Trade Shocks and Growth: The Impact of the Quartz Crisis in Switzerland

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ABSTRACT. Agglomeration economies and clustering effects are a key driver of urban growth. They can also be a source of vulnerability when cities and regions specialize in export-intensive industries. Foreign competition and technological change can threaten the survival of exporters, and shocks to these industries can have long-run effects on the communities which rely on them. In this paper, I study the impact of a rapid and large-scale trade shock: The quartz crisis, which devastated the globally dominant Swiss watch industry in the 1970s. I document the geographic agglomeration pattern of the industry and the impact of the crisis on exports, employment, and wages. Using a differences-in-differences strategy, I show that this trade shock led to a large and rapid loss of population in affected areas, and a long-run change in growth patterns. I explore the mechanisms behind this population change, including the role of manufacturing employment and immigration. I discuss the implications of these results for theories of urban growth, and contrast them with recent work on the China shock in Europe and the United States.

1. Introduction

Agglomeration economies are widely recognized as a key driver of urban and regional growth. They can also be a source of resilience. Path dependence in the location of economic activity has allowed many regions to survive and grow despite the irrelevance of their initial natural advantages or immense physical devastation stemming from wars or natural disasters. Nonetheless, recent work on the China shock in Europe and the US has highlighted how agglomeration can be a source of vulnerability. When cities and regions specialize in certain industries, their growth can be threatened if those industries are subject to disruptive technological change or increased competition from abroad.

This study examines the consequences of one particular trade shock driven by both foreign competition and technological innovation: The quartz crisis, which led to the dramatic

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decline of the Swiss watch industry. From its roots in 16th century Geneva, this industry had experienced tremendous growth, becoming a major employer concentrated in many cities and towns across the Swiss Jura Arc; with some exceptions, the industry was completely absent in other areas of the country. Refinement of craftsmanship transmitted over hundreds of years eventually led the Swiss to dominate the global mechanical timepiece industry by the mid-20th century. This dominance was challenged in the mid-1970s by a surge in export competition from Japan and Hong Kong and, most enduringly, the invention of low-cost electronic quartz watch movements, which rendered mechanical timepieces functionally obsolete. This crisis affords an opportunity to study how cities and regions adapt to a sudden trade-induced economic dislocation.

I begin by discussing the geographic agglomeration of the watch industry. Using industry histories, employment data, and a nearly-exhaustive inventory of registered watchmakers and trademarks, I map its pattern of spatial concentration across Switzerland at the municipality level. I illustrate how the adverse shocks in the 1970s led to a sharp decline in exports, employment, and relative wage growth in the industry. Using a differences-in-differences approach, I then examine the growth of watchmaking areas compared to other areas of Switzerland before and after the crisis. I find evidence of only a modest growth rate differential before the crisis; during the crisis, municipalities involved in watchmaking experienced a sharp decline in population, followed by decades of stagnant growth.

To explore the mechanisms behind this population change, I exploit microdata from the Swiss Federal Census to document worker flows at the canton level. I show that cantons which were more exposed to the crisis saw a sizable reduction in their labor forces, and that this was largely driven by a decline in manufacturing workers. There is little evidence to suggest a shift towards non-manufacturing employment. Both native and foreign-born workers were affected similarly during the crisis, but the impact on the foreign workforce was larger in later decades, suggesting a long-run shift in immigrant location choices. None of these results are sensitive to a canton’s share of non-watch manufacturing activity, suggesting
that the impacts are industry-specific and not driven by general declines in manufacturing or export competitiveness.

This paper connects to several related strands of research in trade and economic geography. Many studies have examined the impact of trade disruptions on local labor markets; a smaller number have extended this to examine how these labor market changes translate into migration patterns, with differing results. Similar in spirit to this study, Hanlon (2017) analyzes the effect of a transitory shock to the British textile industry due to cotton shortages stemming from the U.S. Civil War. He finds that this trade shock led to a temporary decline in relative growth and a persistent decline in the population level for cities specializing in textile production. The disruption I study reflected a permanent demand shock for the Swiss, which led to a decline in both the population level and growth rate of affected areas.

This study is also closely related to recent work on the China shock. Autor, Dorn and Hanson (2013) found that the sharp rise in imports from China to the U.S. between 1990 and 2007 had a substantial negative impact on employment and wages in regions vulnerable to Chinese competition. However, this shock did not translate into a sizable population decline in affected areas, suggesting that the geographic/sectoral mobility of displaced workers may be quite low. China shock research in other contexts has found similar results, revealing a limited mobility response, likely due to offsetting job gains in other sectors. Greenland, Lopresti and McHenry (2019) extend the work of Autor et al. (2013) to account for pre-existing growth trends and additional years of data, finding that the China shock did result in a negative shift in growth rates in affected areas, but with a considerable lag.

All of this research focuses on broad increases in import competition, which negatively impacts those affected by greater foreign competition, but which also generates benefits through lower prices for consumer and intermediate goods. The results of Feenstra, Ma and

1Analyzing the China shock in Norway, Balsvik, Jensen and Salvanés (2015) find a substantial impact on unemployment and labor force participation, but little mobility response. Donoso, Martín and Minondo (2015) likewise find little mobility response in Spain, as manufacturing workers displaced by import competition from China were generally absorbed into non-manufacturing industries, resulting in little impact on unemployment or labor force participation. Dauth, Findeisen and Suedekum (2014) found that overall job losses in Germany due to Chinese import competition were substantial, but that they were offset by employment gains due to export-oriented industries aimed at China and Eastern Europe.
Xu (2019) highlight the importance of this second factor; they revisit the Autor et al. (2013) results and find that, while some industries did lose a substantial number of jobs to import competition, a sizable share of these losses were offset by job gains in export industries, particularly those directed at countries other than China. In contrast, my study focuses on a very narrow, industry-specific export shock. My results highlight the possibility that trade shocks may have heterogeneous effects depending on their precise nature. Smaller cities and towns that experience a negative competition shock, but benefit little in terms of gains from trade, may see a much larger mobility response than the extant literature has found in response to the China shock. The data available here also allow for an analysis of the impact of trade at the very local level. Most work on the China shock in the U.S. has focused on commuting zones (CZs), which necessarily masks any within-CZ migration effects. My data allows me to measure the impact of trade on individual towns and cities, as well as the impact at the larger cantonal level (closer in size to a typical CZ in the U.S.). The fact that I find much larger responses at the local level suggests that this additional granularity reveals a mobility response that would be missed at a more aggregate level.

This study also contributes to the economic geography literature on urban and regional growth and the long-run impact of population shocks. There are competing theories seeking to explain the spatial distribution of population and economic activity, including those based on locational fundamentals, increasing returns, and random growth. The locational fundamentals perspective suggests that the size and growth of cities and regions is determined by geographic advantages, including natural resources and market access.\(^2\) The increasing returns theory suggests that scale economies and market size can generate self-reinforcing cycles of growth, which would imply that temporary shocks could have persistent effects, and that the distribution of city sizes may have multiple equilibria (Krugman 1991).\(^3\)

\(^2\)Davis and Weinstein (2002) find evidence for this theory in Japan, where intensive bombing during World War II appears to have had little persistent impact on the spatial distribution of population. Miguel and Roland (2011) find similar results in Vietnam, which was subject to the largest bombing campaign in human history.

\(^3\)A number of studies have found support for this, showing that population growth exhibits path dependence even when initial geographic advantages become obsolete. Bleakley and Lin (2012) find that proximity to historic canoe portage sites in the U.S. strongly predicts population density today. Likewise, Redfearn (2009) finds that employment density in Los Angeles exhibited a high degree of stability over the last century.
growth theory suggests that the mean and variance of city growth rates is independent of their size, conditional on being above a certain threshold (Gabaix 1999). This theory would suggest that temporary shocks can have permanent effects. My analysis contributes to this literature by examining a large, rapid, and purely economic shock to an important local industry. Consistent with increasing returns and random growth, my results suggest that shocks like this can have persistent effects on population levels. In contrast with random growth theory, I also find a persistent effect on growth rates.

The paper proceeds as follows. Section 2 reviews the data sources used in the analysis. Section 3 describes the growth and spread of the watch industry in Switzerland and its interactions with global competitors, outlining the economic forces that led to the decline of the industry. Section 4 examines the implications of the crisis for regional growth. Section 5 concludes.

2. Data

The empirical analysis is based on data from numerous sources and can be divided into three broad categories: Locational information for the areas involved in watchmaking, economic data on the scale of the watch industry in Switzerland (and competing countries), and disaggregated, geographically-harmonized population data. I discuss each of these in further detail below.

2.1. Geography of the watch industry. Watchmaking emerged in many cities and towns across the country, and no complete inventory is available at the municipal level. To determine what municipalities were engaged in the production of watches, I consulted a number of historical works on the development of the watch industry in Switzerland, including Jaquet and Chapuis (1970), Landes (1983), Glasmeier (2000), Trueb (2005), Marti (2007), Donzé (2011), and Donzé (2014). From these, most centers of watch production were identified.

Examining the case of Germany, Bosker, Brakman, Garretsen and Schramm (2007, 2008) and Schumann (2014) all find that temporary shocks associated with World War II had persistent effects on the distribution of population, consistent with the existence of multiple equilibria.

4The share of the industrial workforce engaged in watchmaking at the canton level (up to 1965) is available; see panel (H) of appendix figure A4.
Pritchard (1997) has compiled the most complete historical inventory of Swiss watchmakers to date, covering the entire period from 1775 to 1975. To supplement my initial inventory, I digitized the cities and towns recorded for the 5,578 watchmakers for which this information was available. The frequency of appearances here along with supplemental research was used to determine the final list of 89 municipalities substantially engaged in watchmaking prior to the crisis. Figure 1 illustrates the locations of these municipalities.

**Figure 1. Watchmaking Regions of Switzerland**

Darker areas denote municipalities involved in watchmaking.

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2.2. **Exports, exchange rates, and labor market outcomes.** Data on exports of watches from Switzerland is drawn from HSSO (2012d) and table 10 of Landes (1983).\(^5\) The HSSO data covers the period 1960-1986 and is drawn from the Statistisches Jahrbuch der Schweiz, Bde. 1931-1987. Landes’s export data is sourced from a 1980 report by the Chambre Suisse d’Horlogerie, and covers the period from 1926 to 1980. Where they overlap, both series report the same export figures. This data is presented in figure 2. Export data for Japan

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\(^5\)Much of the data utilized here comes from the Historical Statistics of Switzerland (HSSO), which aggregates social and economic data from a large array of historical sources. See Leimgruber (2018) for a history of this project.
comes from table 8.4 of Glasmeier (2000), sourced from the Japanese Ministry of Trade and Industry; it is shown alongside the Swiss data in figure 3. Exchange rates for the Swiss franc and Japanese yen (relative to the US dollar) are drawn from FRED (2020a,b).

Estimates of total employment in the Swiss watch industry are drawn from Bédat (1992), Glasmeier (2000), Donzé (2011), and HSSO (2012a,b,e). The estimates from each source differ in the time span covered; some are drawn from official government statistics while others are based on information from trade groups. Some provide different estimates for the same years, likely due to differences in the extent to which they capture part-time and home workers. Appendix figure A2 plots the raw data from each series, revealing a generally high level of agreement and the same trend of expansion followed by decline. To construct a single estimated time series for employment covering the entire period of interest, 1900 to 2000, I linearly interpolate each series over the range it covers, then average these interpolated series. This estimated series is plotted in figure 4. HSSO (2012e) provides a breakdown of employment across cantons and nine different secondary-sector industries over the period 1895 to 1965. This is used to estimate the share of manufacturing workers employed in watchmaking and other sectors for each canton as of 1965 (appendix figure A4). HSSO (2012f) provides an estimate of the foreign share of the workforce in watchmaking for the 1966 to 1981 period; this is used to compare the change in native and foreign employment during the crisis.

Data on wages in the industrial sector is taken from HSSO (2012c), which reports average nominal wages for all male secondary-sector workers and separate averages for twelve subsectors. This data was sourced from statistical yearbooks and Federal Office of Industry,

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7The subsectors included are chemicals, clothing, construction, electricity, food, graphic arts, metals and machines, paper, stone and earth, textiles, watches and jewelry, and wood. I exclude the clothing and paper industry wage data from the individual-subsector analysis, as the definition of both subsectors was changed substantially in 1974, so it is not clear if the wage series is comparable pre- and post-crisis. However, both are included in the overall average by necessity.
Commerce, and Labor publications. Appendix figure A3 illustrates the evolution of mens’ wages in each subsector relative to the average.

2.3. Population. To track regional growth over time, a geographically-harmonized population time series is needed. Switzerland is subdivided into 26 cantons, each with substantial political autonomy.\textsuperscript{8} Some cantons are further subdivided into districts, and all cantons record the municipality as the smallest official administrative subdivision.\textsuperscript{9} In the year 2000, there were 2,826 municipalities; population characteristics for these can be found in table 1. Mergers of municipalities are very common; divisions occur as well, but they are relatively rare. The Federal Statistical Office of Switzerland has provided a decadal population data series that harmonizes merged municipalities over the entire period from 1880 to 2000; divided municipalities are reported separately, and controls are added to each model to account for population changes due to secessions.\textsuperscript{10} Additional microdata comes from the 5 percent sample of the Swiss population from each decadal census from 1970 to 2000 available through IPUMS (MPC 2019); while this data contains more detail, it only covers the period after 1970 and only reports geographic location at the canton level.

3. Historical context for the quartz crisis

The watch industry in Switzerland initially rose to international prominence in Geneva during the 16\textsuperscript{th} century, later expanding throughout the Jura Mountain Arc. Watchmaking became a major industry in cities like La Chaux-de-Fonds, Le Locle, and Neuchâtel, and the

\textsuperscript{8}Prior to 1979, there were only 25 cantons; the canton of Jura seceded from Bern in 1979, hence its absence from appendix figure A4. In the population time series, municipalities that are part of Jura are recorded as such over the entire time span.

\textsuperscript{9}All areas of Switzerland are part of a municipality; some municipalities are proper cities and towns, others are entirely rural.

\textsuperscript{10}While the boundaries have been largely harmonized in this data series, there are occasional population changes due to land/building exchanges or changes in recorded municipality for individual villages/hamlets. Of the 2,896 municipalities, 193 were identified as possibly subject to boundary changes that may have affected population levels. Most of these changes occurred in the late 19\textsuperscript{th} or early 20\textsuperscript{th} century. Only five affected watchmaking municipalities, including Vevey (1892), La Chaux-de-Fonds (1900), Les Ponts-de-Martel (1910), Biel (1919), Geneva (1982), and Sion (1989,1900). The first four of these boundary changes occurred far before the crisis period I focus on. The last three affected only a handful of individuals. Excluding all 193 municipalities with possible boundary changes yields results that are virtually identical to those presented below.
Table 1. Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Watch-producing municipalities</th>
<th>Other municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average population:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▷ 1900</td>
<td>7,887</td>
<td>936</td>
</tr>
<tr>
<td></td>
<td>(22,276)</td>
<td>(2,666)</td>
</tr>
<tr>
<td>▷ 1970</td>
<td>16,787</td>
<td>1,705</td>
</tr>
<tr>
<td></td>
<td>(52,939)</td>
<td>(5,483)</td>
</tr>
<tr>
<td>▷ 1980</td>
<td>15,141</td>
<td>1,792</td>
</tr>
<tr>
<td></td>
<td>(46,753)</td>
<td>(5,089)</td>
</tr>
<tr>
<td>▷ 2000</td>
<td>15,212</td>
<td>2,114</td>
</tr>
<tr>
<td></td>
<td>(46,327)</td>
<td>(5,064)</td>
</tr>
<tr>
<td><strong>Median population:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▷ 1900</td>
<td>1,423</td>
<td>488</td>
</tr>
<tr>
<td>▷ 1970</td>
<td>1,969</td>
<td>591</td>
</tr>
<tr>
<td>▷ 1980</td>
<td>2,014</td>
<td>636</td>
</tr>
<tr>
<td>▷ 2000</td>
<td>2,417</td>
<td>830</td>
</tr>
<tr>
<td><strong>Share of total Swiss population:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>▷ 1900</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>▷ 1970</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>▷ 1980</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>▷ 2000</td>
<td>19%</td>
<td>81%</td>
</tr>
<tr>
<td><strong>Total number</strong></td>
<td>89</td>
<td>2,807</td>
</tr>
</tbody>
</table>

Standard deviations are reported in parentheses.

surrounding area would come to be known as the “Watch Valley.” This can be seen in the upper left portion of figure 1; most of Switzerland’s watch industry concentrated in this largely French-speaking region of the country. Some outposts in German-speaking areas developed in the 19th century, particularly in Grenchen, Solothurn, and Schaffhausen, while in the south, some watchmaking emerged in the predominantly Italian-speaking canton of Ticino (Landes 1983). The industry grew substantially throughout the 19th and early 20th century. Between 1910 and 1940, the industry experienced instability due to trade disruptions stemming from World War I, the Bolshevik Revolution (which closed off the important Russian market to trade), and the Great Depression (Donzé 2011, Glasmeier 1991). Following World War II, exports began to grow rapidly (figure 2). Post-war demand was high, and Switzerland’s main European rivals had seen their industrial capacity decimated. By the 1950s, the
Swiss had achieved a position of global dominance, accounting for over half of global watch exports (Landes 1983). Swiss exports reached a peak of around 84 million units in 1974.

**Figure 2. Exports of Swiss Watches, 1926-1986**

The spectacular growth in Swiss watch exports over the 1950s and 1960s was matched by an equally spectacular decline beginning in the mid-1970s. This period is often referred to as the quartz crisis.\(^\text{11}\) Two major factors led to this decline. The first was the rise of competition from Japan. Japanese companies, such as Seiko, Citizen, Orient, and Casio, began to hone their ability to mass produce mechanical watch movements that were both high quality and affordable (Glasmeier 2000). Exports from Japan expanded rapidly throughout the 1970s, and finally exceeded those of Switzerland by 1981 (figure 3). By 1985, the Japanese were exporting three times as many watches as the Swiss, whose exports declined by over 50 percent from a peak of 84 million in 1974 to around 30 million in the early 1980s. This represented a major competition shock for the Swiss.\(^\text{12}\)

\(^{11}\)It has also been referred to as the *crise horlogère* (watchmaking crisis).

\(^{12}\)Donzé (2011, 2014) argues that the impact of Japanese competition was magnified by exchange rate dynamics. The 1970s collapse of the Bretton Woods system and ensuing inflation in the United States greatly increased the demand for safe currencies, including the Swiss franc (Baltensperger and Kugler 2017). This flight to safety led to a dramatic appreciation of the franc relative to the US dollar (figure A1). While the Japanese yen also appreciated relative to the dollar, this appreciation was much less severe. As the U.S.
The second and perhaps more enduring factor in this decline was the result of a crucial technology shock: The development of quartz wristwatches. In contrast to purely mechanical timepieces, these kept time using an electronic quartz oscillator, with much greater accuracy than any mechanical watch. In December 1969, Seiko released the *Astron*, the first production quartz wristwatch. Priced at around the cost of a new car, it posed little threat to the existing mechanical industry. However, the technology developed rapidly, and by the end of the 1970s the cost of producing a reliable quartz watch had declined to a small fraction of the cost of a quality mechanical timepiece. This shift towards easy-to-manufacture quartz movements allowed both Japan and (especially) Hong Kong to greatly expand their watch industries. Additionally, a shift towards inexpensive digital LCD-screen watches put Switzerland at a structural disadvantage (Glasmeier 2000). Japan and the United States had developed a substantial electronics industry as a byproduct of World War II; Switzerland, however, lagged in this area as a result of its neutrality. Hong Kong benefited greatly from trade and technology transfer with Japan and the U.S., and they were easily able to account for 36 percent of Swiss watch exports prior to the crisis, this change in relative exchange rates likely accelerated the Japanese takeover of the watch market.

13The first quartz-based wall clocks had been proposed at Bell Labs in the 1920s; however, it took much longer to practically miniaturize the technology (Marrison 1948, Stephens and Dennis 2000).
expand their digital watch industry (Donzé 2011). Employment in Hong Kong’s watch and clock industry rose from around 10,000 in 1970 to almost 50,000 in 1980 (Donzé 2012). By then, Hong Kong was the world’s fastest growing watch producer (Thompson 2017). With the development and mass marketing of quartz watches, Swiss mechanical timepieces were rendered functionally obsolete.

The shocks outlined above had a rapid and sizable impact on the Swiss watch industry. Many firms responded by shrinking employment and output; others closed entirely. In 1970, there were 1,618 enterprises involved in watchmaking in Switzerland, but by 1980 that number had declined by nearly half to 861 (Donzé 2011). Overall employment in watchmaking fell sharply (figure 4). From its 1970 peak of almost 90,000, employment declined to less than 50,000 over the course of the decade; by 1990, employment would reach 32,000. Only five of the twenty-six cantons experienced an absolute decline in employed workers between 1970 and 1980, and three of them (Neuchâtel, Solothurn, and Bern) were centers of watchmaking, with over 20 percent of their secondary-sector workforce engaged in the watch industry prior to the crisis. The canton of Neuchâtel was hit particularly hard. 24 percent of its workers (and almost 60 percent of its secondary-sector workers) were employed in watchmaking prior to the crisis (Garufo 2015). By 1990, only 11 percent of workers remained in the watch trade. Neuchâtel’s total employed population declined by 9 percent between 1970 and 1980, and its employment to population ratio declined by 7 percent.

Nominal wage growth also suffered relative to other industries. Panel (I) of appendix figure A3 shows the growth of nominal hourly wages for men in the watch industry, plotted against an average across all industrial sectors. The wage series are virtually identical until the early 1970s, when a clear divergence begins. Between 1970 and 1983, the average wages across all industries increased by 132 percent; this increase was only 87 percent for the watches and jewelry subsector. The overall price index for the Swiss franc increased approximately 88 percent over this period, suggesting stagnant wages in watchmaking despite growing real wages in other industries. Appendix figure A3 also shows the evolution of wages for nine other
secondary-sector industries. For eight of these industries, there is essentially no divergence from the average for the entire period for which I have data.\footnote{The one exception is the textiles sector, which saw a similar decline. However, the clothing industry contributed relatively little to employment in the major watchmaking cantons, and was virtually absent in Neuchâtel. The share of industrial workers in watchmaking at the canton level was negatively correlated with the share in the clothing sector (appendix table A1).}

4. IMPLICATIONS FOR REGIONAL GROWTH

The results in section 3 suggest a large and rapid economic shock to a highly spatially-concentrated industry. What impact did this have on the growth of the affected cities and regions? Figure 5 documents the average decadal change in log population for municipalities engaged in watchmaking compared to other municipalities between 1888 and 2000. Prior to the crisis, watchmaking municipalities tended to have relatively high growth rates. However, a stark divergence emerged during the period of the crisis in the 1970s. Between 1970 and 1980, watchmaking areas saw population declines of 0.09 log points on average, while non-watchmaking areas grew by 0.05 log points.\footnote{I use the change in log population growth as the main outcome variable, following Autor et al. (2013) and others in this literature. Using raw growth rates provides very similar results.} Overall, watchmaking municipalities lost almost 150,000 residents over this period. The rest of Switzerland saw an increase...
in population of almost 250,000. This was the largest decadal divergence between these two groups over the entire period examined, and a decline without precedent in the previous 100 years. Following that decline, growth in watchmaking areas was anemic amidst strong overall population growth in Switzerland. Appendix figure A5 shows the entire distribution of municipal growth rates for the pre-crisis, crisis, and post-crisis decades, illustrating that these results are not driven by outliers, but reflect a sizable shift in the entire distribution of growth rates for watchmaking municipalities.

**Figure 5. Average Municipal Growth Rates**

![Average Municipal Growth Rates](image)

Average of decadal change in log population across municipalities, computed separately for watchmaking and non-watchmaking areas.

As is clear from figure 1 and table 1, municipalities involved in the watch trade differed systematically from others. Geographically, they were more likely to be located in the mountainous northern and western areas of the country, close to the borders with France and Germany. Culturally, they tended towards French-speaking areas. They were also larger on average, and exhibited greater variance in population size. Differences in size and location could result in differential growth patterns.\(^{16}\) This motivates the use of a standard

\(^{16}\)Leuba (2019) shows that natural amenities strongly influence the spatial distribution of income in Switzerland, providing further evidence on the importance of accounting for local fixed effects.
differences-in-differences approach, where we can compare the relative decadal change in log population \( \Delta \ln(\text{population}_{mt}) = \ln(\text{population}_{mt}) - \ln(\text{population}_{mt-10}) \) between watchmaking and non-watchmaking municipalities, accounting for year and municipality fixed effects. Equation 4.1 presents the general estimating equation.

\[
\Delta \ln(\text{population}_{mt}) = \beta' \gamma_t \times \lambda_m + \gamma_t + \delta_m + \phi \ln(\text{population}_{mt-10}) + \varphi \ln(\text{population}_{mt-10})^2 + \eta' X_{mt} + \epsilon_{mt}
\] (4.1)

This empirical specification includes municipality \((\delta_m)\) and year \((\gamma_t)\) fixed effects, as well as a quadratic for the lagged level of log population; this allows for a systematic relationship between city size and growth. The year fixed effects are interacted with an indicator \(\lambda_m\) for municipalities that were engaged in watchmaking prior to the crisis.\(^{17}\) In the most basic specification, presented in column (1) below, the only other predictors included in \(X_{mt}\) are indicators for municipal secession (where necessary). Additional predictors are added in other regressions. In my preferred specification, nonparametric canton-level time trends are included in \(X_{mt}\) to account for growth fluctuations at the regional level. The estimated \(\beta\)s from this regression, representing the average difference in log population change between watchmaking municipalities and others for each decade, are plotted in figure 6; exact values and standard errors are given in column (3) of table 2.

This analysis shows that, prior to the 1970s crisis, watchmaking municipalities tended to grow at a slightly faster rate, on average about 0.02 log points, once differences in size and

\(^{17}\)Typically, studies of trade-induced disruption use a measure of employment intensity, rather than the indicator approach I use here (see, e.g., Autor et al. (2013)). In that case, the main term of interest would take the form \(\beta' \gamma_t \times \frac{\text{Emp}_{mtw}}{\text{Emp}_{mt}}\), where \(\text{Emp}_{mtw}\) is the number of workers employed in watchmaking in a given year/municipality and \(\text{Emp}_{mt}\) is the total number of workers, so that \(\frac{\text{Emp}_{mtw}}{\text{Emp}_{mt}}\) measures the share of the working population employed in watchmaking. This is not feasible to implement in this setting, as there is no comprehensive record of municipality-level employment in different industrial sectors. Thus, I follow the approach of Hanlon (2017), measuring exposure to the shock using an indicator for pre-crisis involvement in watchmaking. Given the relatively small size of most affected cities (averaging fewer than 20,000 residents in 1970, with a median of 2,000), the presence of watchmaking at scale likely made the sector an important part of the local economy for most of these cities. For the few cities for which data on pre-crisis watchmaking employment exists, the employment shares are quite high. In Saint-Imier and Tramelan, watchmaking employed 22% and 14% of the total population in the early 1970s; across the entire district of Courtelary, home to 18 municipalities (11 engaged in watchmaking), 13% of the total population was employed in this industry (Marti 2007).
Figure 6. Relative 10-Year Average Changes in Log Municipal Population

Graph depicts the coefficients and confidence intervals from column (3) of table 2.

Regional growth trends are accounted for. Watchmaking areas grew somewhat faster at the end of the 19th century and in the 1950s, both of which were boom times for the industry. These areas may have grown moderately more slowly during the 1910-1941 period, possibly due to instability experienced by the industry during this time (discussed in section 3). Though the estimated grow rate differential does vary from year to year, it is significantly different from zero in only two of the eight pre-crisis decades, and positive in both cases.

This changes substantially after the onset of the crisis. Between 1970 and 1980, watchmaking areas grew almost 0.13 log points slower than non-watchmaking areas. This large relative growth disparity persists through the following two decades. Between 1990 and 2000, growth in watchmaking cities was 0.06 log points lower than in others, a relative decline not seen in any decade in the 80 years preceding the crisis. The estimated growth disparities, accounting for year/municipality fixed effects, differences in population size, and variation in regional growth trends, are strikingly similar to those seen in the raw data. The differences in growth rates shown in figure 6 are numerically almost identical to those found in figure
This strongly suggests that the crisis led to a substantial population decline, followed by decades of stagnant growth, and that this is not an artifact of broader regional trends.

Table 2 provides results from several alternative specifications. Results from the most basic analysis, including only year/municipality fixed effects and secession indicators, are shown in column (1). Column (2) add linear canton-specific time trends. Both of these specifications yield results very similar to those of the primary specification with nonparametric trends, shown in column (3). I column (4), I replicate (3) while excluding all municipalities that may have experienced boundary changes; this yields virtually identical results. In column (5), I include canton-level lagged employment shares in eight non-watch industrial sectors, interacted with year fixed effects to allow their impact to vary over time. This should capture growth changes due to changes in the relative performance of different industries. This approach yields even larger estimates for the impact of the crisis. Overall, all of these models show a substantial decline in the population of watchmaking municipalities (in both relative and absolute terms) during the quartz crisis, and the growth disparities persisted for at least two decades. The size of the 1970-80 decline in watchmaking areas was without precedent in the previous 100 years.

The possibility remains that the decline in watchmaking cities and towns was due to other microregional factors, such as proximity to national borders or changes in transportation infrastructure. To test for this, I employ a placebo-type approach using municipalities that were located proximate to watchmaking areas. I use the main specification from column (3) of table 2 and estimate it on two samples. The first sample includes only watchmaking municipalities and municipalities outside of districts containing watchmaking activity. The second sample replaces watchmaking municipalities with non-watchmaking municipalities with non-parametric trends, shown in column (3). I column (4), I replicate (3) while excluding all municipalities that may have experienced boundary changes; this yields virtually identical results. In column (5), I include canton-level lagged employment shares in eight non-watch industrial sectors, interacted with year fixed effects to allow their impact to vary over time. This should capture growth changes due to changes in the relative performance of different industries. This approach yields even larger estimates for the impact of the crisis. Overall, all of these models show a substantial decline in the population of watchmaking municipalities (in both relative and absolute terms) during the quartz crisis, and the growth disparities persisted for at least two decades. The size of the 1970-80 decline in watchmaking areas was without precedent in the previous 100 years.

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18 Both Fretz, Parchet and Robert-Nicoud (2017) and Büchel and Kyburz (2020) have illustrated the importance of infrastructure development for regional growth in Switzerland.  
19 Since historic municipality-level geospatial data is not available, I treat municipalities as proximate if they are located in the same district. Districts tend to be fairly small; currently, the median district land area is 66 square miles, with an average of 104 square miles. This is roughly the land area of Brooklyn and Queens, respectively. While most municipalities are associated with a district, some areas do not have district subdivisions. I group non-districted municipalities together by canton; the largest of these non-districts is in the canton of Neuchâtel, with a land area of approximately 309 square miles (about the size of New York City proper).
Table 2. Relative Changes in Log Municipal Population Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Change in log total population</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>1900 × (\lambda_m)</td>
<td>0.050***</td>
<td>0.055***</td>
<td>0.056***</td>
<td>0.051***</td>
<td>0.0172</td>
<td>0.0168</td>
</tr>
<tr>
<td>1910 × (\lambda_m)</td>
<td>-0.007</td>
<td>0.004</td>
<td>0.026</td>
<td>0.026</td>
<td>0.0212</td>
<td>0.0211</td>
</tr>
<tr>
<td>1920 × (\lambda_m)</td>
<td>-0.020</td>
<td>-0.005</td>
<td>-0.006</td>
<td>-0.005</td>
<td>0.0178</td>
<td>0.0173</td>
</tr>
<tr>
<td>1930 × (\lambda_m)</td>
<td>-0.052***</td>
<td>-0.034**</td>
<td>-0.017</td>
<td>-0.017</td>
<td>0.0137</td>
<td>0.0135</td>
</tr>
<tr>
<td>1941 × (\lambda_m)</td>
<td>-0.061***</td>
<td>-0.042***</td>
<td>-0.028*</td>
<td>-0.031*</td>
<td>0.0150</td>
<td>0.0153</td>
</tr>
<tr>
<td>1950 × (\lambda_m)</td>
<td>0.001</td>
<td>0.022*</td>
<td>0.016</td>
<td>0.015</td>
<td>0.0114</td>
<td>0.0112</td>
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<tr>
<td>1960 × (\lambda_m)</td>
<td>0.070***</td>
<td>0.095***</td>
<td>0.089***</td>
<td>0.088***</td>
<td>0.0201</td>
<td>0.0196</td>
</tr>
<tr>
<td>1970 × (\lambda_m)</td>
<td>0.001</td>
<td>0.031</td>
<td>0.024</td>
<td>0.030</td>
<td>0.0231</td>
<td>0.0230</td>
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<tr>
<td>1980 × (\lambda_m)</td>
<td><strong>-0.158</strong>*</td>
<td><strong>-0.126</strong>*</td>
<td><strong>-0.126</strong>*</td>
<td><strong>-0.121</strong>*</td>
<td><strong>-0.126</strong>*</td>
<td><strong>-0.126</strong>*</td>
</tr>
<tr>
<td>1990 × (\lambda_m)</td>
<td><strong>-0.132</strong>*</td>
<td><strong>-0.102</strong>*</td>
<td><strong>-0.091</strong>*</td>
<td><strong>-0.086</strong>*</td>
<td><strong>-0.102</strong>*</td>
<td><strong>-0.102</strong>*</td>
</tr>
<tr>
<td>2000 × (\lambda_m)</td>
<td><strong>-0.103</strong>*</td>
<td><strong>-0.074</strong>*</td>
<td><strong>-0.061</strong>*</td>
<td><strong>-0.057</strong>*</td>
<td><strong>-0.103</strong>*</td>
<td><strong>-0.074</strong>*</td>
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<td>Year FEs</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Canton-level trends</td>
<td>None</td>
<td>Linear</td>
<td>Nonparametric</td>
<td>Nonparametric</td>
<td>Nonparametric</td>
<td>Nonparametric</td>
</tr>
<tr>
<td>Omit boundary changes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Lagged industry shares</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>34,643</td>
<td>34,643</td>
<td>34,643</td>
<td>32,334</td>
<td>31,770</td>
<td></td>
</tr>
<tr>
<td>Adjusted (R^2)</td>
<td>0.204</td>
<td>0.230</td>
<td>0.277</td>
<td>0.274</td>
<td>0.290</td>
<td></td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Regressions of decadal change in log municipal population on various predictors for the period 1888 to 2000. All regressions include a quadratic of the log municipal population level in the previous decade and indicators for municipal secession (if necessary). All regressions also include year fixed effects interacted with an indicator (\(\lambda_m\)) for involvement in watchmaking; these coefficients are reported in the table. Bold indicates growth rates in the post-crisis period. Column (2) adds canton-specific linear time trends. Column (3) replaces the linear time trends with year-canton fixed effects (these coefficients are plotted in figure 6). Column (4) repeats (3), but excludes any municipality that may have experienced a boundary change. Column (5) repeats (3) with the inclusion of lagged canton-level employment shares in eight non-watch industrial sectors; employment shares are interacted with year fixed effects to allow their impact to vary over time. Standard errors are clustered at the municipality level.
located within a watchmaking district; these act as a placebo group whose growth can then be compared to that of municipalities outside these districts (and uninvolved in watchmaking). The results can be see in figure 7

**Figure 7.** Relative 10-Year Average Changes in Log Municipal Population

Graph depicts the coefficients and confidence intervals from two regressions. The first compares growth in the 89 watch-producing municipalities to that of the 2,174 other municipalities outside of watchmaking districts. The second compares growth in the 633 non-watch-producing municipalities located in watchmaking districts to the same set of municipalities outside of watchmaking districts.

What we see here is that municipalities engaged in watchmaking and those adjacent to them had very similar relative growth patterns prior to 1970. Indeed, the relative growth rates of these two groups of municipalities were, statistically, virtually indistinguishable between 1888 and 1970. This changes considerably after 1970; while the growth rates of adjacent municipalities were, on average, about the same as other non-watchmaking areas, the watchmaking municipalities experienced sharp relative declines. This large gap persists through the end of the sample period. This provides additional support for the hypothesis that the presence of watchmaking specifically was the key driver behind these population losses. It also serves to highlight the extremely localized effect of this economic shock.
To further understand the mechanisms behind this population decline, I exploit the Swiss federal census microdata available through IPUMS (MPC 2019). This 1-in-20 random sample of the population contains information on individual labor force participation, industry of employment, and place of birth. However, it has two important limitations: The data only extends from 1970 to 2000, and the finest unit of geography available is the canton.\(^{20}\) I re-estimate a simpler version of equation (4.1), including only year fixed effects interacted with a measure of watchmaking intensity in 1960 (\(\theta_c\)) and a separate measure of the importance of non-watch industrial production (\(\tilde{\theta}_c\)). This allows me to explore how different segments of the population evolved during and after the crisis, and how the intensity of watchmaking involvement affected these trends (controlling for overall employment in industrial activity). The estimating equation is given in (4.2).

\[
\Delta \ln(p_{\text{pop},ct}) = \alpha + \beta' \gamma_t \times \theta_c + \eta' \gamma_t \times \tilde{\theta}_c + \gamma_t + \epsilon_{ct}
\]  

(4.2)  

I consider a number of outcome variables for \(p_{\text{pop},ct}\), including total population, population in the labor force, manufacturing and non-manufacturing employment, and foreign- and native-born population. The measure of exposure to the quartz crisis is \(\theta_c\), computed as the share of a canton’s population in 1960 that was employed in watchmaking.\(^{21}\) While the share of the employed population would be a more accurate measure, the lack of 1960 data from IPUMS precludes this calculation. For ease of interpretation, I normalize \(\theta_c\) to range from zero to one, with zero representing a canton with no watchmaking industry, and one representing the canton with the highest share of the population engaged in watchmaking. To mitigate the concern that these results may be driven by export sensitivity in general, rather than the watch industry in particular, I include additional interactions between the year fixed effects and \(\tilde{\theta}_c\), which measures the share of a canton’s 1960 population employed

\(^{20}\)Two cantons, Appenzell Innerrhoden and Appenzell Ausserrhoden, are combined in the IPUMS data.  
\(^{21}\)While the consistent-boundary census microdata records individuals living in the area of the canton of Jura in 1970, this canton was still part of Bern until 1979, so I am unable to compute the share of its population involved in watchmaking. I assign Jura the share computed for Bern before it seceded; while this is likely an underestimate, I am aware of no other data on which to base this calculation. Results are not sensitive to excluding Jura entirely.
in the industrial sector excluding watchmaking. Bergier (1984) notes that during this time period, the industrial sector accounted for approximately 90 percent of Swiss exports, so this measure should effectively capture the extent to which cantons were exposed to non-watch-related export shocks. Like \( \theta_c \), this measure is normalized to lie within the unit interval. The correlation between \( \theta_c \) and \( \tilde{\theta}_c \) is quite low at 0.05, suggesting that the watch industry was not concentrated in areas that would be relatively sensitive to export shocks for other reasons. Nonetheless, I include the \( \tilde{\theta}_c \) interactions in all models; the results are not sensitive to excluding them.

Table 3 shows the results of this analysis, and figure 8 presents the \( \theta_c \) interaction coefficients graphically. Using the IPUMS data supplemented with 1960 canton population counts from the municipality series, the regression in column (1) shows no difference in overall population growth between more or less exposed cantons over the 1960-1970 period. Between 1970 and 1980, overall Swiss growth was low, but substantially lower for watch-intensive cantons. This persists until 1990, after which the growth differential shrinks to zero. Column (2) shows a substantial relative decline in the employed population in watchmaking areas after 1970; like the overall population decline, this persists up to the 1990s. Turning to column (3), it becomes clear that this relative employment decline is being driven by a sharp fall in manufacturing employment. While manufacturing employment was declining throughout the country after 1970, as it did in many highly developed countries, it fell much faster in watch-intensive cantons. This is not the case for non-manufacturing employment, which continued to grow across cantons after 1970. Areas specializing in non-watch industrial activity also see a decline in manufacturing employment, but this does not become significant until the 1980s.

Switzerland has historically maintained a policy of openness towards immigrant workers, facilitating both cross-border commuters and an unusually large immigrant population. In the early 1970s, immigrants accounted for approximately 17 percent of the Swiss population. This changed in the mid-70s when the country entered a recessionary environment; restrictions on temporary workers were increased as the Swiss government tried to use the size of the
### Table 3. Changes in Log Cantonal Population Growth

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in log total:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>0.085**</td>
<td>(0.0393)</td>
<td></td>
<td></td>
<td>-0.033</td>
<td>0.084**</td>
</tr>
<tr>
<td></td>
<td>0.075**</td>
<td>(0.0401)</td>
<td>-0.026</td>
<td>0.123***</td>
<td>-0.033</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.096***</td>
<td>0.199***</td>
<td>0.070</td>
<td>0.206***</td>
<td>0.558***</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>0.107***</td>
<td>0.140***</td>
<td>-0.037</td>
<td>0.167***</td>
<td>0.170***</td>
<td>0.068*</td>
</tr>
<tr>
<td>1970 × θc</td>
<td>0.026</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.087***</td>
<td>-0.162***</td>
<td>-0.207***</td>
<td>-0.069</td>
<td>-0.100*</td>
<td>-0.076**</td>
</tr>
<tr>
<td></td>
<td>-0.096***</td>
<td>-0.087*</td>
<td>-0.235***</td>
<td>0.037</td>
<td>-0.185**</td>
<td>-0.100***</td>
</tr>
<tr>
<td></td>
<td>-0.008</td>
<td>-0.051</td>
<td>0.003</td>
<td>-0.047</td>
<td>-0.120**</td>
<td>0.014</td>
</tr>
<tr>
<td>1970 × ˜θc</td>
<td>0.059</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.075</td>
<td>-0.057</td>
<td>-0.135</td>
<td>0.093</td>
<td>-0.042</td>
<td>-0.070</td>
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<tr>
<td></td>
<td>-0.022</td>
<td>-0.064</td>
<td>-0.268***</td>
<td>0.117</td>
<td>-0.477***</td>
<td>0.022</td>
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<td></td>
<td>-0.087</td>
<td>-0.099</td>
<td>-0.322**</td>
<td>0.017</td>
<td>-0.055</td>
<td>-0.113</td>
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<tr>
<td>1970 × ˜θc</td>
<td>(0.0584)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1980 × θc</td>
<td>(0.0547)</td>
<td>(0.0709)</td>
<td>(0.1073)</td>
<td>(0.0776)</td>
<td>(0.1028)</td>
<td>(0.0598)</td>
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<tr>
<td>1980 × ˜θc</td>
<td>(0.0608)</td>
<td>(0.0885)</td>
<td>(0.0903)</td>
<td>(0.0979)</td>
<td>(0.1669)</td>
<td>(0.0569)</td>
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<tr>
<td>2000 × ˜θc</td>
<td>(0.0588)</td>
<td>(0.0720)</td>
<td>(0.1485)</td>
<td>(0.0652)</td>
<td>(0.0660)</td>
<td>(0.0736)</td>
</tr>
<tr>
<td>Observations</td>
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<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.549</td>
<td>0.661</td>
<td>0.532</td>
<td>0.864</td>
<td>0.743</td>
<td>0.145</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Regressions of decadal change in log (sub)population on year fixed effects interacted with a measure of watchmaking employment (θ_c) and industrial employment excluding watchmaking (˜θ_c) as a share of total population in 1960. Both measures are scaled to lie in the unit interval, with zero representing no employment in that sector and one representing the highest share of employment in that sector observed across cantons. The data used in column (1) spans the period 1960-2000; in all other columns, the data begins in 1970. Outcome in column (1) is the change in log total population at the canton level; in column (2), I restrict to the population in the labor force; in columns (3) and (4), the populations are workers employed in manufacturing and workers employed in non-manufacturing industries, respectively; in columns (5) and (6), the populations are workers who are foreign-born and native-born, respectively. Standard errors are clustered at the canton level.

Immigrant population to regulate the unemployment rate of native workers (Baltensperger and Kugler 2017, Kuhn 1978). It is also likely that some immigrants left the country voluntarily for economic opportunities elsewhere. Between 1970 and 1980, the foreign-born
population declined by 0.05 log points on average across cantons unexposed to the quartz crisis; this decline was larger for more exposed cantons. The foreign-born population began to grow again after the recession, but at a much lower rate in watch-intensive cantons. This relative decline in the foreign-born population explains some, but not all, of the total population decline in the watchmaking areas. In column (6), it is clear that this disparity was also large for native workers during the recession. The relative decline in the growth rate of the native-born population extends until 1990 and disappears thereafter, while the relative decline for foreign-born workers continues up to 2000. This suggests that the decline in population experienced by watchmaking areas was not driven entirely by immigration patterns. From the HSSO (2012f) data on the foreign share of the watchmaking workforce, we can see that the decline in foreign workers was not disproportionate; between 1974 and 1981, the foreign share fell from 33 percent to 29 percent. This was very similar to the decline in the share for industry overall, which fell from 38 percent to 34 percent. Taken together, these results suggest that the impact of the crisis was fairly uniform across native and foreign workers.
5. Conclusion

This study has examined the impact of a large trade shock to an important, geographically-concentrated local industry. After rising to a position of global dominance in the mid-20th century, the Swiss watch industry rapidly contracted during the quartz crisis of the 1970s. Due to historical factors dating back centuries, this industry had developed and agglomerated in a relatively small number of cities and towns, and was an important part of these local economies. Using a long panel of municipality-level population records, I show that these cities and towns tended to have modestly larger growth rates in the decades prior to the crisis. During the crisis, these places experienced a rapid loss of population. In the decades following, their growth was anemic despite overall high growth rates in Switzerland. These local population declines were large enough to affect the balance of population across Swiss cantons, an effect that is independent of general changes in the competitiveness of the Swiss manufacturing sector.

These results contrast which much of the work on the China shock in the U.S. and Europe. Studies of the impact of rising trade with China have found that it resulted in substantial employment dislocations in Germany (Dauth et al. 2014), Norway (Balsvik et al. 2015), Spain (Donoso et al. 2015), and the U.S. (Autor et al. 2013), however, none of these studies found a sizable mobility response. A recent reanalysis of the China shock in the U.S. by Greenland et al. (2019) did find that growth patterns shifted towards less import-exposed areas, but that this was not associated with a sizable absolute population loss. The very different results I find here could be explained by several factors. Most China shock research has focused on larger units of geography encompassing entire labor market areas. This would tend to mask any within-labor market migration patterns that would appear with the much more localized population data I use. However, I also find population losses at the larger canton level, suggesting that this may not explain all of the difference between my results and others.

Another important possibility is raised by the results of Dauth et al. (2014) and Feenstra et al. (2019). Both of these studies document job losses due to Chinese competition; however,
they find that these losses are generally offset by job gains in export-oriented industries. Different types of trade shocks may have asymmetric effects. Import competition due to a wider liberalization of trade may be accompanied by increased export competitiveness, especially if the costs of intermediate inputs decline. It may also result in lower consumer goods prices, partially offsetting the welfare impacts of trade competition. This differs substantially from the trade shock I study, which affected a single industry that was almost entirely export oriented, so there were little accompanying gains from trade. Unlike the China shock, this was essentially a crisis without opportunity for Switzerland. This is much closer in spirit to the British cotton shock studied by Hanlon (2017); however, unlike that shock, this one was effectively permanent. Given the relatively high labor costs in Switzerland, and their technological disadvantage in the production of liquid crystal displays (commonly used in quartz watches), the Swiss stood to gain relatively little from embracing the low-margin quartz market. Instead, they were forced to pivot towards the much smaller luxury market. While the industry still remains a high-value one for Switzerland, it nonetheless employs substantially fewer people than it did at its peak in 1974. This explains the persistent effects of the crisis.

What do these results mean for theories of urban growth? Whatever locational advantages the major watchmaking cities and towns have, it has clearly not led their growth to return to trend. Switzerland’s population increased by over 38 percent between 1970 and 2018; despite this, most of the major centers of watch production (Biel/Bienne, La Chaux-de-Fonds, Le Sentier, Le Locle, Neuchâtel) are smaller today than they were in 1970. This is more in line with the expectations generated by models based on increasing returns. Population shocks may have persistent level effects, and removing a major source of agglomeration economies can lead to a permanent reduction in growth rates.
References


HSSO (2012a). Historical Statistics of Switzerland Table F.0. hsso.ch/2012/f/0.


6. Appendix

**Figure A1. CHF/USD and JPY/USD Exchange Rates**

![CHF/USD and JPY/USD Exchange Rates](image)

**Figure A2. Employment in Watchmaking, 1900-2000**

![Employment in Watchmaking, 1900-2000](image)

Data from multiple sources; see section 2.2.
Figure A3. Nominal Hourly Wages for Men across Industries, 1926-1983

Data from HSSO (2012c).
Figure A4. Distribution of Industrial Employment across Cantons, 1965

(A) Chemicals.  (B) Clothing.  (C) Food, beverages, tobacco.

(D) Machines and instruments.  (E) Metals.  (F) Printing.

(G) Stone and earth.  Watches and jewelry.  (H) Wood.

Data from HSSO (2012e).

Figure A5. Distribution of Municipal Growth Rates

Table A1. Cross-correlation table

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<th>% Watches</th>
<th>% Chem.</th>
<th>% Cloth</th>
<th>% Food</th>
<th>% Mach.</th>
<th>% Metals</th>
<th>% Print</th>
<th>% Stone</th>
<th>% Wood</th>
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