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Market Access and the Arrow of Time

Abstract

We revisit the natural experiments of division and unification of Germany now that more time has passed and more data have become available. We show that local market access shocks are not symmetric in time. The negative shock to local market access following the division of Germany lead to a fast and strong downward adjustment of the size of West-German cities near the new border. In contrast, the positive shock of reunification did not lead to any change in their relative size, even three decades after the German reunification.

JEL-Codes: F150, J610, N940, R120.

Keywords: market access, iron curtain.

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1 Introduction

The question of how market access affects economic development is a key question in understanding economic geography, economic development throughout history and in quantifying the benefitial effects from trade. It is a key element to explaining differences in economic activity and wealth within and across countries (Redding and Venables 2004). By considering the effects of transportation infrastructure or the effects of changes to trade arrangements, the economic literature provided many examples of instances in which better market access caused population growth and increased wealth. What this paper contributes to this literature is to contrast a negative shock to market access with a positive one in a comparable setting. We show that there are big differences in the way they unfold. Just as it is easier to scramble an egg than it is to unscrabmle it, it seems to be easier to destroy economic connections than to build them.

In a seminal paper on the importance of local market access, Redding and Sturm (2008, from here on referred to as RS) study the effect of the division of Germany on towns close to the newly established border. They find that West-German towns that experienced a disproportionate loss of their market access, declined in terms of population. This population reduction starts almost immediately following the loss of local market access and continues for three decades, before converging to a new equilibrium with a much lower steady-state population level. This effect is only observable for small cities, large cities close to the border are shielded from the loss of local market access and don't experience a statistically significant population reduction. An economic geography model of market access, also part of their paper, can explain these findings, both qualitatively and quantitatively. This model does not feature memory of any sort, or time in any other important way, and hence its comparative statics are symmetric in time: A sudden, unexpected reduction of local market access of a given size in this model has the opposite effect of a sudden, unexpected increase of local market access of the same size. Hence, this paper contains a clear hypothesis on what should happen to border towns following the reunification of Germany. Alongside the effects of division, which is the core part of RS, they consider the effects of reunification. Following their model, they expect a relative increase in the population of cities close to the East-West border. Given the time at which this paper was written, it only uses the years 1992-2002 to study the period after unification. RS do not find such a positive effect, which they attribute to the relative short period. They expect recovery of border cities to become more pronounced in the decades following 2002.

More time has passed, and more data have become available. Germany recently released results of the 2021 census, including population counts for towns and cities up to the year 2021. These additional data enables us to revisit the reunification experiment, and to test if the increased market access for West German towns close to the east had an effect by now. Doing so we can tripple the post-experimental period of the reunification experiment from one decade as in RS to three. This is about the time the negative effects of division on West-German towns took to fully adjust to what appears to be a new steady state equilibrium. Three decades is also three-quarters of the total time of German division.

The surprising conclusion we draw from this exercise is that no reunification treatment effect can be found in this setting. Even three decades after reunification, which is the lifespan of an entire generation, border towns have not started to adjust to the new economic environment. West German cities close to the border and cities that are further away experience perfect parallel development of their population sizes.

We discuss a few of the potential reasons why this effect is not visible, without finding a good reason. We also don't find any reason why we should not consider reunification as a valid natural experiment of positive market access. The stark difference of the reaction of these towns to the two versions of this experiment remains surprising to us. While we don't have a good reason to explain the reunification non-result, we contrast it with other examples in the literature of path-dependent cities that don't adjust to changes in economic fundamentals below. This double-experiment could help to shed light on the contexts in which path-dependent behavior of cities emerges. These findings are also consistent with a literature showing that trade flows within the EU respond strongly to internal regional borders (Santamaria et al 2022).

These new results are important for a number of reasons. First, an implication is that market access should not be used as a linear variable, particularly in contexts where it appears with positive and negative signs simultaneously. Second, this asymmetry might extend to other fields such as trade, where perhaps a positive and a negative tariff shock, or other trade shocks, might lead to reactions that are not simply inverse of one another. Third, these results are important in light of a literature that sometimes finds cities that adjust to shocks, and sometimes concludes that there is path-dependent behavior of city population.[1] Fourth, we contribute an example that can help to explain internal border effects in trade, and that might help to clarify the conditions when they arise. What we contribute to this literature is an example where path dependent behavior appears for cities in the case of a local market access increase, but does not when market access shrinks.

2 Results

The history of German reunification is well known and its economic timeline has been described in detail in many other papers. Here, we only summarize key points that are relevant in the context of using this historic episode as a natural experiment. Regarding the role of expectations, people widely believed that the division of Germany was permanent well into the 1980s. Opinion polls from the 1980s show that fewer than 10 percent of respondents expected reunification to occur during their lifetime (Herdegen 1992). Hence we would not expect any treatment effect due to changing expectations long before 1990. Regarding the speed of reunifiation, the process from the first cracks in the Iron Curtain to a legally unified Germany happened remarkably fast. A state treaty of monetary, economic and social union was enacted rapidly after reunification, followed by East Germany adopting the West German constitution. Existing West

[1] See a recent survey by Lin and Rauch (2022) for references and Allen and Donaldson (2018) for a theoretical framework.

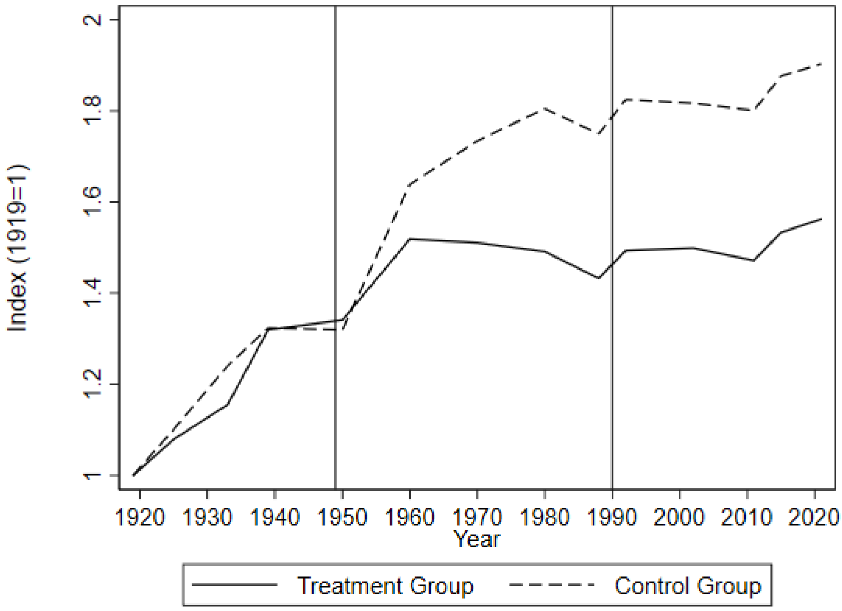


Figure 1: Population indices of treatment and control cities in West-Germany. Treatment is defined as being within 75km of the East-West border. Vertical lines indicate the dates of division and reunification of Germany.

German international treaties and taxation laws were extended to East Germany. All these legal adjustments completed before the end of 1990.[2] This new legal framework removed any administrative barrier for trade early on. The removal of physical barriers and the reconstruction of transport infrastructure connecting east and west also started immediately and were supported with large subsidies. They took longer to complete. In the context of local market access it is worth pointing out that it relies less on highways and railway transport than longer-distance trade.

We use data from the German Statistisches Bundesamt to extend the RS dataset with the years 2011, 2015 and 2021.[3] This data consists of population for all cities in West Germany, where we use the definition of a city as in RS. In Figure 1 we show population indices for population in West-German cities that are within 75km of the East-West border, contrasted with West-German cities that are further away. Both lines represent indices that are normalized to a value of one in 1919. What is new relative to RS are the years after 2002, which are 2011, 2015 and 2021. The figure shows the contrast between the rapid and quantitatively large divergence of the two graphs following the division and the parallel trend in which population develops after reunification. It does not appear that any convergence in the direction of closing

[2]The legal documents referred to here are the state treaty (Staatsvertrag) of July 1990, the unification treaty (Einigungsvertrag) of October 1990 and the West German constitution (Grundgesetz).

[3]Tables “Gemeinden in Deutschland nach Fläche, Bevölkerung und Postleitzahl (3. Quartal)”, downloaded from https://www-genesis.destatis.de/genesis/ on January 10th, 1012.

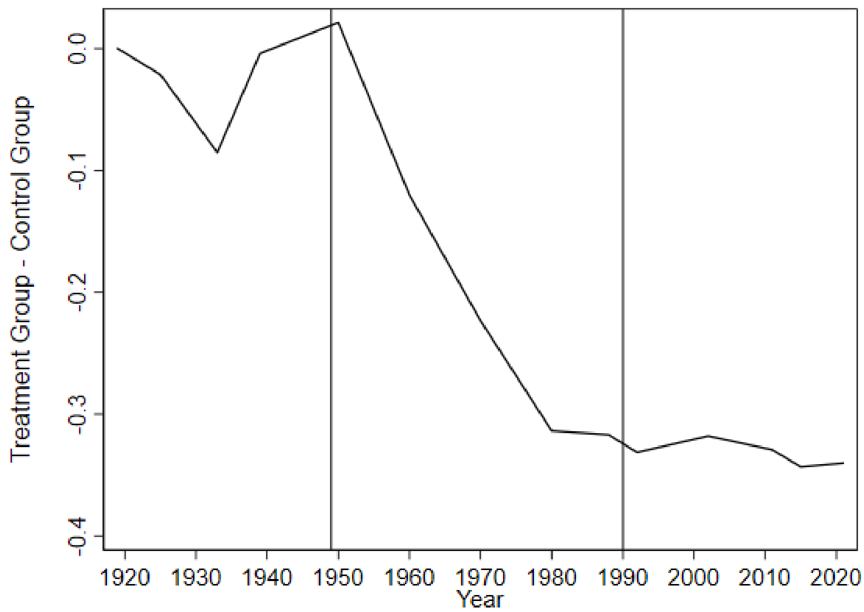


Figure 2: Difference in population indices as in Figure 1, treatment - control.

the gap between the two lines started following unification. It is worth pointing out that there was movement in population numbers after reunification, in the form of population growth, consisting mainly of two upward steps after 2010. So the population dynamic in these cities was not entirely static. The population increase after 1990 happened in a remarkably parallel way in treatment and control cities.

In Figure 2 we show the difference between treatment and control indices as in Figure 1. There was possibly a small uptick of this graph between 1992 and 2002, that however reversed in the following decade. Overall, the figure highlightst again the lack of convergence between the two samples after 1990. In terms of magnitudes, the difference displayed in Figure 2 is -0.32 in 2002 and falls further to -0.34 in 2021. So, the difference between treatment and control cities continued to widen during the entire reunification period as measured here, albeit only by a small amount.

To understand how much population growth we could expect, we simulate the model developed by RS to give us a model prediction for population growth after reunification. We calibrate this model, using the same assumptions and parameter values suggested there. We do not repeat the model discussion and setup here. There are two important differences in how we compute the vector of non-tradable amenities H_c. First, we calibrate the model for 1980, the last year before reunification for which we have data. This assumes that the division experiment has completed, and cities in both East and West Germany reached their new steady-state equilibria in 1980. The horizontal line between 1980 and 1988 in Figure 1 could suggest equilibrium. Second, the sample used in the RS exercise consists of the cities in East and West Germany as well as a sample of cities that are in today's Poland and Russia in a single calibration for Germany pre-division. However, during the time of division, people could not freely migrate between East and West. Hence we calibrate the model separately for cities on either side of the border and obtain the vector of H_c separately from two separate simulations, one for each block. Having computed H_c for East and West, we can simulate the reunification experiment, and get predicitions for expected population growth. This prediction is shown in Appendix Figure 1. As expected, this exercise predicts that cities closer to the border should grow faster than cities that are further away. The effect falls rapidly and monotonically in distance, cutoff points near either 75 or 100km seem sensible for a treatment region if that region should capture all cities with a positive treatment effect. Effects are quantitatively large.

Our adapted calibration exercise of this model can be challenged along several lines. For instance, East Germany was a planned economy with limits on internal mobility, hence this model might not fit well for this part of the map. We verify that the calibration leads to similar results if we use the 1939 calibration numbers from RS. It is also not clear how the divided city of Berlin should be used in such a calibration. In our preferred specification, we split Berlin into an eastern and western part and use each part together with East and West Germany respectively. We verify that other treatments, such as dropping Berlin from the calibration, or counting it entirely as an eastern city lead to similar results. We also make the assumption that equilibrium was reached on both sides of the border, which might not have been the case. It appears in Figure 2 that the differential stopped falling after 1980 and became horizontal. But we don't know if cities in East Germany experienced a similar trend. We also verify that the prediction is similar when using the original calibrated values for H_c computed by RS. We don't show the results of all these calibrations, which all look similar to Appendix Fibure 1. The larger conclusion we draw from simulations of this kind is that any variation of a calibration of this model along similar lines will deliver similar qualitative results: A larger local market should lead to faster population growth. A longer discussion of this calibration and its results are presented in the Online Appendix.

We test the different trends between division and reunification in Table 1. Deliberately, the table follows specifications in RS closely, with again the addition of more years following reunification. The independent variables in this regression are all dummy variables. $Border$ is an indicator for a city being within 75km of the border, $division$ and $reunification$ are indicators for the period of division and reunification respectively. The dependent variable measures annualized population growth. While we included the year 2015 in the previous two figures, we omit it from the dataset used to create the table, so that the reunification data look more similar to the prior data, that mainly consisted of roughly decadal periods. What is new in this table relative to RS is that the additional years enable us to include division and reunification results in a similar way in the same table. An insignificant coefficient on $Border$ in column (1) confirms that there was no differential trend between treatment and control cities in the period before division. The coefficient on $Border \times division$ is negative and significant, and implies a reduction of the annualized growth rates of treatment cities of 0.75 percentage points. The

	Population growth				
	(1)	(2)	(3)	(4)	(5)
Border × division	-0.746***	-0.746***		-1.097***	-0.384
	(0.182)	(0.182)		(0.260)	(0.252)
Border × reunification	-0.202			-0.344	-0.0246
	(0.151)			(0.224)	(0.181)
Border × year 1992-2002		-0.270			
		(0.172)			
Border × year 2002-2011		-0.186			
		(0.144)			
Border × year 2011-2021		-0.149			
		(0.186)			
Border 0-25km × reunification			0.0645		
			(0.183)		
Border 25-50km × reunification			-0.185		
			(0.222)		
Border 50-75km × reunification			-0.360		
			(0.285)		
Border 75-100km × reunification			0.508***		
			(0.175)		
Border 0-25km × division			-0.702***		
			(0.257)		
Border 25-50km × division			-0.783***		
			(0.189)		
Border 50-75km × division			-0.620*		
			(0.374)		
Border 75-100km × division			0.399		
			(0.341)		
Border 0-25km			-0.110		
			(0.185)		
Border 25-50km			0.144		
			(0.170)		
Border 50-75km			0.289		
			(0.272)		
Border 75-100km			-0.299*		
			(0.160)		
Border	0.129	0.129		0.233	-0.009
	(0.139)	(0.139)		(0.215)	(0.148)
City sample	All cities	All cities	All cities	Small cities	Large cities
Observations	1,190	1,190	1,190	600	590

Table 1: Data are a panel of 119 West German cities. The left hand side variable is annualized city population growth. Years included: 1919-1925, 1925-1933, 1933-1939, 1950-1960, 1960-1970, 1970-1980, 1980-1988, 1992-2002, 2002-2011, and 2011-2021. Year effects included in all columns. Border is an indicator for being within 75km of the East-West border. Division is an indicator for the years 1950-1988. Reunification is an indicator for the years 1992-2021. Small and large cities are defined as below or above median in 1919. Robust standard errors are clustered by city. Significance at 1 percent (***), 5 percent (**) and 10 percent (*).

coefficient on $Border \times reunification$ is negative, closer to zero, and not statistically significant. This confirms the observation from the figures that there was no differential trend in terms of population growth between treatment and control cities since reunification. All of these findings are consistent with the trends visible in Figure 1.

In column (2), we divide the reunification and border interaction effect into three sub-periods corresponding to the three component reunification decades. This decomposition does not change coefficients on *Border* and $Border \times division$ numerically. All three coefficients on the sub-periods are not statistically significant at 5 percent level and small in terms of magnitude. The sign on all coefficients is negative. This confirms the impression from Figure 1, that there was no convergence between treatment and control in any of the reunification periods, and that if anything, the gap widened further.

Column (3) decomposes the effect in size bins by distance to the border. While the trend of the negative effect of division declines with distance to the border and loses in terms of statistical significance with increased distance, we don't observe the same for these distance categories following reunification. All coefficients within 75km of the border in the reunification period are small and statistically insignificant. The largest of the reunification coefficients is the distance indicator capturing the band of 75km-100km, which is positive and statistically significant at one percent. When we investigate this set of cities and years, we find that this positive effect is not driven by one outlier, but rather a number of positive growth draws in this sample, the largest being fast population growth in Giessen between 2011-2021. We don't have an explanation why this effect appears, and attribute it to noise. We note that this distance band only contains 10 cities and hence may be prone to small sampling noise. There is a resulting concern that perhaps random fluctuations in this particular distance band, which is classified as control group when using a 75km treatment cutoff, downward biases the differential trend. In Figure 3 below, we verify that there is also no convergence of city sizes between treatment and control if treatment is defined alternatively as 0-100km.

Columns (4) and (5) repeat the exercise from column (1) separately for a sample of only small and large cities, which are defined as above or below median in 1919. The negative effect for division is only found in the case of small cities. When it comes to the reunification period, both coefficients on $Border \times reunification$ in columns (4) and (5) are not statistically significant at conventional levels and small in terms of magnitude. So neither small or large cities mean revert to their initial relative size after reunification when looked at separately. They both follow similar trends to the control cities. Considering magnitudes further, small cities have a smaller coefficient, and hence continue to decline in size relative to large cities. This difference, however, is small and not statistically significant.

3 Discussion

In this section, we discuss a few potential explanations for what factors could lead to the observed differences in adjustment following division and reunification. A first concern could

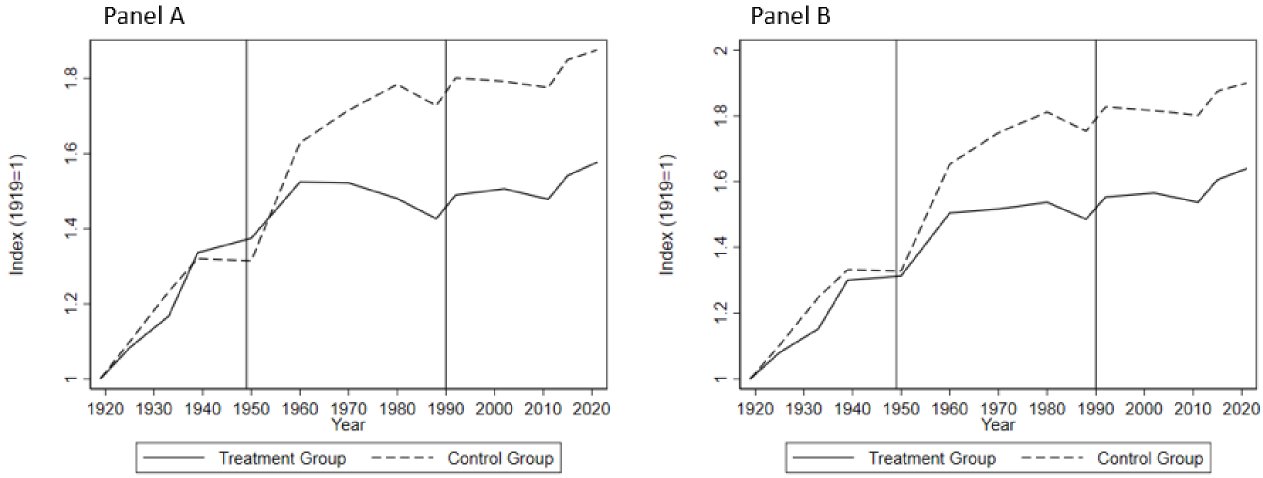


Figure 3: Similar to Figure 1, except that treatment is defined as being within 50km of the East-West border in Panel A, and as being within 100km of the East-West border in Panel B.

simply be that the definition of treatment is not a good fit for the reunification period and that the true effect would be visible when using a better specified treatment definition. The positive coefficient on $Border\ 75 - 100km \times reunification$ in column (3) of Table 1 could suggest as much. To address this concern, we repeat the exercise with different treatment definitions in Figure 3. Panel A uses a more narrow definition of 0-50km while Panel B uses a wider definition of 0-100km. Differences appear wider in Panel A during the period of division, consistent with the observation that effects are stronger closer to the border. Neither panel however shows any narrowing of the gap in the reunification period. We conclude that a miss-specified treatment definition is not likely the cause of us failing to find convergence in city sizes post reunification.

Second, perhaps East Germany simply was not an attractive local market for West Germany given its lower average income and its higher unemployment. Incomes between Eastern and Western states were comparable before division (Ritschl 1996), but differed substantially after reunification. In terms of the model of RS, this explanation would be consistent with the model if cities in the east could be counted as effective zeros. The first response to this explanation is that in the three decades of reunification, gaps in GDP and unemployment have narrowed. Figure 4 shows nominal GDP for states in East and West Germany.[4] The figure shows that eastern states had higher growth rates, and after 2020 they have caught up with the lower end of the West-German distribution. The unemployment gap equally narrowed substantially. For example, in 2000 unemployment was 17,1% in East Germany and 7,6% in West Germany, falling to 6,7% and

[4]We obtain GDP per capita for Länder using Table“VGR der Länder (Entstehungsrechnung) - Bruttoinlandsprodukt zu Marktpreisen (nominal): Bundesländer, Jahre” and Table “Bevölkerung: Bundesländer, Stichtag” from Statistisches Bundesamt DeStatis, downloaded from https://www-genesis.destatis.de/genesis/ on January 10th, 1012.

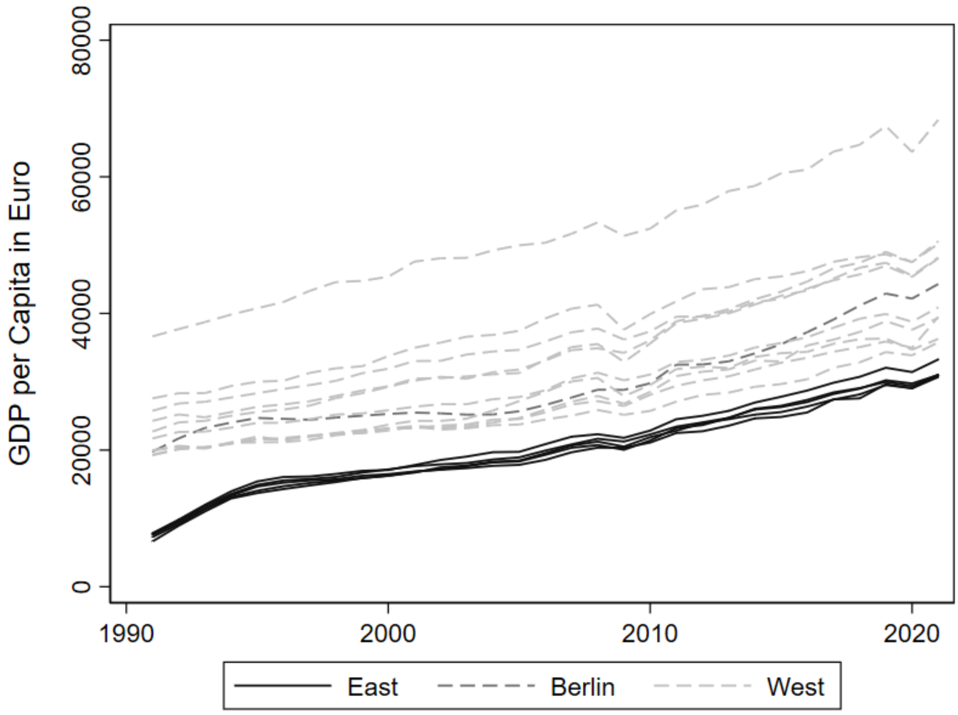


Figure 4: Nominal GDP per capita for German states.

5% in 2022 respectively.[5] This closing of the gap was influenced by large subsidies benefitting East Germany and does not only reflect improvements in technology and productivity. Any source of income would create local demand and hence improve the value of local market access. We would expect that a narrowing gap in GDP and unemployment would lead to some movement in differential population growth between treatment and control cities, if it was the only factor preventing the closing of the gap. A second response to this potential explanation would be, that large differences in unemployment and income would provide incentives for migration from east to west, which would also appear as treatment effects in our regressions if internal migration is higher at short distances (as in Bakker et al. 2020). On average, about 1 percent of the East German population migrated West per year between 1991-2004, which is a similar proportion to people who migrated between western states during the same period (Nitsch and Wolf 2013).

A third potential explanation could be that subsidies could have counterbalanced and offset market forces. This explanation would be particularly relevant if there were subisidies or other policies that correlate with the treatment areas. And indeed, there were programs to help areas in West Germany close to the eastern border ("Zonenrandgebiet") from 1971. These programs were stopped shortly after reunification in 1994. Ehrlich and Seidel (2018) show that the economic and demographic effects of these subsidies were substantial, but seem to have involved a reallocation of economic activity from a region 20-30km west of the Zonenrandgebiet into the Zonenrandgebiet. These findings suggest that the effect of these policies only contributed to a reallocation of economic activity within a region 60-70km of the East-West border and was entirely contained therein. This region lies within the treatment definition of 75km used here. Any reallocation that is contained within this region would not show up in specifications such as in Figure 1. These subsidies were stopped shortly after reunification and don't directly influence most of the reunification period directly. Could it be that the end of these subsidies offset the positive effect of a gain in market access? If so, these two effects would have to cancel each other out for three decades to be consistent with our findings. Ehrlich and Seidel (2018) show that cities that lost these subsidies did not experience a negative shock, and that rather the positive effect of the Zonenrandgebiet support persisted after the program was ended. They come to this conclusion from regressions that control for market access changes, and that use data that varies with distance to the former border. Regarding other types of subsidies, following reunification, large subisidies of various kind were created to help the Eastern States catch up with the West, under the *Aufbau Ost* program, financed through a combination of new types of debt and new taxes. These programs however were not targeted towards regions near the former border, but at East Germany as a whole, and thus can't explain the differential non-effect we report.

Fourth, a further explanation might be that economic borders consist of more than walls and are hard to remove, such that border effects can persist even in the absence of physical borders or

[5]Data from Bundesagentur für Arbeit. (3. Januar, 2023). "Arbeitslosenquote in West- und Ostdeutschland von 1994 bis 2022." Downloaded on 17. January 2023 from https://de.statista.com/statistik/daten.

regulatory barriers. Regional political borders remain a strong impediment to trade in Europe more generally (Santamaria et al 2022). While trade between East and West Germany exceeds trade with comparable neighboring countries in the early 1990s (Nitsch 2002), the former East-West border remains a substantial detectable negative barrier to intra-German trade even 20 years after reunification compared trade by West Germany states. This Iron-Curtain legacy effect is estimated to disappear 33-40 years after reunification (Nitsch and Wolf 2013). This echos Beestermöller and Rauch (2018), who show that European trade between countries to the East and West of the Iron Curtain converged to gravity predicitions within a few decades after 1990. An explanation for this long shadow could be that social and business networks take time to re-establish. Once established, personal relationships lead to economic relationships rapidly, including in the context of German unification (Burchardi and Hassan 2013). Taking these estimates together, we would have expected the legacy of the border to disappear, or at least reduce by now. Ethnic or linguistic differences that can lead to trade barriers (Schulze and Wolf 2009, Felbermayr and Toubal 2010) are not likely to matter in the case of reunited Germany where language, history and ethnicity coincide.[6] Therefore we don't think that persistent trade barriers between East and West can explain the lack of convergence we observe in more recent decades.[7]

Fifth, we note that the non-reaction is consistent with other examples of path-dependent behavior in the size of cities. Michaels and Rauch (2018) show that many Roman towns were founded in locations with suboptimal market access. They suffered from less population growth than cities in more favourable locations, yet this differential growth effect was so small that towns in inefficient locations still exist with sizable populations after almost two millenia. Similarly, Bleakley and Lin (2012) find path depenent behavior of portage towns that lasted for centuries. Hanlon (2017) analyzes the effect of the U.S. Civil War on the spatial structure of the U.K. textile industry. In this period, English cities specializing in cotton textiles came under economic pressure. Not only did these cities suffer short-term loss of population compared with other textile centers based on wool, linen, or silk, but these negative effects persisted well beyond the duration of the war. Kline and Moretti (2014) show that a temporary regional development program led to gains in manufacturing that continued well beyond the duration of the program. Path-dependent bahviour of infrastructure was documented in the specific context of German division in the case of airports (Redding et al 2011). The literature, however, also provides many examples where city sizes respond rapidly to shocks, including to changes in market access (Davis and Weinstein 2002, Brakman et al 2004, Miguel and Roland 2011, Maurer and

[6]In the aftermath of the Second World War, West Germany received a large inflow of eight million ethnic Germans that were expelled from territories in Eastern Europe, increasing its population by 20 percent. Therefore, the population of West Germany in 1990 consisted of people originating from territories bordering East Germany to the west, east and south (Peters 2022).

[7]A related hypothesis could be that local market access perhaps simply is not that important. For example, Baum-Snow et al (2020) find that roads that improve local market access have small or negative effects on prefecture economic activity and population in China. However, if this was the case, we could not explain the strong and fast effects observed during the period of division.

Rauch 2022, Bakker et al 2021). What our new results add to this literature is show that the direction of local market access change could influence the strength of lock-in effects such that a negative shock could lead to a faster and stronger adjustment than a positive one.

4 Conclusion

While West-German cities near the East-West border suffered a relative decline in terms of population during the period of German division, they did not experience relative excess growth following reunification. Here, the same natural experiment was repeated twice in the opposite direction, and only once resulted in a measurable response. This shows an asymmetry in time in the way cities react to market access shocks. They seem to react to a negative shock to their local market access in a fast and sizable negative way, but they seem not to react to a positive shock at all.

This new result is important for a number of reasons. First, an implication is that market access should not be used as a linear variable, particularly in contexts where it appears with positive and negative signs simultaneously. Second, this asymmetry might extend to other fields such as trade, where perhaps a positive and a negative tariff shock, or other trade shocks, might lead to reactions that are not simply inverse of one another. Third, these results are important in light of a literature that sometimes finds cities that adjust to shocks, and other times concludes that there is path-dependent behavior of city population. We suggest that the direction of the shock could influence whether path-dependence occurs.

References

- Allen, Treb, and Dave Donaldson. “The geography of path dependence.” Unpublished manuscript (2018).
- Bakker, Jan David, Christopher Parsons, and Ferdinand Rauch. “Migration and urbanization in post-apartheid south africa.” The World Bank Economic Review 34.2 (2020): 509-532.
- Bakker, J. D., Maurer, S., Pischke, J. S., & Rauch, F. (2021). “Of mice and merchants: connectedness and the location of economic activity in the Iron Age.” Review of Economics and Statistics, 103(4), 652-665.
- Baum-Snow, N., Henderson, J. V., Turner, M. A., Zhang, Q., & Brandt, L. (2020). Does investment in national highways help or hurt hinterland city growth?. Journal of Urban Economics, 115, 103124.
- Beestermöller, Matthias, and Ferdinand Rauch. “A dissection of trading capital: Trade in the aftermath of the fall of the iron curtain.” The Journal of Economic History 78.2 (2018): 358-393.
- Bleakley, Hoyt, and Jeffrey Lin. “Portage and path dependence.” The Quarterly Journal of Economics 127.2 (2012): 587-644.
- Brakman, Steven, Harry Garretsen, and Marc Schramm. “The spatial distribution of wages: Estimating the Helpman-Hanson Model for Germany.” Journal of regional science 44.3 (2004): 437-466.
- Burchardi, Konrad B., and Tarek A. Hassan. “The economic impact of social ties: Evidence from German reunification.” The Quarterly Journal of Economics 128.3 (2013): 1219-1271.
- Davis, Donald R., and David E. Weinstein. “Bones, bombs, and break points: the geography of economic activity.” American economic review 92.5 (2002): 1269-1289.
- Ehrlich, Maximilian V., and Tobias Seidel. "The persistent effects of place-based policy: Evidence from the West-German Zonenrandgebiet." American Economic Journal: Economic Policy 10.4 (2018): 344-74.
- Felbermayr, Gabriel J., and Farid Toubal. “Cultural proximity and trade.” European Economic Review 54.2 (2010): 279-293.
- Hanlon, W. Walker. “Temporary shocks and persistent effects in urban economies: Evidence from British cities after the US Civil War.” Review of Economics and Statistics 99.1 (2017): 67-79.
- Herdegen, Gerhard. 1992. “Einstellungen zur Deutschen Einheit.” In Handwörterbuch zur deutschen Einheit, ed. Werner Weidenfeld and Karl-Rudolf Korte, 272-83. Frankfurt am Main: Campus.
- Kline, Patrick, and Enrico Moretti. “People, places, and public policy: Some simple welfare economics of local economic development programs.” Annu. Rev. Econ. 6.1 (2014): 629-662.
- Lin, Jeffrey, and Ferdinand Rauch. “What future for history dependence in spatial economics?.” Regional Science and Urban Economics 94 (2022): 103628.
- Maurer, Stephan, and Ferdinand Rauch. “Economic geography aspects of the Panama Canal.” Oxford Economic Papers 75.1 (2023): 142-162.
- Michaels, Guy, and Ferdinand Rauch. “Resetting the urban network: 117–2012.” The Economic Journal 128.608 (2018): 378-412.
- Miguel, Edward, and Gerard Roland. “The long-run impact of bombing Vietnam.” Journal of development Economics 96.1 (2011): 1-15.
- Nitsch, Volker, “Border effects and border regions: lessons from the German unification”, Hamburgisches Welt-Wirtschafts-Archiv (HWWA) Discussion Paper, ISSN 1616-4814, 2002.

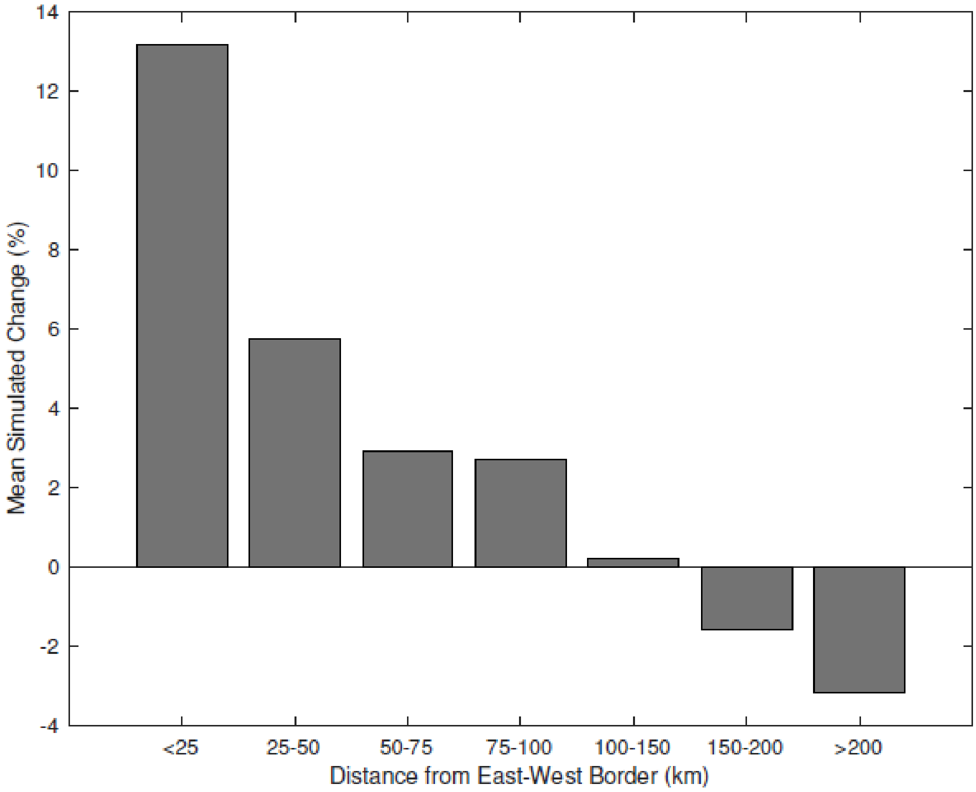
- Nitsch, Volker, and Nikolaus Wolf. “Tear down this wall: on the persistence of borders in trade.” Canadian Journal of Economics/Revue canadienne d’économique 46.1 (2013): 154-179.
- Peters, Michael, “Market size and spatial growth - evidence from Germany’s post-war population explusions”, Econometrica, Vol 90, No 5, 2357-2396, September 2022.
- Redding, Stephen J., and Daniel M. Sturm. “The costs of remoteness: Evidence from German division and reunification.” American Economic Review 98.5 (2008): 1766-97.
- Redding, Stephen J., Daniel M. Sturm, and Nikolaus Wolf. “History and industry location: evidence from German airports.” Review of Economics and Statistics 93.3 (2011): 814-831.
- Redding, Stephen, and Anthony J. Venables. “Economic geography and international inequality.” Journal of international Economics 62.1 (2004): 53-82.
- Ritschl, A. O. (1996). An exercise in futility: East german economic growth and decline, 1945-89. In Crafts, N. and Toniolo, G., editors, Economic Growth in Europe since 1945, pages 498–540. Cambridge University Press, New York.
- Santamaria, M., Ventura, J., and Yeşilbayraktar, U. (2022). Exploring European Regional Trade, Working Paper.
- Schulze, Max-Stephan, and Nikolaus Wolf. “On the origins of border effects: insights from the Habsburg Empire.” Journal of Economic Geography 9.1 (2009): 117-136.

5 Online appendix

Appendix Figure 1 shows the results of a calibration of RS for 1980. This figure corresponds to Figure 1 in RS. We calibrate this model, using the same assumptions, equations and parameter values suggested there. We do not repeat the exposition of this exercise here, which would be entirely repetitive. There are two important differences in how we calibrate non-tradable amenities H_c. First, we calibrate the model for 1980, the last year before reunification for which we have data. Wen then contrast this pre-period with the differential market access predicted post reunification. Second, RS use the sample of cities in the East and West as well as cities that are in today's Poland and Russia in a single calibration to approximate city sizes before division. However, during the time of division, people could not freely migrate between East and West. Hence we calibrate the model separately for cities on either side of the border and obtain the vector of H_c separately from two separate simulations, one for each block. The x-axis shows ranges in distance from the former border in km, the y axis depicts mean simulated change in population, that is the simulated growth of Wester German city population relative to the average city growth in Germany.

The city of Berlin constitutes a challenge in this calibration exercise, as it is located in East Germany but was itself divided into Eastern and Western parts. RS calibrate the model with data from 1939 and simulated only Western Germany after the division, the division of Berlin did not constitute a challenge. This is different in the present case, however. A suitable approach might be to split Berlin into an Eastern and a Western part for the calibration - each calibrated with East or West Germany respectively. This is the approach we follow here, we divide Berlin, compute two separate amenities, and add these two amenity values to measure amenties for the new reunified city of Berlin. This sum can be seen as an upper limit of total amenities in the city as the amount of amenities per person decrease with city size. A lower bound would be to treat Berlin as de facto combined, which results in a lower measured amenity value. We compute that second simulation also, and find that while the result changes slightly quantitatively, they remain qualitatively the same.

We also find that the qualitative results of such calibration exercises do not depend much on the level of amenities in the East. For instance, using the amenity values from the original Redding and Sturm (2008) calibration for 1939, the results hardly change at all - even quantitatively they are very similar. The same holds true for a general level change of amenities in the East. A constant increase in the level of amenities for Eastern cities makes the entirety of Eastern cities more attractive and leads to a general migration to the East. But the difference-in-difference prediction is not much affected by such adjustment and resulting general West-East migration. Any calibration we tried in which the market mechanism is restored and towns close to the border gain market access leads to a strong and monotonically declining treatment effect.



Appendix Figure 1: Model prediction for population change by distance to the East-West border.