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Can Kings Create Towns that Thrive?
The long-run implications of new town foundations*

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Abstract

Town foundations have been at the core of urban planning since the onset of civilization. This paper describes the long-run impact of an urbanization place-based policy that was considered a failure by contemporary policy-makers. We test the impact of founded towns using a series of town foundations that took place between 1570 and 1810, when the Swedish Crown conferred monopoly market rights to trade upon 31 previously rural ordinary parishes. We show that towns were founded in locations with little natural potential, evident in their limited impact on agricultural surplus in the surrounding hinterlands. However, the new foundations drove extensive growth in terms of population and created positive spillover effects up to 40-50 km around the settlements. Still, the founded towns remained extraordinarily small by the end of the policy period. It was not until the Industrial Revolution that these towns began to thrive. We suggest that trading rights and sunk investments initially served to coordinate expectations about future growth. Once the towns started to grow, agglomeration effects generated persistence in the long term.

Keywords: Economic geography, economic history, path dependency, urbanization, agricultural surplus.

1 Introduction

The dawn of a new dynasty often involves the creation of settlements. From Memphis —allegedly founded by King Menes who united Egypt (c.3100 BC)— to the almost 20 towns founded by Alexander the Great (356—323 BC), powerful rulers have sought immortality by creating urban centers that live on. Although current rulers may have more modest ambitions, recent years have seen a growing interest in the concept of new town foundations. Most prominently, China has launched a large urbanization drive which has entailed turning some hundred million farmers into registered metropolitan residents, partly by creating new urban areas. When reports about these towns hit the Western media many articles denigrated these settlements as ghost towns, as little more than a collection of buildings lacking a population. However, some observers have noted that these new areas are only just beginning to take off [Shepard, 2015]. Only time will tell whether these towns can become vibrant urban centers in the future.

This paper addresses this issue by adopting a long-term perspective, as we consider a series of town foundations that took place in Sweden between 1570 and 1810. Interestingly, the towns were founded in locations that were, in most cases, sub-optimal for population growth and limited by organic constraints. We demonstrate how early modern urbanization was dependent on the production capacity of the local

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hinterland by estimating the local rural response to a changing distance to town in a difference in differences model with panel data. Our findings support the existence of extensive growth (population and gross production of grain), but do not show any signs of intensive growth (gross production per capita and agricultural yields). To further adjust for the fact that only second-rate land was available to create new towns, we match agricultural parishes based on distance to medieval towns, to the coast, to the contemporary capital of Finland (Turku), and on soil quality by parish. The results highlight the importance of first nature advantages, such as local agricultural surplus, in explaining pre-industrial urbanization, in line with the classical argument suggested by Childe [1935] and, more recently, Wrigley [2016] and Henderson et al. [2017].

Since the towns were founded in places that could not sustain larger urban populations, the urbanization policy was deemed a failure by the Crown and other contemporary observers.[1] The founded towns were small and could hardly function as local knowledge hubs or generate any economies of scale by the end of the policy period (around 1864). It was only after the monopoly trade rights in towns had been removed and the Industrial Revolution had improved transportation technology that the founded towns were able to overcome their organic constraints. Thus, we may observe how the founded towns took-off in terms of population over the course of the 19th century. Moreover, since many of the founded towns are functioning urban centers today, we find these effects to be persistent. In order to identify the mechanisms behind the persistence of urbanization, we select a counterfactual sample of rural-parishes, similar in terms of observables to the parishes that were granted market rights by the Kings.

The second part of the paper demonstrates that, although the founded towns were marginally larger than any comparable rural parishes by 1810, population size and pre-industrial agglomeration effects were not decisive factors driving long-term growth. We propose to investigate alternative channels of long-run persistence pertaining to population compositions and sunk investments in infrastructure. Our results indicate that the founded towns were overly endowed with infrastructure by 1810. However, this over-endowment does not fully explain population size by 1900. Instead, the founded towns appear to have grown due to the combined effect of past infrastructure and past population combined with some residual effect. By 2000, the population gap in former founded towns can be explained almost entirely by the combined effects of population size in 1900. Our results underline that the town foundation policy, initially over-endowing towns with trade privileges and infrastructure, drove people to certain locations. After a century of industrialization and growth, these towns became thriving hubs that were large enough to sustain long-run growth. Today, these settlements enjoy agglomeration advantages that explain their relative success compared to their counterfactual rural parishes.

These findings contribute to the literature on urban growth in several ways. First, we engage with the literature on the long-run impact of place-based policies (Kline and Moretti [2013], Jedwab et al. [2015], Jedwab and Moradi [2016]). However, in contrast to the previous literature that focuses on the impact of local infrastructure investments on urbanization, our focus is on urbanization as a policy *per se*.

[1] Naturally, the policy might still have succeeded in terms of generating tax revenues for the Crown. Unfortunately, the documents from the domestic tax that were collected in market towns (*Lilla tullen*) have not survived for us to investigate this part of the policy.

As such, our study digs deeper into the economic foundations of urbanization and considers these factors in light of the variance of natural and agglomeration advantages during different economic phases.

Second, we contribute to the literature on the mechanisms contributing to the long-run persistence of urban growth patterns. While previous papers have demonstrated persistence *even after* initial advantages have become obsolete (Bleakley and Lin [2012]; Jedwab and Moradi [2016]; Jedwab et al. [2015]), we demonstrate the persistence of town foundations *only after* their initial advantage (mercantile trading rights) disappeared. As a matter of fact, the founded towns persisted even when lacking both natural geography and agglomeration advantages initially. By investigating potential mechanisms that may explain their persistence, we show that their gained trading rights and sunk investments served to coordinate expectations about future growth. Such expectations helped to attract population and drove agglomeration economies in the long run. Thus, we emphasize the coordination of population as an additional channel to the persistence of agglomeration effects. This result echoes the importance of understanding the emergence of multiple spatial equilibria in initially non-urbanized countries. While previous studies have demonstrated the effects for colonial Africa (Jedwab and Moradi [2016] and Jedwab et al. [2015]), our study adds a case of long-term urban persistence in a northern European context of initial stagnation that was eventually replaced by more than a century of modern economic growth.

Third, our paper relates to the literature on the causes and effects of urbanization. Classical pieces like Bairoch et al. [1991] and De Vries [2006] have provided substantial research on medieval towns and their organic growth patterns and have documented some cases of town foundations across Europe. A related debate about urbanization as an engine of agricultural development started with the early work of the archaeologist Gordon Childe [1935]. Childe coined the term "neolithic revolution" and stressed that agricultural surplus was a pre-requisite for urban growth. More recently Tony Wrigley [2016] and Henderson et al. [2017] have stressed the importance of agricultural surplus in explaining pre-industrial urbanization. Our paper demonstrates the binding agricultural constrains of the founded towns during the pre-industrial period. Thus, we argue that urbanization cannot be the sole driver of agricultural surplus, as suggested by Jane Jacobs [1973] among others.

We are not the first to look at the Swedish founded towns as a case of mercantilist urban planning. Just over half a century ago, Eli Hecksher described these towns as a failure, stating that *"privileges of township were conferred upon a great number of communities which were without any potentialities for urban economic development"* (Heckscher [1963, p.50]). However, while Hecksher only emphasized the shortcomings of these founded towns, we demonstrate the mechanisms behind their short-run failure as well as their long-run success.

The paper is organized as follows. Section 2 presents the conceptual framework of urbanization and long-term persistence. We explain how the data can be used as a historical natural experiment in Section 3. Section 4 describes the data used in the short-run analysis, while Section 5 presents the short-run results of the towns and describes the potential causality mechanisms. Section 6 deals with the long-term persistence channels. Finally, Section 7 concludes.

2 Drivers of urban growth

"*The great commerce of every civilized society is that carried on between the inhabitants of the town and those of the country. – The country supplies the town with the means of subsistence, and the materials of manufacture. The town repays this supply by sending back a part of the manufactured produce to the inhabitants of the country.*" Adam Smith in *Inquiry into the nature and causes of the wealth of nations*, p. 401, cited in Wrigley [2016].

A fundamental insight from the dawn of modern economics is that specialization drives economic (Smithian) growth. A model describing specialization as the driver of urban growth was pioneered by Wrigley [1985]. Building on the observation that rising real incomes will induce a faster growth in the demand for non-agricultural products than for agricultural products, specialization results in non-agricultural workers relocating to towns that depend on the agricultural surplus from the surrounding hinterland to meet their needs. As the towns grow, they begin to function as hubs for trade and concentrate sources of demand and supply, potentially stimulating the growth of agricultural output. In a closed market, both the level and rate of change of urban population depends on the size of the agricultural surplus available to the urban sector. Ultimately this translates into a land constraint.[2]

Based on the alleged dynamic effects of the urban sector, the question of whether a policy to stimulate urbanization could generate long-term effects arises. Theoretically, the answer depends on the elasticity of agricultural surplus, on the transportation costs of conveying agricultural goods to towns, and on the taxes or customs that might be imposed on the urban-rural trade. For pre-industrial economies, it is clear that both the agricultural sector and the nature of transportation will present substantial obstacles to urban growth.

To understand the constraints imposed by agriculture, we distinguish between the parishes' response to a change in their distance to the closest town in terms of extensive and intensive growth. Although a parish may increase its agricultural production per acre by clearing land, such increase might not be enough to stimulate urban growth. For as long as land productivity is achieved at the expense of decreasing output per capita, agriculture will only drive growth in population and gross production. In order to stimulate urbanization, the agricultural sector must generate a surplus (increasing gross production per capita) that can be traded in the market (see for example Wrigley [2016]). Scholars have attempted to estimate the maximum proportion of the urban population before industrialization by carefully considering the constraints imposed by the agricultural sector. Bairoch et al. [1991, p. 149] concluded that given the average yield of wheat in continental Europe around 1800, urbanization should amount to around 13-15 percent of the total population. Based on Bairoch's assumption and adding the mass of fuel needed to heat towns in colder climates, Van de Woude et al. [1990] estimated that a town with 10,000 inhabitants would need an average of 10 horse-drawn carts full of grain and 30-50 carts of firewood daily to

[2]Tony Wrigley [1985] used this insight to estimate agricultural and industrial productivity over time between England and the Continents in pre-industrial times. More recently, he added that land was not only needed for cultivating necessary crops, but also for growing trees to be used as firewood for cooking and heating (Wrigley [1985]). Before coal could replace firewood for energy purposes, the land constrain was especially binding in the colder climates of North-western Europe. Allen [2000] used a similar approach to estimate employment structure in Europe 1300-1800 and agricultural output based on estimates of urban and rural populations.

subsist. The forest reserves this would require would amount to some 50-80 square kilometers (Van de Woude et al. [1990, p.8-9]).

The latter argument stresses that climatic circumstances influence differences in organic constraints.[3] As such, we can say the Swedish economy is remarkably less fortunate than others in terms of soil quality on average. Although there are some areas of Sweden that are as good as the best places in other European countries, for the most part of Sweden's soil can produce less cereal output than any of the other countries or none at all. Note as well that the amount of energy required in terms of firewood in 1800 is remarkably higher than anywhere else. The constraints of organic growth in terms of energy were an obstacle to potential urbanization before the advent of coal, especially in a cold and poorly endowed country like Sweden.

In addition to agriculture, the pre-industrial transportation technology also imposed constraints on urban growth. Before the advent of steam shipping and railway technology transportation was limited to the capacity of man, draught animals or to simpler sailing or rowing boats. For Sweden, it has been shown that roads completely dominated all domestic transportation up to 1810 (Thorburn [2000, p50]). While a man could transport 35-40 kilograms of freight for 30-35 kilometers per day, a horse could carry about three times the weight over a similar distance per day (Bairoch et al. [1988, p.11-12]). Introducing a cart drawn by pack animals could increase the weight of the load but would do little to speed up the travel time. Horses pulling a wheeled vehicle could travel some 40-50 kilometers per day, which resulted in a relatively small scope for a day's transportation, if we assume that farmers going to the market wished to travel and return to their home within a day. A potential threshold distance for farmers going to the market has previously been confirmed at 50-60 kilometers for 18th century farmers in Southern Sweden (Bergenfeldt [2014]). Even though waterways were sometimes used for moving bulkier goods, sailing vessels were generally slower than horses, so shipping was mostly used for long-distance trade. The speed of a rowing boat was similar to a horse-drawn cart, suggesting that the market potential for a pre-industrial farmer was not significantly larger using water transportation compared to travelling by roads.[4]

The organic constraints of a pre-industrial economy suggest that town location should be strongly determined by natural endowment conditions. Unless urbanization could generate dynamic effects on agricultural surplus by providing market incentives for farmers, we expect the optimal locations for urban growth to be occupied by organic growing towns. Section 3 demonstrates exactly this point by showing that the parishes that received market rights from the Kings were second-rate.

[3] Appendix A shows organic constraints to urban growth in Table 5.

[4] Von Thünen's (1826) classical rings of specialization describe this "tyranny of distance" well. The basic idea is that land around the towns specialize according to transportation costs and demand. Products with low transportation costs like cereals can be produced intensively far from population clusters, while products with high transportation costs and less durable (like fruits and greens) need to be produced closer to towns, where population is specialized in trade and other non-agricultural tasks. Given that foods and fuels are necessities to the urban population, the model indirectly suggests a limit to the growth of towns since their cost increase rapidly with distance. However, it has previously been shown for 19th century Prussia that growing markets resulted in enlarged rings of specialization in agriculture (Kopsidis and Wolf [2012]).

2.1 Mechanisms of persistence

The specialization model implies that urbanization is dependent on local agricultural surplus, especially when transportation costs are high. Thus, early pre-industrial towns are more likely to emerge when natural conditions in terms of soil quality are beneficial. However, the model cannot explain why towns are likely to persist in a world of falling transportation costs. The persistence of pre-industrial towns has instead been extensively debated by a literature divided along two lines: those studies that stress the importance of natural advantages such as fertile soil or suitable trading sites (first nature geography) versus those that emphasize man-made advantages such as local population density (second nature geography).

A pioneering study by Bosker and Buringh [2015] sought to disentangle the role of both forces explaining the emergence of the European city network from 800 to 1800 and found that first nature geography played a dominant role while second nature geography mattered to a lesser extent. Similarly, geographical fundamentals have been found to explain persistence over the long term, even after devastating shocks. Davis and Weinstein [2002] and Miguel and Roland [2011] both show how local population density measures were resilient, even after the massive destruction related to the Atomic bombs in Japan and the intense bombing campaigns of Vietnam. The resilience of economic activity resulted in a long-run persistence of the distribution of population density in these countries, allegedly explained by the first nature geography determining the location of towns.

However, the persistence of towns needs not only be driven by natural advantages. A recent strand of literature stresses that settlements can persist even after the factors that explained their emergence become obsolete. Bleakley and Lin [2012] have famously shown that portage sites (i.e. locations suitable for trading when water navigation forms the basis for trading patterns) still determine the locations of many north American towns or cities, despite water navigation being an obsolete mode of transportation today. Investigating the mechanisms of persistence, Bleakley and Lin [2012] find few observable differences in factors and amenities between portage and non-portage sites today. Instead, the authors argue that historical portage sites acted as a coordination device, raising population density in particular locations, causing increasing returns to scale to sustain the cities into present days. Henderson et al. [2017] similarly find that persistence can be driven by local economies of scale when analyzing the world-wide spatial distribution of economic activity of today. However, due to differing timing of shocks to transportation technology, early developers see their towns or cities localized in agricultural regions, while late developers enjoying declining trade costs develop in coastal regions that are less dependent on local agricultural surplus. A related study by Jedwab et al. [2015] tests the impact of colonial railways on local urbanization rates in Kenya. Despite the subsequent decline of railroads and the departure of colonial settlers they find that railroads matter when explaining urban path dependence, both in terms of providing direct value as a sunk investment and when solving a spatial coordination problem. A similar study on railroads in Ghana, finds the mechanism of persistence to be more consistent with forces of local increasing returns (Jedwab and Moradi [2016]).

Finally, Michaels and Rauch [2017] develop a model of path-dependency that takes time-varying benefits of first and second nature into account. They show that as long as the values of the geographic fundamentals are left unchanged, towns will persist in certain locations, even after large temporary shocks. However, if the value of locational advantages change (perhaps due to changing transportation costs) towns will only persist if the value of fundamentals is larger than the productivity advantage of local returns to scale. The authors show that historical towns founded by the Roman Empire have persisted to the present day in France, while British towns were able to relocate after the collapse of the Western Roman Empire. When urbanization re-emerged in Britain, towns tended to relocate closer to the coasts. Thus, related to our findings Michaels and Rauch [2017] interestingly find that cities may become trapped in sub-optimal locations by historical accident and persist for as long as the benefits of agglomeration and/or the value of sunk investments are larger than the costs of the poor location.

3 The Swedish town foundation policy as a natural experiment

The Swedish pre-industrial economy was relatively backward with low and stagnant GDP per capita until the 19th century. However, there were signs of dynamism in certain respects: population increased more than fourfold between 1570 and 1810, production and exports of metals to the Continent sky-rocketed in the 17th century (Schön et al. [2015]) and state capacity improved gradually from the centralization of the state with the coronation of King Gustav Vasa (1523). The town foundation policy was part of the Crown's effort to modernize the country and raise taxes to pay for growing military expenses, partly related to the growth of the Swedish Baltic Empire (1611-1721).

We argue that pre-industrial Sweden provides a unique testing ground to explore the long-run implications of founded towns for two main reasons. First, the endeavor of the Swedish Crown to advance the much-desired empire provides unparalleled data records to test for the effects of the town foundations in the early modern period (Ahlberg [2005]).[5] Second, the institutional setting of the Swedish pre-industrial economy closely resemble the features of the rural-urban specialization model presented in section 2 of this paper. From the 17th century onwards, Sweden's economic policy moved from a concern over provisions, promoting imports over exports, to an emphasis on a favorable balance of trade following mercantilist principles. The prime instruments of the policy were tariff protection and the creation of industrial privileges. These orthodox regulations were gradually removed in the 19th century and the Decree of Extended Freedom of Trade was finally established in 1864, ending any remaining mercantilist regulations.

Since the 13th century trade in Sweden was only permitted in towns holding market rights (Magnus Ladulås' prohibition of *Landsköp*). The traditional principles that were purportedly behind the policy of founding new towns were to limit commerce and manufacturing to the towns and prevent unregulated trade in the countryside. Rural parishes could therefore be thought to operate under autarky in the absence of a nearby town. To further use town policy as a means to raise state revenues, the "petty toll" (Lilla Tullen) amounting to 1/32 of the sales value of all domestically traded goods was introduced in 1622. While historical records show that the Crown was aware that ending rural trade would be as difficult as *'catching all the wolves in the woods'*, (King Gustav Vasa cited in Heckscher [1963, p.77]),

[5] Town foundations have not been uncommon in history. These events were recurrent in England during the 11th and 12th centuries (see Beresford [1967]) and in Poland during the Early Modern period as shown by De Vries [2006]. Founded towns have also been a common feature in many colonial countries. Currently, China's urban planning policy shows that the interest in town foundations is still relevant today.

we may still think of towns as instrumental in collecting the revenues of trade. The strict regulation of commerce in towns was also manifest in that most rural towns were only given monopoly rights to trade with their local hinterland. However, they were not allowed to trade on foreign markets. On the contrary, foreign trade was concentrated in towns with staple rights.[6] Between 1570 and 1810, some 20 towns held staple rights at some point.[7]

In line with the mercantilist policies to control and tax trade, 31 new towns were added to the existing medieval towns between 1570 and 1810.[8] In Figure 1, the 31 founded towns appear with dark flags while medieval towns are represented by light circles. Whilst medieval towns only existed in southern and middle Sweden, the founded towns are located throughout the country from north to south. A major purpose of the new towns was to raise taxes for the Crown by serving as commercial centers. Some towns were also founded in the areas gained from Denmark in the 17th century where military concerns were an additional determinant of location. The factor that decided the location of a town was however not the existence of any traditional infrastructure of regional commerce, but the desire to direct local trade away from informal rural markets and into towns where it could be regulated. For that reason, previous informal trading spots were avoided (Sandberg [1996, p.186]). Ultimately, towns were located wherever the Crown could easily acquire land. This was not always straightforward as much ownership of land was in the hands of the peasantry. Some of the new towns were founded on royal demesne or on church lands, but in most cases the Crown had to acquire peasant-owned land. According to the law, freeholder peasants owned their land without any stipulations and could refuse to move. It seems unlikely that the Crown could obtain the most promising areas in terms of agricultural surplus or economic potential simply because the "best places" were already taken by medieval towns or existing villages. Furthermore, since only a handful of towns were allowed to engage in trade with foreign markets, suitability for international trade was not a deciding factor. In fact, founded towns were less likely to be situated along the coast or at sites with access to water transportation compared to medieval towns.

After the Crown had identified a location, peacefully acquired the land, and declared the town charters, it also had to ensure that the town infrastructure was built and that people actually moved there. Often the Crown would try to force the traders in the region to settle in the new towns. The targeted populations can be described as peasant-burghers who often mixed their business with some agriculture or fishing activities (Sandberg [1996]). Records show that the people that moved into the founded towns were not significantly wealthier, or more likely to belong to a higher social class than the rural popula-

[6]Staple right was a medieval institution that allowed certain towns to hold a regular market with foreign ports and allowed them to store merchandise for traders for a few days. In Sweden, these were usually held by medieval towns with ports.

[7]Among the founded towns, only three held staple rights before 1765. Thereafter, the regulations were gradually liberalized, and more towns gained access to foreign markets. At the turn of the 19th century nine founded towns held staple rights. Thereafter the trade regulations gradually lost importance.

[8]The founded towns in our sample period are: Alingsås, Åmåls, Ängelholm, Askersund, Borås, Eskilstuna, Filipstad, Falun, Gränna, Härnösand, Hudiksvall, Karlshamn, Karlskrona, Karlstad, Kristinehamn, Lindesberg, Luleå, Mariefred, Mariestad, Nora, Norrtalje, Östersund, Piteå, Sala, Säter, Söderhamn, Strömstad, Sundsvall, Umeå, Vaxholm, and Vimmerby. We follow the definition of founded towns suggested by Nilsson et al. [2005] in considering Göteborg and Kristianstad as continuations of the Medieval towns Nya Lödöse and Vä (that lost their privileges simultaneously). Thus, in terms of location, these towns were not founded on new sites, although they formally count as a founded towns in Swedish historiography. Parishes around Göteborg and Kristianstad will not be considered "treated" since they have a similar distance to a town with market rights before and after the foundation.

tion.[9] From historical town charter records we can infer that the Crown subsidized the formation of the town. Most often, the Crown offered 6 to 10 years tax relief for burghers settling in the founded town, in addition to detailed promises of monopoly trade with the local hinterland. In some cases, the towns were also allowed to keep the first year's tax revenue in order to pay for the necessary infrastructure investments. The case of Hudiksvall, which was granted town charter rights by King Johan III in 1582, may serve as an illustrative example. The first sentence of the charter declared that the urban site was authorized to claim common ground. Thereafter the King offered the merchants of Hudiksvall freedom from tax for six years. The tax income generated from the local trade was to be spent on building a church, a city hall and a toll house. The King continued the charter by decreeing a prohibition for anyone other than the citizens of Hudiksvall to trade in the local area (Hälsingland and Medelpad), he also declared that the population was to remain in the town after the period of tax freedom had ended.[10] The last amendment was probably important because the peasants were often reluctant to move to the towns. Anecdotal evidence mentioned by Heckscher [1963, p.110] reveals that a group of peasants who moved to the city of Umeå by force petitioned for relief, referring to themselves as "townsmen by command". Thus, it was not unusual for local farmers to protest and try to delay the creation of a town, although historical documents bear witness to the force which the policies were put into place. When we analyze the historical town charter records from 1570 to 1810, we observe that every site that is mentioned with imposed town charters appears in our database as a founded town, mitigating the potential concern that our database only captures the surviving towns.

3.1 Randomness of the treatment and alternative placebo sample

To further favor the new foundations, the Crown sometimes removed market privileges from neighboring medieval towns and forced people to relocate to the new places. A good example of this is Kristianopel, initially founded by Christian IV, King of Denmark, with the intention of making it *"the Constantinople of the north"*. After 1658, when Sweden gained its current southern territory from Denmark, King Karl XI decided to remove Kristianopel's town charters in favor of Karlskrona, a new town founded some 35 kilometers away. The relocation of market rights meant that many of the rural parishes surrounding Kristianopel saw their "distance to town" increase by more than a day's journey back and forth, if using a cart drawn by pack animal operating at the speed outlined in section 2. We suggest that this externally changing distance, from the perspective of the surrounding parishes, can be used in a regression model to estimate the impact of urban markets on agricultural growth.[11]

Despite our efforts to argue that the selected locations were causing a varying random treatment in the surrounding parishes, we further address the potential concern that the selected rural parishes were special in some way. Therefore, we use an alternative sample of locations that had been selected to become towns but that were never founded. Queen Christina (1626-1689) became Sweden's sovereign

[9] This point is reinforced for 1810 in Table 2, where one can see that only the wealthiest class seems to differ between the planned towns and the selected counterfactual rural parishes, by a very small percentage.

[10] *Privileger, resolutioner och förordningar för Sveriges städer* Stadshistoriska Institutet [1939], Volume 3, p. 420-423

[11] After the closure of trading rights, Kristianopel gradually reverted back to a village, and reported a mere 137 inhabitants in 1890.

after her father, King Gustavus Adolphus II, died on the side of the protestants in the 30-years war. During her youth Christina was drawn to Catholicism and in 1654 she abdicated her throne suddenly and left for Rome. Following the impulse of the Crown to urbanize and modernize Sweden, Christina had planned the foundation of eight towns in the Swedish territory (see Figure 1, where these are marked with a red C). However, the unexpected termination of her reign meant that these towns where never fully functional: either they were planned but never formally received market rights, or they received market rights that were shortly later withdrawn.[12] We consider Christina's planned towns as a placebo check in our research design, using the parishes that she selected to become towns as random and valid as the 31 actual towns in our sample, with the slight inconvenience that these never had enough time to experience a change in status in terms of market rights.

4 Data description

Swedish historical data are internationally well-known for their high quality and coverage. As mentioned before, the Swedish Crown had a strong tradition of recording statistics regarding the population, produce, and tax revenue, starting with King Gustav Vasa in the 16th century. Statistical authorities had gathered annual population data since 1749, making these the longest annual population records in the world. Before 1749 there is a wealth of church and fiscal sources. Particularly valuable material has been preserved from around 1570 in the form of a one-off wealth tax called Älvsborg's ransom and in the "soil book" (*Jordebok*) from 1630 and 1690 and then, yearly, from the end of the 1730s. From the early 19th century, there are also detailed official agrarian statistics in terms of produce and animals.

Älvsborg's ransom was a special wealth tax designed to meet the costs of the redeem of the Älvsborg's castle after from the Danish occupation after the war. It comprised a tenth of all cattle, agricultural surplus and metal goods at household-level and its detailed information has made it a popular and well-known source for historians interested in the 16th century economy. Additionally, the so called "soil books" reported the basic tax that became the foundation of the Swedish tax system from the 17th century to the beginning of the 20th century. The tax collection in the sources was carefully carried out and recorded by local priests under the supervision of regional bailiffs. The books record the name of the farm head and the tax or interest rate that was often paid in kind for each farm. Although issues with tax evasion might be inherent to this sort of data, previous work has often pointed out the quality of the data when cross-checking with other sources.[13] The observability of agricultural output was probably rather high by the local bailiffs and priests in the small Swedish parishes. In addition, as we have no reason to believe that the potential errors are not systematic, we are less worried about any potential bias in our results. The original sources can be found online from the Swedish National Archive.[14]

[12] These places have been identified thanks to the collection of historical architectural records by Ahlberg [2005]. Naturally, Queen Christina's abdication may not be the only reason that these towns did not materialize. Some of the locations were discussed by various sovereigns on several occasions. Some towns with the same name eventually materialized, but at a different place than first intended. These "placebo" towns have in common that they represent geographical locations that were at some point intended to receive market rights. They correspond to the plans of Torneå, Arjeplog, Grythyttan, Avesta, Järle, Andersö, Nya Kopparberget and Slite.

[13] For a thorough discussion about the quality of pre-industrial sources, see Myrdal and Söderberg [1991].

[14] https://sok.riksarkivet.se/

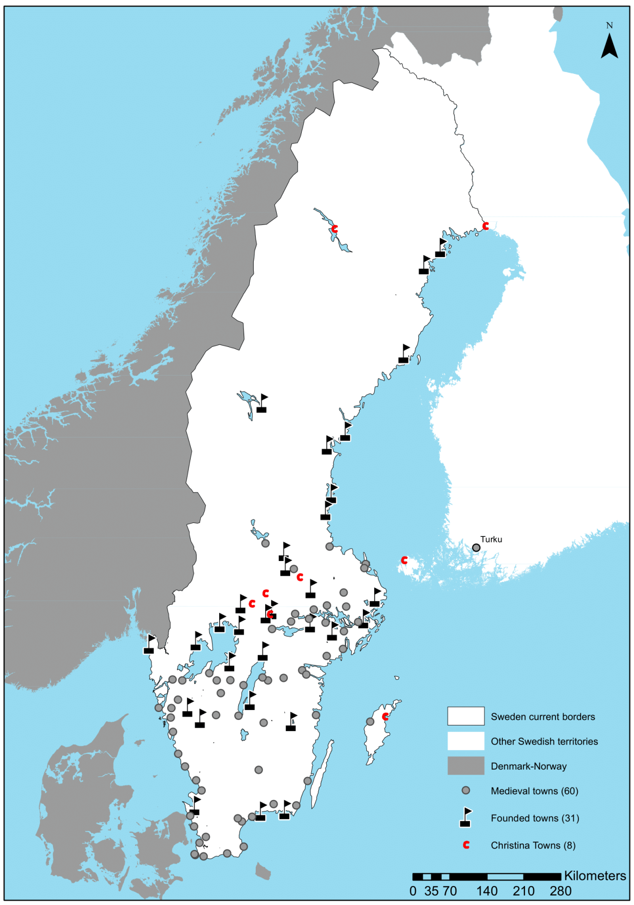


Figure 1: Towns in Sweden 1570-1810

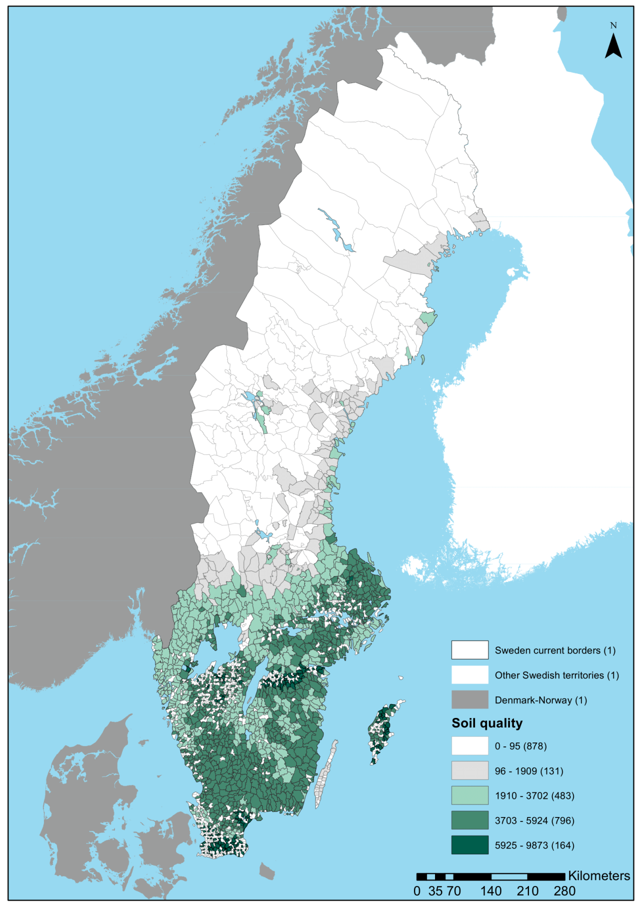


Figure 2: Parish soil quality from FAO-GAEZ

The present dataset has been put together by collecting and harmonizing the above-mentioned sources in a large research project at the University of Gothenburg (Linde [2012]; Palm [2012a,b, 2013]; Palm and Linde [2014]) resulting in a panel of 2,218 parishes at constant borders at 60-year intervals between 1570 and 1810. From this dataset, we have geocoded and extracted the information about population and the amounts of seed and harvested grain converted into rye equivalents. The conversion of different grains (wheat, corn, oats, and rye) into rye equivalent units makes the comparison of agricultural output easier between areas as, during this period, rye was the most commonly grown grain in Sweden.[15] In addition to population and rye-equivalent agricultural production, we use a database on population of historical towns provided by Lilja [1996]. Our dataset includes information about the kind of rights granted to each town and the dates these were in force. Figure 1 shows the location of the towns (medieval, new foundations and the placebo towns, i.e. those planned by Queen Christina) present in the dataset.

In addition to historical data, we use soil quality for each of these geo-coded historical parishes reported by the Global Agro-Ecological Zones database from the Food and Agriculture Organization FAO [2011], which allows us to retrieve data for suitability for more than 20 crops based on the mineral and climatic characteristics of the land in any part of the world. These records, shown in Figure 2, represent a relatively fertile southern Sweden and a contrasting fruitless north. These data are mostly used to find comparable parishes both for the ones affected by closer new town foundations, and for the new towns themselves.

In this context, we have enough material to perform a spatial analysis on the effects of the town foundation policy in terms of extensive growth (population and gross production) and intensive growth (production per capita and yields), where we consider the parishes exposed to a changing distance to town as part of the "treated group" whereas parishes that stay within the same distance to town for the entire period, are considered untreated by the policy and form the "control group". The last part of the paper also uses data on population structure by parish from the Centre for Demographic and Ageing Research [2010]: Tabellverket 1749-1859, and from the Swedish Census recoded to HISCLASS data (Folkräkningen, NAPP project). For local infrastructures in terms of transportation (mostly coming from SCB and Riksarkivet) and in terms of non-transportation infrastructures, we used data from the Swedish National Heritage Board database. More detailed information about these particular sources is provided in section 6.

5 Short-run effects of new town foundations

Throughout our period, 589 out of 2,129 parishes changed their distance to town. There were 672 instances of changing distances to towns in total, since some parishes changed their closest town more than once, as distance to town could change when a new town was created, when market rights from an old town were removed, or when a town was burnt down as a result of a dispute or war. Given

[15] The dataset was downloaded from Svensk Nationell Datatjänst, SND. The far north of Sweden consists of some very large parishes, as seen from Figure 2. 89 parishes with an area larger than 314 square kilometers have been omitted from the sample, since it is hard to analyze geographical effects in parishes where average distance from its centroid to the next parish border is more than 10 kilometers, resulting in a sample of 2,129 parishes. Including these parishes in the sample, however, does not change the results.

the institutional character of pre-industrial Sweden, we argue that a founded town can be thought of as a local shock to market access to the surrounding hinterlands.[16] Our "treatment" variable varies in intensity, since changes in the distance to town vary from parish to parish.

The first panel regression takes the following form:

$$ln(outcome)_{it} = \alpha + \beta_1 * distancetotown_{it} + \lambda_t + \rho_i + \epsilon_{it} \quad (1)$$

We are primarily interested in the effect of the changing distance to town in parish *i* at time *t* after controlling for time fixed effects λ_t, and parish fixed effects, ρ_i. Distance to town at time *t* refers to the first benchmark year in our database after the foundation of a new town. The main regression picks up the average effect of a town foundation for the entire period after the town was formed. The distance to town variable can be modelled in various forms, but for simplicity we report results in terms of dummies with differing kilometer cut-offs.

The impacts of gaining market access through a decreasing distance to town vary widely. *Extensive growth* is captured by increases in cultivated land driving population growth and increases in gross production. *Intensive growth*, on the other hand, requires effects in production per capita or increases in yield rates. To test for extensive growth, we therefore run the regression on the logarithm of population and gross production, while we test for intensive growth by running the same regression on the logarithm of production per capita and yields. However, spatially correlated errors might be a concern in our regressions, so we also estimate standard errors robust to spatial correlation assuming a linear decay up to 100 km based on Conley [1999], reported in Table 6 in Appendix B. We find that the Conley HAC standard errors are generally larger, suggesting that errors are positively spatially correlated.

The result from Equation 2 on the full sample is presented in Table 1. Columns 1-2 report extensive growth variables, whereas columns 3-4 report intensive growth. The coefficients in column 1 suggest that reducing distance to town will increase population density with a magnitude of 70% ($e^{0.528} - 1$) if a town appears within 10 kilometers of the centroid of the parish. This magnitude represents an increase of 179 people based on the mean population of the treated sample of parishes at the beginning of the period (See Table 7 in Appendix C). The effect of the new foundation diminishes gradually with distance and becomes statistically insignificant after 50 km. Accounting for spatial correlation using HAC Standard Errors makes the effect insignificant at 30 km from the new foundation. Our results suggest that positive spillovers from the new town foundations recede at distances of some 30-50 km from the towns. This distance is quite consistent with the historical evidence of daily distances travelled by pre-industrial farmers reported in Bergenfeldt [2014].

The effects of town foundation on population growth suggested by the point estimate might appear large in percentage terms. However, one should keep in mind that Sweden's population increased by 4.5 times between 1570 and 1810 (Table 4 in Appendix A) and that these town foundations were part of the Kingdom's strategy to expand into marginal lands, sometimes even by forcibly relocating people to the new settlements. The extensive nature of the growth shown in column 2 of table 1, where gross

[16] However, even if town foundations are exogenous, there is the potential concern that losing market rights is not. Therefore, we also restrict the sample to measure the changing distance to towns exclusively coming from the foundations, finding no qualitative change in our results or interpretation.

Table 1: Effect of change in distance to new town in terms of spillovers: Regression results using unbalanced samples

	Panel A: Extensive Growth		Panel B: Intensive Growth	
	(1)	(2)	(3)	(4)
Dep. variables in ln	Population density	Gross production/area	Gross production/person	Yields
Distance to town cut-offs				
<10 km	0.528***	0.382***	-0.146	0.018
	(0.096)	(0.094)	(0.097)	(0.080)
10 - 20 km	0.474***	0.425***	-0.049	0.087
	(0.093)	(0.083)	(0.085)	(0.071)
20 - 30 km	0.454***	0.498***	0.044	0.037
	(0.093)	(0.082)	(0.084)	(0.070)
30 - 40 km	0.411***	0.531***	0.121	-0.024
	(0.099)	(0.085)	(0.087)	(0.072)
40 - 50 km	0.261**	0.313***	0.051	-0.111
	(0.105)	(0.085)	(0.087)	(0.072)
50 - 60 km	0.007	-0.220*	-0.227**	-0.250***
	(0.149)	(0.113)	(0.116)	(0.096)
60 - 70 km	0.138	0.039	-0.099	0.342***
	(0.142)	(0.115)	(0.119)	(0.098)
70 - 80 km	0.208	0.071	-0.138	0.174
	(0.139)	(0.136)	(0.140)	(0.116)
80 - 90 km	-0.078	-0.153	-0.075	-0.127
	(0.196)	(0.148)	(0.152)	(0.126)
90 - 100 km	-0.224	-0.559***	-0.335*	-0.265*
	(0.211)	(0.169)	(0.173)	(0.144)
Observations	10,645	10,645	10,645	10,645
R-squared	0.749	0.465	0.185	0.218
Number of parishes	2,129	2,129	2,129	2,129
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Note: this table shows the spillover effects of a change in distance to town in ln variables related to Extensive (Panel A) and Intensive (Panel B) growth measured at different distance cut-offs. Standard Errors below coefficients in brackets, significance denoted by *** p<0.01, ** p<0.05, * p<0.1.

production per area increased by a magnitude of 46% ($e^{0.382} - 1$) within a 10 km distance increasing to 70% ($e^{0.531} - 1$) within the 40 km cut off, but tapering off with longer distances to the founded town. The spatial auto correlation adjusted results show a similar pattern in terms of significance, where the effect of the new towns affects population density up to 30 km of the town and agricultural gross production is only statistically significant within 20-40 km around the new town. This increase in patterns of population and agricultural gross production surrounding the newly founded towns is consistent both with the traditional specialization literature (Thünen [1826]), and with the more local historiography of southern Sweden (Bergenfeldt [2014]).

In contrast to the extensive growth variables, however, we do not see any intensive growth in the surroundings of a founded town. The coefficients on gross production per capita (column 3) or agricultural yields (column 4) are small and insignificant at all geographical cut-offs with both kinds of standard errors. Since the results on the extensive margin suggest that more land is being farmed, we could expect average yields to decrease if farmers pushed into marginal lands. The small and insignificant coefficients on yields however suggest that potential decreasing average yields were mitigated by some intensification of production. Better farmers might have self-selected near new towns, or towns might have stimulated technology improvements in land productivity. The forces might have balanced on average in terms of land productivity, but in terms of labor productivity it is clear that the hinterland could not generate any surplus per capita to be traded in the new town.[17] The estimated lack of increases in gross production per person suggests that agricultural constraints on potential surplus imposed a limit to town growth, as suggested by Wrigley [2016].[18]

5.1 Balancing the sample

To what extent can we claim that these results are causal? As the most promising places in terms of agricultural surplus were already occupied by organic medieval towns, the Crown probably had to settle for second-best locations in terms of agricultural productivity, thus we may regard the previous estimates to be downwardly biased. For the sake of closer causality inference, we run the regression on a balanced sample of parishes with similar characteristics that can be regarded as comparable based on Abadie and Imbens [2016] and Imbens [2015], who propose a methodology to estimate average treatment effects based on the probability that untreated individuals could be treated under a set of confounding variables. In this case, we assume that the Crown could consider the distance to medieval towns, the amount of people that could potentially live in the town (population density), the ability to produce agricultural surplus (proxied by soil quality by FAO-GAEZ database), the capacity to trade via ports (km distance to coast) and the distance to the capital of Finland (Turku) which was part of Sweden at that time.

Performing the Propensity Score Matching based on our confounding variables results in a smaller and more restrictive amount of observations in the analysis: 958 parishes, where there are 479 treated parishes that correspond with 479 untreated matched parishes. Further, notice that we must drop all the parishes in northern Sweden as there are no comparable matching parishes: there were no medieval towns in the area, and soil quality was extremely low. Table 7 in Appendix C shows the pre-treatment characteristics of the full sample (589 treated parishes from a total of 2,129 parishes) in Panel 1, compared to the balanced sample in 1570 (Panel 2). As seen from column 2 in the table, parishes that were affected by a founded town were initially less densely populated, had statistically worse agricultural surplus per area and worse soil quality. They also start-off with a larger average distance to a town (60 km) than the untreated parishes. The differences between the Treated and the Untreated parishes are large and significant in terms of all the characteristics we measure, as seen from the means difference tests reported in columns (4) and (5).

[17] It is important to bear in mind that rural trade was prohibited and that farmers were generally unlikely to produce any large or systematic agricultural surplus destined for the market before the emergence of a town.

[18] As a robustness check, we run the same regression with the placebo-towns founded by Queen Christina and find that the placebo check does not provide any positive effects on either extensive nor intensive growth. Results are available from the authors upon request.

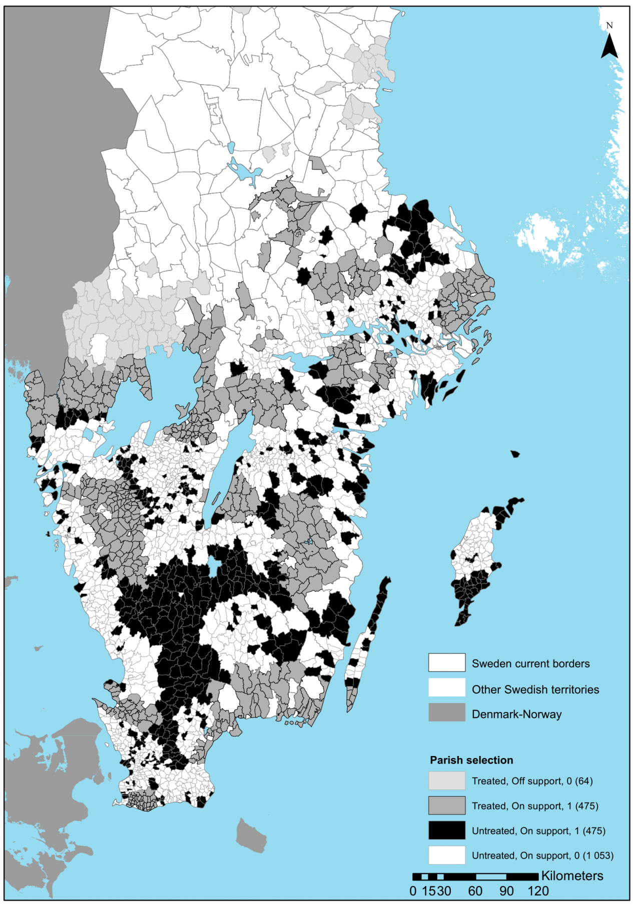


Figure 3: Parish balanced sample

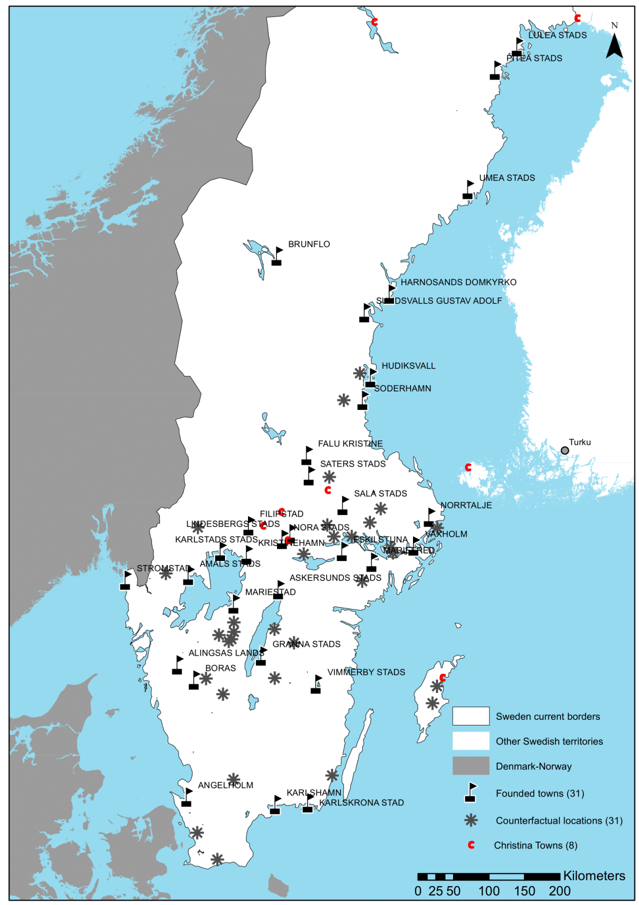


Figure 4: Founded towns and counterfactuals

Thus, we re-consider the effect of the change in distance to the closest town on 479 parishes that are more comparable in terms of their pre-treatment characteristics (distance to medieval towns, population density, soil quality, distance to the coast and distance to Turku) with a matching parish remaining at the same distance to town during the whole period. The selection of parishes can be seen in Figure 3, where the treated parishes are colored in dark-gray, and the untreated matched parishes are black. Although there are still significant differences between the treated and the untreated in the balanced sample, the means differences have now been reduced consistently for all the variables (column (8)). Regression results from the balanced sample can be found in Tables 8 and 9 in Appendix C. The coefficient estimations for the balanced sample are consistently larger compared to the full sample: a new town foundation within the next 10 km affects the population three times more than in the full sample, confirming our suspicion that our prior estimates were downward biased due to the inferior nature of the land selected by the Kings. Balancing the sample still leads to the same conclusions: the effect of the new town in terms of population density is significant until the boundary of 40-50 km but decays with distance, and gross production per area is positively and significantly affected only up to the 30-40 km ring. The significance of the coefficients also suggests that agricultural production follows the model described by Von Thünen [1826]. Most importantly, we are not able to detect any evidence of intensive growth in the areas affected by founded towns.

5.2 Dynamic effects

Our panel dataset allows us to explore some of the dynamics using lagged treatment effects. Nonetheless, our panel is only composed by five benchmark years, which means that we are somewhat limited from exploring the full dynamics of the policy. As a first test of the parallel trends assumption in our PSM balanced difference in differences estimations, we test whether there is any significant effect before the town creation treatment takes place. This test should ideally result in insignificant coefficients, indicating no systematic growth effects between treated and untreated parishes before the policy was put in place. Although much of the policy took place between 1570 and 1630, with 17 founded and 3 ended towns, we cannot test the parallel trends assumption in this part of the sample since these town foundations lack pre-treatment observations. For the regressions including a forward lag, we are restricted to the parishes shocked by changing distances to new towns after 1630, shocked by 14 created and 4 ended towns, which still reports results on 249 treated parishes.[19]

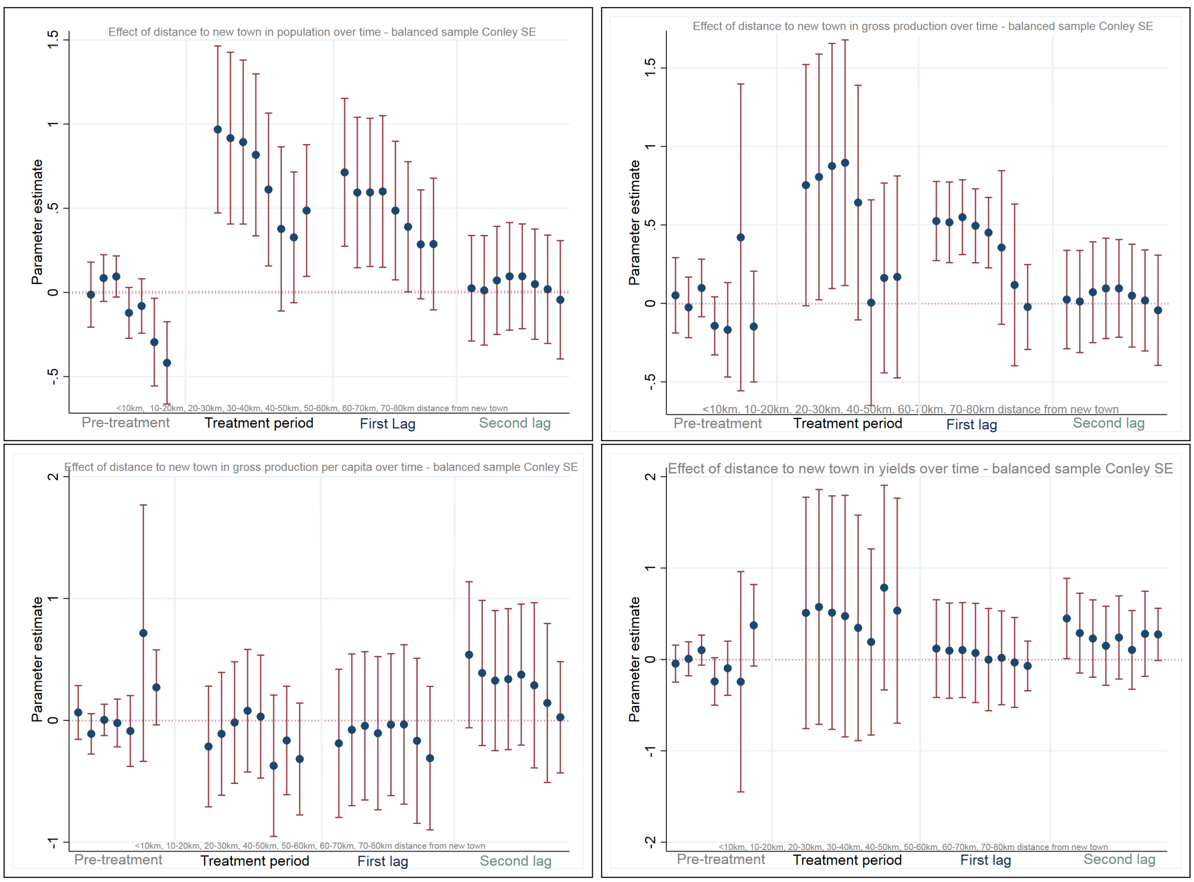
We also test the persistence of the effects modifying Equation 1 by lagging the effect of the treatment. The virtue of this approach is that it tests the remaining effects in terms of differences in the outcome variables between the treated and non-treated parishes. Our panel does not allow for very many lags before we run out of degrees of freedom, but we test the long-run effect using one and two-period lags, which covers 120 years after the treatment. Because we only have 31 towns changing at different benchmark years, lack of degrees of freedom does not allow us to include the lags simultaneously. Thus, the

[19]The regressions include the dummies for distance to town at *t-1* simultaneously controlling for the post-treatment effect. This involves making year *t-2* the reference benchmark year.

coefficient returns the lagged average difference in outcome between treated and non-treated parishes relative to the previous period. The results of the dynamic effect estimations are presented in Figure 5.[20]

The upper left panel shows the dynamic effects of changing distance to town in terms of population growth. The pre-treatment effect (forward lag) is not significant at less than 50-60 km cut-offs and shows a non-systematic pattern with positive forward lag at 50-60 km and negative thereafter, suggesting that the balanced sample behaves well in terms of pre-treatment trends and infer that the town treatment effect may thus be causal. The treatment effect is however positive and significant, showing that the effect decays with distance. Getting access to a new town at more than 50 kilometers distance has no effect on the log of population as we show in Tables 1 and 8.

Figure 5: Dynamic effects of a decrease in distance to town - balanced sample



Note: These graphs show the coefficient values and confidence intervals of the effect of a new town on Population, gross production, gross production per capita and yields before, during and after one and two lags at different distance cut-offs (within 10 km, 10-20 km, 20-30 km, 30-40 km, 40-50 km, 50-60 km, 60-70 km and 70-80 km). Confidence intervals based on spatial HAC robust standard error dependence following Conley [1999], assuming a linear decay and cut-off at 100 km. For the balanced sample spatial SE correction reduces the standard errors marginally, but uncorrected standard errors do not affect inference.

The upper right panel shows the pattern in terms of gross production per capita, the forward lag does not appear to be systematically biased, but the treatment periods suggests that there are indeed

[20]For dynamic effects on the full sample see Appendix D, Figure 9.

significant increases in gross production per area, consistent with our previous results. The lower panel does not suggest much impact on gross production per person or yields, apart from in the areas very close to the towns two periods after. This suggests that the strongest effects of the town foundation policy were on population and gross production growth. The modest lagged effects we estimate are only present in the balanced sample. This suggests that if there was an agricultural response to town foundations it seems to have taken more than a century and it was only visible in areas that were generally suitable for agricultural production (i.e. in our balanced sample). Since we do not detect any long-term effects of agricultural surplus in the full sample, our findings provide credibility to Hecksher's conjecture that the founded towns were formed in areas that lacked potential for economic development.

6 Long-run success: The persistence of founded towns

So far we have tested the effects of founded towns on the surrounding parishes, now we turn our attention to the parishes that became towns themselves. Could the new towns grow to the potential expected by the Crown? To answer this question, we compare founded towns to counterfactual parishes that never gained market rights. We match our 31 towns with similar parishes based on the same criteria as in Section 5.1 (i.e. population density, distance to the coast, distance to Turku, soil quality and closeness to the same medieval town in 1570) following Falck et al. [2011]. In order to mitigate the serious concern that the control group might be influenced by population spillovers from the founded towns, we additionally impose a matching condition stating that the counterfactual parish must be outside the 50 km buffer around the founded town that we established in Table 1.[21] Thereafter, we run difference-in-difference regressions using the following baseline regression with *t* corresponding to the closest benchmark year after the town foundation. We also estimate the regression allowing for lags:

$$ln(population)_{it} = \alpha + \beta_1 dtown_{it} + \lambda_t + \rho_i + \epsilon_{it} \tag{2}$$

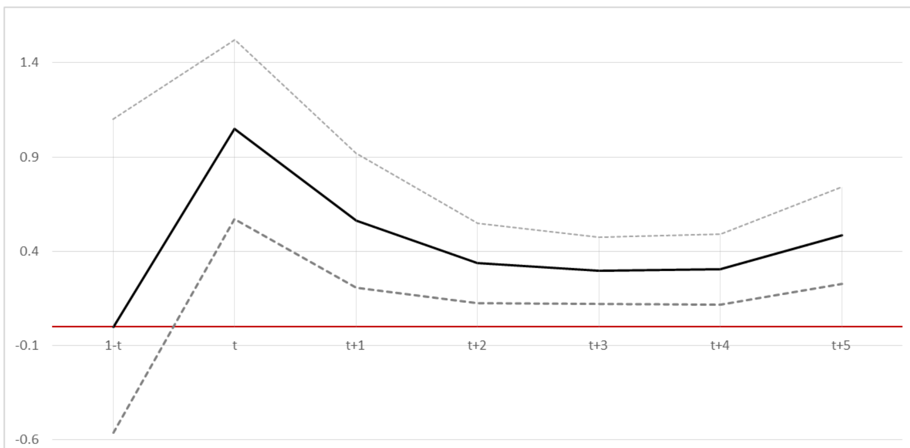
The regression in based on 31 founded towns and 31 counterfactual towns, again in a panel with 5 benchmark periods 60 years apart. The results are presented in Figure 4, where it is evident that the founded towns and counterfactual parishes were growing at similar rates before the foundation policy. However, when a parish became a town, the average effect at time *t* was to more than double the population ($e^{0.9} - 1$). However, lagging the effects shows that there were no dynamic growth effects in the founded towns, as growth figures gradually diminished and were almost not significantly different from zero at conventional levels after three periods (180 years). Since the first founded towns had appeared by 1630, lagging the effect three periods (180 years) already considers their effect in 1810.

This message is reinforced by Figure 7, showing population (left panel) and population density (right panel) in founded towns together with the entire sample of rural parishes in 1810. As seen, most founded towns were not larger than rural parishes in terms of population. Most of the town foundations were not very different in terms of population density by 1810 either, where we can see a slightly higher population

[21] We have tried several combinations of these characteristics to find a set of counterfactual parishes comparable to our founded towns resulting in a different sample of parishes. These, however, have resulted in very similar results.

density in the towns than in the rural parishes. This proves that Heckscher was right in conjecturing that founded towns remained *"not larger than rural parishes equipped with the legal status of a town"* (Heckscher [1963]). There is only one notable example to this rule: Karlskrona was the only founded town that managed to become a functional town in economic terms, defined by Bairoch et al. [1991] as having a population of more than 5,000 inhabitants. Importantly, in contrast to the other founded towns, Karlskrona towns held staple rights. Thus, access to foreign markets appears crucial for pre-industrial urbanization in Sweden. We interpret this as evidence of the harsh organic constraints faced by the founded towns. As long as market regulations restricted access to foreign markets and before the transport revolution had made longer-distance trade in energy material and grains possible, it appears that a country as cold and poorly endowed in terms of soil quality as Sweden could not sustain many larger towns.

Figure 6: Marginal effect of becoming a town on population

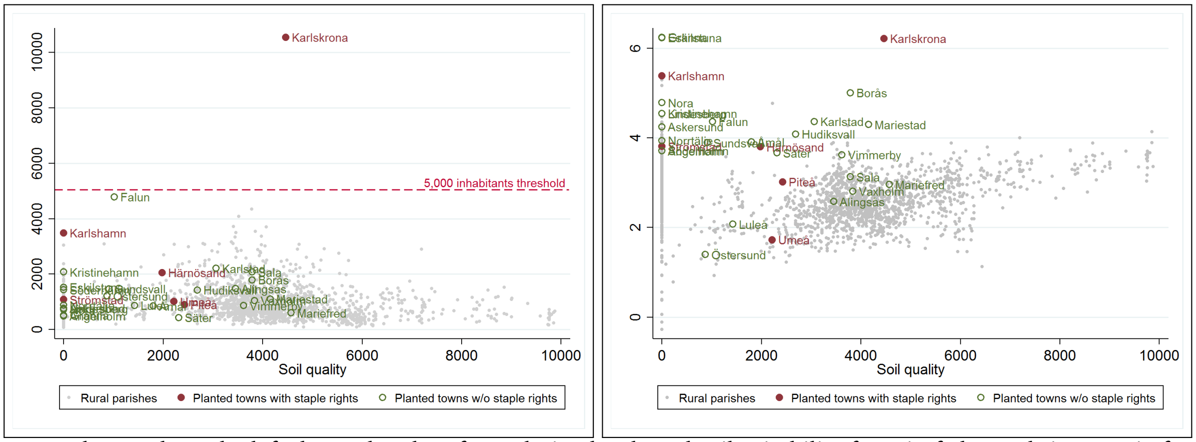


Note: The graph shows the marginal effect and confidence interval of becoming a founded town on parishes' population at different time periods using the sample of founded towns and their counterfactual parishes computed through difference in differences regressions using the estimated effect of the treatment at different time lags.

Nevertheless these small towns persisted in the long run. The left-hand panel of Figure 8 shows average population sizes over the long run in the treated parishes compared to their counterfactuals. We also add the average population of our eight towns planned by Queen Christina as a placebo check. Interestingly, the placebo-towns follow the founded towns rather closely on average until the end of the 19^{th} century. While the figure shows that the founded towns and the placebo towns had grown marginally larger than the control group by 1810, neither the towns nor the parishes grew to larger than some 2,000 people on average.

However, it is clear that something happened in the founded towns during the 19^{th} century. As mercantilist restrictions were gradually removed and completely abolished in 1864, the towns started growing. The growth of towns coincided with the arrival of the Industrial Revolution in Sweden. Being a peripheral late-comer the industrial take-off is often dated to some time around the mid-19^{th} century with an

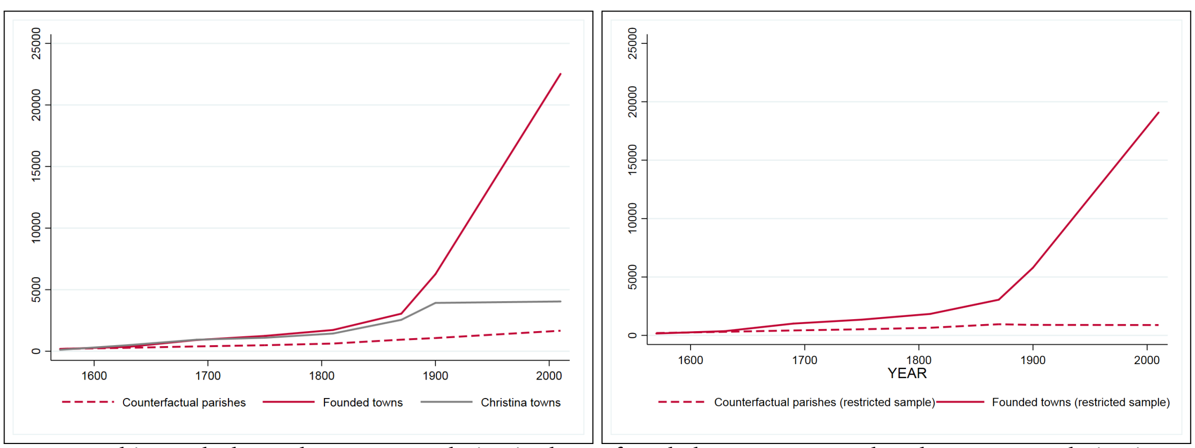
Figure 7: Population ceiling and density in founded towns and parishes, 1810



Note: The graph on the left shows the plot of population levels and soil suitability for rain-fed cereals in 1810 in founded towns with and without staple rights and all the parishes. The graph on the right shows the plot of population density on soil suitability in 1810.

export boom and state investments in railroads.[22] By 1900, the average population size of the founded towns had already passed the 5,000 benchmark, while the counterfactual parishes remained stagnant. The towns founded by Christina stagnated as well, despite their relatively larger average size by 1810. By 2000, the difference between the founded towns and the counterfactual parishes had amplified.

Figure 8: Population growth in founded towns, counterfactual parish locations and towns planned by Queen Christina, and on restricted sample.



Note: This graph shows the mean population in the 31 founded towns compared to the mean population in the 31 counterfactual rural parishes and the historical sample of parishes selected by Queen Christina that never fully gained the town status. Population data for rural parishes from 1865, 1880 and 1900 as been thankfully shared by Lennart Anderson Palm. Data for 2000 have been obtained from Harlén [2003] and Statistics Sweden (SCB).

One concern with these graphs is that the difference between founded towns and the counterfactuals is driven by the founded towns along the northern-eastern coast, bordering Finland. Since Finland was

[22] The agricultural constraint to population growth was relaxed by 1800 with the introduction of the potato. This agricultural invention has previously been shown to more than double output per acre, accounting for some 10 per cent of population growth between 1800 and 1850 (Berger [2018]).

annexed to Russia by 1809, population growth in these towns could potentially be driven by refugees from Finland populating these areas. In order to mitigate this concern, we omit the northern town foundations (six towns and their corresponding counterfactuals) in the right-hand panel of Figure 8. As seen from the figure, this omission does not drive the result.

Table 2: Variable means by sample and t-statistics of mean differences

VARIABLES	1810				1900			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Founded towns	counterfactual parishes	Diff (1 -2)	t-stat	Founded towns	counterfactual parishes	Diff (5-6)	t-stat
Population	1211	833	378	2.462 ***	6260	1253	5007	4.989 ***
	(133)	(90)	(160)	0.0211	(988)	(175)	(1004)	0.000
Population characteristics								
Status/Skills								
Civil servants	0.071	0.001	0.070	11.198 ***				
	(0.006)	(0.001)	(0.006)	0.000				
Clergy	0.015	0.007	0.008	3.726 ***				
	(0.001)	(0.001)	(0.002)	0.001				
Nobility	0.006	0.004	0.002	0.845				
	(0.001)	(0.001)	(0.002)	0.402				
High skilled					0.013	0.005	0.008	10.139 ***
					(0.001)	(0.001)	(0.001)	0.000
Medium skilled					0.107	0.036	0.071	9.262 ***
					(0.001)	(0.005)	(0.008)	0.000
Farmers					0.016	0.073	-0.057	-6.696 ***
					(0.001)	(0.008)	(0.008)	0.000
Unskilled					0.166	0.172	-0.006	-0.234
					(0.009)	(0.023)	(0.025)	0.8156
Wealth								
Rich	0.035	0.009	0.025	4.301 ***				
	(0.005)	(0.003)	(0.006)	(0.001)				
Middle class	0.249	0.298	-0.049	-1.292				
	(0.021)	(0.031)	(0.038)	(0.201)				
Poor	0.483	0.520	-0.037	-0.867				
	(0.027)	(0.033)	(0.043)	(0.390)				
Very poor	0.233	0.195	0.038	0.770				
	(0.036)	(0.034)	(0.049)	(0.444)				
Wealth per taxed					2250.200	1504.680	745.520	6.878 ***
					(102.887)	(34.107)	(108.393)	0.001
Sunk investments								
Transportation infrastructure								
Ports	0.355	0.000	0.355	4.062 ***	1.258	0.355	0.903	3.585 ***
	(0.087)	(0.000)	(0.087)	0.000	(0.207)	(0.144)	(0.252)	0.001
Roads	3.419	1.065	2.355	5.760 ***	3.387	2.258	1.129	2.960 ***
	(0.321)	(0.254)	(0.409)	0.000	(0.327)	(0.197)	(0.381)	0.004
Rails					1.452	0.484	0.968	4.479 ***
					(0.185)	(0.112)	(0.216)	0.000
Non-transportation infrastructure								
Church	1.000	0.935	0.065	1.438 *				
	(0.000)	(0.044)	(0.045)	0.156				
School	0.065	0.000	0.065	1.438 *				
	(0.045)	(0.000)	(0.045)	0.156				
Townhall	0.806	0.032	0.774	9.798 ***	0.806	0.032	0.774	9.798 ***
	(0.072)	(0.032)	(0.079)	0.000	(0.072)	(0.032)	(0.079)	0.000
Townhall/Courthouse	0.871	0.032	0.839	12.123 ***	0.871	0.032	0.839	12.123 ***
	(0.061)	(0.032)	(0.069)	0.000	(0.061)	(0.032)	(0.069)	0.000
Bank	0.065	0.000	0.065	1.438 *	0.290	0.000	0.290	3.503 ***
	(0.045)	(0.000)	(0.083)	0.156	(0.083)	(0.000)	(0.083)	0.001
Observations	31	31	62		31	31	62	

Notes: Means of variables by sample, standard errors reported under means in parenthesis, t-statistics for the significance of the difference between the treated sample and the counterfactual parishes in columns (3) for 1810 and (7) for 1900, t-statistics in columns (4) for 1810 and (8) for 1900, p-values of Ha:diff!=0 reported under t-statistics. Critical values of Student's t distribution with 60 degrees of freedom are 1.296 for 10% significance (***), 1.671 for 5% (**), and 2.000 for 1% (*). Historical data vary by year. For 1810: Ports are calculated as dummies from the maps available from Swedish Official Statistics (SCB) on domestic shipping for 1828, acknowledging that in 1810 only staple towns were allowed to trade, roads are calculated using the postal routes maps available from Riksarkivet from 1811. For 1900 we calculated rays of steamship routes and roads using a communications map for 1890 from Dahlman on communication networks also available at Riksarkivet and Railroads come from the historical maps available at SCB. Population data for 1810 from Palm and Linde [2014], population structure data and wealth data for 1810 come from the Umeå demographic database: Tabellverket 1749-1859; For 1900: population data comes from the digitized census of 1900 (*Folkränkningen*. See NAPP project for more details), and wealth comes from *Finansstatistiska utredningar 1912, Taxeringen till inkomst och förmögenhet*, (1914), table 1. Sunk investments come from the Swedish Heritage Fund historical database, data on Banks for 1900 come from *Sammandrag af de enskilda sedelutgifvande bankernas och aktiebankernas till Kongl. Finansdepartement igifna uppgifter* 1900.

What explains the persistence of founded towns? To rule out that the relatively small size advantage the founded towns had compared to rural parishes in 1810 did not serve as the sole mechanism for persistence we compare our founded towns to counterfactual parishes of similar population size in 1810. The results are remarkably robust: founded towns had a long-run advantage over rural parishes that persisted into today. Our results indicate that founded towns enjoyed some advantages over other locations that were not considered towns, but that their population size in 1810 was not the only crucial factor for their long-run success. This conclusion can be further supported by comparing the stagnant long-run trends of the placebo towns planned by Queen Christina in Figure 8, which were on average similar in size to the founded towns in 1810. Since we cannot establish that the towns persisted due to agglomeration effects based in the pre-industrial era, we try to think of other mechanisms that could explain the long persistence of towns. We try to come up with as many factors as possible, but they mainly fall under two categories: 1) population characteristics and 2) sunk-investments in infrastructure. We start by analyzing how founded towns might have been different from the counterfactual parishes around the time when the policy ended (around 1810). To better pin down the channels of persistence we then look at how these potential channels of persistence have evolved for an intermediate year (around 1900). Because of limited data availability, we have had to resort to somewhat different measures of channels between 1810 and 1900. For the year 2000 we are only able to observe population, due to problems of finding data at consistent geographical borders.[23]

Our first hypothesis about this long-run persistence is that towns could perhaps attract people with specific skills or wealth, both of which are important for long-term growth. Thus, even if the towns were not that much larger than the rural counterfactuals, the composition of the population could be different. We specifically consider data on social class (status and skills) and relative wealth. For the year 1810, we collect data from the Historical Census in *Tabellverket* (Centre for Demographic and Ageing Research [2010]).[24] For 1900, we had to resort to somewhat different sources, using instead the skill distribution of 1900 population from the digitized Swedish Census recoded into HISCLASS (*Folkräkningen*. See NAPP project for more details), and wealth per capita among the taxed in Swedish crowns (SEK) from official tax records.[25] Using different sources means that figures are not straightforwardly comparable between years. However, our main comparison is between the founded towns and their rural counterfactuals. The difference between the means for these variables can be found in Table 2. Columns (1)-(4) refer to the year 1810 while columns (5)-(8) pertain to 1900. For 1810, we find that the skill composition of people was relatively similar in both towns and parishes, with most of the population belonging to the common class. The largest difference was that some 7 per cent of the population in the founded towns consisted of civil servants, compared to only 0.1 percent in the parishes. Similarly, we find that 3.5 per cent of households in founded towns were considered "rich" compared to about 0.9 per cent in the rural parishes). However, this difference does not translate into a large group of people in these small

[23] A large municipal reform in 1971 intended to reduce the number of parishes by merging small parishes. This means that we are not able to find many of our counterfactual parishes in the current dataset. Luckily, the old parish structure (often associated with the parish church) has remained in informal use, and thanks to the publication of Harlén [2003] and *Svensk uppslagsbok*, we can find population for year 2000 at historical borders. However, finding other variables relating population characteristics and infrastructure will be impossible for the historical boundaries after 1971. Therefore, we restrict the year for our intermediate channel to 1900 and the end year for the population data to 2000.

[24] Source: Centre for Demographic and Ageing Research [2010]: *Tabellverket 1749-1859 (selection=1810)*. Social class from Table V (divided into nobility, clergy, civil servants, merchants and peasantry). Wealth distribution from Table VI following definitions by local priests on the various status of society of households: those who could be called rich are those that have a surplus of about 500 rix-dalers (the contemporary unit of currency) without difficulty, they also include property owners who are in debt in excess of their assets, and the very poor are those who have to be sustained by gifts and contributions of others (Soltow [1985]).

[25] *Finansstatistiska utredningar 1912, Taxeringen till inkomst och förmögenhet* (1914) - Table 1).

settlements. Although the differences between means are statistically significant, it is not clear whether they are economically significant. For 1900, average differences in skill composition between founded towns and their counterfactuals remain relatively small. The largest differences are in terms of medium skilled workers, where towns and rural parishes were relatively similar in terms of high and unskilled workers. However, in terms of wealth, we do see that there has been some kind of accumulation of wealth per taxed citizen in the founded towns by 1900, as they are on average about 50 per cent wealthier than the rural parishes.

Secondly, we suggest sunk investments in infrastructures act as long-run mechanisms of coordination. Towns may persist over the long-run simply if they are over-endowed in terms of access to transportation or amenities. As long as these sunk investments are slowly depreciating, the founded towns may have some initial advantage over the countryside that may persist into present days. We distinguish between sunk investments in infrastructure related to transportation and other infrastructure such as churches, schools, town-halls and banks, thinking that the latter may have had more impact on differences in institutions between towns and countryside. Data on communication infrastructures are taken from historical maps provided by SCB on domestic shipping for 1828, and postal routes maps from 1811 available from *Riksarkivet*.[26] To assess the existence of non-transportation infrastructure, we take data from the historical building records provided by the Swedish National Heritage Board database.[27]

Again, the differences between means in 1810 for the treatment and counterfactual group can be found in the lower part of Table 2. It is clear that the towns had more roads (the average number of roads in towns was 3.419 while the average in parishes is only 1.065, meaning that towns were more often located at a junction in the postal routes network) and were overly endowed in terms of ports (35.5 percent of the towns hosted a port while none of the parishes enjoyed access to this infrastructure). By 1900, the rural parishes had caught up somewhat in terms of infrastructure, although the differences between the means are still statistically significant. In addition, we see that founded towns were somewhat more likely to be endowed with railroads, although it is clear that railroads benefited the rural country-side too. In terms of non-transportation infrastructure we see that both parishes and towns were endowed with churches, the founded towns were overly endowed in terms of court houses, town halls, banks and schools. The differences in these types of infrastructure endowments persisted and even magnified to some extent by 1900.

However, establishing that there were some average differences between town and country in terms of non-transportation infrastructure is not enough to show that these differences may systematically explain long-run population growth. Thus, to dig deeper into this issue we estimate the following regression for the year 1810:

$$ln(population)_{i1810} = \alpha + \beta_1 Founded_{i1810} + \beta_2 Channels_{i1810} + \epsilon_i \qquad (3)$$

[26]Data on postal roads found in historical maps from 1811 and 1828 (*Sverige Topografiska kartor, Sverige, kommunikationskartor*, SE/KrA/0400/02/007 b (1811) SE/KrA/0400/02/015 (1828), port data from official statistics on domestic shipping (*Commerce-Collegii* 1828) and cross-checked using geographical searches by location.

[27]The Swedish National Heritage Board provides data on Cultural historical building information by coordinates in their database "*Bebyggelseregistret - BeBR*".

The intuition behind this specification is that the founded dummy should pick-up any unobserved differences explaining population size between the founded towns and their counterfactuals in 1810. However, controlling for our potential channels of persistence, we might see whether any of these systematically explain population to the degree that the size of the dummy can be reduced. This can be seen in columns (1)-(4) of Table 3. The first conclusion that the simple regression shows is that the town foundation policy resulted in a population advantage of around 44 percent ($e^{0.365} - 1$) on average in 1810. Although this effect is large in relative terms, it still meant that the size of the towns was small. Adding controls for the population characteristics of the town population does not explain the size of the founded towns, as the *Founded* coefficient becomes larger and more statistically significant once these controls are added. Instead, the mechanism explaining the population advantage in 1810 appears to be solely related to sunk investments in infrastructure. Once these controls are added to the regression, the *Founded* dummy becomes insignificant.

In order to test whether infrastructure sunk investments explain the long-run success of the founded towns, we run two separate regressions on population size in 1900 and 2000 using the previous centuries' (around 1810 and 1900) potential channels as explanatory variables. Given that sunk investments matter for long-run population growth, these channels should significantly explain population levels, while simultaneously reducing the size of the *Founded* dummy. In order to gauge the relative effects of sunk investments versus agglomeration effects, we add population a century earlier as controls.

$$ln(population)_i = \alpha + \beta_1 Founded_i + \beta_2 PastChannels_i + \beta_3 PastPopulation_i + \epsilon_i \qquad (4)$$

These results can be found in columns (6)-(9) for population in 1900 with past channels for 1810 and columns (10)-(11) for population in 2000 with past channels for 1900 of Table 3. The regression explaining population in 1900 shows that sunk investments in 1810 no longer matter to the same degree, as the *Founded* coefficient is only marginally reduced. Moving towards the columns that explain population in 2000 we find a different story. Adding the controls for sunk investments in 1900 does not significantly change the size or significance of the *Founded* dummy. Instead, the only control variable that matters is population in 1900. Once population in 1900 is controlled for, population in 1810 does not additionally explain population in 2000. Adding population in 1900 as a control reduced the size of the coefficient for the *Founded* dummy from 1.287 to 0.261 and the coefficient is no longer statistically significant.

We interpret these results as potentially capturing how sunk investments in infrastructures by 1810 served to solve spatial coordination problems, at least given that the effect we truly measure is a residual. However, by 1900 sunk investments do no longer explain population levels. Instead, agglomeration forces have taken over as the long-run driver of growth. Our results underline how the initial over-endowment of infrastructure helped drive populations to the founded towns by 1900. After 1900, no other long-run factor besides past population can significantly explain population by 2000.

Table 3: Channels of transmission on log of population in founded towns and counterfactual parishes

VARIABLES	Log population 1810				Log population 1900					Log population 2000					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Founded	0.365**	0.837***	-0.275	0.158	1.488***	1.933***	1.158**	1.694**	1.539***	2.808***	1.950***	1.753***	0.794	1.287*	0.261
	(0.148)	(0.283)	(0.311)	(0.443)	(0.207)	(0.424)	(0.469)	(0.680)	(0.530)	(0.281)	(0.610)	(0.517)	(0.746)	(0.696)	(0.756)
Population characteristics															
Status/Skills															
Civil servants		-7.310**		-5.641		-3.907		-3.850	1.698						
		(3.078)		(3.436)		(4.614)		(5.284)	(4.225)						
Clergy		-16.94*		-22.35**		-16.11		-21.28	0.706						
		(9.335)		(9.668)		(13.99)		(14.87)	(12.21)						
Nobility		-1.686		-4.988		-9.511		-11.12	-6.215						
		(8.609)		(9.350)		(12.90)		(14.38)	(11.21)						
High skilled											-27.52		2.281	7.300	63.62
											(48.01)		(49.24)	(44.90)	(47.03)
Medium skilled											6.684		8.955	3.989	4.567
											(4.975)		(5.445)	(5.187)	(4.876)
Farmers											-6.116		-2.859	-6.010	-2.060
											(4.600)		(4.606)	(4.306)	(4.299)
Unskilled											-1.573		-2.153	-0.742	-0.0986
											(1.444)		(1.434)	(1.376)	(1.314)
Wealth															
Rich		4.458		6.033*		0.327		0.060	-5.873						
		(3.234)		(3.468)		(4.847)		(5.333)	(4.279)						
Middle class		-1.405		-1.381		0.796		1.477	2.835**						
		(1.085)		(1.107)		(1.627)		(1.702)	(1.345)						
Poor		-0.743		-0.780		0.639		1.411	2.178*						
		(0.979)		(1.010)		(1.468)		(1.554)	(1.215)						
Very poor		-0.681		-0.633		0.007		0.092	0.715						
		(0.830)		(0.828)		(1.245)		(1.273)	(0.996)						
Wealth per taxed											0.000		0.001	0.000	0.000
											(0.000)		(0.000)	(0.000)	(0.000)
Sunk investments															
Transportation infrastructure															
Ports			0.064	0.007			-0.050	-0.215	-0.222			0.329*	0.275	0.081	0.083
			(0.239)	(0.233)			(0.367)	(0.359)	(0.279)			(0.165)	(0.169)	(0.165)	(0.155)
Roads			0.028	0.049			0.046	0.123	0.076			0.231**	0.305**	0.179	0.163
			(0.051)	(0.052)			(0.076)	(0.080)	(0.063)			(0.111)	(0.117)	(0.114)	(0.107)
Rails							0.072					0.237	0.199	0.099	0.095
							(0.143)					(0.171)	(0.182)	(0.168)	(0.158)
Non-transportation infrastructures															
Church			0.299	0.182			-0.122	-0.134	-0.313			-1.498	-1.405	-1.476	-1.565*
			(0.425)	(0.402)			(0.632)	(0.619)	(0.482)			(1.082)	(1.086)	(0.990)	(0.930)
School			0.300	0.070			-0.533	-1.085	-1.153*						
			(0.504)	(0.521)			(0.744)	(0.802)	(0.623)						
Townhall/Courthouse			0.628**	0.569*			0.233	0.216	-0.344			0.341	0.084	-0.045	0.261
			(0.277)	(0.295)			(0.412)	(0.454)	(0.367)			(0.452)	(0.471)	(0.431)	(0.420)
Bank			-0.199	-0.572			0.262	0.619	1.182*			0.175	0.009	-0.236	-0.162
			(0.488)	(0.507)			(0.721)	(0.780)	(0.615)			(0.423)	(0.444)	(0.412)	(0.387)
Log population 1800									0.983***					0.875***	0.380
									(0.176)					(0.266)	(0.310)
Log population 1900															0.604***
															(0.223)
Constant	6.567***	7.603***	6.238***	7.404***	6.880***	6.471***	6.902***	5.885***	-1.396	6.787***	6.975***	7.472***	6.752***	1.739	0.591
	(0.105)	(0.958)	(0.410)	(1.044)	(0.146)	(1.436)	(0.620)	(1.605)	(1.805)	(0.198)	(0.834)	(1.089)	(1.315)	(1.940)	(1.870)
Observations	62	61	62	61	62	61	62	61	61	62	61	62	61	61	61
R-squared	0.092	0.299	0.195	0.389	0.463	0.505	0.480	0.546	0.731	0.625	0.668	0.691	0.733	0.783	0.812

Notes: OLS regression coefficients for the log of population and different characteristics of founded town and counterfactual parish locations in the previous benchmark year, standard errors in parenthesis reported under the coefficients. Statistical significance denoted by *** p<0.01, ** p<0.05, * p<0.1. Historical data vary by year. For 1810: Ports are calculated as dummies from the maps available from Swedish Official Statistics (SCB) on domestic shipping for 1828, acknowledging that in 1810 only staple towns were allowed to trade, roads are calculated using the postal routes maps available from *Riksarkivet* from 1811. For 1900 we calculated rays of steamship routes and roads using a communications map for 1890 from Dahlman on communication networks also available at *Riksarkivet* and Railroads come from the historical maps available at SCB. Population and population structure data and wealth data for 1810 come from the Umeå demographic database: *Tabellverket* 1749-1859; For 1900: population data comes from the digitised census of 1900 (*Folkränkningen*. See NAPP project for more details), and wealth comes from *Finansstatistiska utredningar 1912, Taxeringen till inkomst och förmögenhet*, (1914), table 1. Sunk investments come from the Swedish Heritage Fund historical database, data on Banks for 1900 come from *Sammandrag af de enskilda sedelutgifvande bankernas och aktiebankernas till Kongl. Finansdepartement igifna uppgifter 1900*. Population data 1810 from Palm and Linde [2014]. Population data by parish 2000 from Swedish Official Statistics (*Folkmängden per församling 2010-12-31 enligt indelningen 2011-01-01*) and Harlén [2003].

7 Conclusion

Our results establish the long-run success of early modern founded towns that initially seemed to fail. Mercantilist restrictions ensured that growth in these towns was limited by the capacity of the local hinterlands and remained notoriously small before the Industrial Revolution, yet these towns still persist into the present day. The town foundation policy shows that urbanization was not sufficient to trigger intensive growth and agricultural surplus in the areas selected by the Crown. We establish that the locations chosen by the Crown were sub-optimal in terms of urban growth potential and that none of the founded towns had reached the so-called 5,000 inhabitants benchmark, unless staple rights granted access to foreign markets. Comparing rural parishes that were granted market rights to similar rural parishes shows limited growth until 1810. However, during the 19th century with its Industrial and Transport Revolutions, as well as institutional liberalizations, the towns were freed the towns from their previous organic constraints. It was not until this period that the founded towns started to show significant advantages compared to the rural parishes. The growth effect is large and has persisted until today. Neither first nor second nature advantages by 1810 can explain the result.

Instead, our findings emphasize the role of path dependence coming from a potential combination of sunk investments and coordination of future expectations. The paper speaks to current debates along three different lines. Firstly, the initial alleged failure of the policy underlines the importance of overcoming natural constraints to town growth. In the pre-industrial era, these constraints consisted of limits to agricultural surplus and transportation using the existing technology. Current policy-makers may want to consider the existence of other potential constraints for urban growth in a post-industrial world (i.e. supply of skilled workers, amenities and infrastructures, etc.). Secondly, we stress that credible coordination may substitute for agglomeration economies and natural advantages when creating a new town, as long as any natural constraints to town formation have been removed. Thus, signaling to potential migrants and investors a commitment to foster growth in a particular location seems crucial for policy makers. Finally, our paper shows that town formation may take time. The Swedish Kings did not live to see the results of their endeavors but the towns they founded still persist today.

Taken together, our findings support the argument that towns may be stranded in second-best locations, less suitable in terms of physical geography. Yet, if investors are convinced that certain areas will be favored by policy makers in the future, they might invest in these places despite the presence of obvious disadvantages. As urbanization is a strong and persistent trend in today's world, we would like to raise awareness about the fact that policy choices may trap people in sub-optimal locations for centuries. Nevertheless, our findings are also hopeful: the founded towns have persisted until today and appear to be neither better nor worse off than their medieval counterparts in terms of long-run resilience. Thus, while Kings may not be able to create thriving towns, path-dependency forces certainly can.

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A A relative definition of towns

This paper follows a functional definition of towns in terms of market rights, although the debate considering other properties of towns is large. One of the most important contributions to the literature of modern urban growth in Europe is Tisdale's (1942) (De Vries [2006]) demography approach, based on four criteria: population size, density of settlement, share of non-agricultural occupations, and diversity of non-agricultural occupations. De Vries [2006] argues that locations must range high enough in all of these criteria to qualify as towns. De Vries' indiscriminate population cut-off only considers settlements above 10,000 inhabitants. Thus, only Stockholm, Göteborg, and Karlskrona make it into his analysis. Bairoch argues this cut-off to be too high, and proposes to use a (no less arbitrary) 5,000 threshold.

Table 4 shows that France, Italy and Spain were much more populated in 1500, but they grew much less than England, Germany and Sweden, which lagged far behind at the beginning of the period. Although Sweden was only second to England in terms of population growth, the population growth dynamics are not related to urbanization as it is noticeable from remarkably lower population, urbanization rates, and number of towns.

Table 4: Population size and growth in towns

Country	Total population		urbanization rate		Population increase ratios	N towns beyond 10,000
	1500	1860	1500	1750	(1560 - 1860)	(1500-1800)
England	3,942	28,888	7.9	27.7	539	44
Sweden	550	3,824	1.7	4.6	446	3
Germany	1,500	36,049	8.2	8.8	246	56
Italy	10,500	26,081	22.1	22.5	211	75
Spain	6,800	15,642	18.4	21.4	203	43
France	15,000	37,300	8.8	12.7	188	78

Note: This table reports statistics on population from different sources. Total population counts (in thousands) come from Maddison [2007], urbanization rates come from Epstein [2001, p. 10], population increase ratios are from Schön et al. [2015]. England: Wrigley [1985, tab. A9.1, pp. 614-15]. Other countries come from De Vries [2006, tab. 3.6, pp. 36-7].

De Vries' and Bairoch's definitions exclude most of the urban history of Sweden. A recent contribution by Ploeckl [2011], argues that population thresholds should vary across time and space rather than being static, as many of the criteria are affected by their dependence on agricultural endowments at lower than 3,000 inhabitants thresholds. Following the "rank-size rule" developed in Gabaix [1999], if Sweden only had three towns with more than 10,000 inhabitants, most of the growth dynamics occurred in smaller population clusters. The idea is that the ratio of population from the biggest and the second biggest town is half the ratio between towns 2 and 3. Considering that the population of the largest town in Sweden increased from 9,600 inhabitants in 1570 to 72,652 in 1810, it is highly unlikely to find any striking population dynamics in places above 5,000 inhabitants. This is relevant because it proves the role of smaller towns[28], but also shows that Sweden's town foundation policy involved the creation of long-term successful towns that were born too small to influence the capital city. In order to capture urban dynamics for this period, we use the market definition of towns even if we acknowledge that it might fails to account for places that have organically grown to meet all four criteria but do not qualify as towns (i.e., The Hague, some in the UK).

Some researchers (Bairoch et al. [1991]; Van de Woude et al. [1990]; Wrigley [2016]) argue that natural endowments organically constrain urban growth. At first glance, the Swedish economy was remarkably less fortunate than other countries in terms of average soil quality: Table 5 shows that although a few locations in Sweden are as good as the best places in other European countries, the majority of Swedish soil can produce less cereal output than any of the other countries or none at all. The mean value of the quality index is half of that of Spain, but its standard deviation is twice as high as the mean. Moreover, the energy required in terms of firewood is almost four times as high as in Spain. England's

[28] See Desmet et al. [2015] for England's case.

remarkably low consumption of firewood is explained by its rapid transition to using coal as the main source of energy. This "*escape from the organic economy*" has been extensively documented by Wrigley, who argues that it is the main reason behind England's rapid urbanization during between the 16th and 18th centuries (also shown in Table 5).

Table 5: Constraints to organic growth in Europe

Country	Rainfed Cereal Soil Suitability Index			Annual Firewood Consumption in 1800
	Maximum	Mean	SD	GJ/pc
England	9,987	4,182	2,877	2.2
Sweden	9,889	1,312	1,867	37.8
Germany	10,000	5,220	2,297	7.4
Italy	10,000	2,340	2,474	9.3
Spain	9,835	2,696	1,820	12.7
France	10,000	5,364	2,799	9.2

Note: Crop suitability index (value) for high input level rain-fed cereals from FAO/IIASA, 2011-2012. Global Agro-ecological Zones (GAEZ v3.0). Annual Firewood Consumption in 1800 from Kander et al. [2013] and Henriques and Borowiecki [2017].

B Spatial correlation

Table 6: Effect of change in distance to new town in terms of spillovers adjusted to spatial correlation: Regression results using unbalanced samples with HAC Standard Errors

	Panel A: Extensive Growth		Panel B: Intensive Growth	
	(1)	(2)	(3)	(4)
Log dep. variables	Population density	Gross production/area	Gross production/person	Yields
<10 km	0.528*	0.382	-0.146	0.018
	(0.275)	(0.279)	(0.165)	(0.176)
10 - 20 km	0.474*	0.425	-0.049	0.087
	(0.275)	(0.296)	(0.167)	(0.181)
20 - 30 km	0.454*	0.498*	0.044	0.037
	(0.276)	(0.290)	(0.147)	(0.173)
30 - 40 km	0.411	0.531*	0.121	-0.024
	(0.279)	(0.294)	(0.155)	(0.184)
40 - 50 km	0.261	0.313	0.051	-0.111
	(0.277)	(0.285)	(0.155)	(0.168)
50 - 60 km	0.007	-0.220	-0.227	-0.250
	(0.277)	(0.271)	(0.197)	(0.187)
60 - 70 km	0.138	0.039	-0.100	0.342*
	(0.267)	(0.252)	(0.181)	(0.179)
70 - 80 km	0.208	0.071	-0.138	0.174
	(0.249)	(0.221)	(0.154)	(0.126)
80 - 90 km	-0.078	-0.153	-0.075	-0.127
	(0.269)	(0.228)	(0.184)	(0.277)
90 - 100 km	-0.224	-0.559**	-0.335*	-0.265
	(0.257)	(0.230)	(0.174)	(0.326)
Observations	10,645	10,645	10,645	10,645
R-squared	0.035	0.014	0.003	0.005
Number of parishes	2,129	2,129	2,129	2,129
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Note: this table shows the regression coefficients related to a change in distance to town in log variables related to Extensive (Panel A) and Intensive (Panel B) growth measured at different distance cut-offs. Conley HAC Standard errors assuming linear spatial correlation with a decay cut-off at 100 km reported below coefficients, significance denoted by *** p<0.01, ** p<0.05, * p<0.1.

C Balanced sample of parishes: Spillover effects

Table 7: Pre-treatment characteristics of the parish samples

		Panel 1: Unbalanced Sample				Panel 2: Balanced Sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1570 Means	All parishes	Treated complete	Untreated	diff (3)-(2)	t-stat	Treated balanced	Matched	diff (7)-(6)	t-stat
Main variables									
Population	238	257	231	-26	-3.385***	247	264	-17	-1.499*
Population density	6.081	5.020	6.490	1.465	6.018***	5.885	5.771	0.115	0.322
Gross production/area	15.535	11.089	17.235	6.154	5.863***	15.002	12.784	2.218	1.513*
Gross production/person	2.278	2.413	1.93	0.487	5.149***	2.225	1.879	0.345	2.854***
Yields	3.281	3.374	3.250	-0.128	-1.303*	3.239	3.179	0.060	0.403
Confounding variables									
Soil quality	2,864	2,617	2,959	342	3.006***	2,961	2,801	160	1.146*
Km distance to town	31.263	60.692	20.001	-40.686	-22.005***	33.169	30.784	-2.385	-2.229***
Km distance to coast	54.013	61.018	51.333	-9.685	-4.284***	56.248	49.229	-7.019	-2.398***
Km distance to Turku	528.333	515.539	533.226	17.686	2.433***	531.997	539.323	7.326	0.774
Observations	2,129	589	1,540			479	479		

Note: This table shows the means of the pre-treatment characteristics in the whole sample in column (1), in the treated group in column (2) and in the rest of the parishes column (3) for the Unbalanced sample. Columns (6) and (7) present the same statistics for the balanced sample. Columns (4) and (8) show the differences of the means between the untreated and treated samples, and columns (5) and (9) show the t-statistic of the null that these mean differences are equal to zero (Ho:diff=0), where two-side test critical value at 0.05% is 1.960.

Table 8: Effect of change in distance to new town in terms of spillovers: Regression results using a balanced sample

	Panel A: Extensive Growth		Panel B: Intensive Growth	
	(1)	(2)	(3)	(4)
Dep. variables in log	Population density	Gross production/area	Gross production/person	Yields
Distance to town cut-offs				
10 km	0.968***	0.754*	-0.215	0.509
	(0.302)	(0.436)	(0.235)	(0.805)
10 - 20 km	0.917***	0.806*	-0.111	0.574
	(0.291)	(0.438)	(0.237)	(0.815)
20 - 30 km	0.893***	0.875**	-0.018	0.512
	(0.297)	(0.439)	(0.234)	(0.815)
30 - 40 km	0.817***	0.896**	0.079	0.474
	(0.310)	(0.452)	(0.232)	(0.835)
40 - 50 km	0.611**	0.642	0.031	0.346
	(0.294)	(0.431)	(0.228)	(0.803)
50 - 60 km	0.377	0.005	-0.372	0.191
	(0.339)	(0.532)	(0.333)	(0.870)
60 - 70 km	0.327	0.162	-0.165	0.786
	(0.309)	(0.460)	(0.256)	(0.822)
70 - 80 km	0.486	0.169	-0.317	0.534
	(0.321)	(0.440)	(0.234)	(0.804)
Observations	4,790	4,790	4,790	4,790
R-squared	0.752	0.487	0.208	0.226
Number of parishes	958	958	958	958
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Note: this table shows the spillover effects of a change in distance to town in logarithm variables related to Extensive (Panel A) and Intensive (Panel B) growth measured at different distance cut-offs for a balanced sample of parishes balanced on the confounding variables (km distance to medieval town, soil quality, population density, distance to the coast and distance to Turku) and excluding northern Sweden. Standard Errors below coefficients in brackets, significance denoted by *** p<0.01, ** p<0.05, * p<0.1.

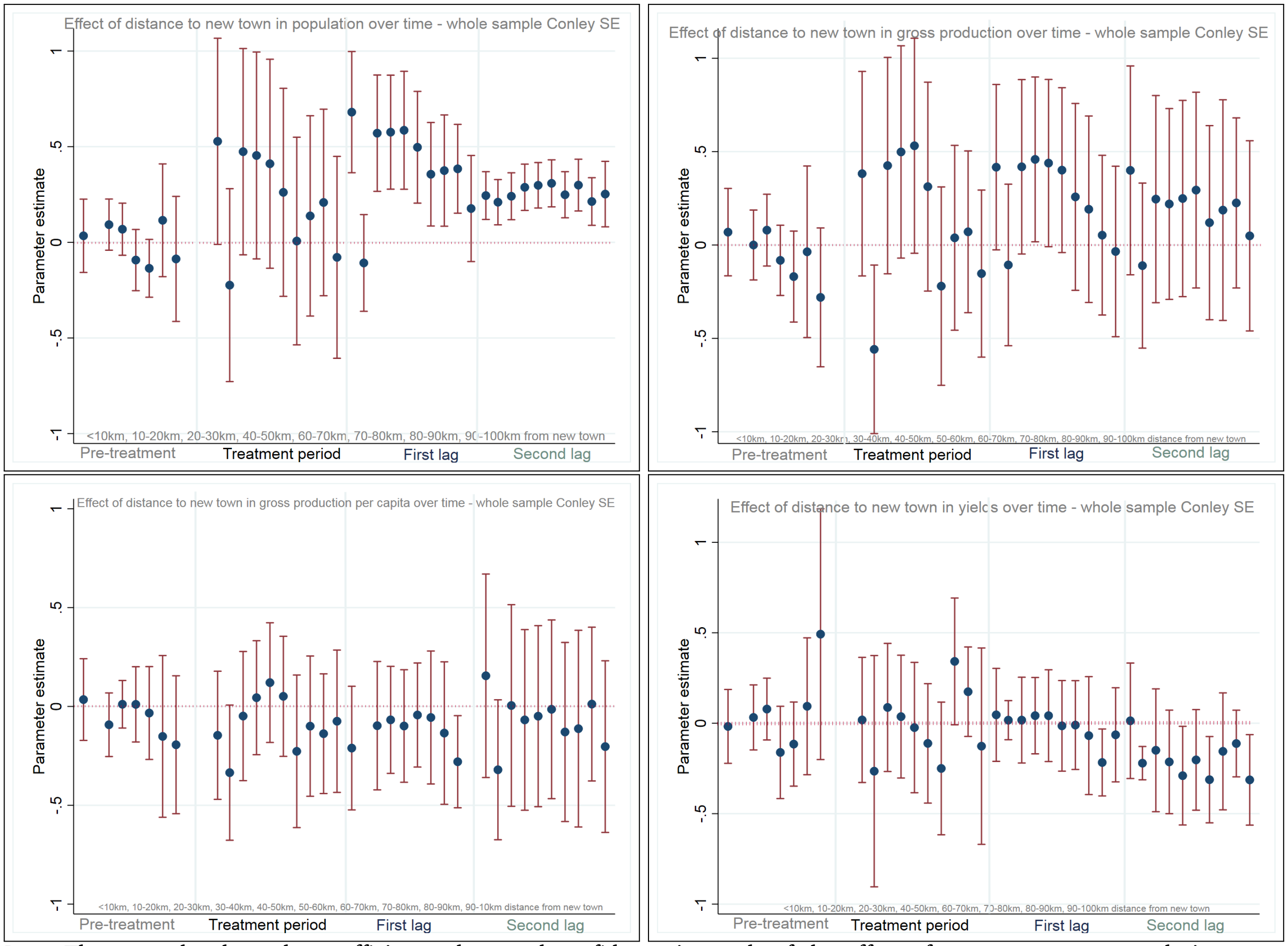
Table 9: Effect of change in distance to new town in terms of spillovers adjusted to spatial correlation: Regression results using balanced sample with HAC Standard Errors

	Panel A: Extensive Growth		Panel B: Intensive Growth	
	(1)	(2)	(3)	(4)
Dep. variables in ln	Population density	Gross production/area	Gross production/person	Yields
Distance to town cut-offs				
10 km	0.968***	0.754*	-0.215	0.509
	(0.253)	(0.392)	(0.253)	(0.646)
10 - 20 km	0.917***	0.806*	-0.111	0.574
	(0.260)	(0.399)	(0.257)	(0.655)
20 - 30 km	0.893***	0.875**	-0.018	0.512
	(0.248)	(0.398)	(0.254)	(0.652)
30 - 40 km	0.817***	0.896**	0.079	0.474
	(0.245)	(0.399)	(0.257)	(0.674)
40 - 50 km	0.611**	0.642	0.031	0.346
	(0.232)	(0.381)	(0.257)	(0.629)
50 - 60 km	0.377	0.005	-0.372	0.191
	(0.249)	(0.334)	(0.296)	(0.519)
60 - 70 km	0.327	0.162	-0.165	0.786
	(0.198)	(0.308)	(0.227)	(0.571)
70 - 80 km	0.486	0.169	-0.317	0.534
	(0.200)	(0.328)	(0.234)	(0.628)
Observations	4,790	4,790	4,790	4,790
R-squared	0.070	0.029	0.008	0.010
Number of parishes	958	958	958	958
Parish FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Note: this table shows the regression coefficients related to a change in distance to town in ln variables related to Extensive (Panel A) and Intensive (Panel B) growth measured at different distance cut-offs. Conley HAC Standard errors assuming linear spatial correlation with a decay cut-off at 100 km reported below coefficients in brackets, significance denoted by *** p<0.01, ** p<0.05, * p<0.1.

D Dynamic effects on the whole sample

Figure 9: Dynamic effects of a decrease in distance to town on the whole sample (biased)



Note: These graphs show the coefficient values and confidence intervals of the effect of a new town on population, gross production, gross production per capita and yields before, during and after one and two lags at different distance cut-offs (within 10 km, 10-20 km, 20-30 km, 30-40 km, 40-50 km, 50-60 km, 60-70 km and 70-80 km). Confidence intervals based on spatial HAC robust standard error dependence following Conley [1999], assuming a linear decay and cut-off at 100 km. For the unbalanced sample, spatial SE correction inflates the standard errors marginally, but does not affect statistical inference.

E Match of founded towns with counterfactual rural parishes

Figure 10: Kernel density plot before and after the match