Neighbourhood effects in welfare use*

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Abstract: This paper aims at analysing the existence of neighbourhood effects in welfare transitions. We do so by analysing the effect of being surrounded by individuals transiting in and out of social assitance, but also other environment characteristics. Our identification strategy follows three steps. We first apply the approach developed by Bayer, Ross and Topa (2008) by focusing on an exogenous source of variation with respect to the neighbours, provided by very fine granularity of the data. We then extend this strategy to check whether interactions may take place at higher level, that is at city level or local labour market level. Finally, we use an IV strategy based on the shift-share approach to examine whether diversity at the level of local labour market mediate social assistance transitions. We apply these methods to Luxembourg administrative social security data available from 2001-2015 which provides precise information at a small geographical unit – the postal code. Preliminary main findings highlight a similar positive impact of the behaviours of the neighbours on both transitions. However, such similarity vanished when dealing with impact of the specificities of the environment.

Keywords: minimum income scheme, neighbourhood effects, diversity, block-level-data

JEL classification : H53; J21 ; R23 ; J60

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1. Introduction

The empirical literature focusing on participation in social assistance programs has to face with a puzzling fact: a non-negligible proportion of individuals eligible for assistance does not claim its welfare benefits (Moffit, 1983). This robust evidence suggests that the decision to participate in welfare is not exclusively linked to individual characteristics and economic incentives. Informational spillovers and norms (through stigma, social approval or peer pressure) have been addressed as important determinant of take-up decisions (Aizer & Currie, 2004, Cohen-Cole & Zanella, 2008a, 2008b, Dahl *et al*, 2014, Figlio 2015). This hypothesis suggests that the extent and quality of social relations may play a key role in individual behaviour. Therefore, the interaction between individuals within the community environment in which they live may influence individuals' behavior and their probability to receive welfare. They may also play a role of social multiplier (see e.g. Glaeser et al. 2003), an important parameter for public policy, inducing as well that analysis of individuals' behaviour isolated from the community environment may be biased (see e.g. Maurin and Moschion, 2009).

Less is know about the neigborhood effects on transition out of social assistance. The environment an individual is confronted with may impact in different ways both types of transitions. Indeed, while stigma and information sharing about the program may explain why being surrounded by beneficiaries affect positively entry into a social program (e.g. Cohen-cole and Zanella, 2008b), information sharing on vacancies or imitation behavior of succesful neighbours may be associated with exit from social assistance (van der Klaauw and van Ours, 2003). Our first contribution is to capture these mechanisms through the effect of neighbours characteristics and behavior on individuals' transition in and out of social assistance.

We address the conceptualization and estimation of neighbourhood effects in welfare transitions using Luxembourg, and its main social assistance scheme - the Revenu Minimum Garanti (RMG) – as a relevant case study for three reasons. Luxembourg has experienced a

remarkable growth over the last thirty years with the consequence of being able to develop substantially its social security system (Hartmann-Hirsch, 2010). The combination of high benefits level by international standards (Van Mechelen and Marchal, 2013) and of the competition on the labour market between residents workers (eligible to social assistance) and non-resident cross-border workers (more than 40% of domestic employment) from neighbouring countries (Fusco *et al*, 2014) with lower reservation wages, make the case for a potentially high level of welfare dependence in Luxembourg. This was confirmed by recent work showing that long-term benefit receipt is frequent in Luxembourg but not welfare recidivism (Immervoll *et al*, 2014; Königs, 2018). Finally, in one of the few studies analysing the Luxembourg social assistance system, Amétépé (2012) estimate a substantial non take up rate for the RMG in Luxembourg of 65%. This makes it even more relevant to analyse the question of peer effect in welfare use or transitions in this country as the environment may mediate the (non) take-up.

In addition, the peculiar composition of Luxembourg resident population (high share of immigrants with heterogeneous skills and earnings capacity, see Hildebrand *et al*, 2015) makes it possible to refine the analysis of neighbourhood effects. To tackle the environment specificities we focus first on the average characteristics of the neighbours and second on the share of different citizenships and the relative mix of foreigners through a diversity index. Algan *et al* (2016), analysed the effect of ethnic diversity on social relationships and housing quality and found that diversity induced social anomie. Hémet and Malgouyres (2018) explore the effect of diversity on individuals' employment prospects at various geographic levels. They find that local labor market diversity has a positive effect on employment, but that neighbourhood diversity has a negative effect. The literature has so far been inconclusive about the link between local diversity and social assistance (Cutler, 2008). The second contribution of this paper will precisely be to tackle this topic.

Focusing on neighbourhood effects raise identification concerns (see e.g. Manski, 1993, 2000). We handle them by using the strategy developed by Bayer, Ross and Topa (2008) based on a very fine spatial granularity of the data. This strategy allows us to assume, and test on observable characteristics, that the remaining variations are almost randomly distributed, once controlling for the endogenous sorting of direct neighbours. The third contribution of this paper is precisely that, to our knowledge, this is the first paper applying this identification strategy to the analysis of neigborhood effects on welfare use. In a second step we extend this strategy to check whether interactions may take place at higher level, that is at city level or local labour market level. Furthermore, we investigate using an IV strategy based on the shift-share method used in the migration literature (Card, 2001) whether diversity at the level of local labour market may significantly mediate mobility in and out of social assistance.

We apply this methodology to Luxembourg social security longitudinal data which reports annual information on Luxembourg resident population from 2001 to 2015. The main advantage of this dataset is the possibility to work at different detailed geographical level including the postal-code level which, in the case of Luxembourg, is close to the street level. The main findings highlight first similar impact of the behaviours of the neighbours on both transitions. However, such similarity vanished when dealing with impact of the specificities of the environment.

The paper is organised as follows. Section 2 presents a short literature review on neigborhood effect identification while Section 3 describes the 'Revenu Minimum Garanti' (RMG) which is Luxembourg main social assistance scheme and the research that has been done on it. In Section 4 we present the data and give some descriptives statistics and in Section 5 the method. Section 6 presents the results while Section 6 concludes.

2. Literature review on neigborhood effects

The identification of the impact of neighbourhood effects, comprising the underlying mechanisms (informational spillover and norms), is complicated by various elements such as omitted variables, the reflection problem and non-random sorting of individuals into neighbourhoods (Durlauf, 2004, Ioannides & Topa, 2010). The reflection problem refers to the difficulty of distinguishing between social effects (individual decision depends on other individuals' decisions) and correlated effects (neighbours may act similarly because they share the same environment) (see Manski 1993, 2000).[1]

Two main strategies have been outlined to assess neighbourhood effects. The first one is based on (quasi-)random experiment which requires the existence of social experiment where individuals are randomly assigned to an area (e.g. see Ludwig *et al*, 2013 about the Moving to Opportunity experiment or Aslund & Fredriksson, 2009 or Casciano & Massey, 2012 about welfare use and dependence). This approach suffers from the fact that they are not necessarily fully exogenous and that generalizability of the results is not for granted. The second one based on methodological and empirical modelling of neighbourhood interactions have documented the existence of a neighbourhood effect on welfare use. Bertrand *et al* (2000) seminal paper uses both residential area and language variation to assess the existence of network effects effects[2] on welfare use. Their results provide an important contribution by supporting varying networks effects on welfare use by (language) group. Other papers have focused more specifically on welfare to work transitions, e.g. Mood (2010) or van der Klaauw & van Ours (2003).

An innovative way to identify neighbourhood effects was proposed by Bayer, Ross & Topa (2008). They focus on exogenous source of variation of neighbourhood in analysing the

[2] In their case, network effects are social links between individuals within a neighbourhood. Those effects summarise quantity of contact (through density of language group) and quality of contact (through welfare use of a language group). Neighbourhood and networks effects are closely intertwined (Topa & Zenou, 2015).

effect of social interactions on the labour markets. Their empirical analysis assess whether individuals have a higher probability to work with individuals living in the same block or group of blocks. The extremely narrowly defined neighbours' reference group offers such an exogenous source of variation under the condition that we control for sorting (through fixed effects). This is because it would be first difficult (for buyers or renters) to identify differences in neighbourhood characteristics area by area in a rather short time period, and second because that the housing opportunities within areas, if any, are rather restricted at this level. This method, which requires the availability of very good data, offers in addition an alternative way to solve the reflection problem. This block-level source of exogenous variation is used by Algan *et al* (2016) in another context. Grossmann and Khalil (2018) use this approach to analyse participation of pregnant women in Medicaid during pregnancy. Their results suggest that information plays a key role to reduce the gap between eligibility and participation in welfare programs, especially in lower knowledge neighbourhood.

This approach has not yet been applied to neighbourhood effects on social assistance transitions which requires accounting for three additional elements. First, the transition in and out social assistance may depend on the specific environment an individual is confronted with.[3] However, identifying neighbourhood effects according to varying context is challenging. Empirical evidence is still rather inconclusive with respect to the connection between local segregation/diversity and outcomes (Cutler *et al*, 2008). Second, possible spatial self-segregation of long-term RMG holders, due for example to housing market conditions, may need to be accounted for. The focus on transitions will provide the opportunity to overcome this issue. Third, the dynamic of the specific local labour markets have to be taken into account given the close link between job availability and welfare participation (e.g. Hoynes, 2000). This

[3] This idea is related to the concept of homophily which refers to personal networks homogeneity (McPherson *et al*, 2001) and which is assumed to limit people's social worlds according to the information they receive (impacting cost acquisition) and the attitudes they form (impacting stigma).

assumption is strengthened by the spatial mismatch hypothesis arguing in the US case that low-skilled minorities (concentrated in the South of the country in our case) have less job opportunities due to their lower access to large labour market (Luxembourg-city labour market) (See Dautel and Walther, 2014).

3. Luxembourg Social Assistance Scheme

The Luxembourg minimum guaranteed income (Revenu Minimum Garanti - RMG) is the main social assistance programme in Luxembourg (See Amétépé, 2012 or Loutsch and Berger, 2019). It was introduced in 1986 and reformed in 1999 with a substantial modification of the eligibility criteria of age, residence and means.[4] Within the RMG scheme, applicants can be entitled to a monetary allowance (complementary allowance/'allocation complémentaire') but also benefit from an activation measure to support their integration in the labour market (integration allowance/'allocation d'insertion'). The complementary allowance can be paid also as a top-up in the event the integration allowance is not sufficient for the household to reach the minimum guaranteed income threshold.

In this paper, we focus on the complementary allowance which is administered by the Fonds National de Solidarité (FNS) within the Ministry of Family and Integration and can be provided without a time limit as long as the criteria of eligibility are met. In particular, applicants are supposed to have exhausted all other forms of support foreseen by the law, must not have been fired due to serious misconduct in previous work activity or have resigned and meet the eligibility requirement in terms of age, residence and means-test.[5]

[4] Note that in the framework of a major reform, the RMG has been replaced in 2019 by the Revenu d'Inclusion Sociale (REVIS). The REVIS is out of the scope of the current paper.

[5] For the activation measures, additional conditions are that an individual must be aged less than 60, be available and fit to participate in activation measures and not receiving unemployment benefits or participating in ADEM measures. Activation measures ('activités d'insertion professionelles – AIP') consist in public work ('travaux d'utilité collective') or internship in enterprise. The beneficiaries receive an integration allowance which is equal to the minimum wage and is subject to payment of health/maternity social contribution, long-term care contribution and pension contribution. See Girardi (forthcoming) for more details on the integration scheme.

When created in 1986, eligibility to the RMG was restricted to individuals aged at least 30 years old. Exceptions were granted for individuals raising children (for whom they receive family benefits) or in situation of illness or disability requiring assistance. In 1999, the age requirement was lowered to 25 years old. In addition to the same previous exceptions, individuals taking care of adults in need of permanent support were also eligible before 25. Since then, the age condition remained at this level while the other exceptions were refined in subsequent laws.

In 1986, eligibility was restricted to Luxembourg residents present in the country since at least ten years without any nationality requirement. The residence requirement was reduced to 5 years within the last twenty years for all residents in 1999 and subsequently modified in 2001 when a distinction by nationality was introduced: Luxembourg nationals as well as European Union/European Economic Space nationals and refugees/apatrids were not anymore subject to a residence length condition, while other individuals were still subject to the 5 year residence.[6]

The means-test condition is based on all types of incomes received by a household (except family allowance and long term care benefits) as well as the size and composition of the household. Individuals are eligible to the RMG if the resources at their disposal are below a minimum threshold fixed by law – and the complementary allowance (CA) is the difference between the minimum threshold the income of the household. The minimum income threshold corresponds to a fixed base rate, which depends on the size and composition of the household and is adjusted for inflation as is the case for other social parameters in Luxembourg.[7] In 1986, a disregard of 20% of the gross (household-specific) guaranteed minimum income applies to

[6] The law of 29 august 2008 precise that members of families of Luxembourg nationals, EU and EEA nationals are exempted from this condition. In addition, EU nationals are not entitled to requesting the RMG for at least 3 month after their arrival.
[7] In 2018, the RMG for a single adult amounted to 1436.20 € per month while the presence of a second adult increase the RMG by 718.14 € per month and any additional adult by 410.95 €. Each child increase the RMG by 130.55 €. The amount of the RMG for a single adult is 1436.20 € per month and for a family of two adults and two children 2154.34 € per month. By comparison, the value of the minimum wage is 2048,54 € for an unskilled worker and 2458.25 € for a skilled worker.

labour income, pension and replacement income (but not to income from capital, parental leave and alimonies which are included in the computation of household income but not subject to disregard), which was increased to 30% in 2002. Therefore, the sum of the complementary allowance and disregarded other income source can reach a maximum level of 130% of the RMG.[8]

The complementary allowance is subject to payment of health/maternity social contribution and long-term care contribution but not of pension contribution (except for individuals who have already been affiliated to the pension insurance for at least 25 years) and beneficiaries can be asked to reimbursed in case they come back to better luck.

Figure 1 reports the number of RMG beneficiaries (individuals and households) since 1987. For the period of interest for this paper, the changes in eligibility rules led to an increase in the eligible population over time, which coupled with a difficult macroeconomic environment of the 2000s can explain the increase in the number of beneficiaries. The 1999 reform was followed by an increase of RMG-holders until 2005. A second increase occurred between 2008 and 2011, followed by a stabilisation of the number of RMG holders which, according to Loutsch and Berger (2019) can be explained by a switch for some of the beneficiaries to a scheme for individuals with disability (RPGH) but also by a strong checks made by the administration. Taking into account the increase of the population size (see Statec website), the proportion of RMG beneficiaries increased regularly from 2.3% to 3.8% from 2001 to 2011 and then remained at this level until 2015.

Figure 1: Number of RMG beneficiaries (1987-2015)

[8] This mechanism was revised in the new REVIS to correct a potential inactivity trap.

Research on social assistance in Luxembourg has been limited. In addition to publication from the social security administration, studies relevant for the current paper are those of Amétépé and Hartman-Hirsch (2010) and Amétépé (2012) analysing the non take up of social assistance and Königs (2012, 2018) who focuses on the dynamics of social assistance benefits. Amétépé (2012) use the 'Panel Socio-Economique Liewen zu Lëtzebuerg' (PSELL3/EU-SILC) to analyse the effectiveness of the RMG in terms of poverty reduction and take up of the benefit. Regarding the latter, and focusing on the population aged at least 18 years old, Amétépé (2012) finds a sizeable non take up rate of 65% in 2007: out of all the households entitled to the RMG, two out of three did not claim the benefits. This level was comparable to the one found in Germany for the same period (Frick and Groh-Samberg, 2007) and France. Part time employed were more likely not to claim the RMG which was interpreted as being the result of stigma while households with non EU immigrants heads were less likely not to claim the benefits but only when not controlling for the occupational status.

On the basis of the FNS monthly records, Königs (2012, 2018) and Immervoll *et al* (2015) analyse the dynamics of the RMG receipts for the years 2001-2009. Königs (2012) finds a high level of persistence in RMG (38% of welfare recipiency last for more than 2 years) while recurrence is low (85% of individuals have no more than 2 benefit spells over the period). These results are comparable to those from the Netherlands and in contrast with those in two Norway and Sweden where long term benefit receipt was an exception but recidivism was frequent.

Social security administration and National Statistical Office provide some portrait of the population of beneficiaires through offical statistics. According to Statec (2012), in 2011, more than half the RMG household are composed of a single adult (56%) while the rest is composed by single parents (18%) and couples with or without children (16%) (see also Loutsch and Berger 2019). Households with children account for approximately one third of the RMG holders and women (54% in 2011) tend to be more represented among RMG

beneficiaries than men (46%). The distribution of beneficiaries by nationality has evolved over time. According to Loutsch and Berger (2019), the share of non luxembourgish among RMG beneficiaries increased from 21% in 1990 to 38% in 2000, 59% in 2010 and 66% in 2017 (See Statec, 2012, for a similar trend for adult population).

4. Data and definitions

We use a set of register micro data for Luxembourg, called SPAFIL (Social Policy Analysis File on Income in Luxembourg) and maintained by the General Inspectorate for Social Security (IGSS - Inspection Générale de la Sécurité Sociale). The dataset is created from administrative social security records and covers annually since 2001 the whole population linked, at a given moment of the calendar year, to the national system of social protection (including cross-border workers) together with cohabiting individuals, which may not be linked to the national system of social protection (e.g. international civil servant married to a person registered to social security).[9] Individuals living in private or collective households (home, jail, etc.) are covered by the data.

The dataset available for this project pertains to the resident population in Luxembourg during the period 2001-2015.[10] Individuals can be linked together by a household identifier but the household unit refers to the fiscal household and not the standard 'resident household' concept used in standard income and living conditions surveys (see Liégeois *et al*, 2011). Fiscal units are composed of individuals married or in formal partnership and children for whom the adults receive family allowances. Two individuals forming a couple without a formal relationship constitute two households.[11]

[9] Households composed only by international civil servants are not covered by the data.
[10] The data contains all the individuals that over the period 2001-2015 have reached the adult age of 18 years old. This means that individuals that were 18 in 2015 are included in the data for the whole period (i.e. they were 4 years old in 2001)
[11] There is no household concept built-in the raw social security data. IGSS has then to rebuild a household concept based on the information available such as the existence of a formal partner relation (wedding or partnership since 2004). Children are associated to the parent receiving family allowance or child tax deduction for them or through which they are co-affiliated to social security. It is not possible to know whether two individuals live together within social security data so that individuals actually living together but not in a formal relationship will count for two households.

In terms of variables, the dataset contains information on all the income sources (labour income, replacement income and social benefits including RMG) available to individuals registered to social security (exceptions are capital income, rental income and private transfers between household).[12] Income components are measured over the calendar year, expressed in gross terms, that is before tax and social contributions, and expressed in intervals in our dataset. The dataset also contains information on socio-demographic or labour market characteristics. Time-varying characteristics are measured on December 31st of each year. The individual variables we use include age, gender, marital status, nationality (current and at birth), occupational status and professional experience.[13] The household variable include the number of children and total household income. Without any selection, our data contains information on 697,201 indivduals over 15 years, which amounts to 7,295,504 persons wave (see Table A1 in annex for details).

The dependent variable was extracted directly from the FNS database and merged to the SPAFIL dataset by IGSS. An individual is considered as a beneficiary of the RMG if he/she has belonged to a household receiving the RMG during a period of time in a given year. This one to one merge does not allow to reconstitute the household composition within the SPAFIL data nor to identify the main applicant of the RMG within the household. This is a drawback of the dataset which is however, to our knowledge, the best available data to analyse the transition in and out of social assistance in Luxembourg.[14]

[12] More specifically, the two datasets of SPAFIL we exploit here are E_RESFRONT, a dataset containing all incomes extracted from social security databases and measured at individual level, and S1_DETAILS, a dataset where the unit of analysis is the fiscal household and which is the outcome of the combination of E_RESFRONT and a microsimulation model to estimate disposable income. The datasets contain gross income component and social contribution but taxes have to be simulated. S1_DETAILS cannot be dissociated from E_RESFRONT and its goal is to measure disposable income: starting from E_RESFRONT, the microsimulation model compute for each individual/household social contribution and personal income tax.

[13] In SPAFIL, the occupational status reflect the situation of December and goes beyond the labour market as an occupational status is report to all the individuals that benefitted from an income from work, a replacement income, a pension or a social benefit. As individuals can receive several incomes during a month, a sequence has been defined by IGSS. For example, an individual combining a salary and a RMG will be recorded as a worker given that income from work comes earlier than RMG benefit in the defined sequence.

[14] The FNS database contains more precise information on the beneficiaries, including an accurate household composition, however it does not contain any information on the non beneficiaries which does not allow to analyse neighbourhood effect.

The key aspect of our data is that it provides precise information at a small geographical unit – the postal code. There are approximately 4000 postal code in Luxembourg which varies in size and in number of observations. To give a sense on our data, Figure 2 reports the distribution of number of observations (and therefore neighbours) per postal code as well as the number of households in 2001-2015. The number of individuals per postal code varies between 1 and 1133, with an average of 120 and a median of 82, while at household level the average is 61 and the median 41. It appears as well that only 10% of the postal code are populated by more than 279 inhabitants (145 households) The number of beneficiaries is naturally lower owing to the low proportion of beneficiaries of social assistance (see previous section) with values going from 0 to 205 for an average of 5 beneficiaries per postal code over the period. These numbers show, that there are opportunities in most of the postal codes to interact with RMG beneficiaries. Information regarding the city of residence in Luxembourg (106 cities) and the local labour market where such city is located (5 local labour market may be distinguished, see for more details Walther & Dautel 2010, Dautel & Walther 2014) are also be derived from this database.

Figure 2: Distribution of individuals and households by postal code (2001-2015)

To deal further with the specicity of the direct environment that the individuals face, we build a diversity index, which is a decreasing transformation of the Herfindahl index, depicting the degree of similarity among agents with respect to their citizenship.

Finally, to have the same order of magnitude between entry and exit and to focus on similar populations in both case, we restrict further our sample to individuals having perceiving the RMG during at least one episode of this period.[15]

[15] While the average entry rate is 0.78%, the average exit rate is 12.92%.

5. Method

Our main strategy of identification follows Bayer, Ross & Topa (2008) by focusing on an exogenous source of variation with respect to the neighbours, provided by very fine granularity of the data. In our data, the neighbouring areas are defined according to the local postal codes corresponding in many cases to the street level. Furthermore, to focus only on this source of variation, i.e. the neighbours, we exclude from our reference group individuals from the same household.

The key of this identification strategy is the exploitation of the thinness of the housing market at a very local level. The distribution of the number of inhabitant at the postal code level in our data is in line with this thinness (see previous section). More precisely, we assume, in accordance with Bayer *et al*. (2008), that individuals are unable to follow an endogenous sorting strategy at this level, leading them first to identify the advantageous characteristics of the neighbours and second to easily rent or buy a location at this place. Consequently, in line with this assumption, any correlation between the characteristics of the neighbours should disappear as far as we condition on postal code fixed effects. We present evidence of this in Table 1 by focusing on the remaining sorting at the postal code level according to different characteristics of the individuals including their nationality, age and other characteristics.

Table 1: Test of endogenous sorting at the city-level and the postal code level

The two remaining elements to handle within this identification strategy are the reflection problem and the potential reverse causality. One way to address the reflection problem is to focus on the behaviour of the neighbours prior to the choice of individuals to move in or out RMG. In practice, we will examine the neighbours' behaviour in t-1 in a robustness check. Reverse causality may apply as well for both mobility in and out of RMG. On one hand, individuals moving into the RMG may suffer from a substantial negative variation

of their income, fostering them to move, for the current period or the next one, to places of residence offering more affordable housing prices. On the other hand, individuals moving out of the RMG by finding a job may have during the same period, or the previous one, move to another area fostering networks effects and employment opportunities. Therefore, not controlling for these changes of place of residence could overestimate the network effects in our case. We deal with this issue by taking advantage of the longitudinal dimension of our dataset including the location place of the individuals. Individuals switching of postal code between t and t-1 (17.4%) and t and t+1 (15.3%) are excluded from the analysis of respectively the mobility in and out of RMG.

As we focus on people moving in and out of RMG during a given year, we model the probability of receiving the RMG in a period conditional on receiving it in the previous period. $Inflow_{ijt} = Pr(RMG_{ijt} = 1 \mid RMG_{ijt-1} = 0)$ refers to individuals entering social assistance while $Outflow_{ijt} = Pr(RMG_{ijt} = 0 \mid RMG_{ijt-1} = 1)$ to individuals exiting social assistance. These variables take the value of 1 if an individual i=1..I, living in area j=1..J at time t = 1 ..T enters/exits RMG and 0 otherwise. Our base model will be the following where $Transitions_{ijt}$ refers to $Inflow_{ijt}$ or $Outflow_{ijt}$:

$$\text{Transitions}_{ijt} = \alpha + \beta X_{it} + \gamma Z_{jt} + \theta_g + \theta_t + \varepsilon_{ijt} \qquad (1)$$

In equation (1), Z_{jt} is a vector of attributes of the area j at time t including the share of RMG-holders and the average characteristics of the neighbours[16], X_{it} is a vector of individual covariates[17] at time t; θ_g is a vector of local fixed effects[18] allowing to control for sorting of

[16] Share of individuals employed, share of unemployed workers, share of individual with a private contract, share of individuals retired or disabled, mean wage, share of individual with a given citizenship.

[17] Number of years of experience on the national labour market, age, gender, number of children, citizenship.

[18] Dummies variables for the communes (106 communes) and dummies variables for the local labour markets (5 local labour markets).

workers among more aggregated areas and θ_t are time fixed effects.[19] Our main coefficient of interest will be γ.

Moreover, to examine further whether the environmental heterogeneity an individual is confronted with matters, we exploit the high diversity of the Luxembourg population (see e.g. Lord & Gerber, 2013). The usual sorting of migrants by country of origin strengthen this opportunity. For that purpose, we include a vector of local diversity detailed above.

It has to be stressed that this identification strategy dealt only with variations at very local level, while interactions among individuals may take place at more aggregate level. Keeping this in mind, we extend the analysis by checking for potential interactions between a random individual and the neighbours of a second random individual, who may be located in different postal code within a given city or a given local labour market.

Assuming that there are remaining interactions at higher level, we develop a complementary approach taking into account the fact that more distant neighbours may affect individuals' social assistance use and that individuals may choose the global area where they live. In that case, the reference group becomes larger including neighbours belonging to the chosen area and a new econometric challenge arises, the sorting of individuals by area. Having in mind that the transitions in and out of RMG may depend on local labour market opportunities, we focus on these areas. Second, in order to handle the resulting selection issue, we use the shift-share type instruments strategy usually applied in the migration literature (Card, 2001), by taking advantages of the availability of former census datasets (1981) providing information where the main groups of individuals were located. This option is based firstly on the observation that migrants tend to locate near migrants from the same country of origin, and secondly, that the attractiveness of local areas may change over time which provides a source of exogenous variation.

[19] Dummies variables for 2002 to 2014.

6. Empirical results

The identification of the neighbourhood effects remains challenging. Most analyses have to deal with first the potential endogenous sorting and second the reflection problem and/or some potential reverse causality. In addition, interactions may take place at different level and their identification may require different strategies. The methodology used in this paper and detailed in the previous section aim at dealing with these issues. To present our main findings, we present first the potential interactions at the postal code level on the mobility in the RMG (Table 2) and out of the RMG (Table 3). We then present the interactions at higher level i.e. the city or local labour markets.

We begin by investigating whether the interactions among individuals may lead an individual to follow the behavior of his neighbours with respect to the entry in the RMG. Model 1 (in column 1) provides a naïve estimate of this effect by allowing for endogenous sorting of the individuals. Control of endogenous sorting is introduced in model 2, by the use of postal code fixed effects. The results highlight in both case a positive and significant effect. However, controlling for endogenous sorting decrease the size of this effect. While in the naïve case a 10 pp increase into the RMG among the neighbours leads to a 1.6 pp increase in the RMG of the individuals, a 0.7 pp increase remains in the second case. All the following results on mobility into the RMG will control for the endogenous sorting. All the results presented in this section deal as well with reverse causality as highlighted in the previous section.

In addition, we examine the impact of the characteristics of the neighbours on the entry into the RMG. These remaining variations almost random, once control for postal code fixed effects, does not appear to affect significantly the behavior of the potential mover in the RMG (Model 3). To strengthen these first results, we control for both the average behavior and average characteristics of the neighbours while taking as well into account the share of RMG

beneficiaries. The results remains rather stable in comparison to previous estimates (detailed results can be provided upon request).

To examine further the potential impact of the characteristics of the neighbours, we focus on their citizenship (Model 4). The large share of migrants among the population provide this opportunity. The distinction between individuals born as Luxembourgish and individuals having acquired this nationality is taken into account. Such distinction appears relevant as these two types Luxembourgish appear to affect in opposite way the entry in RMG, i.e. positive for the natives, negative for the non-natives. The share of some of citizens affect as well positively the entry into RMG, i.e. Portuguese, Germans, other EU-15 nationalities and non-European nationalities. To go further, we focus on the combination of these nationalities at the postal code level by examining the potential impact of diversity among the foreigners (model 5). The use of a diversity among the foreigners, provides evidence of a negative impact of diversity on mobility in RMG. These apparent contradictory results may suggest in accordance with Bertrand *et al* (2000) that foreigners may specifically interact with individuals sharing their citizenship.

Table 2: Estimates of entry into RMG (OLS)

To complete this exam of local interactions we focus on mobility out of RMG (See Table 3). The impact of the behaviour of the neighbour on the mobility out the RMG is similar as the one find for mobility in: a 10 pp increase outside the RMG among the neighbours leads to a 1.1 pp increase outside the RMG, once control for endogenous sorting (Model 2). However, the exam of the impact of the characteristics of the neighbours provide diverging insights when focusing on the mobility outside the RMG. Firstly, the share of old and or disabled persons impact positively the exit from RMG (Model 3), while such effect was negative even non-significant for the inflows. In addition, a positive impact of diversity stand out for mobility out

(Model 5), while a negative impact was found for mobility in. These evidences highlight the usefulness of focusing separately on the mobility in and out to get a more complete picture of the interactions taking place.

A key concern remains to be tackled in our estimations the reflection issue, which is likely to induce simultaneity bias in our estimations. To deal with this problem, we re-examine, as a robustness check, whether the transitions of the neighbours out of RMG in t-1 (i.e. before the transition choice of the individuals examined) still impact the transition of individuals out of RMG in t. The marginal effect (0.08) remains significant and close to the original results (Table 3, Model 6). Unfortunately, data censoring in t-1 in the administrative records, for mainly newcomers in Luxembourg, constrains us to apply these robustness checks for the entry into the RMG.

Table 3: Estimates of exit from RMG (OLS)

It remains however, that all the interactions taking into account until now are at the level of postal codes, while interactions may take place as well at higher levels. To investigate this issue, we randomly select pairs of individuals living in the same postal code or not, but located in the same city (or in the same labour market). Based on these random allocations, we examine whether the neighbours of first individual, may affect the behaviour of the second one likely to leave at some distance. The results, controlling for endogenous sorting of the neighbours through postal code fixed effects, highlight a remaining positive impact of the mobility out of the neighbours and the diversity in terms of citizenship of the neighbours on mobility in for individuals sharing the same city (Table 4a). A positive effect of diversity remains as well when dealing with individuals sharing the same labour market. Conversely, the impact of these variables appears tenuous and non-significant for mobility in RMG, even at the lowest aggregate level, i.e. the city-level (Table 4b).

Table 4: Tests for potential interactions at higher level on mobility in/out the RMG (OLS)

While our tests suggest some interactions among individuals taking place at the city-level or the local labour market level, it remains to identify the existence of such effects. One way to do so is to focus on the diversity variable at the local labour market, by applying a shift-share strategy to deal with the endogeneity of this variable. As a baseline, we also provide basic OLS results for this effect. The results appear in accordance with our previous tests, once endogeneous sorting is taken into account. Basically, diversity among the neighbours at the local labour market impact positively the mobility out of RMG (Table 6). Conversely, diversity becomes non-significant once the shift-share strategy is applied (Table 5).

Table 5: Mobility into the RMG at the local labour market level

Table 6: Mobility out the RMG at the local labour market level

7. Conclusion

This paper analyzes neighbourhood effects on social assistance transition in Luxembourg. Individuals likely to move in or out of RMG appear indeed to follow the behaviours of their direct neighbours. Furthermore, the size of the marginal effects appear somehow similar for both flows, controlling or not for the endogenous sorting of the individuals.

To identify such effects we followed the strategy set-up by Bayer et al. (2008) taking advantage of random variation at a very local level, induced mainly by the constraints of the housing market. In addition, we control for potential reverse causality and the reflection problem by taking advantage of longitudinal data with respect to the place of residence of the individuals.

Further tests highlight that the characteristics of the neighbours, reflecting the specificities of the direct environment that individuals face, have contrasting impact on these two transitions into the RMG. To deal further with the direct environment of the individuals, we focus on the huge diversity characterizing Luxembourg. Contrasting results remain with the negative impact of diversity on the inflows and positive one on the outflows.

Further tests, still based on the Bayer *et al* (2008) set-up highlight potential interactions at higher level, but only for the exit to RMG. Individuals may among other chose a specific place favouring their access to the labour market and therefore their exit from RMG. As such endogenous sorting of individuals may bias our results, we apply an IV strategy based on the shift-share method. The results highlight the positive effect of diversity on the exits and its non-significance effect on the entries. All this may suggest that while diversity may reduce the

probability that individuals from different origin interact, as people with different characteristics are less likely to meet (McPherson *et al*, 2001), the realized interactions may be rather productive enlarging the scope of opportunities on the labour market, even for low-skilled workers, which are overrepresented among RMG holders.

8. References

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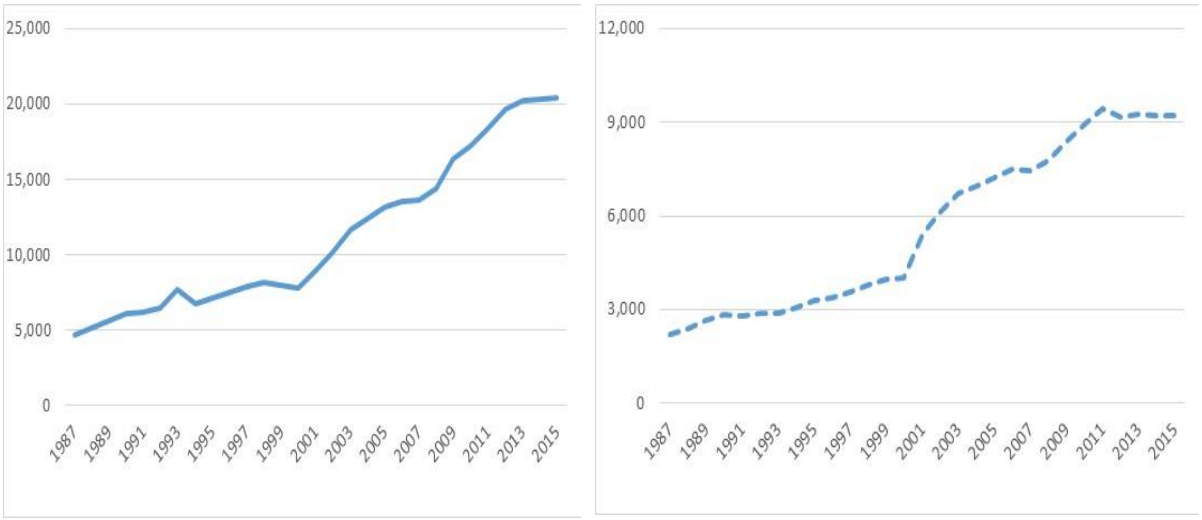
Figure 1: Number of RMG beneficiaries (1987-2015)

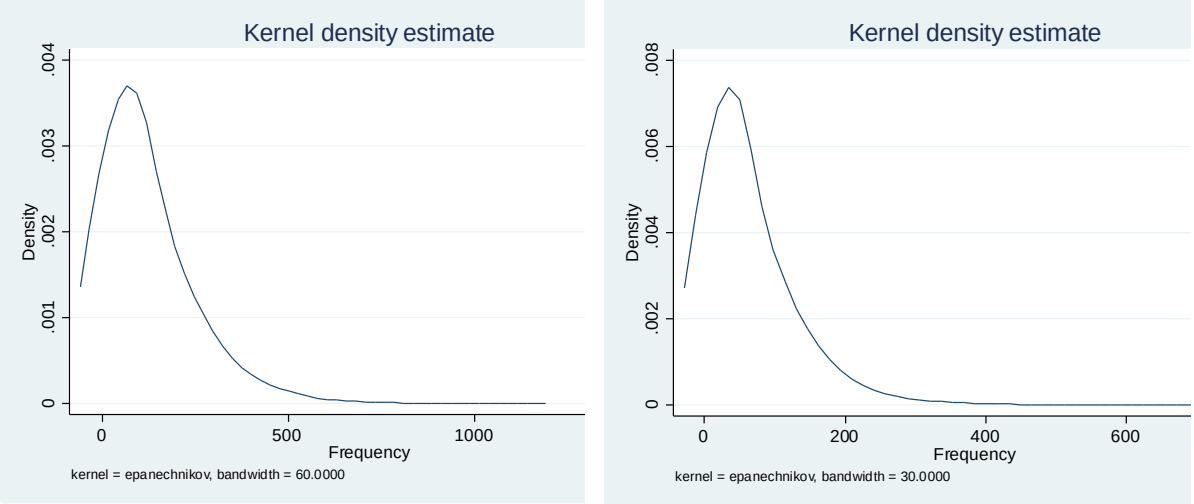
a. Individuals **b.** Households



Source: Authors' Figure based on IGSS official data: https://igss.gouvernement.lu/fr/statistiques/inclusion-sociale/serie-statistique.html

Figure 2: Distribution of individuals and households by postal code (2001-2015)

a. Distribution of individuals **b.** Distribution of households



Source: SPAFIL data, authors' computation

Table 1: Test of endogenous sorting at the city-level and the postal code level

Characteristics of the individual	Unconditional	City + years F.E	Cd postal + years F.E
Citizenship			
Born as Luxembourgish	0.57	0.07	0.01
Recent Luxembourgish	0.24	0.03	0.01
French	0.08	0.03	0.01
Belgian	0.07	0.03	0.01
German	0.04	0.02	0.01
Portuguese	0.32	0.09	0.01
Other EU15	0.09	0.03	0.01
Other EU25	0.03	0.02	0.01
Other	0.16	0.06	0.01
Age			
0-15	0.19	0.02	0
15-24	0.14	0.02	0.01
25-34	0.17	0.03	0.01
35-44	0.17	0.02	0.01
45-54	0.15	0.02	0.01
55-64	0.11	0.02	0.01
65+	0.2	0.07	0.01
Other characteristics			
Married	0.38	0.04	0
Nb of children	0.41	0.08	0.01
Gender	0.51	0.07	0
Wage earner	0.4	0.06	0.01
Unemployed	0.03	0.01	0.01
Old/disabled person	0.15	0.03	0
Allowance	0.25	0.03	0

Source: SPAFIL data,

Table 2: Estimates of entry into RMG (OLS)

	(1)	(2)	(3)	(4)	(5)
$\bar{y}$ Entry_RMG_cd	0.16***	0.07***	0.08***	0.08***	0.08***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Share RMG_cd			0.09***	0.08***	
			(0.025)	(0.025)	
$\bar{x}$ Wage earners cd			-0.04		-0.03
			(0.028)		(0.029)
$\bar{x}$ Household_revenus_cd			0.00		0.00
			(0.004)		(0.004)
$\bar{x}$ Old/disabled persons_cd			-0.02		0.03
			(0.043)		(0.045)
$\bar{x}$ Natio_Lu_at birth_cd				0.10*	
				(0.059)	
$\bar{x}$ Natio_newLu_cd				-0.09*	
				(0.055)	
$\bar{x}$ Natio_Pt_cd				0.16***	
				(0.057)	
$\bar{x}$ Natio_Fr_cd				0.01	
				(0.070)	
$\bar{x}$ Natio_De_cd				0.17*	
				(0.101)	
$\bar{x}$ Natio_Other_EU15_cd				0.22***	
				(0.069)	
$\bar{x}$ Natio_Other_EU25_cd				0.05	
				(0.110)	
$\bar{x}$ Natio_Other_cd				0.22***	
				(0.058)	
$\bar{x}$ Sharing a citizenship_cd				-0.00	-0.01
				(0.011)	(0.011)
Diversity_cd					-0.11***
					(0.035)
Constant	0.06***	1.06***	0.91***	0.80***	1.04***
	(0.003)	(0.210)	(0.075)	(0.086)	(0.082)
Individual fixed effects	-	Inc.	Inc.	Inc.	Inc.
CD postal fixed effects	-	Inc.	Inc.	Inc.	Inc.
Year Fixed effects	Inc.	Inc.	Inc.	Inc.	Inc.
Observations	244,124	244,124	234,466	234,466	234,466
R^2	0.028	0.082	0.096	0.097	0.097

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: SPAFIL data

Table 3: Estimates of exit from RMG (OLS)

	(1)	(2)	(3)	(4)	(5)	(6)
$\bar{y}$ Exit_RMG_cd	0.18***	0.11***		0.11***	0.11***	
	(0.004)	(0.004)		(0.004)	(0.004)	
Share RMG_cd				0.01		
				(0.022)		
$\bar{y}$ Exit_RMG_cd (t-1)						0.09***
						(0.004)
$\bar{x}$ Wage earner_cd			0.02		-0.03	
			(0.023)		(0.026)	
$\bar{x}$ Household_revenus_cd			-0.00		-0.00	
			(0.003)		(0.004)	
$\bar{x}$ Old/disabled persons_cd			0.15***		0.09**	
			(0.035)		(0.040)	
$\bar{x}$ Natio_Lu_at birth_cd				-0.08		
				(0.052)		
$\bar{x}$ Natio_newLu_cd				0.07		
				(0.048)		
$\bar{x}$ Natio_Pt_cd				-0.13**		
				(0.051)		
$\bar{x}$ Natio_Fr_cd				-0.14**		
				(0.062)		
$\bar{x}$ Natio_De_cd				-0.23**		
				(0.090)		
$\bar{x}$ Natio_Other_EU15_cd				-0.11*		
				(0.062)		
$\bar{x}$ Natio_Other_EU25_cd				0.14		
				(0.098)		
$\bar{x}$ Natio_Other_cd				-0.19***		
				(0.051)		
$\bar{x}$ Sharing a citizenship_cd				-0.01	-0.00	
				(0.010)	(0.010)	
Diversity_cd					0.11***	
					(0.031)	
Constant	0.02***	-0.08	-0.14	-0.02	-0.21	0.08
	(0.003)	(0.181)	(0.180)	(0.186)	(0.184)	(0.332)
Individual fixed effects	-	Inc.	Inc.	Inc.	Inc.	Inc.
CD postal fixed effects	-	Inc.	Inc.	Inc.	Inc.	Inc.
Year Fixed effects	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
Observations	240,567	240,567	254,336	240,567	240,567	227,653
R^2	0.030	0.068	0.070	0.068	0.068	0.076

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: SPAFIL data

Table 4: Tests for potential interactions at higher level on mobility in/out of the RMG (OLS)

a. Mobility out of RMG

	City level		Local labour market level	
	(1a)	(1b)	(2a)	(2b)
Mobility out of neighbours	0.04***		0.00	
	(0.004)		(0.004)	
Diversity		0.02**		0.02***
		(0.007)		(0.007)
Constant	-0.20***	-0.20***	-0.19***	-0.21***
	(0.031)	(0.032)	(0.031)	(0.031)
City-level fixed effects	Inc.	Inc.	-	-
Local labour market fixed effects	-	-	Inc.	Inc.
Individual fixed effects	Inc.	Inc.	Inc.	Inc.
Year fixed effects	Inc.	Inc.	Inc.	Inc.
Observations	232,803	232,004	235,507	247,418
R^2	0.026	0.025	0.026	0.026

b. Mobility in RMG

	City level		Local labour market level	
	(1a)	(1b)	(2a)	(2b)
Mobility in of neighbours	-0.00		0.00	
	(0.004)		(0.004)	
Diversity		0.00		-0.00
		(0.008)		(0.007)
Constant	0.60***	0.60***	0.61***	0.60***
	(0.036)	(0.036)	(0.035)	(0.034)
Individual fixed effects	Inc.	Inc.	Inc.	Inc.
Year fixed effects	Inc.	Inc.	Inc.	Inc.
Observations	213,659	226,314	228,438	241,315
R^2	0.058	0.058	0.058	0.058

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: SPAFIL data

Table 5: Mobility into the RMG at the local labour market level

	(OLS)	(IV)
Diversity	-0.13*	-0.10
	(0.078)	(0.077)
Mobility in of neighbours	0.70***	0.70***
	(0.024)	(0.024)
$\bar{x}$ Sharing a citizenship	0.04***	0.04***
	(0.007)	(0.007)
Constant	0.20***	0.17**
	(0.074)	(0.073)
Individual fixed effects	Inc.	Inc.
Local labour market fixed effects	Inc.	Inc.
Year fixed effects	Inc.	Inc.
Observations	247,921	247,921
R^2	0.038	0.038

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: SPAFIL data

Table 6: Mobility out the RMG at the local labour market level

	(OLS)	(IV)
Diversity	0.17**	0.21***
	(0.076)	(0.077)
Mobility out of neighbours	1.01***	1.00***
	(0.028)	(0.028)
$\bar{x}$ Sharing a citizenship	-0.02**	-0.02**
	(0.007)	(0.007)
Constant	-0.16**	-0.20***
	(0.070)	(0.071)
Individual fixed effects	Inc.	Inc.
Local labour market fixed effects	Inc.	Inc.
Year Fixed effects	Inc.	Inc.
Observations	254,362	254,362
R^2	0.031	0.031

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: SPAFIL data

Appendix:

Table A1: sample size, by gender and year

Year	Women	Men	Total
2001	223453	220496	443949
2002	225971	223363	449334
2003	228851	226675	455526
2004	231522	229388	460910
2005	233960	232151	466111
2006	236138	234549	470687
2007	239737	237821	477558
2008	243688	242004	485692
2009	247056	245032	492088
2010	251148	249648	500796
2011	256036	255123	511159
2012	259094	258291	517385
2013	260222	259409	519631
2014	261025	260190	521215
2015	262050	261413	523463
Total	**3659951**	**3635553**	**7295504**

Source: SPAFIL