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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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De Nederlandsche Bank NV
P.O. Box 98
1000 AB AMSTERDAM
The Netherlands

Ctrl+C Ctrl+pay: Do people mirror payment behaviour of their peers? *

Carin van der Cruijsen[a] and Joris Knoben[b]

[a] *De Nederlandsche Bank (DNB), the Netherlands*
[b]*Radboud University (RU), Institute for Management Research, the Netherlands*

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Abstract

For stakeholders in the payment system seeking to influence the usage of specific payment instruments, it is important to know what drives consumers' choice of payment instrument. However, little is known about how the social environment influences payment behaviour. This study fills this gap by researching the relevance of peer effects for payment behaviour. We used the detailed payment diary data of Dutch consumers. Our findings show that payment behaviour is strongly influenced by the environment that people live in, especially when the environment is characterised by strong social cohesion. Hence, our study offers new insights into the diffusion of payment behaviour.

Keywords: payment diaries, payment behaviour, peer effects, consumer survey.
JEL classifications: A14, D12, D14, E42, E58, Z13.

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1. Introduction

Payments carry considerable costs, which depend on the payment instruments used in a country. A recent costs study in Canada shows that the total costs of point-of-sale (POS) payments amount to 0.78% of GDP (Kosse et al. 2017). This study also reveals that in Canada debit cards are the least expensive payment instrument, both in terms of costs per transaction and costs per dollar in sales. Previous costs studies on other countries also show that the societal costs of payments are substantial and that a shift in payment behaviour, from cash to electronic, may result in a major cost savings (e.g. Segendorf and Jansson (2012) on Sweden and Jonker (2013) on the Netherlands). Due to this cost difference and higher efficiency, increased use of electronic payment instruments benefits economic growth, consumption and trade (Hasan et al. 2012). However, in many countries cash is still king (Esselink and Hernández 2017). Hence, there is great interest from central banks, commercial banks and retailers to influence payment behaviour, specifically to steer payment behaviour towards electronic means of payment (e.g. Bagnall et al. 2016, p.50).

To be able to influence consumers' payment behaviour at the POS, it is crucial to understand what drives payment behaviour. Extant research has shown that payment behaviour depends on personal, transaction and payment instrument characteristics (see Kosse (2014) and Humphrey (2010)). In various countries, cash usage has been seen to decrease with income, education and transaction size and to increase with age and the amount of cash in the consumer's pocket (e.g. Arango-Arango et al. 2018). There is also compelling evidence that the use of a particular payment instrument depends on perceived characteristics including user-friendliness, speed, and safety (e.g. Schuh and Stavins 2010; van der Cruijsen and Plooij 2018), and incentives such as the relative cost of card payments compared with cash payments and withdrawal costs (Arango-Arango et al. 2018) or reward programmes (Simon et al. 2010). POS characteristics such as merchant card acceptance and venue also play a role (e.g. Bagnall et al. 2016).[1]

These studies, however, (implicitly) assume that payment behaviour is a purely individual choice. This is remarkable as many studies have shown that peer effects play a role in human decisions within a wide range of contexts. Examples are eating behaviour (see Higgs and Thomas (2016) for a literature review), attending school (e.g. Patacchini et al. 2017), and being productive (e.g. Falk and Ichino 2006). Moreover, there is a growing body of research that speaks to the importance of peer effects for financial decisions too. For example, households that interact with their neighbours or attend church are more likely to invest in equities (Hong et al. 2004), and people copy the investment choices of their neighbours, especially if they live in

[1] However, using Canadian data Wakamori and Welte (2017) find that cash usage in small-value transactions is determined primarily by consumer preferences.

more sociable states (Ivković and Weisbenner 2007). Other examples are that peer information is relevant for retirement savings (e.g. Beshers et al. 2015) and that peer behaviour influences a person's level of risk aversion (Ahern et al. 2014).

We do not know, however, whether the social environment influences payment behaviour. Do people for instance copy the payment behaviour they observe in their environment? On the one hand it could be argued that, like many of the behaviours listed above, peer effects are likely to be present. On the other hand, paying at a POS is highly individual behaviour that does not impact peers, nor does it require specific skills or knowledge that has to be obtained from peers. The first contribution of our research, assessing whether peer effects exist for payment behaviour, therefore pertains to both the payment literature as well as the peer effect literature. With regard to the former, we add the importance of social context to the list of variables that influence payment behaviour. This is of specific importance because, if social context matters, this opens up new avenues for policy interventions based on peer influence. With regard to the latter we contribute to exploring the boundary conditions of when peer effects are relevant. We further strengthen our contribution by assessing whether the presence of copying behaviour depends on a community's degree of social cohesion. By doing so, we shed light on the question when peer effects are more (or less) relevant for the behaviour of individuals.

A second contribution of our work also pertains to the literature on payments. Specifically, we enhance the current insights about the drivers of regional differences in consumer payment behaviour within countries. The majority of research on payment behaviour focuses on the individual level, disregarding the spatial contexts of individuals. Other studies try to explain cross-country differences in payment behaviour (e.g. Bagnall et al. 2016). However, understanding within-country regional differences in payment behaviour is important because in the face of regional differences in payment behaviour, one-size-fits-all policies and interventions at country level may not be effective or efficient.

To achieve our envisaged contributions, we used payment diary data collected in the Netherlands. Nowadays, many central banks use diary information to map out consumer payment behaviour (e.g. Bagnall et al. 2016; Arango-Arango et al. 2018). The main benefit of such data is that it is very rich. In addition to providing detailed information on the actual payment behaviour of Dutch consumers between September 2013 and December 2017, using this data enabled us to include a wide range of controls capturing the background of respondents. Moreover, as is key for the research contribution we intend to make, the place of residence of each respondent is included in the data set. Besides the richness of the data, the Netherlands is a specifically good setting to examine whether people copy payment behaviour they observe in their environment. First, the Netherlands is a very individualistic society.

According to Hofstede et al. (2010), the Netherlands has an individualism score of 80 (on a scale of 0-100), which makes it the fourth most individualistic country in his ranking of 78 countries. As a result, highly individualised choices and decisions may be expected in this context. If we find peer effects in a country where the ties between individuals are less firm, peer effects are likely to be present (and stronger) in countries with stronger ties between individuals. Second, there is a high degree of debit card acceptance in the Netherlands.[2] Consequently, we can focus on differences in consumer behaviour and need not worry about differences in the acceptance level on the retailer side. Last but not least, there are no barriers to copying peer behaviour as the main payment instruments, cash and debit card, are adopted by virtually all consumers.

Foreshadowing our main results, we find that people mirror the payment choices of their peers. In addition, the degree of copying behaviour is influenced by the degree of social cohesion in a neighbourhood.[3] If social cohesion is very strong, people almost exactly copy the payment behaviour of others in their environment. Our findings are robust to the use of various alternative specifications.

These are important findings for central banks, providers and developers of payment instruments, merchants and other stakeholders seeking to stimulate the usage of efficient, safe and sustainable payment instruments. Our study offers new insights into the diffusion of payment behaviour. Influencing payment behaviour is potentially easier in areas with a high degree of social cohesion than in regions where the ties between people are loose if the influencing measures reach a critical part of the community. If this happens, the use of the new payment instrument may spread rapidly because of copying behaviour. However, if the critical mass is not reached, payment behaviour can be very persistent and difficult to change. In regions with weak social cohesion a great deal of effort is needed to reach individuals separately, because of the weaker copying effect.

This paper is structured as follows: section 2 presents the theoretical background and hypotheses. The data used to test whether the social environment influences payment behaviour and the situation in the Netherlands are described in Section 3. Section 4 outlines how the elements of our model are measured and describes the outcomes of these variables. Section 5 includes the main regression results and describes the outcomes of various robustness tests, and section 6 includes our summary and conclusions. We recap the contributions of our research, discuss the policy implications and suggest some avenues for future research.

[2] In 2016, for only 1.6% of the cash transactions and for 1% of debit card transactions, consumers did not use their preferred payment instrument (DNB and Dutch Payments Association (DPA) 2017).
[3] As a measure of social cohesion, we adopt the measure developed by Goudriaan et al. (2006) based on nine items of the three-yearly Netherlands' Housing Research (WoON) specifically designed to measure social cohesion.

2. Theoretical background and hypotheses

2.1 Literature review and our contribution

The payments literature shows large discrepancies in consumer payment behaviour across the globe, even between neighbouring countries. In the US in 2015, consumers used cash as often as debit cards to pay non-bills and the remaining one-third of transactions was paid using other payment instruments (Greene et al. 2017). European consumers mostly use cash on the other hand. In 2016, 79% of all POS transactions within the euro area were made in cash and cash is king in most European countries (Esselink and Hernández 2017). However, there are major differences between countries in the share of cash: the share of POS transactions paid in cash ranged between 45% in the Netherlands and 92% in Malta.

As noted earlier, most studies on payment behaviour focus on the payment behaviour of individuals ignoring their (spatial) context. There are some studies that describe within-country differences in payment behaviour (e.g. Borzekowski et al. 2008; Stavins 2016 for the United States (US) and Bounie et al. 2017 for France). In addition, both the regional patterns and the drivers of payment behaviour have been shown to change over time (van der Cruijsen and Plooij 2018). Specific examples of research on regional payment patterns are the studies by Wang and Wolman (2016) and Ardizzi et al. (2016). The former find that the payment mix people use is driven by the characteristics of the location, which in part proxy for the extent to which people have access to non-cash payments. The latter examined cash anomalies in Italy and found that cash usage in cities and towns depends positively on the local level of criminal activity and money laundering. Neither of these studies, however, explicitly focuses on the role of the payment decisions of others in the same environment, i.e. on peer effects.

Some studies do relate peer effects to financial decisions, but not to payment behaviour specifically. A recent example is the work of Kahn et al. (2017) who analysed 2008-2014 annual panel data on the payment behaviour of US consumers to test social spillovers in consumers' security assessments of payment instruments. They found that the security perceptions of others have a positive effect on people's own security perceptions. Spillover rather than reflection seems to be at play. These studies show that social spillovers are stronger for consumers with a high level of social interaction than for consumers with little interaction with others. Another example is the work of Patacchini and Rainone (2017) who examined various financial decisions by young adults and found that credit card adoption (but not usage) is relatively likely if good friends also have credit cards.

However, the literature linking peer effects to payment behaviour is in its infancy, and we contribute to it by researching in depth whether people's social environment influences their payment behaviour. Like many other everyday decisions, the choice of payment instrument is

not a fully rational decision, but is also influenced by various other factors. Although economic incentives play a key role, they cannot fully explain payment behaviour (e.g. Camera et al. 2016). Even though research on socio-psychological factors is still limited, the few available studies show that a wide range of factors drive payment behaviour, for example social norms (perception of how other people in your environment pay), perceived control over payments, attitudes, feelings and roles (perceived best-suited payment behaviour) (van der Horst and Matthijsen 2013; Khan et al. 2015; van der Cruijsen et al. 2017; van der Cruijsen and van der Horst 2016). As such, there seems to be ample room for peer effects to influence payment behaviour.

2.2 Peer effects and payment behaviour

The theoretical basis for peer effects on behaviour is found in group socialisation theory (Moreland and Levine 1982). This theory defines three channels through which peers may influence behaviour: social utility, observational learning, and enforcing of social norms (Bursztyn et al. 2017). Social utility in this context means that people derive a benefit from acting the same as other people (Loewenstein et al. 1989). Influence of this type of peer effect is often found in behaviour where there is a strong preference for synchronizing behaviour between friends as in, for example, students' choice for a secondary school (Bobonis and Finan 2009). The effects of social utility on economic decisions have also been established in game-theoretical experiments (Gibbons and van Boven 2001), in investment experiments (Bursztyn et al. 2017), and in field studies (Maurer and Meier 2008). With respect to payment behaviour, this channel would be present if people derive utility from using the same payment instrument as others in their community. Such effects are likely to materialise for person-to-person payments, in which case it is convenient and easy to use a payment instrument that others also use. However, given that our study focuses on POS payments, we expect this specific channel of peer influence to be of relatively small, if any, importance.

The second possible peer effect channel is observational learning and word-of-mouth communication (e.g. Ellison and Fudenberg 1993; Ellison and Fudenberg 1995; Banerjee and Fudenberg 2004; Bursztyn et al. 2017). This channel builds on the notion that the decisions of others may reflect private information. Hence, people can use the behaviour of others to guide their own decisions. Examples of such influence on behaviour are widely documented and range from ordering at a restaurant (Cai et al. 2009) to auctioning behaviour (Garvin and Kagel 1994) and the rise of trends and fashions (Bikhchandani et al. 1998). With regard to payment decisions, people may learn from each other how to adopt and use (new) payment instruments. We expect that this channel may be present if a new, technologically advanced, payment method is introduced. However, given that the usage of the most common payment methods (cash, debit

card, and credit card) is rather straightforward, we do not expect this channel to exert any major influence on payment behaviour either.

The third potential channel through which peers can influence behaviour is the existence and formation of social norms from which deviations are costly, due to a preference for conformity, or identity considerations (e.g. Akerlof and Kranton 2000; Benjamin et al. 2010). These kinds of effects are often established in highly visible and social behaviour such as smoking (Zaleski and Aloise-Young 2013) and bullying (Duffy and Nesdale 2009). The study of social norms also has a long tradition with regard to economic behaviour (Elster 1989) and has been linked specifically to the development of stable cooperation between groups of people (Fehr and Gachter 2000). Specifically for payment behaviour, using the newest payment instruments may signal being trendy and highly educated. On the other hand, the use of cash may signal social status (Khan et al. 2015) and there may be communities in which people like to identify with cash users. Therefore, people may be copying the payment behaviour of other people in their environment to conform to explicit and implicit shared social norms.

The discussion of the three peer effect mechanisms reflects the two positions with regard to peer effects and POS payment behaviour discussed in the introduction. On the one hand, we argue that observational learning and social utility will play a modest role at best. Therefore, peer effects could be argued to be smaller than for other types of behaviour. On the other hand, peer effects could occur driven by compliance with social norms. All in all, we do expect the payment methods used by people's peers to influence their own payment behaviour. Our first hypothesis therefore reads:

H1: The higher the share of transactions paid by means of a specific payment instrument by peers in an individual's community, the higher the individual's share of transactions paid with that specific payment instrument will be.

2.3 Social cohesion and peer effects on payment behaviour

If, as argued in hypothesis 1, payment behaviour is influenced by peer effects, this effect would not be expected to be the same across all communities. Rather, this effect, specifically the part of the effect related to the formation of social norms, should be stronger if individuals identify themselves more with the community they are embedded in. This is to say that the effect of peer behaviour in the community on an individual's behaviour is likely to be influenced by the level of social cohesion in that community.

The concept of social cohesion - defined as a sense of identification with and belonging to a collective - and its consequences is central to the science of sociology (Sampson 1991). Addressing the vast amount of literature on social cohesion (Friedkin 2004) is not our objective

here. We will build on some of the earlier work on social cohesion in general and community cohesion in particular (Marquis and Battilana 2009; Almandoz 2012) to argue that a community's degree of cohesiveness will have an effect on the extent to which individuals are influenced by the behaviour of their peers in the community.

Social cohesion refers to the sentiment, sense, and feeling that ties the residents to the specific place - community - and creates commitment and responsibility among the residents to take care of it (Friedkin 2004). A community's social cohesion in this context results from the positive effect that a strong sense of belonging has on things like adherence to common values and norms, the salience of past experiences, and common ideas and culture (Kearns and Forrest 2000, p. 1001). A sense of belonging to the community is valuable in supporting residents' acknowledgement of their collective circumstances and their motivation for collective action. A sense of belonging to a community and kinship among its members are also thought to be conducive to the development and cementing of mutual obligation among individuals (Chaskin 1997).

Previous research has linked community level social cohesion to numerous different kinds of behaviours and outcomes (Sampson et al. 2002). The overall picture that emerges from the literature is that strong social cohesion is a double edged sword in the sense that it creates and enforces strong local norms and values while at the same time isolating the community members from the outside world. This creates a very strong sense of commitment to the community, which has profound effects on behaviour. In a recent study, Simons et al. (2016) show that high levels of social cohesion can lead to overriding of individual preferences in favour of group preferences, even resulting in violation of laws.

With regard to peer effects on payment behaviour, the above implies that the higher the level of social cohesion in a community, the stronger the shared values and standards and the higher the pressure to adhere to these standards and values. This means that the pressure resulting from all three peer behavioural mechanisms, but specifically that of social norms is amplified. This, in turn, should result in higher levels of copying behaviour in communities with higher levels of social cohesion. This line of reasoning leads to our second, and final, hypothesis:

H2: The higher the social cohesion in a community, the stronger the positive relationship between the share of transactions paid by means of a specific payment instrument by peers in an individual's community and the individual's share of transactions paid with that payment instrument.

3. Data and measurements

Before turning to our data sources and the computations used to construct our variables, we should address the operationalisation of our peer group level: the community. Given that our

approach to social cohesion focuses on elements of local culture, norms and identity, municipalities are the obvious (geographical) entities to use in the Dutch context (Norbutas and Corten 2018). Dutch municipalities are relatively small geographical units that coincide with cities or towns and their surrounding environment. They exhibit high levels of economic and social homogeneity (Tolsma et al. 2009; van Tubergen et al. 2005). As such, they serve as an excellent operationalisation of the concept of peer communities as we have defined them. They have also played this role in previous public administration (Plantinga et al. 2011), economics (Knoben et al. 2011) and sociology studies (van Tubergen et al. 2005).

3.1 Payment diaries

To map out the relationship between a person's payment behaviour and the payment behaviour of others, this study uses rich payment survey data collected from Dutch consumers. The data collection was commissioned by DNB and the Dutch Payments Association (DPA). The primary goal of the DNB/DPA Survey on Consumers' Payments (SCP) is to measure payment behaviour (see Jonker et al. 2018). The data spans the period between September 2013 and December 2017. The questionnaire is filled in by members of the *GfK* market research-panel, aged 12 years and over and is representative for the Dutch population of 12 years and over.

The payment survey has two parts: a one-day payment diary to record payment behaviour at physical POSs and an additional questionnaire.[4] In the one-day diary consumers register all the payments they make during the day. They report the POS, the amount paid, the payment instrument used and whether they were able to pay the way they wanted to pay. In the second component of the survey, detailed additional information is collected on consumers' payment preferences, their perceived payment behaviour and personal characteristics. The latter are important as they enable us to apply controls for personal characteristics. Moreover, the data includes the numerical part of the respondents' postal code. This enables us to relate individuals' payment behaviour to the mean payment behaviour of people who live in the same area.

We used a selection of the available survey data. We took the payment dairies where the respondent made at least one payment at a POS on the recording date. We only looked at the payment behaviour of individuals within municipalities for which we have at least thirty observations. Our analyses are based on 106,991 observations: 15,233 observations were made in 2013[5]; 33,064 in 2014; 19,369 in 2015; 19,516 in 2016, and 19,809 in 2017. All weeks and

[4] Jonker and Kosse (2013) show that information on payment behaviour is more reliable for respondents who were asked to fill in their payment behaviour for one day than for respondents who were asked to report their payment behaviour for a longer time span. Data collected using a one-week survey shows 40% fewer transactions than data collected by means of a one-day survey.

[5] Only September and November are covered.

week days are adequately covered.[6] 97% of the payment dairies in our sample were filled in online and 3% was delivered by telephone. Respondents partake at most once every quarter.[7] On average respondents in our sample participated 2.4 times. Most respondents (49%), participated once only. On average respondents in our sample made 2.3 payments per day. 43% reported one payment, 26% two payments, 14% three payments, 8% four payments and the remainder reported more than four payments.

3.2 The situation in the Netherlands

Dutch consumers pay a majority of their POS transactions by debit card (DNB and DPA 2018a; DNB and DPA 2018b). In 2017, 41.4% of transactions at shops, petrol stations, restaurants and other retail outlets was made in cash and 58.1% by debit card. Credit cards were only used for 0.5% of POS purchases and only 43% of consumers are in the possession of a credit card. Debit card payments increased to 3.84 billion transactions in 2017 from 2.15 billion in 2010. Meanwhile, the number of cash transactions fell to 2.74 billion from 4.37 billion. Between 2010 and 2017, the value of debit card payments increased 25% to EUR 101 billion in 2017, whereas the value of cash transactions decreased 33% to EUR 35 billion. Over time it has become more accepted to pay small transactions by debit card. In the Netherlands, payment behaviour varies across types of POS. For example, debit cards are often used in clothes stores and at petrol stations whereas cash is used a lot for payments at market stalls and bars.

Debit card usage has been heavily promoted in the Netherlands. In 2003, the National Forum of the Payments System (NFPS) was established. It represents providers and users of the retail payment system and contributes to a socially efficient organisation of this system. In 2007, banks and retailers launched a campaign to stimulate consumers to pay by debit card (also for small amounts) and retailers to accept debit card payments. The campaign has contributed to the substitution of cash by debit card payments (Jonker et al. 2017).

The Netherlands is well suited to examine whether people copy the payment behaviour they observe in their environment. First, it is an individualistic society (Hofstede et al. 2010). If we find peer effects in a country where the ties between individuals are loose, peer effects are likely to be present in countries with stronger ties as well. Second, the Netherlands has a high degree of debit card acceptance.[8] As a result, we were able to focus solely on differences in

[6] "*For every day of the week and every week in the month, the number of respondents was sufficiently large and representative in terms of gender, age, ethnicity, education, region, country of origin and income.*" (Jonker et al. 2018, p.12).

[7] Hernandez et al. (2017) have shown that it makes no difference for the reported number and value of cash and debit card transactions whether respondents are fresh or trained. This holds true for any demographic group, sector and transaction size.

[8] As mentioned in the introduction to this report, in 2016 consumers did not use their preferred payment instrument for only 1.6% of cash transactions and 1% of debit card transactions (DNB and DPA 2017). Various reasons were reported, including non-acceptance, the payment terminal being out of order, or not having enough cash or the electronic payment instrument in one's pocket.

consumer behaviour. Third, nowadays almost all Dutch consumers are in the possession of a debit card. This means that there are no barriers to copying peer behaviour as all main payment instruments are available to virtually all consumers.

4. Regression method

4.1 Dependent variable and Tobit model

We used regression analysis to find out whether consumers' payment decisions at the counter are related to the payment behaviour of other people in their environment. We ran regressions with the share of transactions paid by debit card by individual *i* on registration date *rd* as dependent variable. This variable is labelled *share of transactions by debit card*$_{i,rd}$ and ranges between 0 and 1. The average is 0.49, meaning that on average an individual in our sample pays 49% of transactions by debit card. 39% did not use a debit card at all, whereas 37% paid all their transactions by debit card. Since scores of the dependent variable are between 0 and 1 and a large proportion of the observations are at these boundaries, we used the Tobit model.[9] We postulated that:

$$share\ of\ transactions\ by\ debit\ card_{i,rd} = \begin{cases} share\ of\ transactions\ by\ debit\ card^*_{i,rd} & if\ 0 < share\ of\ transactions\ by\ debit\ card^*_{i,rd} < 1 \\ 0 & if\ share\ of\ transactions\ by\ debit\ card^*_{i,rd} \leq 0 \\ 1 & if\ share\ of\ transactions\ by\ debit\ card^*_{i,rd} \geq 1 \end{cases} \quad (1)$$

where $the\ share\ of\ transactions\ by\ debit\ card^*_{i,rd}$ is the latent variable:

$$share\ of\ transactions\ by\ debit\ card^*_{i,rd} = \beta_0 + \beta_1 share\ of\ transactions\ by\ debit\ card_{mun} + \beta_2 share\ of\ transactions\ by\ debit\ card_{mun} * social\ cohesion_{mun} + \beta_3 social\ cohesion_{mun} + \beta_4 personal\ controls_{i,rd} + \beta_5 region\ controls_{i,rd} + \beta_6 other\ controls_{i,rd} + \beta_7 date\ controls_{rd} + e_{mun} \quad (2)$$

Equation 2 relates the share of debit card payments on registration day *rd* by individual *i* to the mean share of payments by debit card reported by individuals living in the same municipality *mun* ($share\ of\ transactions\ by\ debit\ card_{mun}$). By including this variable interacted with $social\ cohesion_{mun}$ and the variable $social\ cohesion_{mun}$ we were able to test whether the copying effect depends on the degree of social cohesion. We included personal controls, region controls, other controls and data controls. e_{mun} indicates the standard errors. These are

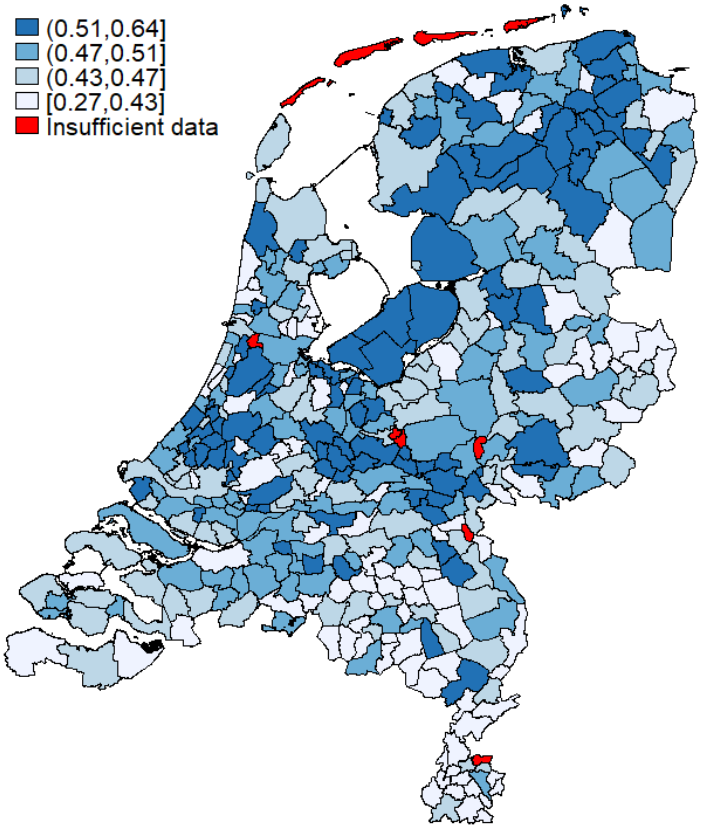
[9] Wooldridge (2002) argues that it makes sense to call the model that fits this type of data well a *corner solution model*. However, in practice the term *censored regression model* is used more often. Wooldridge (2002) argues that the Tobit model is an appropriate method to use for a corner solution dependent variable (Papalia and Di Iorio 2001).

clustered at the municipality level. With regard to hypothesis 2, we expect β_2 to be positive; a higher degree of social cohesion goes together with a stronger peer effect. To assess this effect, we plotted the relationship between average municipal payment behaviour and individuals' predicted payment behaviour for various levels of social cohesion

4.2 Payment behaviour of others

We included the mean of the share of transactions by debit card within municipality *mun* (*share of transactions by debit card*$_{mun}$) as the key explanatory variable. As mentioned before, we only included municipalities with at least thirty observations. Figure 1a shows a graph of the Netherlands with the values for *share of transactions by debit card*$_{mun}$ for each municipality. For 10 municipalities we did not have enough observations, whereas we did for 380 municipalities. When focussing on this selected dataset, we found that in Grave, a town in the southern province of Noord-Brabant, the average share of debit card transactions was the lowest at 27% during the period examined. The highest share was observed in Haren, a town in the northern province of Groningen, namely 64%. On average, people pay 49% of their transactions by debit card.

Figure 1. Average payment behaviour per municipality
Average share of the number of POS transactions by debit card

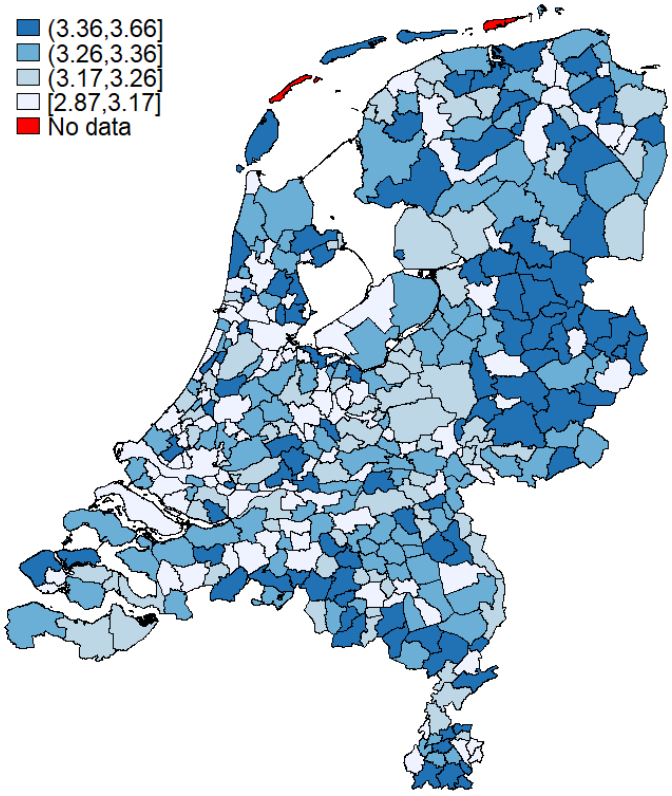


Source: DNB/DPA SCP.
Note: The figure shows the payment behaviour in the municipalities for which we have at least thirty observations.

4.3 Social cohesion

Figure 2 depicts the social cohesion per municipality and shows that it varies a lot across municipalities. It ranges between 2.87 in Groningen and 3.66 in Landerd, a small town in the southern province of Noord-Brabant.

Figure 2. Social cohesion per municipality



Note: This figure shows the municipality averages of the measure developed by Goudriaan et al. (2006) using the WoON2012 survey (Ministry of the Interior and Kingdom Relations and Statistic Netherlands 2012).

As a measure of social cohesion we adopt the measure developed by Goudriaan et al. (2006) based on nine items of the three-yearly Netherlands' Housing Research (WoON) specifically designed to measure social cohesion. We used the outcomes of WoON2012, which was conducted between September 2011 and May 2012 and for which the reference date is January 1, 2012 (Ministry of the Interior and Kingdom Relations, 2012).[10] The sample consists of 78,071 respondents, and the sampling framework was designed to be representative at the municipal level. The respondents answered questions about their living environment including the nine items we are interested in. A respondent's level of kinship is the average of 5-point

[10] For more information see https://www.cbs.nl/en-gb/our-services/methods/surveys/korte-onderzoeksbeschrijvingen/netherlands-housing-survey--woon--, https://www.cbs.nl/en-gb/news/2013/11/netherlands-housing-research-2012 and https://disco.datawonen.nl/disco/info/woon12/2012/Doc/info_frame.htm. URLs last accessed on October 16, 2018.

likert scale answers to nine items: (a) I feel attached to this neighbourhood, (b) I feel at home in this neighbourhood, (c) I have a lot of contact with my neighbours, (d) I have a lot of contact with other people in the neighbourhood, (e) I feel responsible for keeping the neighbourhood a pleasant place to live, (f) people are nice to each other in this neighbourhood, (g) I live in a pleasant neighbourhood with a sense of solidarity, (h) people in this neighbourhood hardly know each other (reversed scale) and (i) I am pleased about the composition of the population in this neighbourhood. This scale is very reliable (alpha = 0.831). We averaged the scores of all individuals in a given municipality to construct the variable *social cohesion*$_{mun}$. *Social cohesion*$_{mun}$ is absent for only two municipalities.

4.4 Control variables

We applied a wide range of commonly used control variables. In all regressions, we added the following individual-specific binary dummy variables to the set of explanatory variables to control for personal characteristics: *male: between 12 and 24; between 35 and 44; between 45 and 54; between 55 and 64; 65 and over, income: middle income; high income; unknown income, education: middle education: high education*, *partner*, *children*, and *native*. *Male* is 1 for male respondents and 0 for female respondents. *Between 12 and 24* is 1 for respondents younger than 25 and 0 for respondents over 25. We constructed the remaining age dummies along the same lines. The reference person is a native, single woman of between 25 and 34 without children and with a personal net monthly income of less than EUR 1,000 and a low level of education.

Second, we applied controls for the characteristics of the environment people live in, e.g. the degree of urbanisation as this may impact payment behaviour. We included the variable *degree of urbanisation*$_{mun}$. It ranges between 1, not urbanised, and 5, highly urbanised.

We also included the *income polarisation*$_{mun}$, variable capturing to what extent people living in the same region are of similar socio-economic status. This is important as similar payment behaviour may also be observed owing to similarities in socio-economic characteristics. Specifically, we used data from Statistics Netherlands about the number of individuals in a municipality in each income decile. Intuitively, the more people are spread out over these income deciles the more polarised their municipality is. To capture this intuition in our variable we applied the 'earth mover distance' (Deza and Deza 2009). This measure captures, how many income deciles on average an individual must be moved in order to get all individuals into the same income decile. If all individuals are already in the same income decile (the least polarised situation) the *income polarisation*$_{mun}$ is 0. If 50% of the individuals is in the highest income decile and 50% in the lowest decile (the most polarised situation) the *income polarisation*$_{mun}$ is 4.5. Given that the Netherlands is a country with relatively egalitarian income distribution, the minimum observed value is 2.09 and the maximum observed value is 2.84.

We also applied controls for other factors by using the detailed information embedded in the payment survey. *Average transaction size in EUR 100* is included to control for the value of the transaction. We also included measures capturing other behaviour during the transaction day: the number of transactions at the POS (*number of transactions*) and the number of withdrawals (*number of withdrawals*). The variable *log (cash on hand in EUR 100)* captures the log of the cash in the consumer's wallet in the morning in EUR 100.[11]

Finally, we applied controls for the registration date. Four sets of dummy variables capture the registration day: (1) month dummies (reference month: January), (2) day of the month dummies (reference day: first day of the month), (3) day of the week dummies (reference day: Sunday), and (4) year dummies (reference year: 2013).

5. Results: People mirror the payment choices of others

5.1 Baseline results

Our main finding is that people mirror the payment choices of others, especially if the municipality is characterised by strong social cohesion. Table 1 column 1-3 show the results of regressions with *share of transactions by debit card*$_i$ as the dependent variable. Column 1 reports the results of a regression with only controls included, column 2 documents the outcomes of a regression with s*hare of transactions by debit card*$_{mun}$, and column 3 shows the outcomes of the full specification (see equation 1 and 2), so with *social cohesion*$_{mun}$ and the *share of transactions by debit card*$_{mun}$ interacted with *social cohesion*$_{mun}$ as explanatory variables. The latter model outperforms the first two models.

Given previous research on payment behaviour, the findings made on the control variables do not come as a surprise. The share of transactions by debit card is the highest among consumers aged between 25 and 34. Teenagers are more inclined to use cash and in the over 35 category debit card usage declines with age. Debit card usage is positively related to education and income. The share of debit card transactions is higher among people who live together with a partner, have children living at home, and/or live in urbanised regions. Consumers making expensive purchases use their debit cards for a larger proportion of their transactions than consumers who on average buy cheap products and services at a POS. Consumers who perform several transactions a day are more likely to reach for their debit card than consumers who only perform one transaction a day. The larger the number of ATM-withdrawals during the registration day, the lower the share of transactions paid by debit card. People with a lot of cash

[11] Note that multicollinearity is not a problem. The mean Variance Inflation Factor (VIF) is 1.67. The maximum VIF is 2.66, the minimum is 1.03.

on hand are less likely to pay a high proportion of their transactions by debit card than people with little cash in their wallet.

Table 1. Mirroring the payment behaviour of other people: baseline regression results
Tobit regressions with *share of transactions by debit card*$_{i,rd}$ as dependent variable

	(1)	(2)	(3)
Share of transactions by debit card$_{mun}$		3.05***	-2.66*
		(0.07)	(1.56)
Share of transactions by debit card$_{mun}$ **social cohesion*$_{mun}$			1.78***
			(0.49)
Social cohesion$_{mun}$			-0.83***
			(0.23)
Male	0.02	0.02	0.02
	(0.01)	(0.01)	(0.01)
Between 12 and 24	-0.28***	-0.29***	-0.29***
	(0.03)	(0.03)	(0.03)
Between 35 and 44	-0.16***	-0.16***	-0.16***
	(0.03)	(0.03)	(0.03)
Between 45 and 54	-0.21***	-0.21***	-0.21***
	(0.02)	(0.02)	(0.02)
Between 55 and 64	-0.29***	-0.29***	-0.29***
	(0.03)	(0.03)	(0.03)
65 and over	-0.36***	-0.35***	-0.35***
	(0.03)	(0.03)	(0.03)
Education: middle	0.29***	0.28***	0.28***
	(0.02)	(0.02)	(0.02)
Education: high	0.37***	0.37***	0.37***
	(0.02)	(0.02)	(0.02)
Income: middle	0.13***	0.13***	0.13***
	(0.02)	(0.02)	(0.02)
Income: high	0.18***	0.18***	0.18***
	(0.02)	(0.02)	(0.02)
Income: unknown	0.12***	0.12***	0.12***
	(0.02)	(0.02)	(0.02)
Partner	0.21***	0.20***	0.20***
	(0.02)	(0.02)	(0.02)
Children	0.05***	0.04***	0.04***
	(0.02)	(0.02)	(0.02)
Native	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)
Degree of urbanisation$_{mun}$	0.03***	0.00	0.01
	(0.01)	(0.00)	(0.01)
Income polarisation$_{mun}$	0.37***	0.03	0.05
	(0.08)	(0.04)	(0.04)
Average transaction size in EUR 100	2.68***	2.66***	2.66***
	(0.03)	(0.03)	(0.03)
Number of transactions	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Number of withdrawals	-0.46***	-0.45***	-0.45***
	(0.02)	(0.02)	(0.02)
Log (cash on hand in EUR 100)	-1.59***	-1.55***	-1.55***
	(0.04)	(0.04)	(0.04)
Constant	-1.23***	-1.79***	0.80
	(0.22)	(0.13)	(0.75)
Number of observations	106,991	106,991	106,991
Model significance	386.11 (0.00)	404.31 (0.00)	399.52 (0.00)
Log-pseudolikelihood	-105643.11	-105182.16	-105178.42
Akaike's information criterion	211432.2	210512.3	210508.8

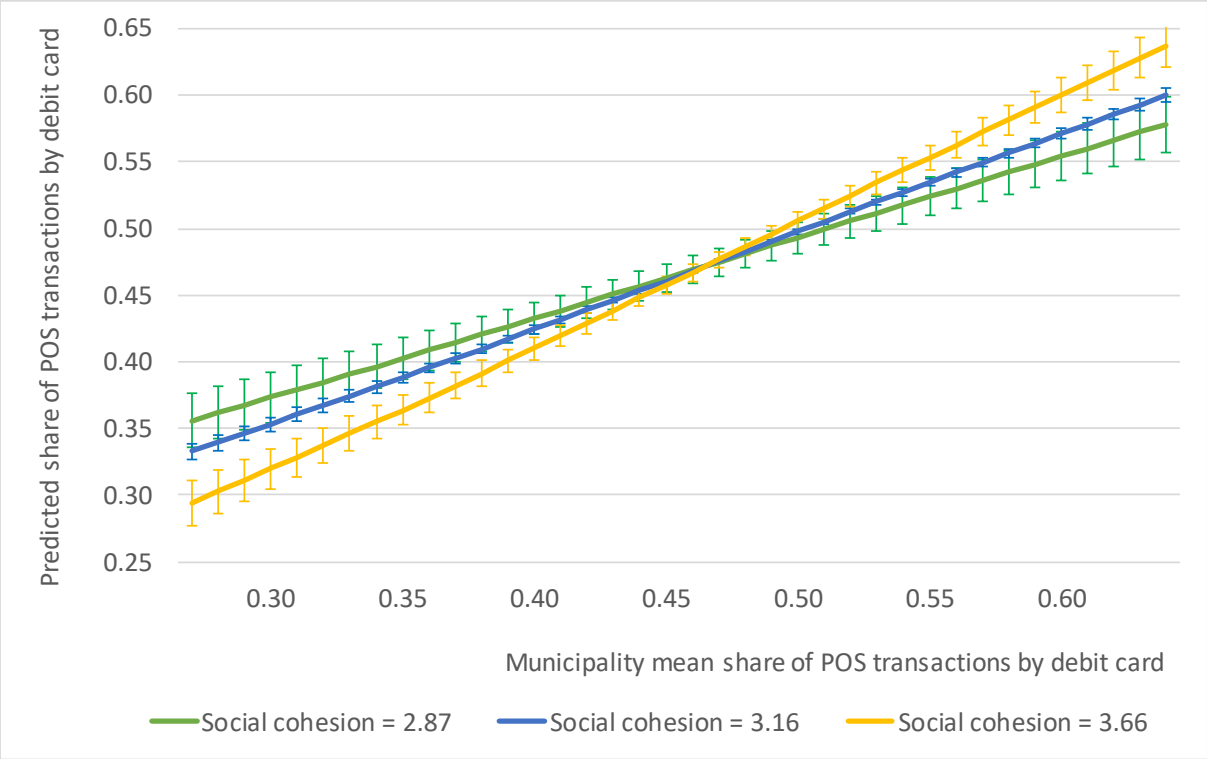
Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

We find support for H1: the results in column 2 reveal that people copy payment behaviour of other people within their municipality. The coefficient of *share of transactions by debit card*$_{mun}$ is positive, which indicates that there is a positive relationship between the payment choices an individual makes and the payment choices made by other people in his or her environment. People living in areas were cash is king are likely to also use cash themselves. However, people living in areas where debit cards are often used for POS transactions are likely to use their own debit cards a lot as well.

To quantify the magnitude of this effect we calculated the predicted share of POS transactions by debit card for the same individual living in different municipalities. For inhabitants living in the average municipality in terms of debit card usage, the predicted individual's share of debit card usage is 49%. By contrast, it is 45% for inhabitants of regions where cash is often used (*share of transactions by debit card*$_{mun}$ - 1 standard deviation). On the other hand, if people live in an area where debit cards are used a lot (*share of transactions by debit card*$_{mun}$ +1 standard deviation), the individual's predicted share of debit card transactions is 53%. Comparing these values implies that the share of debit card payments made by a given individual increases 8 percentage points (or 17%) by moving the individual from a region with (one standard deviation) below average debit card usage to a region with (one standard deviation) above average debit card usage.

We also find support for H2: the copying effect is especially strong in an environment of strong social cohesion (column 3). Figure 3 visualises the effects for three different values of social cohesion: the minimum, mean and maximum value in our sample. It shows an individual's predicted share of transactions paid by debit card given the municipality mean share of debit card payments. The figure shows that there is a peer effect regardless of the level of social cohesion. However, the size of the effect depends heavily on the level of social cohesion. It is especially strong in municipalities characterised by strong social cohesion. In case of maximum social cohesion, people almost entirely copy the behaviour of others in their environment. The slope of the line in Figure 3 is 0.96, i.e. a 10 percentage point increase in the municipality mean share of debit card payments (in %) results in a 9.6 percentage points higher individual share of debit card payments. In a municipality with an average degree of social cohesion, this effect is 7.4 percentage points, whereas it is 6.1 percentage points in case of a minimum degree of social cohesion. Comparing these effect sizes implies that in high social cohesion environments, the peer effect is 1.6 times as strong as it is in low social cohesion environments.

Figure 3. The copying effect for different levels of social cohesion
Predicted share of POS transactions paid by debit card with 95% confidence intervals



Note: 2.87, 3.16, and 3.66 are respectively the minimum, mean, and maximum degree of social cohesion observed in the data. POS= point-of-sale.

5.2 Exploring the peer effect mechanism

Given the nature of our data, it is difficult to causally establish that our findings are truly peer effects. In addition to including a wide range of control variables capturing both individual, payment and regional characteristics, we believe that the moderation effect of social cohesion provides strong evidence that peer effects are truly at play here. Potential alternative explanations would not only have to explain the main effect of regional payment behaviour, but also its amplification by social cohesion. However, as this issue is critical to our study, we performed further analyses to rule out alternative explanations and underpin the claim that our findings actually classify as peer effects. Specifically, we investigated whether the size of the peer effect for individuals who should be more susceptible to the behaviour of others is indeed larger. We did so by isolating a group of respondents born (note: country of birth, not nationality) in countries with low levels of individualism. The Netherlands has relatively large groups of immigrants from Turkey, Morocco, Indonesia, and Surinam that all have very collectivist cultures. Our data contains 2,611 observations from respondents born in one of these four countries. Running our main model for these respondents only (see Appendix C) reveals a peer effect of 4.28 (versus 2.93 for the native respondents living in the same municipalities). The peer effect for this group is estimated to be 46% larger than it is for native Dutch respondents. This is to be expected given the more collectivist cultural background of these respondents. We should

acknowledge that, due to the small sample size of the foreign born respondents, the difference is not statistically significant (p=0.13). Nonetheless, the difference in point estimates does go in the expected direction, providing further evidence that peer effects are actually at play here.

5.3 Robustness

Our findings are robust to the use of various alternative model specifications: in all cases they support H1 and H2. The results of these regressions are provided in Appendix B. Table B.1 summarises the variables used in these regressions.

One of the robustness exercises we performed is estimating regressions with the share of transactions paid in cash (*share of transactions in cash*$_{i,\,rd}$) as the dependent variable and *share of transactions in cash*$_{mun}$ instead of *share of transactions by debit card*$_{mun}$ as the main explanatory variable. On average people in our sample paid 46% of their transactions in cash. 35% of the respondents paid all their transactions in cash, whereas 42% made no cash payments at all. Given that payment instruments other than cash and debit cards only play a minor role in the Netherlands, we expect the cash regression to yield similar results as our baseline debit card regression. The results in Table B.2 of Appendix B confirm our earlier finding that people mirror payment choices in their municipality, especially if this is characterised by strong social cohesion. As expected, the coefficients of the control variables have the opposite sign from those in the baseline case.

The results are also robust to the use of a year-specific measure of the mean payment behaviour within a municipality (Appendix B, Table B.3). A drawback of this time-specific measure is that we can include fewer observations since we need to have at least thirty observations per region for each year. In addition, we ran regressions with the share of the *value* of transactions paid by debit card instead of the share of the number of transactions paid by debit card and again found that consumers mirror payment choices, especially if they live in municipalities characterised by strong social cohesion (Appendix B, Table B.4). The final robustness test that provides evidence of the robustness of our findings comes from running our analyses keeping only the first annual observation of each respondent in the data (Appendix B, Table B.5).

In addition to the robustness tests discussed in this paper, we ran various other robustness test, the results of which are available upon request. First, we ran our analyses including the coefficient of variation of payments by debit card in the municipality as an additional control variable. This control variable accounts for the fact that the peer information is not equally univocal in all municipalities. Second, we included fixed effects at a higher level of spatial aggregation (i.e. the provincial level of which there are 12 in the Netherlands). Third, we ran our models excluding all communities of more than 100,000 households. This is based on

the notion that in larger communities, social cohesion could be argued to operate at lower levels of spatial aggregation than the municipality. Finally, we split our data in two time-periods and analysed them separately to ensure that rising trends in debit card payments do not bias our results. The outcomes for all of these analyses are identical in terms of the sign and significance to those reported in Table 1.

6. Discussion and conclusions

The main result of our study is that people copy the payment behaviour they observe in their environment, especially if the environment is characterised by strong social cohesion. If social cohesion is very strong, people almost exactly copy the payment behaviour of others in their environment. Our findings are robust to the use of various alternative specifications.

With these results we contribute to two strands of literature: the peer effect and the payment literature. The first contribution of our research, assessing whether peer effects exist for payment behaviour, pertains to both strands. With regard to the peer effect literature, we contribute by exploring the boundary conditions of when peer effects are relevant. We showed that peer effects are important even if the deck is stacked against finding them. We studied an individualistic type of behaviour, for which we only expected one peer effect mechanism to be of importance and two other mechanisms to play a modest role at best, in a very individualistic society. Given the sizeable peer effect even in our context, we expect peer effects to be even more important for types of (payment) behaviour for which observational learning and social utility are important too. Examples of such behaviour are technologically new person-to-person payments via bill-splitting apps for smartphones.

With regard to the payment literature, we add the importance of social context to the list of factors that influence payment behaviour. This is of specific importance because this opens up new avenues for policy interventions based on peer influence. Whereas the extant research has shown that payment behaviour depends on personal, transaction and payment instrument characteristics, little was known to date about how the social environment influences payment behaviour. Our study offers new insights into the diffusion of payment behaviour. We further underpin our contribution to the peer effect literature by assessing whether the presence of copying behaviour depends on the communities' degree of social cohesion. By doing so we shed light on the question when peer effects are more (or less) relevant for the behaviour of individuals. Last but not least, we add to the payments literature by advancing our insights with regard to the drivers of regional differences in consumer payment behaviour within countries.

One of the main policy implications of these findings is that place-based policies and interventions will be more effective and efficient than country-level one-size-fits-all policies. Within other fields of economics, regional economic development in particular, a place-based

policy approach has become the norm (see Neumark and Simpson (2015) for an overview). Our research also reveals that policies and interventions can have multiplier effects by influencing not only the targeted individual but also his or her peers. This is an important finding for central banks, providers and developers of payment instruments, merchants and other stakeholders seeking to stimulate the usage of efficient, safe and sustainable payment instruments. The first step is to map out regional payment patterns. The second step is to select the regions where the payment behaviour deviates most from the stakeholder's envisaged payment behaviour. Third, it is important to map out the level of social cohesion per region. The last step is to develop place-based policies and interventions that take into account the starting point with respect to the payment behaviour and factor in the level of social cohesion. Influencing payment behaviour may be easier in areas with a high degree of social cohesion than in regions with a low degree of social cohesion. Suppose one wants to stimulate the use of a new payment instrument. If one is able to reach a critical part of the community, use of the new payment instrument can spread rapidly in areas with a high degree of social cohesion. In areas with strong social cohesion, the new payment behaviour will be copied quickly (a large multiplier effect), and in regions with weak social cohesion more effort is needed to influence payment behaviour because the copying effect is weaker (a small multiplier effect).

In the policy approach outlined above, it is absolutely essential that a critical part of the community is reached. High social cohesion can also lead to very strong resistance against policy interventions if the interventions fail to reach the critical part of the community. This problem is nicely illustrated by events that unfolded in the village of Graauw in the southern Netherlands in 2013. The local bank planned to close down the village's single ATM .[12] The bank motivated these plans with arguments pertaining to the decline in the usage of cash and the costs of maintaining the ATM, mainly related to security. Moreover, it offered several alternatives, including a (first year for free) cash-delivery service, in return. However many residents, especially the elderly, strongly resisted the change. A national interest organisation for the elderly spearheaded the resistance against the plans and effectively mobilised the local population.[13] It emphasised the importance of access to cash, especially for the elderly, but also played heavily on the anti-bank sentiment that prevailed in the wake of the 2008 financial crisis. In the end, the bank was forced to re-open the ATM.[14] The high level of social cohesion in the village was critical to organising the resistance against changing payment behaviour.

[12] https://www.omroepzeeland.nl/nieuws/69986/Inwoners-Graauw-willen-pinautomaat-niet-kwijt. URL last accessed on October 16, 2018.
[13] http://www.kbozeeland.nl/actueel/default.asp?page=archief&id=280. URL last accessed on October 16, 2018.
[14] https://www.betaalvereniging.nl/actueel/persberichten/banken-houden-contant-geld-bereikbaar-in-zeeuws-vlaanderen/. URL last accessed on October 16, 2018.

Despite the important contributions offered by our research, several limitations also apply. First, even though our analyses show strong evidence for peer effects we were unable to establish a causal link between the regional level of payment behaviour and individual payment behaviour. Further experimental studies are required to do this. Second, we did not study which individual matters the most within a community, in the sense that many people copy their behaviour. For stakeholders in the payment system this is interesting information because it could make their policies, interventions and campaigns more effective and efficient. And last but not least, we studied peer effects for two standard ways of payment: cash and debit cards. We made this choice to ensure that differences in the acceptance rate would not influence our results. The downside of this decision is that our results do not necessarily apply to more innovative, and more technologically advanced, payment methods. Even though we would argue that for such methods, peer effects are even stronger, as the observational learning mechanism would come into play, studying peer effects in such contexts seems a logical and fruitful extension of our study.

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Appendix A. Description of variables

Table A.1 Description of variables

Variable	Description	Mean	Sd	Min	Max
Dependent variable					
Share of transactions by debit card$_{i,rd}$	Share of POS transactions paid by debit card by individual *i* on registration date *rd*.	0.49	0.44	0	1
Independent variables					
Share of transactions by debit card$_{mun}$	Mean share of POS transactions by debit card in municipality *mun*.	0.49	0.05	0.27	0.64
Social cohesion$_{mun}$	2012 municipality average of the average of 5-point likert scale answers to nine items measuring social cohesion.	3.16	0.14	2.87	3.66
Male	Binary dummy (1 = male, 0 = female).	0.48	0.50	0	1
Between 12 and 24	Binary dummy (1 = between 12 and 24, 0 = else).	0.13	0.34	0	1
Between 25 and 34	Binary dummy (1 = between 25 and 34, 0 = else). Reference category.	0.13	0.33	0	1
Between 35 and 44	Binary dummy (1 = between 35 and 44, 0 = else).	0.17	0.38	0	1
Between 45 and 54	Binary dummy (1 = between 45 and 54, 0 = else).	0.19	0.39	0	1
Between 55 and 64	Binary dummy (1 = between 55 and 64, 0 = else).	0.17	0.38	0	1
65 and over	Binary dummy (1 = 65 and over, 0 = else).	0.20	0.40	0	1
Education: low	Binary dummy (1 = no education/primary school/courses/LBO/VBO/VMBO/MBO/ MAVO/HAVO/VWO(first 3 years)/ULO/MULO/VMBO/VSO, 0 = else). Reference category.	0.30	0.46	0	1
Education: middle	Binary dummy (1 = MBO 2, 3, 4/MBO old or HAVO/VWO, 0 = else).	0.35	0.48	0	1
Education: high	Binary dummy (1 = HBO/WO bachelor or WO/HBO, 0 = else).	0.34	0.48	0	1
Income: low	Binary dummy (1 = personal net monthly income is less than EUR 1,000, 0 = else or unknown). Reference category.	0.20	0.40	0	1
Income: middle	Binary dummy (1 = personal net monthly income ≥ EUR 1,000 and < EUR 2,000, 0 = else or unknown).	0.25	0.43	0	1
Income: high	Binary dummy (1 = personal net monthly income ≥ EUR 2,000, 0 = else or unknown).	0.22	0.42	0	1
Income: unknown	Binary dummy (1 = personal net monthly income is unknown, 0 = income is known).	0.33	0.47	0	1
Partner	Binary dummy (1 = living together or married, 0 = else).	0.62	0.49	0	1
Children	Binary dummy (1 = household with kids living at home, 0 = else).	0.30	0.46	0	1
Native	Binary dummy (1 = native, 0 = non-native).	0.81	0.40	0	1
Degree of urbanisation$_{mun}$	Measure of the degree of urbanisation (1 = "not", 2 = "not much", 3 = "moderate", 4 = "strong", 5 = "very strong").	3.39	1.24	1	5
Income polarisation$_{mun}$	Measure of how many income deciles individuals on average minimally need to be moved to get all individuals in the same income decile. Theoretically, it ranges between 0 (all individuals are already in the same income decile) and 4.5 (50% of the individuals is in the highest income decile and 50% in the lowest).	2.46	0.11	2.09	2.84
Average transaction size in EUR 100	Average transaction size (in EUR 100).	0.25	0.48	0.00	25.50
Number of transactions	Number of payments at the POS during the registration day.	2.26	1.68	1	16
Number of withdrawals	Number of withdrawals during the registration day.	0.22	0.46	0	4
Log (cash on hand in EUR 100)	Log of the average cash in the consumer's wallet in the morning (in EUR 100).	0.31	0.32	0	4.51

Note: This table describes the variables used in the regressions reported in Table 1. The mean, standard deviation (sd), minimum (min), maximum (max) are reported for the sample included in these regressions. POS = point-of-sale. The number of observations is 96,621. Unreported are summary statistics of the interaction term and the binary dummies to control for the registration data: *February,..., December*, *Day of the month 2,..., Day of the month 31*, *Monday,..., Saturday,* and *2014, 2015, 2016, 2017*.

Appendix B. Robustness

Table B.1 Description of variables included in the robustness exercises

Variable	Description	Mean	Sd	Min	Max	N
Robustness exercise 1						
Share of transactions in cash$_{i,rd}$	Share of POS transactions paid in cash by individual *i* on registration date *rd*.	0.46	0.44	0	1	106,991
Share of transactions in cash$_{mun}$	Mean share of transactions in cash in municipality *mun*.	0.46	0.06	0.30	0.67	106,991
Robustness exercise 2						
Share of transactions by debit card$_{mun,y}$	Mean share of transactions by debit card in municipality *mun* and year y.	0.49	0.08	0.21	0.75	91,286
Robustness exercise 3						
Share of value of transactions by debit card$_{mun}$	Share of value of transactions by debit card in municipality *mun*.	0.53	0.46	0	1	106,991

Note: This table describes the variables used in the regressions reported in Table B.2, B.3 and B.4. The mean, standard deviation (sd), minimum (min), maximum (max) are reported for the sample included in these regressions. POS = point-of-sale.

Table B.2 Mirroring the payment behaviour of others: cash instead of debit card

Tobit regressions with *share of transactions in cash*$_{i,rd}$ as dependent variable

	(1)	(2)	(3)
Share of transactions in cash$_{mun}$		3.08***	-3.17*
		(0.07)	(1.79)
Share of transactions in cash$_{mun}$**social cohesion*$_{mun}$			1.95***
			(0.55)
Social cohesion$_{mun}$			-0.93***
			(0.27)
Male	-0.09***	-0.09***	-0.09***
	(0.01)	(0.01)	(0.01)
Between 12 and 24	0.21***	0.21***	0.21***
	(0.03)	(0.03)	(0.03)
Between 35 and 44	0.19***	0.19***	0.19***
	(0.03)	(0.02)	(0.02)
Between 45 and 54	0.26***	0.25***	0.25***
	(0.02)	(0.02)	(0.02)
Between 55 and 64	0.38***	0.37***	0.37***
	(0.03)	(0.03)	(0.03)
65 and over	0.49***	0.48***	0.48***
	(0.03)	(0.03)	(0.03)
Education: middle	-0.29***	-0.28***	-0.28***
	(0.02)	(0.02)	(0.02)
Education: high	-0.46***	-0.45***	-0.45***
	(0.02)	(0.02)	(0.02)
Income: middle	-0.13***	-0.13***	-0.12***
	(0.02)	(0.02)	(0.02)
Income: high	-0.23***	-0.22***	-0.22***
	(0.02)	(0.02)	(0.02)
Income: unknown	-0.13***	-0.13***	-0.13***
	(0.02)	(0.02)	(0.02)
Partner	-0.17***	-0.17***	-0.17***
	(0.02)	(0.02)	(0.02)
Children	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)
Native	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)
Degree of urbanisation$_{mun}$	-0.05***	-0.00	-0.01
	(0.01)	(0.00)	(0.01)
Income polarisation$_{mun}$	-0.63***	-0.04	-0.08*
	(0.08)	(0.05)	(0.04)
Average transaction size in EUR 100	-1.13***	-1.12***	-1.12***
	(0.01)	(0.01)	(0.01)
Number of transactions	-0.07***	-0.07***	-0.07***
	(0.00)	(0.00)	(0.00)
Number of withdrawals	0.57***	0.56***	0.56***
	(0.02)	(0.02)	(0.02)
Log (cash on hand in EUR 100)	1.71***	1.68***	1.68***
	(0.04)	(0.04)	(0.04)
Constant	2.78***	-0.26*	2.82***
	(0.21)	(0.14)	(0.89)
Number of observations	106,991	106,991	106,991
Model significance	300.52 (0.00)	333.57 (0.00)	331.33 (0.00)
Log-pseudolikelihood	-103464.06	-102956.31	-102950.85
Akaike's information criterion	207074.1	206060.6	206053.7

Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Table B.3 Mirroring the payment behaviour of others: year-specific regional payment behaviour

Tobit regressions with *share of transactions by debit card*$_{i,rd}$ as dependent variable

	(1)	(2)	(3)
Share of transactions by debit card$_{mun,y}$		3.23***	1.06
		(0.06)	(0.96)
Share of transactions by debit card$_{mun,y}$ **social cohesion*$_{mun}$			0.69**
			(0.30)
Social cohesion$_{mun}$			-0.28*
			(0.14)
Male	0.02	0.02	0.02
	(0.01)	(0.01)	(0.01)
Between 12 and 24	-0.27***	-0.27***	-0.27***
	(0.04)	(0.04)	(0.04)
Between 35 and 44	-0.16***	-0.16***	-0.16***
	(0.03)	(0.03)	(0.03)
Between 45 and 54	-0.22***	-0.21***	-0.21***
	(0.02)	(0.02)	(0.02)
Between 55 and 64	-0.30***	-0.30***	-0.30***
	(0.03)	(0.03)	(0.03)
65 and over	-0.36***	-0.36***	-0.36***
	(0.03)	(0.03)	(0.03)
Education: middle	0.29***	0.27***	0.27***
	(0.02)	(0.02)	(0.02)
Education: high	0.38***	0.37***	0.37***
	(0.03)	(0.02)	(0.02)
Income: middle	0.14***	0.13***	0.13***
	(0.02)	(0.02)	(0.02)
Income: high	0.18***	0.18***	0.18***
	(0.03)	(0.02)	(0.02)
Income: unknown	0.13***	0.13***	0.13***
	(0.03)	(0.02)	(0.03)
Partner	0.21***	0.21***	0.20***
	(0.02)	(0.02)	(0.02)
Children	0.05**	0.04**	0.04**
	(0.02)	(0.02)	(0.02)
Native	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)
Degree of urbanisation$_{mun}$	0.02**	0.00	0.01
	(0.01)	(0.00)	(0.01)
Income polarisation$_{mun}$	0.41***	-0.02	-0.01
	(0.09)	(0.05)	(0.05)
Average transaction size in EUR 100	0.96***	0.94***	0.94***
	(0.01)	(0.01)	(0.01)
Number of transactions	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Number of withdrawals	-0.46***	-0.45***	-0.45***
	(0.02)	(0.02)	(0.02)
Log (cash on hand in EUR 100)	-1.58***	-1.53***	-1.53***
	(0.04)	(0.04)	(0.04)
Constant	-1.28***	-1.55***	-0.71
	(0.24)	(0.14)	(0.47)
Number of observations	91,286	91,286	91,286
Model significance	420.11 (0.00)	470.20 (0.00)	473.84 (0.00)
Log-pseudolikelihood	-90322.965	-89668.24	-89666.885
Akaike's information criterion	180791.9	179484.5	179485.8

Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Table B.4 Mirroring the payment behaviour of others: value of transactions

Tobit regressions with *share of the value of transactions by debit card*$_{i,rd}$ as dependent variable

	(1)	(2)	(3)
Share of transactions by debit card$_{mun}$		3.10***	-2.86*
		(0.07)	(1.68)
Share of transactions by debit card$_{mun}$ **social cohesion*$_{mun}$			1.86***
			(0.52)
Social cohesion$_{mun}$			-0.86***
			(0.24)
Male	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Between 12 and 24	-0.29***	-0.29***	-0.29***
	(0.04)	(0.03)	(0.03)
Between 35 and 44	-0.16***	-0.16***	-0.16***
	(0.03)	(0.03)	(0.03)
Between 45 and 54	-0.21***	-0.20***	-0.20***
	(0.02)	(0.02)	(0.02)
Between 55 and 64	-0.28***	-0.28***	-0.28***
	(0.03)	(0.03)	(0.03)
65 and over	-0.35***	-0.34***	-0.34***
	(0.03)	(0.03)	(0.03)
Education: middle	0.30***	0.29***	0.29***
	(0.02)	(0.02)	(0.02)
Education: high	0.39***	0.38***	0.38***
	(0.02)	(0.02)	(0.02)
Income: middle	0.14***	0.14***	0.14***
	(0.02)	(0.02)	(0.02)
Income: high	0.19***	0.19***	0.18***
	(0.02)	(0.02)	(0.02)
Income: unknown	0.12***	0.12***	0.12***
	(0.02)	(0.02)	(0.02)
Partner	0.21***	0.21***	0.21***
	(0.02)	(0.02)	(0.02)
Children	0.05***	0.04**	0.04**
	(0.02)	(0.02)	(0.02)
Native	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)
Degree of urbanisation$_{mun}$	0.03***	0.00	0.01
	(0.01)	(0.00)	(0.01)
Income polarisation$_{mun}$	0.38***	0.04	0.06
	(0.09)	(0.05)	(0.04)
Average transaction size in EUR 100	1.01***	1.00***	1.00***
	(0.01)	(0.01)	(0.01)
Number of transactions	0.05***	0.05***	0.05***
	(0.00)	(0.00)	(0.00)
Number of withdrawals	-0.48***	-0.47***	-0.47***
	(0.02)	(0.02)	(0.02)
Log (cash on hand in EUR 100)	-1.63***	-1.60***	-1.60***
	(0.04)	(0.04)	(0.04)
Constant	-1.28***	-1.85***	0.83
	(0.22)	(0.14)	(0.80)
Number of observations	106,991	106,991	106,991
Model significance	393.42 (0.00)	410.57 (0.00)	409.52 (0.00)
Log-pseudolikelihood	-106017.98	-105565.05	-105561.08
Akaike's information criterion	212182.0	211278.1	211274.2

Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Table B.5 Mirroring the payment behaviour of others: only first yearly observation included

Tobit regressions with *share of transactions by debit card*$_{i,rd}$ as dependent variable

	(1)	(2)	(3)
Share of transactions by debit card$_{mun}$		2.80***	-4.00**
		(0.09)	(1.74)
Share of transactions by debit card$_{mun}$**social cohesion*$_{mun}$			2.12***
			(0.54)
Social cohesion$_{mun}$			-0.98***
			(0.26)
Male	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Between 12 and 24	-0.29***	-0.30***	-0.29***
	(0.04)	(0.04)	(0.04)
Between 35 and 44	-0.16***	-0.16***	-0.16***
	(0.03)	(0.02)	(0.02)
Between 45 and 54	-0.20***	-0.20***	-0.20***
	(0.02)	(0.02)	(0.02)
Between 55 and 64	-0.29***	-0.29***	-0.29***
	(0.03)	(0.03)	(0.03)
65 and over	-0.36***	-0.35***	-0.35***
	(0.03)	(0.03)	(0.02)
Education: middle	0.27***	0.26***	0.26***
	(0.02)	(0.02)	(0.02)
Education: high	0.36***	0.36***	0.36***
	(0.02)	(0.02)	(0.02)
Income: middle	0.14***	0.14***	0.14***
	(0.02)	(0.02)	(0.02)
Income: high	0.18***	0.18***	0.18***
	(0.02)	(0.02)	(0.02)
Income: unknown	0.12***	0.12***	0.12***
	(0.02)	(0.02)	(0.02)
Partner	0.21***	0.20***	0.20***
	(0.02)	(0.02)	(0.02)
Children	0.04***	0.04***	0.04***
	(0.02)	(0.02)	(0.02)
Native	0.01	0.00	0.00
	(0.02)	(0.02)	(0.02)
Degree of urbanisation$_{mun}$	0.03***	0.01***	0.02***
	(0.01)	(0.00)	(0.01)
Income polarisation$_{mun}$	0.42***	0.10*	0.12***
	(0.09)	(0.05)	(0.04)
Average transaction size in EUR 100	1.00***	1.00***	1.00***
	(0.01)	(0.01)	(0.01)
Number of transactions	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Number of withdrawals	-0.46***	-0.46***	-0.46***
	(0.01)	(0.01)	(0.01)
Log (cash on hand in EUR 100)	-1.55***	-1.52***	-1.52***
	(0.04)	(0.04)	(0.04)
Constant	-1.39***	-1.89***	1.18
	(0.22)	(0.16)	(0.86)
Number of observations	88,367	88,367	88,367
Model significance	354.18 (0.00)	360.20 (0.00)	351.23 (0.00)
Log-pseudolikelihood	-87284.145	-86957.783	-86953.22
Akaike's information criterion	174714.3	174063.6	174058.4

Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Appendix C. Natives versus non-natives from less individualistic countries

Table C1. Mirroring the payment behaviour of others: natives versus a selected group of non-natives from less individualistic countries

Tobit regressions with *share of transactions by debit card*$_{i,rd}$ as dependent variable

	(1b) Natives^	(2) Non-natives from less individualistic countries
Share of transactions by debit card$_{mun}$	2.93***	4.28***
	(0.09)	(1.11)
Male	0.02	0.12
	(0.02)	(0.12)
Between 12 and 24	-0.27***	0.08
	(0.04)	(0.35)
Between 35 and 44	-0.17***	-0.15
	(0.03)	(0.13)
Between 45 and 54	-0.23***	0.08
	(0.03)	(0.14)
Between 55 and 64	-0.31***	-0.09
	(0.03)	(0.14)
65 and over	-0.38***	-0.23
	(0.03)	(0.16)
Education: middle	0.28***	0.09
	(0.02)	(0.11)
Education: high	0.37***	0.13
	(0.02)	(0.11)
Income: middle	0.13***	0.20*
	(0.02)	(0.12)
Income: high	0.18***	0.45***
	(0.03)	(0.12)
Income: unknown	0.12***	0.10
	(0.03)	(0.15)
Partner	0.22***	0.03
	(0.02)	(0.07)
Children	0.04**	0.04
	(0.02)	(0.10)
Degree of urbanisation$_{mun}$	0.01	-0.07*
	(0.01)	(0.03)
Income polarisation$_{mun}$	0.04	-0.18
	(0.05)	(0.47)
Average transaction size in EUR 100	0.94***	0.36**
	(0.01)	(0.15)
Number of transactions	0.02***	0.01
	(0.00)	(0.02)
Number of withdrawals	-0.46***	-0.24**
	(0.02)	(0.11)
Log (cash on hand in EUR 100)	-1.55***	-1.23***
	(0.04)	(0.14)
Constant	-1.71***	-1.74
	(0.16)	(1.15)
Number of observations	79,349	2,611
Model significance	3444.50 (0.00)	8.70 (0.00)
Log-pseudolikelihood	-78072.593	-2601.9408
Akaike's information criterion	156291.2	5349.882

Note: Robust standard errors clustered at the municipality level are in parentheses. Unreported are the coefficients of the dummies that control for the registration date: month dummies, day of the month dummies, day of the week dummies and year dummies. The selected group of non-natives consists of people who are born in Indonesia, Surinam, Turkey or Morocco. ^Natives living in municipalities for which we also have payment dairy data from the selected group of non-natives.*** p<0.01, ** p<0.05, * p<0.1.

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De Nederlandsche Bank N.V.
Postbus 98, 1000 AB Amsterdam
020 524 91 11
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