Ilkka Nummela.** 1987. "Förändringar I Levnadstandarden I Finland 1750 - 1913," G. Karlsson, *Levestandarden I Norden 1750 - 1914.* Reykjavik XX nordiske historikerkongres, 67 - 94, **Heikkinen, Sakari and**

We also attempted to construct a similar measure of beta convergence as before by replacing the logarithm of GDP per capita with the logarithm of real wages w_{it} and the catch-up potential will be to the leading city x_{it}:

$$\Delta w_{it} = \beta_0 + \beta_1 w_{it-1} + \beta_2 x_{it-1} + \mu_{it} \quad \textbf{(6)}$$

In this set-up the "leading" city varies in an attempt to identify convergence clubs. There were at least three potential convergence clubs: 1) *Western Europe*: Using London as the leading city; 2) *Southern Europe*: Using Milano as the leading city; 3) *Eastern Europe*: Krakow or Warsaw are preferred leading cities, but both have gaps in their time-series which limits the time-period of comparison. Leipzig has better data but has more "Western European" traits which limits its relevance. Eventually we chose Krakow as it had the longest series and was more representative than Leipzig. The real wage data included thus Finland, Sweden, Norway, London, Milano, and Krakow. All series were confirmed to be I(1), based on individual ADF tests. We selected the following subperiods, based on data availability: 1) *1605-1796*: The start of the Milano time-series is in 1605 and 1795 is the final year before the "gap" in the Warsaw time-series; 2) *1816-1865*: 1816 is the first year of observations following the "Warsaw gap", and the year 1865 is chosen as the end year as it corresponds to the break in the GDP per capita series we identified earlier; 3) *1866-1913*: Rest of the period, lacking some observations for Finland towards the end of the period.

Table 7. Long-run Real Wage Beta Convergence for Finland

Period	**Specification 1**		**Specification 2**			**Specification 3**			**Specification 4**		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1605-1796	-.12*	0.04	-.03	.11**	0.07	-.23**	-.07*	0.07	-.10	.03	0.05
1816-1865	-.07	0.04	.27	.44	0.15	-.09	-.03	0.04	-.07	.05	0.06
1866-1910	-.02	0.00	.02	.12**	0.15	-.02	.11	0.07	.02	.13**	0.09

Sources: see previous figures and tables.

Kai Hoffman. 1982. "Teollisuus Ja Käsityö." *Suomen taloushistoria 2: Teollistuva Suomi*, 52-88, **Schön, Lennart.** 1997. "Internal and External Factors in Swedish Industrialization." *Scandinavian economic history review*, 45(3), 209-23.

Table 8. Long-run Real Wage Beta Convergence for Sweden

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1605-1796	-.24***	0.12	-.20***	.19**	0.19	-.42**	-.08*	0.16	-.26**	-.008	0.12
1816-1865	-.05	0.03	.23	.33	0.07	.08	.18	0.08	-.03	.06	0.04
1866-1913	-.01	0.00	-.02	-.03	0.00	.01	.22***	0.22	-.01	.00	0.00

Sources: see previous figures and tables.

Table 9. Long-run Real Wage Beta Convergence for Norway

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1751-1796	-.85***	0.41	-.28	.54	0.42	-1.26***	-.37	0.43	-.75***	-.15	0.44
1816-1865	-.07	0.04	.08	.16	0.04	.20	.30**	0.12	-.04	.07	0.05
1866-1913	-.01	0.00	.06	.28	0.02	-.00	.26***	0.21	-.01	-.01	0.00

Sources: see previous figures and tables.

Table 10. Long-run Real Wage Beta Convergence for Nordic Countries

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
I:1605-1796	-.19**	0.08	-.14**	.17**	0.16	-.39**	-.09*	0.14	-.18*	.00	0.08
II:1751-1796	-.18*	0.07	.71***	.94***	0.17	-.66**	-.37*	0.13	-.17*	.08	0.10
I:1816-1865	-.03	0.02	.20	.29	0.09	.00	.05	0.03	-.03	.02	0.03
II:1816-1865	-.04	0.03	.13	.21	0.06	.05	.13	0.08	-.04	.03	0.03
I:1866-1910	.02	0.02	.04	.15	0.04	.01	.16***	0.30	.03	.04	0.04
II:1866-1910	.01	0.01	.02	.02	0.01	.01	.20***	0.39	.01	.00	0.01

Sources: see previous figures and tables. I is without Norway, II is with Norway.

The results are contained in Tables 7-10. For Finland, we see very modest convergence with London and Milano early, but no longer in the 19th century. In case of Sweden, there was also (strong) convergence with the rest of Europe, and some divergence in the latter 19th century with Milan. Norway's case was somewhat similar, again with early convergence, and divergence in the 19th century. The results for the Nordic countries as a whole are again similar, although the inclusion of Norway seems to distort the results somewhat.

We next estimated sigma convergence in the real wages, with the following specification, with CV denoting the coefficient of variation:

$$CV_{it} = \beta_0 + \beta_1 w_{it-1} + \beta_2 x_{it-1} + \mu_{it} \quad \textbf{(7)}$$

Table 11. Long-run Real Wage Sigma Convergence for Finland

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1605-1796	.03***	0.14	.09**	.06	0.16	.04**	.01	0.14	.04***	.01*	0.15
1816-1865	-.06	0.77	-.29**	-.23	0,80	-.17***	-.12***	0.78	-.32***	-.13***	0.86
1866-1910	-.00	0.73	.00	.01	0.71	-.00	-.01	0.74	.00	.00	0.73

Sources: see previous figures and tables.

Table 12. Long-run Real Wage Sigma Convergence for Sweden

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1605-1796	.03**	0.13	.09**	.06	0.15	.04	.01	0.13	.04***	.01*	0.14
1816-1865	-.12***	0.81	-.39***	-.25**	0.85	-.23***	-.14***	0.83	-.25***	-.11***	0.87
1866-1913	-.04**	0.67	-.03	.03	0.67	-.05***	-.04	0.6884	.04 **	.00	0.67

Sources: see previous figures and tables.

Table 12. Long-run Real Wage Sigma Convergence for Norway

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
1751-1796	-.00	0.95	.03	.03	0.95	.04	.04	0.95	.01	.02*	0.94
1816-1865	-.03	0.77	-.32***	-.27**	0.81	-.19***	-.14***	0.80	-.07	-.03	0.78
1866-1913	-.02	0.64	.05*	-.11	0.64	-.04**	-.06	0.68	-.03	-.02	0.65

Sources: see previous figures and tables.

Table 13. Long-run Real Wage Sigma Convergence for the Nordic Countries

Period	Specification 1		Specification 2			Specification 3			Specification 4		
	β_1	$\bar{R}^2$	β_1	London	$\bar{R}^2$	β_1	Milano	$\bar{R}^2$	β_1	Warsaw	$\bar{R}^2$
I:1605-1796	.03**	0.14	.09**	.06	0.15	.04**	.01	0.14	.04**	.01*	0.14
II:1751-1796	.00	0.95	.04	.03	0.95	.07	.06	0.95	.01	.01	0,94
I:1816-1865	-.24***	0.85	-.42***	-.22**	0.87	-.29***	-.14***	0.85	-.29***	-.09***	0.88
II:1816-1865	-.24***	0.85	-.48***	-.26**	0.88	-.36***	-.16***	0.88	-.27***	-.08***	0.87
I:1866-1910	.00	0.73	.01	.07	0.69	.00	-.02	0.72	.00	.00	0.73
II:1866-1910	.00	0.73	.01	.07	0.69	.00	-.03	0.72	.00	.00	0.73

Sources: see previous figures and tables. I is without Norway, II is with Norway.

The results are contained in Tables 11-13. For Finland, sigma convergence was present until the latter part of the 19th century, giving us more clues on the timing of Finland's divergence (until the

20th century, as suggested by the GDP analyses). Sweden was again much more connected to the European economic development patterns, and Norway to a much more limited degree too. For the Nordic countries as a whole, the first half of the 19th century suggested more complex linkages with the world economy and the early globalization. Moreover, we tried a panel data approach to these analyses, and we used multiple structural break tests to arrive at the periods that we used. Furthermore, we ran a Hausman test for each specification and chose whether to use fixed or random effects in our panel specifications.

Table 14. Long-run Pooled Real Wage Beta Convergence for the Nordic Countries

Specification 1: $\Delta w_{it} = \beta_0 + \beta_1 w_{it-1}$

	(1-1)		**(1-2)**	
	Fixed effects		**Random effects**	
	Beta	**R^2**	**Beta**	**R^2**
1605-1655	-.134***	.004		
1656-1724	-0.503***	.251		
1725-1796	-.119	.004		
1816-1865			-0.067***	.038
1865-1913	-.010**	.004		
Country fixed effects	Yes		Yes	

Sources: see previous tables and figures.

All specifications listed in Table 14 had the expected sign, and apart from 1725-1796, were significant. In the alternative models (Table 15), the beta coefficients were similar for the first two periods, but they changed for the final three. These results are in line with the earlier results on the individual country real wage analyses.

Table 15. Long-run Pooled Real Wage Beta Convergence for the Nordic Countries (Alternative Models)

Specification 2: $\Delta w_{it} = \beta_0 + \beta_1 w_{it-1} + \beta_2 x_{it-1}$

	(2-1)					**(2-2)**				
	Fixed effects					**Random effects**				
	Beta	**London**	**Milano**	**Warsaw**	**R^2**	**Beta**	**London**	**Milano**	**Warsaw**	**R^2**
1605-1655	-.168**	.263	-.136	-.014	.187					
1656-1724	-.493***	.493***	-.278***	.024***	.355					
1725-1796						.244***	.458***	-.078	.034	.009
1816-1865						.233***	.197	.145	.035***	.009
1865-1913	.020	.082	.141	.000	.144					
Country fixed effects	Yes					Yes				

Sources: see previous tables and figures.

Next, we will examine the real wages in an international industry, shipping, to see whether the differences between these two economies (Sweden and Finland) and Europe as a whole still hold.

4. Seamen's Wages in the Nordic Countries in the Age of Globalization

Did convergence happen in the 19th century? Previous results here suggest that most of that happened in the 20th century and possibly even prior to the 19th century. Was the 19th century a period of divergence in every sense? Did wages in all occupations diverge from leading European economies? When did convergence start when look beyond the macro-level aggregate data? Here we wish to provide yet another comparative mirror by examining the real wages of Swedish and Finnish sailors from the 18th to the 20th century.

In fact, maritime wages are especially interesting as one could assume a certain amount of convergence in wages across the countries in international shipping. Thus, previous historical studies on maritime wages have analyzed possible wage convergence during the first era of globalization.[31] However, number of studies has shown that this kind of convergence did not exist, which, in turn, shows up for example in desertions of Nordic sailors who were on a quest for better pay in foreign port towns.[32] Indeed, previous studies have shown that the seamen's wages were considerable higher on British, German, and North American ships than on the Nordic ones.[33]

Here we focus on the Seamen's House data that begins in the 1750s and covers the period up to the 1950s, and it includes circa 650,000 hiring cases from Sweden and Finland. The data is compiled from the Swedish National Archives' project "Arkion" that combined a database from nine Swedish and one Finnish Seamen Houses from the period in question. These enrollments of individual sailors offer information such as name, date and place of birth, age, marital status,

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[31] **Fischer, Lewis R. and Helge W. Nordvik.** 1989. "Sail in the Baltic, 1863-1900: The Case of Maritime Wages," *The Baltic as a Trade Road: Timber Trade in the Baltic Area, Competition between Steam and Sails.* Kotka: Provincial Museum of Kymenlaakso, , **Royen, Paul C. van; Jaap R. Bruijn and Jan Lucassen** eds**.** 1997. *"Those Emblems of Hell"? European Sailors and the Maritime Labour Market 1570 - 1870.* St. John's, Newfoundland: International Maritime Economic History Association.

[32] **Fischer, Lewis R.** 1980. "A Dereliction of Duty: The Problem of Desertion on Nineteenth Century Sailing Vessels'," R. Ommer and G. Panting, *Working Men Who Got Wet.* St. Johns': Maritime History Group, , **Fischer, Lewis R. and Helge W. Nordvik.** 1988. "Finländare in Den Kanadensiska Handelsflottan 1863-1913." *Historisk Tidskrift för Finland*, (3), **Kindleberger, Charles.** 1992. *Mariners and Markets*. New York-London: Harwester Wheatsheaf, **Ojala, Jari; Jaakko Pehkonen and Jari Eloranta.** 2013. "Desertions in Nineteenth-Century Shipping: Modelling Quit Behaviour." *European Review of Economic History*, 17(1), 122-40.

[33] **Fischer, Lewis R.** 1980. "A Dereliction of Duty: The Problem of Desertion on Nineteenth Century Sailing Vessels'," R. Ommer and G. Panting, *Working Men Who Got Wet.* St. Johns': Maritime History Group, , **Kaukiainen, Yrjö.** 1997. "Finnish Sailors, 1750-1870," P. C. v. Royen, J. R. Bruijn and J. Lucassen, *"Those Emblems of Hell"? European Sailors and the Maritime Labour Market, 1570 - 1870.* St. Johns', Newfoundland: International Maritime Economic History Association, 211 - 32, **____.** 1991. *Sailing into Twilight. Finnish Shipping in an Age of Transport Revolution, 1860-1914*. Helsinki: Suomen Historiallinen Seura, **North, Michael.** 1997. "German Sailors, 1650 - 1900," P. C. v. Royen, J. R. Bruijn and J. Lucassen, *(Eds.), "Those Emblems of Hell"? European Sailors and the Maritime Labour Market, 1570 - 1870.* St. Johns', Newfoundland: International Maritime Economic History Association, 253 - 66.

salary, occupation on board, date of hire and return, specifications about the ship the man was hired to work on (name, tonnage, type, captain), and the likely destination of the ship and information about the voyage, including possible deaths, sicknesses, and desertions.

Thus, we are also able to analyze possible wage convergence between the Nordic countries and other European countries from this large sample, for a particular sector of the economy. In this case, we have only included data from some of the most important destination towns. The salaries paid to (un)skilled workers at home enables us to analyze in more detail the landward opportunities and possible converging or diverging patterns of wages. The comparable data is derived from existing literature. The seamen's wages were made comparable by deflating all values into silver units (grams) by following the standard procedures in the current literature.[34] Furthermore, real wages were calculated by using applicable consumer and cost of living indices.[35] The monetary units used in Sweden and Finland are especially challenging as in certain periods of time even three to four different currencies were used at the same time, all with different exchange rates.[36]

In order to analyze the convergence (or divergence) of wages paid for landward and maritime occupations, we first compared the Finnish data on unskilled workers with the Finnish seamen's wages derived from the dataset. (Table 5) This late 19th century data includes able-bodied (AB) and ordinary sailors (OS) wage data from one Finnish town in data (Kokkola) and wages of urban unskilled outdoor and manufacturing workers in Finland.[37] The opening of opportunities on

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[34] **Allen, Robert C.** 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History*, 38, 411–47, **Söderberg, Johan.** 2011. "Long-Term Trends in Real Wages of Labourers," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, 453-78.

[35] **Edvinsson, Rodney; Tor Jacobson and Daniel Waldenström** eds**.** 2011. *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008*. Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, **Edvinsson, Rodney and Johan Söderberg.** 2011. "The Evolution of Swedish Consumer Prices, 1290–2008," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, 412-52, **Heikkinen, Sakari; Riitta Hjerppe; Yrjö Kaukiainen; Erkki Markkanen and Ilkka Nummela.** 1987. "Förändringar I Levnadstandarden I Finland 1750 - 1913," G. Karlsson, *Levestandarden I Norden 1750 - 1914.* Reykjavik XX nordiske historikerkongres, 67 - 94.

[36] **Denzel, Markus A.** 2010. *Handbook of World Exchange Rates, 1590–1914*. Surrey: Ashgate, **Edvinsson, Rodney.** 2011a. "The Multiple Currencies of Sweden-Finland 1534–1803," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: veriges Riksbank in cooperation with Ekerlids Förlag, 133-237, **____.** 2011b. "Swedish Monetary Standards in a Historical Perspective," R. Edvinsson, T. Jacobson and D. Waldenström, *Historical Monetary and Financial Statistics for Sweden: Exchange Rates, Prices, and Wages, 1277-2008.* Stockholm: Sveriges Riksbank in cooperation with Ekerlids Förlag, 26-66.

[37] **Heikkinen, Sakari.** 1997b. *Labour and the Market: Workers, Wages and Living Standards in Finland, 1850-1913.* Finnish Society of Sciences and Letters Helsinki.

land in Finland from the late 19th century onwards offered new possibilities for unskilled workers, as well as for sailors. Furthermore, the bulk of these new domestic opportunities opened up for unskilled workers capable of using their "brawn"[38] – thus, for men just like ordinary seamen.[39] The analysis suggests (Table 16) that the landward wages first converged with the maritime wages, and from the turn of the century there was a diverging pattern within the wages. Especially the AB wages outperformed urban wages up to the 1880s. There seems to have been a decline in the AB wages at the turn of the century. As regards to the OS wages, the development was even more dramatic, especially in relation to the manufacturing workers. Here, however, one must note that the OS wages in the case of Kokkola might have been under the mean from the late 1880s onwards, when the deep sea shipping in the town practically ceased to exist.[40]

Table 16. Kokkola AB and OS Wages in Proportion to Finnish Urban Unskilled Outdoor and Manufacturing Workers, 1864–1914

	AB/Urban Unskilled Outdoor	OS/Urban Unskilled Outdoor	AB/Manufacturing Workers	OS/Manufacturing Workers
1860	1.40	0.74	1.51	0.80
1870	1.08	0.57	1.23	0.65
1880	0.88	0.52	0.82	0.48
1890	0.97	0.57	0.82	0.48
1900-09	0.64	0.47	0.63	0.46
1860-1913	0.85	0.52	0.84	0.50

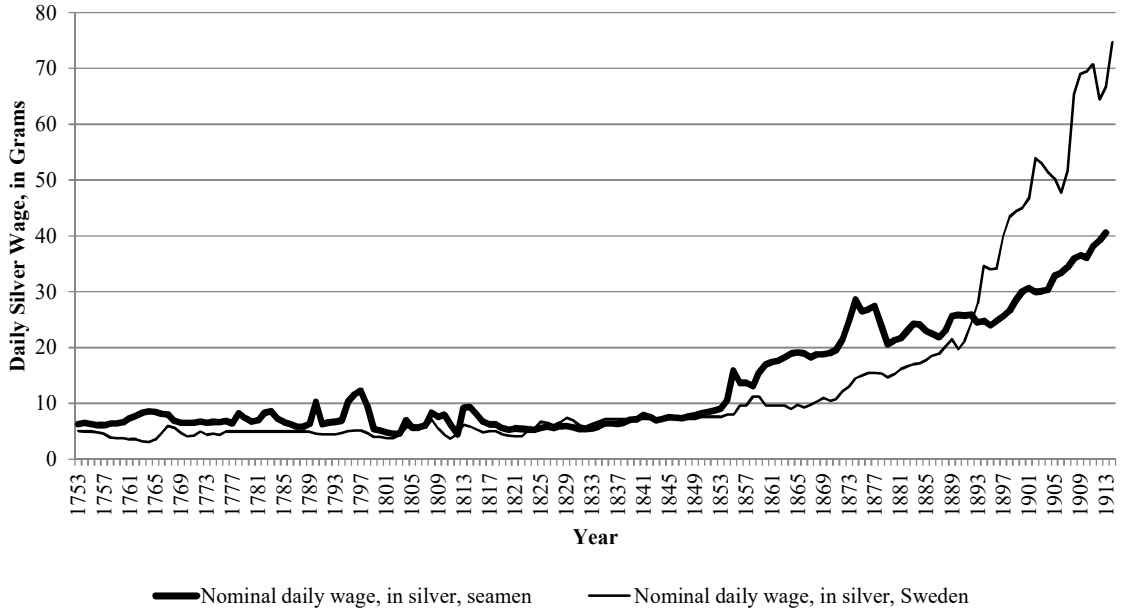
Sources: The data on nominal wages of urban unskilled outdoor and manufacturing workers is derived from (Sakari Heikkinen, 1997a).

[38] From Finns hired to British vessels in late 19th century around 75 per cent were literate, whilst the share of the Swedes was 87 per cent according to the Canadian database.

[39] **Kaukiainen, Yrjö.** 1994a. "Finnish and International Maritime Labour in the Age of Sail: Was There a Market?," L. R. Fischer, *The Market Fo Seamen in the Age of Sail.* St. John's: International Maritime Economic History Association, 101-10, **____.** 1997. "Finnish Sailors, 1750-1870," P. C. v. Royen, J. R. Bruijn and J. Lucassen, *"Those Emblems of Hell"? European Sailors and the Maritime Labour Market, 1570 - 1870.* St. Johns', Newfoundland: International Maritime Economic History Association, 211 - 32, **____.** 1998. "The Maritime Labour Market: Skill and Experience as Factors of Demand and Supply," P. C. v. Royen, L. R. Fischer and D. M. Williams, *Frutta Di Mare. Evolution and Revolution in the Maritime World in the 19th and 20th Centuries.* Amsterdam: Batavian Lion International, 153-59, **____.** 1994b. "Owners and Masters: Management and Managerial Skills in the Finnish Ocean-Going Merchant Fleet, C. 1840-1880." *Research in Maritime History*, 6(1), 49-66.

[40] **Ojala, Jari.** 1996. *Tuhannen Purjelaivan Kaupunki. Kokkolan Purjemerenkulun Historia.* Kokkola: Keskipohjanmaa-säätiö.

Figure 13. Nominal Daily Wages of All Seamen in the Dataset and Daily Wages in Stockholm (in Grams of Silver), 1753–1913



Sources: Arkion database and Söderberg (2011).

Same conclusions can also be drawn when analyzing the larger dataset with five Swedish towns, and comparing this data to the wages of Stockholm laborers. (Figure 13) Wages stagnated in the 18th century, by and large. Seamen's wages were substantially higher, both in Finland and Sweden as the labor market was highly mobile during the expansion period, from 1840s to the 1860s. After that, they seem to have followed a slower pattern of growth, for instance compared to Swedish silver wages as a whole. Thus, the wages paid in Stockholm and the seamen's wages were converging from the mid-18th century up to the late 1840s. Thereafter the wages diverged due to the better maritime wages until the 1870s. From the early 1890s onwards, the nominal daily wages in Stockholm clearly outperformed the wages paid to sailors. This comparison, though, is partly misleading, since the maritime wages of skilled occupations (like mates) are also included in the dataset.

The domestic landward and maritime wage convergence does not explain all the opportunities the sailors had during the period we analyzed. The sailors could be hired for some domestic (un)-skilled work, but also abroad as shipping was, indeed, international business. Though being hired by a foreign ship in a foreign port was restricted by the law up to the late 19th

century, these opportunities were widely used. This can be witnessed in the desertions of Nordic sailors which occurred rather frequently in foreign ports. Besides being enrolled on foreign ships, the sailors also deserted to exploit other landward opportunities: especially in the North American ports, desertions were a way to emigrate.[41]

According to previous studies, seamen's wages were considerably higher in the UK, Germany, the United States, and also in Canada than in the Nordic countries.[42] In the contemporary debate in the mid-nineteenth century it was often argued that Nordic sailors could earn ten times their domestic pay abroad.[43] Our data suggest, though, that this difference was perhaps not as large as claimed. Table 17 shows that in Liverpool and London mean wages were higher than in two port towns in the dataset, namely Gävle from Sweden and Kokkola from Finland. Wages clearly increased in the British port towns, but not as rapidly in Sweden and not at all in Finland. Still, though, there was a clear divergence in the maritime wages paid in the UK and Nordic countries, according to this analysis, during the turn of the 20th century.

Table 17. Mean Wages of Able-bodied (AB) Seamen in London, Liverpool, Kokkola, and Gävle, (Pounds Sterling per Month), 1863–1913

	London	N	Liverpool	N	Kokkola	N	Gävle	N
1860s	2.5	449	2.4	636	2.0	170	2.0	279
1870s	2.8	725	2.9	1397	2.2	305	2.5	2792
1880s	2.8	643	2.9	2186	1.8	324	2.4	2647
1890s	3.4	364	3.3	1025	2.1	251	2.5	1594
1900-1909	4.0	208	3.4	737	1.9	50	2.9	425
1863-1913	3.2	2516	3.1	6148	2.0	1118	2.5	7737

Sources: Arkion sjömanhus –database; Ships and Seafarers of Atlantic Canada – database; Seamen's House Registers of Kokkola at the Vasa Provincial Archives, Finland. See also (Jari Ojala, Jaakko Pehkonen and Jari Eloranta, 2013).

Notes: All wages are in nominal values. Only wages paid on a monthly basis are taken into account in all cases. For London, Liverpool, and New York, moreover, only wages paid in pounds were calculated and obvious outliers deducted (wages over 10 and under one pound per month). Wages for Kokkola and Gävle were included only from 1864 onwards. Only wages paid in markkas (Finland) and kronas (Sweden) were included.

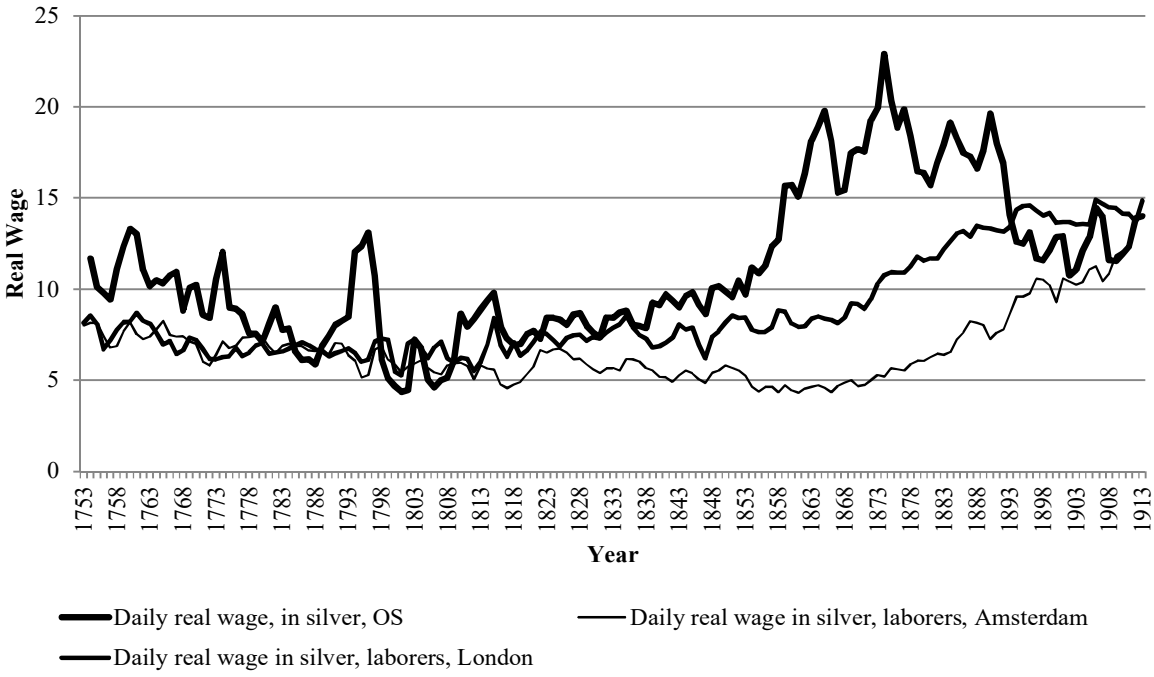
[41] **Fischer, Lewis R.** 1980. "A Dereliction of Duty: The Problem of Desertion on Nineteenth Century Sailing Vessels'," R. Ommer and G. Panting, *Working Men Who Got Wet.* St. Johns': Maritime History Group, , **Kindleberger, Charles.** 1992. *Mariners and Markets*. New York-London: Harwester Wheatsheaf, **Ojala, Jari and Jaakko Pehkonen.** 2006. "Not Only for Money: An Analysis of Seamen Desertion, Finland 1760 - 1914." *International Journal of Maritime History*, 18(1), 25 – 53.

[42] **Fischer, Lewis R.** 1980. "A Dereliction of Duty: The Problem of Desertion on Nineteenth Century Sailing Vessels'," R. Ommer and G. Panting, *Working Men Who Got Wet.* St. Johns': Maritime History Group, , **Kaukiainen, Yrjö.** 1997. "Finnish Sailors, 1750-1870," **P. C. v. Royen, J. R. Bruijn and J. Lucassen**, *"Those Emblems of Hell"? European Sailors and the Maritime Labour Market, 1570 - 1870.* St. Johns', Newfoundland: International Maritime Economic History Association, 211 - 32, **____.** 1991. *Sailing into Twilight. Finnish Shipping in an Age of Transport Revolution, 1860-1914*. Helsinki: Suomen Historiallinen Seura.

[43] **Ojala, Jari and Jaakko Pehkonen.** 2006. "Not Only for Money: An Analysis of Seamen Desertion, Finland 1760 - 1914." *International Journal of Maritime History*, 18(1), 25 – 53.

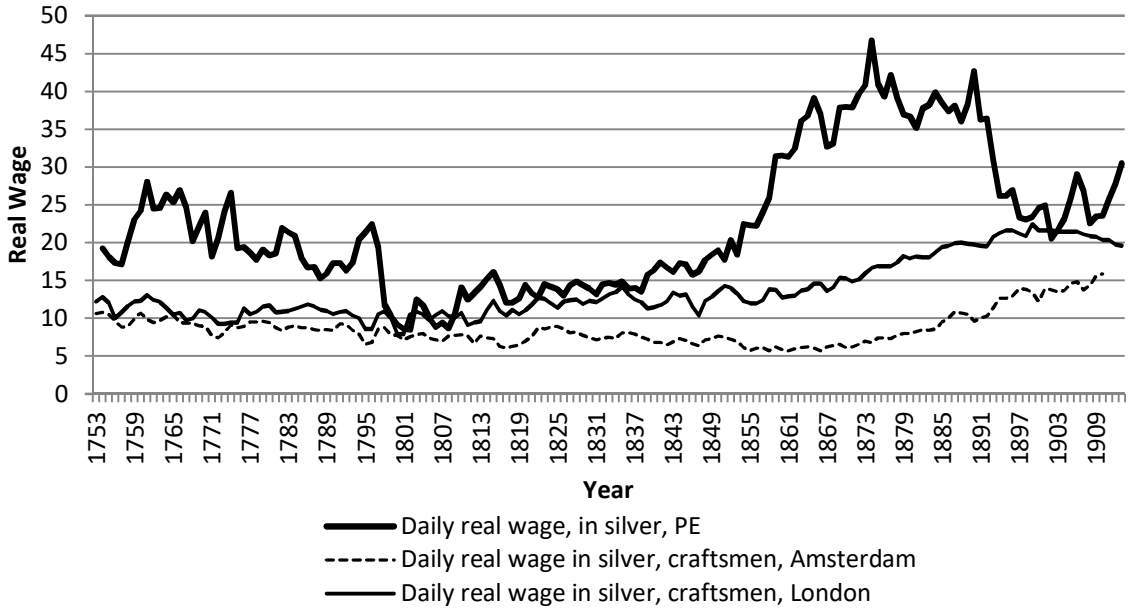
Interestingly, our data suggests that the Nordic ordinary sailors got better pay in real wage values when compared to labourers in major European port towns Amsterdam and London. (Figure 12) Thus, on one hand the Nordic seamen wages were lagging behind the central European economies as suggested in Table 17, but were still competitive to landward opportunities both at home (Figure 13) and abroad (Figure 14) until the end of the 19th century. Swedish ordinary sailors wages converged with the London and Amsterdam wages in the late 18th century – with the exception of few years, presumably caused by the Napoleonic wars. The seamen wages diverged from the late 1820s, and converged, again, from the 1890s onwards.

Figure 14. Daily Real Wages: Swedish/Finnish Ordinary Sailors (OS) and Labourers in London and Amsterdam, 1753-1913



Sources: see previous figures.

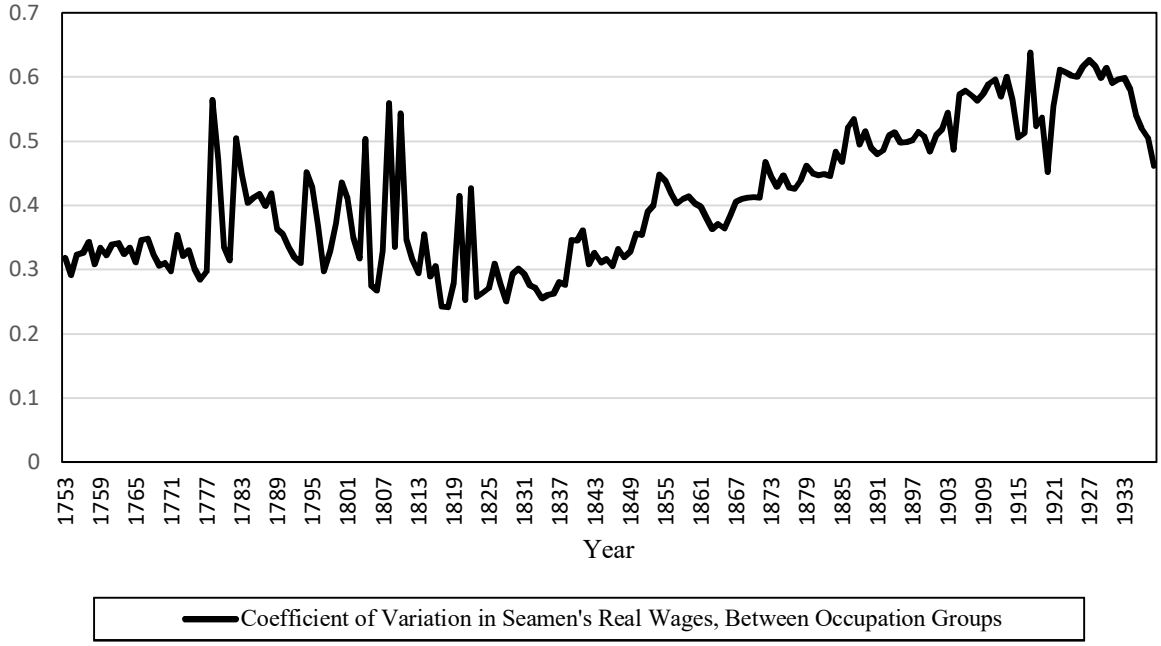
Figure 15. Daily Real Wages: Swedish/Finnish Ordinary Sailors (OS) and Labourers in London and Amsterdam, 1753-1913



Sources: see previous Figures and Tables.

As seen in Figure 15, Swedish and Finnish seamen made, comparatively, a lot of money in the mid-19th century, also in the category of more educated/experienced workers, like craftsmen and ship's supervisors. Those wages dropped, respectively, after the globalization boom in the late 19th century. After that, they converge with the leading European cities, at least temporarily.

Figure 16. Coefficient of Variation for Swedish/Finnish Seamen's Real Wages, 1753-1938



Sources: see previous figures and tables.
Note! Here the seamen were divided into four separate occupational groups to calculate the cv.

This period also featured two distinct phases between the occupational groups on Nordic ships. First, the distribution of the seamen's wages either remained the same or converged until 1830s. (See also Figure 16) After that, there was a strong tendency towards divergence, i.e. the higher occupations benefitted from the globalization boom and the shift towards steam power on ships. Thus, we see skill-biased technological growth in the classical sense during this period. In the interwar period, there is much more volatility, as one would expect. Also, the divergence trend seems to come to an end at this time.[44] These results are preliminary, though, as the conversion to real wages, for example, might have an effect to analysis. All in all, though, we can conclude that it did pay, indeed, to be hired on a Nordic ship – especially during the period from the 1830s up to the 1880s. Moreover, not all Nordic economic sectors diverged from the European economic growth path of the 19th century – in an international sector like shipping the Nordic labor did very well indeed.

[44] **Ojala, Jari; Jaakko Pehkonen and Jari Eloranta.** 2016. "Deskilling and Decline in Skill Premium During the Age of Sail: Swedish and Finnish Seamen, 1751–1913." *Explorations in Economic History*, 61, 85-94.

5. Conclusions and Further Challenges

This paper forms a part of a larger project to study Finnish economy in the long run. Here in this paper we focused on Nordic long-run economic performance and wages by investigating whether convergence (or divergence) emerged over time among the Nordic countries. Moreover, we examined whether they converged toward the economic leaders of the 19th and 20th centuries, namely the UK and USA. Our first comparative mirror was the development of real GDP per capita from the early 19th century to 2010. Our analysis suggests that there was a catch-up process that surfaced among both the Nordic economies themselves and in their relationship with the economic leaders, especially from the early 20th century up until the 1970s.

Our second comparative mirror was the development of Swedish and Finnish real wages from the 16th to 20th century, and the results indicate very similar development between these two countries, with Sweden having higher standards of living, up until 18th century. After that, both countries diverged from the West European "path", and especially Finland seemed to stagnate during the 19th century. Norway's development was similar, with slower growth in the 19th century compared to Sweden. On the whole, the real wages of the Nordic countries also seemed converge with European patterns before the 19th century, but less so after (with some sigma convergence in the first half of the 19th century). Our third comparative mirror pertained to the analysis of a large sample of seamen's wages in Sweden and Finland from the mid-17th century to the First World War. Based on our findings, divergence was not a uniform phenomenon in the 19th century Nordic sphere, since sailors' wages increased substantially during the so-called first era of economic globalization. It is possible that export-led growth path of the Nordic countries already emerged in the late 19th century, although the impact and implementation would not materialize fully until the post-Second World War period.

Obviously our comparative mirrors and this paper are still works in progress. We still need to do more to flesh out the various institutional and other changes that are linked to these processes of change over time. Moreover, we need to refine the convergence analysis performed in the first part of the paper, and look for more data on Denmark and Norway. However, the early findings are interesting, for example from the perspective of the large body of literature on the Great Divergence and Little Divergence. It seems that the Nordic countries did not fit neatly into this pattern. Furthermore, our findings also suggest that we should be careful in generalizing from real

wages for entire countries – sometimes certain sectors (like shipping) could thrive amidst a general trend of divergence from growing economies. The Nordic path towards high equality, thriving schools, and extensive welfare states, while accompanied by relatively rapid economic growth[45] seems to have mostly occurred in the 20th century, although the roots of these processes can surely be traced further back in time. In this paper we have barely scratched the surface on these larger questions.

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