Available online at www.sciencedirect.com
SCIENCE DIRECT®
Explorations in Economic History 42 (2005) 414–438
Explorations in Economic History
www.elsevier.com/locate/eeh

# Path dependent border effects: the case of Poland's reunification (1918–1939)☆

Nikolaus Wolf*

*Freie Universität, Berlin, Germany*

Received 19 February 2004
Available online 4 January 2005

**Abstract**

The paper explores the persistence of former borders in an integrating economic area, the reborn Polish nation state after World War I. It uses a gravity model of trade for the years 1926–1934 in order to assess the impact of former partition borders that Poland inherited from its period of partition between Germany, Russia, and the Habsburg monarchy (1795–1918). The findings point to a persistent but decreasing impact of former borders over time, interrupted during the Great Depression. Compared to recent findings on border effects between Canada and the US or home bias effects across member states of the contemporary European Union or even between US states the Polish domestic market was quite well integrated.


*Keywords:* Economic intergration; Border effects; Interwar period; Poland
*JEL classification:* F11; F12; F14; F15; N74; O51

☆ I am grateful to James Anderson, Michael Burda, Zbigniew Landau, Volker Nitsch, Kevin O'Rourke, Stephen Redding, Albrecht Ritschl, Jerzy Tomaszewski, Harald Uhlig, and to two anonymous referees for helpful comments and discussion.
* Fax: +49 0 30 838 54120.
*E-mail address:* nikolaus.wolf@wiwiss.fu-berlin.de

0014-4983/$ - see front matter 
doi:10.1016/j.eeh.2004.10.002

## 1. Introduction

McCallum (1995) demonstrated that intra-national trade between Canadian provinces seems to exceed interstate trade with US states by a factor of 20. Similar "border effects" have been documented for member states of the OECD (Wei, 1996), and the EU (Nitsch, 2000). Anderson and van Wincoop, 2003 (see also Head and Mayer, 2002) identified factors that reduce the estimated border effects somewhat, but never make them disappear: the trade diverting impact of borders has become a stylised fact.

This paper aims to add a prominent historical case to the border-effects literature: the reunification of Poland in 1918. As economic historians and contemporary economists have pointed out, the European economy after World War I was characterized by a sharp decline in international trade and factor flows, due to political changes after the Peace Conferences in 1919 (Feinstein et al., 1997; Pollard, 1981). The break-up of the Habsburg monarchy and its consequences for East Central Europe have been studied in great detail (Berend and Ranki, 1974; Kaser and Radice, 1985; Komlos, 1983). However, this disintegration on the European scale was mirrored by efforts to integrate a large area in Central Europe: the Second Republic of Poland. By use of domestic trade data I examine whether the economic integration of Poland during the short time span between the two wars succeeded or not. Did Poland overcome the heritage of its partitions? How persistent were former borders in the "Polish economic union," an area with one currency, one government, and one language?

My findings point to persistent but decreasing effects of the former borders over time, interrupted during the Great Depression. I am able to compare my results directly to that of Anderson and van Wincoop (2003) on the effect of the Canadian–US border on aggregate bilateral exports in 1993 between US states and Canadian provinces since I employ their method here. They find a border effect that is much larger than any of my aggregate or sector specific estimates for Interwar Poland suggests. Similarly, if I take the EU (Nitsch, 2000) or even US intra-national trade (Wolf, 2000) as a benchmark, then again interwar Poland was a surprisingly well-integrated economic area.

## 2. Poland after the First World War

Between 1772 and 1795, the noblemen's republic of Poland (*Rzeczpospolita Polska*) was divided into three parts: the empires of tsarist Russia, the Habsburg monarchy and the emergent Prussia. As a consequence of the partitions—"the first very great breach in the modern political system of Europe" (Edmund Burke)—Poland disappeared from the map. Only the specific constellation at the end of the First World War, where all three partition powers were severely weakened through war and revolution, opened the way for its restoration.

The area of Poland in mid-1918 can be described as a power vacuum in central Europe, with several political and military authorities struggling for influence over a territory without clearly shaped borders. As a rough approximation this territory consisted of four distinct parts: the three parts of the former *Rzeczpospolita*, which

Russia, Prussia and the Habsburg monarchy by 1795 had divided between themselves, and some territories in the east that were claimed by several Polish political groups. In official statistics, the state was from 1921 onwards organized in 17 administrative units (*vojvodships*) that followed the former partition borders. These units are often found to be aggregated into the mentioned four parts of the new state: the western, southern, and central *vojvodships*, covering approximately the former partition areas, and the eastern *vojvodships*, covering the newly attained areas in the east.[1] The area of the central *vojvodships* is approximately congruent with the former "Kingdom of Poland" that up to the Polish insurrection in 1863 had autonomy within the Russian empire. Map 1 in the Appendix shows the borders of Poland from 1921 onwards, and indicates the former partition borders. Map 2 shows that the administrative borders of vojvodships followed these former partition borders.[2]

The devastations of the First World War affected 90% of this area, destroyed the harvest and the livestock, buildings and machines, bridges and railways. Even more damage was done by the exploitation through the German and Russian occupants during the war and sabotage during their retreat (Duda and Orłowski, 1999, p. 231). But the major challenge to building up a Polish state was to unify its different parts. Owing to the long period of partition, there were different legislations about virtually all aspects of social, political, and economic life. Tariffs, regulations, and a lack of transport and communication facilities prevented people from reacting to those different legislations. So presumably the Polish economy was not only devastated by a war, but it was also quite inefficient across the four parts of Poland already before the war.

Therefore, from an economic point of view the task was to unify the institutional framework and to improve the facilities for transport and communication in order to remove these inefficiencies. It seems that a majority of Polish politicians understood that task when the situation gradually stabilized in November 1918. The government could actually rely on extensive programs for legal, administrative, and economic unification that had been prepared since 1907 for a future Polish state. However, the agenda was not set by any political or economic "master plan," but rather by the ongoing war that Polish troops fought with the Soviet army in the east.[3]

The war required massive outlays and some mechanism to finance them. Since international credit was not available—the Paris peace conference did not start before January 1919, and Poland was yet to be formally recognized as a state—the government had to choose between the expropriation ("nationalisation") of domestic private capital and some mechanism to tax it (Landau and Tomaszwski, 1999). The political compromise in 1919 relied on early concessions to the socialists on the one hand (the 8-h working day was introduced already in November 1918, see Landau, 1992) and observing private property rights on the other. As a consequence,

[1] Western vojvodships comprised: Poznań, Pomerania, Silesia; central: city of Warsaw, Warsaw, Lódź, Kielce, Lublin, Białystok; southern: Kraków, Lwów, Stanisławów, Tarnopol; and eastern: Wilno, Nowogrod, Polesia, Wolhynia; see Mały Rocznik Statystyczny, Warsaw (1939).

[2] The only exception to this rule is the vojvodship of Białystok, where only the western part belonged to the former Kingdom of Poland, see Maps 1 and 2.

[3] For the following see Landau (1992) and Roszkowski (1992).

the next step was to create the institutional framework necessary to tax capital and labour: a common currency and a working fiscal administration. The unification of the fiscal administration belonged to the very first institutional changes. While for the southern and central *vojvodships* this was formally reached already in April 1919, the former German parts remained separated until January 1922, (Upper) Silesia even up to June 1922.[4] A common income tax was decreed in July 1920, but, because of administrative difficulties, it took several years to implement it on the former Russian territories. Business taxes in turn were introduced and unified on the whole territory by July 1925, following the Russian system of business certifications. However, some differences of the tax system—for example, the real estate tax—were not removed before 1936.[5]

The precondition for any tax system to work was the creation of a common currency area, namely the unification of the five (!) currencies that were in circulation on the Polish territory: the German Mark, the Austrian Crown, and the Russian Rouble, as well as the Polish Mark in the Kingdom of Poland and the "Ost-Rubel" on the territory of "Ober Ost"[6]—two currencies that the Germans introduced on former Russian territories after their occupation. Since the Warsaw government only controlled the Polish Mark, it adopted a stepwise strategy to get rid of the competing banknotes (Landau, 1992). Some months after the introduction of the Polish Mark as a parallel currency in the different areas, the other currencies were withdrawn. For the central, southern, and western *vojvodships*, this was realized already in April 1920, with the exception of Upper Silesia (Nov. 1923).[7] While such a quick institutional change was an indisputable success, it could not create the necessary revenues to win a war. But it opened the way for the Polish government to effectively tax money holders by inflation. As estimated by Zdziechowski (1925), the money supply increased between 1918 and 1919 by 519%, in the following year by another 929%, to reach in 1923 more than 12000000% (!) of the level in 1918.[8] Obviously, the temporal gains from seigniorage and the devaluation of the budget deficit were quickly wiped out by the costs of hyperinflation, namely the loss of access to foreign capital. When Prime Minister Władysław Grabski tried to stabilize the currency in 1924, his definite aim was to link the Polish currency with some foreign currency that had successfully restored the gold standard in order to get access to the international capital market. Indeed, Grabski managed to realize this task with the help of a temporary property tax, fixed in Swiss gold francs, and several international loans. Already in mid January 1924 the nominal exchange rate was stabilized and a new currency, the Złoty, was fixed par with the Swiss gold franc (1 Złoty = 9/31 g of pure gold). A new institution, the Bank Polski S.A., was introduced with the exclusive right to issue

[4] See Markowski (1927), *Organizowanie administracji skarbowej w Polsce (1918–1927)*, Warsaw.

[5] For details see Weinfeld (1935).

[6] "Ober Ost" was a German military state, founded in 1915 by the General Ludendorff, on the territory of the former Grand Duchy of Lithuania. See Vejas G. Liulevicius (2000), *War Land on the Eastern Front: Culture, National Identity and German Occupation in World War I*, Cambridge MA: Cambridge University Press.

[7] See Zbijewski (1931).

[8] See Zdziechowski (1925).

banknotes, while the government kept the right to issue coins (Zbijewski, 1931). The fixed parity turned out to be an overvaluation, which had to be corrected in several devaluations of the Złoty from July 1925 on, but it nevertheless prepared the ground for a stable currency. The exchange rate stabilized at a sustainable level around May 1926, while formally the new parity was fixed only in October 1927 at 1 Złoty = 1000/5924.44 g of pure gold.[9] From now on the government started to defend the parity at any cost, adhering to the gold standard until 1936.

The war in the east also had a direct impact on the transportation system, since it required a network to transport men and material. After rather spontaneous takeovers of the railway networks in the different areas during the last months of the First World War, already in October 1918 a railway ministry started its work and developed a 10-years plan for the completion and extension of the polish railway network. At the same time the heritage of 129 types of cars and 165 types of engines had to be unified, new kinds of freight cars had to be developed (for example, refrigerator wagons), the different densities of the network adjusted and the main economic centers of the former partition areas connected.[10] The speed of the network and its capacity to transport goods was not only a function of the existence of railway connections themselves, but also crucially depended on the material used. Since nearly all freight transport took place on railways with normal gauge, this development of the railway network can be expected to have had a strong integrating impact on the economy. Table 1 gives data on the volume of goods transported on state railways (normal gauge) and inland waterways. There exists no data on road-transports, but the number of registered vehicles during the interwar period suggests that its impact was even less important than inland waterways. Brzosko (1982) estimated the share of railways in total transports as 97.6% (1925) and 98.7% (1938).[11] Table 2 gives the development of important newly built railway lines and the changes in speed.

Thus, the effects of different currencies, different tax systems, and shortage of transport facilities as barriers to trade and mobility within the new Polish state were considerably reduced if not completely removed by 1926. The tariff-barriers were removed already in the mid-1921. One of the first steps to unify the new economy was the introduction of a common external tariff in November 1919. But it took some more time to get rid of internal tariffs and a system of widespread regulations of commodity and factor markets. Again, in part this system was motivated by the need to furnish the Polish troops, fighting with the Soviet army in the east, but it had also aspects of political logrolling between different groups. Especially the markets for agricultural products (for example, bread, grain, potato, and sugar) and basic commodities (for example, coal, soap, and matches) were affected by a variety of

[9] See Dziennik Ustaw RP, Nr. 88, poz. 790, Warsaw, 1927.

[10] Hummel (1939), *Odbudowa i utrzymanie kolei* [Rebuilding And Maintenance Of Railways] in: *Dwudziestolecie komunikacji w Polsce Odrodzonej* [20 Years of Communication in a Reborn Poland], Kraków, p. 146.

[11] Brzosko (1982), also Roman Buczyński, *Struktura rynku zbożowego w Polsce. Referat opracowany dla Komisji Kontroli Cen* [The structure of agricultural markets in Poland. Report at the Commission for Price Regulations], Warsaw (1939), pp. 91ff.

Table 1
Transports (1000 tons) on inland waterways (IW) and railways (RW), 1931–1936

| | | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 |
|---|---|---|---|---|---|---|---|
| Total transports | IW | 496 | 479 | 520 | 671 | 713 | 725 |
| | RW | 63767 | 48716 | 48825 | 54897 | 56203 | 57851 |
| Domestic transports | IW | 173 | 200 | 214 | 297 | 299 | 253 |
| | RW | 37641 | 30878 | 30491 | 34843 | 36740 | 39456 |

*Source*. Concise Statistical Yearbook of Poland 1938, Warsaw 1938, pp. 179, 188.

Table 2
Important railway-connections between main cities and average length of the trip (as in 1937)

| Date of opening | Connection | Distance (km) | Average length of the trip (as in 1937) |
|---|---|---|---|
| 1861 | Kraków-Lwów | ca. 341 | 5.00 h |
| 1917 | Warsaw-Lwów via Lublin | ca. 500 | 8.30 h |
| 1872 | Warsaw-Poznań via Toruń | ca. 376 | 7.0 h |
| Nov. 1921 | Warsaw-Poznań via Września | ca. 304 | 4.45 h |
| 1857 | Poznań-Kraków via Wrocław | ca. 380 | n.a. |
| Nov. 1926 | Poznań-Kraków via Wieluń | ca. 330 | n.a. |
| 1848 | Warsaw-Kraków via Czestochowa | ca. 364 | 8.00 h |
| Nov. 1934 | Warsaw-Kraków via Radom | ca. 320 | 5.20 h |

*Sources*. Pisarski (1974, p. 58), Olszewicz (1938, p. 223).

measures that discriminated between regions and social groups. For example, there remained a customs frontier between the former Prussian partition area and the rest. This kept grain prices in that area at an artificially low level, thereby providing cheap supply for the fighting troops.[12] After the armistice between Poland and Soviet Russia the Polish government launched a program to liquidate the whole system of regulations. The internal customs frontier was removed in mid-1921, and by the end of 1921 most other regulations on the commodity markets had disappeared.[13]

How did the economy react to these dramatic structural changes? Did the different parts of Poland that have been divided for nearly 125 years integrate to one single market? Did the former partition borders disappear? Available data on price convergence suggests that this may have been the case (see Wolf, 2003), but the evidence is limited to a handful of food prices that reflect only developments in a part of the agricultural sector and food industries. However, much richer data is available on domestic trade flows between all parts of the new Polish state and including all sectors of the economy. The next section introduces the basic theoretical background how this kind of data can be used to measure economic integration across political borders.

[12] Kozłowski (1989, p. 157), and Landau and Tomaszwski (1999, p. 69).
[13] Tomaszewski (1966), also Kozłowski (1989, p. 158).

## 3. A theory-based gravity model

Since the work of Hamilton and Winters (1992), Frankel and Wei (1993), and especially McCallum (1995), it has become common to analyse the course of economic integration across political borders within the framework of a gravity model. This empirical model relates trade flows between two economic areas (regions, countries, and vojvodships) to the importer's demand, the exporter's supply, and to the geographical distance between them. It is a helpful tool for exploratory analysis because it usually fits the data very well while imposing only weak restrictions on the underlying economic structures. Several authors, including Redding and Venables (2001), Eaton and Kortum (2002), and most notably Anderson and van Wincoop (2003), have shown that it is possible to derive a gravity formulation from various well-articulated models of trade. Here I will follow Anderson and van Wincoop (2003, 2004).

Let $Y_i^k$ be the value of production and $E_i^k$ the value of expenditure in area $i$ for product $k$. Assume that the allocation of production and consumption within a country $\{Y_i^k,\ E_i^k\}$ is separable from the allocation of trade across countries (see Anderson and van Wincoop, 2004). Moreover, assume that all produced varieties are aggregated by a CES-aggregator, and that all trade costs are proportional to the quantity of trade. Let us define $X_{ij}^k$ as the value of exports from area $i$ to $j$ in product $k$. A CES-demand structure implies

$$X_{ij}^k = \left(\frac{p_{ij}^k}{P_j^k}\right)^{1-\sigma k} E_j^k, \tag{1}$$

where $\sigma^k$ is the elasticity of substitution among varieties within sector $k$, $p_{ij}^k$ is the ("c.i.f.") price charged by $i$ for exports to $j$ and $P_j^k$ is the CES price index

$$P_j^k = \left[\sum_i (p_{ij}^k)^{1-\sigma k}\right]^{1/(1-\sigma k)}. \tag{2}$$

Since we assume trade costs to be proportional to trade, the price $p_{ij}^k$ can be written as $p_i^k t_{ij}^k$, where $p_i^k$ is the ("f.o.b.") supply price received by producers in area $i$ and $t_{ij}^k$ is the markup over that price that is associated with trade costs. The latter is our variable of interest and equals one plus the tariff equivalent of trade barriers.

Imposing for all $i$ and all $k$ the market clearing conditions

$$Y_i^k = \sum_j X_{ij}^k \tag{3}$$

yields the gravity model, namely

$$X_{ij}^k = \frac{E_j^k Y_i^k}{Y^k}\left(\frac{t_{ij}^k}{P_j^k P_i^k}\right)^{1-\sigma k}, \tag{4}$$

where $Y^k$ is the total output in sector $k$ and I assume that trade costs are symmetric ($t_{ij} = t_{ji}$). The price indices $P_j^k$ and $P_i^k$ can be solved as a function of the set $\{Y_i^k,\ E_i^k\}$ and the trade barriers $t_{ij}^k$. Hence, given that trade flows and the set of production and

consumption patterns can be identified, this structure allows to estimate the effect of trade barriers. I will use it to draw inferences about the persistence of the former partition borders that divided Poland until 1918.

## 4. Data and specification issues

There are several ways to estimate the Eq. (4). First, one can use non-linear least squares to estimate the structural equation under the restrictions imposed by the functional forms of the price-indices (Anderson and van Wincoop, 2003). Alternatively, one can use data on price levels, production, and consumption and estimate with OLS, as done in Baier and Bergstrand (2001) or Head and Mayer (2000). However, this kind of data is often unavailable, and even more so in a historical context. Therefore, I will choose a third approach that has become common in the most recent literature, as it delivers unbiased estimates of trade costs with minimal data requirements (see Anderson and van Wincoop, 2003, 2004; Eaton and Kortum, 2002; Hummels, 2001). This approach is to take logs of (4) and replace the price-indices and production variables with a set of area- and time-specific dummies. The equation to be estimated is then

$$\ln(X_{ij}^k) = c + A_i^k + A_j^k + (1-\sigma^k)\ln(t_{ij}^k) + \varepsilon_{ij}^k, \tag{5}$$

where

$$A_i^k = \ln(Y_i^k) - (1-\sigma^k)\ln(P_i^k) \quad \text{and} \quad A_j^k = \ln(E_j^k) - (1-\sigma^k)\ln(P_j^k).$$

Hence, I include a set of time-specific importer dummies, one for each area, which take on the value of one whenever that area enters the panel as an importer. The same holds for a set of exporter dummies. Before proceeding to the estimation, three issues must be addressed. First, the nature of my dataset will make one further modification of (5) necessary, which affects the interpretation of the estimated trade costs. Second, one always needs to make some assumptions about the functional form of these trade costs. And third, there is a recent literature that motivates a careful use of distance as part of the trade costs. Let us first turn to the dataset.

The real challenge in our historical context is to find sufficient data on sub-national units in order to identify the possible impact of the former partition borders across the new state. There exists an outstanding source of information on Polish domestic trade, namely the *Statistical Yearbook of Transported Goods on Polish State Railways (SYToR)*.[14] It was published by the Polish Ministry of Communication for the years 1924–1935 and contains detailed information on the volumes of trade that were transported on Polish state railways between nine *railway districts*. Map 3 (see

[14] Ministerstwo komunikacji, Centralne Biuro statystyki przewozów P.K.P. (Ed.), *Rocznik statystyczny przewozu towarów na polskich kolejach państwowych według poszczególnych rodzajów towarów* [Statistical Yearbook of Transported Goods on Polish State Railways by Different Groups of Goods], Warsaw, 1925–1937.

Appendix) indicates that these nine railway districts can be grouped into those parts of Poland that up to the First World War belonged to the Russian, the German, and the Habsburg empires. To be specific, the data allows us to distinguish between four areas: the district of Katowice, which is congruent with the Polish vojvodship of Silesia (''Silesia''), other parts of the German partition area (''Prussia''), the former Russian partition area (''Russia''), and the former Austrian partition area (''Austria''). For the years 1924 and 1925, the *SYToR* does not give bilateral trade between the districts, and therefore cannot be used to estimate a gravity model. But from 1926 onwards, the data is given as imports and exports of goods between the nine railway districts, and between districts and an aggregate of all foreign destinations outside of Poland. Importantly, the source also includes ''internal trade,'' i.e., shipments within the districts. This latter fact enlarges the cross-section of our sample but it implies a problem about the measurement of distance that will be addressed below. In addition to the aggregate trade data, the yearbook distinguishes between several groups of commodities, but with a varying degree of detail. To account for these changes, I construct seven consolidated groups of traded commodities, namely agricultural products, mineral products (including coal and other fuels, as well as iron ores and salts), machinery and metallurgical products, building materials, textiles, paper, and related products, and chemical products. For 1935, the data is completely reorganized and refers no longer to domestic trade between railway districts but between the *vojvodships*. For the sake of comparability I restrict our analysis to the 9 years 1926–1934.

While the *SYToR* gives excellent information on the development of a domestic market in Poland, there are several shortcomings. First, the data has to be adjusted for some changes in the classification system that took place between 1929 and 1930, and the changing treatment of trade between Poland and the Free City of Danzig/Gdańsk. Second, the exclusion of transport modes other than normal-gauge railways implies a certain bias, especially since less developed areas will usually trade less via railways. However, as already mentioned, those transportation modes had a minimal impact for interregional trade. Nearly all freight transport took place on state-owned normal-gauge railways, while inland navigation and automobiles accounted for negligible shares (see Section 2, Table 1). A third limitation lies in the fact that the data is given in trade volumes (tons), not in values (e.g., Polish Złoty). Hence, we are dealing with

$$X_{ij}^k = p_i^k t_{ij}^k Z_{ij}^k, \tag{6}$$

where $Z_{ij}^k$ is the volume of exports in metric quantities (tons). This is no serious problem, but I have to adjust (5) for this special nature of the data and estimate[15]

$$\ln(Z_{ij}^k) = c + A_i'^k + A_j^k - \sigma^k \ln(t_{ij}^k) + \varepsilon_{ij}^k, \tag{7}$$

where

$$A_i'^k = \ln(Y_i^k) - (1-\sigma^k)\ln(P_i^k) - \ln(p_i^k) \quad \text{and} \quad A_j^k = \ln(E_j^k) - (1-\sigma^k)\ln(P_j^k).$$

[15] I am grateful to Jim Anderson for a helpful discussion of this point.

This equation will be used for all sector-level estimates for the seven commodity groups. For pooled and aggregate estimates, we need some sensible way to weight the metric units for various sectors. My approach here is to use f.o.b. export prices from the Polish foreign trade statistic that exist at a very fine level of disaggregation across commodities.[16] For each of the seven groups of traded goods I derive the corresponding price level at a given year from the foreign trade statistics. This in turn is used to calculate for each group the values (in Złoty per ton) of bilateral export shipments between the districts, the $X_{ij}$, in specification (5). While this obviously neglects regional price variations, the conversion of volumes to values allows us to aggregate up the information for the different commodity groups to the value of total export shipments between the districts. Moreover, the available evidence on regional price variations suggests that prices had converged considerably by 1926 (Wolf, 2003).

Next, one needs to make some assumptions about the nature of "trade costs." Following the literature, I assume that trade costs are a function of transport costs that increase in distance between locations by some exponent, and the costs associated with crossing a border (see Hummels, 2001):

$$t_{ij}^{k} = \mathrm{dist}_{ij}^{\beta 1} \exp(\beta_2^k \mathrm{border}_{ij}^{k}), \tag{8}$$

where $\mathrm{border}_{ij}$ is a dummy variable defined as

$$\mathrm{border}_{ij} = \begin{cases} 1 & \text{if areas } i,\ j \text{ are separated by at least one former partition border,} \\ 0 & \text{else.} \end{cases} \tag{9}$$

A negative and significant coefficient $\beta_2$ on such a dummy would give evidence of a trade diverting effect of the former partition borders on trade. However, in cases where some of the bilateral export flows have to cross more than one border, the literature usually replaces the border dummy by an inversely defined "home bias," specific for a given area. I will make use of both concepts to be comparable to different parts of the literature. Let us define a dummy variable $\mathrm{home}_{ij}$ as

$$\mathrm{home}_{ij} = \begin{cases} 1 & \text{if both areas } i \text{ and } j \text{ were formerly part of the same partition area,} \\ 0 & \text{else.} \end{cases} \tag{10}$$

Here, a positive and significant coefficient estimate on such a dummy would give evidence of a "home bias" in trade: locations within the same partition border trade—*ceteris paribus*—more with each other than with locations across that border. A decrease in home bias over time would be evidence of an increasing degree of economic integration across the political borders under inspection. For a perfectly well integrated economic region one would expect to find no preferential trade patterns between its subunits, i.e., one would expect to find none of the coefficients on the home bias dummies to be significantly different from zero.

[16] I use the following Yearbooks of foreign trade from the Polish statistical Office G.U.S.: *Rocznik Handlu Zagranicznego RP* 1926–1927, 1928, 1929–1930, 1931, 1932, 1933, 1934; all Warsaw (different years).

Finally, recent work by Nitsch (2001) and Head and Mayer (2002) has stressed that any estimated border effect or home bias effect crucially depends on the way we proxy for distance. The standard method is to calculate the geographic distance between two areas as the greater circle distance between their main economic centers, based on longitudinal and latitudinal coordinates. This is what I use here as well to proxy for distance between the districts. The coordinates where derived from the web-based *JOS-distance calculator*.[17] However, if the sample includes trade flows of one area with itself this method cannot be applied any more and the literature usually adopts one of the ad hoc approaches proposed by Wei (1996) and H. Wolf (1997, 2000). Wei (1996) proposed to proxy for internal distance by one forth of the distance from the economic centre of an area to the border of its nearest neighbour, while H. Wolf (1997) proposed the distance between the largest and the second-largest city within an area as a proxy. Head and Mayer (2002) show that all those measures might overstate the actual internal distances, thereby understate the estimated level of potential trade within an area and inflate the resulting home bias factors and border effects. To avoid those problems, I adopt the following strategy. On the one hand, instead of the mentioned ad hoc-measures for internal distance I use a more structural measure as in Head and Mayer (2000). They proposed to model each economic unit as a disk, with all consumers uniformly distributed on the disk and the production concentrated in the centre. Given this, the average internal distance $\text{dist}_{ii}$ within an area can be proxied by a function[18] of the district's area in $\text{km}^2$ as $\text{dist}_{ii} = 0.376\sqrt{\text{Area}_i}$. On the other hand, I replicate the estimation with a dummy variable that controls for internal trade within one area and compare the resulting home bias factors. Table 3 gives some summary statistics of the trade and distance data.

The next section employs that data to pin down the impact of the former partition borders. Did the former borders continue to bias domestic trade, even after their removal in terms of tariffs, currency and tax differences?

## 5. Estimation, results, and interpretation

In this section, I estimate several versions of my benchmark specification (7), where the dependent variable is the sector-specific volume of bilateral exports (in tons) between a pair of railway districts. As described in the text, I have comparable evidence on bilateral export flows between and within the nine railway districts over a period 1926–1934, i.e., a panel of 729 observations with a cross-section of 81 observations over 9 years. Note that I follow here the recent literature and use export shipments

[17] The coordinates are provided as an online service of JewishGen, League City (Texas, USA), under the address http://www.jewishgen.org/jos/josdist.htm.

[18] The average distance between an area's production centre from its consumers can be formalized as $\text{dist}_{ii} = \int_0^R rf(r)\,\mathrm{d}r$, where $R$ is the radius of the stylised disk. Since consumers are uniformly distributed, their density at any given distance $r$ from the centre is given by $f(r) = \frac{C_r}{A_R} = \frac{2r}{R^2}$, where $C_r$ is the circumference at distance $r$ and $A_R$ is the area of the disk. With $R = \sqrt{A/\pi}$ the average internal distance can be written as $\text{dist}_{ii} \approx 0.67\sqrt{\frac{A}{\pi}} \approx 0.376\sqrt{A}$.

Table 3
Summary statistics on the trade and distance data

| | Average (Std) of bilateral export shipments between districts (in 1000 metric tons) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1926 | 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 |
| Agricultural products | 48.9 (16.6) | 51.1 (16.8) | 57.0 (19.6) | 57.8 (20.3) | 63.0 (23.9) | 45.8 (13.2) | 38.9 (11.9) | 36.3 (11.0) | 43.5 (12.6) |
| Building materials | 18.9 (42.0) | 29.6 (68.8) | 39.3 (88.9) | 32.2 (71.5) | 17.1 (46.2) | 11.8 (29.9) | 7.9 (19.8) | 9.1 (22.0) | 11.1 (28.5) |
| Chemicals | 12.3 (25.6) | 16.2 (32.7) | 17.2 (34.8) | 17.5 (37.6) | 11.4 (19.9) | 8.2 (13.5) | 6.9 (11.1) | 7.5 (11.2) | 8.2 (12.5) |
| Machinery, metallurgy | 19.7 (49.3) | 26.4 (71.4) | 32.1 (94.5) | 30.1 (91.6) | 23.7 (73.7) | 17.1 (54.4) | 10.8 (29.2) | 13.3 (40.4) | 14.8 (44.4) |
| Mineral products | 183.4 (427) | 226 (522) | 257 (574) | 276 (623) | 217 (489) | 187 (442) | 147 (358) | 162 (433) | 163 (374) |
| Paper | 2.2 (6.6) | 2.7 (7.5) | 3.2 (8.7) | 3.4 (9.0) | 3.1 (8.3) | 2.6 (5.4) | 2.1(5.5) | 2.6 (7.1) | 2.9 (8.1) |
| Textiles | 2.2 (5.7) | 2.5 (7.1) | 2.6 (7.0) | 2.3 (5.4) | 1.5 (3.0) | 1.4 (2.8) | 1.4 (2.9) | 1.4 (3.1) | 1.7 (4.0) |
| Distance in km | | | | | 338.9 (182.9) | | | | |

*Source*. See text.

rather than the sum over exports and imports, in order to exploit the whole matrix of bilateral shipments. I first focus on the average tariff equivalents of crossing the former partition borders, with a dummy variable constructed according to (9).

I start with simple OLS estimations of (7) for each of the seven sectors, pooling data over the 9 years (Table 4, first column). In a few cases the number of sectoral observations used for the estimation is below 729 due to zero observations. I add a specification that uses a measure of the value of aggregate trade as the dependent variable, where I add up over the seven sectors using the mentioned f.o.b. export prices as weights and also include a measure of the value of trade in remaining sectors.

The overall fit of our model as indicated by the adjusted $R$-square is very good. All parameter estimates for the effect of distance and the former partition borders are highly significant, regardless of the sectors. Hence, as a first result I find that the former borders that divided Poland for 123 years had a highly persistent effect even several years after their removal. Consider the differences among sectors. Intuitively, the effect of distance seems to be highest for goods with a low value to weight ratio such as building materials, or mineral products. However, the model implies that one cannot disentangle the effect of distance or borders from the sector-specific elasticity of substitution $\sigma^k$. To compare the estimates across sectors and to interpret them in terms of tariff-equivalents, one has to put some values on the elasticity of substitution. Recent work suggests that the elasticity of substitution usually varies between 3 and 10 (see Anderson and van Wincoop, 2004). Here I present the resulting tariff-equivalents based on two "reasonable" values for $\sigma^k$ and based on estimates for the respective sector-specific elasticities and OECD data by Evans (2003). Three observations are particularly outstanding: first, different elasticities of substitution have a quite dramatic effect on the implied tariff-equivalent of the

Table 4
The average effects of the former partition borders on domestic trade

| | Parameter estimates ($p$ values in parentheses) | | Implied tariff equivalents | | | Summary statistics | |
|---|---|---|---|---|---|---|---|
| | $-\sigma^k\beta_1^k$ ln(dist) | $-\sigma^k\beta_2^k$ border | $\text{Exp}(\beta_2^k/-\sigma^k)-1$ | | | No. of Obs. | Adj. $R^2$ |
| | | | For $\sigma=2$ | For $\sigma=5$ | Evans (2003) | | |
| Agricultural products | −1.804 (0.000) | −0.996 (0.000) | 0.65 | 0.22 | 0.24 | 729 | 0.842 |
| Building materials | −2.483 (0.000) | −0.642 (0.000) | 0.38 | 0.14 | na | 717 | 0.828 |
| Chemicals | −0.7556 (0.000) | −1.055 (0.000) | 0.65 | 0.22 | 0.28 | 720 | 0.782 |
| Machinery, metallurgy | −0.955 (0.000) | −1.152 (0.000) | 0.78 | 0.26 | 0.75 | 728 | 0.833 |
| Mineral products | −1.410 (0.000) | −1.330 (0.000) | 0.94 | 0.30 | 0.64 | 719 | 0.837 |
| Paper | −1.092 (0.000) | −0.758 (0.000) | 0.46 | 0.16 | 0.22 | 709 | 0.776 |
| Textiles | −1.295 (0.000) | −0.490 (0.000) | 0.28 | 0.10 | 0.19 | 723 | 0.785 |
| Aggregate trade | −1.035 (0.000) | −0.922 (0.000) | "0.59" | "0.20" | "0.32" | 729 | 0.862 |

Not reported, time-varying exporter and importer dummies.

border. For example, if we assume an elasticity of 2, the implied estimate for 1926–1934 for textile products is a tariff-equivalent of 28% for the effect of crossing the former partition borders. Instead, if we assume an elasticity of 5, the tariff-equivalent would be 10%, and if we take the data from Evans (2003), it would be 19%. But second, the ranking of the estimated border effects across sectors does not change much, whether we use the estimated elasticities or simply assume the same uniform elasticity for all sectors. Third, based on Evans (2003) the domestic market for textile products was apparently best integrated across the former borders, while the markets for mineral products (including coal) and machinery was least integrated.

How persistent were the former borders? Did their effect decline, or was it rather stable during the 9 years under examination? Table 5 shows what happens if we allow $\beta_2$ to change over time.

The results strongly suggest that the border effects declined between 1926 and 1934, but that this process was interrupted during the depression years. To test for that decline, I performed Wald-coefficient tests for equality between the $\beta_2$-coefficients for 1926 and 1934. The tests show that the null-hypothesis of stable coefficients can be rejected at a 10% significance level for agricultural products, chemicals, paper and related products, and textiles. To be more specific, if I take the elasticities from Evans (2003), the implied tariff-equivalent of the former partition borders on chemical goods declined from 54% in 1926 to 13% in 1934. For other sectors, and in the aggregate, the decline in point estimates over time suggests the same tendency, but it is too small to be significantly different from stable coefficients. In any case, the results suggest that the former borders were persistent for more than 10 years after reunification but that their effect tended to fade out. The last row of Table 5 shows results for aggregate trade that also allows for changes in distance effects. We find a small but significant increase in distance effects between 1926 and 1934,[19] while the decline in border effects becomes now statistically significant even for aggregate trade.

Next, I check whether there were differences between the various borders. Maps 1 and 3 suggest a distinction between the former partition border that divided the German from the Russian partition area (RuGe), another one that divided the former Habsburg area from the Russian partition area (RuAu), and a border that divided the formerly German district of Katowice from the rest of the country (SilBor). In Table 6, I disentangle these three borders and estimate their respective effect on export flows.

The main message from Table 6 is that Silesia was apparently very well integrated into the new Polish state, while the German–Russian and Austrian–Russian partition borders had a persistent effect on export shipments across all sectors of the economy. Given that the sector-specific elasticity of substitution does not vary across space I find that the former partition borders had different effects on different sectors, while

[19] One of the causes for this increase was probably the slow reaction of the railway administration to adjust tariff rates to the dramatic deflation between 1929 and 1934. In consequence, the costs of railway transportation increased somewhat relative to the value of shipped commodities. See Gieysztor (1939), "Polityka Taryfowa" in: *Inzynier Kolejowy* (1939/16), pp. 69–73.

Table 5
Time-varying border effects; last row, time-varying distance and border effects

| | Parameter estimates ($p$ values in parentheses) | | | | | | | | | | Summary statistics | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $-\sigma^k\beta_1^k$ ln(dist) | | $-\sigma^k\beta_2^k$ border | | | | | | | | No. of Obs. | Adj. $R^2$ |
| | | | 1926 | 1927 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | |
| Agricultural products | −1.804 | | −1.190 | −0.868 | −1.062 | −0.915 | −1.198 | −1.184 | −1.019 | −0.871 | −0.657 | 729 | 0.841 |
| | (0.000) | | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | | |
| Building materials | −2.483 | | −0.805 | −0.381 | −0.425 | −0.516 | −1.004 | −0.709 | −0.771 | −0.596 | −0.570 | 717 | 0.826 |
| | (0.000) | | (0.008) | (0.208) | (0.218) | (0.127) | (0.002) | (0.017) | (0.014) | (0.028) | (0.052) | | |
| Chemicals | −0.757 | | −1.748 | −1.641 | −1.289 | −1.300 | −0.993 | −0.736 | −0.616 | −0.681 | −0.492 | 720 | 0.789 |
| | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.004) | (0.007) | (0.030) | | |
| Machinery, metallurgy | −0.955 | | −1.153 | −1.295 | −1.265 | −1.270 | −1.245 | −1.285 | −1.095 | −0.900 | −0.857 | 728 | 0.832 |
| | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | |
| Mineral products | −1.401 | | −1.594 | −1.599 | −1.750 | −1.624 | −1.392 | −1.201 | −1.003 | −0.864 | −0.940 | 719 | 0.838 |
| | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.002) | (0.014) | (0.004) | | |
| Paper | −1.092 | | −1.107 | −0.890 | −0.962 | −0.726 | −0.604 | −0.637 | −0.651 | −0.709 | −0.544 | 709 | 0.775 |
| | (0.000) | | (0.000) | (0.000) | (0.000) | (0.008) | (0.006) | (0.007) | (0.005) | (0.007) | (0.021) | | |
| Textiles | −1.296 | | −0.868 | −0.582 | −0.430 | −0.497 | −0.589 | −0.427 | −0.353 | −0.313 | −0.351 | 723 | 0.783 |
| | (0.000) | | (0.001) | (0.008) | (0.041) | (0.010) | (0.003) | (0.017) | (0.066) | (0.103) | (0.069) | | |
| Aggregate trade | −1.035 | | −1.035 | −0.936 | −0.900 | −0.752 | −0.914 | −1.018 | −0.978 | −0.924 | −0.847 | 729 | 0.861 |
| | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | |
| Aggregate trade | 1926 ... | 1934 | −1.174 | −1.104 | −1.050 | −0.906 | −0.854 | −1.025 | −0.861 | −0.729 | −0.601 | 729 | 0.864 |
| | | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | | |
| | −0.961 | −1.168 | | | | | | | | | | | |
| | (0.000) | (0.000) | | | | | | | | | | | |

Not reported, time-varying exporter and importer dummies. Last row, time-varying distance effects for 1927–1933.

Table 6
The effect of three different partition borders on trade ($p$ values in parentheses)

| | Parameter estimates ($p$ values in parentheses) | | | | Summary statistics | |
|---|---|---|---|---|---|---|
| | $-\sigma^k\beta_1^k$ ln(dist) | $-\sigma^k\beta_2^k$ RuGe | $-\sigma^k\beta_2^k$ RuAu | $-\sigma^k\beta_2^k$ SilBor | No. of Obs. | Adj. $R^2$ |
| Agricultural products | −2.020 (0.000) | −0.630 (0.000) | −0.524 (0.000) | 0.831 (0.000) | 729 | 0.845 |
| Building materials | −2.355 (0.000) | −0.544 (0.000) | −1.215 (0.000) | 0.604 (0.000) | 717 | 0.861 |
| Chemicals | −0.874 (0.000) | −0.807 (0.000) | −0.536 (0.000) | 0.157 (0.266) | 720 | 0.778 |
| Machinery, metallurgy | −1.051 (0.000) | −0.640 (0.000) | −1.149 (0.000) | 0.766 (0.000) | 728 | 0.867 |
| Mineral products | −1.504 (0.000) | −1.317 (0.000) | −1.111 (0.000) | 1.425 (0.000) | 719 | 0.875 |
| Paper | −1.129 (0.000) | −0.813 (0.000) | −0.506 (0.000) | 0.492 (0.000) | 709 | 0.789 |
| Textiles | −1.039 (0.000) | −0.749 (0.000) | −0.763 (0.000) | −0.513 (0.000) | 723 | 0.808 |
| Aggregate trade | −1.187 (0.000) | −0.652 (0.000) | −0.541 (0.000) | 0.671 (0.000) | 729 | 0.878 |

Not reported, time-varying importer and exporter dummies.

the aggregate effect of the German–Russian and the Austrian–Russian border was very similar, with highly significant point estimates of the coefficients at around −0.6.

Among the causes of this relatively strong "Russian border effect" were probably differences in language and other cultural ties such as religion. According to the 1931 population census (which was somewhat biased towards Polish nationality, see Landau and Tomaszwski, 1999, p. 32), the share of people speaking Polish and the share of people of roman-catholic confession was in some parts of the former Russian partition area below 25% of the total population. This language barrier might at least partly account for difficulties to integrate economically (see Helliwell, 1997). But is the identified border effect "large"? Did the Polish experiment fail with respect to integration? How do our results compare to recent findings on contemporaneous border effects? We can directly compare our results to that of Anderson and van Wincoop (2003) on the effect of the Canadian–US border on aggregate bilateral exports in 1993 between US states and Canadian provinces since we employ their method here. They find a border coefficient on aggregate exports of −1.58, which implies a tariff equivalent of 48% if the average elasticity is 5, and therefore much higher than any of our aggregate or sector specific estimates suggested. Hence, while the former partition borders had a persistent effect on the domestic market even 15 years after reunification, their effect was small compared to that of the Canadian–US border in 1993.

A couple of other authors have examined export flows across the OECD (Wei, 1996), 10 member states of the European Union (Nitsch, 2000), and interestingly for our case also domestic shipments within US states (Wolf, 2000). However, these findings are not directly comparable, mainly because they all used a-theoretical specifications of the gravity model neglecting the price-index terms and the effect of varying elasticities of substitution. Moreover, they all estimated a home bias in trade as defined in (10) rather than a border effect, and used slightly different proxies for internal distances. Nevertheless it may be interesting to compare my results to other work

Table 7
Home bias compared: Poland (1926–1934), the EU (1979–1990), and the US (1993)

| | Poland (1926–1934), Standard errors in parentheses | | EU (1979–1990) from Nitsch (2000), Standard errors in parentheses | US (1993) from Wolf, 2000, $t$ stat in parentheses |
|---|---|---|---|---|
| | Average | Area-specific | Average | Average |
| Distance | −0.976 (0.046) | −0.956 (0.046) | −1.07 (0.08) | −1.00 (43.32) |
| Average home bias | 1.086 (0.052) | — | 1.92 (0.20) | 1.48 (11.53) |
| "Prussia" | | 1.179 (0.155) | | |
| "Russia" | | 0.856 (0.089) | | |
| "Austria" | | 1.373 (0.081) | | |
| Method | OLS | OLS | SUR | OLS |
| Model fit | Adj. $R^2$: 0.89 | Adj. $R^2$: 0.89 | Mean Adj. $R^2$: 0.91 | $R^2$: 0.836 |
| No. of Obs. | 729 | 729 | $12 \times 81$ | 2137 |

on Europe (Nitsch, 2000) and to other work on intra-national home bias (Wolf, 2000). To do so, I re-estimate (7) for aggregate export flows but replace the border dummies by a home bias dummy as defined in (10). Table 7 shows the results for an average home bias and area-specific home biases for the former German partition area except Silesia ("Prussia"), the former Russian Partition area ("Russia"), and the former Austrian partition area ("Austria"). A home bias for Silesia cannot be included, since it would be collinear with the linear combination of the Silesian importer and exporter dummy. I also give the estimates of Nitsch (2000) and Wolf (2000) for comparison.

Both, the various distance estimates and the respective fit of the models are very similar and encourage a comparison between the models. The estimated home bias effects are much lower in the case of Poland and stress again my previous result, that Poland integrated well by modern standards. Holger Wolf's estimate of a home bias of 1.48 implies US states traded by a factor of $\exp(1.48) = 4.39$ more with themselves than with other US states. Not surprisingly, this "home bias factor" is even higher within the European Union. Nitsch's estimate of a home bias of 1.92 means that EU member states traded by a factor of 6.8 more with themselves than across their national borders. The Polish economy apparently integrated very well across the inherited partition borders by any modern standard.

## 6. Robustness: internal distance, Silesia, and an alternative model

In this section, I perform some robustness checks. First, as mentioned in Section 4, there is an issue of the measurement of internal distance. To measure the average distance of trade flows within a given district I employed a measure that was a function of the district's area, based on some simple assumptions. Instead, I used the great circle distance between main economic centers of the districts to proxy for distance between different districts. However, it might be the case that this overstates internal within-district distance relative to between-district distance. If so, this would understate the estimated level of potential trade within an area and inflate the resulting home bias factors and border effects (Head and Mayer, 2002). This effect is probably less impor-

Table 8
Robustness checks, $p$ values in parentheses

| | Distance-mismeasurement? | Excluding Silesia |
|---|---|---|
| Distance | −0.822 (0.000) | −1.259 (0.000) |
| "Prussia" | 0.802 (0.000) | 0.867 (0.000) |
| "Russia" | 0.616 (0.000) | 0.725 (0.000) |
| "Austria" | 1.406 (0.000) | 0.965 (0.000) |
| "Prussia"*int | 1.181 (0.002) | — |
| "Russia"*int | 0.415 (0.000) | — |
| "Austria"*int | 0.434 (0.000) | — |
| Adj. $R^2$ | 0.905 | 0.910 |
| No. of Obs. | 729 | 576 |

Not reported, time-varying importer and exporter dummies.

tant in our case where the underlying areas for which I estimate a home bias ("Prussia," etc.) are themselves composites of several areas (districts) than it is in cases where all home bias relies on the measure of national vs. international trade (for example, Nitsch, 2000). To deal with the issue I could simply drop all information on internal trade and repeat our estimation. But the resulting coefficients would not be fully comparable to the previous ones, since we would no longer use the same set of information. Alternatively, I use an appropriate dummy variable $\text{int}_{ij}$, which takes on the value of 1 if the exporting district coincides with the importing district ($i = j$). Obviously, just adding the dummy as an intercept or slope, i.e., interacting it with the remaining gravity variables, would not capture the effect of internal distance on the home bias dummies. It would simply split each of the gravity coefficients into two components. Instead, if I interact $\text{int}_{ij}$ with the home bias dummies themselves, this singles out all effects on home bias that are specific to internal trade relations, including a possible mis-measurement of internal distance. The results are given in Table 8, column 1. We see that the home bias estimates for "Prussia" and "Russia" decrease, while the estimates for "Austria" remain unchanged. In any case, this does not affect the key result that the former borders were persistent but had a comparatively small effect.

Second, one might suspect that Silesia was a rather special part of the country. It was by far the most highly industrialised part of the country, had a very good infrastructure and a much higher population density than other parts of Poland. To document this, Table 9 gives some proxies for the relative economic size of the nine railway districts under investigation. First, there is comparable evidence on local income tax yields for the years 1927–1928 from financial statistics of the local self-government authorities. According to parliament acts from 1923 and 1925, the local self-governments were conceded 15% of the total yields of the national income tax yielded on their territory.[20] The resulting local shares of the income tax yields were published by the Statistical Office GUS for the years 1925, 1926, and 1927–1928 on the level of local administrative districts (*powiaty*). Thereafter they were

[20] See Dziennik Ustaw R.P. 1923, No. 94, poz. 747 and Dziennik Ustaw R.P. 1925, No. 129, poz. 918. According to the latter act, the only exception to this rule was the city of Warsaw being authorized to withhold 20% of the income tax yields.

Table 9
Different proxies for relative economic size of railway districts (Y), Warsaw = 1

| Railway district [former partition area] | Calculated value of total shipments per capita | | | Local income tax yields per capita | Mean network density | Density of radio usage (radio users per capita) | |
|---|---|---|---|---|---|---|---|
| | 1926–1928 | 1929–1931 | 1932–1934 | 1927–1928 | 1926–1928 | Grouped vojvodships | 1938 |
| Warsaw [Russia] | 1 | 1 | 1 | 1 | 1 | Warsaw and Lód'z | 1 |
| Radom [Russia] | 0.471 | 0.558 | 0.613 | 1.324 | 0.891 | Kielce, Lublin, Wolhynia | 0.641 |
| Wilno [Russia] | 0.634 | 0.760 | 0.725 | 0.771 | 0.905 | Bialystok, Nowogrodek, Wilno, Polesie | 0.540 |
| Poznań [Germany] | 2.874 | 2.926 | 2.284 | 3.964 | 2.866 | Poznań | 1.008 |
| Gdańsk/Toruń [Germany] | 1.877 | 1.862 | 1.620 | 2.974 | 2.805 | Pomerania | 1.277 |
| Katowice [Germany] | 7.968 | 7.663 | 6.880 | 7.005 | 5.691 | Silesia | 2.298 |
| Kraków [Austria] | 0.792 | 0.876 | 1.010 | 1.599 | 1.803 | Kraków | 0.479 |
| Lwów [Austria] | 0.548 | 0.677 | 0.748 | 0.668 | 1.506 | Lwów and Tarnopol | 0.741 |
| Stanisławów [Austria] | 0.774 | 0.833 | 0.830 | 0.817 | 1.616 | Stanisławów | 0.200 |

*Note*. The total shipment data were calculated and used year-by-year, but given in 3-years intervals to save space. *Sources*. See text.

no longer reported as a separate category.[21] Hence, the evidence for the years 1925–1928 can be aggregated up to the railway districts. Taking into account the mentioned problems in collecting direct taxes on the former Russian partition area (see Section 2), I use only the evidence for 1927–1928. Second, there is data available to calculate the mean density of the railway network in the nine railway districts for several years.[22] While this measure will obviously be biased because of different railway policies during the partition period, it nevertheless should give a rough idea of the state of economic development in a railway district. Third, I am able to explore the number of radio users as in 1938, which might be expected to increase with the economic size of an area.[23] Since this information is available only at the level of vojvodships, I have to group the vojvodships to match approximately the information at a district level according to Maps 2 and 3 (see Appendix). To make the shipment values, the income tax yields and the number of radio users comparable with the network density data, I convert them into per capita terms. I do this using again the inter- and extra-polations of the population data from the 1921 and 1931 censuses. Table 9 gives the results, each relative to the district of Warsaw. The differences between Silesia, which is congruent with the district of Katowice, and the rest of Poland, are outstanding.

Hence, it may be justified to treat the district of Katowice separately from the other districts. The second column in Table 8 therefore reports a estimation of (7), where I exclude all exports from and towards the district of Katowice from the sample. We find that the main results survive—as expected given that we already saw that Silesia was better integrated into Poland than the rest—but that the estimates of home bias are somewhat smaller. This shows that the high degree of integration of Silesia into the Polish economy was due to the fact that Silesian exports easily penetrated the markets of the other partition areas, but not vice versa: the home bias effects are smaller for the rest of the Polish economy if we disregard the fact that exports from those parts had difficulties to penetrate into Silesia.

As a final robustness check, I use a more traditional gravity specification and explore whether this makes any difference to the Anderson and van Wincoop (2003) model. Consider the following simple gravity specification (11):

$$\ln(X_{ij}) = \text{AreaEffects} + \ln(Y_i Y_j) + \ln(\text{Pop}_i \text{Pop}_j) + \ln(\text{dist}_{ij}) + \text{border}_{ij} + \varepsilon_{ij}, \tag{11}$$

where $X$ is the value of exports shipments from district $i$ to area $j$, $Y$ is some proxy for the economic size of the district, Pop is a district's population and border is again a

[21] The data were published for the years 1925, 1926, and 1927–1928 as *Statystyka finansów komunalnych* [Statistic of local finances], Warsaw (different years), for the years 1930–1931 and thereafter as *Statystyka Samorządowa* [Statistic of local self-government], Warsaw (different years).

[22] The area data for the railway districts can be found in a publication by the Ministry of Communication (Ed.), *Dziesiêciolecie Polskich Kolei Państwowych 1918–1929* [10 years of Polish State Railways 1918–1929], Warsaw (1928), the length of usable railway track for the different districts is contained in *Rocznik Statisticzny P.K.P.* [Statistical Yearbook of the P.K.P.], Warsaw (different years).

[23] See GUS (Ed.), *Mały Rocznik Statystyczny 1939* [MRS, Small Statistical Yearbook for 1939], Warsaw (1939), p. 349.

dummy as defined in (9). The population data is simply inter- and extrapolated from the 1921 to 1931 census data, which are available at the level of administrative districts and can be aggregated up to the level of vojvodships and railway districts, respectively.[24] When about the proxies for economic sizes, I cannot proceed as usual and take the areas' GDP values to proxy for size, since even at a national level we still lack a consensus estimate of Poland's GDP for the period. However, there are ways to circumvent this difficulty. Essentially, the gravity formulation does not require the absolute value of a district's economic size, but only their relative values. An obvious proxy for these relations on the district level is given by the value of total shipments that originate from a certain district, i.e., the sum of total export shipments originating in a district going to destinations within that district, to all other districts, as well as to foreign destinations. Again, as described above, I can use price data from the foreign trade statistics to aggregate the volume data for commodity groups and calculate a district's value of total shipments.

As a plausibility check, compare the resulting relative sizes of the railway districts with available data on alternative indicators of economic size as documented in Table 9 above. If we compare that shipment proxy to the local income tax yields per capita, it apparently understates the economic size of the districts of Radom and Kraków, as well as Poznań and Gdańsk/Toruń. However, the opposite holds if we compare it to the proxy based on radio usage. The proxy based on the mean network density in turn delivers similar relative sizes compared to the shipment proxy, except for the former Austrian districts Kraków, Lwów, and Stanisławów. Hence, my shipment proxy might tend to slightly overstate the economic size of Silesia (district of Katowice) and to understate the size of the former Austrian districts. Of course, these are very rough indicators and they are not perfectly comparable because of different coverage over area and time. Nevertheless, taken together they indicate that a proxy based on the value of total shipments delivers some compromise indicator and therefore rather "reasonable" orders of magnitude for the relative sizes of different districts. Table 10 gives the results of an estimation of the traditional gravity specification (11) based on the described data on population and size proxies. I add a set of time-specific area-effects to account for the neglected price-level effects. Note that in difference to the importer and exporter dummies used in Section 5, these area effects do not distinguish whether a district enters the equation as an importer or an exporter and hence gain us the necessary degrees of freedom to include size- and population proxies.

The fit is similar to that of the previous models. The distance coefficient is a bit low, and population is not significant, but our size-proxies do rather well. Most importantly, the estimated border effects are very similar to my previous estimates and they show the same pattern over time: a clear tendency to decrease, somewhat interrupted by the depression years. What is more, a Wald coefficient-test rejects now the null-hypothesis of stable coefficients even for aggregate export shipments at a 10% significance level.

[24] The revised census data for 1921 are published in *Rocznik Statystyki Rzeczypospolitej Polskiej za rok 1924* (1925), pp. 11–17, the revised census data for 1931 are published in MRS (1939), pp. 11–14.

Table 10
A traditional gravity model: dependent variable ln($X$), $p$ values in parentheses

| | Average border effect | Time-varying border effects |
|---|---|---|
| Ln(distance) | −0.683 (0.000) | −0.681 (0.000) |
| Ln($Y$_Imp) | 0.778 (0.000) | 0.777 (0.000) |
| Ln($Y$_Ex) | 0.736 (0.000) | 0.735 (0.000) |
| Ln(Pop_Imp) | 0.044 (0.847) | 0.040 (0.860) |
| Ln(Pop_Ex) | 0.027 (0.904) | 0.023 (0.917) |
| Border | −1.040 (0.000) | — |
| Border*26 | | −1.239 (0.000) |
| Border*27 | | −1.152 (0.000) |
| Border*28 | | −1.125 (0.000) |
| Border*29 | | −0.967 (0.000) |
| Border*30 | | −0.938 (0.000) |
| Border*31 | | −1.177 (0.000) |
| Border*32 | | −1.068 (0.000) |
| Border*33 | | −0.923 (0.000) |
| Border*34 | | −0.778 (0.000) |
| No. of Obs. | 729 | 729 |
| Adj. $R^2$ | 0.836 | 0.835 |

Not reported, time-varying area dummies.

## 7. Conclusion

The evidence on Interwar Poland presented in this paper suggests once more that borders matter. Moreover, their trade diverting effects seem to persist even after their complete formal abolishment in terms of tariff and non-tariff barriers to trade such as different currencies, regulations on trade and factor mobility, tax laws, and so forth. The former partition borders that divided Poland for a period of nearly 125 years continued to bias trade flows even 15 years after their complete removal. Over time the former partition borders apparently lost some of their diverting impact on domestic trade flows as the estimated home bias factors tend to decline somewhat, thereby indicating better economic integration of the new state. During the depression years this tendency comes to a halt, and the old fault lines of partition regain some of their influence on Poland's economy, before the border effects decrease again.

So, was Poland's reunification a success? I can directly compare my results to that of Anderson and van Wincoop (2003) on the effect of the Canadian-US border on aggregate bilateral exports in 1993 between US states and Canadian provinces since I employ their method here. They find a border effect that is much higher than any of my aggregate or sector specific estimates for Interwar Poland suggests. Similarly, if I take the EU (Nitsch, 2000) or even US intra-national trade (Wolf, 2000) as a benchmark, then again interwar Poland was a surprisingly well-integrated economic area, and Poland's reunification was a success at least in terms of economic integration. Instead, if our benchmark is a world without friction, then my findings make a strong point for the impact of historical heritage on economic structures.

## Appendix A

See Maps 1–3


Map 1.


Map 2.


Map 3.

## References

Anderson, J., van Wincoop, E., 2003. Gravity with Gravitas: a solution to the Border Puzzle. American Economic Review 93 (1), 170–192.

Anderson, J., van Wincoop, E., 2004. Trade Costs. Boston College, Mimeo.

Baier, S.L., Bergstrand, J.H., 2001. The growth of world trade: Tariffs, transport costs and income similarity. Journal of International Economics 53, 1–27.

Berend, I.T., Ranki, G., 1974. Economic Development in East-Central Europe in the 19th and 20th Centuries. Columbia University Press, New York and London.

Brzosko, E., 1982. Rozwój transportu w polsce w latach 1918–1939. ExLibris SGPiS, Szczecin.

Duda, J., Orłowski, R., 1999. Gospodarka Polska w dziejowym rozwoju Europy do 1939 roku. UMCS, Lublin.

Eaton, J., Kortum, S., 2002. Technology, geography and trade. Econometrica LXX, 1741–1779.

Evans, C.L., 2003. The Economic Significance of National Border Effects. American Economic Review 93 (4), 1291–1312.

Feinstein, C.F., Temin, P., Toniolo, G., 1997. The European Economy between the Wars. University Press, Oxford.

Frankel, J., Wei, S.-J., 1993. Trade Blocs and Currency Blocs. In: de la Deheza, Guillermo (Ed.), The Monetary Future of Europe. CEPR, London.

Gieysztor, J., 1939. Polityka taryfowa. Inzynier Kolejowy 14 (173), 69–73.

Hamilton, C., Winters, L.A., 1992. Opening up international trade in eastern Europe. Economic Policy 14 (April), 139–141.

Head, K., Mayer, T., 2000. Non-Europe: the magnitude and causes of market fragmentation in the EU. Weltwirtschaftliches Archives 136 (2), 284–314.

Head, K., Mayer, T., 2002. Illusory Border Effects: distance mis-measurement inflates estimates of home bias in trade. CEPII Working Paper No. 2002-01.

Helliwell, J.F., 1997. National Borders, Trade and Migration", NBER Working Paper No. 6027.
Hummel, B., 1939. Odbudowa i utrzymanie kolei [Rebuilding and Maintenance of Railways]. In: Dwudziestolecie komunikacji w Polsce Odrodzonej [20 Years of Communication in a Reborn Poland], Kraków.
Hummels, D., 2001. Towards a Geography of Trade Costs. Purdue University, Mimeo.
Kaser, M.C., Radice, E.A. (Eds.), 1985. The Economic History of Eastern Europe 1919–1975, vol. 3. Clarendon Press, Oxford.
Komlos, J., 1983. The Habsburg Monarchy as a Customs Union: Economic Development in Austro-Hungary in the Nineteenth-Century. Princeton University Press, Princeton.
Kozłowski, K., 1989. Problemy gospodarcze Drugiej Rzeczypospolitej, Warsaw.
Landau, Z., 1992. *Integracja Gospodarcza Polski w Latach 1918–1923* in: *Studia Historyczne* (XXXIII/1/127,1991), pp. 63–76. Reprinted in Paul Latawski (1992): *The Reconstruction of Poland, 1914–1923*, London: Basingstoke.
Landau, Z., Tomaszwski, J., 1999. *Zarys Historii Gospodarczej Polski 1918–1939*, Warsaw, Ksiazka i Wiedza.
Liulevicius, V.G., 2000. War Land on the Eastern Front: Culture, National Identity and German Occupation in World War I. Cambridge University Press, Cambridge, MA.
Markowski, B., 1927. Organizowanie administracji skarbowej w Polsce (1918–1927), Warsaw.
McCallum, J., 1995. National Borders Matter: Canada–US regional trade patterns. American Economic Review 85 (3), 615–623.
Nitsch, V., 2000. National borders and international trade: evidence from the European union. Canadian Journal of Economics 33 (4), 1091–1105.
Nitsch, V., 2001. It's not right, but it's okay: on the measurement of intranational and international trade distances, Mimeo, Bankgesellschaft Berlin.
Olszewicz, B., 1938. Obraz Pols ki dzisiejszej. Wydawnictwo M. Arcta, Warsaw.
Pisarski, M., 1974. Koleje Polskie (1842 – 1972), Warsaw.
Pollard, S., 1981. The Integration of the European Economy since 1815. Allen and Unwin, London.
Redding, S., Venables, A., 2001. "Economic Geography and International Inequality", CEP Discussion Paper No. 495, London School of Economics.
Roszkowski, W., 1992. The reconstruction of the Government and State apparatus in the Second Polish Republic. In: Latawski, Paul (Ed.), The Reconstruction of Poland, 1914–1923. Basingstoke, London, pp. 158–177.
Tomaszewski, J., 1966. Handel regelmentowany w Polsce 1918–1921, Zeszyty Naukowe SGPiS, Warsaw.
Wei, S.-J., 1996. "Intra-national vs. International Trade: How Stubborn are Nations in Global Integration?" NBER Working Paper No. 5531.
Weinfeld, I., 1935. Skarbowść Polska. Bibljoteka Prawnicza, Warsaw.
Wolf, H.C., 1997. "Patterns of Intra- and Inter-State Trade", NBER Working Paper 5939.
Wolf, H.C., 2000. Intra-national home bias in trade. The Review of Economics and Statistics 82 (4), 555–563.
Wolf, N., 2003. Economic Integration in Historical perspective: the Case of Interwar Poland, 1918–1939, Ph.D. diss. Humboldt-Universität zu Berlin.
Zdziechowski, J., 1925. Finanse Polski w latach 1924 i 1925, Warsaw.
Zbijewski, W., 1931. *Waluta Polska* in: *Odrodzona Skarbowoœæ Polska*, Warsaw.